Progress®



Progress Developer Studio for OpenEdge

Online Help

OpenEdge®

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Preface

Purpose

This content is an introduction to the OpenEdge database Docker container images. It describes the high-level tasks to perform when working with the database container images.

Audience

This content is for OpenEdge developers who want to test and validate changes to their business logic by creating OpenEdge databases on demand and dispose of them as soon as the purpose is served.

Organization

This content covers the following sections:

- Why use OpenEdge database Docker containers?
- What are the prerequisites for using OpenEdge database Docker containers?
- What are the main tasks to perform when using OpenEdge database Docker containers?

Documentation conventions

See Documentation Conventions for an explanation of the terminology, format, and typographical conventions used throughout the OpenEdge content library.

1

Learn About Progress Developer Studio for OpenEdge

Progress Developer Studio for OpenEdge® is an integrated ABL development environment that helps you to :

- Quickly build user-interface and business logic
- Incorporate and manage application data sources
- Run, debug, and deploy code

Progress Developer Studio for OpenEdge consists of a set of editors, views, dialogs, and wizards that run in the Eclipse framework. Because Eclipse is an open-source, plug-in based framework, you can integrate a wide variety of software tools into the Eclipse installation that supports Progress Developer Studio for OpenEdge. See the Eclipse Plugin Central Web site for more information.

For details, see the following topics:

- Concepts
- Tasks
- Reference

Concepts

Eclipse terminology

Eclipse is an open, extensible development environment that supports a wide range of tools and applications from diverse sources. All applications are installed as plug-ins to the Eclipse environment. You can read about and obtain many such plugins at http://www.eclipseplugincentral.com.

While running Eclipse, you have access to its extensive online documentation. You can refer to the Eclipse Workbench User Guide, accessible from **Help** > **Help Contents**. Also see Eclipse information resources on page 25 for links to external sources of Eclipse information.

A workspace is a folder where your work is stored. A workspace can contain almost any number of projects, which are usually structured as sub-folders of the workspace folder. When you start Progress Developer Studio for OpenEdge, Eclipse prompts you for the path name of your workspace. You can enter either an existing or a new folder.

An important fundamental concept is that Eclipse is a project-based environment. Projects contain resources, which are the files and folders that are organized under a particular project name. You can create resources within a project, import them from another project, or add them from your file system.

Eclipse presents information in windows called views, each of which serves a specific purpose. For example, the Outline view shows the logical structure of a resource, such as an ABL source code file or an application model. The Database Structure view allows you to examine a database schema.

In addition to views, each perspective usually includes an editing area. You can work with multiple files of different types simultaneously in this area, using the appropriate editor for each file according to its type.

Work with OpenEdge perspectives on page 31

In the Eclipse Workspace, you can arrange multiple views and save that set of views as a perspective. Progress Developer Studio for OpenEdge offers several predefined perspectives integrating diverse tools that combine to support a broader function, such as code editing, debugging, or database design.

See also

Work with OpenEdge perspectives on page 31
OpenEdge perspectives and views on page 43

Preferences and properties

In Eclipse, the distinction between preferences and properties is generally a matter of scope. Preferences apply to the entire workspace, while properties apply to individual resources.

Preferences usually apply either to the Eclipse framework itself or to individual plug-ins. To access preference dialogs, select **Window** > **Preferences** on the main menu bar. From the preference dialogs, you can access pages containing general Eclipse settings as well as pages for individual plug-ins. For example, there are preferences that apply to all the editors that are installed in the Eclipse workbench. There are also preferences that apply only to specific editors (such as the ABL Editor, the Visual Designer, and XML editors).

Properties tend to have a narrower scope. They apply to individual resources (projects, folders, or files) in a workspace. To access property sheets, right-click on a selected resource in a Resources view and select Properties from the context menu.

Note: When an OpenEdge project uses the shared AVM, some project properties must be set at the workspace level. These properties (AppBuilder, Assemblies, Database Connections, Projects, and PROPATH) are identical for all projects that use the shared AVM. Set workspace-level properties from dialogs under the **Shared OpenEdge AVM preference** page from the main menu bar (**Window** > **Preferences** > **Progress OpenEdge** > **Shared AVM**) .

See also

Eclipse Terminology on page 18
The ABL Virtual Machine AVM on page 19
Set Workspace preferences on page 29
Set project properties on page 65
Preferences on page 33
Shared AVM preference page on page 36

Database connection profiles

Database connection profiles contain all the information necessary to connect to a database. The information can include startup parameters, user name and password, host name, port number, and more. Connection profiles are stored in an XML file (`databaseConnection.xml`), which is part of the metadata of a workspace.

Database connection profiles are available to all projects in a workspace. You can select any or all of the profiles from a project's Database Connections property sheet.

You can transfer the database connection profiles to other workspaces using Export/Import utilities in Progress Developer Studio for OpenEdge.

See also

Add a new database connection to a project on page 64
Add existing database connections to a project on page 64
Export database connections on page 68
Import database connections on page 69
Database preferences on page 35
Add/Edit Connection Profile wizard on page 39
Export workspace database connections page on page 90
Import workspace database connections page on page 87

The ABL Virtual Machine (AVM)

Basically, the AVM is a platform for compiling and running ABL code. Often called the OpenEdge runtime or client, the AVM also provides many other services, such as performing syntax checks, running OpenEdge and user-designed tools, and running startup procedures. In Progress Developer Studio for OpenEdge, every OpenEdge project is associated with an AVM.

Note: The AVM process is `prowin.exe` for Windows applications and `_progres.exe` for TTY applications.

Project-specific AVMs

You might want to configure individual AVMs when projects in a workspace do not have the same requirements. You could, for example, create projects with different PROPATH settings by configuring an individual AVM for each project.

Configure project-level AVMs on the properties pages for OpenEdge projects (**Project** > **Properties** > **Progress OpenEdge**).

Shared AVMs

You can configure an AVM that is available to every project within a workspace. If, for example, you are developing an application that is divided into multiple project modules within a single workspace, you might want all the project modules to use an AVM that has the same startup parameters, the same PROPATH, the same database connections and so on. Configuring a shared AVM for all the project modules guarantees that all those settings are the same. In addition, the shared AVM conserves memory and CPU resources.

You configure a shared AVM as a workspace preference (**Window** > **Preferences** > **Progress OpenEdge** > **Shared AVM**).

Runtime AVMs

By default, when you run an ABL executable in a project, the AVM associated with the project (project-specific or shared) runs the ABL executable. However, you can also create launch configurations that start a new instance of the AVM when you run the file.

Configure separate runtime AVMs when you create launch configurations in your workspace (**Run** > **Run Configurations...**).

Note: You cannot use a shared or project-level AVM when you are running in debug mode. You must configure a separate runtime AVM (**Run** > **Debug Configurations...**).

See also

Preferences and properties on page 18
Set the default AVM startup parameters on page 29
Set up a shared AVM on page 30
Shared AVM preference page on page 36
Startup preference page on page 34

Get started with Progress Developer Studio for OpenEdge

Getting started with Progress Developer Studio for OpenEdge requires some basic knowledge of the Eclipse framework. At a minimum, you should understand the following concepts that are explained in the Eclipse Workbench User Guide:

- Projects
- Views
- Perspectives

Also see the Basic Tutorial in the Eclipse Workbench User Guide for more information about working in the Eclipse framework.

See the following help topics when you are ready to begin using Progress Developer Studio for OpenEdge:

- Start Progress Developer Studio for OpenEdge on page 27
- Set workspace preferences on page 29
- Work with OpenEdge perspectives on page 31
- Get help on page 21

Once Progress Developer Studio for OpenEdge is running, either open an existing project or create a new project.

See also

Eclipse terminology on page 18
Preferences and properties on page 18
Database connection profiles on page 19
The ABL Virtual Machine (AVM) on page 19
Start Progress Developer Studio for OpenEdge on page 27
Set workspace preferences on page 29
Work with OpenEdge perspectives on page 31
Get help on page 21
Learn About OpenEdge Projects on page 47
OpenEdge workspace preferences on page 33
OpenEdge database connection wizard on page 39
OpenEdge perspectives and views on page 43

Get help

This topic describes how to locate and use the help that is available for Progress Developer Studio for OpenEdge.

Help display options

To change the way help is displayed, select **Windows** > **Preferences** from the main menu bar of Progress Developer Studio for OpenEdge . Select the Help node in the tree view. The various options for displaying help appear.

For example, you can choose to display help in an external browser rather than in the Eclipse help browser. Displaying help in an external browser is useful when you are working in a modal window in Eclipse. If you are viewing help in the default Eclipse browser, you cannot view help when the modal window is open. If you display help in an external browser, you can change focus from the modal window to the browser.

For more information about help display options, see in the Eclipse Workbench User Guide.

See also

The Progress Developer Studio for OpenEdge Guide on page 21
Search on page 22
Context sensitive help on page 23
Context sensitive help for NE controls Windows only on page 23
Visual Designer tutorials on page 24
Cheat sheets on page 24
OpenEdge information resources on page 24
Eclipse information resources on page 25

The Progress Developer Studio for OpenEdge Guide

The Progress Developer Studio for OpenEdge Guide, an online help volume in the Eclipse help system, is the primary source of documentation for the tools in Progress Developer Studio.

The content of the Progress Developer Studio for OpenEdge Guide is organized under the following topics:

- Learn About Progress Developer Studio for OpenEdge on page 17—Contains help on basic topics, such as starting Progress Developer Studio for OpenEdge setting up a workspace, working with perspectives, and getting help.
- Learn About OpenEdge Projects on page 47—Describes how to set up and use OpenEdge projects.
- REST project type on page 140—Describes REST support in Progress Developer Studio for OpenEdge.
- Learn About ABL WebApp on page 197—Describes Data Object support in Progress Developer Studio for OpenEdge.
- Learn About OpenEdge Business Rules on page 233—Describes OpenEdge Business Rules in Progress Developer Studio for OpenEdge.
- Learn About ABL Editor on page 261—Contains help on using the ABL code editor.
- Learn About Visual Designer on page 369—Contains help on developing graphical user interfaces with .NET forms and controls.
- Learn About Class Browser on page 433—Contains help on an Progress Developer Studio for OpenEdge view that allows you to see the structure and content of the various classes that you work with in creating ABL applications. The Class Browser's contents are organized by resources, which are collections of classes (types).
- Run and Debug ABL Programs on page 451—Contains help on using launch configurations and the ABL Debugger.
- Learn About ABL GUI Designer on page 519—Describes how to launch and run non-Eclipse OpenEdge tools (such as the AppBuilder and the Data Dictionary).
- Learn About Meta Catalog on page 689—Contains help on a tool for indexing and finding code elements.
- Learn About Business Logic Tools on page 719—Contains help on tools for modeling application components.
- Learn About Developer Studio Customization on page 751—Describes how to modify the Progress Developer Studio for OpenEdge user interface, how to create automated startup procedures, and how to subscribe to events.

In addition to the Progress Developer Studio for OpenEdge Guide, the Progress DB Navigator Guide provides help on a tool you can use to manage, explore, and connect to databases.

See also

Help display options on page 21
Search on page 22
Context-sensitive help on page 23
Context-sensitive help for .NET controls (Windows only) on page 23
Visual Designer tutorials on page 24
Cheat sheets on page 24
OpenEdge information resources on page 24
Eclipse information resources on page 25

Search

The default Eclipse help browser allows you to limit text searches to specified modules in the help system. Use the Search scope link at the top of browser to define a named search scope.

You can also modify your searches by creating query statements or by expanding or limiting results. See in the Eclipse Workbench User Guide.

Also note that you can do an index search. On the Eclipse help browser, click on the index icon at the bottom of the Contents pane. The Index pane, which allows you to either search or browse the index, replaces the Contents pane

See also

The Progress Developer Studio for OpenEdge Guide on page 21
Help display options on page 21
Context sensitive help on page 23
Context sensitive help for NET controls Windows only on page 23
Visual Designer tutorials on page 24
Cheat sheets on page 24
OpenEdge information resources on page 24
Eclipse information resources on page 25

Context-sensitive help

To access the help for a particular user-interface element (view, editor, or dialog):

1. Change focus to the user-interface element.
2. Press **F1**. Or, in some cases, click on a help icon .

A list of topics appears either in an or in a Help view. (See in the Eclipse Workbench User Guide for information.) In either case, you see a primary list of topics at the top. At the bottom, you can access dynamic help which is a list of topics generated by a search on the name of the widget and the name of the perspective.

If you want to see the Progress Developer Studio for OpenEdge help topics in the primary list of available topics, select an element within the widget (for example, a node in a tree view or a text field). Otherwise, you might see general Eclipse help in the primary list with the Progress Developer Studio for OpenEdge topics appearing in the dynamic help list.

See also

The Progress Developer Studio for OpenEdge Guide on page 21
Help display options on page 21
Search on page 22
Context sensitive help for NET controls Windows only on page 23
Visual Designer tutorials on page 24
Cheat sheets on page 24
OpenEdge information resources on page 24
Eclipse information resources on page 25

Context-sensitive help for .NET controls (Windows only)

When you are working in the Visual Designer, you can get help on an individual control by pressing **F1** when a control is selected on the Design Canvas.

See also

Get control-specific information on page 384
The Progress Developer Studio for OpenEdge Guide on page 21
Help display options on page 21
Search on page 22

Context sensitive help on page 23
Visual Designer tutorials on page 24
Cheat sheets on page 24
OpenEdge information resources on page 24
Eclipse information resources on page 25

Visual Designer tutorials

You can find tutorials that explain the features and functions of the OpenEdge Visual Designer in Learn About Visual Designer on page 369.

Note: The Visual Designer runs only on Windows platforms.

See also

The Progress Developer Studio for OpenEdge Guide on page 21
Help display options on page 21
Search on page 22
Context sensitive help on page 23
Context sensitive help for NET controls Windows only on page 23
Cheat sheets on page 24
OpenEdge information resources on page 24
Eclipse information resources on page 25

Cheat sheets

The Eclipse framework provides cheat sheets as guides for completing complex procedures. This release provides a number of cheat sheets that supplement the procedural help for Progress Developer Studio for OpenEdge. Choose **Help** > **Cheat Sheets** from the main menu bar to view the list of available cheat sheets.

See also

The Progress Developer Studio for OpenEdge Guide on page 21
Help display options on page 21
Search on page 22
Context sensitive help on page 23
Context sensitive help for NET controls Windows only on page 23
Visual Designer tutorials on page 24
OpenEdge information resources on page 24
Eclipse information resources on page 25

OpenEdge information resources

There is a lot of useful information about OpenEdge available at the following Web sites:

OpenEdge Community

http://communities.progress.com/pcom/community/psdn/openedge

http://communities.progress.com/pcom/community/psdn/openedge

OpenEdge Architect (Progress Developer Studio for OpenEdge) forum

http://communities.progress.com/pcom/community/psdn/openedge/architect

OpenEdge Product Tour and Progress Software Evaluation Kits

http://communities.progress.com/pcom/docs/DOC-11318

OpenEdge documentation

http://communities.progress.com/pcom/docs/DOC-16074

Education Services

http://web.progress.com/en/education/index.html

Technical Support

http://web.progress.com/en/openedge/support.html

See also

The Progress Developer Studio for OpenEdge Guide on page 21
Help display options on page 21
Search on page 22
Context sensitive help on page 23
Context sensitive help for NET controls Windows only on page 23
Visual Designer tutorials on page 24
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Eclipse information resources

Primary documentation for the Eclipse platform is available in the Eclipse Workbench User Guide, which is included in the online help for Progress Developer Studio for OpenEdge (**Help** > **Help Contents**). For documentation and articles about Eclipse, go to the eclipse.org Web site.

See also

The Progress Developer Studio for OpenEdge Guide on page 21
Help display options on page 21
Search on page 22
Context sensitive help on page 23
Context sensitive help for NET controls Windows only on page 23
Visual Designer tutorials on page 24
Cheat sheets on page 24
OpenEdge information resources on page 24

Introduction to Code Analyzer for ABL

Code Analyzer for ABL (CABL) is a third-party plugin. While installing **OpenEdge 12.0**, you will have the option to install Code Analyzer for ABL. If you choose to install Code Analyzer for ABL, the plugin will get installed in **Progress Developer Studio for OpenEdge**.

Code Analyzer for ABL continuously analyzes and measures the quality of your code and highlights any problems. Code Analyzer for ABL also provides recommendations on how to fix the problem. This helps to achieve coding best practices and to improve product performance.

You can run Code Analyzer for ABL on a specific file, a set of files, recently changed files or even the complete project.

If you right-click on the project and rollover Code Analyzer for ABL, the following three options are displayed:

- Analyze changed files
- Analyze
- Bind to a SonarQube project

If you right-click on a file and rollover Code Analyzer for ABL, the following two options are displayed:

- Analyze
- Exclude

You can manage Code Analyzer for ABL project properties by right-clicking the project and selecting Code Analyzer for ABL from the context menu. Click the **arrow** to view the properties.

- **Analyzer Properties** — This property allows you to configure the analyzer options.
- **File Exclusions** — This property allows you to choose the file(s) to be excluded from analysis.

To include the file again, select **File Exclusions** in your project **Properties** and then remove the specific file.

Code Analyzer for ABL also allows you to review highlighted issues in the editor. To do this, place your cursor on the **red circle marker** on the left of the line of code.

To view Code Analyzer for ABL properties, open the Code Analyzer for ABL panel from **Window** > **Preferences** > **Code Analyzer for ABL**.

- **General Code Analyzer for ABL Settings** — In this tab, you can configure the severity of the Code Analyzer for ABL marker.

Click the arrow beside Code Analyzer for ABL to view the other properties.

- **Analyzer Properties** — This property allows you to configure the analyzer options.
- **File Exclusions** — This property allows you to choose the file(s) to be excluded from analysis.
- **Miscellaneous** — This property allows you to provide usage statistics to the software provider anonymously.
- **Rules Configuration** — You can enable rules by clicking on the checkboxes accordingly.

After modifying any of the properties, click **Apply** or **Apply and Close**.

Views

There are five views of Code Analyzer for ABL.

- **Code Analyzer for ABL Issue Location** — In this panel, you can view the exact location of the issue.
- **Code Analyzer for ABL On-The-Fly** — In this panel issues are displayed and updated as you type your code.
- **Code Analyzer for ABL Report** — This panel opens by default when you open Developer Studio. This provides you with a comprehensive report of the issues in the file(s) or project.
- **Code Analyzer for ABL Rule Description** — This panel provides you with the details of all available rules.
- **SonarQube Servers** — This panel allows you to connect to SonarQube server.

Rules

Code Analyzer for ABL for OpenEdge comes preconfigured with six complementary rules. To enable them, click on the checkboxes in the **Window** > **Preferences** > **Code Analyzer for ABL** tab. Click the **arrow** beside Code Analyzer for ABL and from the list, select **Rules Configuration**. Check **oe** and **oedb** to enable the six rules for ABL code.

There are five rules for **oe** and one for **oedb**. Below are the details.

- oe
  - Backslash in string — highlight backslash character in strings, as they are compiled differently on UNIX and Windows
  - MD5 / SHA1 usage — reports usage of outdated hash algorithms
  - Unused variables — highlight variables which are neither read nor written during the flow of execution
  - CAN-DO in WHERE clause — highlight usage of CAN-DO in a WHERE clause, causing performance issues
  - Detect WholeIndex — on database tables (if XML XREF is activated in PDSOE)
- oedb
  - No indexes — highlights table where no index is defined (applies to DF files)

To review the rule descriptions, **right-click** on the issue in the **Code Analyzer for ABL Report** panel and click **Rule Description**. The **Rule Description** panel is displayed with the details.

More customized rules can be created if needed. To know how to create rules, refer to SonarQube rules

For more information on **Code Analyzer for ABL**, refer to Get started with SonarQube and CABL - Code Analyzer for ABL.

Tasks

Start Progress Developer Studio for OpenEdge

Launch Progress Developer Studio for OpenEdge from the Start menu by selecting one of the Developer Studio items under the **Progress** node.

Note: Some of the Developer Studio items include the **Clean** (`-clean`) option. The -clean option in the startup command clears any cached data before starting the Eclipse executable. This is useful when restarting Eclipse after modifying any plugins. It ensures that you see the latest version of all files.

In general, the Progress Developer Studio for OpenEdge startup sequence is:

1. Eclipse starts, modified by any startup parameters set on a command line or in icon properties. (See Set Eclipse startup preferences on page 28.)
2. The **Workspace Launcher** dialog appears and prompts you to specify the path of a workspace. (See Select a workspace on page 28.)
3. The Eclipse Workbench appears in one of the following modes:

- If you specified a new workspace, Eclipse opens displaying the **Welcome to Progress Developer Studio** page.
- If you specified an existing workspace, Eclipse attempts to start the AVM and any required database connections.The Workbench displays an existing workspace in the state in which it was left the last time it was opened.

See also

Set Eclipse startup preferences on page 28
Select a workspace on page 28
Set up a shared AVM on page 30
Set workspace preferences on page 29

Set Eclipse startup preferences

- When you start Progress Developer Studio for OpenEdge from a desktop icon or from a Start menu selection, the default startup command points to the `OpenEdge-install-dir/oeide/launchPDSOE.bat` batch script, which in turn points to the Eclipse executable (**eclipse.exe**) and the JRE that was specified during the installation of OpenEdge.
- You might need to add startup parameters to the default so that Progress Developer Studio for OpenEdge runs on your system. For example, the default memory allocation (256MB) for Java might be inadequate in your operating environment. You can add the following command line parameters to increase the available memory for Java:

  ```
  -vmargs -Xmx<memory size>
  ```

- In Windows, you can open the properties of a desktop icon or a Start menu selection and add startup parameters in the Target field of the **Properties** dialog .

Note: Running Eclipse (in the Eclipse Workbench User Guide), scroll to Advanced Topics in Running Eclipse for a complete list of startup parameters.

Select a workspace

- When you start Progress Developer Studio for OpenEdge, Eclipse prompts you to specify a workspace in the **Workspace Launcher** dialog. A workspace is a folder that contains the content of your projects along with any project metadata.
- You can specify an existing workspace, or you can specify a folder in your file system that will function as a workspace. By default, the **Workspace Launcher** dialog maintains a list of the last five workspaces that you used.
- You can change workspaces when Progress Developer Studio for OpenEdge is running by selecting **File** > **Switch Workspace** from the main menu bar. Progress Developer Studio restarts when you change workspaces. If you want to work in multiple workspaces, you must start a separate instance of Progress Developer Studio for each workspace.

Note: See files in the Eclipse Workbench User's Guide.

See also

Eclipse terminology on page 18
Start Progress Developer Studio for OpenEdge on page 27

Set workspace preferences

Workspace preferences are settings that apply to all the projects in a workspace. To set workspace preferences for OpenEdge projects:

1. Select **Window** > **Preferences**.

   Preference pages contributed by plugins are listed in the tree view in the left pane.
2. Expand the OpenEdge node.
3. Select a preference page and specify the desired options.

See also

Preferences and properties on page 18
Eclipse terminology on page 18
Set the default AVM startup parameters on page 29
Set up a shared AVM on page 30
OpenEdge workspace preferences on page 33

Set the default AVM startup parameters

To set the default AVM startup parameters:

1. Select **Window** > **Preferences**.

   Preference pages contributed by plugins are listed in the tree view in the left pane.
2. Expand the Progress OpenEdge node.
3. Select the Startup node.
4. Specify the desired port ranges and startup parameters.

   Do not specify database connections as startup parameters. Use the **Database Connections** tab in the **Project Properties** dialog instead.

The startup parameters in the Default Development Startup field can be included, appended to, or overridden on a project's OpenEdge properties page. The default startup parameters can also be included, appended to, or overridden on the Shared OpenEdge AVM preference page.

See also

The ABL Virtual Machine (AVM) on page 19
Start Progress Developer Studio for OpenEdge on page 27
Startup preference page on page 34
Shared AVM preference page on page 36

Set up a shared AVM

To configure a shared AVM:

The shared AVM starts if there is a project associated with it.

1. Select **Window** > **Preferences** from the main menu bar of Progress Developer Studio for OpenEdge.
2. Open **Progress OpenEdge** > **Shared OpenEdge AVM** in the tree view of the **Preferences** dialog.
3. Set the AVM startup parameters on the Shared OpenEdge AVM preference page.
4. In the child nodes of the Shared OpenEdge AVM page, you can set the other properties (AppBuilder, Assemblies, Database connection, and PROPATH) that affect all the projects that use the shared AVM. In addition, you can choose which projects use the shared AVM.

See also

The ABL Virtual Machine (AVM) on page 19
Start Progress Developer Studio for OpenEdge on page 27
Shared AVM preference page on page 36
Startup preference page on page 34

Export the Workspace Settings

You can export your current workspace settings so that you can apply the same preferences to another settings.

To export Workspace settings:

1. Select **File** > **Export** from the main menu bar of Progress Developer Studio for OpenEdge.

   The **Export** wizard opens.
2. Select **Progress OpenEdge** > **Workspace Settings** and click **Next**.

   The **Export Workspace Settings** page appears.
3. Perform the steps as mentioned:

   - Select **Progress OpenEdge Preferences** to export all the preferences in the **Window** > **Preferences** > **Progress OpenEdge** node.
   - Select **Progress Databases Preferences** to export all the preferences in the **Window** > **Preferences** > **Progress Databases** node.

   Note: Progress OpenEdge Preferences is specific to Progress Developer Studio for OpenEdge settings.

   Only the modified preferences get exported, not the ones that are present by default.

   ---

4. Select the location where you want to save the .zip file in **To Archive file**.
5. Click **Finish**.

   The preferences (for the Progress Databases and Progress OpenEdge nodes in the workspace) are saved to `*.zip` file.

Import the Workspace Settings

You can import saved workspace settings to your current workspace.

1. Select **File** > **Import** from the main menu bar of Progress Developer Studio for OpenEdge.

   The **Import** wizard opens.

2. Select **Progress OpenEdge** > **Workspace Settings** and click **Next**.

   The **Import Worspace Settings** page opens.

3. Select the location of the `*.zip` file in the **From Archive file** from where you want to import the settings.

4. Perform the tasks as mentioned:

   - Select **Progress OpenEdge Preferences** to import all the preferences in the **Window** > **Preferences** > **Progress OpenEdge** node.
   - Select **Progress Databases Preferences** to import all the preferences in the **Window** > **Preferences** > **Progress Databases** node.

5. Click **Finish**.

   Note: You must restart the workspace for the preferences to take effect.

   The preferences settings are applied to your current workspace.

Work with OpenEdge perspectives

The perspectives included with Progress Developer Studio for OpenEdge are OpenEdge AppBuilder, OpenEdge Server, Debugger, DB Navigator, OpenEdge Editor, OpenEdge Tools for Business Logic, and OpenEdge Visual Designer.

See also

Open a perspective on page 31
Modify a perspective on page 32
Set a perspective to its default state on page 32
Eclipse terminology on page 18
OpenEdge perspectives and views on page 43

Open a perspective

Opening a perspective

To open an OpenEdge perspective in the Eclipse Workbench:

1. Select **Window** > **Open Perspective**.
2. Select an OpenEdge perspective from the list.

See also

Eclipse terminology on page 18
Modify a perspective on page 32
Set a perspective to its default state on page 32
OpenEdge perspectives and views on page 43

Modify a perspective

You can add views to a perspective, and you can close currently open views, thereby removing them from the perspective. You can save a given configuration of views as a custom perspective.

To modify the current perspective:

1. Select **Window** > **Show View** from the main menu bar.
2. Select Other to display a full set of views, organized in categories shown as folders, from which you can choose. You can select any view. Progress Developer Studio views are in folders whose names begin with "Progress."

   Note: The views in the Progress OpenEdge Support Views folder are not intended to be selected. OpenEdge automatically displays these views when they are required. If selected from the **Show View** list, they may appear empty and non-functional.

3. To remove a view from the current perspective, close it by clicking the X on the view's tab.
4. To save your current configuration of views as a perspective, choose **Save Perspective As** from the **Window** menu and enter a name. You can overwrite an existing perspective by entering its name (a confirmation prompt appears), but it is not recommended. It is advisable to leave the standard Progress Developer Studio perspectives unchanged so that you retain the ability to return to a default state.

See also

Eclipse terminology on page 18
Open a perspective on page 31
Set a perspective to its default state on page 32
OpenEdge perspectives and views on page 43

Set a perspective to its default state

1. After you change a standard perspective by adding or removing views, you might want to reset it to its unmodified state. To do so, choose **Window** > **Reset Perspective**, and click **OK** at the confirmation prompt.
2. The perspective returns to its last-saved state. To ensure that you can always return to the original, as-installed state, refrain from saving changes to a standard perspective. Instead, save your custom perspective with a new name.

See also

Eclipse terminology on page 18
Open a perspective on page 31
Modify a perspective on page 32
OpenEdge perspectives and views on page 43

View the log files

To view the following log files, browse to the `.metadata` folder in your workspace:

- **Logs** folder — Contains feature-specific log files.
- **`.log`** file — Displays all the log entries for the Developer Studio. It includes all the log entries in the various feature-specific log files.
- **`Log4j.properties`** file — Displays the log settings for each logger. Each workspace has its own `log4j.properties` file. If you edit the properties for a specific logger, it changes the logging in the feature-specific log file and not the `.log` file. You must restart the workspace after editing the file.

Note: For more information on editing these log settings, see the log4j Apache documentation.

Reference

OpenEdge workspace preferences

Preferences usually apply either to the Eclipse framework or to individual plug-ins. To access preference dialogs, select **Window** > **Preferences** on the main menu bar. From the **Preference** dialog, you can access pages containing general Eclipse settings as well as pages for individual plug-ins. For example, there are preferences that apply to all the editors that are installed in the Eclipse workbench, and there are also preferences that apply only to specific editors (such as the ABL Editor, the Visual Designer, and XML editors).

See also

Eclipse terminology on page 18
Preferences and properties on page 18
Set workspace preferences on page 29
Views preference page on page 33
Database Connections preferences on page 35
Shared AVM preference page on page 36
Preference pages for OpenEdge tools on page 38

Views preference page

The Views preference page allows you to set some general preferences that affect the Console, Outline, and Resources views. It also allows you to suppress or enable warning messages regarding running code that contains errors.

Select **Window** > **Preferences** to open the **Preferences** dialog. In the tree view, expand Progress OpenEdge and select Views to open the Views preference page.

The following options are available on the Views preference page:

Show compile log in Console view	Display build messages in the standard **Eclipse Console** view. No build messages are displayed when this check box is cleared.

Show informational messages in Console view	Display informational messages (such as project startup status) in the standard **Eclipse Console** view. No informational messages are displayed when this check box is cleared.
Show warning messages in Console view	Display warnings (such as the failure to start the AVM) in the standard **Eclipse Console** view. No warnings are displayed when this check box is cleared.
Split functions and procedures in Outline view	Display functions and procedures in separate categories in the Outline view while editing an ABL source file. The alternative is to show procedures and functions grouped together in a single category labeled Code Sections. Regardless of the setting here, you can toggle between these two display options by double-clicking the root node for one of the categories (Functions, Procedures, or Code Sections).
Show procedure libraries in Resources view	Include a fully expandable node in the **Resources** view that shows all procedure libraries available to each project. Clear this check box if you do not want this node to appear in the Resources tree.
Show warning message when running procedures that contain errors	Enable a pop-up alert that appears when you run a procedure with errors, allowing you to abort the Run command. The alert includes a **Do not show this warning again** option. (You can re-enable warnings after suppressing them by selecting this option again.)

See also

Eclipse terminology on page 18
Database connection profiles on page 19
Work with perspectives on page 31
OpenEdge perspectives and views on page 43
OpenEdge workspace preferences on page 33

Startup preference page

The Startup preference page displays the default OpenEdge ABL Virtual Machine (AVM) startup parameters and the port number range.

Select **Window** > **Preferences** to open the **Preferences** dialog. In the tree view, expand Progress OpenEdge and select Startup to open the Startup preference page.

The following options are available on the Startup preference page:

Lower Port Number, Upper Port Number	Specifies the range of ports on which Progress Developer Studio for OpenEdge can establish a connection with Eclipse. One port is used for each concurrent Eclipse session in which one or more OpenEdge tools are run. No changes to this port range should be necessary.

Default startup parameters	Specifies any appropriate parameters for running the OpenEdge AVM. You can override or append to these parameters on a per-project basis on the OpenEdge properties page(**Project>Properties>OpenEdge**). You can also override or append to these parameters on the Shared AVM preferences page (**Window>Preferences>Shared OpenEdge AVM**). **Note:** Do not specify database connections as startup parameters. Use the Database Connections page for this purpose. You can use a parameter file by including `-pf parameter_file_path`. Use a full path statement to avoid problems if multiple projects use the default parameters. A relative path statement is interpreted relative to the project working directory, which is usually different for each project.
PAS for OpenEdge	Specifies the default PAS for OpenEdge.
Start PAS for OpenEdge automatically	Starts the default PAS for OpenEdge when you start Progress Developer Studio for OpenEdge.

See also

Set workspace preferences on page 29
Set project properties on page 65
OpenEdge workspace preferences on page 33
Database connections preferences on page 35

Database connections preferences

The Database Connections preference page is used to maintain connections available to the project. The connections displayed in this page contain ABL connection information and optional SQL connection information. This page provides a list of available database connections as defined for the workspace.

The following options are available on the Database Connections preference page:

New	Adds a new connection profile where you can define a new workspace database connection. For more information, see Add/Edit OpenEdge database connection profile wizard on page 39.
Edit	Modifies aspects of an existing connection profile. This button is disabled until a connection is selected. For more information, see Add/Edit OpenEdge database connection profile wizard on page 39.
Copy	Copies an existing connection profile.
Remove	Deletes a connection profile.
Import	Imports a connection profile. When using this function, you must specify the location of the export file. You can import the entire file or individual resources. For information on importing database connections, see Import database connections on page 69.

Export	Exports a connection profile. This function allows you to export either all connection profiles or individual database connection profiles to a system file. For information on exporting database connections, see Export database connections on page 68.
Import DF	(Progress OpenEdge databases only) Imports the data definitions from a `.df` file into the specified database.
Export DF	(Progress OpenEdge databases only) Exports the data definitions to a `.df` file for the specified database.

See also

Add existing database connections to a project on page 64
Add a new database connection to a project on page 64
Import and export schema changes on page 820
OpenEdge database connection wizard on page 39
Export workspace database connections page on page 90
Import workspace database connections page on page 87
Import data definitions page on page 87
Export Data Definitions page on page 89

Shared AVM preference page

The Shared AVM preference page allows you to set some general options for the shared AVM that runs in the current workspace.

Select **Window** > **Preferences** to open the **Preferences** dialog. In the tree view, expand Progress OpenEdge and select Shared AVM to open the Shared AVM preference page.

The following options are available on the Shared AVM preference page:

Working directory	The directory where shared AVM configuration files (`.propath`, `.dbconnection`, `assemblies.xml` and `toolbox.xml`) are stored. By default, this is a directory named `.sharedavm`, which is in the workspace folder.
Temp directory	The directory in which temporary files are created. By default, this is the working directory specified when Progress Developer Studio for OpenEdge is installed.
Startup parameters	Any appropriate parameters for starting the shared AVM. **Note:** Do not specify database connections as startup parameters. Use the Database Connections page for this purpose. You can use a parameter file by including `-pf parameter_file_path`. A relative path statement is interpreted relative to the project working directory. If you check the Add default parameters option, the parameters in the Startup parameters box are appended to the defaults

Add default parameters	Use the default startup parameters. **Note:** Although you can see the default startup parameters on this page, you cannot change them. Go to the Startup preference page on page 34 to change these defaults.
Use TTY for runtime	Run ABL procedures in a character client window rather than a GUI window. The client window opens when you open the project.
Use global Toolbox for Visual Designer	Use the global toolbox. The path of the global `toolbox.xml` file is specified on the Visual Designer preference page.
Import Working Directory as Project	Import the shared AVM working directory as an Eclipse project, which makes it visible in the **Resources** view. If you do not import the shared AVM working directory, you must use some other file manager application (Windows Explorer, for example) to view the folder. **Note:** An imported shared AVM working directory is an Eclipse project, and not an OpenEdge project. Therefore it does not have the special preferences and properties associated with an OpenEdge project.

Note: Shared AVM settings can be imported and exported from the **File** menu. In the Import or Export wizard, expand the Progress OpenEdge node and select Shared AVM Settings. The wizard allows you to specify a source or destination for the settings.

See also

Preferences and properties on page 18
The ABL Virtual Machine (AVM) on page 19
Database connection profiles on page 19
Set workspace preferences on page 29
Shared AVM properties on page 37
Projects page on page 38
Export shared AVM settings page on page 91
Import shared AVM settings page on page 88

Shared AVM properties

Shared AVM properties

Under the Shared AVM preference page, there are property pages for AppBuilder, Assemblies, Database Connections, Projects, and PROPATH. You use these pages to set the relevant properties only for projects that use the shared AVM.

If a project does not use the shared AVM, use the project property pages **Project** > **Properties** > **OpenEdge** (from the main menu bar) to set these properties.

See also

AppBuilder properties page (Windows only) on page 77
Assemblies properties page (Windows only) on page 78
Database connections properties page on page 83
Projects page on page 38
PROPATH properties page on page 85

Projects page

The Projects page, found under the Shared OpenEdge AVM preference page, contains a list of the projects contained in the current workspace. Projects that use the shared AVM are indicated by a check mark. You can add or remove the check mark to change shared AVM usage.

Note: If you change an existing project to use the shared AVM, you may need to update the shared AVM settings to include the PROPATH, assemblies, and database connections of the project.

See also

The ABL Virtual Machine (AVM) on page 19
Set workspace preferences on page 29
OpenEdge workspace preferences on page 33
Shared AVM preferences page on page 36

Preference pages for OpenEdge tools

The following topics contain information on the preference pages for various OpenEdge tools:

The PAS for OpenEdge Server perspective on page 100 in the PAS for OpenEdger online help

Class Cache options on page 340 in the ABL Editor online help

Learn About Developer Studio Customization on page 751 in the Customization online help

Launch configurations for running and debugging programs on page 451 in Running and Debuggin ABL Programs online help

OpenEdge Debugger preferences on page 456 in Running and Debugging ABL Programs online help

ABL Editor preferences on page 329 in the ABL Editor online help

Learn About Meta Catalog on page 689 in the Meta Catalog online help

Learn About Business Logic Tools on page 719 in the Tools for Business Logic online help

Class Cache options on page 340 in the Visual Designer online help

Parsing options on page 341 in the ABL Editor online help

AppBuilder preferences on page 559 in the GUI Desginer online help

Views preference page on page 33 in the Getting Started online help

Database connections preferences on page 35 in the Getting Started online help

Shared AVM preference page on page 36 in the Getting Started online help

Startup preference page on page 34 in the Getting Started online help

See also

Eclipse terminology on page 18
OpenEdge workspace preferences on page 33
Set workspace preferences on page 29
OpenEdge workspace preferences on page 33

OpenEdge database connection wizard

The OpenEdge database connection wizard allows you to create database connection profiles that are available to any project in a workspace. You can access the wizard by selecting **New** or **Edit** from the Database connections preferences on page 35 topic.

This topic describes each page in the OpenEdge database connection wizard.

Add/Edit OpenEdge database connection profile wizard

You can access the **Connection Profile wizard** by selecting **New** or **Edit** from the Database connections preferences on page 35 topic.

Note: The wizard is labeled **Add Connection Profile** when you select **New** and **Edit Connection Profile** when you select **Edit**. However, both pages contain identical fields and controls.

The Add/Edit OpenEdge Database Connection page contains the following options:

Connection name	This is a unique name that describes the connection. This is a required field.
Physical Name	The complete path name of an OpenEdge database. You can specify the path relative to the current workspace folder.
Description	Describes the type of database connection. This is an optional field.
Logical Name	The logical database name.
Host name	The host name must be **localhost** when you are using the OpenEdge Personal RDBMS database (which is the default RDBMS packaged with Progress Developer Studio for OpenEdge). You cannot connect to an OpenEdge Personal RDBMS database that is running remotely. If you are connecting to an OpenEdge Workgroup or to an an OpenEdge Enterprise RDBMS, you can specify the host name of the system where the database server process is running. If the database is running on the local system, you can use **localhost** in place of the host name.
Service/port	Identifies the service or the port number to use on the host machine when connecting to a broker process. **Note:** If you are connecting to an OpenEdge database, you can find appropriate values by checking the configuration settings for the database in Progress Explorer.

User ID	If the user ID and the password were previously created, enter the information in the **User ID** field. You must specify a user ID.
Password	The password to access the database.
Aliases	Specifies a list of aliases that are created at the start of the client session. The validation is the same as the logical name.
Group	Used for organizing your connection profiles. You can add a new group or you can select an existing group.
Other Parameters	Displays a string of supported database connection parameters.

See also

Database connection profiles on page 19

Define a SQL connection profile

When you create a new database connection using the connection profile wizard, you can specify whether or not to define a SQL connection. A SQL connection is necessary to display the tables and columns in the DB Structure view.

The following options are available on the Define a SQL connection profile page:

Define SQL connection	When this checkbox is selected, you can define a new SQL connection, or you can assign a connection that already exists.
Add new SQL connection	The **Add new SQL connection** radio button indicates that the connection profile uses a new SQL connection. Select this option, then click **Next** to display the **Add New SQL Connection Profile** page.
Use existing SQL connection	The Use existing SQL connection radio button indicates that the connection profile uses a previously defined SQL connection. Existing connections are listed. To assign an existing connection, select the checkbox nearest the connection profile and click **Next**. The next page in the connection profile wizard (Define an OpenEdge database server configuration on page 42) appears. **Note:** When you select the **Use existing SQL connection** radio button, items in the browser become selectable.

Database connection profiles on page 19

See *OpenEdge Data Management: SQL Development* and *OpenEdge Data Management: SQL Reference* manuals for more information on SQL connections. You can find OpenEdge manuals in the Product Documentation section of the Progress Software Developer's Network Web site.

Add a SQL connection profile

When you create a new database connection using the connection profile wizard, you are prompted to create a new SQL connection, or assign an existing connection to the database. The **Add SQL connection profile** page allows you to define a new SQL connection. This page appears when you select the **Define SQL Connection** checkbox and the corresponding Add new SQL connection radio button, then click **Next**.

Note: By default, the Define SQL Connection checkbox and the corresponding Add new SQL connection radio button are enabled.

The following options are available on the Add SQL connection profile page:

Connection name	This is a unique name that describes the connection. This field is automatically populated if you defined the connection name in the first page of the database connection wizard.
Driver	Specifies the JDBC driver for the connection profile. Select the driver that is appropriate for the database from the drop-down menu. For more information, see Configure a JDBC driver on page 780.
User ID	Specifies the User ID for the SQL connection profile. This field is automatically populated if you defined the user ID in the first page of the database connection wizard. You can omit both the user ID and the optional password from the connection profile if the auto-login checkbox is not selected. However, you will be prompted for the user ID and password every time you make a connection.
Password	Specifies the password to access the database.
Open on Eclipse startup	Opens the database connection when Progress Developer Studio for OpenEdge starts. **Note:** If you enable this option, you still must enter a valid user ID and an optional password. This option slows the startup of Eclipse. If you select the Auto-start a database server on the next page of database connection wizard, you can not use this option; the system will attempt to connect before the database automatically starts.
Auto-Login on connect	Automatically logs into the database when Progress Developer Studio for OpenEdge starts. The system attempts to log in using the provided user ID and password.
URL details	Allows you to edit **URL** information for your system. Selecting this checkbox enables all URL fields.

Host name	The host name must be **localhost** when you are using the OpenEdge Personal RDBMS database (which is the default RDBMS packaged with Progress Developer Studio for OpenEdge). You cannot connect to an OpenEdge Personal RDBMS database that is running remotely. This value defaults to the host name entered on the first page.If you are connecting to an OpenEdge Workgroup or OpenEdge Enterprise RDBMS, you can specify the host name of the system where the database server process is running. If the database is running on the local system, you can use **localhost** in place of the host name.
Service/port	Identifies the service or the port number to use on the host machine when connecting to a broker process. **Note:** If you are connecting to an OpenEdge database, you can find appropriate values by checking the configuration settings for the database in Progress Explorer.
Database name	Represents the name of the database. **Note:** If you are connecting to an OpenEdge database, check for the correct name in the **Databases** folder in Progress Explorer.
SQL parameters	Displays any additional SQL parameters delimited by a semi-colon in the format key1=value; key2=value.

See *OpenEdge Data Management: SQL Development* and *OpenEdge Data Management: SQL Reference* manuals for more information on SQL connections. You can find OpenEdge manuals in the Product Documentation section of the Progress Software Developer's Network Web site.

See also

Database connection profiles on page 19
Add existing database connections to a project on page 64
Add a new database connection to a project on page 64
Database connections preferences on page 35

Define an OpenEdge database server configuration

This page appears when you define the database server configuration when Progress Developer Studio for OpenEdge starts. The fields in this dialog apply databases configured locally; use Progress Explorer to configure remote databases.

Note: The information in this dialog is optional. Use Progress Explorer to configure remote databases.

The following options are available on the Define an OpenEdge database server configuration page:

Auto-start database server	Automatically starts the database server when you start Progress Developer Studio for OpenEdge. Use this option only if you are starting a local database.

Physical name	Specifies the pathname of the OpenEdge database. This field is automatically populated if you have defined the connection name in the first page of the database connection wizard.
Service/Port	Identifies the service or port number to use on the host machine when connecting to a broker process. This field is automatically populated if you defined the connection name in the first page of the database connection wizard.
Parameters	Specifies a string of supported database connection parameters.
Auto-shutdown database server	Automatically stops the database server when you quit Progress Developer Studio for OpenEdge.

OpenEdge perspectives and views

The topics summarize the perspectives and views that are available with Progress Developer Studio for OpenEdge:

For more detailed information about using these perspectives and views, refer to the appropriate online help volumes.

See also

The Eclipse platform on page 18
Open a perspective on page 31
Modify a perspective on page 32
Set a perspective to its default state on page 32

OpenEdge default perspectives

OpenEdge perspectives are available when you select **Window** > **Open Perspective** from the main menu bar of Progress Developer Studio for OpenEdge.

The following table lists the OpenEdge perspectives and the default views that each perspective includes:

Perspective	Default views	Associated help volume in the Progress Developer Studio for OpenEdge Guide
OpenEdge Editor	• Resources • Outline • DB Structure • Console • Problems • Tasks	Learn About ABL Editor on page 261

Perspective	Default views	Associated help volume in the Progress Developer Studio for OpenEdge Guide
OpenEdge Visual Designer (Windows only)	• Resources • Properties • Outline	Learn About Visual Designer on page 369
OpenEdge Debugger	• Debug • Variables • Breakpoints • Expressions • Dynamic Objects • Console • Tasks	Run and Debug ABL Programs on page 451
OpenEdge AppBuilder	• AppBuilder Framework • Resources • Outline • DB Structure • Console • Problems • Tasks	Learn About ABL GUI Designer on page 519
OpenEdge Server	• Resources • Outline • DB Structure • Properties • Console • Problems • Tasks • Servers • OpenEdge Server Monitor	Learn About PAS for OpenEdge on page 99

Perspective	Default views	Associated help volume in the Progress Developer Studio for OpenEdge Guide
OpenEdge Tools for Business Logic	• Resources • Properties • Outline • DB Structure • Connections • Problems	Learn About Business Logic Tools on page 719
Progress DB Navigator	• Connection Info • DB Structure • Navigator • Connections • DB Details • SQL • Results • SQL History • SQL Editor	Learn About Progress DB Navigator on page 775 (outside of the *Progress Developer Studio for OpenEdge Guide*)

See also

Eclipse terminology on page 18
Open a perspective on page 31
Modify a perspective on page 32
Set a perspective to its default state on page 32
OpenEdge views on page 45

OpenEdge views

You can add a view to a perspective by selecting **Windows** > **Show View** menu from the Progress Developer Studio for OpenEdge main menu bar. Views are organized in categories in the Show View window that appears when you select **Window** > **Show View** > **Other**. Within each category, views are listed in alphabetical order.

See also

The Eclipse platform on page 18
Open a perspective on page 31
Modify a perspective on page 32
Set a perspective to its default state on page 32
OpenEdge default perspectives on page 43

2

Learn About OpenEdge Projects

Progress Developer Studio for OpenEdge, like other Eclipse-based development environments, is project based. Projects exist in the context of a workspace. Project folders contain the files and sub-folders that are the project's resources.

The features available for OpenEdge projects include:

- A predefined set of OpenEdge facets and project types.
- A set of commonly used project types for OpenEdge application development and a framework to create custom project types, as required. These project types are convenient configurations for a specific type of project that is provided by default in Progress Developer Studio for OpenEdge.
- A facet for each project type that is configured by default. For example, a WebSpeed project type has an OpenEdge WebSpeed facet, and so on. Progress Developer Studio for OpenEdge also creates a facet for each custom project type that you define.

With OpenEdge projects, you can create:

- All new OpenEdge projects as faceted projects.
- A specialized project type for the current project with the New OpenEdge Project wizard.

All OpenEdge projects that you create in Progress Developer Studio for OpenEdge are faceted projects. A faceted project uses one or more predefined configurations called facets. A facet is used as a way of adding project functionality that you can turn on or off. Within OpenEdge projects, you can use facets to add a specific module type to a project.

Note: A module is used to organize content that is being developed for a server and usually consists of a hierarchy of files that reside in the Eclipse workspace.

When you add a facet to a project, the facet is used as a marker for performing certain setup requirements or for marking the project as a specific project type.

You can use the **New OpenEdge Project** wizard or the **Project Properties** dialog to create a specialized project type for your current project. You can save this project type, but it will only be available within the workspace of the project.

For details, see the following topics:

- Concepts
- Tasks
- Reference

Concepts

Note: For general information about projects in Eclipse, see *Working with Projects, Folders, and Files* (in the Eclipse Workbench User's Guide).

OpenEdge project and resource data files

When you are working in an OpenEdge project, Progress Developer Studio for OpenEdge often creates data files that contain configuration information for the project or for project resources. You often include these data files when you are importing, exporting, or sharing projects or project resources.

Most project data files are visible in a project's **Resources** view. Some files (`.resx`, for example) are hidden by default. The **Resources** view has a **Filters** option on its drop-down display menu where you can choose which file types to display or hide.

Note: You should not edit project data files. You could introduce errors that would make the project or some of its resources unusable. Project data files are usually updated automatically in Progress Developer Studio for OpenEdge when you change settings using property or preferences pages. Some project data files are automatically updated when you **Add**, **Modify**, or **Delete** resources.

Some of the OpenEdge project data files are:

Name	Description
`assemblies.xml`	A list of the assemblies where .NET classes are stored that is referenced at compile time and run time.
`.dbconnection`	A list of the database connections used by a project.
`filename``.resx`	A .NET resource file that can contain localized values for controls, as well as binary graphic files.

Name	Description
filename.esboe	A list of the Sonic Enterprise Service Bus (ESB) annotations in ABL code that can be exported to a Sonic environment.
.project	General project information, such as the name and the nature of the project.
.propath	A list of the directories in the project's PROPATH.
toolbox.xml	A list of the changes to the Visual Designer Toolbox.

See also

Database connection profiles on page 19
.NET assemblies and the Visual Designer (Windows only) on page 371
Add Sonic ESB annotations on page 305
Add and remove assembly references (Windows only) on page 413
Delete a container (Windows only) on page 382
Share Toolbox settings (Windows only) on page 409
Project properties pages on page 75

Configuration variables

You can use variables in place of explicit directory paths in certain fields in project property pages. Besides reducing typing errors, using variables and then sharing settings can lessen the need to specify new paths when importing properties to a project. The following predefined variables are available at the project and workspace level:

- @{DLC}—The root directory of your OpenEdge installation.
- @{ROOT}—The project root directory, specified when you create the project.
- @{WORK}—The project working directory, specified on the Progress OpenEdge properties page on page 75 page. (You can enter a period (.) to represent @{WORK}.)
- @{RCODE}—The directory (if any) specified in the **Build destination** field on the Build properties page on page 79 page.
- @{APP}—The application root directory, if any, specified on the Configuration variables properties page on page 82 page.
- @{DB}—The database root directory, if any, specified on the Configuration variables properties page on page 82 page.
- @{TEMP}—The directory where temporary files are created.

The following is the list of the locations where these variables apply:

- In the **Configuration File** field (for Dynamics) on the AppBuilder properties page (Windows only) on page 77 properties page.
- In the **Build destination** field and **Source entry** on the Build properties page on page 79 properties page.
- In the **Source** tab of the Build properties page on page 79 properties page.

- In the alias directory entries on the SpeedScript properties page on page 86 properties page.
- In **PROPATH** entry in the PROPATH properties page on page 85 properties page.
- In **Assemblies properties** page for `assemblies.xml` file location.
- In **File Destinations properties** page for ESB and REST invocation files.

In addition to the above predefined variables, you can also define new configuration variables and use them to define project properties. See Defining new configuration variables for more information.

See also

Create a new OpenEdge project on page 58
Export and import project resources and properties on page 66
Share project properties on page 66
Progress OpenEdge properties page on page 75
AppBuilder properties page (Windows only) on page 77
Build properties page on page 79
Configuration variables properties page on page 82
Database connections properties page on page 83
PROPATH properties page on page 85

OpenEdge DevOps Framework

The **OpenEdge DevOps Framework** is a Gradle plugin that allows you to seamlessly transition between your development and integration environments when you build your ABL project outside of Progress Developer Studio for OpenEdge. This framework enables you to have the same environment setup for both your development and integration environments.

To work with the OpenEdge DevOps Framework plugin, you use the configuration file, `build.config`, that is generated when you create an ABL project in Progress Developer Studio.

OpenEdge DevOps Framework configuration file

Progress Developer Studio for OpenEdge projects consists of the OpenEdge DevOps Framework configuration file named as `build.config`.The `build.config` file contains all the project configurations required for you to build a project.

The `build.config` file allows you to move your project's property settings along with your project so that your development and integration environment uses the same configuration. You do not need to set up the configurations again. This file can also be used for multiple development workspaces that use the same configuration settings.

OpenEdge DevOps Framework configuration parameters

This topic describes the parameters in the `build.config` file.

The **default value** and **description** for each `build.config` file parameter are specific to Progress Developer Studio.

Note: Progress recommends that you do not modify the `build.config` file manually within Progress Developer Studio. All the parameters can be updated from the Progress Developer Studio user interface (**Project Properties**) with the exception of the following:

- `streamIO.enabled`
- `languages.list`
- `textSegGrow`
- `minSize.enabled`

You can update the `build.config` file manually to build the project outside of Progress Developer Studio.

The `database` and `compilableFileExtensions` parameters are not used with Progress Developer Studio.

For file portability, Progress recommends that you use variables instead of an absolute path for the following attributes:

- `'buildDir'`
- `'oeide.xrefXmlDir'`
- `'oeide.preCompileCallbackRoutine'`
- `'avm.wrkDir'`
- `'avm.avmOptions.tmpDir'`
- `'avm.avmOptions.assembliesDir'`

The following default variables are supported:

- **`ROOT`**—Project's root location
- **`WRKDIR`**—Working directory; set during installation

Note: The **System properties**, **System environment variables**, and **Eclipse variables** are also supported.

The variable to be used as `"${<variable-name>}"`, for example, `buildDir="${ROOT}/myBuildDir"`

Global parameters

Parameters	Default value	Description
`buildDir=''`	—	Specifies the project build directory. This directory contains the saved r-code files. If this field is blank then the r-code files are saved in the same directory as the source files.

oeide parameters

The following table contains the IDE-specific configurations that are only used by Progress Developer Studio for OpenEdge.

Parameter	Default value	Description
`useSharedAVM=''`	`false`	Specifies whether to use a shared AVM when building projects in Progress Developer Studio. This parameter uses a Boolean value to specify whether the project uses a shared or a dedicated AVM.
`oeideEvents=''`	`true`	This parameter uses a Boolean value to enable or disable oeide events. This parameter enables you to write procedures that use the ABL SUBSCRIBE statement to capture and respond to those events.
`useGlobalToolboxVD=''`	`false`	This parameter uses a Boolean value to enable or disable the global Visual Designer toolbox.
`addDefaultParams=''`	`true`	Specifies whether to use the default startup parameters when starting the AVM. This parameter uses a Boolean value to enable or disable the passing of default AVM parameters.
`hideTTYConsole=''`	`true`	Uses a Boolean value to enable or disable the project-specific run-time console.
`useProjectCompilerSettings=''`	`false`	Uses a Boolean value to enable or disable the use of project-specific 'strictOptions' under 'compile'.
`saveRCode=''`	`true`	Uses a boolean value to enable or disable persistant r-code on compiling sources.
`xrefXmlDir=''`	—	Specifies the output value of the `XREF-XML` option when `xrefXml.enabled='true'`. This parameter uses a string value to specify the path where cross-reference information is saved in an XML file.

Parameter	Default value	Description
`preCompileCallbackRoutine=''`	—	Specifies the path to an ABL file that is run before compilation. This uses a string value to specify the path to a procedure that runs prior to compilation. For example, this option can used to set `SECURITY-POLICY:XCODE-SESSION-KEY`.

AVM parameters

Parameter	Default value	Description
`wrkDir=''`	The project's root directory	Specifies the working directory in which the AVM starts. This parameter uses a string value to specify the path to the working directory, from where the AVM run time starts.

AVM option parameters

The following table lists the AVM option parameters (defined in the `build.config` file as `avmOptions`).

Parameter	Default value	Description
`tmpDir=''`	The DLC working directory	Specifies the temporary directory for the AVM run time (equivalent to the `-T` startup parameter option). This parameter uses a string value to specify the path.
`tty.enabled=''`	false	Flag to use `_progres` or `prowin` executables. For `_progres`, the value is `true`; otherwise, it is `false`. This parameter uses a Boolean value.
`startupParameters=''`	—	Specifies the startup parameters as a string. This parameter uses a string value to pass startup parameters.
`assembliesDir=''`	—	Specifies the location of the `Assemblies` directory (equivalent to the `-assemblies` startup parameter option). This parameter uses a string value.

Compile parameters

Parameter	Default value	Description
`compilableFileExtensions=''`	`p`, `w`, `cls`, `pgen`, `html`, `htm`	This parameter allows you to set the compilable file extensions.

Compile option parameters

The following table lists the Compile option parameters (defined in the `build.config` file as `compileOptions`).

Parameter	Default value	Description
multiCompile.enabled=''	false	This parameter uses a Boolean value to set the COMPILER:MULTI-COMPILE attribute.
xcodeKey=''	—	XCODE option in the COMPILE statement. Specify the expression as a string.
xrefXml.enabled=''	false	XREF-XML option in the COMPILE statement. To enable this option, set the value to true. Specify the expression as a Boolean value.
streamIO.enabled=''	false	STREAM-IO option in the COMPILE statement. To enable this option, set the value to true. Specify the expression as a Boolean value.
minSize.enabled=''	false	MIN-SIZE option in the COMPILE statement. To enable this option, set the value to true. Specify the expression as a Boolean value.
attrSpace.enabled=''	false	This parameter uses a Boolean value to set the ATTR-SPACE option in the COMPILE statement.

Strict option parameters

The following table lists the Strict option parameters (defined in the build.config file as strictOptions).

Parameter	Default value	Description
`requireFullNames=''`	`ignore`	Specifies the `OPTIONS require-full-names` in the `COMPILE` statement. Value can be `ignore/warning/error`.
`requireFieldQualifiers=''`	`ignore`	Specifies the `OPTIONS require-field-qualifiers` in the `COMPILE` statement. Value can be `ignore/warning/error`.
`requireFullKeywords=''`	`ignore`	Specifies the `OPTIONS require-full-keywords` in the `COMPILE` statement. Value can be `ignore/warning/error`.
`requireReturnValues=''`	`ignore`	Specifies the `OPTIONS require-return-values` in the `COMPILE` statement. Value can be `ignore/warning/error`.

Languages parameters

Parameter	Default value	Description
`list=''`	—	Comma-separated list of language segments to include in the compiled r-code.
`textSegGrow=''`	—	`TEXT-SEG-GROW` option. growth-factor as an integer. Supported only when a language list is provided.

Project type options for application development

In the latest version of OpenEdge, the process of creating a project has been simplified. The **New OpenEdge Project** wizard displays three categories for front-end (client) and back-end development (server) and general application development. When you open the **Create an OpenEdge Project** page, you have to select from the following options. How these options map to previous version of the product is shown in the following table for your convenience:

Option in previous versions	Option in 12.0
OpenEdge	Do not select any category and click **Finish** or select **OpenEdge Basic** in the General category.
ABLUnit	Select **ABLUnit** in the General category.
Custom	Select **Custom** in the General category.

Option in previous versions	Option in 12.0
PAS for OpenEdge	Select **APSV**, **WEB**, or **REST** as transport in the Server category.
ABL Web App project with WebHandler service	Select **WEB** as transport in the Server category.
ABL Web App project with REST (Mapped RPC) service	Select **REST** as transport in the Server category.
ABL Web App project with DataObject service and WebSpeed WebHandler service provider	Select **WEB** as transport and click the **Create a Data Object Service** check box in the Server category.
ABL Web App project with DataObject service and REST RPC service provider	Select **REST** as transport and click the **Create a Data Object Service** check box in the Server category.
GUI for .Net	Select **GUI for .Net** in the Client category.
AppBuilder	Select **AppBuilder** in the Client category.
ChUI	Select **ChUI** in the Client category.
Web UI	Select **Web UI** in the Client category.

Custom project type

A custom project type is a combination of different project types added to a single project. In a custom project type, you can specify the folder layout, the default files in each folder, and the PROPATH settings for folders in each project. You can also share these custom project types with other developers. The custom project types you create can be used as templates for new projects.

For information on creating custom projects, see Create a custom project on page 61.

See also

Create a custom project on page 61
New OpenEdge Project wizard on page 71

ChUI project type

A ChUI project type is an OpenEdge project specialized for character-based UI development and uses TTY as the runtime.

For information on creating ChUI projects, see Create a ChUI project on page 59.

See also

Create a ChUI project on page 59
New OpenEdge Project wizard on page 71

GUI for .NET project type (Windows only)

A GUI for .NET project type is an OpenEdge project specialized for .NET-based GUI development. By default, a GUI for .NET project type uses GUI as the runtime.

For information on creating a GUI for .NET project, see Create a GUI for .NET project (Windows only) on page 60.

See also

Create a GUI for NET project (Windows only) on page 60
New OpenEdge Project wizard on page 71

OpenEdge project type

An OpenEdge project type is a standard OpenEdge project without specialized properties.

For information on creating an OpenEdge project, see Create a standard OpenEdge project on page 60.

See also

Create a standard OpenEdge project on page 60
New OpenEdge Project wizard on page 71

Tasks

Create a new OpenEdge project

Progress Developer Studio for OpenEdge provides various project types for OpenEdge application development and also a framework to create custom project types, as required. Facets for each project type is configured by default.

To create an OpenEdge project:

1. Select **File** > **New** > **OpenEdge project** from the **Progress Developer Studio for OpenEdge** main menu bar or the **Project Explorer** view context (right-click) menu. The **New OpenEdge Project** wizard opens and displays the **Create an OpenEdge Project** page.
2. Enter a name in the **Project name** field. The root folder for the new project with this name is created in your current workspace. To choose a different location for the project, clear the **Use default** check box. Then either browse to or enter the path to the required location.
3. Do one of the following:
   - To create a project for the back-end development of the application, select the **Server** category from the left section.

     Select the server type that you want to deploy the services to and the transport type that you want to use for deploying the application.
   - To create a project for the front-end development of the application, select the **Client** category from the left section.

     Select the **Desktop Application** or the **Web Application** option button to create a project for a desktop application or a web application respectively and select one of the project types.

- To create a basic, ABLUnit, Dynamics, or custom OpenEdge project, select the **General** category from the left section.

Note: If you do not select a category (Client, Server, or General) and click **Finish**, a basic OpenEdge project without any specialization is created.

4. Click **Finish**. The project is created and is displayed in the **Project Explorer** view.
5. To review or modify project properties after the project is created, right-click the project in the **Project Explorer** view and select **Properties**.

Note: For large applications with multiple modules, it is recommended that you create separate projects for the modules. You must also create separate projects for modules that have a different PROPATH or that require different database connections.

Create a ChUI project

A ChUI project type is an OpenEdge project specialized for character-based UI development and uses TTY as the runtime.

To create an OpenEdge project specialized for character-based UI development:

1. Select **File** > **New** > **OpenEdge Project** from the Progress Developer Studio for OpenEdge main menu bar or the **Project Explorer** view context (right-click) menu. The New OpenEdge Project wizard opens and displays the Create an OpenEdge Project page on page 71.
2. Type a name in the **Project name** field.

   The root folder for the new project is created in your current Eclipse workspace, unless you specify a different location.
3. To choose a different location for the project, click and clear the **Use default** check box. Then either browse to, or enter the path to the desired location.
4. Select **Client** from the left section.
5. Select the **Web Application** option button and select the **ChUI** option button.
6. Click **Next**. The Select AVM and layout options page on page 72 appears.
7. Specify the OpenEdge AVM options and the Project layout options (or leave the default settings) and click Next. The Define PROPATH page on page 74 appears.
8. Leave the default settings or modify the PROPATH entries to be used by the project and click **Next**. The Select database connections page on page 74 appears.
9. Select the database connections to be used by the project and click **Finish**.

You will see your project and its resources in the **Project Explorer** view.

See also

Create a new OpenEdge project on page 58
Create an OpenEdge Project page on page 71
Select AVM and layout options page on page 72
Define PROPATH page on page 74
Select database connections page on page 74

Create a GUI for .NET project (Windows only)

To create an OpenEdge project specialized for .NET-based GUI development:

1. Select **File** > **New** > **OpenEdge Project** from the Progress Developer Studio for OpenEdge main menu bar or the **Project Explorer** view context (right-click) menu. The New OpenEdge Project wizard opens and displays the Create an OpenEdge Project page on page 71.
2. Type a name in the **Project name** field.

   The root folder for the new project is created in your current Eclipse workspace, unless you specify a different location.
3. To choose a different location for the project, click and clear the **Use default** check box. Then either browse to, or enter the path to the desired location.
4. Select **Client** from the left section.
5. Select the **Desktop Application** option button and select the **GUI for .NET** option button.
6. Click **Next**. The Select AVM and layout options page on page 72 appears.
7. Specify the OpenEdge AVM options and the Project layout options (or leave the default settings) and click **Next**. The Define PROPATH page on page 74 appears.
8. Leave the default settings or modify the PROPATH entries to be used by the project and click **Next**. The Select database connections page on page 74 appears.
9. Select the database connections to be used by the project and click **Finish**.

You will see your project and its resources in the **Project Explorer** view.

See also

Create a new OpenEdge project on page 58
Create an OpenEdge Project page on page 71
Project Facets page on page 75
Select AVM and layout options page on page 72
Define PROPATH page on page 74
Select database connections page on page 74

Create a standard OpenEdge project

To create a standard OpenEdge project without specialized properties:

1. Select **File** > **New** > **OpenEdge Project** from the Progress Developer Studio for OpenEdge main menu bar or the **Project Explorer** view context (right-click) menu. The New OpenEdge Project wizard opens.
2. Type a name in the **Project name** field.

   The root folder for the new project is created in your current Eclipse workspace, unless you specify a different location.
3. To choose a different location for the project, click and clear the **Use default** check box. Then either browse to, or enter the path to the desired location.
4. Select **General** from the left section.

Note: If you do not select a category (Client, Server, or General) and click **Finish**, a basic OpenEdge project without any specialization is created.

5. Select the **OpenEdge Basic** option button.
6. Click **Next**. The **Select AVM and layout options page** appears.
7. Specify the OpenEdge AVM options and the Project layout options (or leave the default settings) and click **Next**.
8. Leave the default settings or modify the PROPATH entries to be used by the project and click **Next**. The Database connections page appears.
9. Select the database connections to be used by the project and click **Finish**.

You will see your project and its resources in the **Project Explorer** view.

See also

Create a new OpenEdge project on page 58
Create an OpenEdge Project page on page 71
Project Facets page on page 75
Select AVM and layout options page on page 72
Select database connections page on page 74

Create a custom project

You can create a new custom project by following the below steps or you can select one of the predefined custom project configurations (if any) that appear in the **Custom** option in the **General** category in the **OpenEdge Project** wizard.

When you select a predefined custom project, the **New OpenEdge** wizard displays the folder structure of the project on the Review custom project layout page on page 74 and the PROPATH entries are displayed on the Define PROPATH page on page 74.

To create a custom project:

1. Select **File** > **New** > **OpenEdge Project** from the Progress Developer Studio for OpenEdge main menu bar or the **Project Explorer** view context (right-click) menu. The New OpenEdge Project wizard opens and displays the Create an OpenEdge Project page on page 71.
2. Type a name in the **Project name** field.

   The root folder for the new project is created in your current Eclipse workspace, unless you specify a different location.
3. To choose a different location for the project, click and clear the **Use default** check box. Then either browse to, or enter the path to the desired location.
4. Select **General** from the left section.
5. Select the **Custom** option button.
6. Click **Next**. The Project Facets page on page 75 appears.
7. Select the facets to be enabled for the project or leave the default settings and click **Next**. The Select AVM and layout options page on page 72 appears.
8. Specify the OpenEdge AVM options and the Project layout options (or leave the default settings) and click **Next**. The Define PROPATH page on page 74 appears.
9. Leave the default settings or modify the PROPATH entries to be used by the project and click **Next**. The Select database connections page on page 74 appears.
10. Select the database connections to be used by the project and click **Finish**.

You will see your project and its resources in the **Project Explorer** view.

See also

Create a new OpenEdge project on page 58
Create an OpenEdge Project page on page 71
Project Facets page on page 75
Select AVM and layout options page on page 72
Define PROPATH page on page 74
Select database connections page on page 74

Create an AppBuilder project

To create an OpenEdge project specialized for AppBuilder application development:

1. Select **File** > **New** > **OpenEdge Project** from the Progress Developer Studio for OpenEdge main menu bar or the **Project Explorer** view context (right-click) menu. The New OpenEdge Project wizard opens and displays the Create an OpenEdge Project page on page 71.
2. Type a name in the **Project name** field.

   The root folder for the new project is created in your current Eclipse workspace, unless you specify a different location.
3. To choose a different location for the project, click and clear the **Use default** check box. Then either browse to, or enter the path to the desired location.
4. Select **Client** from the left section.
5. Select the **Desktop Application** option button and select the **AppBuilder** option button.
6. Click **Next**. The Select AVM and layout options page on page 72 appears.
7. Specify the OpenEdge AVM options and the Project layout options (or leave the default settings) and click **Next**. The Define PROPATH page on page 74 appears.
8. Leave the default settings or modify the PROPATH entries to be used by the project and click **Next**. The Select database connections page on page 74 appears.
9. Select the database connections to be used by the project and click **Finish**.

You will see your project and its resources in the **Project Explorer** view.

See also

Create a new OpenEdge project on page 58
Create an OpenEdge Project page on page 71
Project Facets page on page 75
Select AVM and layout options page on page 72
Define PROPATH page on page 74
Select database connections page on page 74

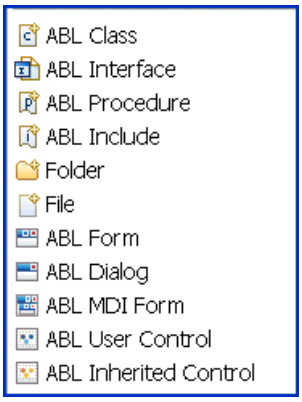
Add resources to a project

Resources are the files and folders that comprise a project.

Note: For information about adding existing resources to a project see Export and import project resources and properties on page 66.

To add a new file or folder to an OpenEdge project:

1. Select the project name from the **Project Explorer view**.
2. Right-click and select **New** from the pop-up menu.
3. Select either Folder or one of the ABL file types from the **New** menu:



4. If you select **Folder**, the **New Folder** dialog appears. Specify the location of the folder in the project tree and name it.

   If you want to add a folder that already exists in your file system, click the **Advanced** button. Select **Link** to folder in the file system and browse to find the folder.

5. If you select one of the ABL file types, a dialog appears that allows you to specify the name and other information about the file.

   The resulting file is generated from a standard ABL template. Therefore, the file will contain sections appropriate to the file type, and the file will have an appropriate extension. For example, **ABL Procedure** produces a `.p` file similar to the following:

```
/*------------------------------------------------------------------------
    File        : query.p
    Purpose     :

    Syntax      :

    Description :

    Author(s)   :
    Created     : Tue Aug 22 11:29:25 EDT 2006
    Notes       :
  ----------------------------------------------------------------------*/

/* ***************************  Definitions  ************************** */


/* ***************************  Preprocessor Definitions  ************************** */


/* ***************************  Main Block  *************************** */
```

6. If you select **File**, you can link to a file in the local file system.

   In the **New File** dialog, click the **Advanced** button. Select **Link** to folder in the file system and browse to find the file that you want to include in your project.

See also

Create a new OpenEdge project on page 58
Add existing database connections to a project on page 64
Add a new database connection to a project on page 64
Set project properties on page 65

Add existing database connections to a project

You can either add an existing database connection to your project, or you can Add a new database connection to a project on page 64 for your project. An existing database connection is one that can be shared by all the projects in your workspace.

To add to an existing database connection:

1. From the **Project Explorer** view, select a project.
2. Right-click to expand the context menu.
3. From the context menu, select **Properties**.
4. In the **Project Properties** page, expand **Progress OpenEdge** in the tree view on the left.
5. Select **Database Connections**.
6. Select the **Show All** radio button to list all connected databases.
7. Click check boxes next to the databases that you want to add to the project.
8. Click **OK**.

See also

Add resources to a project on page 62
Add a new database connection to a project on page 64
Set project properties on page 65
Export and import project resources and properties on page 66
Work with Projects, Folders, and Files (in the Eclipse Workbench User's Guide)
Database connections properties page on page 83

Add a new database connection to a project

To create a new database connection:

1. From the **Project Explorer** view, select a project.
2. Right-click to expand the context menu.
3. From the context menu, select **Properties**.
4. In the **Project Properties** page, expand **Progress OpenEdge** in the tree view on the left.
5. Select **Database Connections**.
6. Select **Configure Database Connections** from the top of the Database connections properties page on page 83.

7. Click **New** to open the **Add Connection Profile** wizard.
8. Specify connection parameters on pages of the **Add Connection Profile wizard**. When you complete the wizard, the new connection is listed in the **Database Connections preferences** page. Click the checkbox next to the connection name to add it to the project.

See also

Create a new OpenEdge project on page 58
Add resources to a project on page 62
Add existing database connections to a project on page 64
Set project properties on page 65
Export and import project resources and properties on page 66
Database connections properties page on page 83
Add/Edit OpenEdge database connection profile wizard on page 39

Set project properties

To review the project properties and modify them if necessary:

1. Right-click the project in the **Project Explorer** view and select **Properties** from the context menu.
2. In the left pane of the **Properties** page, expand **Progress OpenEdge** in the tree view.
3. Click the appropriate node and make any desired changes. Click **Apply** to save the settings on the currently open tab and continue, or click **OK** to save all settings and close the **Project Properties** dialog.

Note: If you previously saved project settings as a named profile, and those settings are appropriate for the current project, you can load them by clicking **Change Profile** on the **Progress OpenEdge** page and selecting the profile.

See also

Create a new OpenEdge project on page 58
Add resources to a project on page 62
Add existing database connections to a project on page 64
Add a new database connection to a project on page 64
Export and importing project resources and properties on page 66
Configuration variables on page 49
Progress OpenEdge properties page on page 75
AppBuilder properties page ((Windows only)) on page 77
Build properties page on page 79
Modules properties page on page 84
Configuration variables properties page on page 82
Database Connections properties page on page 83

Save project property profiles

You can save your current project property settings as a named project property profile. This allows you easily change from one group of settings to another. Project property profiles are available to any new or existing project in your workspace.

Note: Changing project property profiles does not change PROPATH settings, source and build folders, or database connections for a project. These settings are not saved in a project property profile.

To save a project property profile:

1. Right-click the project folder in the **Project Explorer** view and select **Properties** from the context menu.
2. In the left pane of the **Properties** window, select **Progress OpenEdge**.
3. Select the **Custom** page and click **Save Profile**.
4. Enter a name for the profile and click **OK**.

See also

Set project properties on page 65
Change project property profiles on page 66
New OpenEdge Project wizard on page 71

Change project property profiles

To change to a different project property profile:

1. Right-click the project folder in the **Project Explorer** view and select **Properties** from the context menu.
2. In the left pane of the **Properties** window, select **Progress OpenEdge**.
3. Click **Change Profile**.
4. Select a profile from the **Select Development Profile** dialog.
5. Click **OK**. A message confirms that the selected profile was added to the project.

See also

Set project properties on page 65
Share project properties on page 66
Save project property profiles on page 66
New OpenEdge Project wizard on page 71

Export and import project resources and properties

A generic feature of Eclipse is the ability to import resources and settings from one project to another.

The topics describe the options for importing resources and settings.

Share project properties

You can store the current set of project properties so that they are included with the rest of the content when the project is imported into a different workspace. This eliminates the need to reset the properties.

To share the current project settings:

1. Right-click the project folder in the **Project Explorer** view and select **Properties** from the context menu.
2. In the left pane of the **Properties** window, select **Progress OpenEdge** > **Custom**.
3. On the **Custom** tab, click **Share Settings**.

Sharing settings saves the property settings in a file called `project.xml`, located in the project's root directory.

Note: The `project.xml` file does not contain PROPATH settings, source and build folders, or database connection information. PROPATH settings and source/build folder settings are saved in the project's `.propath` file. Database connection settings are saved in the project's `.dbconnection` file.

If `project.xml` file is not present when a project is imported its properties revert to default settings.

See also

Set project properties on page 65
Save project property profiles on page 66
Configuration variables properties page on page 82

Import resources

There are several methods to import resources (files and folders) into a project:

1. Use the context menu in the **Project Explorer** view. The context menu contains the typical file system commands (such as **Copy** and **Paste**). By navigating in the Project Explorer tree view, you can use these commands to copy or move file resources from one project to another.
2. Use the import (**File** > **Import** > **General** > **File System**) or export (**File** > **Export** > **General** > **File System**) wizard to manage file and folder resources.
3. In the **New File** or **New Folder** dialog (see Add resources to a project on page 62), click the **Advanced** button. Select Link to folder (or File) in the file system and browse to find the file that you want to include in your project.

Note: When you copy a file from one project to another, any breakpoints that existed in the original are not preserved in the copy. However, you can export breakpoints to an XML file and then Import breakpoints on page 70 to a file in another project.

See also

Add resources to a project on page 62

Export projects

You can use basic Eclipse Export/Import functionality to create an archive of a project that can be distributed to other systems or to other users.

To export a project:

1. Do the following before exporting a project:

a) Click **Share Settings** on the Configuration variables properties page on page 82 to create a `project.xml` file in your project folder.

b) Export any workspace level database connection profiles using the **Export Workspace Database Connections** dialog. The profile information goes to an XML file which you must import separately from the project archive.

2. To create an archive of the project:

a) Select **File** > **Export** > **General** > **Archival File**.

b) Select the project name and all project files in the **Archive File** dialog. Be sure to include all "dot" files (`.propath`, `.dbconnection`, etc.) and the `project.xml` file.

c) Specify the path and the name of the archive file.

d) Select the archive format (tar or zip) and any other options you require.

e) Click **Finish**.

See also

Import projects on page 68
Share project properties on page 66
Export database connections on page 68
Import database connections on page 69
Import breakpoints on page 70

Import projects

You can use basic Eclipse Export/Import functionality to create an archive of a project that can be distributed to other systems or to other users.

To import an archived project:

1. Start Progress Developer Studio for OpenEdge in the workspace where you want to import the project.
2. Import database connections on page 69 profiles.
3. Select **File** > **Import** > **General** > **Existing Projects into Workspace**.
4. On the **Import Projects** page, choose **Select archive file**.
5. Browse to the archive file that contains the project.
6. Click **Finish**. The project is created and opened in the workspace. Note, however, that Import breakpoints on page 70 are not preserved.

See also

Export projects on page 67
Share project properties on page 66
Export database connections on page 68
Import database connections on page 69
Import breakpoints on page 70

Export database connections

To export connection information:

1. Start Progress Developer Studio for OpenEdge in the workspace that is the source of the connection information.
2. Select **File** > **Export**. The **Export** dialog appears.
3. Choose the **Progress OpenEdge/Database Connections** node and click **Next**. The **Export Workspace Database Connections** dialog appears.
4. Select the database connections you want to export by clicking the checkbox next to the connection name. You can export all connections by selecting the **Select All** radio button.
5. In the **To database connection file** field, specify the target location for the exported XML file.
6. Select the **Overwrite existing files without warning** checkbox to replace existing database files without a warning message.
7. Select the **Exclude user ID and password** checkbox to prevent user ID or password information from being included in the exported XML file. You should use this option if you are exporting connection information to some other user.
8. Click **Finish**.

See also

Database Connections preferences on page 35
Add existing database connections to a project on page 64
Add a new database connection to a project on page 64
Import database connections on page 69

Import database connections

You can import database connection information from one workspace to another. This eliminates the task of manually duplicating connection profiles. First you export connection information from a workspace to an XML file. Then, you can import that XML file to another workspace.

To import connection information:

1. Start Progress Developer Studio for OpenEdge in the workspace where the connection information will be imported.
2. Select **File** > **Import**. The **Import** dialog appears.
3. Choose the **Progress OpenEdge/Database Connections** node. The **Import Workspace Database Connections** dialog appears.
4. In the **From database connection file** field, enter the name of the database connection file that you want to import. The database connection file is an XML file created in the **Export Workspace Database Connections** dialog.
5. Select the **Ignore duplicate connections** checkbox to suppress the listing of connections that already exist in your workspace. The Database connections browse shows a list of the connections that are defined in the database connection file. You can select any or all of the connections from the list
6. Click **Finish** and the imported connections will be available to the projects in your workspace.

See also

Database Connections preferences on page 35
Add existing database connections to a project on page 64
Add a new database connection to a project on page 64
Export database connections on page 68

Import breakpoints

When you copy a project from one workspace to another, any breakpoints that existed in the original are not preserved in the copy. However, you can export breakpoints from a workspace to an XML file and then import those breakpoints to projects in another workspace.

To import breakpoints from one workspace to another:

1. Start Progress Developer Studio for OpenEdge in the workspace that is the source of the breakpoint information.
2. Choose **File** > **Export** > **General** > **Breakpoints**.
3. Click **Next** and the **Export Breakpoints** dialog appears.
4. Select the breakpoints you want to export from the checklist. Breakpoints from files in all open projects are listed.
5. Specify the path name of the file where you want to export the breakpoints.
6. Click **Finish** and the breakpoints are saved to an XML file. By default, a `.bkpt` extension is added to the file name.
7. Start Progress Developer Studio for OpenEdge in the workspace where you want to import the breakpoint information.
8. Choose **File** > **Import** > **General** > **Breakpoints**.
9. Click **Next** and the **Import Breakpoints** dialog appears.
10. Browse and select the breakpoint file specified in **Step 4** above.
11. Click **Finish**. The breakpoints are added to the appropriate files.

Note: Breakpoints are only imported for existing resources. The project and the actual resource file must exist in the current workspace before you can import breakpoints. No warning message is displayed when the import fails because the resource does not exist.

Define new configuration variables

In addition to the predefined variables available in Progress Developer Studio for OpenEdge, you can define new configuration variables at the project and workspace level. Creating configuration variables at the project level ensures that the projects, which contain linked resources using the configuration variables, remain portable across workspace and systems.

To define new configuration variables:

1. Right-click the project in the Project Explorer view and select **Properties** from the context menu.
2. Expand **Progress OpenEdge** in the tree view in the left pane of the **Properties** page.
3. Select the **Configuration Variables** node.
4. Click **Add** to open the **New Variable** dialog.
5. Specify a name for the new variable in the **Name** field.

6. Specify an associated location for the new variable. You can provide a directory location on the file system by clicking Folder or select an existing variable by clicking **Variable**.
7. Click **OK** to save the settings.

   To edit an existing configuration variable, select the variable and click **Edit** on the **Configuration Variables properties** page.

Reference

New OpenEdge Project wizard

The **New OpenEdge Project** wizard allows you to create faceted OpenEdge projects in a simple and configurable manner. It contains multiple pages: the pages vary depending on the type of project you select on the Create an OpenEdge Project page on page 71.

You can start the New OpenEdge Project wizard by selecting **File** > **New** > **OpenEdge Project** from the main menu bar.

Based on the project type you select on the Create an OpenEdge Project page on page 71, the New OpenEdge Project wizard displays the appropriate page. This topic documents these pages.

Create an OpenEdge Project page

The **Create an OpenEdge Project** page of the **New OpenEdge Project** wizard allows you to select the type of faceted project you want to create and set general options for it.

Note: The subsequent pages on the **New OpenEdge Project** wizard depend on the project type you select on this page.

It contains the following controls:

Project name	Allows you to assign a name that is unique in the workspace to a folder that will contain project resources. **Note:** Avoid changing the project name outside of Progress Developer Studio for OpenEdge (with Windows Explorer, for example). The project will become corrupted and you will be unable to reopen it. To change the name after the project is created, choose the project name in the Project Explorer view and select **File** > **Rename** from the main menu bar.
Use default location	Specifies that the project folder will be created in the default location, which is the top level of the workspace folder.
Location	When **Use default location** is not selected, specifies the directory that will contain the project folder.
Project type configuration	Allows you to select the project type you want to create. The default value is OpenEdge.

Next	Shows the next page of the wizard based on the project type you select.
Finish	Creates a project with the default configuration settings defined for the selected project type.

The **Project type configuration** drop-down menu provides the following options:

<custom>	Creates a custom project that is a combination of different project types added to a single project. **Note:** When you create a custom project type you must select the facets associated with the project on the Project Facets page on page 75.
REST	Creates an OpenEdge project with REST service functionality.
ChUI	Creates an OpenEdge project with character-based UI functionality.
GUI for .NET	Creates an OpenEdge project with .NET-based GUI.
OpenEdge	Creates a standard OpenEdge project.
Data Object	Creates an OpenEdge project for Data Object application development to be deployed to traditional servers.
ABL Web App	Creates an OpenEdge project for deploying one or more ABL services or static web user interface content as a single web app to PAS for OpenEdge.

Note: The **Project type configuration** drop-down menu also displays the custom projects that you create using the **Customization Editor**. For more information see *Customization* help.

See also

OpenEdge project and resource data files on page 48
Select AVM and layout options page on page 72
Define PROPATH page on page 74
Select database connections page on page 74
Review custom project layout page on page 74
Project Facets page on page 75

Select AVM and layout options page

The **Select AVM and layout options** page of the **New OpenEdge Project** wizard allows you to specify the OpenEdge AVM options and the Project layout options. You can use this page to specify the project runtime, the project source folder, and the project `r-code` folder. The OpenEdge AVM options on this page depend upon the project type you select on the Create an OpenEdge Project page on page 71 and the facets associated with it.

It contains the following controls:

Use project-specific AVM	Specifies that an AVM, dedicated solely to the project you are creating, starts whenever you open the current workspace. To change this setting after the project is created, use the **Progress OpenEdge** properties page.
Use shared AVM	Specifies use of the AVM that is available to all projects in the workspace. To change this setting after the project is created, use the **Progress OpenEdge** properties page.
Use TTY for runtime	Allows you to run ABL procedures and classes in a character client window rather than in a GUI window. A separate window opens for each program that you run. The wizard automatically selects this option based on the project type you select on the Create an OpenEdge Project page on page 71. **Note:** The GUI client is supported only on Windows. Therefore, on non-Windows platforms, **Use TTY for runtime** is automatically selected and cannot be changed. It does not change according to the type of project you select. In addition to the client windows that open when you run programs, a runtime console is launched for the project AVM when the project opens or for the shared AVM when the workspace opens. However, by default this console window is hidden. After the project is created, to change the TTY setting or to make the project runtime console visible, use the **Progress OpenEdge** properties page (if using a project-specific AVM) or the **Shared AVM** preferences page.
Use project root directory for source and r-code	Specifies that source and `r-code` will be in the top-level of the project folder. **Note:** This option is selected by default.
Use separate source and r-code directories	Specifies where source and `r-code` are located if the location is other than the project root directory. Paths must be specified relative to the project root directory. **Note:** This setting establishes a relationship only between one source location and specified corresponding `r-code` destination. If `r-code` is generated from source residing in any other location in the project, it will end up, by default, in the same directory as the source. Also note that the default build destination property can be changed if you clear the Source directory selection but retain the `r-code` directory selection. The specified `r-code` destination will be applicable to source code from any location in the project. After the project is created, use the **Build** or **PROPATH/Source** properties pages to modify or extend these settings.

See also

OpenEdge project and resource data files on page 48
The ABL Virtual Machine (AVM) on page 19

Create a new OpenEdge project on page 58
Create an OpenEdge Project page on page 71
Define PROPATH page on page 74
Select database connections page on page 74
Review custom project layout page on page 74
Project Facets page on page 75

Define PROPATH page

The **Define PROPATH** page of the **New OpenEdge Project** wizard allows you to view and modify the PROPATH entries configured in the project type that you select on the Create an OpenEdge Project page on page 71.

By default all PROPATH entries are part of the OpenEdge tooling. To exclude a PROPATH entry from OpenEdge tooling, select the **Exclude from OpenEdge tooling** node under the PROPATH entry that you want to exclude. The **Exclude from OpenEdge tooling** node appears as a child node for each PROPATH entry.

If the project types you select provide PROPATH entries, then the order of the PROPATH entries depends on the hierarchy of those project types.

After the project is created, you can change PROPATH settings from the **PROPATH property** page. However, if the project uses a shared AVM, you must use the **Shared AVM/PROPATH** preference page.

See also

PROPATH Properties page on page 85

Select database connections page

The **Select database connections** page of the **New OpenEdge Project** wizard allows you to choose from the available database connection profiles in the workspace. It also allows you to start the Progress Developer Studio for OpenEdge database connection wizard, which you can use to create a new database connection profile.

After the project is created, you can add or remove database connection profiles from the **Database connections properties** page. However, if the project uses the shared AVM, you must use the **Shared AVM/Database Connections** preference page.

See also

Add a new database connection to a project on page 64
Database Connections properties page on page 83

Review custom project layout page

The **Review custom project layout** page of the **New OpenEdge Project** wizard displays the folder structure of the custom project type. The content shown on this page is read-only.

Note: The **Create an OpenEdge Project** page displays all the custom project types that you create using the Customization Editor. See Create custom project types on page 756 help for information on creating custom project types.

When you select multiple custom project types that have a folder structure with similar files, the page prompts you if you want to override the files and display a single instance of the files.

See also

Create a custom project on page 61
New OpenEdge Project wizard on page 71

Project Facets page

The **Project Facets** page of the **New OpenEdge Project** wizard allows you to view, add, and remove facets associated with the custom project type configuration.

Note: Progress Developer Studio for OpenEdge allows you to create a custom project type when you want a combination of different project types to be added to a single project. To do so, select **<custom>** from the **Project Type** drop-down list.

See also

Create a custom project on page 61
New OpenEdge Project wizard on page 71

Project properties pages

The **Properties** dialog is where you specify the values that control the behavior of the currently selected project. This dialog appears when you select a project folder in the **Project Explorer** view and select Properties from the context menu, the **Project** menu (Project > Properties), or the **File** menu (File > Properties).

In a tree view on the left of the window, you can select project properties pages that apply to the Eclipse framework, to third party plugins, or to Progress Developer Studio for OpenEdge. The Progress OpenEdge node contains project properties pages that apply specifically to OpenEdge projects:

See also

Create a new OpenEdge project on page 58
Set project properties on page 65

Progress OpenEdge properties page

The **Progress OpenEdge properties** page allows you to view and to adjust certain characteristics of the OpenEdge AVM, which is the client that runs your ABL code.

To access the **Progress OpenEdge properties** page, right-click an OpenEdge project name in the **Project Explorer** view and choose **Properties** from the context menu. Click the **Progress OpenEdge** node to view the page.

The following controls are available:

Change Profile	Load a previously saved set of project properties (see Configuration variables properties page on page 82). The current profile appears to the right of this button. Click to select from a list of saved profiles.

Use OpenEdge shared AVM	Use the AVM that is available to all projects in the workspace rather than an AVM that is dedicated to the currently selected project. If you change an existing project to use the shared AVM, you may need to update the shared AVM settings to include the PROPATH, assemblies, and database connections of the project. **Note:** If you select the shared AVM for a project, most of the settings on this property page will appear dimmed. They cannot be changed on this page, and they may also be inaccurate. You must go to the Shared OpenEdge AVM preference page to view or to change those settings.Select **Window** > **Preferences** from the main menu bar. Then open **Progress OpenEdge** > **Shared OpenEdge AVM** from the Preferences page tree view. Also be aware that settings changed on the Shared OpenEdge AVM preference page affect all projects that use the shared AVM.
Configure shared OpenEdge AVM	Open the Shared OpenEdge AVM preference page, which allows you to change shared AVM settings.
Current version	The version of the OpenEdge runtime that is used by Progress Developer Studio for OpenEdge (a read-only informational field).
Installation	The root directory in which OpenEdge is installed (a read-only informational field).
Working directory	Specify the directory in which the OpenEdge runtime starts when the project is opened. By default, this is the project root directory.
Temp directory	Specify the directory in which temporary files are created. By default, this is the working directory specified when Progress Developer Studio for OpenEdge was installed.
Startup parameters	Specify any appropriate parameters for starting the AVM in the context of the currently selected project. **Note:** Do not specify database connections as startup parameters. Use the Database connections properties page on page 83 page for this purpose. You can use a parameter file by including `-pf` *`parameter_file_path`*. A relative path statement is interpreted relative to the project working directory. If you check the Add default parameters option, the parameters in the Startup parameters box are appended to the defaults.

Add default parameters	An option to use the default startup parameters. **Note:** Although you can see the default startup parameters on this page, you cannot change them here. Go to the **Progress OpenEdge/Startup** preference page to change the defaults.
Use TTY for runtime	An option to run ABL procedures and classes in a character client window rather than in a GUI window. A separate window opens for each program that you run. **Note:** The GUI option is supported only on Windows. Therefore, on non-Windows platforms, **Use TTY for runtime** is automatically selected and unchangeable. In addition to the windows that open when you run a program, a runtime console is launched for the project-specific AVM when you open the project. However, by default this console window is hidden.
Hide TTY runtime console	An option, selected by default, to suppress the display of the project-specific runtime console. This setting is changeable only if **Use shared AVM** is deselected and **Use TTY for Runtime** is selected.
Use global Toolbox for Visual Designer	An option to use a global (common) Toolbox that might be shared with other projects in the workspace. By default, each OpenEdge project that you create uses a dedicated Toolbox that is specific to that project.
Share Settings	Saves the current set of project properties in a project.xml file in the project root directory, allowing the project to retain its properties after being imported to another workspace.
Import Settings	Imports a set of project properties from a previously generated properties file and applies them to the currently selected project.
Save Profile	Saves the current set of project properties so that you can recall them and apply them to any project.

See also

Set project properties on page 65
AppBuilder properties page (Windows only) on page 77
Build properties page on page 79
Configuration variables properties page on page 82
Database Connections properties page on page 83
PROPATH properties page on page 85

AppBuilder properties page (Windows only)

The AppBuilder properties page allows you to configure the properties of your AppBuilder project in Progress Developer Studio for OpenEdge. This controls the behavior of the ABL GUI procedure (`.w`) files in the currently selected OpenEdge project.

You can access the AppBuilder page by right-clicking an OpenEdge project name in the Project Explorer view and choosing Properties from the context menu. Expand the Progress OpenEdge node in the tree view, and then click the AppBuilder node.

Note: If you chose the shared AVM for the currently selected project, most of the settings on this property page will be disabled. They cannot be changed on this page. You must go to the AppBuilder page under the Shared OpenEdge AVM preference page to view or to change these settings. Select **Window** > **Preferences** from the main menu bar. Then open **Progress OpenEdge** > **Shared OpenEdge AVM** > **AppBuilder** from the tree view. Also, be aware that settings changed on the Shared OpenEdge AVM/AppBuilder preference page affect all projects that use the shared AVM.

The following controls are available:

Enable Dynamics	Enable the AppBuilder for Progress application development in Progress Developer Studio for OpenEdge.
Configuration File	Specify the path of the XML configuration file where Dynamics session types are defined.
Session Type	Specify a name of the session type.
Qualify database fields with a database name	Adds a database name to all field references within the generated code.
Default to suppressing database VIEW-AS phrases	Suppress the VIEW-AS phrases that specify a certain field to be viewed as a specific widget.
Character Terminal Colors	Opens the dialog which allows you to customize the background and foreground colors of the dynamics objects and frame in the design window.

See also

Set project properties on page 65
Configuration variables on page 49
Progress OpenEdge properties page on page 75
Build properties page on page 79
Configuration variables properties page on page 82
Database Connections properties page on page 83
PROPATH properties page on page 85

Assemblies properties page (Windows only)

The Assemblies properties page allows you to specify the location and to modify the content of the `assemblies.xml` file. The `assemblies.xml` file is a list of the assemblies where .NET classes are stored and is referenced at compile time and run time. It is automatically created for your Progress Developer Studio for OpenEdge project when you place a control on a form or manually add an assembly to the project.

To access the Assemblies page, right-click an OpenEdge project name in the Project Explorer view and choose Properties from the context menu. Expand the Progress OpenEdge node in the tree view, and then click the Assemblies node.

Note: If you chose the shared AVM for the currently selected project, the settings on this property page will appear dimmed. They cannot be changed on this page, and they may also be inaccurate. You must go to the Assemblies page under the Shared OpenEdge AVM preference page to view or to change these settings. Select **Window** > **Preferences** from the main menu bar. Then open **Progress OpenEdge** > **Shared OpenEdge AVM** > **Assemblies** from the tree view. Also, be aware that settings changed on the Shared OpenEdge AVM/Assemblies preference page affect all projects that use the shared AVM.

The following controls are available:

Use default location	Reference the `assemblies.xml` file in the default location, which is the top level of the project's folder.
Workspace/File System	If the `assemblies.xml` file is not in the default location, specify some other location by navigating in the workspace or in the file system. The selection appears in the box above the controls.
assemblies.xml file viewer	Shows the information in the `assemblies.xml` file, which includes the assembly names, plus version, culture, encryption, and processor information.
Add	Open the **Add Assembly References** dialog, where you can add both global and local assemblies to the `assemblies.xml` file.
Move Up/Down	Change the order in which the assembly selected in the viewer is referenced. This is useful, for example, if you need to establish the precedence a new assembly containing patches has over the original assembly.
Remove	Remove the assembly selected in the viewer from the `assemblies.xml` file. When you delete a control with the Visual Designer, the assembly reference is not automatically removed from the `assemblies.xml` file. Although unused assembly references do no harm, you can delete them with this control.

See also

.NET assemblies and the Visual Designer (Windows only) on page 371
The ABL Virtual Machine (AVM) on page 19
Add and remove assembly references (Windows only) on page 413
Use the Class Browser on page 433
Progress OpenEdge properties page on page 75
Configuration variables on page 49
PROPATH properties page on page 85
Database Connections properties page on page 83
Configuration variables properties page on page 82
Build properties page on page 79

Build properties page

The Build properties page consists of two tabs, **Build** and **Source** tab.

To access the Build and Source properties page, right-click an OpenEdge project name in the **Project Explorer** view and choose **Properties** from the context menu. Expand the **Progress OpenEdge** node in the tree view, and then click the **Build** node.

The Build properties page allows you to view and adjust options related to compiling ABL source code and saving `r-code`.

The following controls are available on the **Build** tab:

Build only when source files are newer than r-code	Compile only those source files for which no up-to-date `.r` files are present. This option can save time when compiled code already exists.
Enable Kendo UI Builder automatic build	Triggers an automatic build of Kendo UI Builder whenever the content in the Kendo UI Builder folder in the Web UI project changes.

Project build destination	The directory that will contain saved `.r` files. If this field is blank, `.r` files are saved in the same directory as the source files.
	The OpenEdge compiler calculates the destination by appending the project relative path of the source to the path specified in the Build destination box. If, for example, the source file is in:
	`C:\workspace\myproject\src\subdir1`
	and you specify the build destination as:
	`C:\workspace\rcode`
	the `.r` files end up in:
	`C:\workspace\rcode\src\subdir1`
	When you compile a `.cls` file, the directory structure below the path specified in the Build destination box matches the internal package name declared in the `.cls` file.
	Note: The settings on the Source tab of the PROPATH properties page override the build destination specified here. Also note that the Source tab allows you to set multiple source/destination folders. Whereas, the build destination setting on the Build properties page only allows you to specify a single destination folder for all the `.r` files in the project.

Static file destination	The directory, relative to the project root folder, to which static files are copied. This setting is optional.
Generate Sonic invocation files on build	Automatically generate Sonic `.esboe` files whenever a build occurs for the project.
Generate Rest invocation files	Automatically generate Data Service Catalog `.pidl` files whenever a build occurs for the project. For more information, see ABL Service artifacts on page 201.

Configure Workspace settings	Use this page to specify the file extensions associated with compilable ABL files. See also Editor Build options on page 334.
Compilable File Extensions	A comma separated list of the file type extensions that the OpenEdge Editor and SpeedScript can compile.

The **Source** tab allows you to specify the directories in the project where source code resides, the environment (TTY or GUI) of the source code, and the build destination for r-code. You can specify multiple sets of source/destination folders.

The following fields and controls are available on the **Source** tab:

Source directory viewer	Displays a list of folders in the selected project that are designated as locations of source files under the **ROOT** node. When you expand a directory in the list, you see four nodes: Environment (the runtime environment), Build Destination (where r-code is created), Excluded (lists the resources excluded from the build), and Platform node. You can specify a unique environment and build destination for each source directory in your project. **Note:** Source files that are not in one of the designated source file folders shown in this view will still be built. The destination folder for the r-code will be whatever is specified as a build destination on the **Build properties** page. If there is no build destination specified, the r-code destination is the same folder that contains the source file.
Add Folder	Displays a list of the folders in your project that you can designate as containers of the project's source code. It includes the root folder and any sub-folders that are resources in your project structure. When you select a folder from the list, it appears in the Source directory viewer.
Remove	Allows you to remove the selected folder as a container for source code. This does not remove the folder from the file system, neither does it remove the folder as a project resource. If Excluded node is selected, Remove allows deleting the excluded entries from this node so that they are included in the build. See also Include resources in the build on page 317.
Edit	• If a source directory is selected, **Edit** allows you to change to a different source folder in the project. • If **Environment** is selected, **Edit** allows you to designate the runtime environment (GUI or TTY) of your code. By default, the environment is all, which signifies that your code is intended to run in both environments. • If **Build Destination** is selected, **Edit** allows you to designate where to put the `r-code` in the file system. • If Excluded node is selected, **Edit** allows you to modify the excluded entries (Exclude resources from the build on page 315 or Include resources in the build on page 317 in the build).

Move Up	Changes the build order. You can move the resources or projects up to the top in the build process, so that they are built first.
Move Down	Changes the build order. You can move down the resources or projects to the bottom in the build process, so that they are built last.

See also

Set project properties on page 65
Add Sonic ESB annotations on page 305
Progress OpenEdge properties page on page 75
AppBuilder properties page (Windows only) on page 77
Assemblies properties page (Windows only) on page 78
Configuration variables properties page on page 82
Database connections properties page on page 83
Modules properties page on page 84
PROPATH properties page on page 85
Configuration variables on page 49

Configuration variables properties page

The **Configuration Variables properties** page allows you to view and define custom configuration variables, to make a project retain its settings when imported into another workspace, and to save settings in a named profile.

To access the Configuration Variables properties page, right-click an OpenEdge project name in the Project Explorer view and choose Properties from the context menu. Expand the Progress OpenEdge node in the tree view, and then click the Configuration Variables node.

The following controls are available:

{APP}	An optional variable (only valid in project properties pages) that represents the root directory for your application, and is used in path statements. Enter the appropriate path. **Note:** This is a predefined variable and cannot be deleted.
{DB}	An optional variable (only valid in project properties pages) that represents the root directory for your database, and is used in path statements. Enter the appropriate path. **Note:** This is a predefined variable and cannot be deleted.
Add	Defines a new configuration variable.

Edit	Edits an existing configuration variable.
Remove	Deletes the selected configuration variable. **Note:** You cannot delete the predefined variables: { APP} and {DB}.

See also

Set project properties on page 65
Export and import project resources and properties on page 66
Configuration variables on page 49
Progress OpenEdge properties page on page 75
AppBuilder properties page (Windows only) on page 77
Build properties page on page 79
Database Connections properties page on page 83
PROPATH properties page on page 85

Configuration Variables preferences

The **Configuration Variables** preference page provides a list of available configuration variables as defined for the workspace.

The following options are available:

Add	Defines a new configuration variable.
Edit	Modifies aspects of an existing configuration variable. This button is disabled until a configuration variable is selected.
Remove	Deletes the selected configuration variable.

Database connections properties page

The **Database Connections** properties page allows you to select database connections for a project. You can choose from all of the database connections available in the workspace. Progress Developer Studio for OpenEdge automatically connects to selected databases when you open the project.

To access the Database Connections page, right-click an OpenEdge project name in the Project Explorer view and choose Properties from the context menu. Expand the Progress OpenEdge node in the tree view, and then click the Database Connections node.

Note: If you chose the shared AVM for the currently selected project, the settings on this property page appear dimmed. They cannot be changed on this page, and they may also be inaccurate. You must go to the Database Connections page under the Shared OpenEdge AVM preference page to view or to change these settings. Select **Window** > **Preferences** from the main menu bar. Then open **Progress OpenEdge** > **Shared OpenEdge AVM** > **Database Connections** from the tree view.Also, be aware that settings changed on the Shared OpenEdge AVM/Database Connections preference page affect all projects that use the shared AVM.

The following controls are available:

Configure Database Connections	Opens up the Database connections preferences on page 35 page where you can add, edit and delete, and import and export database connection profiles.
Show Selected	Show only the database connections that are associated with the currently selected project.
Show All	Show all database connections that are available in the current workspace.
Connections viewer	Displays a list of available database connections, along with their associated attributes. Those connections which are currently assigned to the project are checked and displayed first in the list. To assign a database connection to the current project, select the checkbox. When a row is checked, it is repositioned at the top of the list, just below the last checked item.
Connection String	Displays the database startup parameters for the connection selected in the Connections viewer. Click on a connection name in the viewer to select it.
Select All	Selects all rows.
Deselect All	Deselects all rows.
Edit	Starts an **Edit Connection Profile** dialog, where you can change connection parameters.

See also

Set project properties on page 65
Progress OpenEdge properties page on page 75
AppBuilder properties page (Windows only) on page 77
Configuration variables properties page on page 82
Database connections properties page on page 83
PROPATH properties page on page 85

File Destinations properties page

The **File Destinations properties** page contains fields where you can specify the destination of Sonic ESB (`.esboe`), and REST (`.pidl`) invocation files. To set the automatic generation of either of these invocation files, open the **Build properties** page.

See also

Build properties page on page 79

Modules properties page

The Modules properties page allows you to view and configure the modules for ABL AppServer, ABL WebApp, and ABL REST project types.

Note: The Modules properties page displays only if an ABL AppServer facet, an ABL Web App facet, or an ABL REST Service facet is installed on the currently selected project. You install these facets when you create an ABL AppServer project type, an ABL WebApp project type, or an ABL REST project type on the Create an OpenEdge Project page.

To access the Modules page, right-click the project name in the Project Explorer view and choose Properties from the context menu. Expand the Progress OpenEdge node in the tree view, and then click the Modules node.

The following controls are available:

Module viewer	Displays a tree view of the module name and the folders that are configured for the project.
Modify	Allows you to change the module name that is configured for the selected project and to select the folders to be published.

See also

Publish modules and services on PAS for OpenEdge on page 106

PROPATH properties page

To access the PROPATH properties page, right-click an OpenEdge project name in the Project Explorer view and choose Properties from the context menu. Expand the Progress OpenEdge node in the tree view, and then click the PROPATH node.

Note: If you chose the shared AVM for the currently selected project, the settings on this property page will appear dimmed. They cannot be changed on this page, and they may also be inaccurate. You must go to the PROPATH page under the Shared OpenEdge AVM preference page to view or to change these settings. Select **Window** > **Preferences** from the main menu bar. Then open **Progress OpenEdge** > **Shared AVM** > **PROPATH** from the tree view. Also, be aware that settings changed on the Shared OpenEdge AVM/PROPATH preference page affect all projects that use the shared AVM.

The PROPATH tab lets you control where the AVM searches for files and procedures.

The following controls are available on the PROPATH tab:

PROPATH viewer	Displays PROPATH settings in a tree view format. You can expand nodes to see more detail about a particular setting. It usually opens with a default list of typical settings, which you can modify with the controls on the left of the page. The settings should include all locations that might contain files needed for your application, and should be arranged in an appropriate search order. A PROPATH entry can be either a directory or a procedure library. By default all PROPATH entries are part of the OpenEdge tooling. To exclude a PROPATH entry from OpenEdge tooling, select the Exclude from OpenEdge tooling node under the PROPATH entry that you want to exclude. The Exclude from OpenEdge tooling node appears as a child node for each PROPATH entry.
Move Up, Move Down	Changes the position in the list of a current entry, and thus changes the search order.

Remove	Deletes an entry from the list.
Edit	Changes the value of the current entry.
Add Procedure Library	Adds a procedure library from the selected project.
Add External Library	Adds a procedure library from the file system.
Add Workspace Directory	Adds a directory from the current workspace.
Add External Directory	Adds a directory from the file system.
Add Standard Paths	Displays a list of common locations that you can choose to add to your PROPATH setting.

See also

Set project properties on page 65
Add resources to a project on page 62
Progress OpenEdge properties page on page 75
AppBuilder properties page (Windows only) on page 77
Assemblies properties page (Windows only) on page 78
Build properties page on page 79
Configuration variables properties page on page 82
Database Connections properties page on page 83
Modules properties page on page 84
Configuration variables on page 49

SpeedScript properties page

The **SpeedScript properties** page applies to WebSpeed projects.

The option Generate `.w` file for **WebSpeed** is selected by default in order to enable the automatic generation of the `.w` files that are necessary to debug **SpeedScript**.

The **SpeedScript editor e4gl code generation** field allows you to specify the destination of generated `.w` files. By default, the target is `SpeedScriptGen`, a folder in the current project.

Project Facets of Project Properties page

The **Project Facets** page of **Project Properties** allows you to view, add, and remove facets from a project. This page is available only if the selected project is a faceted project. If the project facet that you add to this page contains any configuration pages, the page displays a **Further configuration** available link. You can select this link to open the corresponding pages.

See also

Create a new OpenEdge project on page 58
New OpenEdge Project wizard on page 71

Progress OpenEdge Import and Export wizards

Import data definitions page

The **Import Data Definitions** page of the **Import wizard** allows you to import schema changes from a data definition file into the Progress database.

Note: This feature is limited to Progress OpenEdge databases and does not impact other databases like Oracle, SQL, etc.

To access this page, select **File** > **Import**, expand the **Progress OpenEdge** node in the tree view, and select the **Database Definitions** node.

Note: You can also access this page by selecting **Import DF** on the Database connections preferences on page 35 page.

The following controls are available on the Import data definitions page:

Input file	Specifies the data definition file to be imported. Enter the path or browse to select a path and the file name in the local system.
Target database	Specifies the active database where the schema from the selected data definitions file is loaded.
Force Commit	Ensures that the data dictionary continues to load and commit changes even if it encounters errors.
Add Object Online	Adds new objects without obtaining an exclusive lock.

Note: You cannot import data definitions into an empty database. An error is displayed when you select an empty database. An empty database refers to a database without any AREA defined. The page prompts you when the import operation is successful and displays an error if a database connection error occurs or the file location authentication fails.

See also

Import and export schema changes on page 820
Export Data Definitions page on page 89

Import workspace database connections page

The **Import workspace database connections** page of the **Import** wizard allows you to import connection information from one workspace to another. After exporting connection information from a workspace to an XML file, you can import that XML file to another workspace.

To access this page, select **File** > **Import**, expand the **Progress OpenEdge** node in the tree view, and select the **Database connections** node.

Note: You can also access this page by clicking Import on the **Database connections preferences** page.

The following controls are available on the Import workspace database connections page:

From database connection file	Specifies the database connection file to be imported. **Note:** The database connection file is an XML file created on the Export workspace database connections page. Type the path, select a previous path from the drop down list, or browse to select a path and file name on the file system.
Ignore duplicate connections	Ignores listing of connections that already exist in your workspace.
Database connections	Displays a list of the connections defined in the database connection file, along with their associated attributes. To select database connections to be imported, select their corresponding check boxes.
Connection string	Displays the database startup parameters for the connection selected in the **Database connections** viewer. Click a connection name in the viewer to select it.
Select All	Selects all database connections.
Deselect All	Deselects all database connections.

See also

Database connection profiles on page 19
Export database connections on page 68
Import database connections on page 69
Database connections preference page on page 35
Export workspace database connections page on page 90

Import shared AVM settings page

The **Import shared AVM settings** page of the **Import wizard** allows you to import settings used by the shared AVM from the local file system.

To access this page, select **File** > **Import**, expand the Progress OpenEdge node in the tree view, and select the Shared AVM settings node.

The following controls are available on the **Import shared AVM settings** page:

From directory	Specifies the source directory to import the files from. Type the path, select a previous path from the drop down list, or browse to select a path and file name on the file system.
Shared AVM settings	Displays a list of settings used by the shared AVM to be imported from the local file system.
Select All	Selects all shared AVM settings.

Deselect All	Deselects all shared AVM settings.
Overwrite existing files without warning	Replaces the existing files without a warning message. If the specified file already exists in the file system, you will be prompted to overwrite the file. Select this option if you do not want to be prompted.

See also

Shared AVM preferences page on page 36
Export shared AVM settings page on page 91

Import Workspace OpenEdge Explorer connections page

The **Import Workspace OpenEdge Explorer Connections** page of the Import wizard allows you to import connection information from one workspace to another. After exporting connection information from a workspace to an XML file, you can import that XML file to another workspace.

To access this page expand the **Progress OpenEdge > Server > OpenEdge Explorer Connections** node in the **Preferences** page, and then click **Import**.

The following controls are available on the import Explorer connections page:

Field	Description
From OpenEdge Explorer connection file	Specifies the Explorer connection file to be imported. Enter the path, select a previous path from the drop down list, or browse to select a path and file name on the file system. **Note:** The explorer connection file is an XML file created on the Export workspace database connections page.
OpenEdge Explorer connections	Displays a list of the connections defined in the Explorer connection file, along with their associated attributes.
Select All	Selects all OpenEdge Explorer connections.
Deselect All	Deselects all OpenEdge Explorer connections.
Ignore duplicate profiles	Ignores listing of connections that already exist in your workspace.

See also

Export Workspace OpenEdge Explorer connections page on page 92

Export Data Definitions page

The **Export Data Definitions** page of the **Export** wizard allows you to export schema changes to a data definition file which can be used by other OpenEdge developers.

Note: This feature is limited to Progress OpenEdge databases and does not impact other databases like Oracle, SQL, etc.

To access this page, select **File** > **Export**, expand the **Progress OpenEdge** node in the tree view, and select the **Database Definitions** node.

Note: You can also access this page by selecting Export DF on the Database connections preferences on page 35 page.

The following controls are available on the **Export Data Definitions** page:

Source database	Specifies the active database to which the data definitions are exported. You can either choose from the drop-down list of active databases or select the location and file in the local system.
Select Tables	Opens the **Select Tables** dialog in which you can select one or more tables for the source database. All the tables are selected by default. **Note:** The **Select Tables** option is enabled when you select a database in the **Source** database field.
Create Incremental DF file	Exports the incremental changes between two selected databases to the local system.
Comparison Database	Specifies the database that is compared to the source database and exports the incremental changes between the two. **Note:** The **Comparison Database** field is enabled when you select the **Create Incremental DF file** check box.

Note: The page prompts you when the export operation is successful and displays an error if a database connection error occurs or the file location authentication fails.

See also

Import and export schema changes on page 820

Export workspace database connections page

The **Export workspace database connections** page of the **Export** wizard allows you to export connection information from a workspace to an XML file.

To access this page, select **File** > **Export**, expand the **Progress OpenEdge** node in the tree view, and select the **Database connections** node.

Note: You can also access this page by clicking **Export** on the **Database connections preferences** page.

The following controls are available on the **Export workspace database connections** page:

Database connections	Displays a list of the configured database connections, along with their associated attributes. To select the database connections to be exported to the XML file, select their corresponding check boxes.
Connection string	Displays the database startup parameters for the connection selected in the Database Connections viewer. Click a connection name in the viewer to select it.
Select All	Selects all database connections.
Deselect All	Deselects all database connections.
To database connection file	Specifies the target location for the exported XML file. Type the path, select a previous path from the drop down list, or browse to select a path and file name on the file system.
Overwrite existing files without warning	Replaces the existing database connections files without a warning message. If the specified database connections file already exists in the file system, you will be prompted to overwrite the file. Select this option if you do not want to be prompted.
Exclude user ID and password	Prevents user ID or password information from being included in the exported XML file. Select this option if you are exporting connection information to some other user.

See also

Database connection profiles on page 19
Export database connections on page 68
Import database connections on page 69
Database connections preference page on page 35
Import workspace database connections page on page 87

Export shared AVM settings page

The **Export shared AVM settings** page of the **Export wizard** allows you to export settings used by the shared AVM to the local file system.

To access this page, select **File** > **Export**, expand the Progress OpenEdge node in the tree view, and select the Shared AVM settings node.

The following controls are available on the **Export shared AVM settings** page:

Shared AVM settings	Displays a list of settings used by the shared AVM to be exported to the local file system.
Select All	Selects all shared AVM settings.
Deselect All	Deselects all shared AVM settings.

To directory	Specifies the destination directory for the exported files. Type the path, select a previous path from the drop down list, or browse to select a path and file name on the file system.
Overwrite existing files without warning	Replaces the existing files without a warning message. If the specified file already exists in the file system, you will be prompted to overwrite the file. Select this option if you do not want to be prompted.

See also

Shared AVM preference page on page 36
Import shared AVM settings page on page 88

Export Workspace OpenEdge Explorer connections page

The **Export Workspace OpenEdge Explorer Connections** page of the Export wizard allows you to export Explorer connection information from a workspace to an XML file.

To access this page expand the **Progress OpenEdge > Server > OpenEdge Explorer Connections** node on the Preferences page, and then click **Export**.

The following controls are available on the the export Explorer connections page:

Field	Description
OpenEdge Explorer connections	Displays a list of the configured Openedge Explorer connections, along with their associated attributes.
Select All	Selects all OpenEdge Explorer connections.
Deselect All	Deselects all OpenEdge Explorer connections.
To OpenEdge Explorer connection file	Specifies the target location for the exported XML file. Enter a path, select a previous path from the drop down list, or browse to select a path and file name on the file system.
Overwrite existing files without warning	Replaces the existing OpenEdge Explorer connections file without a warning message. If the specified OpenEdge Explorer connections file already exists in the file system, you will be prompted to overwrite the file. Select this option if you do not want to be prompted
Exclude user ID and password	Prevents user ID or password information from being included in the exported XML file. Select this option if you are exporting connection information to some other user.

See also

Import Workspace OpenEdge Explorer connections page on page 89

Build and Compile options

The following tables summarize the **Build and Compile** options available with Progress Developer Studio for OpenEdge. Some of these options are provided by the Eclipse framework, while others are a part of the Progress Developer Studio for OpenEdge functionality. The tables also list the help topics associated with each option that you can refer to for detailed information.

Options provided by Progress Developer Studio for OpenEdge:

Option	Description	Associated help topics
Build Working Set Automatically	Allows you to automatically build a working set. To access this option, select **Project** > **Build Working Set Automatically**. **Note:** The **Build Working Set Automatically** option is enabled only when the automatic build preference (at the project level) is disabled (ensure that **Project menu** > **Build Automatically** is not selected).	Build a working set automatically on page 320
Clear OpenEdge Compile Errors	Clears any error messages for a particular file from the Problems view or the marker bar. To use this option, select **Project** > **Clear OpenEdge Compile** > **Errors** or select **Progress OpenEdge** > **Clear OpenEdge Compile** > **Errors** from the ABL Editor context (right-click) menu.	Clear OpenEdge errors on page 314 Progress OpenEdge context menu on page 346
Save automatically before build	Saves all the modified resources in the Workbench before a manual build. To access this option, select **Windows** > **Preferences** > **General** > **Workspace**.	
Compilable file extensions	Specifies the file extensions defined in the workspace for file types that the OpenEdge Editor and SpeedScript can compile. To access this option select **Windows** > **Preferences** > **Progress OpenEdge** > **Editor** > **Build**.	Editor Build options on page 334 SpeedScript properties page on page 86
Compile on save if required	Compiles ABL source files each time you save them. To access this option select **Windows** > **Preferences** > **Progress OpenEdge** > **Editor** > **Build**.	Compile ABL code on page 311 Editor Build options on page 334

Option	Description	Associated help topics
Exclude from Build	Excludes compilable resources when you build your project. You can exclude files, folders, or both from the build. To access this option select the Progress OpenEdge menu that is available from the ABL Editor context (right-click) menu. You can also exclude resources using **Exclusion Pattern Selection** and **Add Resource Exclusions**. See Exclude resources using Exclusion Pattern Selection on page 315 and Exclude resources using Add Resource Exclusions on page 316 for more information.	Excluded resources on page 264 Exclude resources from the context menu on page 315 Progress OpenEdge context menu on page 346
Include in Build	Includes the excluded resources to the build. This option is only available for the resources that were excluded from the build. To access this option select the Progress OpenEdge menu that is available from the ABL Editor context (right-click) menu. You can also include resources using the Source tab of the **Build properties** page. See Including resources using the Source tab for more information.	Include resources using the context menu on page 317 Progress OpenEdge context menu on page 346
Recompile files that have errors	Allows you to compile only the files that have errors. To access this option for a project, right-click the project or a folder or select the project from the main menu and select **Compile Files with Error**. You can also select **Compile All Files with Error** from the main menu in the **Problems** view to compile all the files with the errors.	Compile ABL code on page 311 Compile files with errors on page 313
Compile	Allows you to explicitly compile your current file. To access this option, select **Compile** from either the **Source** menu or the ABL Editor context (right-click) menu.	Compile ABL code on page 311 Progress OpenEdge context menu on page 346
Save r-code	Saves `.r` files when you build the code. When this option is enabled, OpenEdge saves compiled `.r` files in the directory you specify in the **Build destination** field; or, if that field is blank, in the same directory as the source file. To access this option, select **Properties** > **Progress OpenEdge** > **Build**.	Configure r-code generation on page 468

Option	Description	Associated help topics
Build only when source files are newer than r-code	Compiles only those source files that do not have the latest `r-code`. This option can save time when compiled code already exists. To access this option, select **Properties** > **Progress OpenEdge** > **Build**.	
Project build destination	Specifies the directory that will contain the r-code. If this field is blank, the `r-code` is saved in the same directory as the source files. To access this option, select **Properties** > **Progress OpenEdge** > **Build**.	Configuration variables on page 49
Pre-compile callback routine	Specifies a procedure that runs prior to compilation. To access this option, select **Properties** > **Progress OpenEdge** > **Build**.	
Source tab	Allows you to specify the directories in the project where source code resides, the environment (TTY or GUI) of the source code, and the build destination for `r-code`. To access this option, select **Properties** > **Progress OpenEdge** > **Build**.	

Options provided by the Eclipse framework:

Option	Description	Associated help topics
Build All	Performs an incremental build on all the projects in the Workbench. It builds (compiles) all the resources in the Workbench that are affected by any resource changes since the last incremental build. To use this option, select **Project** > **Build All**. To build all resources, even those that have not changed since the last build, select **Project** > **Clean** before building the project. **Note:** The **Build All** option is only available if the **Build Automatically** menu option is not selected. You can access this option from the **Project** menu or from the **General** > **Workspace preference page**.	

Option	Description	Associated help topics
Build Project	Builds the selected projects in the workspace. To use this option, you can: • Select the project that you want to build and then select **Project** > **Build Project** • Select **Build Project** from the project context (right-click) menu **Note:** The **Build Project** option is only available if the **Build Automatically** menu option is not selected. You can access this option from the **Project** menu or from the **General** > **Workspace preference page**.	
Build Working Set	Builds (compiles) all the resources in the working set that are affected by any resource changes since the last build. It also allows you to create a new working set by using Select Working Set. To access this option select **Project** > **Build Working Set**. **Note:** The **Build Working Set** option is only available if the **Build Automatically** menu option is not selected. You can access this option from the **Project** menu or from the **General** > **Workspace preference page**.	Build a working set manually on page 320 Create a new working set on page 319
Build Automatically	Allows you to toggle the auto build preference. When checked, builds are invoked automatically as resources are saved. Automatic builds are always incremental and always operate over the entire workspace. To access this option, select **Project** > **Build Automatically**. You can also configure your preferences (**Window** > **Preferences** > **General** > **Workspace**) to perform builds automatically on resource modification.	Compile ABL code on page 311

Option	Description	Associated help topics
Build Order	Allows you to explicitly define the order in which projects are built. Alternatively, you can let the platform compute the build order by interpreting project references as prerequisite relationships. The build order is applied for building the entire workspace or for a group of projects. To access the build order options, select **Windows** > **Preferences** > **General** > **Workspace** > **Build Order**. The following build order options are provided: • **Up** and **Down**: Manually changes the build order. • **Add Project** and **Remove Project**: Add and removes projects from the build order. • **Use default build order**: Allows the platform to compute the order in which the projects are built. Turning off this option enables access to the projects list, the order of which can be manipulated. • **Max iterations when building with cycles**: Allows you to specify the maximum number of times the workbench will attempt to iterate over the build order before giving up. You can also use the Source tab of the **Build properties** page to change the build order, add, and remove projects from the build order.	
Wait for ongoing build to complete before launching	Controls whether to wait for the ongoing build to complete before launching other resources. To access this option select **Windows** > **Preferences** > **Run/Debug** > **Launching**.	
Build (if required) before launching	Allows you to manually build the project before launching, when the Build Automatically option is not selected. To access this option select **Windows** > **Preferences** > **Run/Debug** > **Launching**.	

3

Learn About PAS for OpenEdge

The Progress Application Server (PAS) is a platform that provides Web server support for Progress applications. Progress applications are packaged as Web application archives (WAR files) and deployed to the Java Servlet Container of a running instance of PAS. Client access to a PAS server is through HTTP/HTTPS protocols. Clients include (but are not limited to) browser-based applications and mobile apps.

PAS for OpenEdge is an application server based on the Apache Tomcat Web server and servlet container.

For more information on PAS for OpenEdge, see the Learn about PAS for OpenEdge.

For details, see the following topics:

- Concepts
- Tasks
- References

Concepts

What is PAS for OpenEdge?

The PAS for OpenEdge is the core application server, based on Apache Tomcat, that is the foundation for application servers in OpenEdge as well as other Progress products. PAS for OpenEdge is an application server that is tailored specifically to support OpenEdge applications.

PAS for OpenEdge is available as two separate products:

- **The Progress Production Application Server for OpenEdge**—configured as a secure Web server for OpenEdge application deployment
- **The Progress Development Application Server for OpenEdge**—configured as a Web server for developing and testing OpenEdge applications

Application development, testing, debugging, and deployment is supported by the Progress Development Studio (PDS) for OpenEdge, which includes a project type and a development server for PAS for OpenEdge. The PDS for OpenEdge is the recommended development tool for Web applications deployed on PAS for OpenEdge.

Administration and configuration support is provided by the OpenEdge Management (OEM) and OpenEdge Explorer tools. For more information, see *Manage Progress Application Server for OpenEdge with OpenEdge Management*.

PAS for OpenEdge also includes a command line utility (**TCMAN**), plus APIs (**JMX** and **REST**) for creating your own administrative scripts and utilities.

The PAS for OpenEdge Server perspective

The PAS for OpenEdge appears in the OpenEdge Server perspective, which includes the various views that you use to perform related activities in Progress Developer Studio for OpenEdge. The perspective is based on the OpenEdge Editor perspective but also includes the **Servers** view and the **Progress OpenEdge Server Monitor** view.

By default, the OpenEdge Server perspective includes the following views:

- **Project Explorer**—A hierarchical view of the projects and resources in a workspace. The view is an adaptation of the view with some OpenEdge-specific menu options.
- **Outline**—A list of the structural elements of the file that is currently open in the ABL Editor or an XML Editor. The view is the view customized for working with ABL.
- **DB Structure**—An OpenEdge view that displays the schema of connected databases. You can drag and drop schema elements (tables, fields, and others) from this view into a file that is open in the ABL Editor.
- **Console**—A Workbench view that displays the text output from commands (runtime startup, for example) similar to the output in a command window.
- **Problems**—A log of the errors, warnings, and other information associated with a file that has been opened in the ABL editor. The view is the standard .
- **Tasks**—A To-Do list. The view is the standard .
- **Properties**—The properties of the object currently selected in the Workbench.
- **Servers**—A list of all defined servers, including PAS for OpenEdge. This list appears if the AdminServer is running; otherwise, the view is blank.
- **Progress OpenEdge Server Monitor**—A status view for a PAS for OpenEdge instance.

PAS for OpenEdge launch configuration

A launch configuration is a group of settings that govern an instance of the OpenEdge AVM. You can define the settings for one or more launch configurations for each PAS for OpenEdge instance.

For more details, see Launch configurations for running and debugging programs on page 451 help.

Project support for PAS for OpenEdge

Most operations that you perform with Progress Developer Studio for OpenEdge take place within the context of a project. You can create multiple projects and maintain them concurrently in your workspace.

ABL WebApp project type for PAS for OpenEdge

The ABL Web App project type is an OpenEdge project that lets you deploy one or more ABL services as a single web app to PAS for OpenEdge. It contains the ABL WebApp, Progress Adapters, and OpenEdge facets. It contains ABL REST (for ABL Service of REST type), or ABL Data Object (for ABL Service of Data Object type) facets depending on the ABL Service type that you created while creating the project.

After creating the project, if you define any ABL Service for that project, the corresponding facet gets added.

You can see the facets enabled for your project using the Project Facets page on page 75 page.

Terminology related to PAS for OpenEdge

The following terms describe various components that apply to PAS for OpenEdge support in Progress Developer Studio for OpenEdge:

Server	An instance of a server runtime. You can define many servers for a given runtime. For PAS for OpenEdge support in Progress Developer Studio for OpenEdge, a server is used to connect to OpenEdge Explorer and provides connection information and publishing options for a particular PAS for OpenEdge.
Server configuration	A collection of files used to configure a running server. Typically, the configuration consists of a set of port numbers and other properties.
Server Runtimes (or runtimes)	The software application that executes as a server platform. For OpenEdge, this refers to the location of the OpenEdge installation that is used to communicate with OpenEdge Explorer and provide PAS for OpenEdge functionality
Modules	A collection of files used to organize content that is being developed for a server. A module usually consists of a hierarchy of files that reside in the Eclipse workspace. Modules also have a many-to-many relationship with other modules, and the file hierarchy for modules does not indicate any specific module containment. A PAS for OpenEdge project is allowed one module, and a PAS for OpenEdge module is required for publishing code to a server.
Facets	A mechanism used to add project functionality that you can turn on or off. Within OpenEdge, you can use facets to add a specific module type to a project. When you add a facet to a project, the facet is used as a marker for performing certain setup requirements or for simply marking the project as a specific project type.
ABLApplication	A logical name to groups different ABL Web applications.

Overview of WebSpeed support in PAS for OpenEdge

PAS for OpenEdge is available as a host for WebSpeed applications.You can migrate existing WebSpeed applications to PAS for OpenEdge, or you can use Progress Developer Studio for OpenEdge to develop new WebSpeed applications that run on PAS for OpenEdge.

Tasks

Create a PAS for OpenEdge instance

PAS for OpenEdge is an application server that lets you deploy all OpenEdge services on a single server.

To define PAS for OpenEdge:

1. From the **Servers** view in the **OpenEdge Server** perspective, right-click and select **New** > **Server** from the context menu. The **Define a New Server** box appears.
2. To select PAS for OpenEdge as the server type, do one of the following:
   - Type Progress Application Server in the **Select the server type** field. This setting filters the results to display only the PAS for OpenEdge's list.
   - Select **Progress Software Corporation** > **Progress Application Server** as the server type from the list in the box.

   Note: The server's host name, `localhost`, is prefilled. The Server name and the Server runtime environment details are also listed. If you want to specify a different server runtime environment, performs Steps 3 through 5. Otherwise, go to step 6.
3. Click **Add**. The **Identify an OpenEdge** installation box appears.
4. Enter the runtime environment name and the OpenEdge version number and then click **Finish**.
5. To set up the runtime environment, click **Configure runtime environments** and follow the steps provided in Defining the OpenEdge AVM runtime.
6. Click **Next**. The **Define a new Progress Application Server** box appears, in which the Server details are prefilled.
7. Do one of the following:
   - Select the name of the connection from the OpenEdge Explorer connection drop-down list.

     Note: Make sure that the selected OpenEdge Explorer connection has a PAS for OpenEdge defined.
   - Click **Configure**. The **Progress OpenEdge** > **Server** > **OpenEdge Explorer Connections Preferences** page opens.
8. Select the **Progress Application Server for OpenEdge** and the default **ABL Application**.
9. Click **Next**. The **Add and Remove** box appears. It displays the available project modules (OE project, REST, or Data Object service module).

10. To configure an available project module, select the module in the **Available** list and click **Add** or double-click the module in the Available list. To configure all the available project modules, click **Add All**.

    Note: You can remove a project module from the Configured list by selecting the module and by clicking **Remove** or double-clicking the module in the Configured list. You can also select more than one project module and click **Remove All**.

11. Click **Finish**. ABL Service modules and the business logic is published to the PAS for OpenEdge instance.

See also

What is PAS for OpenEdge? on page 99
Terminology related to PAS for OpenEdge on page 101

Add an OpenEdge Explorer connection

To publish PAS for OpenEdge code remotely, you must have a configured OpenEdge Explorer connection.

Note: The **Use secure connection** option visible on this page is not implemented.

To add an **OpenEdge Explorer** connection:

1. Choose **Window** > **Preferences**.
2. Select **Progress OpenEdge** > **Server** > **OpenEdge Explorer Connections**.
3. The **OpenEdge Explorer Connections** page opens. Do the following:
   a) Click **Add**. The **Add OpenEdge Explorer Connection** dialog opens.
   b) Type the connection name.
   c) Type the Host name or IP address.
   d) Specify the port. (The default port is `9090`.)
   e) Type the user name. (The default user name is `admin`.)
   f) Type the password. (The default password is `admin`.)
   g) Provide the **OpenEdge Explorer URL**. (If you are using the default host name and port number, the URL is `http://localhost:9090`.)
   h) To finish the connection setup, click **Finish**, or click **Create Default Server and Finish**. If there are no default servers available in the Servers view, a default server will be created and will appear in the **Servers** view.
4. Click **OK** to close the **OpenEdge Explorer** connection.

Define the OpenEdge AVM runtime

The OpenEdge AVM (ABL Virtual Machine) runtime defines for Eclipse the location of one or more OpenEdge runtime installations and allows you to configure which installation you want to use. You can set up multiple OpenEdge installations, or you can reuse a single installation.

The first time you run Progress Developer Studio for OpenEdge, it automatically creates two runtimes (one for the AppServer server type, and one for the WebSpeed server type) for the current installation. You can create a new runtime for the current version or for other installations where a server product is installed.

To specify the server runtime you want to use, begin with the **Eclipse Server Runtimes Environment** preferences. Choose a runtime from the list of existing OpenEdge runtimes on the preferences page, or create a new OpenEdge runtime.

1. To access the list of installed runtime environments:
   a) From the Progress Developer Studio for **OpenEdge** menu bar, select **Window** > **Preferences**. The **Preferences** page appears.
   b) Select **Server** > **Runtime Environments**. The **Server Runtime Environments** page appears, showing the list of all available OpenEdge runtimes.
2. You can now do the following:
   a) Use, modify, remove, or search for an installed OpenEdge runtime environment
   b) Add an OpenEdge installed runtime environment
   c) Add a third-party runtime environment
3. To use, modify, remove, or search for an installed OpenEdge runtime environment, from the **Server Runtime Environments preferences** page, do one of the following:
   - To use an existing OpenEdge runtime environment, select it and click **OK**. The **Preferences** page closes.
   - To modify an existing OpenEdge runtime environment, select it and click **Edit**. The **Edit Server Runtime Environment** dialog appears. Modify the runtime environment name and/or OpenEdge version, and click **Finish**. Then click **OK** to close the **Server Runtime Environments preference** page.
   - To remove an existing OpenEdge runtime environment, select it and click **Remove**. The runtime environment is deleted from the list. This deletion invalidates all existing servers that are relying on that runtime.
   - To reuse a previously removed runtime, recreate it (if necessary) and reassign the runtime for the server from the PAS for OpenEdge server editor on page 118.
   - To search for an existing OpenEdge runtime environment that does not appear in the list, click **Search**. The **Search For Runtime Environments** dialog appears. Locate the runtime environment directory and click **OK**. Then click **OK** to close the **Preferences** page.
4. To add an OpenEdge installed runtime environment, from the **Server Runtime Environments preferences** page, you can add an OpenEdge installed runtime environment.
   a) Click **Add**. The **New Server Runtime Environment** dialog appears.
   b) Type **OpenEdge** in the **Select the type of runtime environment** field to filter the results, or select **Progress Software Corporation OpenEdge AppServer** as the runtime environment from the list provided.
   c) To create a new local server, select the **Create a new local server** check box.
   d) Click **Next**.

e) Type the Runtime environment name and OpenEdge version in the fields provided.

f) If you chose to create a new local server in Step 3, click **Next**, define a new AppServer broker by Add an OpenEdge Explorer connection on page 103, and click **Next**, define the publishing rules, click **Finish**, and click **OK**. If you did not choose to create a new local server, click **Finish**, and click **OK**.

5. To add a third-party runtime environment, from the **Server Runtime Environments Preferences** page, you can click **Add** and then click **Download additional server adapters** to download and install the Eclipse WTP Server Adapter and additional development tools for a number of third-party server adapters.

Note: For more information, see the overview in the .

See also

Server Runtime Environments preferences on page 120

Access OpenEdge Explorer

You can access OpenEdge Explorer from several different perspectives, including the OpenEdge Server. (It might be necessary for you to reset the perspectives in existing workspaces to see new view and perspective shortcuts.)

From the Progress Developer Studio for OpenEdge menu bar, select **OpenEdge** > **Admin** > **OpenEdge Explorer**. Depending on whether you have installed OpenEdge Management (which includes OpenEdge Explorer) or just OpenEdge Explorer, one of the following occurs:

- If you have OpenEdge Management installed, the login window appears. Type your user name and password, and click **OK**. The Web browser opens to the management console.
- If you have OpenEdge Explorer only, the OpenEdge Explorer connection defined in the **OpenEdge Explorer Connections** page is used to open the Web browser.

See also

Progress OpenEdge Server preferences on page 121

Define a PAS for OpenEdge's runtime environment

The **Server Runtime Environments' Preferences** page lets you define PAS for OpenEdge's runtime environment.

To define PAS for OpenEdge's runtime environment:

1. Click **Window** > **Preferences**. The **Preferences** page appears.
2. In the left pane, expand **Server** > **Runtime Environments**. The **Server Runtime Environments** page appears in the right pane.
3. Click **Add**. The **New Server Runtime Environment** box appears.
4. From the server runtime environment list, click **Progress Software Corporation** > **Progress Application Server**. The **Identify an OpenEdge installation** box appears.
5. Enter the runtime environment name and the OpenEdge version number and then click **Finish**.

Rename a PAS for OpenEdge instance

You can rename a PAS for OpenEdge instance.

To rename a server:

1. From the **Servers** view in the **OpenEdge Server** perspective, right-click the required PAS for OpenEdge instance and then click **Rename** from the context menu.
2. Type the new name of the PAS for OpenEdge, and press **Enter**.

Publish modules and services on PAS for OpenEdge

You can use the **Servers** view in the OpenEdge Server perspective to create a PAS for OpenEdge instance and publish the WebApp Modules and ABL Services to PAS for OpenEdge. The modules of OpenEdge projects with the selected ABL AppServer facets, ABL services of the REST, WebHandler, or the REST RPC, types are deployed on the ABL application publish directory of the selected PAS for OpenEdge.

To add the WebApp Mdules and ABL Services, right-click on the server and select **Add and Remove**. From the available list of WebApp Modules and ABL Services, select the ones to add and click **Add** and click **Finish**. To publish the business logic, right-click on the PAS for OpenEdge instance and select **Publish**.

Note: If the **Automatically publish when resources change** (default) option is selected for the PAS for OpenEdge instance, the server automatically tries to publish the changes after the specified publishing interval (which, by default, is set to 15 seconds).You can change this value using the **Publishing interval** control in the Server Editor, which is displayed by double-clicking the server. For more information on changing the publishing settings, see PAS for OpenEdge server editor on page 118.

Alternatively, you can select **If server is started, publish the changes automatically**, checkbox on the **Add and Remove** window to publish the WebApp Mdules and ABL Services..

The ABL services are deployed using **PASOEContent** to build `.WAR` files. A single `.WAR` file is created for all Data Object and REST services in a project and gets deployed on basis of the project, for example if a project has ten services and a single `.WAR` file with the project name containing all the services gets deployed. If the project `.WAR` file exists, the services are published incrementally or else the entire `.WAR` file is published.

To publish an ABL Service:

1. In the **Servers** view, right-click a PAS for OpenEdge instance that you want the ABL Service to be deployed to, and select **Add and Remove**. The Add and Remove page opens.
2. Select an ABL AppServer content module and ABL Services of REST, or WebHandler, REST RPC type from the **Available** section, and click **Add** to move it to the **Configured** section.
3. Click **Finish**. The web application is published as `<WebAppName>.war` to the webapps folder of the selected PAS for OpenEdge instance. It is published to the default **ROOT** web application depending on what you have set in the project properties page.

   The `openedge.properties` file in the `<PAS Instance>/conf` path is updated with the following entry under the webApps' WEB section:

```
handler1=OpenEdge.Web.DataObject.DataObjectHandler: /pdo/
```

DataObjectHandler is the new OpenEdge.Web.DataObject.DataObjectHandler available in the existing OpenEdge.Net.pl library in both source and r-code forms. This handler uses the above generated <service>.gen file, and translates a HTTP request into a call to a business entity.

If you undeploy a WebSpeed based Data Object service, the <service>.json and <service>.gen files are removed from the server.

If want to publish already associated module/service(s), do one of the following to publish:

- Select **Publish** from the context menu
- Select the **Publish to the server** icon on the Servers view toolbar

If all assigned or added modules on server are published successfully, then the **Servers** view displays the status of the server as **Started**, **Synchronized**, and the status of the server modules as **Synchronized**, **Published**.

Note:

If ABL AppServer modules are published to PAS for OpenEdge, the artifacts get deployed on the ABL application publish directory of the selected PAS for OpenEdge.

When REST services are published to PAS for OpenEdge, <service>.paar files are deployed to the server. When REST based Data Object Services are published, <service>.paar and <service>.json files are deployed to the server.

You can change the publish directory by changing the value in the Publish directory field in the **Server launch configuration wizard startup** tab, the default location is <PAS Instance>/openedge.

Delete a PAS for OpenEdge instance

You can use the Delete option from the Servers view to remove a PAS for OpenEdge instance from the Servers view.

To delete a PAS for OpenEdge instance:

1. From the **Servers** view in the **OpenEdge** perspective, right-click the required PAS for OpenEdge instance and then click **Delete** from the context menu.
2. Click **Yes** to confirm.

   The PAS for OpenEdge and all its services and resources are deleted from the **Servers** view.

View PAS for OpenEdge log files

You can view the log information of a currently running PAS for OpenEdge in the **Console** view. The log information includes server-related errors, warning messages, and informative messages. Progress Developer Studio for OpenEdge stops logging this information when the server is stopped or removed from the **Servers** view.

The **Console** view is available when you start or restart a server from within Progress Developer Studio for OpenEdge.

You can open the **Console** view to display the PAS for OpenEdge log file in one of the following ways:

- From the **Servers** view, select the PAS for OpenEdge whose log information you want to view and then select **Show In** > **Console** from the context (right-click) menu.
- From the Progress Developer Studio for OpenEdge menu bar, select **Window** > **Show View** > **Other** > **General** > **Console**, click **Display Selected Console** from the **Console** view toolbar, and then select the server log from the drop-down list.

Work with PAS for OpenEdge launch configuration

You can run a PAS for OpenEdge instance from within the Progress Developer Studio for OpenEdge environment using the PAS for OpenEdge launch configuration. Each time you do so, Progress Developer Studio for OpenEdge runs a launch configuration, which you can customize to suit the needs of your application and its target implementation.

Starting a PAS for OpenEdge instance at runtime loads the properties defined for the server instance, the ABL applications, and the application properties (the ABL application properties are defined in `<openedgeWork>/<instancename>/conf/openedge.properties`). The session manager and agents are configured with the ABL Application. You can use the PAS for OpenEdge launch configuration to edit the session and agent properties.

Access the PAS for OpenEdge launch configuration

To access the PAS for OpenEdge launch configuration wizard, do one of the following:

- Select the PAS for OpenEdge instance that you want to run and then select **Open** from the context (right-click) menu.

  Then, in the server editor, select the **Launch configuration** link.

- Click the drop-down arrow next to **Run** to open a menu from which you can start an existing configuration, create, and run a default configuration.

The PAS for OpenEdge launch configuration appears.

Work with ABL WebApp

Create an ABL WebApp project

You can create an OpenEdge ABL WebApp project and customize the options for ABL services development.

To create an OpenEdge project specialized for Data Object Service development:

1. Select **File** > **New** > **OpenEdge Project** from the Progress Developer Studio for OpenEdge main menu bar or the Project Explorer view context (right-click) menu. The New OpenEdge Project wizard opens and displays the Create an OpenEdge Project page on page 71.
2. Type a name in the **Project name** field.

   The root folder for the new project is created in your current Developer Studio workspace, unless you specify a different location.

3. To choose a different location for the project, click and clear the **Use default** check box. Then either browse to, or enter the path to the desired location.

4. Select **Server** from the left section.
5. Select **REST** as the transport to create an OpenEdge project with a REST (Mapped RPC) service that can be deployed to PAS for OpenEdge.
6. Select the **Create a Data Object Service** check box.
7. Click **Next**. The **Provide ABL Web App deploy details** page appears.
8. Specify the Web Application deploy options and provide the Business Logic details (or leave the default settings). From the **Supported servers** list, select the servers that will be the destination for your published web objects. The primary function of these servers is to support publishing your code for running, testing, and deploying your REST service. For example, select **oepas1** from the list to publish your REST service. Then click **Next**. The **Create an ABL Service** page appears.
9. In the Service Type options, fill up the details (or leave with default settings). The default name of the REST service is the REST project name and Service appended to it. For example, `<projectname>Service`. You can specify a different name in the **Service name** field and a relative URI in the **Service relative URI** field. Filling up of **Service description** field is optional. Click **Next**. The **Select AVM and layout options** page appears.
10. Specify the OpenEdge AVM options and the project layout options (or leave the default settings) and click **Next**. The **Define PROPATH** page appears.
11. Leave the default settings or modify the PROPATH entries to be used by the project and click **Next**. The **Select database connections** page appears.
12. Select the database connections to be used by the project and click **Finish**.

You will see your project and its resources in the Project Explorer view.

See also

ABL WebApp project type on page 200
ABL WebApp project folder structure on page 201

Create an ABL REST Service

You can create ABL Services using the **New ABL Service** wizard and deploy them to PAS.

1. Select **File** > **New** > **ABL Service** from the Progress Developer Studio for OpenEdge main menu bar. The **New ABL Service** wizard opens.

   Note: You can also right-click an ABL Web App project, and then select **New** > **ABL Service** from the context menu. You can also access the **New ABL Service** wizard while creating the ABL Web App project.

2. By default, the **Project** field displays the currently open project to which you can associate the ABL service. Click Browse**(...)** if you want to select a project other than the current one.
3. Enter a **Service name** to display the name of the service.
4. To create an ABL Service, do one of the following:

   - To create an ABL Service of WebSpeed (WebHandler) type:

     1. Select **WEB** transport type.
     2. Enter a name in **Create new** to create a new Web handler or click **Select existing** and then click **Browse** to add an existing Web handler.
     3. Click **Add** to enter a **Resource URI**.

Note:

The Resource URI must start with "/".

You can edit or remove a resource URI using **Edit** and **Remove**. Use the Up and Down keys to sort the resource URIs.

When you finish creating the ABL service, the WebSpeed service is generated and appears under the **Defined Services** node.

- To create an ABL Service of REST (Mapped RPC) type:
  1. Select the **REST** transport type.
  2. Enter a relative path for all the resources to be defined in **Service relative URI**. For example, `/Customer`.

     Note: The relative URI must start with "/".

  3. (Optional) Enter **Service description** for the REST service.
- To create an ABL Service of Data Object type with the WebSpeed WebHandler service provider:
  1. Select the **WEB** transport type.
  2. Select the **Create Data Object Service** check box.
  3. Enter a name in **Create new** to create a new Web handler or click **Select existing** and then click **Browse** to add an existing Web handler.
  4. Click **Add** to enter a **Resource URI**.

     Note:

     The Resource URI must start with "/".

     You can edit or remove a resource URI using **Edit** and **Remove**. Use the Up and Down keys to sort the resource URIs.

     When you finish creating the ABL service, Data Object service with WebSpeed WebHandler service provider and `service.json` and `service.gen` files are created and appears under the Defined Services node.

- To create an ABL Service of Data Object type with the REST RPC service provider:
  1. Select the **REST** transport type.
  2. Create the **Create Data Object Service** check box.
  3. Enter a relative path for all the resources to be defined in **Service relative URI**. For example, `/Customer`.

Note:

The relative URI must start with "/".

When you finish creating the ABL service, Data Object service with REST service provider and a `service.json` file is created and appears under the Defined Services node.

4. (Optional) Enter **Service description** for the REST service.

5. Click **Finish**.

Create a WebHandler Class

The web-disp.p control program available for WebSpeed applications for traditional servers does not exist in PAS for OpenEdge. Web object execution is controlled by a built-in handler object. This default handler class can be modified to implement any web-disp.p customizations that you want to replicate. However, you cannot migrate web-disp.p to a PAS for OpenEdge instance.

To modify the default handler class, create a new WebHandler class.

To create a new WebHandler class:

1. Select **File** > **New** > **WebHandler** from the Progress Developer Studio menu bar. The **New WebHandler** wizard opens.

   Note: You can alternatively right-click the project and select **New** > **WebHandler**.

2. Specify an open project that will contain the class code and other project code in the **Package root** field. Click **Browse** if you want to select a project other than the current one (the default value).
3. Specify a package name in the **Package** field that corresponds to a sub-folder of the package root, and will contain the class file. Click **Browse** if you want to select a project other than the current one (the default value). A period (.) must separate each subfolder from its parent folder in the path name.
4. Specify the name of the Web handler class in the **WebHandler name** field.
5. Select the **Final** check box if you do not want to allow inheritance from this Web handler class. A `FINAL` option is included in the generated ABL code. A `Final` class cannot be `Abstract`.
6. Select the **Abstract** check box to specify that the Web handler class is abstract and cannot be instantiated. An abstract class is designed to serve as a super class from which other classes inherit and implement members. Therefore, an `Abstract` class cannot be `Final`.
7. Select the **Widget pool** check box to specify that a USE-WIDGET-POOL option is included in the generated ABL code.
8. Select the **Serializable** check box to mark the Web handler class as serializable by including the `SERIALIZABLE` modifier in the generated ABL code.

   Note: If the class inherits from a super class that is not serializable, then it cannot be marked as serializable. The WebHandler class should always inherit `OpenEdge.Web.WebHandler` directly or through other classes.

9. Specify another class in the current project as a super class (or a different project that is available in the propath) from which the new class inherits state and behavior in the **Inherits** field. Click **Browse** or enter the class path by typing. A period (.) must separate each node from its parent folder in the path name.

Note: By default, the super class name is populated as `OpenEdge.Web.WebHandler`. The super class cannot be generic.

10. Specify one or more interfaces in the current project or a different project that is available in the propath that the class implements using the **Implements** section. Click **Add** and select the required interfaces in the **Interface Selection** dialog. Click **Remove** to remove an interface from the list after adding it.
11. Select the methods in the **Method stubs** section that you want to generate in the Web handler class.

Note: The GET method is selected by default.

12. Select one of the following error-handling statements to add it to the generated ABL code:
    - **Block level**: Includes the `BLOCK-LEVEL ON ERROR UNDO, THROW` statement in the generated ABL code.
    - **Routine level**: Includes the `ROUTINE-LEVEL ON ERROR UNDO, THROW` statement in the generated ABL code.
13. Select **Throw a Not Implemented exception** option button to specify that "`METHOD NOT IMPLEMENTED`" error code is added to stubs for members implemented via interface and stubs for inherited abstract members.
14. Select **Return a default value** option button to specify that the default return values are added to stubs for members implemented through interface and stubs for inherited abstract members.
15. Click **Finish**.

Export an ABL Service

The Export ABL Web application wizard allows you to package an ABL service as a `.WAR` file to deploy as a complete web application or to export services incrementally by creating a `.ZIP` file that contains `.PAAR` files for each selected ABL REST and ABL Data Object (REST RPC) and `.gen` and `pdo.handlers` file for ABL Data Object (WebHandler). You can use the `.WAR` file or the `.ZIP` file to deploy the packaged Web application to a remote server.

To export as ABL Web Application:

1. In the Project Explorer view, select the ABL WebApp project that contains the ABL services that you want to export as a Web application.
2. Right-click the project and click **Export** from the context menu. The Export ABL Web application dialog box opens.

Note: You can also select the service, right-click, and select **Export**.

3. The **Project** drop-down list displays the project you have selected in Step 1. You can select a different project from the drop-down list.

Note: The **Project** drop-down displays only the ABL Web App projects in your current workspace.

4. In the **Destination** drop-down list, specify a location or click drop-down displays only the ABL Web App projects in your current workspace.**Browse** to select a different location for the Web application.
5. Select one of the following options:

- **Export ABL services for Progress Application Server** to export the services by creating a single `.WAR` file for all the selected ABL services in the project.
- **Export services for incremental deployment** to export services by creating a `.ZIP` file that contains `.PAAR` file for each selected ABL REST, `.PAAR` and `.json` files for each selected REST based Data Object Service, `.handlers` files for selected ABL WebSpeed services, and pdo `.handlers` and `.gen` files of WebSpeed based Data Object Services.

6. Select the **Service Name** check box to select all the services in the project or click the individual ABL services that you want to export.
7. Click **Finish**.

   When you export an ABL Service of any type fully, a `.WAR` file with PAS for OpenEdge content folder of ABL WebApp project is exported with some other files depending on the ABL Service type as follows:

   - When you export ABL Service of REST type, `.PAAR` files for each selected service is generated in the `WEB-INF/adapters/rest/`*`servicename`* location.
   - When you export ABL Service of WebSpeed type, merge.properties files is generated in the `WEB-INF/tlr` location. This file contains multiple entries for each handler of the selected services:

     ```
     [${oepas-app}.${oepass-webapp}.WEB]
     adapterEnabled=1
     handler1=sampleHandlerClass:/uri1
     srvrDbug=0
     ```

   - When you export REST based ABL Service of Data Object type, `.PAAR` files for each selected service is generated in the `WEB-INF/adapters/rest/`*`servicename`* location and *`servicename`*`.json`
   - When you export WebSpeed based ABL Service of Data Object type, `merge.properties` file is generated the file in the static folder.`WEB-INF/tlr` file in the location with a single entry as follows:

     ```
     handler1=OpenEdge.Web.DataObject.DataObjectHandler:/pdo/
     ```

     `servicename``.json` in the static folder and *`servicename`*`.gen` file in `WEB-INF/openedge` is generated

When you export an ABL Service of any type incrementally, a `.ZIP` file containing the static folder of ABL WebApp project and the openedge folder in the Web-INF folder is exported with some other files depending on the ABL Service type as follows:

- When you export an ABL Service of REST type, `.PAAR` files for each selected service is generated in the `WEB-INF/adapters/rest/`*`servicename`* location.
- When you export an ABL Service of WebSpeed type, *`servicename`*`.handlers` file for each service is created in in `WEB-INF/openedge` location. Here is an example of `.handlers` file:

```
{
"version": "1.0",
"servicename": "sampleWebSpeedservice",
"handlers": [{
"className": "SamplehandlerClass",
"URIs": [
"\/uri1",
"\/uri2"
]
}]
}
```

- When you export a REST based ABL Service of Data Object type, `.PAAR` files for each selected service is generated in the `WEB-INF/adapters/rest/`*`servicename`* location and *`servicename`*`.json` file in the static folder.
- When you export a WebSpeed based ABL Service of Data Object type, *`servicename`*`.json` file in Static folder and *`servicename`*`.gen` file in the `WEB-INF/openedge` location are generated. A single `pdo.handlers` file for all the selected services is generated in the `WEB-INF/tlr` location as follows:

```
{
"version": "1.0",
"serviceName": "pdo",
"handlers": [{
"className": "OpenEdge.Web.DataObject.DataObjectHandler",
"URIs": ["\/pdo\/"]
}]
}
```

Migrate a REST Project to ABL WebApp Project

You can migrate an existing traditional REST project and all its services to an ABL WebApp project to deploy the project to PAS for OpenEdge instance.

1. Remove all the services from the REST manager and REST Broker that are related to the project that you are migrating.
2. Select the project and click **Properties** > **Project Facets**. The Project Facets page opens.
3. Clear the REST and ABL AppServer facets check boxes.
4. Click **Apply**.
5. Select ABL AppServer, ABL Web App, and ABL REST Service facets check boxes.

6. Click **Apply**.
7. Click **OK**. The project is now an ABL WebApp project

Migrate a Data Object Project to ABL WebApp Project

You can migrate an existing traditional Data Object project and all its services to an ABL WebApp project to deploy the project to PAS for OpenEdge instance.

1. Remove all the services from the REST manager and REST Broker that are related to the project that you are migrating.
2. Select the project and click **Properties** > **Project Facets**. The Project Facets page opens.
3. Clear the Data Object, REST and ABL AppServer facets check boxes.
4. Click **Apply**.
5. Select ABL AppServer, ABL Web App, ABL Data Object Service, and ABL REST Service facets check boxes.
6. Click **Apply**.
7. Click **OK**. The project is now an ABL WebApp project

Upgrade an ABL WebApp project

If you have imported an ABL WebApp project from an older OpenEdge version to the current version of Progress Developer Studio, you must upgrade the **Spring Security** files.

To upgrade the Spring Security files, complete the following steps:

1. Right-click the ABL WebApp project and select **Progress OpenEdge** > **Migrate Spring Security Files**. The **Migrate Spring Security Files** dialog box also opens.

   Note: The dialog box also opens when you open an old workspace or import an old project to the lastest workspace that contains ABL WebApp projects.

2. Click **OK**.

   Note: If you click **Cancel**, you must later follow the previous step to upgrade.

   The Spring Security files in the current `WEB-INF` folder in the project directory are moved to the newly created backup folder. The migrated Spring Security files are placed in the `WEB-INF` folder.

Work with Web UI Project Type

Web UI project is a new OpenEdge project type that allows you to develop web front-end applications and deploy it on the PAS OE server. It supports deploying the build output of Kendo UI Builder project to the selected PAS instance.

A new facet, Web UI, is added to the project properties when you create a Web UI project.

Create a Web UI project

You can use the Web UI project to develop web front-end applications deployed on PAS for OpenEdge. You can also use the Web UI project to deploy the applications created in Kendo UI Builder.

To create a Web UI project:

1. Select **File** > **New** > **OpenEdge Project** from the Progress Developer Studio for OpenEdge main menu bar or the Project Explorer view context (right-click) menu. The New OpenEdge Project wizard opens and displays the Create an OpenEdge Project page on page 71.
2. Type a name in the **Project name** field.

   The root folder for the new project is created in your current Eclipse workspace, unless you specify a different location.
3. To choose a different location for the project, click and clear the **Use default** check box. Then either browse to, or enter the path to the desired location.

   Note: If you want to use a Kendo UI Builder project with the Web UI project, ensure that the name of the project is same as the Kendo UI Builder app, and you select the same location for the Web UI project where the Kendo UI Builder project resides.
4. Select **Client** from the left section.
5. Select the **Web Application** option button and select the Web UI option button.
6. Click **Next**.
7. Type a name in the **WebApp name** field.
8. From the **Supported servers** list, select the servers that will be the destination for your published application. The primary function of these servers is to support the publishing of your code for running, testing, and deploying your Web App to PAS for OpenEdge.
9. Click **Finish**. The project is deployed to the selected PAS for OpenEdge instances with the name you provided. If you have associated this project with Kendo UI Builder, the debug folder is added to the build output folder in the Project Explorer to contain all Kendo UI Builder content.

Export a Web UI project

You can export a Web UI project as a `.WAR` file (to a PAS for OpenEdge server) or a `.ZIP` file (to an external Web Server) to create an archive of a project that can be distributed to other systems or users.

To export the Web UI project:

1. In the Project Explorer view, select the required Web UI project that you want to export.
2. Right-click the project and click **Export** > **Web UI Application** from the context menu. The **Export Web UI Application** dialog box opens.
3. The Project drop-down list displays the project you have selected in Step 1. You can select a different project from the drop-down list.

   Note: The Project drop-down displays only the Web UI projects in your current workspace.
4. In the **Destination** drop-down list, specify a location or click **Browse** to select a different location for the export.

5. Select one of the following servers that you want to deploy the `.WAR` or `.ZIP` file to:
   - **PAS for OpenEdge** to export the contents of PASOEContent and Debug or Release folders to PAS for OpenEdge server.
   - **External Web Server** to export the contents of Debug or Release folders to an external Web Server.
6. Select one of the following options:
   - **Export Release Build** to export the contents of the Release folder that contains the production build used for publishing in the Kendo UI Builder structure in the Project Explorer.
   - **Export Debug Build** to export the contents of the Debug folder that contains the development build used for debugging the Kendo UI Builder structure in the Project Explorer.
7. Click **Finish**. A `.WAR` or `.ZIP` file is exported for the selected project based on build type.

Migrate an existing project to a Web UI project

You can migrate an existing project, and all its services, to a Web UI project to deploy the project to PAS for OpenEdge.

To migrate:

1. Remove all the services from the existing projects that are related to the project that you are migrating.
2. Select the project and click **Properties** > **Project Facets**. The **Project Facets** page opens.
3. Clear the facets related to the current project.
4. Click **Apply**.
5. Select **Web UI facet** check box.
6. Click **Apply**.
7. Click **OK**. The project is now a Web UI project.

Publish a Web UI project

The Web UI project is published to the PAS instance that you selected while creating the project. You can also publish it to another PAS instance using the **Add and Remove** dialog box in the **Servers** view.

Note: For more information on changing the publishing settings, see PAS for OpenEdge server editor on page 118.

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1. In the **Servers** view, right-click a PAS instance that you want the project to be deployed to, and select **Add and Remove**. The **Add and Remove** page opens.
2. Select the Web UI project and click **Add** to move it to the **Configured** section.
3. Click **Finish**. The project and its content is published to the selected PAS instance.

If you want to publish already associated project, do one of the following to publish:

- Select **Publish** from the context menu
- Select the **Publish to the server** icon on the Servers view toolbar

If all assigned or added modules on server are published successfully, then the **Servers** view displays the status of the server as **Started**, **Synchronized** and the status of the server modules as **Synchronized**, **Published**.

Note: A single `.WAR` file is created for each Web UI project. If the project is already published, then any changes to the Web UI project are published incrementally.

PAS for OpenEdge server editor

You can use the **PAS for OpenEdge Server Editor** to view or modify PAS instance properties for an ABL Service or a Web UI project.

From the **Servers** view in the OpenEdge Server perspective, you can access the PAS for OpenEdge Server Editor in the following ways:

- Double-click a PAS for OpenEdge instance
- Select a PAS for OpenEdge instance, right-click, and then select **Open**

The PAS for OpenEdge Server Editor provides information in the following categories:

- **General Information** — Provides the host name and other common settings
- **Connection** — Specifies the information for connection to the OpenEdge Explorer
- **Publishing** — Specifies the publish settings
- **Timeouts** — Specifies the time limit to complete server operations (Start and Stop)

General Information

You can modify the following General Information properties in the PAS for OpenEdge Server Editor:

Option	Description
Server name	The name of the PAS for OpenEdge instance.
Host name	The name of the host machine.
Runtime Environment	The current runtime environment. You can click the drop-down list or the Runtime Environment link to change to a different OpenEdge AVM runtime or OpenEdge version.

Connection

You can modify the following OpenEdge Explorer properties in the PAS for OpenEdge Server Editor:

Option	Description
OpenEdge Explorer connection	The name of an existing OpenEdge Explorer connection. To add a connection, click **Configure** .
PAS for OpenEdge	To choose from a list of available PAS servers, click the drop-down arrow. To refresh the list, click **Refresh**. **Note:** Remember that you cannot create a new PAS for OpenEdge Server in Progress Developer Studio for OpenEdge; to create a PAS for OpenEdge Server, use OpenEdge Management.
ABL Application	The name of the ABL Application that is to be deployed to the selected PAS for OpenEdge instance.

Publish

You can modify the publishing settings to choose one of the following options:

- Never publish automatically
- Automatically publish when resources change
- Automatically publish after a build event

You can also set the publishing interval in seconds.

Timeouts

You can specify the time limit (in seconds) for completing **Start** and **Stop** server operations.

Note: You can start and stop the PAS for OpenEdge Server from the Servers view using the **Start** and **Stop** options on the PAS for OpenEdge Server's context menu.

Publish source code

You can select this option to publish the source code from the folders that are in the project propath.

Publish r-code

You can select this option to publish the r-code of the source files from the folders that are in the ABL WebApp project propath.

Launch the OpenEdge web app

You can launch the app from the **Server** view.

To launch an app:

1. In the **Servers** view, expand the PAS for OpenEdge instance.
2. Right-click the WEB UI module and click **Launch App**. The `http://host:port/WebApp` URL opens and launches the app.

Undeploy a Web UI project

The **Remove** context option in the **Add and Remove** dialog box allows you to undeploy a Web UI module from a PAS instance.

To undeploy a Web UI module:

1. From the **Severs** view, select a PAS for OpenEdge instance from which you want to undeploy the Web UI module.
2. Select **Add and Remove** on the PAS server context menu. The **Add and Remove** dialog appears and displays a list of deployed Web UI module.
3. Select the **Web UI module** from the **Available** list, and then click **Remove**. This moves the selected Web UI module to the **Configured** list.

   Note: To remove all the deployed Web UI modules, click **Remove All**.

4. Select the **If server is started, publish changes immediately** check box to publish changes immediately upon the startup of PAS.
5. Click **Finish** to save your changes.

Delete a published Web UI project

You can use the **Delete** option to remove a Web UI project.

Note: Make sure you want to delete the Web UI project as it is also associated with your Kendo UI Builder app.

To delete a Web UI project:

1. From the Project Explorer view, right-click the Web UI project.
2. Select **Delete** from the context menu. A confirmation dialog prompts you to confirm the deletion.
3. Click **Yes** to confirm the deletion.

   The selected Web UI project and its artifacts are deleted from the workspace. The *WebAppName*`.war` file and the *WebAppName* folder are also deleted from the PAS instance webapps folder in the OpenEdge installation folder. The current workspace is automatically refreshed.

References

PAS for OpenEdge preferences

Server Runtime Environments preferences

You set OpenEdge runtime AVM properties in the **Eclipse Server Runtime Environments preferences** page. You access the page by selecting **Window** > **Preferences** > **Server**.

You can add, edit, or remove server runtime environments by using the following options:

Add	To select a new OpenEdge AVM runtime, click **Add**.
Edit	To make changes to a server runtime name or OpenEdge version number, select the server runtime in the list and click **Edit**.
Remove	To remove a server runtime, select it and click **Remove**.
Search	To find an existing server runtime that is not in the list, click **Search**. Locate the environment, and click **OK** to add the server runtime to the list.

See also

Define the OpenEdge AVM runtime on page 103

PAS for OpenEdge server preferences

You can set several Progress OpenEdge Server preferences related to publishing and to the **Progress OpenEdge Server Monitor** view.

You can access the **Progress OpenEdge Server preferences** page in several different ways, such as:

- From the Progress Developer Studio for OpenEdge menu bar, by choosing **Window** > **Preferences** > **Progress OpenEdge** > **Server**.
- From the Progress OpenEdge Server Monitor view on page 129, by clicking the dropdown arrow on the view toolbar and selecting Preferences.

You can set these **Server** preferences:

WebSpeed Broker URL	Set the Web browser URL for OpenEdge Explorer.
Trim agents on publish	Select this option to trim all agents automatically from the broker whenever a publish event occurs. Whenever modules are published to the server, all the server's agents will be trimmed immediately after the publish event succeeds. If the publish event fails for any reason, the agents will not be trimmed. **Note:** This option is enabled by default.
Remove deleted files and folders on publish	Select this option to remove all files and folders from the publish location on publishing. This will remove from the server any files or folders that you have removed from the module. **Note:** This option is enabled by default.
Remove all files and folders when cleaning server publish directory	Select this option to remove all files and folders following the completion of clean operations. **Note:** This option is enabled by default.

Publish empty folders	Select this option if you want to publish folders even if they are empty. **Note:** This option is enabled by default.
Run/Debug - Update properties from server before starting/launching	Select this option to use the broker's defined properties rather than the server's launch configuration. (When a server is started, all the server's launch configuration properties are used for the broker on the remote machine. Selecting this option prevents the overwriting of the broker properties with the server properties.) **Note:** This option is cleared by default.
Publish filters	Select one or more items in the filter list to avoid publishing specific resources. To remove a filter, select it in the **Publish Filters** table and then click **Remove**.
Filter	To add a filter, click **Add** (next to the Publish Filters table) and then type the filter expression in this field. Then click **Update**.
Server status refresh interval (in seconds)	Specify the refresh delay interval for server status updates. **Note:** The default is 15 seconds.
Enable Agent State tab	Select this option to show the tab in the **Progress OpenEdge Server Monitor** view. **Note:** This option is cleared by default.
Restore Defaults	Click to restore the original set of publish filters and all other preference options on this page.
Apply	Apply the preference selections.

OpenEdge Explorer connections preferences

The OpenEdge Explorer Connections preferences page is used to maintain the available explorer connections. By default, an OpenEdge Explorer Connection profile is created when a new workspace is launched. You can manually edit the explorer connection or create a new explorer connection.

Access this page by clicking **Progress OpenEdge** > **Server** > **OpenEdge Explorer Connections** in the Preferences page.

This page includes the following options:

Add	Displays the Add an OpenEdge Explorer connection on page 103 dialog that allows you add a new explorer connection profile.

Edit	Displays the Edit Connection Profile dialog that allows you to edit the selected explorer connection profile.
Remove	Removes the selected explorer connection profile from your workspace.
Default	Allows you to select a default explorer connection profile.
Import	Displays the Import Workspace OpenEdge Explorer connections page on page 89 dialog that allows you to import a connection profile.
Export	Displays the Export Workspace OpenEdge Explorer connections page on page 92 dialog that allows you to export a connection profile.

See also

Access OpenEdge Explorer on page 105
PAS for OpenEdge server preferences on page 121

ABL Service Project Property page

The ABL Service project property page helps you to set up the deploy options after you create a new ABL service.

This page appears when you right-click a project and select **Properties**.

Note: The options that you select, will apply to all the services that you created for this project.

The following options are available:

Field	Description
Deploy as a default (ROOT)	Select if you want the services to be placed in the ROOT WebApp folder when you publish the project. The services are published incrementally.
Deploy as WebApp	Select if you want the `.WAR` file to be published with the WebApp name that you provide.
Supported servers	From the list, select the servers that will be the destination for your published Web App. The primary function of these servers is to support publishing your code for running, testing, and deploying your WebApp to PAS for OpenEdge.

PAS for OpenEdge launch configuration settings

The **PAS for OpenEdge** launch configuration wizard displays the following tabs:

Server	Displays the server name, host name, and runtime associated with the PAS for OpenEdge.

Startup	Lets you specify the session and agent parameters of the PAS for OpenEdge.
PROPATH	Lets you control where the AVM searches for files and procedures. The PROPATH is associated with the default ABL application in the PAS for OpenEdge instance.
Databases	Lets you add the database connection for running the configuration. These database connections are associated with the default ABL application in the PAS for OpenEdge instance.
Common	Lets you set options for specifying where the application launch configuration is saved, how it is accessed, and how it runs.

Server tab (PAS for OpenEdge)

The **Server** tab in the PAS for OpenEdge section of the **Configurations** wizard specifies the PAS for OpenEdge instance used by the launch configuration.

The following controls are available on the **Server** tab:

Name (accessible from all tabs)	(Required) Specifies the name of the launch configuration, which appears on menus and in the left pane of the **Configurations** wizard.
Server	(Required) Specifies the PAS for OpenEdge instance that starts when the launch configuration runs.
Runtime Environment	(Read-only) Specifies the version of the PAS for OpenEdge instance.
Host Name	(Read-only) Specifies the machine on which the PAS for OpenEdge broker runs.
Apply	Saves the current launch configuration definition.
Revert	Discards unsaved changes to the current launch configuration definition.
Run or Debug	Starts or debugs the specified PAS for OpenEdge instance.
Close	Closes the **Configurations** wizard.

Startup tab (PAS for OpenEdge)

The **Startup** tab of the **Progress Application Server for OpenEdge** section in the **Configurations** wizard specifies the PAS for OpenEdge instance used by the launch configuration.

The following controls are available on the **Startup** tab:

Name (accessible from all tabs)	(Required) Specifies the name of the launch configuration, which appears on menus and in the left pane of the **Configurations** wizard.

Publish directory	Specifies the directory in which the AVM starts when the configuration runs. By default, the value is set to the OpenEdge installation working directory. If you created the launch configuration using the **New Server** wizard, the value you set for the PAS for OpenEdge is used. Click **Workspace**, **File System**, or **Variables** to specify a location by browsing or using a variable.
Session Procedures	Specifies the procedure that is to run when each of these PAS for OpenEdge operations occurs. Click **Browse** to display and select from the **Select Activation Procedure** dialog.
Agent Procedures	Specifies the startup and shutdown procedure that is to run when each of these PAS for OpenEdge operations occurs.
Startup procedure parameters	(Optional) Specifies one or more startup parameters to be used when the startup procedure, if any, runs.
Agent startup parameters	(Optional) Specifies one or more startup parameters to be used when the server instance starts.
Import From Server	Loads the Startup tab values of the agent properties from `openedge.properties` file. **Note:** The PROPATH and database information are not copied.
Apply	Saves the current launch configuration definition.
Revert	Discards unsaved changes to the current launch configuration definition.
Run or Debug	Starts or debugs the specified PAS for OpenEdge instance.
Close	Closes the Configurations wizard.

PROPATH tab (PAS for OpenEdge)

The **PROPATH** tab in the **Progress Application Server for OpenEdge** section in the **Configurations** wizard allows you to control where OpenEdge searches for files and procedures when the launch configuration runs.

The **PROPATH** tab provides the following controls:

Name (accessible from all tabs)	(Required) Specifies the name of the launch configuration, which appears on menus and in the left pane of the Configurations wizard.
Tree view	Displays the current PROPATH definition.
Add Project	Opens a browser that lets you select a project from which the PROPATH settings are imported. OpenEdge copies the PROPATH of the project you choose to the selected location in the launch configuration PROPATH.

Copy ini Settings	Opens a browser that lets you select an initialization (`.ini`) file from which the PROPATH settings are imported. OpenEdge replaces the entire existing PROPATH with the PROPATH defined in the selected initialization file.
Other command buttons	Function as described in the PROPATH properties page on page 85 for the **Project Properties** dialog.
Agent startup parameters	(Optional) Specifies one or more startup parameters to be used when the server instance starts.
Import From Server	Loads the **Startup** tab values of the agent properties from `openedge.properties` file. **Note:** The PROPATH and database information are not copied.
Apply	Saves the current launch configuration definition.
Revert	Discards unsaved changes to the current launch configuration definition.
Run or Debug	Starts or debugs the specified PAS for OpenEdge instance.
Close	Closes the Configurations wizard.

Note: The only OpenEdge substitution variables that this tab supports are `@WORK` and `@DLC`. In addition, the Eclipse substitution variables (**Window** > **Preferences** > **Run/Debug** > **String Substitution**) are supported.

Databases tab (PAS for OpenEdge)

The **Databases** tab in the **Progress Application Server for OpenEdge** section in the **Configurations** wizard allows you to specify the OpenEdge database connections used by the PAS for OpenEdge launch configuration.

The following controls are available on this tab:

Name (accessible from all tabs)	(Required) Specifies the name of the launch configuration, which appears on menus and in the left pane of the Configurations wizard.
Show selected/Show all	Filters the database connection list to show: only those connections that are currently used by the configuration, or all available connections.
Database connection list	Lists the available OpenEdge database connections, filtered according to the **Show selected/Show all/Show from project** selection. The launch configuration uses those entries that are checked.
Other controls	Function as described in the Database connections preferences on page 35 for the Project Properties dialog.
Apply	Saves the current launch configuration definition.
Revert	Discards unsaved changes to the current launch configuration definition.

Run or Debug	Starts or debugs the specified PAS for OpenEdge instance.
Close	Closes the Configurations wizard.

PAS for OpenEdge debug configuration settings

The PAS for OpenEdge debug configuration wizard displays the following tabs:

Server	Displays the server name, host name, and runtime associated with the PAS for OpenEdge.
Startup	Lets you specify the session and agent parameters of the PAS for OpenEdge.
PROPATH	Lets you control where the AVM searches for files and procedures. The PROPATH is associated with the default ABL application in the PAS for OpenEdge instance.
Databases	Lets you add the database connection for running the configuration. These database connections are associated with the default ABL application in the PAS for OpenEdge instance.
Source	Lets you add custom source lookup paths to the entries.
Debugger	Lets you specify connection properties, attach the Debugger to a broker, and add secure client connection properties.
Common	Lets you set options for specifying where the application launch configuration is saved, how it is accessed, and how it runs.

WebHandler Class

The **WebHandler ABL Class** wizard helps you create new web handler class file.

This wizard appears when you select **File** > **New** > **WebHandler**.

Note: If WebHandler does not appear in your File menu, click **File** > **New** > **other** and select **Progress OpenEdge** > **Editor** > **WebHandler**. You can alternatively right-click the project and select **New** > **WebHandler**.

The following controls are available:

Package root	Specifies a currently open project to contain the class code and other project code. Click **Browse** if you want to select a project other than the current one (the default value).
Package	Optionally specifies a package name that corresponds to a sub-folder of the package root, and will contain the class file. Click **Browse** if you want to select a project other than the current one (the default value). A period (.) must separate each subfolder from its parent folder in the path name..
WebHandler name	(Required) Specifies the name of the WebHandler class.

Final	If selected, specifies that inheritance from this class is not allowed. A `FINAL` option is included in the generated ABL code. A `Final` class cannot be `Abstract`.
Abstract	If selected, specifies that the Web handler class is abstract and cannot be instantiated. An abstract class is designed to serve as a super class from which other classes inherit and implement members. Therefore, an `Abstract` class cannot be `Final`.
Widget pool	If selected, specifies that a USE-WIDGET-POOL option will be included in the generated ABL code.
Serializable	If selected, marks to mark the WebHandler class as serializable by including the `SERIALIZABLE` modifier in the generated ABL code. **Note:** If the class inherits from a super class that is not serializable, then it cannot be marked as serializable.
Inherits	Optionally specifies another class in the current project as a super class (or a different project that is available in the propath) from which the new class inherits state and behavior in the **Inherits** field. Click **Browse** or enter the class path by typing. A period (.) must separate each node from its parent folder in the path name. **Note:** By default, the super class name is populated as `OpenEdge.Web.WebHandler`. The super class cannot be generic.
Implements	Lets you optionally specify one or more interfaces in the current project or a different project that is available in the propath that the class implements using the **Implements** section. Click **Add** and select the required interfaces in the **Interface Selection** dialog. Click **Remove** to remove an interface from the list after adding it.
Method stubs	Specifies the methods that you want to generate in the Web handler class.
Error-handling statement	Adds one of the following error-handling statements to the generated ABL code: • **Block level**: Includes the `BLOCK-LEVEL ON ERROR UNDO, THROW` statement • **Routine level**: Includes the `ROUTINE-LEVEL ON ERROR UNDO, THROW` statement

Throw a Not Implemented exception	If selected, specifies that "`METHOD NOT IMPLEMENTED`" error code is added to stubs for members implemented via interface and stubs for inherited abstract members.
Return a default value	If selected, specifies that the default return values are added to stubs for members implemented through interface and stubs for inherited abstract members.

Progress OpenEdge Server Monitor view

The **Progress OpenEdge Server Monitor** view provides the status of and a summary of the properties of a PAS for OpenEdge instance. You can access the Monitor view as follows:

- From any other perspective, select **Window** > **Show View** > **Other** > **Server** > **Progress OpenEdge Server Monitor**
- From the **Servers** view, right-click anywhere and select **Progress OpenEdge Server Monitor**

In the **Progress OpenEdge Server Monitor** view, expand the PAS for OpenEdge instance. All the deployed web applications and their services are listed. If you select a web application or an ABL REST or Data Object Service, then its properties are listed in the right section. If you select the **web** node (present under each web application), the deployed web handlers and the resource URI s and the URIs to access the handler classes for the deployed services are listed in the right section.

Progress OpenEdge Server Monitor view toolbar

You can use the buttons on the Progress OpenEdge Server Monitor view toolbar to accomplish the following tasks:

	Automatically refresh the server status at a predetermined interval.
	Refresh the server status. (Available only when server is started and selected.)
	Add one or more agents. (Available only when server is started and selected.)
	Trim one or more agents. (Available only when server is started and selected.)
	Trim all agents. (Available only when server is started and selected.)
	Open a Web browser by using the currently selected server and start the OpenEdge Explorer connection the server is using. **Note:** For more information, see Access OpenEdge Explorer on page 105.
	Access PAS for OpenEdge server preferences on page 121.

Update transport properties

When you create an ABL Web App project, by default the `merge.template` file is available in the `<prj>/PASOEContent/WEB-INF/tlr` location, with the default values for all supported transports. You can update the default values of these transports by editing the values in the `merge.template` file.

For example, if you do not support SOAP clients, you can change the SOAP transport's `adapterEnabled` property in the `merge.template` file from 1 to 0 as shown below:

```
# Transport properties for the SOAP protocol
[${oepas-app}.${oepas-webapp}.SOAP]
       adapterEnabled=0
       adminEnabled=1
       adminSoapAction=urn:services-progress-com:wsa-admin:01
       debugClients=
       wsaUrl=http://${psc.as.host.name}:${psc.as.http.port}/${oepas-webapp}/soap
       wsdlEnabled=1
```

The modified values (if any) are considered at the time of publishing the application for the first time and exporting the application as a complete Web Application, but not if you are exporting it incrementally.

Use Apache Ant tasks

This topic discusses the Ant tasks that you can write for ABL WebApp and Web UI projects to automate processes.

Note: For more information about Apache Ant tasks, refer to the Apache Ant documentation.

Package an ABL WebApp ANT project

You can write an ABL WebApp Package task to package an ABL Web App project as a `.WAR` file to publish it as a new and complete Web App or as a `.ZIP` file to publish the Web App incrementally to a PAS for OpenEdge instance.

Note: To package an ABL WebApp ANT project, the following `pathelement location` attributes have been added to the existing `build.xml`.

```
<pathelement location="${dlc.java.dir}/ext/commons-logging-1.2.jar"/>
<pathelement location="${dlc.java.dir}/ext/xmlschema-core-2.2.1.jar"/
```

Task-level properties and elements:

Name	Description
`srcdir`	Specifies the location of the project for which the `.WAR` or `.ZIP` file is to be generated.
`dlc`	Specifies the location of your OpenEdge installation.

Name	Description
verbose	(Optional) Enables the verbose mode. The valid values are true, false, on, off, yes, and no. **Note:** By default, the value is set to false.
services	(Optional) Specifies the names of the services in the project. **Note:** If there are multiple services, separate the names with a comma.
isIncremental	(Optional) Specifies whether to generate a .ZIP file for deploying the app incrementally or a .WAR file for deploying the app at once. The valid values are true, false, on, off, yes, and no. **Note:** By default, the value is set to false and a .WAR file is generated for full deployment.
webAppName	(Optional) Specifies a name for the generated .WAR or .ZIP file. **Note:** By default, the name of the project is assigned to the .WAR or .ZIP file.
destdir	(Optional) Specifies the destination directory where the .ZIP file is generated.

Here is a sample build.xml file for packaging an ABL WebApp project:

```
<?xml version="1.0" encoding="UTF-8"?>
<project name="ABLWebApp" default="main" basedir=".">

 <property name="dlc.dir" value="$DLC"/>
 <property name="dlc.java.dir" value="${dlc.dir}/java"/>
 <property name="src.dir" value="$srcdir/WebAppPrjRest"/>
 <property name="dest.dir" value="$destdir/WebAppPrjRest"/>

    <!-- Target for defining 'taskdef' -->
    <target name="taskdef">
     <echo>Task Definitions</echo>

       <taskdef resource="com/progress/openedge/pdt/ant/ablwebapp/ablwebapps.properties">

            <classpath>
             <pathelement location="${dlc.java.dir}/ant-ablwebapp.jar"/>

    <!-- ABLWebApp Dependencies -->
              <pathelement location="${dlc.java.dir}/ant-libs/ablwebapp.jar"/>
           <pathelement location="${dlc.java.dir}/ant-libs/ablwebapp-dependencies.jar"/>


             <!-- CodeModel Dependencies -->
           <pathelement location="${dlc.java.dir}/ant-libs/codemodel-dependencies.jar"/>


             <!-- AST and its Dependencies -->
```

```
            <pathelement location="${dlc.java.dir}/ant-libs/ast.jar"/>
            <pathelement location="${dlc.java.dir}/ant-libs/ast-dependencies.jar"/>

            <!-- Additional deps -->
            <pathelement location="${dlc.java.dir}/ant-libs/velocity-1.7.jar"/>
            <pathelement location="${dlc.java.dir}/ant-libs/velocity-1.7-dep.jar" />
            <pathelement location="${dlc.java.dir}/ant-libs/1padapters-restExpose.jar"
 />
            <pathelement location="${dlc.java.dir}/1padapters-idl.jar" />
            <pathelement location="${dlc.java.dir}/ext/jettison-1.2.jar" />
            <pathelement location="${dlc.java.dir}/ext/commons-logging-1.2.jar" />
            <pathelement location="${dlc.java.dir}/ext/xmlschema-core-2.2.1.jar" />
         </classpath>
        </taskdef>
    </target>

 <!-- Main task -->
 <target name="main" depends="taskdef">
  <ABLWebAppPackage srcdir="${src.dir}" dlc="${dlc.dir}" verbose="false"
   isIncremental="true" webAppName="${app.name}" destdir="${dest.dir}" />
 </target>

</project>
```

Package REST services

You can write a PaarGeneration task to package REST services to `.PAAR` files. These `.PAAR` files can be deployed to a PAS for OpenEdge instance or exported.

Task-level properties and elements:

Name	Description
`srcdir`	Specifies the location of the project for which `.PAAR` files are to be generated.
`dlc`	Specifies the location of your OpenEdge installation.
`verbose`	(Optional) Enables the verbose mode. The valid values are true, false, on, off, yes, and no. **Note:** By default, the value is set to false.
`services`	(Optional) Specifies the names of the services available in the project. **Note:** If there are multiple services, separate the names with a comma. If you do not specify a service, `.PAAR` files are generated for all the REST services in the project.
`destdir`	(Optional) Specifies the destination directory where the `.PAAR` files are generated.

Here is a sample build.xml file for packaging a REST service:

```
<?xml version="1.0" encoding="UTF-8"?>
<project name="ABLWebApp" default="main" basedir=".">
```

```
  <property name="dlc.dir" value="$DLC"/>
  <property name="dlc.java.dir" value="${dlc.dir}/java" />

  <property name="app.name" value="ExportWebApp1" />
  <property name="src.dir" value="$srcdir/${app.name}" />
  <property name="dest.dir" value="$destdir/ant/paars" />

     <!-- Target for defining 'taskdef' -->
     <target name="taskdef">
      <echo>Task Definitions</echo>

        <taskdef resource="com/progress/openedge/pdt/ant/ablwebapp/ablwebapps.properties">

             <classpath>

              <pathelement location="${dlc.java.dir}/ant-ablwebapp.jar" />

              <pathelement location="${dlc.java.dir}/ant-libs/ablwebapp.jar" />
             <pathelement location="${dlc.java.dir}/ant-libs/ablwebapp-dependencies.jar"
  />

              <!-- CodeModel Dependencies -->
             <pathelement location="${dlc.java.dir}/ant-libs/codemodel-dependencies.jar"
  />

              <!-- AST and its Dependencies -->
              <pathelement location="${dlc.java.dir}/ant-libs/ast.jar" />
              <pathelement location="${dlc.java.dir}/ant-libs/ast-dependencies.jar" />

              <!-- Additional deps -->
              <pathelement location="${dlc.java.dir}/ant-libs/velocity-1.7.jar" />
              <pathelement location="${dlc.java.dir}/ant-libs/velocity-1.7-dep.jar" />
              <pathelement location="${dlc.java.dir}/ant-libs/1padapters-restExpose.jar"
  />
              <pathelement location="${dlc.java.dir}/1padapters-idl.jar" />
              <pathelement location="${dlc.java.dir}/ext/jettison-1.2.jar" />
              <pathelement location="${dlc.java.dir}/ext/commons-logging-1.2.jar" />
      <pathelement location="${dlc.java.dir}/ext/xmlschema-core-2.2.1.jar" />
          </classpath>
         </taskdef>
     </target>

  <!-- Main task -->
  <target name="main" depends="taskdef">

   <PaarGeneration srcdir="${src.dir}" dlc="${dlc.dir}" verbose="false"
    destdir="${dest.dir}\${app.name}" />

  </target>

 </project>
```

Generate a Data Object Service Catalog file

You can write a CatalogGeneration task to generate a Catalog file for a Data Object Service in an ABL Web App project.

Task-level properties and elements:

Name	Description
`srcdir`	Specifies the location of the ABL Web App project.
`dlc`	Specifies the location of your OpenEdge installation.

Name	Description
verbose	(Optional) Enables the verbose mode. The valid values are true, false, on, off, yes, and no. **Note:** By default, the value is set to false.
serviceName	Specifies the name of the service.
resources	Specifies a comma-separated list of resources (classes and procedures) associated with the Data Object Service. **Note:** Make sure to specify at least one resource and the resources must be accurately annotated.
destdir	(Optional) Specifies the destination directory where the Catalog file is generated.

resources element

Contains a set of ABL source files that are required to generate the Catalog file. You can configure this element using pathelement or fileset elements.

Note: For more information on `pathelement` or `fileset` elements, refer to the Apache Ant documentation.

dbinfo element

Contains the database connection details that the catalog generation task depends on. Each `dbinfo` element is considered a single database connection information.

Name	Description
name	Specifies the name of the database or the database file with its full path, for example, `Sports2020 or $DLC\WRK\Sports2020.db`.
host	(Optional) Specifies the host name, for example, localhost.
port	(Optional) Specifies the server port or service name.
userId	(Optional) Specifies the user ID that you use to log in to the database.
password	(Optional) Specifies the password that you use to log in to the database.

Note: Make sure that the server and database is running when you run the ANT task.

Here is a sample `build.xml` file for Data Object Service catalog generation. The code output will look similar to the following example.

```
<?xml version="1.0" encoding="UTF-8"?>
<project name="ABLWebApp" default="main" basedir=".">
 <property name="dlc.dir" value="$DLC" />
```

```
     <property name="dlc.java.dir" value="${dlc.dir}/java" />
     <property name="src.dir" value="$srcdir/CatalogAnt/test" />
     <property name="dest.dir" value="$destdir/CatalogAnt/cat" />
     <property name="app.name" value="$ProjectName" />

    <!-- Target for defining 'taskdef' -->
 <!-- Java is not shipped from from 12.1 onwards. So we need to set JAVA_HOME or copy
jdk from Java location to $DLC -->

    <target name="taskdef">
        <echo>Task Definitions</echo>

       <taskdef resource="com/progress/openedge/pdt/ant/ablwebapp/ablwebapps.properties">

            <classpath>
                <pathelement location="${dlc.java.dir}/ant-ablwebapp.jar" />

                <!-- ABLWebApp Dependencies -->
                <pathelement location="${dlc.java.dir}/ant-libs/ablwebapp.jar" />
              <pathelement location="${dlc.java.dir}/ant-libs/ablwebapp-dependencies.jar"
 />

                <!-- CodeModel Dependencies -->
              <pathelement location="${dlc.java.dir}/ant-libs/codemodel-dependencies.jar"
 />

                <!-- AST and its Dependencies -->
                <pathelement location="${dlc.java.dir}/ant-libs/ast.jar" />
                <pathelement location="${dlc.java.dir}/ant-libs/ast-dependencies.jar"
/>

                <!-- Additional deps -->
                <pathelement location="${dlc.java.dir}/ant-libs/velocity-1.7.jar" />
                <pathelement location="${dlc.java.dir}/ant-libs/velocity-1.7-dep.jar"
/>
              <pathelement location="${dlc.java.dir}/ant-libs/1padapters-restExpose.jar"
 />
                <pathelement location="${dlc.java.dir}/1padapters-idl.jar" />
                <pathelement location="${dlc.java.dir}/1padapters-util.jar" />
                <pathelement location="${dlc.java.dir}/ext/jettison-1.4.0.jar" />
                <pathelement location="${dlc.java.dir}/ext/commons-logging-1.2.jar" />
                <pathelement location="${dlc.java.dir}/ext/xmlschema-core-2.2.1.jar" />

                <pathelement location="${dlc.java.dir}/ext/xercesImpl-2.12.0.jar" />
            </classpath>
        </taskdef>
    </target>

 <!-- Main task -->

    <target name="main" depends="taskdef">
        <mkdir dir="${dest.dir}" />

      <CatalogGeneration srcdir="${src.dir}" dlc="${dlc.dir}" verbose="true"
resources="${src.dir}\AppServer\tst.cls" serviceName="testWebDOJService"
destdir="${dest.dir}" >
       <!-- Configure Database Info -->
            <dbinfo name="Sports2020" host="localhost" port="4546" />
        </CatalogGeneration>

    </target>


</project>
```

Package a Web UI project

You can write a WebUiPackage task to package a Web UI project as a `.WAR` file to publish it as a new Web App to a PAS for OpenEdge instance.

Task-level properties and elements:

Name	Description
`srcdir`	Specifies the location of the project for which `.WAR` file is to be generated.
`dlc`	Specifies the location of your OpenEdge installation.
`verbose`	(Optional) Enables the verbose mode. The valid values are true, false, on, off, yes, and no. **Note:** By default, the value is set to false.
`buildType`	(Optional) Specifies if the project is for publishing on a production build or debugging on a development build. The valid values are release and debug.
`webAppName`	(Optional) Specifies a name for the generated `.WAR` file. **Note:** By default, the name of the project is assigned to the `.WAR` file.
`destdir`	(Optional) Specifies the destination directory where the `.WAR` file is generated.

Here is a sample build.xml file for packaging a Web UI project:

```
<?xml version="1.0" encoding="UTF-8"?>
<project name="ABLWebApp" default="main" basedir=".">

 <property name="dlc.dir" value="$DLC"/>
 <property name="dlc.java.dir" value="${dlc.dir}/java"/>

 <property name="app.name" value="WebUiPrj"/>
 <property name="src.dir" value="$srcdir/${app.name}"/>
 <property name="dest.dir" value="$destdir/ant/wars1/${app.name}"/>

    <!-- Target for defining 'taskdef'-->
    <target name="taskdef" depends="copy">
     <echo>Task Definitions</echo>

       <taskdef resource="com/progress/openedge/pdt/ant/ablwebapp/ablwebapps.properties">

            <classpath>

             <pathelement location="${dlc.java.dir}/ant-ablwebapp.jar"/>

             <pathelement location="${dlc.java.dir}/ant-libs/ablwebapp.jar"/>
           <pathelement location="${dlc.java.dir}/ant-libs/ablwebapp-dependencies.jar"/>


             <!-- CodeModel Dependencies -->
           <pathelement location="${dlc.java.dir}/ant-libs/codemodel-dependencies.jar"/>
```

```
            <!-- AST and its Dependencies -->
            <pathelement location="${dlc.java.dir}/ant-libs/ast.jar"/>
            <pathelement location="${dlc.java.dir}/ant-libs/ast-dependencies.jar"/>

            <pathelement location="${dlc.java.dir}/ext/jettison-1.2.jar"/>

         </classpath>
        </taskdef>
    </target>

 <!-- Main task -->
 <target name="main" depends="taskdef">

  <WebUiPackage srcdir="${src.dir}" dlc="${dlc.dir}" verbose="false"
   webAppName="${app.name}" destdir="${dest.dir}" buildType="release"/>

 </target>

</project>
```

4

Learn About OpenEdge REST

OpenEdge provides the ability for REST clients to initiate the execution of business logic on a PAS for OpenEdge server, and to receive back results from that execution. REST (Representational State Transfer) is an architectural style for distributed computing that was defined in conjunction with the HTTP protocol. A REST client is similar to any other OpenEdge client, and uses HTTP as its communication protocol.

For details, see the following topics:

- Concepts
- Tasks
- Reference

Concepts

Project support for REST

Most operations that you perform with Progress Developer Studio for OpenEdge take place within the context of a project. You can create multiple REST projects and maintain them concurrently in your workspace. By default, the REST project opens in OpenEdge Server perspective.

Note: To deploy REST Services to a PAS for OpenEdge server, you must use an ABL WebApp project with a REST service type.

You can create a REST project and a REST module. For details, see Create a REST project on page 144.

See also

REST project type on page 140
Create a REST project on page 144

REST project type

A REST project type is an OpenEdge project that is specialized for developing and deploying ABL REST Web applications. An OpenEdge REST project contains the following OpenEdge facets:

- ABL AppServer
- ABL REST Service
- ABL WebApp
- OpenEdge
- Progress Adapters

You can see the facets enabled for your project using the Project Facets page on page 75 page.

See also

Create a REST project on page 144
Develop an ABL REST Web applications on page 146
Deploy ABL REST Web applications on page 155
REST Expose Editor on page 159

Terminology related to REST support

The following terms describe various components that apply to REST support in Progress Developer Studio for OpenEdge:

Component	Description
ABL routine	ABL routines are internal procedures, user-defined functions, or class methods.
REST service	A service defined to expose your REST interface annotated ABL class and procedure files to a Web server as a REST Web application WAR file. The defined REST service appears under the **Defined Services** node in the project directory. For more information, see Define an ABL REST service on page 147.

Component	Description
REST Web application	A WAR file that includes one or more REST services. Any REST Web application, using its WAR file, is an independently deployable and manageable Web server application. The REST application will be deployed on the PAS for OpenEdge instance applications directory at `$WRK/<pas_instance>/webapps`. You can Publish an ABL REST service on page 156 associated with a PAS for OpenEdge instance to create a REST application WAR file. To package multiple REST services into a single REST application WAR application, use the Export a REST application on page 157 wizard.
REST resource	A resource is any URI that resolves to a single HTTP method call. For more information, see Add REST resources on page 150.

See also

Generated artifacts for a REST service on page 141
Create a REST project on page 144

REST service artifacts

The REST services you define using the **New REST service** wizard appears under the **Defined Services** node in your REST project.

The REST service artifacts are generated under `.services/Expose/rest/service_name` in your project directory, where `service_name` is the name of the defined REST service. A separate REST service node is created for each REST service you define, and its artifacts are generated under that REST service.

Note: The `.services` node does not appear by default under your project in the **Project Explorer** view. To view the `.services` node, open **Filters and Customization** dialog (select **View** > **Filters and Customization** from the **Project View** toolbar), clear the `.*resources` check box, and then click **OK**.

Each of the REST service node includes the following two files:

- `resourceModel.xml` — Includes the resource URI information.
- `spring.xml` — Includes the AppServer end point details, `resourceModel.xml`, and `mapping.xml` entry.

Note: Progress recommend you to not modify or delete any file under the `.services` node in your REST project.

See also

Define REST service on page 147
Work with REST Expose Editor on page 148
Create REST project on page 144

REST service annotations

The REST service annotations falls into two categories: REST main annotations and REST detail annotations.

REST main annotations

REST main annotation makes an ABL procedure or class, or an external procedure file available as a REST resource. This annotation must precede any ABL statement in the procedure or class file.

The illustration below provides an example of REST main annotation:`@openapi.openedge.exportFILE(type="REST", executionMode="{external | single-run | singleton}", useReturnValue="{true | false}", writeDataSetBeforeImage="{true | false}").`

`File`

This keyword specifies that the annotation applies to an ABL class or procedure level. This is a mandatory attribute for main annotation.

`type`

This attribute specifies the type of defined service such as `REST` for a REST service or `DataObject` for a DataObject service. This is a mandatory attribute.

`executionMode`

This attribute specifies how the ABL class or procedure, or an external procedure runs. If you specify the value as `EXTERNAL`, the procedure runs externally, the value `SINGLE-RUN` allows you to call internal procedures and user defined functions in a procedure file, and the value `SINGLETON` allows you to call methods in a class file or internal procedures in a procedure file. This is a mandatory attribute.

`useReturnValue`

This attribute specifies whether a return string is used for procedures. The default value is false. This is an optional attribute.

`writeDataSetBeforeImage`

This attribute specifies whether before-image data is written out when ProDataSet parameters are serialized as XML. Before-image is not supported for JSON. The only valid value for REST is false. This is an optional attribute.

See also

Define REST service annotations on page 146
REST detail annotations on page 142

REST detail annotations

REST detail annotation makes an ABL routine (internal procedures, methods, and user-defined functions) available as a REST resource. This annotation must precede the internal procedure or function, or method statements. When you use this annotation, you must also use an REST main annotation at the beginning of the source files.`@openapi.openedge.export(type="REST", useReturnValue="{true | false}", writeDataSetBeforeImage="{true | false}").`

`type`

This attribute specifies the type of defined service such as REST for a REST service or `DataObject` for a DataObject service. This is a mandatory attribute.

`useReturnValue`

This attribute specifies whether a return string is used for the internal procedures. The default value is false. This is an optional attribute.

`writeDataSetBeforeImage`

This attribute specifies whether before-image data is written out when ProDataSet parameters are serialized as XML. The default value is false. If no ProDataSer parameters exist, `writeDataSetBeforeImage` is ignored. Before-image data is not supported for JSON. This is an optional attribute.

See also

Define REST service annotations on page 146
REST main annotations on page 142

Default parameter mapping

REST supports default parameter mapping. The default parameters mapping is supported for only the query and path parameters in a HTTP request.

The default parameter mapping for REST will follow these rules:

Note: Input parameter mean either Input or Input-Output.

- If an input parameter name is contained in the resource URI as a query, then the input parameter is automatically mapped as a query parameter. For example, if a query parameter `?custid=[custid]` is contained in a resource URI and an input parameter `custid` is contained in the interface parameters, then the query parameter is automatically mapped with that input parameter.
- If an input parameter name is contained in the resource URI as a path, then the input parameter is automatically mapped as a query parameter. For example, if a path parameter `{custid}` is contained in a resource URI and an input parameter `custid` is contained in the interface parameters, then the path parameter is automatically mapped with that input parameter.

See also

Associate REST resource verbs with operations on page 152
Map REST resource verb parameters on page 152

Tasks

Build a REST Web application

To expose an ABL class or procedure file as a REST service, follow these steps:

1. Create an OpenEdge REST project using the Create a REST project on page 144 wizard.
2. Annotate ABL procedure and class files with REST interface annotations using the Define an ABL REST service annotations on page 146 wizard.
3. Create REST service using the New REST Service dialog on page 158 wizard.

   Note: If you select to create a default REST service when creating the REST project, you can skip this step.

4. Map REST resource verbs and parameters using the REST Expose Editor on page 159.
5. Package as a REST Web application WAR file using the Package ABL REST Web applications on page 157 wizard.
6. Deploy REST services to the PAS for OpenEdge instance using the Publish an ABL REST service on page 156 option.

See also

Develop an ABL REST Web applications on page 146
Deploy ABL REST Web applications on page 155
Package ABL REST Web applications on page 157

Create a REST project

To create an OpenEdge project specialized for REST Web application development:

1. Select **File** > **New** > **OpenEdge Project** from the **Progress Developer Studio for OpenEdge** main menu bar or the **Project Explorer** view context (right-click) menu. The New OpenEdge Project wizard opens and displays the Create an OpenEdge Project page on page 71.
2. Type a name in the **Project name** field.

   The root folder for the new project is created in your current Eclipse workspace, unless you specify a different location.

3. To choose a different location for the project, click and clear the **Use default** check box. Then either browse to, or enter the path to the desired location.
4. Select **Server** from the left section.
5. Select **REST** as the transport to create an OpenEdge project with a REST (Mapped RPC) service that can be deployed to PAS for OpenEdge.
6. Click **Next**. The **Provide ABL Web App deploy details** page appears.

7. Specify the Web Application deploy options and provide the Business Logic details (or leave the default settings). From the **Supported servers** list, select the servers that will be the destination for your published web objects. The primary function of these servers is to support publishing your code for running, testing, and deploying your REST service. For example, select **oepas1** from the list to publish your REST service. Then click **Next**. The **Create an ABL Service** page appears.
8. In the Service Type options, fill up the details (or leave with default settings). The default name of the REST service is the REST project name and Service appended to it. For example, `<projectname>Service`. You can specify a different name in the **Service name** field and a relative URI in the **Service relative URI** field. Filling up of **Service description** field is optional. Click **Next**. The **Select AVM and layout options** page appears.
9. Specify the OpenEdge AVM options and the project layout options (or leave the default settings) and click **Next**. The **Define PROPATH** page appears.
10. Leave the default settings or modify the PROPATH entries to be used by the project and click **Next**. The **Select database connections** page appears.
11. Select the database connections to be used by the project and click **Finish**.

You will see your project and its resources in the **Project Explorer** view.

See also

Create an OpenEdge project page on page 71
Select AVM and layout options page on page 72
Define a REST service on page 147
Define PROPATH page on page 74
Select database connections page on page 74

Create a REST project with Project Facets

You can use the **Project Facet** properties page to associate the REST facet to an existing OpenEdge project (non-REST project). This changes the nature and behavior of the selected OpenEdge project as a REST project. The ABL AppServer modules and REST services will be associated with the project.

To create a REST project with Project Facets:

1. On the **Project Explorer** view, select an OpenEdge project.
2. Right-click the project, and then select **Properties** on the context menu. The **Properties** page of the selected OpenEdge project appears.
3. Select **Project Facets**. The **Project Facets** page appears.
4. From the **Project Facet** list, select the following facets:
   - **ABL AppServer**
   - **ABL Rest Service**
   - **ABL Web App**
   - **OpenEdge**
   - **Progress Adapters**
5. Click **OK** to save your settings and close the properties page.

On the **Project Explorer** view, you can view the following REST related modules under the project in the **Project Explorer** view:

- `.services`
- **AppServer**
- **PASOEContent**

See also

Create a REST project on page 144
Project Facets page on page 75

Develop an ABL REST Web applications

To develop an ABL REST Web Application, follow the links.

- Define an ABL REST service annotations on page 146
- Define an ABL REST service on page 147
- Work with the REST Expose Editor on page 148

Define an ABL REST service annotations

To create an REST Web application, you must identify the procedures and classes to be exposed as REST services. You must add REST interface annotations to the ABL code that specify which procedures or classes should be exported. To use a procedure `.p` or class `.cls` file, you must add the service interface definition to it. Defining the service interface refers to defining or adding REST interface annotations in the ABL class and procedure file.

1. Right-click on the ABL class or procedure file in the **Project Explorer** view, **Source**, or the **Procedure Editor** tab, and select **Progress OpenEdge** > **Define Service Interface** on the context menu. The **Define Service Interface** wizard appears.
2. Select **REST** from the **Definition Mode** drop-down.
3. In the **Project Explorer** view, the ABL class or procedure selected in Step 1 is automatically checked from the list of procedures and classes in the workspace, and the corresponding resources, internal functions, procedures, and methods are listed in the **ABL routines** area.
4. In the **Backup** area, select the **Backup selected resources** check box to back up the procedure files before defining the service interface.
5. In the **Location** area, click **Browse** and specify the backup location, and then click **Next**. The **Edit Annotation** page appears. It displays the following parameters in the REST main annotation and REST detail annotation sections:
   - `File` — This attribute is mandatory. It specifies that the annotation applies to the main annotation at the ABL class or procedure level.
   - `Type` — This attribute is mandatory. The value of this attribute is a comma separated list of types. If you are annotating an external procedure for use with a PAS for OpenEdge REST Adapter, the value of this attribute must include REST. If you are exporting a procedure for use with both the REST Adapter and the ESB Adapter, then the value of this attribute can include both types.

- `executionMode` — This attribute is mandatory. It specifies how the ABL class or procedure, or an external procedure runs. If you specify the value as `EXTERNAL`, the procedure runs externally, the value `SINGLE-RUN` allows you to call internal procedures and user defined functions in a procedure file, and the value `SINGLETON` allows you to call methods in a class file or internal procedures in a procedure file. Ensure that the top-level procedure contains no parameters and the state is discarded between calls to internal procedures and functions. Persistent procedures are not supported since REST services are stateless in nature.
- `useReturnValue` — This attribute is optional. It specifies whether a return string is used for procedures. The default value is false.
- `writeDataSetBeforeImage` — This attribute is optional and the only valid value for REST is false. It specifies whether before-image data is written out when ProDataSet parameters are serialized as XML. Before-image is not supported for JSON.

6. In the **REST main annotation** area, click **Edit** to edit the REST annotation for the ABL file. The **New REST Annotation** dialog appears.
7. In the **New REST Annotation** dialog, you can specify the following:
   a) Enter the type of annotation to be added in the **Type** field.
   b) Select **EXECUTION MODE** from the drop-down.

   Note: ABL procedure supports all the execution modes for REST. ABL class supports only `SINGLETON` execution mode for REST.

   c) Select **USE RETURN VALUE** check box, if the ABL procedure file returns a value. A `retVal` parameter is added to the procedure file to store the return value.
   d) Select **WRITE DATASET BEFORE IMAGE** check box, if you want before-image data written to the OpenEdge file when ProDataSet parameters are serialized as XML.
8. Click **OK**.
9. In the **REST detail annotation** area, click **Edit** to edit the REST annotation for the ABL routine of the main procedure file. The **New REST Annotation** dialog appears, perform the following steps:
   a) Select **USE RETURN VALUE** check box, if the selected internal procedure returns a value. A `retVal` parameter is added to the procedure file to store the return value.
   b) Select **WRITE DATASET BEFORE IMAGE** check box, if you want before-image data written to the OpenEdge file when ProDataSet parameters are serialized as XML.

   Note: You can edit REST detail annotation only if an ABL routine is selected in 3 on page 146.

10. Click **Finish**.

See also

Develop ABL REST services on page 146

Define an ABL REST service

The **New ABL Service** dialog allows you to define an ABL service. You can use the defined ABL service to expose your REST interface annotated ABL class and procedure file as a REST Web application.

To define an ABL service:

1. From the **Project Explorer** view, select a project for which you want to create an ABL service.
2. Right-click the project, and then select **New > ABL Service** on the context menu.
3. In the **Project** field, select a project where you want to generate the REST service. By default, the field displays the project you have selected in Step 1 on page 148. You can browse and select a different project. This is a mandatory field.
4. Select **REST** in the **Transport** drop-down list.
5. In the **Service name** field, enter a valid name for the ABL REST service. This is a mandatory field.

   Note: You cannot have REST services with the same name under the same OpenEdge project.

6. In the **Service relative URI** field, enter a relative URI for all the resources to be defined in the REST service. The relative path must start with "/". For example, `/service relative URI`. This is a mandatory field.
7. In the **Service description** field, enter a description for the REST service. This is an optional field.
8. Click **Finish**.

This creates the ABL REST service under the **Defined Services** node in the selected ABL REST project, and then opens the REST Expose Editor on page 159.

Note: When you define a REST service for a non-REST project such as an OpenEdge project, the REST and Progress Adapters facets are enabled by default for that project. The project behaves as a REST project enabling you to develop and deploy REST Web applications. The **Project Facets** page displays the facets associated for your current OpenEdge project. See Project Facets page on page 75 page.

See also

REST service artifacts on page 141
Use the REST Expose Editor on page 149
REST Expose Editor on page 159
Export a REST application on page 157

Work with the REST Expose Editor

Open the REST Expose Editor

The **REST Expose Editor** allows you to define a mapping between the ABL class and procedure file with REST interface annotations and the defined REST service. You can manage the REST resources defined for the REST service, associate REST resource verbs (HTTP methods) with the REST interface annotated ABL routines, and map the input and output parameters.

The **REST Expose Editor** opens by default on creation of a REST service. However, you can reopen the REST editor if you have closed the editor while working or want to view or modify the mappings of the defined REST Web application.

To open the REST Expose Editor:

1. From the **Project Explorer** view, expand the OpenEdge project where you have defined a REST Web application.
2. Expand the **Defined Services** node.
3. Right-click the REST service that you want to open, and then select **Edit** from the context menu.

The selected REST service opens in the the **REST Expose Editor**.

See also

Use the REST Expose Editor on page 149
REST Expose Editor on page 159

Use the REST Expose Editor

The **REST Expose Editor** allows you to define mapping between the exposed ABL applications (ABL class and procedure files with REST interface annotations) and the defined REST service.

Mapping the defined REST service with the exposed ABL class and procedure files include the following steps:

1. Adding REST resources to the defined REST service. For more information, see Add REST resources on page 150.
2. Mapping REST (HTTP) verbs with an REST interface-annotated ABL class (`.cls`) and procedure (`.p`) files. For more information, see Associate REST verbs with operations on page 152.
3. Mapping the HTTP Request and Response parameters with the Interface parameters. For more information, see Map REST resource verb parameters on page 152.

See also

Define a REST Web application on page 147
Work with the REST Expose Editor on page 148
REST Expose Editor on page 159

Modify service relative URI

You can use the **Edit Service Relative URI** dialog on the **REST Expose Editor** to modify the relative URI of a defined REST service.

To edit the application relative path:

1. Open the REST service of which you want to modify the relative URI with the Open the REST Expose Editor on page 148.
2. On the **REST Expose Editor**, click **Edit** beside the **Service relative URI** field.

   The **Edit Service Relative URI** dialog appears.

3. In the **Service relative URI** field, enter a different relative URI for the REST service.

   Note: This is the relative path for all the resources defined in the REST service. The relative URI must start with "/". For example, "`/<service resource path>`".

4. Click **OK** to save your changes.

The modified relative path appears in the **Service relative URI** field on the **REST Expose Editor**.

See also

Open the REST Expose Editor on page 148
Edit Service Relative URI dialog on page 161
REST Expose Editor on page 159

Add REST resources

The **New REST Resource** dialog allows you to add REST resources to a defined REST service.

Note: Each REST resource you create includes these four REST verbs (HTTP methods) : `GET`, `PUT`, `POST`, and `DELETE`. These REST verbs appear under **Verb Association** on the **REST Expose Editor**.

To add a REST resource:

1. On the **Resources** toolbar, click the **Add Resource**  icon.

   The New REST Resource dialog appears.

2. In the **Resource URI** field, enter a Uniform Resource Indentifier (URI) for the resource. The REST resources you add are identified with Uniform Resource Identifier (URI). The name must start with `/`. For example, `/resource URI`.

   Note: In a REST resource URI, you cannot use the Java reserved words such as int, char, or boolean, as the path or query parameter names. For more information, see Add REST parameters on page 150.

   ---

3. Click **OK**.

This creates the REST resource and displays on the **Resources** list.

See also

Open REST Service with REST Expose Editor on page 148
Add REST parameters on page 150
Delete a REST resource on page 151
Modify a REST resource name on page 151

Add REST parameters

The REST service URI supports query, path, and form parameters.

Note: You cannot use the Java reserved words as the parameters such as int, char, or boolean.

Path parameter	Path parameters are used to identify entities, represent hierarchies or to provide data to a resource. They are not intended to filter or restrict information like query parameters. A resource can have more than one path parameter to represent hierarchical data. The curly braces are only used to identify path parameter values. The illustration below provides URI examples with path parameters: `/customers/{customer-id}`, where `{customer-id}` indicates it is a path parameter, and `customer-id` is the path parameter value. `/customers/{customer-id}/orders/{order-id}`, wherein `customer-id` and `order-id` are the two path parameters defined in the URI. You can add a path parameter using the New REST Resource dialog on page 161
Query parameter	Query parameters represents search criterion and restricts the result list like a filter. They are not intended to identify entities of a resource or to select the representation like path parameters. A query parameter starts with a "?". A resource can have more than one query parameter that is separated with "&".

The illustration below provides URI examples with query parameter:

`/customers/{customer-name}/info?zip=[cust-zip]` , where ? indicates that it is a query parameter, `zip` is the parameter name, and `[cust-zip]` is the query value.

`/customers/{customer-name}/info?zip=cust-zip&name=cust-name`, wherein `zip` and `cust-name` are the two query parameters defined in the URI.

Here the customer zip code is passed as a query parameter using which the query returns the matching customer names.

Note: In a resource URI, you must always specify a query parameter after a path parameter. Any path parameter specified after a query parameter will be handled as a query parameter.

You can add a query parameter using either the New REST Resource dialog on page 161 or Manage nodes on page 154

Form parameter

Form parameters can be used with only the PUT and POST verbs. You can add a form parameter using the Manage nodes on page 154 dialog.

See also

REST Expose Editor on page 159

Change a REST resource name

The **Edit Resource** option allows you to modify the name of a selected REST resource.

To modify the REST resource name:

1. On the **Resources** list, right-click a REST resource for which you want to modify the resource name, and then select **Rename Resource** from the context menu.

   The selected REST resource is highlighted for inline editing.

2. Enter a different resource name, and then press **ENTER**.

This modifies the name of the selected REST resource.

See also

Open the REST Expose Editor on page 148
Add a REST resource on page 150
Use the REST Expose Editor on page 149

Delete a REST resource

You can use the **Delete Resource** option to delete a REST resource that you have added to a REST service.

Note: When you delete a REST resource, the associated REST verbs and its mappings are deleted.

To delete a REST resource:

1. In the **Resources** list, select a REST resource that you want to delete.
2. Do one of the following:

   - On the **Resource** list toolbar, click the Delete resource icon.

- Right-click the REST resource, and then select **Delete resource** from the context menu.

Note: If you delete a parent REST resource, all its child resources are deleted.

3. Click **Yes** on the confirmation prompt to delete the selected resource.

This removes the selected REST resource from the **Resources** list.

See also

Open the REST Expose Editor on page 148
Add a REST resource on page 150
Use the REST Expose Editor on page 149

Associate REST verbs with operations

The **Associate Operation with Verb** dialog allows you to associate an operation (REST interface-annotated ABL procedure or class file) with a verb of a REST resource.

All the REST interface-annotated ABL class and procedure files available in your current project are displayed under the **Resources** list on the **Associate Operation With Verb** dialog. You can associate each REST resource verb with only one operation.

Note: You cannot associate a REST verb with multiple operations.

To associate an operation with a verb:

1. On the **REST Expose Editor**, click the Select operation icon beside a verb of a REST resource. For example, From the **Verb Association** section, click the Select operation icon beside the **GET** verb.

   The **Associate Operation With Verb** dialog appears with a list of REST interface-annotated ABL class and procedure files.

2. From the **Resources** list, select an operation which you want to associate with the selected verb. If the selected ABL class or procedure file includes an exposed internal procedure, methods, or UDFs, they appears under the **ABL routines** list.
3. From the **ABL routines** list, select an REST interface-annotated ABL routine that you want to associate with the verb.
4. Click **OK**.

The selected operation appears beside the associated verb in the **Verb Association** section.

See also

Associate Operation With Verb dialog on page 162
Work with the REST Expose Editor on page 148

Map REST resource verb parameters

After you specify mapping between the REST interface-annotated ABL routine and the defined REST resource verb, you need to create mapping rules that associate the interface parameters (input and output parameters of an ABL routine) with the response or request parameters (input and output parameters in the REST resource). The **REST Expose Editor** provides a visual mapping tool to create the mapping rules.

A REST resource verb includes two distinct parameter mapping:

- Request Mapping — Interface input and output parameters can be mapped to any of the header, body, cookie, query string parameters, path parameter, or form parameter elements of the incoming HTTP request.
- Response Mapping — Interface **Input-Output** and Output parameters are mapped to any combination of header, body, cookies and response code elements in the outgoing HTTP response.

When you select a REST resource verb in the **Verbs Association** section, the mapping definition section on the **REST Expose Editor** displays hierarchical representations of the REST resource parameters and the ABL routine parameters. There is a tab for each type of parameter mapping: **Input** and **Output**.

On **Input** tab, input parameters to operation are mapped from elements of a request component that consists of the following:

- Request URL parameters including resource URI, query string parameter, and form parameter
- Request HTTP message including method, cookies, and headers
- Server context including servlet request, response, context, and config

You can map each element of the request to input parameters.

On **Output** tab, output parameters from an operation are mapped to a HTTP (REST resource) response.

Elements of a HTTP parameters include:

- Interface parameters
- Advanced parameters including constants

Elements of a HTTP response include:

- Response status line including response code
- Response headers (also content-type) including headers and cookies
- Response body

In the mapping definition section, the source tree is on the left and the target on the right. For input parameters, the Request is the source and the interface parameters (ABL routine parameters) is the target; for output parameters the interface parameters (ABL routine parameters) is the source and the Response is the target. To create a mapping rule, click on the parameter field and drag a line to the required operation parameter.

When creating a rule for mapping an interface parameters that contains a simple type (integer, string, or boolean) to a HTTP (REST resource) parameter that contains similar type, you can drag a line between the elements as follows:

- Click on an element that you want to map and drag a line to an element you want to map it to. Repeat this step for each mapping rule that want to define.

The mapping section represents each defined rule with a blue line between elements.

Note: You can delete a defined mapping rule, by selecting the blue line defined between the elements and selecting **Delete** from the context menu or pressing the **DELETE** key. **Delete All** option on the context menu allows you to remove all the defined mapping rules.

See also

Default parameter mappings on page 143
Work with REST Expose Editor on page 148
Add nodes on page 154

Manage nodes

The **Mapping Definitions** section on the **REST Expose Editor** allows you to add, modify, or delete the custom node entries added to an element of a HTTP request or response.

Note: The option of adding a node is available for only for HTTP Header and it's children.

To add a node:

1. Select an element of a HTTP request or response.
2. Right-click the element, and then select **Add node** on the right-click context menu.

   The **Add Node** dialog appears.
3. From the **Type** down-down, specify an element type for which you want to create the node such as Query String Parameter, Header, Body, or Cookie. If you select a PUT or POST verb on the **Verb Association** section, the **Type** drop-down will also include the Form Parameter type.

   Note:

   For a HTTP response, you can see only Header, Body, and Cookie in the **Type** drop-down.

   If you selected Header as Type, you can select content-type as the Header name from the drop-down list.

   ---
4. In the **Query String Parameter**, **Form Parameter**, **Header**, or **Cookie** field, specify a value for the selected element. For example, `Query1` for Query String Parameter. The **Expression value** field displays the specified parameter value. For example, `${rest.queryparam['Query1']}.`

   The following example illustrates how to specify the **Cookie** field (a `CHAR` or `LONGCHAR` type). After choosing the Cookie field from the drop-down list, you set the cookie (as per the HTTP cookie standard) as follows:

   ```
   Set-Cookie: HSID=AYQEVn.DKrdst; Domain=.foo.com; Path=/; Expires=Wed, 13-Jan-2021
   22:23:01 GMT; HttpOnly
   ```

   `Set-Cookie` is a directive for the browsers to store the cookie. The **Expression value** field displays the following parameter value: `${rest.cookie['Set-Cookie: HSID=AYQEVn.DKrdst; Domain=.foo.com; Path=/; Expires=Wed, 13-Jan-2021 22:23:01 GMT; HttpOnly']}`.

   For more information on HTTP cookie specifications and setting a HTTP cookie, see the online information sources.

   Note: The field does not allow Java reserved words such as `INT`, `CHAR`, and `BOOLEAN` to be used as parameter names.

   ---
5. From the **Name** drop-down list in the **Body type**, select a parameter. This list displays the input and output parameters of the operation (ABL routine) that is associated with the REST resource verb.

   Note: The **Name** and **JSON type** fields appear when you specify the node type as Body in the **Type** drop-down.

   ---
6. From the **JSON type** drop-down, select a data type. This list displays the OpenEdge supported JSON data types.

Note: The **JSON type** drop-down will be enabled only when you specify your own parameter instead of selecting one of the parameters listed in the drop-down.

You can see the added node entry under the selected HTTP request or response element. The defined node context menu provides the options to edit (**Edit node**) or delete (**Delete**) the node.

See also

Map REST resource verb parameters on page 152

Deploy ABL REST Web applications

To deploy an ABL REST Web Application, follow the links.

- Create a PAS for OpenEdge instance on page 155
- Publish an ABL REST service on page 156
- View REST service URI on page 157

Create a PAS for OpenEdge instance

Use the **New Server wizard** to create a new an PAS for OpenEdge instance and define a connection to OpenEdge Explorer.

To create an PAS for OpenEdge instance:

1. From the **Servers** view in the OpenEdge Server perspective, right-click and choose **New>Server** on the context menu. The **Define a New Server** dialog appears, allowing you to choose PAS for OpenEdge server as the type of server you want to define.
2. To choose PAS for OpenEdge server as the server type, either:
   - Type **Progress Application Server for OpenEdge** in the **Select the server type field**, which filters the results to show the list of PAS for OpenEdge servers.
   - Select **Progress Software Corporation** > **Progress Application Server for OpenEdge** as the server type from the list provided.

   The **Server's host name** as **localhost**, **Server name** and **Server runtime environment** details are listed in the dialog.
3. Click **Next**.
4. In the **Define a new Progress Application Server for OpenEdge** page, do one of the following:
   - Select the name of the connection from the **OpenEdge Explorer connection** drop-down list.
   - Click **Configure**. The **Progress OpenEdge** > **Server** > **OpenEdge Explorer Connections Preferences** page opens. For information about how to configure an OpenEdge Explorer connection, see Add an OpenEdge Explorer connection on page 103.
   - Select the PAS for OpenEdge server from the **Progress Application Server for OpenEdge** drop-down list, or click **Refresh** to list all the PAS for OpenEdge server.

     The list of PAS for OpenEdge servers includes all PAS for OpenEdge servers in alphabetical order, which are managed by the OpenEdge Explorer connection you specify.

Note: You cannot create a new PAS for OpenEdge server in Progress Developer Studio for OpenEdge; to create a PAS for OpenEdge instance, use OpenEdge Explorer.

- Select the **ABL Application** from the drop-down list.
- When you select the PAS for OpenEdge server, the name of the server is updated in the **Server name** field.

5. Click **Next**. The **Add and Remove** dialog appears, showing all available ABL REST Web applications from the workspace. See Add and Remove dialog on page 165.
6. Click **Finish**.

The defined PAS for OpenEdge instance appears in the **Servers** view.

See also

The PAS for OpenEdge Server perspective on page 100
Deploy ABL REST Web applications on page 155

Publish an ABL REST service

After starting PAS for OpenEdge, you can publish an ABL REST service using the Servers view in your OpenEdge Server perspective. To publish an ABL REST service, create a server instance, associate the REST service to the defined server, and then publish the ABL REST service to the PAS for OpenEdge instance. See Learn About PAS for OpenEdge on page 99.

Note: After you republish an ABL REST service, the service is enabled by default and becomes available for client requests.

To publish an ABL REST service:

- From the **Servers** view, do one of the following:
  - Right-click a server instance, and then select **Add and Remove...** on the context menu. The **Add and Remove** window opens.
  - Select the service from the Available service list and click **Add**.
  - Click **Finish**.

This publishes the ABL REST service. For the published REST Service, a REST Web application, .WAR file is generated. For example, if you use PAS for OpenEdge to deploy an ABL REST service, a WAR file with the REST service name is created under the OpenEdge installation directory, `@WORK\<PAS Instance>\webapps\<Project Name>\WEB-INF\adapters\rest`. A separate WAR file is created for each deployed ABL REST service.

For more information about the ABL REST Web application WAR file layout, see the *Progress OpenEdge Application Server: Administration* guide.

You can disable or enable a deployed REST service from OpenEdge Management and OpenEdge Explorer.

After deploying the ABL REST service, if you modify the artifacts of a project related to the deployed service, the status of the respective artifact's module changes to **Republish**. You must republish the server manually if you have not set it to republish automatically so that the deployed service reflects the changes.

See also

Expose an ABL application as a REST Web application on page 146
Generate WAR file on page 157

View REST service URI

When you deploy an ABL REST service to the PAS for OpenEdge server, the **Progress OpenEdge Server Monitor** view displays the Uniform Resource Identifier (URI) of the REST service.

To view the ABL REST service URI:

1. Access the Servers view by selecting **Window** > **Show View** > **Other** > **Server** > **Progress OpenEdge Server Monitor**.
2. Place the cursor on the REST service whose URI you want to view.

The URI for the REST service appears in a tooltip.

See also

Publish a REST service on page 156

Package ABL REST Web applications

Export a REST application

Exporting a REST application allows you to package an ABL service as a `.WAR` file to deploy as a complete web application or to export services incrementally by creating a `.ZIP` file that contains `.PAAR` files for each selected ABL REST and ABL Data Object (REST RPC) and `.gen` and `pdo.handlers` file for ABL Data Object (WebHandler).

For more details on exporting a REST Web application, refer to Export an ABL Service on page 112.

See also

Create an ABL REST Service on page 109

Work with REST services

Undeploy REST services

The **Remove** context option allows you to undeploy a REST service from the PAS for OpenEdge instance.

To undeploy a REST service:

1. From the **Servers** view, select a REST service that you want to undeploy.
2. Right-click a REST service, and then select **Remove** on the context menu.
3. Click **OK** at the confirmation prompt.

This undeploys the selected REST service from the PAS for OpenEdge instance.

See also

Create an ABL REST Service on page 109
Publish REST service on page 156

Delete a REST service

You can use the **Delete** option to remove a defined REST service from your project.

To delete a REST service:

1. From the **Project Explorer** view, expand the **Defined Services** node under your REST project.
2. Right-click a REST service, and then select **Delete** on the context menu.

   A confirmation dialog prompts you to confirm the deletion.
3. Click **Yes** to confirm the deletion.

The selected REST service and its artifacts are deleted from the project. The selected project is automatically refreshed.

See also

Define an ABL REST service on page 147

Reference

New REST Service dialog

The **New REST Service** dialog allows you to create a REST service.

Access this dialog by clicking **New** > **REST Service** on the **File** menu.

The **New REST Service** dialog includes the following options:

Option	Description
Service name	Specify a name for the new REST service.
Service description	Specify a description for the REST service.
Service relative URI	Specify a relative path for all the resources to be defined in the REST service. For example, `/Customer`. **Note:** The relative URL must start with "/".
Project	Select a project where you want all the REST service artifacts to be generated. Click  icon to select a different project from the **Select Project** dialog. **Note:** By default, the project name you select when creating the REST service is displayed in the **Project** field.
Supported Servers	Select the Supported Server instances with which you want to associate the defined REST service.
Finish	Creates a REST service along with the REST artifacts under the selected OpenEdge project. **Note:** The REST service appears under the **Defined Services** node in your OpenEdge project.

See also

Create an ABL REST service on page 109
REST Expose Editor on page 159

REST Expose Editor dialogs

REST Expose Editor

The **REST Expose Editor** allows you to define mapping between an REST-annotated ABL class and procedure file and a defined REST service.

Note: The **REST Expose Editor** opens after you have successfully defined a REST service. If you have closed the REST editor, you can re-open the editor by choosing **Edit** on the REST Service right-click context menu or double-clicking the REST Service. See Open the REST Expose Editor on page 148.

The **REST Expose Editor** includes the following options:

Option	Description
Service relative URI	Displays the relative URI of the current REST Service open in the REST editor. You can modify the relative path by clicking **Edit** which opens the **Edit Service Relative URI** dialog. **Note:** The relative URL must start with "/", for example, /<application relative path>.
 **Add Resource**	Opens the **New REST Resource** dialog which allows you to add a REST resource to the REST service currently open in the REST editor. Each REST resource you add is associated with these four REST (HTTP) verbs: `Get`, `Put`, `Post`, and `Delete`.
 **Delete Resource**	Deletes a selected REST resource. **Note:** When you delete a REST resource, all its child resources are deleted.
Resources	Displays a list of the REST resources added to the current REST Service.
Verb Association	Displays the REST verbs (HTTP methods) for a REST resource selected on the **Resources** list.
	Opens the **Associate Operation With Verb** dialog which allows you to associate a REST verb with an operation (REST interface-annotated ABL class or procedure file).
	Deletes the operation associated with a REST verb.
Mapping Definitions	Displays the parameter mapping section for a selected REST resource verb. This topic contains the following two tabs: • **Input** – Allows you to map the REST input parameters to the input parameters of the associated ABL routine (interface parameters). • **Output** – Allows you to map the REST output parameters to output parameters of the associated ABL routine (interface parameters). **Note:** You must associate a REST resource verb with a REST-annotated ABL class or procedure file, to populate the **Mapping Definitions** section with the interface parameters.

See also

Work with the REST Expose Editor on page 148

Create a REST Web application on page 147
REST Expose Editor dialogs on page 159

Edit Service Relative URI dialog

The **Edit Service Relative URI** dialog allows you to modify the relative path of a defined REST Service.

Access the **Edit Service Relative URI** dialog by clicking **Edit** next to the **Service relative URI** field on the **REST Expose Editor**.

The **Edit Service Relative URI** dialog includes the following options:

Option	Description
Service relative URI	Specify a new relative path for the REST Service. This is the path for all the resources defined in your REST Service. The relative path must start with "/". For example, "/<service relative path>".
OK	Displays the modified relative URL in the **Service relative URI** field on the **REST Expose Editor**.

See also

Modify service relative URI on page 149
REST Expose Editor on page 159

New REST Resource dialog

The **New REST Resource** dialog allows you to add REST resources to a defined REST Service.

Access this dialog by clicking Add Resource  icon on the **REST Expose Editor**.

The **New REST Resource** dialog includes the following options:

Option	Description
Resource URI	Specify a resource URI for the REST resource you want to create. The REST resources you add are identified with Uniform Resource Identifier (URI). The resource URI must start with "/". For example, "/<REST resource name>". **Note:** In a REST resource URI, you cannot use the Java reserved words (such as int, char, or boolean) as the path or query parameter names. For more information, see Add REST parameters on page 150.
OK	Adds the REST resource to the **Resources** list on the REST editor.

See also

Add REST resources on page 150
REST Expose Editor on page 159

Associate Operation With Verb dialog

The **Associate Operation With Verb** dialog allows you to associate an operation (REST interface-annotated ABL class or procedure file) with a verb of a REST resource.

Access this dialog by clicking the  icon present beside a REST verb on the **REST Expose Editor**.

This dialog includes the following options:

Option	Description
Resources	Displays a list of REST interface-annotated ABL class (`.cls`) and procedures (`.p`) files. **Note:** All the REST interface-annotated ABL class and procedure files available in your current project are displayed under the **Resources** list.
Procedures/Functions	Displays a list of internal procedures and functions of the REST interface-annotated ABL class or procedure file selected on the **Resources** list.
OK	Associates the operation to the selected verb of a REST resource. The selected operation appears beside the associated verb in the **Verb Association** section.

See also

Map REST methods on page 152
Use the REST Expose Editor on page 149
REST Expose Editor on page 159

PAS for OpenEdge related dialogs and context menu

PAS for OpenEdge server Editor

You use the **PAS for OpenEdge server Editor** to view or modify an PAS for OpenEdge instance properties that define the connection to the OpenEdge Explorer and the ABL service.

From the **Servers** view in the OpenEdge Server perspective, you can access the **PAS for OpenEdge server Editor** in either of the following ways:

- Double-click an PAS for OpenEdge instance.
- Select a PAS for OpenEdge instance, right-click, and then select **Open**.

The **PAS for OpenEdge server Editor** provides information in the following categories:

- **General Information**—Specifies the host name, and other common settings.
- **Connection**—Specifies the information for connection to the OpenEdge Explorer.
- **Publishing**—Helps in modifying the settings for publishing.
- **Timeouts**—Specifies the time limit to complete server operations (**Start** and **Stop**).
- **Publish Location**—Helps in specifying the publishing locations.

General Information

You can modify the following **General Information** properties in the **PAS for OpenEdge server Editor**:

Option	Description
Server name	The name of the PAS for OpenEdge server.
Host name	The name of the host machine.
Runtime Environment	The current runtime environment. You can click the drop-down list or the Runtime Environment link to change to a different OpenEdge AVM runtime or OpenEdge version.
Open launch configuration	Clicking on the link opens the **Edit launch configuration properties** window. This window allows the configuration of **Server**, **Startup**, **PROPATH**, **Databases**, **Common**.

Connection

You can modify the following OpenEdge Explorer properties in the **PAS for OpenEdge server**:

Option	Description
OpenEdge Explorer connection	The name of an existing OpenEdge Explorer connection. To add a connection, click **Configure**.
ABL Application	To choose from a list of available ABL REST Application, click the drop-down arrow. To refresh the list, click **Refresh**.

Publishing

You can modify the publishing settings to choose one of the following options:

- Never publish automatically
- Automatically publish when resources change
- Automatically publish after a build event

You can also set the publishing interval in seconds.

Timeouts

You can specify the time limit (in seconds) for completing **Start** and **Stop** server operations.

Note: You can **Start** and **Stop** the **PAS for OpenEdge server** from the **Servers** view using the **Start** and **Stop** options on the PAS for OpenEdge instance context menu on page 164.

Publish Location

You can choose to **Publish source code** and **Publish r-code** by checking the boxes.

PAS for OpenEdge instance context menu

Right-clicking a PAS for OpenEdge instance in the **Servers** view displays the PAS for OpenEdge server context menu. This menu has the following options:

Option	Description
New	Creates a new Create a PAS for OpenEdge instance on page 155.
Open	Opens the PAS for OpenEdge server Editor on page 162.
Copy	Copies the selected PAS for OpenEdge server.
Paste	Creates a new PAS for OpenEdge server node of the copied PAS for OpenEdge server.
Delete	Deletes a PAS for OpenEdge instance.
Rename	Modifies the name of a selected PAS for OpenEdge server.
Restart	Restarts the selected PAS for OpenEdge instance.
Start/Stop	Starts or stops the selected PAS for OpenEdge instance.
Publish	Publishes the **ABL Rest service** to the PAS for OpenEdge server. See Publish an ABL REST service on page 156.
Clean	Removes any invalid resources from the server before doing a republish.
Add and Remove	Opens the Add and Remove dialog on page 165 which allows you to associate the ABL REST services with a selected PAS for OpenEdge instance.
Monitoring	Opens the **Monitoring** properties page which you can use to monitor server ports to view data sent and received over the ports of the selected PAS for OpenEdge server.
OpenEdge Explorer	Opens the **OpenEdge Explorer** page. When started, OpenEdge Explorer prompts for an administrator user name and password. The default is admin for both. After login, it runs in a browser embedded in the active perspective.
Server Monitor	Opens the **Progress OpenEdge Server Monitor** view. This view allows you to view the status and properties of the deployed PAS for OpenEdge instance and ABL REST services.
Properties	Opens the **General properties** page for the selected PAS for OpenEdge server. This page contains general information of the PAS for OpenEdge server such as **Name**, **Type**, **Vendor**, and **Location**.

See also

Progress OpenEdge Server Monitor view on page 166

Add and Remove dialog

The **Add and Remove** page of the **New Server** wizard allows you to associate or disassociate ABL REST services with a PAS for OpenEdge instance.

This page includes the following options:

Option	Description
Available	Displays a list of available ABL REST services.
Configured	Displays a list of configured ABL REST services.
Add	Moves a selected ABL REST service to the configured list.
Add All	Moves all available ABL REST services to the configured list.
Remove	Moves a selected ABL REST service to the available list.
Remove All	Moves all the associated ABL REST services to the available list.
Finish	Finish adding and removing ABL REST services.

See also

Create a PAS for OpenEdge instance on page 155

Progress OpenEdge Server Monitor view

The **Progress OpenEdge Server Monitor** view provides the properties and statistics of the PAS for OpenEdge instances and its associated ABL REST services, defined in the **Servers** view. It is the default view that appears in the console area of the OpenEdge Server perspective.

If you do not see the **OpenEdge Progress Server Monitor** view, you can open the view from the main menu by selecting **Window** > **Show View** > **Progress OpenEdge Server Monitor**.

Progress OpenEdge Server Monitor view toolbar

You can use the buttons on the **Progress OpenEdge Server Monitor** view toolbar to accomplish the following tasks:

	Automatically refresh the server status at a predetermined interval.
	Refresh the server status. (Available only when server is started and selected.)
	Add one or more agents. (Available only when server is started and selected.)
	Trim one or more agents. (Available only when server is started and selected.)
	Trim all agents. (Available only when server is started and selected.)
	Open a Web browser by using the currently selected server and start the OpenEdge Explorer connection the server is using. **Note:** For more information, see Access OpenEdge Explorer on page 105.

PAS for OpenEdge server statistics

The **Progress OpenEdge Server Monitor** view provides summary of a selected PAS for OpenEdge instance on the **Summary** tab and statistics on the **Properties** tab.

Note: The properties and statistics displayed in this view are read-only. You can modify these properties from the OpenEdge Management console.

See also

Progress OpenEdge Server Monitor view on page 166

REST service statistics

The **Progress OpenEdge Server Monitor** view provides summary of a selected ABL REST service on the **Summary** tab and properties on the **Properties** tab. The REST service properties are stored in the `<service name>.props` file.

Note: The summary, statistics, and properties displayed in this view are read-only. You can modify these properties from the OpenEdge Management console.

See also

Progress OpenEdge Server Monitor view on page 166

Status of PAS for OpenEdge instance and ABL REST service

You can use the Servers view to view the current status of an PAS for OpenEdge instance and its associated ABL REST services.

The Servers view allows you to manage the PAS for OpenEdge instances. This view displays a list of all your PAS for OpenEdge instances and ABL REST services that are associated with that PAS for OpenEdge instance.

Access the Servers view by selecting **Window** > **Show View** > **Servers** from the main menu.

The following table lists the possible statuses:

Status	Description
[Stopped]	The PAS for OpenEdge instance is stopped and not connected to the PAS for OpenEdge container. You cannot deploy ABL REST service and ABL REST Web applications to the PAS for OpenEdge container. **Note:** Select **Start** on an PAS for OpenEdge instance context menu to start the PAS for OpenEdge instance.
[Starting]	The PAS for OpenEdge instance is in the process of connecting to the PAS for OpenEdge and is beginning the server process.
[Started]	The PAS for OpenEdge instance is successfully connected to the PAS for OpenEdge. Both the PAS for OpenEdge instance and PAS for OpenEdge are ready to deploy services.
[Started, Synchronized]	Both the PAS for OpenEdge instance and its associated ABL REST services are in sync. ABL REST services are copied to a location on the `webapps` folder. For example, in case of PAS for OpenEdge, the ABL REST services are published to the `webapps` folder in your OpenEdge installation directory, `$WRK/<pas_instance>/webapps`. A separate `.WAR` file is created for each deployed ABL REST service.
[Stopped, Synchronized]	The PAS for OpenEdge server instance is in stop state. Both the PAS for OpenEdge instance and its associated ABL REST services are in sync.
[Started, Republish]	Either the server or the associated services, or both have changed. When the server is restarted, the modified services are also republished. **Note:** The status appears as **Republish** beside the modified ABL REST service. Select **Republish** on the PAS for OpenEdge instance context menu to republish the ABL REST service.
[Synchronized] [Not Published]	Both the PAS for OpenEdge instance and its associated ABL REST services are in sync. The ABL REST service is not deployed to the PAS for OpenEdge container and disabled for client access.
[Synchronized] [Published]	Both the PAS for OpenEdge instance and its associated ABL REST services are in sync. The ABL REST service is deployed to the PAS for OpenEdge container and enabled for client access. **Note:** When an ABL REST service is deployed to a PAS for OpenEdge container, the deployed ABL REST service is enabled by default and will be available for client access.

Status	Description
[Synchronized] [PAS for OpenEdge server is not started]	Both the PAS for OpenEdge instance and its associated ABL REST services are in sync. But, the PAS for OpenEdge instance is not started. Right-click the PAS for OpenEdge instance, and then select **Start** on the context menu to start the PAS for OpenEdge server.
[Republish]	Indicates that a ABL REST service is modified and must be re-deployed to the PAS for OpenEdge container.
[Not Published]	Indicates that the PAS for OpenEdge instance is started but the **Publish changes immediately** check box was not selected on the **Provide ABL Web App deploy details page** while creating the ABL REST project. Select **Publish** on the PAS for OpenEdge context menu to publish the ABL REST services having the status as **Not Published**.

Note: Before you publish or republish the ABL REST services to the PAS for OpenEdge container, ensure that the selected PAS for OpenEdge instance is started. You can start or stop the PAS for OpenEdge instance from the Servers view using the **Start** and **Stop** option on the PAS for OpenEdge instance context menu or from the Servers view toolbar.

See also

OpenEdge Server Monitor view on page 166
Publish an ABL REST service on page 156
PAS for OpenEdge instance context menu on page 164

PAS for OpenEdge instance and REST service logs

You can display a PAS for OpenEdge instance log file and a ABL REST service log file from the **Console** view. By default, the **Console** view is available in the OpenEdge **Server** perspective for a ABL REST project.

Note: Ensure that the PAS for OpenEdge instance is started and ABL REST service is enabled to view their logs. By default, the ABL REST service is enabled when it is published to the PAS for OpenEdge container. For more information on enabling or disabling a ABL REST service/application, see the Configure OpenEdge Components with OpenEdge Management.

You can open the **Console** view to display a PAS for OpenEdge log file and a REST service log file in any of the following ways:

- From the **Servers** view, right-click a PAS for OpenEdge instance. Then, choose **Show In > Console**.
- From the main menu, select **Window > Show View > Console** view, click **Display Selected Console** from the toolbar.
- From the main menu, select **Window > Show View > Console** and from the **Console** view, click **Display Selected Console** from the toolbar and select a PAS for OpenEdge instance log or a REST service log from the drop-down list.

See also

Status of PAS for OpenEdge instance and ABL REST service on page 167

5

Learn About ABLUnit Test Framework

ABLUnit is a unit testing framework for the Advanced Business Language (ABL) programs. It is similar to JUnit-based and XUnit-based unit testing frameworks.

ABLUnit for Progress Developer Studio for Open Edge helps you to write and run repeatable unit test cases or test suites. The automated testing of your programs checks if the code is working as intended and is valid.

It helps you to:

- Identify bugs in your code.
- Write modular and loosely-coupled code.
- Test the code in parts

The ABLUnit testing framework supports two types of test cases:

- Test Class and Test Suite Class (`.cls` file)
- Test Procedure and Test Suite Procedure (`.p` file)

ABLUnit testing framework includes the following components:

- Annotations for marking the test cases
- Assertions for testing expected results
- Test suites for easily organizing and running test cases
- Test runners for running a test case or test suite from the command line or launch configuration

- Results view for viewing and analyzing the test results

For details, see the following topics:

- Concepts
- Tasks
- Reference

Concepts

Test Class

A test class is an ABL class that contains one or more test methods. All the naming requirements of the test class are similar to ABL class.

Here is an example of an ABL class file; any method in a test class can be converted to a test method by adding `@Test annotation` as shown in the example.

```
USING Progress.Lang.*.
CLASS MyClass:
  METHOD PUBLIC CHARACTER M1( ):
    DEFINE VARIABLE result AS CHARACTER NO-UNDO.
    result = "M1".
    RETURN result.
  END METHOD.
  METHOD PUBLIC INTEGER M2( ):
    DEFINE VARIABLE result AS INTEGER NO-UNDO.
    result = 10.
    RETURN result.
  END METHOD.
END CLASS.
```

Here is the ABLUnit test class for the above class file:

```
ROUTINE-LEVEL ON ERROR UNDO, THROW.
USING OpenEdge.Core.Assert.
CLASS MyTestClass:
    @Test.
   METHOD PUBLIC VOID TestM1( ):
      DEFINE VARIABLE obj AS MyClass NO-UNDO.
      DEFINE VARIABLE returned AS CHARACTER NO-UNDO.
      obj = new MyClass().
      returned = obj:M1().
      Assert:equals("M1",returned).
   END METHOD.
   @Test.
   METHOD PUBLIC VOID TestM2( ):
      DEFINE VARIABLE obj AS MyClass NO-UNDO.
      DEFINE VARIABLE i AS INTEGER NO-UNDO.
   obj = new MyClass().
      i = obj:M2().
      Assert:equals(0,i).
   END METHOD.
END CLASS.
```

Test Suite Class

A test suite class is an empty ABL class. It contains a list of test classes, test suite classes, test procedures, and test suite procedures. It helps you to group and organize test classes. When a test suite class is run, all the test classes, test procedures, test suite classes, and test suite procedures added in the test suite class willl be run.

The ABL class is identified as a test suite by the `@TestSuite` annotation and you can add the test classes to this test suite as comma separated values to the classes attribute and test procedures as comma separated values to the procedures attribute as shown in the examples below:

```
@TestSuite(classes= "Org.test.TestClass1, Org.test.TestClass2").

@TestSuite(procedures= "Org/test/test_proc1.p, Org/test/test_proc2.p").

@TestSuite(classes= "Org.test.TestClass2, Org.test.TestClass4",
procedures= "Org/test/test_proc1.p, Org/test/test_proc2.p").
```

If `@TestSuite` annotation is present, only the classes and procedures attribute values are read for identifying the test cases and the business logic is not executed.

Here is an example of test suite:

```
USING Progress.Lang.*.
ROUTINE-LEVEL ON ERROR UNDO, THROW.
@TestSuite(procedures="test.p").
@TestSuite(procedures="testLogin.p").
@TestSuite(classes="testcls.cls").
CLASS testSuite:

END CLASS..
```

Test Procedure

A test procedure is an ABL procedure file that has one or more internal test procedures. All the naming requirements of the test procedure are similar to ABL procedures.

Here is an example of an ABL procedure file; any procedure can be converted to a test procedure by adding `@Test` annotation as shown in the example.

```
/File: InternalProcedureToTest.p/
PROCEDURE P1:
   DEFINE OUTPUT PARAMETER out AS INTEGER.
   out = 20.
END PROCEDURE.
```

The following is the test procedure for the above procedure.

```
ROUTINE-LEVEL ON ERROR UNDO, THROW.
USING OpenEdge.Core.Assert.
@Test.
PROCEDURE TestP1:
DEFINE VARIABLE hproc AS HANDLE  NO-UNDO.
DEFINE VARIABLE out AS INTEGER.
RUN InternalProcedureToTest.p PERSISTENT SET hProc.
RUN p1 IN hProc (OUTPUT out).
Assert:equals(20,out).
END PROCEDURE.
```

Note: The `RUN PERSISTENT` might typically be placed in a `@Before` or `@Setup` procedure to avoid repeating code in a test case that runs multiple internal procedures.

Test Suite Procedure

A test suite procedure is an empty ABL procedure. It contains a list of test classes, test suite classes, test procedures, and test suite procedures. When you run a test suite, all the test procedures and test suite are also run by default.

The test suite procedure is identified as a test suite by the `@TestSuite` annotation and you can add the test procedures to this test suite as comma separated values to the classes or procedures attribute, similar to test suite class.

If `@TestSuite` annotation is present, only the classes and procedures attribute values are read for identifying the test cases to run and the business logic, if any, in the procedure is ignored.

Here is an example of test suite procedure:

```
@TestSuite(procedures="TestProcedure.p").
```

Annotations supported with ABLUnit

The ABLUnit testing framework uses annotations to identify and execute the test methods or internal procedures in a test case.

The following table gives an overview of the available annotations in the ABLUnit testing framework:

Component	Version
`@Test`	Identifies that a method or a procedure is a test method or procedure. **Note:** This annotation is mandatory for a test method or procedure.
`@Testsuite`[1]	Identifies that the suite of test procedures or test methods is a test suite. **Note:** This annotation is mandatory for a test suite.
`@Setup`	This identifies a ABLUnit lifecycle method and is executed before the methods or procedures in a test case. This annotation prepares the test environment such as reading input data or initializing the class. You can have multiple @Setup methods and procedures and they are executed in the order in which they are are defined.
`@TearDown`	Executes the method or procedure after each test. This annotation cleans up the test environment such as deleting temporary data or restoring defaults.
`@Before`	Executes the method or procedure once per class, before the start of all tests. This annotation can be used to perform time-sensitive activities such as connecting to a database.
`@After`	Executes the method or procedure once, after all the tests are executed. This annotation is used to perform clean-up activities such as disconnecting from a database.
`@Ignore`	Ignores the test. You can use this annotation when you are still working on a code, the test case is not ready to run, or if the execution time of test is too long to be included.
`@Test` (expected="ExceptionType")	Fails the method if the method does not throw the exception mentioned in the expected attribute.

Lifecycle of ABLUnit framework

The ABLUnit testing framework uses annotations to specify that a method in a test class or an internal procedure in a test procedure is a test case.

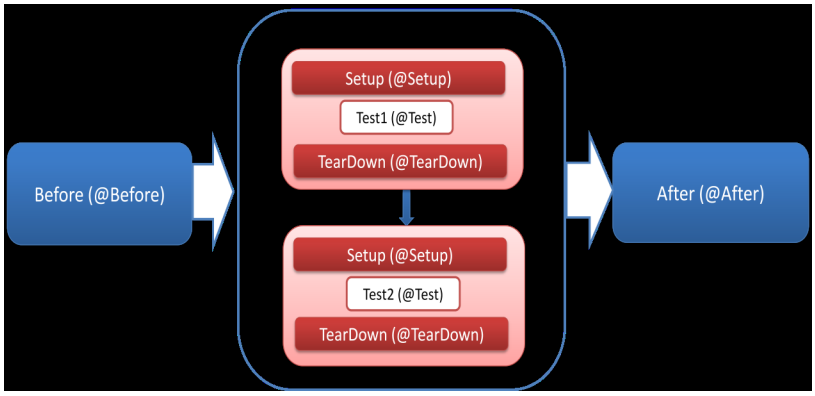
[1] Only programs (classes or procedures) that have an `@TestSuite` annotation or at least one `@Test` annotation are considered tests, and are added to the list of tests to run. All other programs are ignored by the ABLUnit test runner.

In ABLUnit, every test should be annotated with `@Test` annotation. A test case procedure or a test case class can have any number of tests and one set of `Setup` and `TearDown` methods or procedures which are annotated with `@Setup` and `@TearDown` annotations. A test case procedure or class can have one `Before` and `After` methods or procedures which are annotated with `@Before` and `@After` methods.

The ABLUnit testing framework can be invoked, for example, by providing a test class or a test procedure. The framework identifies the tests by looking for test annotations associated with methods or procedures. The execution of a test case proceeds in the following sequence:

1. If a method or procedure marked with `@Before` annotation is present, it is executed before any tests.
2. If a method or procedure marked with `@After` annotation is present, it is executed after executing all the tests.
3. For each test method or procedure:
   - `@Setup` annotated method or procedure is executed, if there is any.
   - The test method or procedure is executed.
   - `@TearDown` annotated method or procedure is executed, if there is any.

Figure 1: ABLUnit Execution Cycle



Updates to ABLUnit

Application code that extends or calls any classes in the `OpenEdge.ABLUnit` namespaces may need to be recompiled or updated to use the new public API (classes and methods). The following changes require the modification and removal of a number of public members:

- Methods with lifecycle annotations
- Lifecycle method failure and error reporting
- `errNum` key for expected error numbers
- Failure and errors written to `results.xml`
- `<skipped>` element for ignored tests
- Stop conditions caught
- `<properties>` element for test suites
- `@Testsuite` or `@Test` annotations required

Note: All output produced in the `results.xml` file with the JUnit results standard.

Methods with lifecycle annotations

The ABLUnit test framework has the concept of lifecycle methods that add behavior to test cases and individual tests, for instance, code that must run before each test method. Previous releases allowed multiple methods with the same annotation to be run, but at run time, only a single lifecycle method was run.

Now, all of the methods that have lifecycle annotations are run in the order in which they are defined. Methods must all have the same signature (return void, no parameters), but the OOABL class requires the methods to have different names.

In the following example, `Setup_A` and `Setup_B` both run before `Test1` runs.

```
class Tests.MyTest:
    @Test.
    method public void Test1():
    // test method
    end method.

    @Setup.
    method public void Setup_A():
        // setup logic
    end method.

    @Setup.
    method public void Setup_B():
        // setup logic
 end method.
end class.
```

In order for multiple methods with lifecycle annotations to be run, additional behavior changes were made.

Lifecycle method failure and error reporting

A test that returns `OpenEdge.Core.AssertionFailedError` is a failure because a particular assertion was tested. All other conditions raised are considered errors.

If a test method has one or more lifecycle methods, and one of those methods (either the test method itself or one or more of the lifecycle methods) raises any error, then the most severe condition raised is reported. For example, if the test method raises a failure due to an assertion failing, and the lifecycle method raises an error, then the error is reported because an error is more severe than a failure.

errNum key for expected error numbers

The `@Test` annotation enables developers to specify the type of exception raised using an expected key with an OOABL type name value. To specify an error number, use the `errNum` key. The value for `errNum` must be an integer. The test passes if the following are true:

- The test raises an exception, and the exception matches the expected type.
- An `errNum` value is provided.
- The exception's first error number equals the `errNum` value.

If no `errNum` key is provided, then only the expected type is used to determine a test's success.

For example, the following test passes because it does not expect the class to exist.

```
@Test(expected="Progress.Lang.SysError", errNum=15287).
method public void Test_ClassNotFound():
    define variable obj as Progress.Lang.Object no-undo.
    obj = dynamic-new 'This.Class.Does.Not.Exist' ().
end method.
```

Failures and errors written to result.xml

A single test may have zero, one, or more lifecycle methods associated with it. The `@Setup` and `@TearDown` methods run before and after each test method, respectively. Failures or errors resulting from the test method or its lifecycle methods each have a failure or error element created in the `results.xml` file.

For example, there are two failures in the test named `test3`:

```
<testcase classname="TestRunFailure.AfterEachFailure" name="test3"
          status="Error" time="0">
    <failure message="Expected: TRUE but was: no"
             type="OpenEdge.Core.AssertionFailedError">
        IsTrue OpenEdge.Core.Assert at line 177
    </failure>
    <error message="** Invalid character in numeric input T. (76)"
           type="Progress.Lang.SysError">
        TestRunFailure.AfterEachFailure at line 9
    </error>
</testcase>
```

<skipped> element for ignored tests

If a test is ignored, then a `<skipped>` element is added with a `message` attribute.

```
<testcase classname="TestRunFailure.BeforeAllFailure" name="test"
          status="Success" time="0">
    <skipped message="Ignored" />
</testcase>
```

Stop conditions caught

ABLUnit handles stop conditions raised in test methods (explicitly or implicitly). The message written to the `results.xml` varies depending on the value of the `-catchStop` parameter.

If the `-catchStop` parameter has a value of 0, then the `Progress.Lang.AppError` error is raised and caught, and the message "stop condition raised for <*`test-name`*>" is added as an error to the test result.

If the `-catchStop` parameter has a value of 1, then the `Progress.Lang.Stop` exception is caught, and an error message is added to the test results. The message is typically "Stop condition raised" except for lock conflicts. If there is a lock conflict, then the message is "Lock conflict raised".

<properties> element for test suites

A `<properties>` element is added to `<testcase>` (test classes and procedures) `<testsuite>` elements. This element contains a number of properties that describe the session.

The following is a list of properties and the ABL functions or attributes used to determine their values:

```
<properties>
    <property name="proversion"           value=proversion(1) />
    <property name="process-architecture" value=process-architecture />
    <property name="opsys"                value=opsys />
    <property name="window-system"        value=session:window-system />
    <property name="cpinternal"           value=session:cpinternal />
    <property name="startup-parameters"   value=session:startup-parameters />
</properties>
```

@TestSuite or @Test annotation required

Only programs (classes or procedures) that have an `@TestSuite` annotation or at least one `@Test` annotation are considered tests, and are added to the list of tests to run. All other programs are ignored by the ABLUnit test runner.

ABLUnit project type

An ABLUnit project type is an OpenEdge project specialized for ABLUnit testing. The ABLUnit testing functionality allows you to write and execute the unit tests for the OpenEdge ABL code. For information on creating an OpenEdge ABLUnit project type, see Create an ABLUnit project on page 179.

Tasks

Access ABLUnit perspective

The ABLUnit perspective helps you to create test class, test procedure, or test suite.

To access the ABLUnit perspective:

1. Do one of the following:
   - Click **Open Perspective** on the Workbench toolbar.
   - Select **Window** > **Open Perspective**.
2. Select **Other** > **OpenEdge ABLUnit** and click **OK**.

Create an ABLUnit project

Using the **New Project** wizard, you can create an ABLUnit project that will contain all your test cases.

To create a new project:

1. Select **File** > **New** > **OpenEdge Project** from the Progress Developer Studio for OpenEdge main menu bar or the **Project Explorer** view context (right-click) menu. The New OpenEdge Project wizard opens and displays the Create an OpenEdge Project page on page 71.
2. Type a name in the **Project name** field.

   The root folder for the new project is created in your current Eclipse workspace, unless you specify a different location.
3. To choose a different location for the project, click and clear the **Use default** check box. Then either browse to, or enter the path to the desired location.
4. Select the **General** category from the left section.
5. Select the **ABLUnit** option button.
6. Click **Next**. The Select AVM and layout options page on page 72 appears.
7. Specify the OpenEdge AVM options and the Project layout options (or leave the default settings) and click **Next**. The Define PROPATH page on page 74 appears.

8. Leave the default settings or modify the PROPATH entries to be used by the project and click **Next**. The Select database connections page on page 74 appears.
9. Select the database connections to be used by the project and click **Finish**. A dialog appears with an option to open the new project in the **ABLUnit** perspective.

   A new project is created in the **Project Explorer** view. A tests folder is created under the new **ABLUnit** project that will contain the test cases.

Create test cases using ABLUnit

A test case is a test class containing one or more test methods or one or more test procedures. By default when a test case is run, all contained test methods or test procedures are also run.

Progress Developer Studio for Open Edge provides the following ABLUnit wizards:

- New ABLUnit Test Class
- New ABLUnit Test Procedure
- New ABLUnit Test Suite Class
- New ABLUnit Test Suite Procedure

Note: You can create test cases or test suites using the ABLUnit wizards or create a new ABL Class or Procedure file, and manually enter the required test annotations.

To create a test case using the ABLUnit wizard:

1. Open an OpenEdge ABLUnit project in which you want to create a test case.
2. Select **File** > **New**. If the required test case or test suite does not appear in the menu, select **Other**. The **New** wizard appears.
3. Expand **Progress OpenEdge** > **ABLUnit**, and select the required test case or test suite type.
4. Click **Next** to launch the corresponding wizard.
5. Fill in the appropriate information for the new test case.
6. Click **Finish**.

   The test case of test suite you have created opens in the **ABL Editor** window.

Run test cases and test suites

You must have the `[BLOCK | ROUTINE]-LEVEL ON ERROR UNDO, THROW` statement in the test files to run the ABLUnit test cases.

Run test cases from OpenEdge

You can run an ABLUnit test case from the Progress Developer Studio for OpenEdge environment using the ABLUnit launch configuration. You can run the test cases or test suites or run a specific test method or test internal procedure inside a test case. It also supports running all the test cases and test suites in a specific project or package or folder. When you run a test case, all the test methods and test procedures defined in the test case are also run.

Access Progress OpenEdge ABLUnit launch configurations

To access the Progress OpenEdge ABLUnit launch configurations wizard, do one of the following:

- Click **Run** to run the currently selected ABLUnit test case.
- Click the drop-down arrow next to **Run** to open a menu from which you can start an existing configuration, create and run a default configuration.

The **Run Configurations** wizard opens.

Define and run a new ABLUnit launch configuration

You can use the Run Configurations wizard to set all options for a new launch configuration or to edit an existing configuration.

To define and run a new OpenEdge ABLUnit launch configuration:

1. Click **Run Configurations** next to **Run**.
2. Click **New launch configuration** on the wizard toolbar and enter a name for the configuration in **Name**. The wizard creates a new ABLUnit launch configuration and displays it in the tree view in the left pane.
3. Set values as necessary for the available options. See Progress OpenEdge ABLUnit launch configuration settings for more information.
4. After defining the options, click **Apply** to save the configuration. You can also add this configuration to **Run** for later use. See Add an ABLUnit launch configuration to the Run menu on page 181 for more information.
5. To run the configuration, click **Run**. The ABLUnit test case runs. ABLUnit View opens and displays the test result.

Add an ABLUnit launch configuration to the Run menu

It is helpful to add the launch configurations that you use frequently to the drop-down menu of **Run** on the main toolbar. This menu has a section (not visible when empty) at the top to which you can add any of your ABLUnit launch configurations.

To add ABLUnit launch configuration:

1. Click the drop-down arrow next to **Run** on the main toolbar.
2. Click **Organize Favorites**.

   The **Organize Run Favorites** dialog box opens.
3. Click **Add** to open the **Add Run Favorites** dialog box and select the ABLUnit launch configuration to be added to the menu.

   Note: The **Add Run Favorites** dialog box displays ABLUnit launch configurations only if they have been previously defined. See Define and run a new ABLUnit launch configuration on page 181 for more information.

   The ABLUnit launch configuration that you select in the **Add Run Favorites** dialog box displays in the **Favorites** section of the **Organize Run Favorites** dialog box.
4. Click **OK**.

Copy or deleting ABLUnit launch configurations

The Run Configurations wizard allows you to copy and delete existing ABLUnit launch configuration definitions.

To copy or delete an ABLUnit launch configuration:

1. Click the drop-down arrow next to **Run** on the main toolbar and click **Run Configurations**.
2. Do one of the following:
   - Right-click an ABLUnit launch configuration in the left pane and select **Duplicate** from the context menu. The wizard creates and opens a copy of the selected configuration. The duplicate configuration has the same name as the source, with an incremental number in parentheses appended.
   - Right-click an ABLUnit launch configuration in the left pane and select **Delete** from the context menu.

Run test cases from the command prompt

You can also run test cases and the test suites from the proenv command prompt. Run the `ABLUnitCore.p` driver program by passing the test case, the test suite, or the folder containing test cases and the test suites as a parameter.

You have the following options:

- Run multiple test cases by providing the test cases as parameters separated by commas (,...,...).
- Run only the test method or test procedure in a specific test case by providing the name of the test method or test procedure separated by # with the test case name.

  The following command shows you how to use the `ABLUnitCore.p` driver program:

  ```
  prowin -p (Driver Program) -param <parameters>
  ```

  The following examples show you how to run a test class, a test procedure, a test suite, or a test folder:

  ```
  prowin -p ABLUnitCore.p -param testpackage.testclass
  prowin -p ABLUnitCore.p -param testprocedure.p
  prowin -p ABLUnitCore.p -param testSuite.cls
  prowin -p ABLUnitCore.p -param testSuite.p
  prowin -p ABLUnitCore.p -param C:\tests
  ```

  Note: You must provide the qualified name of the test class and the full path or the relative path of the test procedure. To run the test classes, the classes must be available in the PROPATH.

  The following is an example that passes multiple test cases:

  ```
  prowin -p ABLUnitCore.p -param testclass1.cls
  prowin -p ABLUnitCore.p -param testclass1#testmethod
  prowin -p ABLUnitCore.p -param testclass1.cls,testclass2.cls
  prowin -p ABLUnitCore.p -param testclass1#testM1,testclass2#testM2
  prowin -p ABLUnitCore.p -param testProcedure1.p,testProcedure2.p
  prowin -p ABLUnitCore.p -param testProcedure1.p#testP,testProcedure2.p prowin -p
  ABLUnitCore.p -param testSuite.cls
  prowin -p ABLUnitCore.p -param testSuite.p prowin -p ABLUnitCore.p -param "C:\testFolder"
  prowin -p ABLUnitCore.p -param testclass1.testclass
  prowin -p ABLUnitCore.p -param testclass1.testclass#testmethod
  prowin -p ABLUnitCore.p -param testclass1.testclass,testclass2.testclass
  prowin -p ABLUnitCore.p -param testclass1.testclass#testM1,testclass2.testclass#testM2

  prowin -p ABLUnitCore.p -param testProcedure1.p,testProcedure2.p
  prowin -p ABLUnitCore.p -param testProcedure1.p#testP,testProcedure2.p prowin -p
  ABLUnitCore.p -param testSuite.cls
  prowin -p ABLUnitCore.p -param testSuite.p prowin -p ABLUnitCore.p -param "C:\testFolder"
  ```

  Note: Currently, we do not support running multiple tests from single test procedure or test class.

- Pass the configuration file as a parameter as shown below:

  ```
  prowin -p ABLUnitCore.p -param "CFG=C:\ABLUnit\tests\ablunit.json"
  ```

  Here is a sample configuration (in JSON format) that displays all the valid options.

  ```
  {
      "options": {
          "output": {
              "location": "C:/ABLUnit/results",
              "format": "xml"
          },
          "quitOnEnd": true,
          "writeLog": true,
          "showErrorMessage": true,
          "throwError": true
      },
      "tests": [
          {
              "test": "C:/ABLUnit/tests/MyTestClass.cls"
          },
          {
              "test": "C:/ABLUnit/tests/MyTestProcedure.p"
          },
          {
              "folder": "C:/ABLUnit/tests/test-folder"
          },
          {
              "test": "C:/ABLUnit/tests/MyTestClass1.cls",
              "cases": [
                  "testItAgain"
              ]
          }
      ]
  }
  ```

  The options of the file are as follows:

  - `options` specifies additional data for the run time framework.
  - `output` specifies the location of the output directory to write the test results. The XML will not be created if the `type info` for a program provided as a (potential) test case cannot be determined. This will happen if the program (class or procedure) fails to compile. If the output location is not specified, `results.xml` file is generated under the current working directory. You can change the location of `results.xml` by using the following command:

    ```
    prowin -p ABLUnitCore.p -param "TestCaseClass.cls -outputLocation <path>"
    ```

    Note: Only xml results are supported and the only valid value for `format` is xml.

  - The values for `quitOnEnd`, `writeLog`, `showErrorMessage`, `throwError` can be true or false only. If `quitOnEnd` is true then the application closes. It can be set to false, if another application uses the ABLUnit as a library. For example, if `writeLog` is true then a log file, `ablunit.log` is created in the current working directory and writes error messages to that log file. If `showErrorMessage` is set to true then the error messages is displayed in a new window. If ABLUnit is used as a library inside another program, set `throwError` to true, the framework displays the errors occurred.
  - `tests` lets you add the tests that you want to run and each test can be configured using `test`.
  - `folder` specifies the location that contain the tests, it is equivalent to using `test`, however the reverse is not true.

Run test cases using an Apache ANT task

You can use a custom ANT task (`build.xml`) to run ABLUnit tests cases. The task is a part of `ant-ablunit.jar` and is located in:

`$DLC\java location`

Make sure that Apache ANT is installed on your machine and copy the `ant-ablunit.jar` file into the installation location of Apache ANT.

You must write an XML file (`build.xml`) for ABLUnit that runs test cases from the ABLUnit testing framework and can display the results in the console or save it to an XML file.

You can define ABLUnit tests by nesting elements in the test cases or using batch tests to run the ANT task.

ABLUnit Task-Level Properties

You can set the following are properties that you can set at the ANT task level for ABLUnit. You can override the properties while running individual test or batch test elements.

Name	Description
DLC	Specifies the installation location of OpenEdge.
environment (Optional)	Specifies the environment (GUI or TTY) in which test cases should run. By default, the test cases run in the GUI environment.
printsummary (Optional)	Prints a one-line summary of each test case that you run. The valid values are true, false, on, off, yes, and no. By default, the value is set to true.
haltonerror (Optional)	Stops the build process if an error occurs while running a test case. By default, the process proceeds even when errors occur.
haltonfailure (Optional)	Stops the build process if a test fails. By default, the process proceeds even if the test case fails.
tempdir (Optional)	Specifies the directory in which temporary files are placed while running the build process. By default, the working directory is used.

ABLUnit Elements

You can use the following ABLUnit elements in an ANT task to run an ABLUnit test case.

dbinfo element

Provides a database to be used while running a test case. This is a sub-element of the main ANT task and can appear any number of times. Each dbinfo element is considered as a single db connection. Set the following properties for this element:

Name	Description
name	Specifies the database name including the absolute path or the relative path if the database file is in the current working directory, for example in `$DLC\WRK\Sports2020.db`.
host (Optional)	Specifies the host name of the server, for example, `localhost`.
port (Optional)	Specifies the port of the server or the service name, for example, `4545`.

Note: The database must be available and the server must be active while running an ANT task.

propath element

Sets the PROPATH to be used while executing an ANT task. You can configure it with the pathelement element.

Note: For more information about pathelement, see the Apache ANT documentation.

test element

Configures an individual test case. Set the following properties for this element:

Name	Description
name	Specifies the name of a test class (`.cls`) or a test procedure (`.p`) file.
todir (Optional)	Specifies the directory to which the results of the ANT task are written.
outfile (Optional)	Specifies the name of the test results file. The format attribute file decides the extension of the file.
format (Optional)	Specifies the format of the results. Currently, we support on XML format.
DLC (Optional)	Specifies the installation location of OpenEdge. This property overrides the value you set in the ABLUnit task.
environment (Optional)	Specifies the environment (GUI or TTY) in which test cases must run. It overrides the value you set in the ABLUnit task.
printsummary (Optional)	Prints a one-line summary of each test case that you run. The valid values are true, false, on, off, yes, and no. It overrides the value you set in the ABLUnit task.
haltonerror (Optional)	Stops the build process if an error occurs while running the test case. This property overrides the value you set in the ABLUnit task.
haltonfailure (Optional)	Stops the build process if a test case fails. This property overrides the value you set in the ABLUnit task.

batchtest element

Configures a batch test case. You can configure a batch test case with the fileset element.

Note: For more information about fileset, see the Apache ANT documentation.

Set the following properties for this element:

Name	Description
todir (Optional)	Specifies the directory into which the results of the ANT task are written.
format (Optional)	Specifies the format of the test result.
DLC (Optional)	Specifies the installation location of OpenEdge. This property overrides the value you set in the ABLUnit task.
environment (Optional)	Specifies the environment (GUI or TTY) in which the test case must run. This property overrides the value you set in the ABLUnit task.
printsummary (Optional)	Prints a one-line summary of each test case that you run. The valid values are true, false, on, off, yes, and no. This property overrides the value you set in the ABLUnit task.
haltonerror (Optional)	Stops the build process if an error occurs while running the test case. This property overrides the value you set in the ABLUnit task.
haltonfailure (Optional)	Stops the build process if a test fails. This property overrides the value you set in the ABLUnit task.

Here is a sample `build.xml` file (Ant task):

```
<?xml version="1.0" encoding="UTF-8"?>
<project name="ABLUnit-Ant" default="main" basedir=".">

 <!-- ABLUnit task definition target starts here -->
 <target name="taskdef">
  <taskdef name="ablunit" classname="com.progress.openedge.ant.ablunit.ABLUnitTask"
   classpath="dist/ant-ablunit.jar" />
 </target>

 <!-- Main target starts here -->
 <target name="main" depends="taskdef">
  <ablunit dlc="$DLC" environment="gui"
   printsummary="true" haltonerror="no" haltonfailure="no" tempdir="${basedir}/tmpdir">

   <dbinfo name="$DLC\WRK\Sports2020.db" host="localhost" port="4545" />
   <propath>
    <pathelement location="${basedir}/samples/classes" />
    <pathelement location="${basedir}/samples1/classes" />
   </propath>

   <test name="${basedir}/samples/MyTestClass.cls" todir="${basedir}/results"
   outfile="result-MyTestClass-gui" format="xml" />
   <test name="${basedir}/samples/MyTestProcedure.p" todir="${basedir}/results"
   outfile="result-MyTestProcedure" format="xml" />

   <batchtest todir="${basedir}/results" format="xml">
    <fileset dir="${basedir}/samples1">
     <include name="**/*.cls" />
     <include name="**/*.p" />
    </fileset>
   </batchtest>

  </ablunit>
 </target>
</project>
```

Use the ABLUnit view

You can use the **ABLUnit** view to:

- Display the progress and status of a running test case
- Import results of an executed test case from an XML file
- Open the corresponding file that contains the test case
- View details of the last ten executed test cases and run those test cases

The **ABLUnit** view is displayed in the ABLUnit perspective by default. If it is not already displayed, you can access it by selecting **Window** > **Show View** > **Progress OpenEdge Editor** > **ABLUnit**.

To open the file containing the test cases, do one of the following:

- Select **Go to File** from the context (right-click) menu of the **ABLUnit** view
- Double-click the file in the tree view of the **ABLUnit** view

The corresponding file opens in an editor.

To view details of the last ten executed test cases and to run any of those test cases, do the following:

1. Select the drop-down arrow of the **Test Run History** control on the **ABLUnit** view toolbar.

   The drop-down list displays the name of the test case (path relative to the workspace) followed by the date and time (yyyy/mm/dd hh:mm:ss) when the test was executed.

2. Double-click to select the test case that you want to execute from the list.

Note: For more information about the controls available in the **ABLUnit** view, see ABLUnit view on page 192.

Reference

Test case generation wizards

This topic includes the following topics:

New ABLUnit Test Class wizard

The **New ABLUnit Test Class** wizard allows you to create an ABLUnit test class. You can also select the class for which the test methods should be generated.

This wizard appears when you select **File** > **New** > **ABLUnit** > **Test Case Class** from main menu or from **New** > **ABLUnit** > **Test Case Class** from the context menu in the **Project Explorer** view.

The following controls are available in this wizard:

Field name	Description
Package root	(Required) Specifies a currently open project that will contain the class code, other project code, and any assembly references. Click **Browse** if you want to select a project other than the current one (the default value).
Package	Optionally, specifies a package name that will contain the class file, corresponding to a sub-folder of the package root. Click **Browse** or enter the folder path. A period (.) must separate each subfolder from its parent folder in the path name.
Class name	(Required) Specifies the name of the test case class. The name must begin with a letter; spaces and most non-alphanumeric characters are not allowed. The `.cls` extension is appended automatically.
Inherits	Optionally specifies another class in the current project as a super class from which the new class inherits state and behavior. Click **Browse** or enter the class path by typing. A period (.) must separate each node from its parent folder in the path name. **Note:** The super class cannot be generic.
Which method stubs would you like to create?	Optionally, allows you to generate stubs for any of the following methods: • Before—Adds a test method annotated using `@Before` to the test class • After—Adds a test method annotated using `@After` to the test class. • Setup—Adds a test method annotated using `@Setup` to the test class. • TearDown—Adds a test method annotated using `@TearDown` to the test class.
Class to test	Specifies the class for which you want to create the ABLUnit test class. Click **Browse** to view all the available classes in the selected project or enter the class path by typing. A period (.) must separate each node from its parent folder in the path name.
Next	Displays the **Select Methods** page that lists all the methods in the selected class. On this page, you can select the methods for which you want the stubs to be generated.
Finish	Generates a test class with the selected test method stubs and opens it in the ABL Editor.

New ABLUnit Test Case Procedure wizard

The New ABLUnit Test Procedure wizard allows you to create a test procedure (.p) file. Additionally you can select the procedure for which the test procedures should be generated.

This wizard appears when you select **File** > **New** > **Test Case Procedure** from the main menu or **New** > **Test Case Procedure** from the context menu of the **Project Explorer** view.

The following controls are available:

Field name	Description
Container	Specifies the currently open project or a folder within the project where the test procedure is to be created. Click **Browse** if you want to select a project other than the current one.
File name	(Required) Specifies the test procedure name. The `.p` extension is appended automatically.
Setup	Adds a test internal procedure annotated using `@Setup` in the test procedure.
TearDown	Adds a test internal procedure annotated using `@TearDown` in the test procedure.
Before	Adds a test internal procedure annotated using `@Before` in the test procedure.
After	Adds a test internal procedure annotated using `@After` in the test procedure.
Procedure to test	Specifies the ABL procedure for which you want to create the test procedure. Click **Browse** if you want to select a procedure file other than the current file.
Finish	Generates a test procedure with the selected annotations, which opens in the ABL Editor.

New ABLUnit Test Suite Class wizard

The **New ABLUnit Test Suite Class** wizard allows you to create a test suite class. A test suite class contains a list of test cases and/or other test suites. You can use test suites for grouping and organizing test cases. When you run a test suite, all the test cases and suites that belong to that test suite are executed by default.

This wizard appears when you select **File**>**New**> **ABLUnit**>**Test Suite Class**. You can also select New>ABLUnit>Test Suite Class from the context menu in the **Project Explorer** view.

The following controls are available in this wizard:

Field name	Description
Package root	(Required) Specifies a currently open project that will contain the class code, other project code, and any assembly references. Click **Browse** if you want to select a project other than the current one (the default value).

Field name	Description
Package	Optionally, specifies a package name that will contain the class file, corresponding to a sub-folder of the package root. Click **Browse** or enter the folder path. A period (.) must separate each subfolder from its parent folder in the path name.
Class name	(Required) Specifies the name of the test suite class. The name must begin with a letter; spaces and most non-alphanumeric characters are not allowed. The `.cls` extension is appended automatically.
Test classes and procedures to include in the suite	Displays a list of test classes and procedures that you add to or remove from the test suite.
Add	Opens the **Select Class** or **Procedure** dialog that allows you to select test class and test procedure files that you want to include in the test suite.
Remove	Deletes an item from the list of test classes and procedures to be included in the test suite class.
Finish	Generates a test suite class with the selected test classes and procedures included and opens it in the ABL Editor.

New ABLUnit Test Suite Procedure wizard

The New ABLUnit Test Suite Procedure wizard allows you to create a test suite procedure. A test suite procedure contains one or more test cases. You can select both the test class and test procedure files as part of your test suite procedure.

When a test suite procedure is run, all the test cases included in the test suite procedure are executed.

This wizard appears when you select **File** > **New** > **Test Suite Procedure**. You can also select **New** > **ABLUnit** > **Test Suite Class** from the context menu in the **Project Explorer** view.

The following controls are available:

Field name	Description
Container	Specifies the currently open project or a folder within the project where the test procedure is to be created. Click **Browse** if you want to select a project other than the current one (the default value).
File name	(Required) Specifies the test suite procedure name. The `.p` extension is appended automatically.
Add	Opens the **Select Class** or **Procedure** dialog which allows you to select the test class or test procedure files which you want to include in the suite.

Field name	Description
Remove	Deletes a selected test class or test procedure file from the test suite procedure.
Finish	Saves your selections and generates a test suite procedure file, which opens in the ABL Editor.

ABLUnit view

The ABLUnit view displays the test run progress and status, and also allows you to import a test run result from a XML file.

This view includes the following controls:

Controls	Description
	Reruns a particular test method, test class, test procedure, or test suite.
	Shows the next failed test.
	Shows the previous failed test.
	Shows failed cases only.
	Imports the results of a test case that was previously run.
	Displays details of the last ten executed test cases and lets you execute them.
	Exports the results of a test case, which was previously run, to an XML file.

Progress OpenEdge ABLUnit launch configuration settings

The ABLUnit launch configuration wizard displays the following tabs:

Tab name	Description
ABLUnit	Lets you run a single test case or multiple test cases from the folder.
Startup	Lets you specify the startup parameters for running test cases. For detailed information about the controls provided on the **Startup** tab, see Startup tab (Application) on page 488.
PROPATH	Lets you control where the AVM searches for files and procedures.

Tab name	Description
Databases	Lets you add the database connection for running the configuration.
Common	Lets you set options for specifying where an ABL application Launch configurations for running and debugging programs on page 451 is saved, how it is accessed, and how it runs.

Progress OpenEdge ABLUnit debug configuration settings

The ABLUnit debug configuration wizard displays the following tabs:

Tab name	Description
ABLUnit	Lets you debug a single test case or multiple test cases from the folder.
Startup	Lets you specify the startup parameters for running test cases.
PROPATH	Lets you control where the AVM searches for files and procedures.
Databases	Lets you add the database connection for running the configuration.
Common	Lets you set options for specifying where an ABL application debug configuartion is saved, how it is accessed, and how it runs.

Add New Test Method wizard

The **Add New Test Method** wizard enables you to add a test method to a test class (`.cls`) file when the file is open in ABL editor.

To access the wizard, select **Source** > **Add Test Method** from the context menu in ABL editor or from the main menu. You can also click **Alt+Shift+L** key sequence.

Note: This option is enabled only when you have a test class (`.cls`) file open in ABL editor. This option is visible only when the current perspective is ABLUnit perspective or the class file is a part of ABLUnit faceted project.

The wizard has the following controls that you can use to add a test method to a `.cls` file:

Field name	Description
Method name	Specifies a name for the test method that you want to add to your required test class file.
Annotation	Specifies an annotation type for the test method from the drop-down menu. The annotation types are Test, Before, After, Setup, and TearDown.
Insertion position	Specifies the position in current test class file where you want to place the annotated test method.
Generate	Generates the annotated test method in your test class file.

Add New Test Procedure wizard

The **Add New Test Procedure** wizard enables you to add a test internal procedure to a test procedure file when the file is open in ABL editor.

To access the wizard, right-click the file and select **Source> Add Test Procedure** > from the context menu in ABL editor or the main menu. You can also click the **Alt+Shift+K** key sequence.

Note: This option is enabled only when you have a test procedure file open in ABL editor. This option is visible only when the current perspective is ABLUnit perspective or the procedure file is a part of ABLUnit faceted project.

The wizard has the following controls that you can use to add a test procedure to a file:

Field name	Description
Procedure name	Specifies a name for the test internal procedure that you want to add to your required test procedure file.
Annotation	Specifies an annotation type for the test internal procedure from the drop-down menu. The annotation types are Test, Before, After, Setup, and TearDown.
Insertion position	Specifies the position in your test procedure file where you want to place the annotated test internal procedure.
Generate	Generates the annotated test internal procedure in your test procedure file.

Assert API

The Assert API provides a set of assertion methods to validate the expected result of a method or procedure in a test with that of the actual result.

This API is a part of the `OpenEdge.Core.Assert`, `OpenEdge.Core.Assertion.AssertFile`, `OpenEdge.Core.Assertion.AssertJSON`, `OpenEdge.Core.Assertion.AssertError`, and `OpenEdge.Core.Assertion.AssertObject classes` in the `OpenEdge.Core.pl` file.

Note: All the Object-related APIs are a part of the `OpenEdge.Core.Assertion.AssertObject class` in the `OpenEdge.Core.pl` file.

Note: For more information on a detailed list and description of the classes and the methods.

6

Learn About ABL WebApp

An ABL WebApp implements a server-side resource that provides OpenEdge data and operations for access by a resource client through the agency of an ABL Service. This resource is implemented by an ABL Business Entity, which is typically an ABL user-defined class that is coded to access the data through methods that implement the resource operations.

An ABL Service is a Data Object Service Catalog. This Data Object Service Catalog defines the schema of the data and the operations on the data that is supported by one or more ABL resources. In this way, a single ABL Service can support client access to multiple resources running on a single PAS for OpenEdge instance.

Progress Developer Studio for OpenEdge provides wizards and other tools to accelerate the development of server-side ABL Services

You can develop ABL Services using ABL Web App projects that support ABL Service development using facets that work with PAS for OpenEdge only. For more information on working with the ABL Web App project and creating ABL Data Object Services, see the Learn About PAS for OpenEdge on page 99 help.

For details, see the following topics:

- Concepts
- Tasks
- Reference

Concepts

Prerequisites for ABL WebApp project support

The following are the prerequisites for ABL WebApp support in the Progress Developer Studio for OpenEdge:

- OpenEdge Explorer (OEE) to work with the Server functionality. By default, OpenEdge Explorer is shipped with OpenEdge. If you have not configured OEE during OpenEdge installation, you can manually configure it post installation. For more information, see the *Install OpenEdge*.
- Java Runtime Environment (JRE) v1.8. You must install Java before installing OpenEdge.

See also

Learn About ABL WebApp on page 197

Terminology related to ABL WebApp support

The following terms describe various components that apply to ABL WebApp support in Progress Developer Studio for OpenEdge:

Term	Description
ABL routine	An ABL routine can be internal procedures, user-defined functions, or class methods.
PAS for OpenEdge	A Java container provided with OpenEdge that allows you to deploy ABL Services. When installing Progress Developer Studio for OpenEdge, PAS for OpenEdge is also installed and configured. The PAS for OpenEdge container will be located in your OpenEdge installation directory at `$DLC/WRK/oepas1`.
Progress ABL WebApp	Progress-supported, JavaScript implementation of the open source Cloud Data Object. It provides client access to the data and operations of a single ABL resource, so the client code can call methods on a Progress ABL WebApp to execute the ABL WebApp operations on the server. The data for these operations is serialized between the ABL Service and the client as JSON media. The Progress ABL WebApp uses a Data Service Catalog file to acquire the client resource's metadata from the server. For more information, see: • Create a Business Entity class on page 206 • Data Service Catalog schema properties on page 228

Term	Description
Data Service Catalog file	A Data Service Catalog file is generated from a Business Entity class file in Progress Developer Studio for OpenEdge. It provides the definition of the resources in an ABL WebApp service. The Data Service Catalog includes an entry for each built-in (CRUD and Submit) method and each invocation (or Invoke) method for a resource. It also includes the schema for the resource. The Progress ABL WebApp uses the schema information for its built-in CRUD and Submit methods. For each method, the catalog provides parameter mapping information. This information (metadata) from the catalog is used to construct the HTTP request for the operation calls made to the REST adapter. For more information, see: • Create a Business Entity class on page 206 • Data Service Catalog schema properties on page 228
Business Entity	A Business Entity defines a resource that contains schema and operations (business logic) to work on the schema. It contains pre-defined ABL WebApp interface annotations for the schema and operations. The ABL WebApp interface annotated Business Entity class is exposed as an ABL WebApp resource. An OpenEdge ABL WebApp uses the REST Adapter as an interface to the PAS for OpenEdge server to run the Business Entity's operations. A Business Entity follows a prescriptive programming model that works well with the Progress ABL WebApp. It can be exposed directly to a Progress ABL WebApp or as a separate service interface. For information on creating Business Entity class files, see: • Create a Business Entity class on page 206 • New Business Entity wizard on page 216
ABL resource	A Business Entity or other singleton class or procedure that has an ABL WebApp interface defining a data model (a single temp-table or ProDataSet) and ABL WebApp operations. A Business Entity as defined by the OpenEdge Reference Architecture is an example of a resource. It is expected to define a data using logical schema along with business logic to access and update the data. It is always an abstraction from the physical database. This can also be considered the back end of a remote data object. For more information, see Define ABL WebApp resources on page 206.

Term	Description
ABL Service	ABL Service is the service interface for a resource. Resources within a ABL Services are accessed using a client side API. OpenEdge provides the Progress ABL WebApp, which provides this API for JavaScript clients. Each resource is defined in a catalog file which identifies the schema and operations supported for the resource. The ABL Services defined for your project appear under the **Defined Services** node and the `.json` files appear under the `PASOEContent/static` node in your project directory in the **Project Explorer** view. For more information, see Create an ABL Service on page 211.
ABL Web Application (WAR)	An ABL Web Application is one or more ABL Services packaged for deployment to the PAS for OpenEdge container in a `war` format. For more information, see the Publish ABL services on page 213 and Export an ABL Web Application on page 214.

See also

Learn About ABL WebApp on page 197

ABL WebApp project type

An ABL WebApp project type is an OpenEdge project that is specialized for ABL Service development and deployment. An ABL WebApp project contains the following OpenEdge facets:

- ABL AppServer
- ABL Data Object Service
- ABL REST Service
- ABL WebApp
- OpenEdge
- Progress Adapters

You can see the project facets that are associated with an ABL WebApp project using the Project Facets of Project Properties page. To access Project Facets properties page, select **Properties** from the ABL WebApp right-click menu. For more information, see Project Facets page on page 75.

Note: ABL WebApp projects can be used to deploy ABL Services only to traditional servers. To deploy ABL Services to a PAS for OpenEdge instance, you must use an ABL WebApp project with an ABL Service type.

See also

Create an ABL WebApp project on page 108

ABL WebApp project folder structure

The **New OpenEdge Project** wizard enables you to create ABL WebApp projects in Progress Developer Studio for OpenEdge. Each ABL WebApp project you create contains the following nodes:

.services	Contains the artifacts of the exposed ABL Data Object and ABL REST services. By default, the `.services` folder contains empty **Consume** and **Expose** nodes. On generation of a ABL Service, its artifacts are generated and listed under the Expose node. For more information, see ABL Service artifacts on page 201.
.settings	Contains the facets information that are installed for the project and the server related configuration.
PASOEContent	The `.json` file is created on defining a ABL Service in the **PASOEContent** folder. A separate `.json` file is created for each defined ABL Service with the same name as that of the ABL Service name..

Note: The `.json` file is created in the PASOEContent folder on defining an ABL Service. A separate `.json` file is created for each defined ABL Service with the same name as that of the ABL Service name.

Note: The `.services`, and `.settings` node do not appear by default under your project directory in the Project Explorer view. To view these nodes, open **Available Customizations** dialog (select **View Menu** > **Customize view** from the **Project View** toolbar), clear the `.*resources` check box, and then click **OK**. Progress recommends you to not edit the files listed under these hidden nodes.

See also

Create an ABL WebApp project on page 108
ABL WebApp project type on page 200
ABL Web Application WAR file structure on page 202
Create an ABL Service on page 211

ABL Service artifacts

The ABL Services you define using the **New ABL Service** wizard appears under the **Defined Services** node in your project.

The ABL artifacts are a combination of ABL REST artifacts followed by ABL Data Object. The ABL Service artifacts are generated under **.services** > **Expose** > **rest** > **service_name** in your project directory, wherein `service_name` is the name of the defined ABL Service. A separate ABL Service node is created for each ABL Service you define, and its artifacts are generated under that ABL Service node.

Note: The **.services** node does not appear by default under your project in the **Project Explorer** view. To view the **.services** node, open **Available Customizations** dialog (select **View Menu** > **Customize view** from the Project View toolbar), clear the **.*resources** check box, and then click **OK**.

On creation of a ABL Service, the following artifacts are generated:

resourceModel.xml	The file contains resource URI and mapping information of the verbs with operations (ABL interface annotated ABL routines). The `resourceModel.xml` file is listed under **.services** > **Expose** > **rest** > **<service_name>** in your project directory.

spring.xml	The file contains the AppServer end point details and `resourceModel.xml` entry. The `spring.xml` file is listed under **.services** > **Expose** > **rest** > **<service_name>** in your project directory.
<service_name>.json	The file contains information about the operations and schema for ABL resources. The `.json` file is a replica of the selected ABL resources (ABL class and procedure files with ABL interface annotations) that is represented in the JSON (Java Script Object Notation) format. The `.json` files are listed under the WebContent directory with `serviceName.json` in your project directory.

Note: Progress recommends you to not modify or delete a ABL Service artifact or any other file listed under the `.services` node.

See also

ABL WebApp project type on page 200
Create an ABL Service on page 211

ABL Web Application WAR file structure

The below table describes the directory structure of a ABL Web Application (`.WAR` file):

Folder/File	Description
/	The ABL Web Application (web application) root directory. This directory contains META-INF, static, WEB-INF, and `index.jsp`.
/META-INF	Contains only the `MANIFEST.MF` file.
/static	Contains the static HTML pages, images (gif, jpeg), style sheets (css), and any other static files you want to locate on the Web server. Also contains Data Service catalog (`.json`) file. **Note:** The Data Service catalog, `.json` file is copied from the PASOEContent node in your ABL Web Application project directory. This alsoso contains auth, error, and images folder.
/WEB-INF	Contains the configuration files for the ABL Web Application application. This directory contains adapters, classes, backup, jsp, metadata, openedge, spring, tlr `web.xml`, `oeablSecurity.xml`, `logging.xml` and `users.properties` file.
/index.jsp	This HTML page is an OpenEdge supplied template welcome page.
/static/auth	Contains HTML files for use in logging into and out of ABL Web Application. The files `login.html`, `logout.html`, `loginfail.html`, `login.jsp` and `logout.jsp` are OpenEdge supplied template pages that support the HTTP form-authentication model.

Folder/File	Description
/static/error	Contains OpenEdge supplied HTML template pages for customizing HTTP error returns. **Note:** This will override the Java containers default error pages and provide a consistent output for all Java containers.
/static/home.html	This HTML page is an OpenEdge supplied HTML template landing page for successful log in and log out operations.
/WEB-INF/adapters	Contains two folders, rest and soap. The rest foldercontains the adapter application runtime properties `runtime.props` file and **_oepingService** folder. The **_oepingService** folder contains the service `.paar` files.
/WEB-INF/classes	Contains the `manifest.txt` file used by the ABL Services.
/WEB-INF/oeablSecurity.xml	The `oeablSecurity.xml` files are OpenEdge supplied template security configurations for common authentication models.
/WEB-INF/users.properties	This file contains the user-level access information.
/WEB-INF/web.xml	This file is the ABL Web Application application descriptor that contains the OpenEdge supplied objects for managing security, dynamic content, static content, and AppServer data services.

See also

Export an ABL Web Application on page 214

Tasks

Work with ABL WebApp

Progress Developer Studio for OpenEdge allows you to create the ABL Services to build an ABL WebApp, using the one of the following ways.

Create a customized ABL WebApp following a series of steps and wizards.

- Define ABL WebApp resources on page 206
- Create an ABL Service on page 211

Create an ABL WebApp project

You can create an OpenEdge ABL WebApp project and customize the options for ABL services development.

To create an OpenEdge project specialized for Data Object Service development:

1. Select **File** > **New** > **OpenEdge Project** from the Progress Developer Studio for OpenEdge main menu bar or the Project Explorer view context (right-click) menu. The New OpenEdge Project wizard opens and displays the Create an OpenEdge Project page on page 71.
2. Type a name in the **Project name** field.

   The root folder for the new project is created in your current Developer Studio workspace, unless you specify a different location.
3. To choose a different location for the project, click and clear the **Use default** check box. Then either browse to, or enter the path to the desired location.
4. Select **Server** from the left section.
5. Select **REST** as the transport to create an OpenEdge project with a REST (Mapped RPC) service that can be deployed to PAS for OpenEdge.
6. Select the **Create a Data Object Service** check box.
7. Click **Next**. The **Provide ABL Web App deploy details** page appears.
8. Specify the Web Application deploy options and provide the Business Logic details (or leave the default settings). From the **Supported servers** list, select the servers that will be the destination for your published web objects. The primary function of these servers is to support publishing your code for running, testing, and deploying your REST service. For example, select **oepas1** from the list to publish your REST service. Then click **Next**. The **Create an ABL Service** page appears.
9. In the Service Type options, fill up the details (or leave with default settings). The default name of the REST service is the REST project name and Service appended to it. For example, `<projectname>Service`. You can specify a different name in the **Service name** field and a relative URI in the **Service relative URI** field. Filling up of **Service description** field is optional. Click **Next**. The **Select AVM and layout options** page appears.
10. Specify the OpenEdge AVM options and the project layout options (or leave the default settings) and click **Next**. The **Define PROPATH** page appears.
11. Leave the default settings or modify the PROPATH entries to be used by the project and click **Next**. The **Select database connections** page appears.
12. Select the database connections to be used by the project and click **Finish**.

You will see your project and its resources in the Project Explorer view.

See also

ABL WebApp project type on page 200
ABL WebApp project folder structure on page 201

Add WebSpeed functionality in ABL WebApp project

You can add WebSpeed functionality to an existing ABL WebApp project by updating the project facets.

To learn about how to develop an ABL WebApp project, refer to Create an ABL WebApp project on page 108.

To add the WebSpeed functionality, follow the steps.

1. **Right-click** on the project and click **Properties**. Alternatively, you can press **Alt+Enter**. The project properties window is displayed.
2. Select **Project Facets** from the left panel.
3. From the various facets, select **WebSpeed** checkbox.
4. Once you select the WebSpeed checkbox, an information is displayed in the Project Facets panel with **Further configuration available** link. Click **Further configuration available**.

5. The **Modify Faceted Project** window is shown. In the **Define WebSpeed dynamic content module** page, keep the default selections and click **Next**.
6. In the **Define static web content module** page, keep the default selections and click **Next**.
7. In the **Define PROPATH** page, keep the default selections and click **Next**.
8. In the **Select database connections** page, click **OK**. This will close the **Modify Faceted Project** window.
9. Click **Apply and Close** to close the project properties window.

You will see the project and its WebSpeed resources in the Project Explorer view.

To know how to deploy or publish the project, refer to Deploy ABL WebApp project with WebSpeed functionality on page 205.

See also

Create an ABL WebApp project on page 108
Deploy ABL WebApp project with WebSpeed functionality on page 205
ABL WebApp project type on page 200
ABL WebApp project folder structure on page 201

Deploy ABL WebApp project with WebSpeed functionality

To deploy or publish an ABL WebApp project with WebSpeed feature, follow the steps:

Note: The instance directory will be referenced using the environment variable `CATALINA_BASE` in the steps below.

---

1. Copy static files used by the WebSpeed application to `${CATALINA_BASE}/webapps/<webapp>/static/webspeed` (the default location), or another directory under `${CATALINA_BASE}/webapps/<webapp>`.
2. If you've made any modifications to `web/objects/web-util.p` to support your WebSpeed application, migrate them to the newer version of `web/objects/web-util.p` where significant changes have been implemented to support running in a multi-session agent (`_mproapsv`)
3. In `${CATALINA_BASE}/conf/openedge.properties`, locate the `[<CATALINA_BASE>.<webapp>.WEB]` node, where `<CATALINA_BASE>` is the instance name and `<webapp>` is the name of the named webapp or `ROOT` for the `ROOT webapp`.
   a) Modify the `wsRoot` property to specify the directory where the static files are located. Make sure the directory specification begins with `/` and is relative to `${CATALINA_BASE}/webapps/<webapp>` (`<webapp>` may be `ROOT`).
   b) Confirm that the `defaultHandler` property is set to `OpenEdge.Web.CompatibilityHandler`.
4. The url to run the WebSpeed application on PAS for OpenEdge will be in one of the following forms:
   - For the `ROOT webapp`:

     ```
     http://<host>[:port]/web/<path to r-code>
     ```

   - For a `named webapp`:

     ```
     http://<host>[:port/<webapp>/web/<path to r-code>
     ```

Note: The path to the `r-code` is relative to the PROPATH.

WebSpeed applications that use the following features cannot be migrated in this way:

- WebSpeed applications that use HTML mapping are not supported.
- WebSpeed applications with a modified `web-disp.p` and supporting files will need the custom Web Handler, `web-handler.p`, to implement the necessary customizations. This file can be found in `$DLC/src/web/objects/web-handler.p`.

See also

Create an ABL WebApp project on page 108
ABL WebApp project type on page 200
ABL WebApp project folder structure on page 201

Define ABL WebApp resources

Create a Business Entity class

A Business Entity class file with Data Service Catalog schema properties can be generated through Progress Developer Studio for OpenEdge by either creating an express Data Object project or by using the **New Business Entity** wizard.

This topic explains using the **New Business Entity** wizard to create a Business Entity class.

The Business Entity class files generated in Progress Developer Studio for OpenEdge inherit from the abstract class `OpenEdge.BusinessLogic.BusinessEntity`, which contains generic methods performing the **CRUD** and **Submit** operations.

Depending on how you create a Business Entity class, Developer Studio either generates default code or generates only stubs for the methods that implement operations for the Data Object resource. In any case, you may need to add or modify any default code to implement certain features. For information on how to add and modify code for a Business Entity class, see the sections on Data Object Services in *OpenEdge Development: Web Services* guide.

The **New Business Entity** wizard provides the following ways to create a Business Entity class:

- Create a Business Entity class from a database table on page 206
- Create a Business Entity class from the schema file on page 208

However, when generating the Data Service Catalog file, Progress Developer Studio for OpenEdge uses the Abstract Syntax Tree (AST) to read the DataSet and temp-tables in the Business Entity class file, regardless of how it was created (from a database table or using the schema from a source file).

See also

ABL WebApp project type on page 200
Create an ABL WebApp project on page 108
New Business Entity wizard on page 216

Create a Business Entity class from a database table

To create a Business Entity class from a selected database table:

1. Select an OpenEdge Data Object project and select **New Business Entity** from the context menu.

   The **Create a Business Entity class** page of **New Business Entity wizard** appears.

2. Specify values for the controls on the **Create a Business Entity class** page. See Create a Business entity class page on page 216 for detailed information about each control.

3. Click **Next**.

   The Select a schema file page appears.

4. The **Resource name** field displays the name specified in the **Business Entity name** field. You can enter a different name. This is an alias of Business Entity class name.

5. Select the operation as **Read-only**, **CRUD**, or **CRUD and Submit**. The ABL code is generated with the specified operations.

6. Select **Write dataset before image**, if you want the before-image data written to the file.

   Note: The **Write dataset before image** option is selected by default if the **CRUD and Submit** option is selected. The before-image data is required to perform the Submit operation.

7. Select the **Select database table** option button to select a database connection and table.

   a) In the **Connection** field, select the database connection that you want to use to dynamically define the temp-table.

   b) In the **Table** field, select the database table from selected database connection.

8. Select **Expose as Data Object Service** to expose the defined Business Entity class as a Data Object resource.

   Note: This generates default Data Object interface annotations to define a Business Entity as a Data Object resource.

9. Specify a **Uniform Resource Identifier (URI)** to access the Data Object resource in the **Resource URI** field. By default, the resource name is displayed in the field with a prefix "/". You can enter a different URI name.

10. Click **Finish**.

The wizard creates and opens the Business Entity class, which includes the temp-table definition with the Data Object interface (described in the Data Service Catalog) annotations defining the scheme attributes, in the ABL Editor.

Note: You can manually edit or add annotations to the Business Entity class. For more information about these annotations, see Data Service Catalog schema properties on page 228.

The wizard also generates a Data Object resource from the Business Entity class file. By default, the defined Business Entity class files are listed under the AppServer node in your project directory. .

Note: When you add a Business Entity class file to a non-Data Object project such as OpenEdge project except ABL Web App project, the Data Object facet gets enabled for the project. The project behaves as a Data Object project using which you can develop Data Object Services. The **Project Facets** page (select **Properties > Project Facets** on the project context menu) displays the facets associated with your current project. For more information, see Project Facets page on page 75.

See also

Create a Business Entity class on page 206
New Business Entity wizard on page 216

Create a Business Entity class from the schema file

To create a Business Entity class from the schema of a selected source file:

1. Select an OpenEdge Data Object project and select **New Business Entity** from the context menu.

   The **Create a Business Entity class** page of **New Business Entity wizard** appears.

2. Specify values for the controls on the **Create a Business Entity class** page. See Create a Business entity class page on page 216 for detailed information about each control.

3. Click **Next**.

   The Select a schema file page appears.

4. The **Resource name** field displays the name specified in the **Business Entity name** field. You can enter a different name. This is an alias of Business Entity class name.

5. Select the operation as **Read-only**, **CRUD**, or **CRUD and Submit**. The ABL code is generated with the specified operations.

6. Select **Write dataset before image**, if you want the before-image data written to the file.

   Note: The **Write dataset before image** option is selected by default if the **CRUD and Submit** option is selected. The before-image data is required to perform the **Submit** operation.

7. Select the **Select Schema from file** option.

8. In the **Schema file** field, specify a schema for the defined Business Entity class by clicking **Browse** and selecting a schema file. The schema can be either a temp-table or a dataset.

   Note: If you select a schema file from your current workspace, only the relative path of the project is displayed in the **Schema file** field. If the selected schema file is from outside your workspace, then the absolute path is displayed. If a schema file is not selected, the Business Entity class file is generated with a default dataset and a single temp-table.

9. The **Schema** field displays a list of all the temp-tables and datasets of the selected file; select the required temp-table or dataset.

10. Select one of the following options:

    - **Include file**: Select this option if the selected schema file is an include (`.i`) file. If the selected schema file is an include file, then it is included in the Business Entity class file.

      Note: If the Include file option is selected, the Business Entity class file is created by including the selected file. No annotations are generated for the temp-table defined in the selected file.

    - **Schema definition**: Select this option to copy the selected schema definition to a Business Entity class file. This option is enabled if the selected schema file is a procedure (`.p` or .w), a class (.cls), or an include (.i) file.

Note: If the **Schema definition** option is selected and the selected file is an include file, the wizard adds the temp-table schema definition from the selected file to the new Business Entity class file along with annotations if the include file does not already have any annotations. In this case, the annotations are generated based on the temp-table definition. If the include file already has annotations then no additional annotations are added.

- **Class hierarchy**: Select this option if you want to select the schema definition from class hierarchy.

11. Select **Expose as Data Object Service** to expose the defined Business Entity class as a Data Object resource.
12. Specify a Uniform Resource Identifier (URI) to access the Data Object resource in the **Resource URI** field. By default, the resource name is displayed in the field with a prefix "/". You can enter a different URI name.
13. Click **Finish**.

The wizard creates and opens the Business Entity class, which includes the temp-table definition with the Data Object interface (described in the Data Service Catalog) annotations defining the scheme attributes, in the ABL Editor.

Note: You can manually edit or add annotations to the Business Entity class. For more information about these annotations, see Data Service Catalog schema properties on page 228.

The wizard also generates a Data Object resource from the Business Entity class file. By default, the defined Business Entity class files are listed under the AppServer node in your project directory.

Note: When you add a Business Entity class file to a non-ABL WebApp project such as OpenEdge project, the ABL Data Object facet gets enabled for the project. The project behaves as an ABL WebApp project using which you can develop ABL Data Object applications. The **Project Facets** page (select **Properties** > **Project Facets** on the project context menu) displays the facets associated with your current project. For more information, see New Business Entity wizard on page 216.

See also

Create a Business Entity class on page 206
New Business Entity wizard on page 216

Use the Define Service Interface wizard

You can use the **Define Service Interface** wizard to add the ABL Data Object interface annotations to your existing ABL class and procedure files. Defining the service interface involves adding ABL Data Object interface annotations to the ABL class (`.cls`) and procedure (`.p`) files. You can then expose the ABL Data Object annotated ABL class and external procedure files as ABL Data Object resources.

Note: To create a ABL Data Object resource from an ABL external procedure, the ABL external procedure must be coded to be run as a singleton procedure. For more information, see the `SINGLETON` option of the `RUN` statement in *OpenEdge Development: ABL Reference* guide.

To add ABL Data Object interface annotations to an ABL class or procedure file:

1. From the **Project Explorer** view, select a ABL WebApp project.
2. Right-click the ABL WebApp project, and then select **Progress OpenEdge** > **Define Service Interface** on the context menu. The **Define Service Interface** wizard appears.

3. From the **Definition Mode** drop-down, select **Data Object**. By default, it is set to Data Object.
4. From the **Workspace resources** list, select the ABL class and procedure files to which you want to add ABL Data Object interface annotations. This defines the ABL Data Object interface annotations at the procedure or class file level.

   Note: If the selected ABL application contains ABL routines (internal procedures, methods, and user-defined functions), they appear on the **ABL routines** list.

5. From the **ABL routines** list, select the ABL routines to which you want to add the ABL Data Object annotations. This defines the ABL Data Object interface annotations at the routine level.
6. Click **Next**. The **Edit Annotation** page appears.

   The **Edit Annotation** page displays the selected resources in the **Select a file** list and allows you to select a schema file for a resource and associate a ABL Data Object operation: **CRUD** (**Create**, **Read**, **Update**, and **Delete**), **Submit**, and **Invoke**.

7. From the **Select a file** list, select an ABL resource for which you want to define a schema file and associate ABL Data Object operations: **CRUD**, **Submit**, or **Invoke** with ABL routines.
8. On the **Main Annotations** tab, specify the resource URI and schema for the selected resource. For more information, see the Edit Annotation page on page 222 tab.

   Note: Select the **Enable Main Annotation** check box to enable editing.

9. On the **CRUD** annotations tab, associate ABL routines with **CRUD** operations (**Create**, **Read**, **Update**, and **Delete**) or the **Submit** operation. You can use only one-to-one association. For more information, see the Edit Annotation page on page 222 tab.

   For example, if there is an ABL routine defined as P1 and you want to associate it with the create operation, then select P1 in the **Routine name** drop-down for the create operation. You cannot associate the ABL routine P1 with any other **CRUD** operation once it is associated with one operation.

   To associate an ABL routine with the **Submit** operation, you must select the **Before-Image** option. The **Submit** operation is only applicable to the datasets (not temp-tables) that you select on the **Main Annotations** tab. For more information, see the Edit Annotation page on page 222 tab.

   Note: Before you associate any operation with an ABL routine, you must select a schema file for the current ABL application on the **Main annotations** tab.

10. On the **Invoke Annotations** tab, associate one or more ABL routines with an invoke operation. You can map as many ABL routines in an ABL file as you have available to an invoke operation. For more information, see the Edit Annotation page on page 222 tab.

    Note: You cannot associate an ABL routine that is already associated with one of the **CRUD** operations, with the invoke operation.

11. On the **Field Annotations** tab, specify the fields and appropriate field-level annotations for the selected resource. For more information, see the Edit Annotation page on page 222 tab.
12. Click **Finish** to save your settings and close the **Define Service Interface** wizard.

The selected ABL class and procedure files are annotated with ABL Data Object interface annotations, and this completes the generation of a ABL Data Object resource for each file.

Note: When you add ABL Data Object interface annotations for ABL resources from a non-ABL WebApp project such as ABL AppServer facets, like ABL REST Service, the ABL Data Object Service facet is enabled for the project and an ABL Data Object Service gets created. The project behaves as an ABL WebApp project using which you can develop ABL Data Object applications. When you add annotations to any class or procedure file, if the ABL AppServer facet is not available for the project then the project is converted to an ABL Web App project with additional ABL REST Service and ABL Data Object Service facets and a REST based ABL Data Object service is created. The Project Facets page (select **Properties** > **Project Facets** on the project context menu) displays the facets associated with your current project.

Create an ABL Service

The **New ABL Service** wizard allows you to define a ABL Service for a set of existing ABL resources. ABL resources are ABL class and procedure files with ABL interface annotations.

Note: A default ABL Service with the project name and Service appended to it is created when you define an ABL WebApp project. For example, `<projectname>Service`. You can see the defined ABL Service under the **Defined Services** node in your project. For more information, see Create an ABL WebApp project on page 108 wizard.

To define a ABL Service:

1. From the **Project Explorer** view, select an OpenEdge project for which you want to create the ABL Service.
2. Right-click the ABL WebApp project, and then select **New** > **ABL Service** on the context menu. The **New ABL Service** wizard appears.

   Note: If you do not see **ABL Service** on the context menu, then select **Other**. On the **Select a wizard** dialog, select **Progress OpenEdge** > **Service** > **ABL Service**, and then click **Next**.

3. In the **Project** field, browse to select a project for which you want to generate the ABL Service. By default, the field displays the project you have selected in Step 1 on page 211.
4. Select the **Create a Data Object Service** checkbox in the Service type section.
5. In the **Data Object service details** section, provide the **Service name** for the ABL Service and the **Service relative URI** field gets populated with the Service name automatically. This is relative URI for all the resources defined in the ABL Service. The relative path must start with `"/"`. For example, `/service_relative_URI`.

   Note: You cannot have a duplicate ABL Service name under the same OpenEdge project.

6. In the **Service description** field, enter a description for the ABL Service. This is an optional field.
7. Click **Next**. The **Create a Data Object service** wizard appears wherein you can create the Data Object resources. Data Object resources are ABL class and procedure files with Data Object interface annotations.
8. From the **Resources** list, select the Data Object resources. This list displays the Data Object resources of your current project.

   Note: Data Object resources with invalid names and names which include numeric characters, and those which include preprocessors are not supported by Data Object. If any such Data Object resource is selected, the Data Object Service will fail and display an error message.

9. Click **Select All** to add all the available Data Object resources.

Note: Click **Deselect All** to clear the selection of the Data Object resources.

10. Click **Finish**.

This creates the ABL Service under the **Defined Services** node in the selected ABL WebApp project.

Note: When you define an ABL Service for a non-ABL WebApp project such as OpenEdge project, the ABL Data Object Service facet gets enabled for the project. The project behaves as an ABL WebApp project enabling you to develop ABL Web Applications. The Project Facets page on page 75 displays the facets associated with your current project.

See also

Project Facets page on page 75
ABL Service artifacts on page 201
Create an ABL WebApp project on page 108
Create a Business Entity class on page 206
New ABL Service wizard on page 225

Edit an ABL Service

The Edit ABL Service page allows you to edit an ABL service of WebHandler type, REST type (with or without Data Object), WebApp type (with or without Data Object) as required.

To edit an ABL service:

1. From the Project Explorer view, expand the Defined Services node under your ABL Web App project.
2. Right-click an ABL Service, and then select **Edit** on the context menu. The Edit ABL Service wizard appears. You can also double-click to open the wizard.

   Note: You cannot modify the Project, Transport and Service name fields. They are disabled.

3. Do one of the following:
   a) To edit an ABL service of Data Object type with a REST service provider, enter a Service relative URI and Service description as required. In the Service relative URI field, specify a resource Uniform Resource Identifier (URI). This is relative URI for all the resources defined in the ABL Service. The relative path must start with `/`. For example, `/sampleURI`.

      Note: You cannot modify the Service type, Service name, or WebHandler fields. You can edit or remove a resource URI using Edit and Remove. Use the Up and Down keys to sort the resource URIs.

   b) Click **Next** and select the resources.
4. Click **Next**. The second page of Edit ABL Service wizard appears where you can select the Data Object resources (ABL Service annotated ABL procedure and class files) for the defined service.
5. From the Resources list, modify your previous selection by adding or removing the resoures.
6. Click **Select All** to add all the available resources.

Note: Click **Deselect All** to clear the selection of the resources.

7. Click **Finish**.

See also

Define a ABL Service on page 211
Delete an ABL Service on page 213
New ABL Service wizard on page 225

Delete an ABL Services

You can use the **Delete** option to remove defined ABL Services from your project.

To delete Data Object Services:

1. From the **Project Explorer** view, expand the **Defined Services** node under your ABL WebApp project.
2. Right-click the ABL Services that you want to remove, and then select **Delete** from the context menu.
   Alternatively, you can select the ABL Service(s) you want to remove and press **Delete** on the keyboard.
3. Click **Yes** to confirm the deletion when prompted.

The selected ABL Services and their artifacts are deleted. The selected project is automatically refreshed.

See also

Define an ABL Service on page 211

Deploy ABL Services

Start and stopping PAS for OpenEdge server

The **Servers** view provides options to start and stop PAS for OpenEdge container shipped with OpenEdge.

To start PAS for OpenEdge:

1. Open the **Servers** view by selecting **Window** > **Show View** > **Other** > **Server** > **Servers**.
2. Right-click on an PAS for OpenEdge instance that you want to start.
3. Select **Start** on the context menu.

See also

Publish ABL Services on page 213

Publish ABL services

You can publish an ABL Service(s) using the Servers view in your OpenEdge Server perspective. To publish an ABL Service, you must create a server instance, associate the ABL Service with the defined server, and then publish the associated ABL Service to the PAS for OpenEdge container shipped with Progress OpenEdge.

When you install Progress Developer Studio for OpenEdge, PAS for OpenEdge server is installed and configured with Progress OpenEdge. Before you publish to the PAS for OpenEdge server, you must start it. For more information, see Start and stopping PAS for OpenEdge server on page 213.

Note: The ABL Service are published as separate `.WAR` files when you deploy them using the **Publish** option from the **Servers** view. If you want to deploy the ABL Services as a single WAR file, you must export them as a `.WAR` file. For more information, see the Export an ABL Web Application on page 214.

To publish a ABL Service:

1. From the **Servers** view, select the relevant server instance of the ABL Service that you want to publish.
2. Do one of the following:
   - Select **Publish** on the server instance's context menu.
   - Select a server instance, and then click the **Publish to the server** icon on the **Servers** view toolbar.

This publishes the selected ABL Services to the PAS for OpenEdge container. For a published ABL Service, a separate WAR file is generated and deployed to the PAS for OpenEdge container. For example, an ABL Service published to the PAS for OpenEdge instance, that is shipped with OpenEdge, a WAR file with the selected ABL Service name is created in your OpenEdge installation directory, `$WRK/<pas_instance>/webapps`. A separate WAR file is created for each deployed ABL Service.

You can view the server's status in the Servers view beside the published ABL Service's node.

After deploying the ABL Service, if you modify the artifacts of a project related to the deployed service, the status of the respective artifact's module changes to Republish. You must republish the server manually if you have not set it to republish automatically so that the deployed service reflects the changes.

See also

Start and stop PAS for OpenEdge server on page 213
Export an ABL Web Application on page 214
ABL Web Application WAR file structure on page 202

Export an ABL Web Application

The **ABL Web Application** wizard enables you to package the ABL Services as an ABL Web Application (`.WAR` file) as follows:

- ABL Service(s) into a single WAR file

  Note: You can select more than one ABL Service to package into a single ABL Web Application `.WAR` file.

- Each ABL Service as as a `.PAAR` file

The `.WAR` file that is created is used to deploy the package ABL Application to the PAS for OpenEdge server or on any Java container that is associated with the server.

To export as a `.WAR` file or incremental service:

1. In the **Project Explorer** view, select the ABL Web Application project that contains the ABL Services that you want to export as a ABL Web Application.
2. Right-click the project and select **Export** from the context menu.

   The **Export ABL Application** dialog appears.

   Note: If you do not see the ABL Web Application option on the context menu, then select **Export**. On the **Export** wizard, select **Progress OpenEdge** > **ABL Web Application**, and then click **Next**.

3. The **ABL project** drop-down list displays the project you have selected in step 1. You can select a different project from the drop-down list.

   Note: The ABL Web Application project drop-down displays only the projects in your current workspace.

4. In the **Destination** drop-down list, specify a location or click **Browse** to select a different location for the ABL Web Application.

   Note: The **Destination** drop-down displays a list of previous `.WAR` file generation locations of your current workspace.

5. Select one of the following options:

   - **Export as a WAR file** to export services by creating a single `.WAR` file for all the selected ABL Services in the project.
   - **Export services incrementally** to export services by creating a `.PAAR` file for each ABL Service in the project.

     Note: A dummy `.PAAR` file is created for each ABL Service.

6. From the **ABL Services** list, select one or more ABL Services that you want to export by cliking on the checkbox.

   Note: The **ABL Services** section lists the ABL services defined in the project you have selected in the **ABL WebApp project** drop-down list.

7. Click **Finish**.

The ABL Web Application (`.WAR` file) or the `.PAAR` file is created in the location specified in the **Destination** field. By default, the `.WAR` file is created with the project name you select in the **ABL WebApp project** drop-down list and the `.PAAR` file is created with the name of the service appended to the project name.

See also

ABL Web Application WAR file structure on page 202
Publish ABL services on page 213

Reference

New Business Entity wizard

The **New Business Entity** wizard allows you to create an ABL class (`.cls`) which automatically includes the Data Object interface annotations. You can then expose the Data Object interface annotated Business entity class as a Data Object resource.

Alternatively, you can create an ABL class file using the **New ABL Class** wizard, and use the **Define Service Interface** wizard to add Data Object interface annotations to expose the defined class file as a Data Object resource.

You can access the **New Business Entity** wizard by selecting **File** > **New Business Entity** in the OpenEdge Server perspective.

Note: If you do not see **Business Entity** on **File > New**, then select **File > New > Others**. On the wizard selection page, select > **Progress OpenEdge** > **Business Components** > **Business Entity**, to open the **New Business Entity** wizard.

The **New Business Entity** wizard includes the two pages, described in the following topics.

Create a Business entity class page

The **Create a Business entity class** page of the **New Business Entity** wizard allows you to define a Business entity class with pre-defined Data Object interface annotations added to it.

This page includes the following options:

Option	Description
Package root	Specifies a currently open project in which you want to the Business entity class code and other project code. Click **Browse** if you want to select a project other than the current one (the default project).
Package	(Optional) Specifies a package name, corresponding to a sub-folder of the package root, to contain the Business entity class file. Click **Browse** or type the folder path. A period (.) must separate each subfolder from its parent folder in the path name.
Business entity name	(Required) Specifies the name of the Business entity class. The name must begin with a letter; spaces and most non-alphanumeric characters are not allowed. The `.cls` extension will be appended automatically. **Note:** You cannot specify duplicate class names under the same project root.

Option	Description
Final Modifier	Select this check box to specify that inheritance from this Business entity class is disallowed. A FINAL keyword is included in the generated ABL code. **Note:** A final class cannot be abstract.
Abstract Modifier	Specifies that the Business entity class is abstract and cannot be instantiated. An abstract class is designed to serve as a super class from which other classes inherit and implement members. Therefore, an abstract class cannot be final. **Note:** If you select the **Abstract** check box, the **Expose as Data Object Service** check box on the next page of the wizard will be disabled.
Widget Pool Modifier	If selected, specifies that a USE-WIDGET-POOL keyword is included in the generated ABL code.
Serializable Modifier	If selected, marks the class as serializable by including the SERIALIZABLE modifier in the generated ABL code. **Note:** If the class inherits from a super class that is not serializable, then it cannot be marked as serializable.
Inherits	Displays another Business entity class in the current project as a super class from which the new class inherits state and behavior. Click **Browse** to select a different class path or enter the super class's name. A period (.) must separate each node from its parent folder in the path name. **Note:** The super class cannot be generic.
Implements	(Optional) Specifies one or more interfaces in the current project that the class implements. Click **Add** and select the desired interfaces at the **Interface Selection** dialog. Use **Remove** to remove an interface from those added to the list. **Note:** The class cannot implement a generic interface.
Default constructor	Specifies that the Business entity class is to include a default constructor method.
Destructor	Specifies that the Business entity class is to include a destructor method.

Option	Description
Super class constructors	Select this check box to specify that the Business entity class is to include all constructor methods declared in the parent class.
Error-handling statement	Adds one of the following error-handling statements to the generated ABL code: • **Block level**: Includes the BLOCK-LEVEL ON ERROR UNDO, THROW statement in the generated ABL code • **Routine level**: Includes the ROUTINE-LEVEL ON ERROR UNDO, THROW statement in the generated ABL code
Throw a Not Implemented exception	If selected, specifies that "METHOD NOT IMPLEMENTED" error code is added to stubs for members implemented via interface and stubs for inherited abstract members.
Return a default value	If selected, specifies that default return values are added to stubs for members implemented via interface and stubs for inherited abstract members.
Description	(Optional) Specifies a description for the Business entity class. This text will appear in the file header.
Purpose	(Optional) Specifies an explanation of the purpose of the Business entity class. This text will appear in the file header.
Next	Takes you to the next page of **New Business Entity** wizard.

See also

Select a schema file page on page 218

Select a schema file page

The **Select a schema file** page of the **New Business Entity** wizard allows you to define schema and Data Object operations that you want to generate for a Business entity class file. You can expose the Data Object interface annotated Business entity class file as a Data Object resource.

This page includes the following controls:

Control	Description
Resource Name	Displays the Business entity name specified in the **Business entity name** field. You can enter a different name. This is an alias of the Business entity class name.

Control	Description
Read-Only operations	Specifies the access method as a read-only operation. The ABL code (including the Data Object interface annotations) is generated with `Read` method. **Note:** When you select dataset with multiple relations, `Invoke` methods are also generated for each temp-table.
CRUD operations	Specifies the access method for the operation as create, read, update, or delete. The ABL code (including the Data Object interface annotations) is generated with predefined **CRUD** (create, read, update, and delete) operations.
CRUD and Submit operations	Specifies the access method for the operation as **Create**, **Read**, **Update**, **Delete**, or **Submit**.
Write dataset before image	Writes the before-image data to the new Business entity class file. **Note:** The **Write dataset before image** option is selected by default if the **CRUD and Submit** option is selected. The before-image data is required to perform the submit operation.
Select database table	Creates a Business entity class from the selected database table.
Connection	(Required if **Select database table** is selected) Specifies the database connection that you want to use to dynamically define the temp table.
Table	(Required if **Select database table** is selected) Specify the database table from selected database connection.
Select schema from file	Creates a Business entity class from the selected schema file.

Control	Description
Schema file	(Required if **Select schema from file** is selected) Specifies a schema for the defined Business entity class. The schema can be either a temp-table or dataset. Click **Browse** to select a schema file. The schema paths are displayed depending on the location of the file. They are as follows: • If you select a schema file from your current workspace, the path relative to the workspace root is displayed in the **Schema file** field. • If you select a schema file from a directory in your PROPATH, the path relative to the directory is displayed in the **Schema file** field. • If the selected schema file is neither in your workspace, nor in the PROPATH, the absolute path is displayed. **Note:** If a schema file is not selected, the Business entity class file is generated with a default dataset and a single temp-table.
Schema	(Required if **Select schema from file** is selected) Displays a list of all the temp-tables and datasets of the selected file.
Include file	Is enabled if the selected schema file is an include (`.i`) file. **Note:** If the selected schema file is an include file, then it is included in the Business entity class file.
Schema definition	Copies the selected schema definition to a Business entity class file. This is the default option. **Note:** This option is enabled if the selected schema file is a procedure (`.p` or `.w`), a class (`.cls`), or an include (`.i`) file.
Class Hierarchy	Enables you to select the schema definition from class hierarchy.

Control	Description
Expose as Data Object Service	Adds Data Object interface annotations to the defined Business entity class file and exposes it as a Data Object resource. **Note:** If the **Expose as Data Object Service** check box is clear, the Business entity class is generated without the Data Object interface annotations. The defined Business entity class file cannot be exposed as a Data Object resource. Alternatively, you can use the **Define Service Interface** wizard to add Data Object interface annotations to a Business entity class file.
Finish	Completes the wizard and opens the defined Business entity class including the Data Object interface annotations in the ABL Editor. This also completes the generation of Data Object resource from the Business entity class file.

See also

New Business Entity Class wizard on page 216
Use the Define Service Interface wizard on page 209

Define Service Interface wizard

Define Service Interface page

The **Define Service Interface** page allows you to add the Data Object interface annotations to your existing ABL class and procedure files.

Access this wizard by selecting **Progress OpenEdge > Define Service Interface** on the project context menu.

This page includes the following options:

Option	Description
Definition mode	Specify the interface definition type as Data Object from the drop-down.
Workspace resources	Displays a list of ABL class and procedure files of your current workspace.
ABL routines	Displays a list of defined internal procedures, methods, and user-defined functions (UDFs).
Backup selected resources	Select this check box to back up the selected resources before adding the Data Object interface annotations.

Option	Description
Location	Specify a location where you want to save the back-up resources. Click **Browse** to specify a back-up location.
Next	Takes you to the **Edit Annotations** page of the **Define Service Interface** wizard. **Note:** You must select at least one ABL routine to have the **Next** button enabled.

See also

Define Data Object Service annotations on page 209
Edit Annotations page on page 222

Edit Annotation page

The **Edit Annotations** page of the **Define Service Interface** wizard allows you to select a schema file for the selected ABL class or procedure file, and associate a Data Object operation with an ABL routine.

This page includes the following options:

Option	Description
Select a file	Displays a list of ABL classes and procedures selected in the **Workspace resources** list on the first page of the **Define Service Interface** wizard.
Main annotation	
Enable Main Annotation	Select to enable editing the Main Annotations page.
Execution mode	Specify singleton as the execution mode from the drop-down. This is the only default execution mode for both the procedure and class files.
Return value	Select this check box if the selected procedure returns a string value. A `useReturnValue` parameter is added with the Data Object interface annotations to the procedure file. By default, this option is not selected. **Note:** The **Return value** check box is disabled for a class file.
Before-image	Sets the `writeDatasetbeforeImage` parameter value to **TRUE** for the selected ABL routine. By default, this option is disabled for the Data Object resource.
Resource name	Displays the name of the resource selected in the **Select a file** list. You can specify a different name for the resource.

Option	Description
Resource URI	Specify a **Uniform Resource Identifier (URI)** to access a resource. By default, the resource name is displayed in the field with a prefix "/". You can enter a different URI name.
Schema file	Specify a schema for the selected resource. The schema can either be a temp-table or dataset. Click **Browse** to select a schema file. **Note:** You can select the schema file either from the workspace or file system. If the selected schema file is from your current workspace, only the relative path of the project is displayed in the **Schema file** field. If the selected schema file is from outside your workspace, then the absolute path is displayed.
Schema	Displays a list of the temp-tables and datasets of the schema selected in the **Schema file** field.
Schema name	Displays the schema definition selected from the **Schema** list.
Main annotation for the above selected file	Displays the file-level Data Object interface annotations defined for the selected ABL class or procedure file.
CRUD annotations	
Operation	Displays the **CRUD** (**Create**, **Read**, **Update**, and **Delete**) and **Submit** operations that you can associate with ABL routines. You can have only one-to-one association. For example, if there is an ABL routine defined as P1 and which you want to associate with a create operation, then select P1 in the **Routine name** drop-down for the create operation. You cannot associate the ABL routine P1 with any other **CRUD** operation when it is associated with one operation. To associate an ABL routine with the **Submit** operation, you must select the **Before-Image** option. **Note:** The **Submit** operation is only applicable to the datasets (not temp-tables) that you select in the **Main Annotation** tab.
Routine name	Displays a list of ABL routines of the selected ABL procedure or class file. **Note:** This list displays only the ABL routines selected in the **ABL routines** list on the first page of the **Define Service Interface** wizard.
Alias	(Optional) Specify an alias for an operation.

Option	Description
Return value	(Optional) Select this check box if the ABL routine selected in the **Routine name** field returns a string value. By default, this option is not selected. **Note:** The **Return value** check box is enabled only for internal procedures. This is disabled for both the user-defined functions (UDFs) and methods.
Before-Image	Sets the `writeDatasetbeforeImage` parameter value to TRUE for the selected ABL routine. **Note:** This option only applies to datasets and not to temp-tables.
Data Object detail annotation	Displays the ABL routine-level Data Object interface annotations.
Invoke annotations	
Operation	Displays invoke or count operation that you can associate with an ABL routine. **Note:** You cannot associate an ABL routine with an invoke or count operation, which is already associated with one of the **CRUD** operations. You can not associate more than one count operation for the selected resource.
Routine name	Displays a list of ABL routines of the selected ABL procedure or class file. **Note:** This list displays the ABL routines selected in the **ABL routines** list on the first page of the **Define Service Interface** wizard.
Alias	(Optional) Specify an alias for an operation.
Return value	(Optional) Select this check box if the ABL routine selected in the **Routine name** field returns a string value. By default, this option is not selected. **Note:** The **Return value** check box is enabled only for internal procedures. This is disabled for both the UDFs and methods.
Before-Image	Sets the `writeDatasetbeforeImage` parameter value to TRUE for the selected ABL routine.
Data Object detail annotation	Displays the routine-level Data Object interface annotations.
Field annotations	

Option	Description
TempTable	Displays the **TempTables** available for the class file. Select the required TempTable.
Field	Select the field that you want to add annotations for.
Annotation type	Select the type of annotation that you want to add. The valid values are Semantic type and Foreign Key. **Note:** If you want to add multiple fields to the same Foreign key, edit the annotations in the business entity file manually.
Foreign Key Name	If you selected Foreign key, provide a name for the Foreign key field.
Parent Schema File	If you selected Foreign key, browse to the file that has the schema defined. **Note:** Ensure that the selected file has file-level REST or DataObject annotations and Temp-table schema.
Parent Table	If you selected Foreign key, select the table that displays the TempTables defined in the selected schema file.
Parent field	If you selected Foreign key, select a field from the parent table that can be referred to as a parent for the selected field.
Finish	The Data Object interface annotations are added to the selected ABL applications and closes the **Define Service Interface** wizard.

Note: When you add ABL Data Object interface annotations for ABL resources from a non-ABL WebApp project such as ABL AppServer facets, like ABL REST Service, the ABL Data Object Service facet is enabled for the project and an ABL Data Object Service gets created. The project behaves as an ABL WebApp project using which you can develop ABL Data Object applications. When you add annotations to any class or procedure file, if the ABL AppServer facet is not available for the project then the project is converted to an ABL Web App project with additional ABL REST Service and ABL Data Object Service facets and a REST based ABL Data Object service is created. The Project Facets page (select **Properties** > **Project Facets** on the project context menu) displays the facets associated with your current project.

New ABL Service wizard

The **New ABL Service** wizard allows you to create a ABL Service for a set of existing ABL resources.

Access this wizard by choosing **New > ABL Service** on the ABL WebApp project context menu.

The **New ABL Service** wizard includes the following options:

Option	Description
Service name	Specify a name for the ABL Service. This is a mandatory field.

Option	Description
Service description	Specify a description for the ABL Service. This is an optional field.
Service relative URI	Specify a Uniform Resource Identifier (URI) for a ABL Service. For example, `/relative URI`. **Note:** The relative URI must start with `"/sampleURI"`.
Project	Select a project wherein you want to generate all the ABL Service related files (artifacts). **Note:** By default, the project name you select when creating the ABL Service is displayed in the **Project** field.
Supported Servers	Select the Supported Server instances with which you want to associate a defined ABL Service. **Note:** The list displays the Supported Server instances registered with OpenEdge Management.
Resources	Displays a list of ABL resources. These are ABL interface annotated ABL class and procedure files.
Select All	Selects all the ABL resources available on the **ABL routines** list.
Deselect All	Clears the selection of all ABL resources on the **ABL routines** list.

Note: When you create an ABL Service for a non-ABL WebApp project such as OpenEdge project, the ABL Data Object Services facet gets enabled for the project. The project behaves as a ABL WebApp project enabling you to develop ABL Web Applications. The Project Facets page on page 75 (select **Properties** > **Project Facets** on the project context menu) displays the facets associated with your current project. For more information, see Project Facets page on page 75.

See also

Create an ABL Service on page 211

ABL Service context menu

Right-clicking on a **ABL Service** displays the **ABL Service** context menu.

Note: The defined ABL Services are available under the **Defined Services** node in the ABL WebApp project.

The **ABL Service** context menu has the following options:

Option	Description
Edit	Opens the Edit an ABL Service on page 212 dialog which allows you edit a defined **ABL Service**.
Delete	Removes the selected defined **ABL Services** (along with their ABL artifacts) from the project.
Export	Packages an ABL service(s) as separate ABL Web Applications or into a single ABL Web Application (`.WAR` file) or to export services incrementally by creating one `.PAAR` file for each **ABL Service** in the project.

See also

Define an ABL Service on page 211
Edit an ABL Service on page 212
Delete an ABL Service on page 213

Export ABL Web Application wizard

The **Export ABL Web Application** wizard enables you to package a **ABL Service(s)** as separate ABL Web Applications into a single ABL Web application (`.WAR` file) or to export services incrementally by creating one `.PAAR` file for each ABL Service in the project.

Access this dialog box by selecting **Export** > **ABL Web Application** on the ABL WebApp project context menu.

The dialog box includes the following options:

Option	Description
ABL WebApp project	Specifies an ABL WebApp project that contains the ABL Services that you want to export as a ABL Web Application.
Destination	Allows you to select a location from the drop-down list. Click **Browse** to select a different location for the file. **Note:** The **Destination** drop-down menu displays a list of previous `.WAR` or `.PAAR` file generation locations of your current workspace.
Export as a WAR file	Select to export services by creating a single `.WAR` file for all the selected ABL Services in the project.
Export services incrementally	Select to export each service separately by creating a `.PAAR` file for each selected ABL Service in the project.
ABL services	Allows you to select ABL services from the list. **Note:** The **ABL services** section lists the ABL services defined in the project selected in the ABL WebApp Project drop-down.

See also

Export an ABL Web Application on page 214

Add and Remove dialog

The **Add and Remove** dialog enables you to associate or disassociate ABL Services with a PAS for OpenEdge instance.

Access this dialog by selecting a PAS for OpenEdge instance in the Servers view, and then choose Add and Remove on the context menu.

Note: You can also access the Add and Remove page from the **New Server** wizard. For more information, see the Create a PAS for OpenEdge instance on page 155.

This page includes the following options:

Option	Description
Available	Displays a list of available ABL Services that you can associate with an PAS for OpenEdge instance.
Configured	Displays a list of ABL Services associated with an PAS for OpenEdge instance.
Add	Moves a selected ABL Service to the **Configured** list.
Add All	Moves all available ABL Services to the **Configured** list.
Remove	Moves a selected ABL Service to the **Available** list.
Remove All	Moves all the associated ABL Services to the **Available** list.
Finish	Finish adding and removing ABL Services.

See also

Create a PAS for OpenEdge instance on page 155
PAS for OpenEdge server Editor on page 162

Data Service Catalog schema properties

The JSDO provides a set of built-in methods that correspond to the Business Entity **CRUD** and Submit operations. For these operations to work successfully together, the data (and its schema) are shared between the operations. The Data Service Catalog file includes an entry for each built-in method and each invocation (or Invoke) method for the ABL resource. It also includes the schema for the resource. The JSDO uses the schema information for its built-in **CRUD** and **Submit** methods. For each method, the catalog provides parameter mapping information. This information (metadata) from the catalog is used to construct the HTTP request for the operation calls made to the REST adapter.

OpenEdge provides the following Data Service Catalog schema properties:

- foreignkey property on page 229
- method property on page 230
- primarykey property on page 230
- readOnly (can only be added using the Field property on page 232)
- recordName (can only be added using the Entity property on page 231)
- required property on page 231

The entity level properties can be added using the **Entity** property annotation. See Entity property on page 231 for more information.

The field level properties can be added using the **Field** property annotation. See Field property on page 232 for more information.

The following table provides a summary of the Data Service Catalog schema properties.

Property	Parent node	Type	Default value
foreignkey	Entity	Object	undefined
method	Operation	String	undefined
primarykey	Entity	Array of strings	undefined
readOnly	Field of Entity	Boolean	false
recordName	Entity	String	undefined
required	Field of Entity	Boolean	false

foreignkey property

The `foreignkey` property, `@openapi.openedge.entity.foreignkey`, is added at the entity level in the schema to specify the foreign key of an entity. It specifies the relationships of an entity to other entities, which may not be defined in the same resource (for a DataSet) or in the same catalog.

Progress Developer Studio for OpenEdge generates annotations to specify the foreign keys if it can find fields that correspond to the indexes in a unique index on another table.

When you generate a Business Entity class file from an express Data Object project or from a database table (that has a foreign key constraint on it) in the **New Business Entity** wizard, Progress Developer Studio for OpenEdge reads the respective information from the database and adds the `foreignkey` annotation above the temp-table definition.

Sample `foreignkey` annotation for a table that has a foreign key constraint on it:

```
@openapi.openedge.entity.foreignkey (fields="ORDERNUM,Linenum",
parent="ORDER", parentFields="ORDERNUM,Linenum").

DEFINE TEMP-TABLE ttOrderLine BEFORE-TABLE bttOrderLine
FIELD Discount AS INTEGER INITIAL "0" LABEL "Discount"
FIELD ExtendedPrice AS DECIMAL INITIAL "0" LABEL "Extended Price"
FIELD Itemnum AS INTEGER INITIAL "0" LABEL "Item Num"
FIELD Linenum AS INTEGER INITIAL "0" LABEL "Line Num"
FIELD OrderLineStatus AS CHARACTER INITIAL "Ordered" LABEL "Order Line Status"
FIELD Ordernum AS INTEGER INITIAL "0" LABEL "Order Num"
FIELD Price AS DECIMAL INITIAL "0" LABEL "Price"
FIELD Qty AS INTEGER INITIAL "0" LABEL "Qty"
INDEX itemnum  Itemnum  DESCENDING
INDEX orderline IS  PRIMARY  UNIQUE  Ordernum  DESCENDING  Linenum  DESCENDING
INDEX OrderLineStatus  OrderLineStatus  DESCENDING
INDEX SYS_001_000000004  Ordernum  DESCENDING .

DEFINE DATASET dsOrderLine FOR ttOrderLine.
```

You can manually change the value of the `foreignkey` annotation in the Business Entity class file.

See also

Data Service Catalog schema properties on page 228

method property

The method property, `@openapi.openedge.method.property`, is added at the operation level in the schema to specify additional properties for CRUD and submit methods.

Note: The method property annotation must be added manually to the Business Entity class file.

Sample method property annotation:

```
@openapi.openedge.method.property (name="capabilities",
value="top, skip, id, orderBy").
```

See also

Data Service Catalog schema properties on page 228

primarykey property

The `primarykey` property, `@openapi.openedge.entity.primarykey`, is added at the entity level in the schema to specify the primary key of an entity.

Progress Developer Studio for OpenEdge generates an annotation for the primary key if the primary index is unique.

When you generate a Business Entity class file from an express Data Object project or from a database table in the **New Business Entity** wizard, Progress Developer Studio for OpenEdge reads the database for information about the primary keys defined on the table and accordingly adds the `primarykey` annotation above the temp-table definition.

Sample `primarykey` annotation:

```
@openapi.openedge.entity.primarykey (fields="EmpNum").


DEFINE TEMP-TABLE ttBenefits BEFORE-TABLE bttBenefits
FIELD EmpNum AS INTEGER INITIAL "0" LABEL "Emp No"
INDEX EmpNo IS PRIMARY UNIQUE EmpNum DESCENDING.
```

You can manually change the value of the `primarykey` annotation in the Business Entity class file.

See also

Data Service Catalog schema properties on page 228

required property

The `required` property, `@openapi.openedge.entity.required`, specifies the mandatory fields of an entity. It indicates whether a field can have a null value (unknown value in ABL or undefined in JSON).

In ABL, there is no temp-table support to specify whether or not a field is mandatory. So, the annotations for required fields are obtained from the database table definition when you generate a Business Entity class file from an express Data Object project or from a database table in the **New Business Entity** wizard.

Sample `required` annotation:

```
@openapi.openedge.entity.required (fields="HealthCare,MedicalSpending").

    DEFINE TEMP-TABLE ttBenefits BEFORE-TABLE bttBenefits
    FIELD HealthCare       AS CHARACTER LABEL "Health Care"
    FIELD MedicalSpending  AS INTEGER   INITIAL "0" LABEL "Medical Spending"
    FIELD StockPurchase    AS INTEGER   INITIAL "0" LABEL "Stock Purchase"
    FIELD XTZDEPENDENTCARE AS INTEGER   INITIAL "0" LABEL "Dependent Care"
    INDEX EmpNo IS PRIMARY UNIQUE EmpNum DESCENDING
```

The `required` annotation is added at the entity level to avoid a large number of annotations being added to a temp-table. But, when generating the Data Service Catalog, the required property is added at the field level.

See also

Data Service Catalog schema properties on page 228

Entity property

The `Entity` property, `@openapi.openedge.entity.property`, uses the following parameters:

Parameter	Description
Name	Specifies the name of the property to be added at the entity level.

Parameter	Description
Value	Specifies the value of the property as a string. The value can also be a comma delimited list of strings.
Type	(Optional) Indicates how the property is generated in the Data Service Catalog file. The type can be a string, integer, boolean, or an array. **Note:** The default type is a string. If the type is an array, the generated code looks like a JSON array of strings where each item corresponds to each item in the comma delimited value string.

Sample `Entity` property annotation:

```
@openapi.openedge.entity.property (name="recordName",
value="Name", type="string").
```

See also

Data Object Catalog schema properties on page 228

Field property

The `Field` property, `@openapi.openedge.entity.field.property`, uses the following parameters:

Parameter	Description
Field	Specifies the name of the field in the schema.
Name	Specifies the name of the property to be added at the field level.
Value	Specifies the value of the property as a string. The value can also be a comma delimited list of strings.
Type	(Optional) Indicates how the property is generated in the Data Service Catalog file. The type can be a string, integer, boolean, or an array. **Note:** The default type is a string. If the type is an array, the generated code looks like a JSON array of strings where each item corresponds to each item in the comma delimited value string.

Sample `Field` property annotation:

```
@openapi.openedge.entity.field.property (field="numOrders",
name="readOnly", value="true", type="boolean").
```

See also

Data Service Catalog schema properties on page 228

7

Learn About OpenEdge Business Rules

Progress Developer Studio for OpenEdge and Progress Corticon Studio are standalone Eclipse-based development environments that can be integrated into a single Eclipse instance to use the capabilities of integrated business rules in Progress OpenEdge. Progress Corticon is a Business Rules Management System. Its patented "no-coding" rules engine automates sophisticated decision processes. It provides the simple yet powerful Corticon Decision Services Methodology for modeling business rules.

Integrating OpenEdge and Corticon enables you to use ABL data structures (such as ProDataSets and temp-tables) as Corticon data structures (Vocabularies and entities). OpenEdge business rules provide tooling support for creating and updating Corticon Vocabularies, and runtime support for simple invocation of Corticon Decision Services.

You can use the integrated environment of Progress Developer Studio for OpenEdge and Corticon Studio to do the following:

- Use a Business Rules server to perform some or all of the business logic from an ABL client
- Re-use the existing business logic data structures (ProDataSets and/or temp-tables) with a Business Rules server without modification
- Generate output from a Business Rules server easily, using ABL data structures, instead of XML
- Generate a resource containing ProDataSet and temp-table schema information from an ABL source code
- Create ABL source code from a resource containing ProDataSet and temp-table schema information
- Import Corticon Vocabulary from a resource containing ProDataSet or temp-table schema information
- Export Corticon Vocabulary to a resource
- Test an OpenEdge application containing both ABL and Corticon business logic from within Progress Developer Studio for OpenEdge
- Create a single project in Progress Developer Studio for OpenEdge containing both ABL and Corticon artifacts

For details, see the following topics:

- Concepts
- Tasks
- Reference

Concepts

Terminology related to OpenEdge Business Rules

The following terms describe the various components that apply to an integrated development environment of OpenEdge and Corticon:

Component	Description
ProDataSet	A predefined view of data usually from multiple data sources (such as temp tables and database buffers) that are related to each other through data relationships. It is a potentially complex in-memory data structure that can be passed as a single parameter with a single handle from one procedure to another, within a single OpenEdge session or between sessions.

Component	Description
Vocabulary	A structured dictionary containing all necessary business terms and relationships between them used by the Business Rules. It is an eCore model that defines a relational data structure against which rules are applied. The relational data structure contains domains, entities, attributes and relationships (including cardinality), and maps to the ABL file's ProDataSet and temp-tables. A Vocabulary is used to build rule models in a Rulesheet or test cases in a Ruletest.
Rulesheet	A set of rules (conditions and actions and plain language statements) written from a common business Vocabulary. By organizing these rules, it becomes a self-contained, independent unit of automated decision-making.
Ruleflow	A set of one or more Rulesheets organized for sequential execution. A Ruleflow aggregates and organizes Rulesheets into a single unit of automated decision-making. It may be assembled from multiple Rulesheets, provided that all the Rulesheets use the same Vocabulary file. In other words, a Ruleflow can have only one associated Vocabulary. After a Ruleflow has been saved and deployed to the Corticon Server, it is called a Decision Service.
Ruletest	A mechanism within Corticon Studio for creating use cases or test scenarios of sample data and sending them to a Rulesheet or Ruleflow for processing. Ruletests consist of one or more Testsheets which test independent Rulesheets or Ruleflows, or can be linked together to test a succession of Rulesheets or Ruleflows to simulate a process sequence. Like Rulesheets, Ruletests also use a common Vocabulary model.
Decision Service	Automates a discrete decision-making task. A Decision Service is implemented as a set of Business Rules and exposed as a web service or a Java service. By definition, the rules within a Decision Service are complete and unambiguous. For a given set of inputs, a Decision Service addresses every logical possibility uniquely, ensuring decision integrity. After they are deployed to the Corticon server, Ruleflows become Decision Services. Multiple versions of a single Decision Services can be deployed concurrently.
Business Rules server	A high-performance and scalable system resource that manages pools of Decision Services and executes their rules against incoming requests. It can be easily configured as a Web Services server that exposes Decision Services as true Web Services.

See also

Learn About OpenEdge Business Rules on page 233

Tasks

Integrate Corticon Studio and Progress Developer Studio for OpenEdge

You can use the capabilities of Business Rules in Progress OpenEdge by integrating Progress Developer Studio for OpenEdge and Progress Corticon Studio into a single environment.

To integrate Corticon Studio plugins to Progress Developer Studio for OpenEdge, use one of the following methods:

- While installing Corticon Studio, select the Eclipse location of Progress Developer Studio for OpenEdge as the external Eclipse location on the **External Eclipse configuration** page.
- After installing Progress Developer Studio for OpenEdge and Corticon Studio, open **Command Prompt**, go to the installation directory of Corticon Studio and run the following code:

```
integrateCorticon.bat -install <PDSOE Eclipse location>
```

Note: For information on integrating Progress Developer Studio for OpenEdge plugins to Corticon Studio, see the *Progress Corticon Documentation*.

See also

Learn About OpenEdge Business Rules on page 233

Configure Corticon Server on PAS for OpenEdge

You must configure the Corticon server on your **PAS for OpenEdge** to make it available for deploying projects.

By default, the **PAS for OpenEdge** instance (`oepas1`) gets created during the installation of Progress Developer Studio for OpenEdge.

By default, Corticon Server is a part of the Corticon Studio installation but has the following license restrictions:

- The request must come from the same machine on which the server is running. Requests from any other machine or host are disallowed.
- Only a single reactor is available per Decision Service. This means that only one Decision Service can be executed at a time. This allows you to deploy multiple Decision Services simultaneously. Since ABL is single-threaded and since this license is intended for a single-user development scenario, it is ideal for the intended use case. If you want to test the system more thoroughly, you must purchase a proper licensed server.

Note: These conditions only apply to the execution of a Decision Service. They do not affect the service availability check and other administrator functions.

To configure the Corticon server:

1. Based on the Corticon Server (purchased or default) that you are using, do one of the following:
   - If you are using the default Corticon server that comes with the Corticon Studio installation, copy the `Axis.war` file located in the Corticon Studio installation directory to the OpenEdge `%WORK%\oepas1\webapps` directory.
   - If you have purchased the Corticon server license, download the Corticon Server for Java Archive from the Progress Download Center available at http://www.progress.com/esd, and copy the `Axis.war` file located in it to the OpenEdge `%WORK%\oepas1\webapps` directory.
2. Start **PAS for OpenEdge**.
   a) Open the **Servers** view in an OpenEdge perspective of Progress Developer Studio for OpenEdge by selecting **Window** > **Show View** > **Other** > **Server** > **Servers** > **OK**.
   b) Select the OpenEdge PAS instance and then, select **Start** in the context menu or on the **Servers** toolbar.

   Note: You can also start **PAS for OpenEdge** from the **Proenv** command prompt using:

   1. Select `Start > Progress > OpenEdge 12.0 > proenv`
   2. Press `Enter`
   3. Type `cd oepas1\bin`
   4. Press `Enter`
   5. Type `tcman start`

   ---

3. In a web browser, enter the URL for the PAS for OpenEdge with default ports: `http://<hostname>:<port>/axis`, and go to the Corticon Server console to verify if the Corticon Server is successfully installed.

   The **Corticon Server Console** login page appears after successful installation. The Corticon server has the following five defined server console login user names:

User name	Password
admin	admin
administrator	changeme
modeler2	modeler2

User name	Password
modeler1	modeler1
Tester	tester

Note: See the *Progress Corticon Documentation* for more information about using the Corticon server and for other installation options.

Generate Business Rules Vocabulary Definition

A **Business Rules Vocabulary Definition (.brvd)** file is used to exchange ProDataSet and/or temp-table schema information between OpenEdge and Corticon at design time. It is a proprietary format of an XML-based file.

The schema generated and exported from OpenEdge can be imported and used as the basis for Vocabulary entities and attributes in Corticon Studio. For more information on importing business rules vocabulary definition, see the *Progress Corticon Documentation*.

To generate a Business Rules Vocabulary Definition file:

1. Create an OpenEdge project or select an existing one.
2. From the project or editor's context (right-click) menu, select **Progress OpenEdge** > **Generate Business Rules Vocabulary Definition**.

   Note: You can also select the **Generate Business Rules Vocabulary Definition** menu option from the **Outline** view. See Use Outline view to generate Business Rules Vocabulary Definition on page 239 for more information.

   The **Generate Business Rules Vocabulary Definition** wizard appears.
3. In the left tab, select the ABL source file whose ProDataSets and/or temp-tables you want to add to the Business Rules Vocabulary Definition file.
4. By default, the wizard displays the **Workspace Resources** tab that lists files in the workspace. To view files in the file system, select the drop-down arrow and then select **File System**.

   Note: You can use the **Browse ABL Files**  option available on the toolbar of the **File System Resources** tab to add files from the local file system to the current list. This option is enabled only when you select **File System**. To use database temp-tables containing the LIKE keyword you must select a workspace resource.
5. When you select a file in the left tab, the **ProDataSets and Temp-Tables** tab displays all the ProDataSets and temp-tables available in that file. Select the ProDataSet and/or temp-table that you want to include in the Business Rules Vocabulary Definition file.

Note: If the selected file has any compilation errors, then no ProDataSets and temp-tables are displayed for that file.

The **Selected data structures** list displays the ProDataSets and/or temp-tables that you select in the **ProDataSets and Temp-Tables** tab. To remove an item from this list, select the item and then select  on the **Selected data structures** toolbar.

6. In the **Definition file** field, click **Browse** to specify a location in your file system and a name for the Business Rules Vocabulary Definition file.

Note: If you have specified a default rules Vocabulary folder on the Set Business Rules preferences on page 241, the location of that folder is displayed when you click **Browse**. You can change this location if necessary. You can also specify a workspace location for the Business Rules Vocabulary Definition file. In which case, you must refresh the OpenEdge project containing the file to be able to view it in the **Project Explorer** view.

7. Click **Finish**.

   A Business Rules Vocabulary Definition (.brvd) file is created in the specified location with the selected ProDataSets and/or temp-tables. If the same file already exists, a dialog prompts you to replace it.

See also

Export Business Rules Vocabulary Definition on page 239
Generate Business Rules Vocabulary Definition wizard on page 244

Use Outline view to generate Business Rules Vocabulary Definition

You can use the **Outline** view to open the **Business Rules Vocabulary Definition** wizard to generate a Business Rules Vocabulary Definition file.

1. Open the procedure file in the **Project Explorer** view.
2. Select **Window** > **Show View** > **Outline**.

   The **Outline** view opens and displays all the defined ProDatasets or a TempTables of the procedure file that you have selected.
3. Select a ProDataset or a TempTable, right-click and select **Generate Business Rules Vocabulary Definition**.

   The **Generate Business Rules Vocabulary Definition** wizard opens.

   For more information on generating business rules Vocabulary definition, see Generate Business Rules Vocabulary Definition on page 238.

Export Business Rules Vocabulary Definition

A **Business Rules Vocabulary Definition** (`.brvd`) file is used to exchange ProDataSet and/or temp-table schema information between OpenEdge and Corticon at design time. It is a proprietary format of an XML-based file.

The schema generated and exported from OpenEdge can be imported and used as the basis for Vocabulary entities and attributes in Corticon Studio. For more information on importing business rules vocabulary definition, see the *Progress Corticon Documentation*.

To export a Business Rules Vocabulary Definition file:

1. Select **File** > **Export** > **Progress OpenEdge** > **Business Rules Vocabulary Definition**.

   Note: You can also select this option from the context (right-click) menu in the **Project Explorer** view.

   The **Export Business Rules Vocabulary Definition** wizard appears.

2. In the left tab, select the ABL source file whose ProDataSets and/or temp-tables you want to add to the Business Rules Vocabulary Definition file.
3. By default, the wizard displays the **Workspace Resources** tab that lists files in the workspace. To view files in the file system, select the drop-down arrow and then select **File System**.

   Note: You can use the **Browse ABL Files**  option available on the toolbar of the **File System Resources** tab to add files from the local file system to the current list. This option is enabled only when you select **File System**. To use database temp-tables containing the LIKE keyword you must select a workspace resource.

4. When you select a file in the left tab, the **ProDataSets and Temp-Tables** tab displays all the ProDataSets and temp-tables available in that file. Select the ProDataSet and/or temp-table that you want to include in the Business Rules Vocabulary Definition file.

   Note: If the selected file has any compilation errors, then no ProDataSets and temp-tables are displayed for that file.

   The **Selected data structures** list displays the ProDataSets and/or temp-tables that you select in the **ProDataSets and Temp-Tables** tab. To remove an item from this list, select the item and then select  on the **Selected data structures** toolbar.

5. In the **Definition file** field, click **Browse** to specify a location in your file system and a name for the Business Rules Vocabulary Definition file.

   Note: If you have specified a default rules Vocabulary folder on the **Business Rules** preferences page, the location of that folder is displayed when you click **Browse**. You can change this location if necessary. You can also specify a workspace location for the **Business Rules Vocabulary Definition** file. In which case, you must refresh the OpenEdge project containing the file to be able to view it in the **Project Explorer** view.

6. Click **Finish**.

   The selected ProDataSets and/or temp-tables are exported to the specified **Business Rules Vocabulary Definition** file.

See also

Generate Business Rules Vocabulary Definition on page 238
Export Business Rules Vocabulary Definition wizard on page 243

Set Business Rules preferences

The **Business Rules** preferences page allows you to specify the default folder where the Business Rules Vocabulary Definition (.brvd) file is located.

To set preferences for Business Rules:

1. Select **Window** > **Preferences** > **Progress OpenEdge** > **Business Rules**.
2. At the **Rules vocabulary folder** field, select **Browse** to specify the location where you want to create the Business Rules Vocabulary Definition file.

   The location that you specify here becomes the default location of the Business Rules Vocabulary Definition file and is displayed when you select the **Browse** button at the **Definition file** field of the **Generate Business Rules Vocabulary Definition** and **Export Business Rules Vocabulary Definition** wizards. You can change this location at the time of generating or exporting the Business Rules Vocabulary Definition file.

See also

Generate Business Rules Vocabulary Definition wizard on page 244
Export Business Rules Vocabulary Definition wizard on page 243

Use Business Rules API to invoke Decision Services

OpenEdge allows you to use Business Rules API to call the Decision Service that is deployed onto the Corticon Server. A SOAP message is sent to the Corticon Server and Corticon updates the values of the entity and returns them to OpenEdge. The returned Vocabulary model structure is the same as the one passed.

Note: To invoke a Decision service from ABL business logic, you must add the required procedure library and include files to the project's PROPATH. See Add Business Rules libraries to PROPATH on page 242 for more information.

To invoke a Decision Service, use the following API classes:

Class	Description
OpenEdge.BusinessRules.DecisionService class on page 245	Creates a **Decision Service** instance.
OpenEdge.BusinessRules.RulesServerConnectionParameters class on page 246	Returns parameters for connecting to a Business Rules server. Initially, access to Decision Service and Admin Service are through separate connections (although they can be specified by one parameter).
OpenEdge.BusinessRules.RulesServerConnection class on page 245	Describes the server connection for an OpenEdge Rules Server. This is a specialized class whose main purpose is to provide an abstraction from the fact that the connection to the Rules server is a Web Services connection.
Progress.Json.ObjectModel.JsonObject class on page 249	Denotes a dynamic number of properties, each addressable by a Unicode string called a name.
Progress.Lang.AppError class on page 250	Is the ultimate super class of all application errors. An application error is simply any collection of data you need to provide meaningful information about a condition. Representing a user-defined error as an error object allows your application to throw and catch or return the error in the ABL structured error handling model.

Add Business Rules libraries to PROPATH

You can configure an OpenEdge project with Corticon settings to run Corticon-related functionality from within Progress Developer Studio for OpenEdge. To do so, you must add the Business Rules libraries (`OpenEdge.BusinessRules.pl` file) to the list of procedure libraries appended to PROPATH in Progress Developer Studio for OpenEdge.

Note: You must also add these entries to the PROPATH of any production environments.

To add the Business Rules libraries to PROPATH:

1. Select a project in the **Project Explorer** view and select **Properties** from the context (right-click) menu or select **Project** > **Properties** from the main menu bar.

   The **Properties** page for the selected project appears.

2. Select **Progress OpenEdge** > **PROPATH**.

   Note: For a shared AVM project, select **Window** > **Preferences** > **Progress OpenEdge** > **Shared AVM** > **PROPATH**.

3. Select **Add External Library** and select the `OpenEdge.BusinessRules.pl` file from the file system.

Note: If the project uses GUI as the runtime, the `OpenEdge.BusinessRules.pl` file is located in `$DLC/gui/rules` and if the project uses TTY as the runtime, the file is located in `$DLC/tty/rules`, where DLC is the default installation directory.

The selected procedure library appears in the PROPATH section (the left pane on the **PROPATH** properties page.

4. To use the output of the `GetMessages()API` (which, returns the messages for the most recent decision service invocation), add the `@{DLC}/gui/rules` or `@{DLC}/tty/rules` folder to the PROPATH along with the `OpenEdge.BusinessRules.pl` file by selecting **Add External Directory** on the PROPATH properties page.
5. Click **OK**.

Note: You can also add PROPATH entries while creating a project using the **Define PROPATH** page.

See also

Use Business Rules API to invoke Decision Services on page 241

Reference

Export Business Rules Vocabulary Definition wizard

The **Export Business Rules Vocabulary Definition** wizard allows you to export ProDataSets and temp-tables from the workspace and/or file system to an intermediate Business Rules Vocabulary definition (.brvd) file. This intermediate .brvd file can be imported to Corticon Studio to generate and package Vocabulary and rules and then deployed onto the Corticon server.

The **Export Business Rules Vocabulary Definition** wizard includes the following controls:

Control	Description
Workspace Resources	(Default) Displays a list of ABL class and procedure files available in your current workspace.
File System Resources	Displays a list of files that you select from the file system. This tab appears only when you select **File System** using the drop-down arrow on the toolbar.
ProDataSets and Temp-Tables	Displays the available ProDataSets and temp-tables for each selected file.
Selected data structures	Displays the ProDataSets and temp-tables that you select in the **ProDataSets and Temp-Tables** tab.
Definition file	Specifies the location of the Business Rules Vocabulary Definition file to which the selected ProDataSets and temp-tables are exported.

See also

Export Business Rules Vocabulary Definition on page 239

Generate Business Rules Vocabulary Definition wizard

The **Generate Business Rules Vocabulary Definition** wizard allows you to generate a **Business Rules Vocabulary Definition** (`.brvd`) file for the selected ProDataSets or temp-tables. This intermediate .brvd file can be imported to Corticon Studio to generate and package Vocabulary and rules and then be deployed onto the Corticon server.

The **Generate Business Rules Vocabulary Definition** wizard includes the following controls:

Control	Description
Workspace Resources	(Default) Displays a list of ABL class and procedure files available in your current workspace.
File System Resources	Displays a list of files that you select from the file system. This tab appears only when you select **File System** using the drop-down arrow on the toolbar.
ProDataSets and Temp-Tables	Displays the available ProDataSets and temp-tables for each selected file.
Selected data structures	Displays the ProDataSets and temp-tables that you select in the **ProDataSets and Temp-Tables** tab.
Definition file	Specifies the location where the Business Rules Vocabulary Definition file is saved.

See also

Generate Business Rules Vocabulary Definition on page 238

OpenEdge Business Rules API reference

The following sections describe the various APIs supported by the OpenEdge-Corticon framework for invoking Decision Services:

- Class and Interface reference on page 244
- Class Properties and Methods reference on page 252

Class and Interface reference

This topic contains reference entries that describe the built-in classes and interfaces supported for OpenEdge Business Rules. These classes and interfaces contain types and other artifacts directly pertaining to OpenEdge and Corticon integration. They also contain types and other artifacts for generic handling of server connections and their parameters.

OpenEdge.BusinessRules.DecisionService class

The `OpenEdge.BusinessRules.DecisionService` class provides the functionality to create a Decision Service instance.

Constructors

The following constructor invokes the currently available version of a Decision Service, as determined by the Corticon Server, specified by the `OpenEdge.BusinessRules.RulesServerConnection` class:

```
PUBLIC (pcDecisionServiceName AS CHARACTER, poServer AS
OpenEdge.BusinessRules.RulesServerConnection)
```

The following constructor invokes the specified version of a Decision Service running on the Corticon Server as specified by the `OpenEdge.BusinessRules.RulesServerConnection` class:

```
PUBLIC (pcDecisionServiceName AS CHARACTER, pdVersion AS DECIMAL, poServer
AS OpenEdge.BusinessRules.RulesServerConnection)
```

The following constructor invokes the version of a Decision Service running on the Corticon Server that is effective at the date or time provided, as specified by the `OpenEdge.BusinessRules.RulesServerConnection` class:

```
PUBLIC (pcDecisionServiceName AS CHARACTER, ptEffectiveOn as DATETIME-TZ,
poServer AS OpenEdge.BusinessRules.RulesServerConnection)
```

Super Class

Progress.Lang.Object class

Public Properties

Name property on page 254	Version property on page 256	EffectiveOn property on page 254

Protected Property

ServerConnection property on page 255

Public Methods

InvokeService() method on page 258	GetMessages() method on page 258	IsServiceAvailable() method on page 259

OpenEdge.BusinessRules.RulesServerConnection class

The `OpenEdge.BusinessRules.RulesServerConnection` class describes the server connection for an OpenEdge Business Rules server. It uses Web Services connections to access the Business Rules server.

Super Class

OpenEdge.Core.ServerConnection.WebServiceServerConnection class on page 247

OpenEdge.BusinessRules.RulesServerConnectionParameters class

The `OpenEdge.BusinessRules.RulesServerConnectionParameters` class returns parameters for connecting to a Business Rules server. Although the Decision Service and Administration Service can be specified by one parameter, access to them is through separate connections. The initial implementation uses WebServices but the `OpenEdge.BusinessRules.DecisionService` class abstracts that from a caller. The implementation affects the parameters values passed in.

Constructors

The following constructor creates a JSON object containing valid connection parameters:

```
PUBLIC (INPUT poOptions AS JsonObject)
```

The following constructorcreates a character representation of a JSON object containing valid connection parameters:

```
PUBLIC (INPUT pcOptions AS CHARACTER)
```

Interface

OpenEdge.Core.ServerConnection.IconnectionParameters interface on page 246

Public Properties

DecisionServiceConnectionParameters property on page 253	AdminServiceConnectionParameters property on page 252	FormatMask property on page 254

Public Method

GetConnectionString() method on page 257

OpenEdge.Core.ServerConnection.FormatMaskEnum class

The `OpenEdge.Core.ServerConnection.FormatMaskEnum` class contains various simple format masks for connection parameters. These format masks can also be represented by individual format provider classes.

Super Class

OpenEdge.Lang.EnumMember class on page 247

Public Properties

Default property on page 253	None property on page 254	DashSpace property on page 253	ABLConnect property on page 252
DoubleDashSpace property on page 253	DoubleDashEquals property on page 253	NameEquals property on page 254	Custom property on page 253

OpenEdge.Core.ServerConnection.IconnectionParameters interface

The `OpenEdge.Core.ServerConnection.IconnectionParameters` interface returns connection parameters for the Decision Service calls.

Public Property

FormatMask property on page 254

Public Method

GetConnectionString() method

See also

OpenEdge.BusinessRules.RulesServerConnectionParameters class on page 246

OpenEdge.Core.ServerConnection.IServerConnection interface

The `OpenEdge.Core.ServerConnection.IserverConnection` interface describes the connection to a server (such as a database or a Web Service).

Public Properties

Server property on page 255	ConnectionParameters property on page 252	Connected property on page 252

Public Methods

Connect() method on page 256	Disconnect() method on page 257	CreateServer() method on page 256	DestroyServer() method on page 256

OpenEdge.Core.ServerConnection.WebServiceServerConnection class

The `OpenEdge.Core.ServerConnection.WebServiceServerConnection` class describes a Web Service connection.

Constructors

```
PUBLIC (INPUT poConnectionParameters AS OpenEdge.Core.ServerConnection.
WebServiceConnectionParameters)
```

Interface

OpenEdge.Core.ServerConnection.IServerConnection interface on page 247

Public Properties

ServiceName property on page 255	Operation property on page 254	PortName property on page 255	Server property on page 255

OpenEdge.Lang.EnumMember class

The `OpenEdge.Lang.EnumMember` class is an enumeration definition class. It is an abstract class.

Constructors

The following constructor allows the specification of an integer value and a character name for the enumeration:

```
PROTECTED (piValue as INTEGER INPUT pcName AS CHARACTER)
```

The following constructor allows only the specification of an integer value for the enumeration:

```
PROTECTED (piValue as INTEGER)
```

The following constructor allows only the specification of a character name for the enumeration:

```
PROTECTED (INPUT pcName AS CHARACTER)
```

Public Properties

Name property on page 254	Value property on page 255

Public Method

ToString() method on page 259

OpenEdge.Lang.WidgetHandle class

The `OpenEdge.Lang.WidgetHandle` class is a primitive class for widget-handle variables.

Constructors

The following default constructor results in the WidgetHandle object having an unknown value:

```
PUBLIC ()
```

The following constructor initializes the WidgetHandle's value:

```
PUBLIC (phValue AS HANDLE)
```

Public Property

Value property on page 255

Public Method

ToString() method on page 259

Progress.Json.ObjectModel.JsonObject class

This class denotes a dynamic number of properties each addressable by a Unicode string called a name. The properties can be another `JsonObject`, a `JsonArray`, a value of any JSON data type or the JSON null value. JSON data types are `String`, `Number` and `Boolean`.

Serializable:

Yes

Constructors

```
PUBLIC JsonObject( )
```

Interfaces

This class does not implement an interface.

Public Properties

This class does not define properties.

Public Methods

Add( ) method (JsonObject)	AddNull( ) method (JsonObject)
AddNumber( ) method (JsonObject)	Clone( ) method (JsonObject)
GetCharacter( ) method (JsonObject)	GetCOMHandle( ) method (JsonObject)
GetDate( ) method (JsonObject)	GetDatetime( ) method (JsonObject)
GetDatetimeTZ( ) method (JsonObject)	GetDecimal( ) method (JsonObject)
GetHandle( ) method (JsonObject)	GetInt64( ) method (JsonObject)
GetInteger( ) method (JsonObject)	GetJsonArray( ) method (JsonObject)
GetJsonObject( ) method (JsonObject)	GetJsonText( ) method (JsonObject)
GetLogical( ) method (JsonObject)	GetLongchar( ) method (JsonObject)
GetMemptr( ) method (JsonObject)	GetNames( ) method (JsonObject)
GetRaw( ) method (JsonObject)	GetRecid( ) method (JsonObject)
GetRowid( ) method (JsonObject)	GetType( ) method (JsonObject)
Has( ) method (JsonObject)	IsNull( ) method (JsonObject)
Read( ) method (JsonObject)	Remove( ) method (JsonObject)

Set( ) method (JsonObject)	SetNull( ) method (JsonObject)
SetNumber( ) method (JsonObject)	Write( ) method (JsonObject)
WriteFile( ) method (JsonObject)	WriteStream( ) method (JsonObject)

Public Events

This class does not define events.

Notes

The following example shows the constructor for `JsonObject`:

```
DEFINE VARIABLE myObj AS JsonObject NO-UNDO.
DEFINE VARIABLE myLongchar AS LONGCHAR NO-UNDO.

myObj = NEW JsonObject( ).
myObj:Write(myLongchar, TRUE).
```

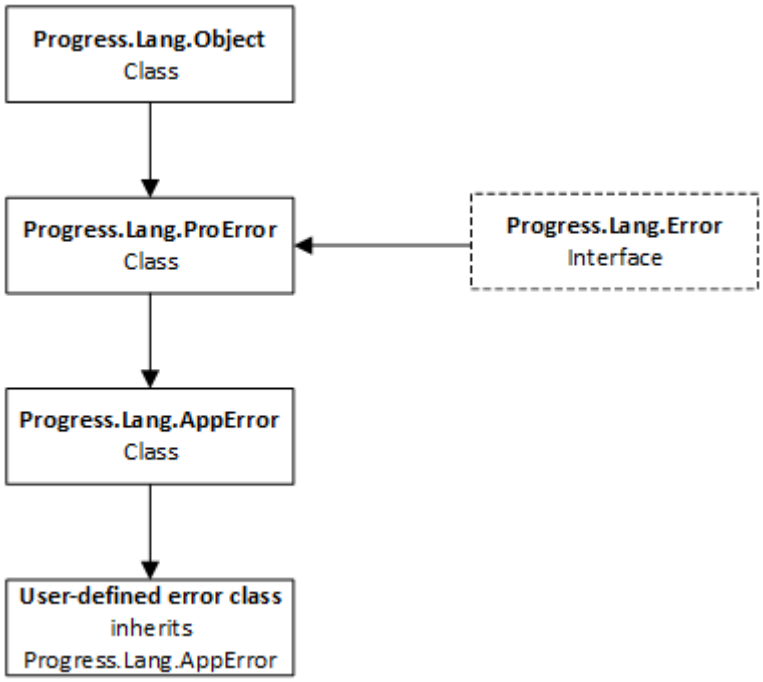
In the above example, `myObj` is an empty object. The variable `myLongchar` is set to the value of `"{ }"`.

Progress.Lang.AppError class

`Progress.Lang.AppError` is the super class of all application errors. An *application error* is simply any collection of data you need to provide necessary information about a condition.

An application error can be raised either by using the `RETURN ERROR` or the `UNDO, THROW` statement.

The following figure represents the hierarchy of ABL classes that provide `Progress.Lang.AppError` with all its features:



Progress.Lang.ProError is the super class of all error objects in ABL. From Progress.Lang.Object it inherits the basic features of an ABL class. It also implements the Progress.Lang.Error interface which provides the basic properties and methods for handling errors.

Progress.Lang.AppError adds the properties and methods needed for populating an AppError object with your error messages.

You can create your own hierarchy of more complex AppError types by creating subclasses of AppError.

When the AVM encounters the RETURN ERROR statement, it implicitly throws a Progress.Lang.AppError object and places any error string in the object's ReturnValue property. ReturnValue is included in the AppError object to provide a bridge between the older functionality of RETURN ERROR *ErrorString* and error objects. See *ABL Error Handling*, for more information.

Serializable:

Yes

Constructors

The following is the default constructor. This constructor creates an AppError object with an empty message list and does not set any properties.

```
PUBLIC AppError ( )
```

The following constructor creates an AppError object and assigns the first message on the object with the values from the *ErrorMessage* and *MessageNumber* arguments. It also sets the NumMessages property to 1. This error message and message number can be accessed with the GetMessage(1) and GetMessageNum(1) methods.

```
PUBLIC AppError ( INPUT ErrorMessage  AS CHARACTER
                  INPUT MessageNumber AS INTEGER )
```

The following constructor creates an AppError object with the ReturnValue property set with the value of the *ReturnValue* parameter. This constructor is used when the AVM implicitly creates an AppError object for a RETURN ERROR *ErrorString* statement. You can also invoke this constructor directly.

```
PUBLIC AppError ( INPUT ReturnValue AS CHARACTER )
```

Note: This constructor does not set an error message. If the AddMessage( ) method is not used to set one, no message is displayed if an object constructed this way is thrown and handled by default error handling.

Interfaces

This class does not implement interfaces (beyond those it inherits from its base class).

Public Properties

ReturnValue property	—	—

Public Methods

AddMessage( ) method	RemoveMessage( ) method

Public Events

This class does not contain events.

Notes

- All `AppError` instances, both those created implicitly and user-defined application errors, created with the NEW function (classes) appear on the `SESSION:FIRST-OBJECT` chain, just like any other user-defined object.

See also

CATCH statement, Progress.Lang.SysError class

Class Properties and Methods reference

This topic contains reference entries that describe each built-in class property and method that ABL supports for working with OpenEdge Business Rules and structured error handling. Class properties and methods are mechanisms that allow you to monitor and control the behavior of class-based objects.

ABLConnect property

The ABLConnect property defaults to `OpenEdge.Core.ServerConnection.FormatMaskEnum:DashSpace`.

Data type: `OpenEdge.Core.ServerConnection.FormatMaskEnum`

Access: PUBLIC STATIC

Applies to: `OpenEdge.Core.ServerConnection.FormatMaskEnum` class

AdminServiceConnectionParameters property

The AdminServiceConnectionParameters property contains connection parameters for the Admin Service calls such as `IsServiceAvailable()`.

Data type: `OpenEdge.Core.ServerConnection.IConnectionParameters`

Access: PUBLIC

Applies to: `OpenEdge.BusinessRules.RulesServerConnectionParameters` class

Connected property

The Connected property returns `True` if the server is valid and connected. Otherwise, returns `False`.

Data type: LOGICAL

Access: PUBLIC

Applies to: `OpenEdge.Core.ServerConnection.IServerConnection` interface

ConnectionParameters property

The ConnectionParameters property specifies the parameters for the connection.

Data type: `OpenEdge.Core.ServerConnection.IConnectionParameters`

Access: PUBLIC

Applies to: OpenEdge.Core.ServerConnection.IServerConnection interface

Custom property

The Custom property is a custom mask that is too complex for simple substitute-based parsing.

Data type: OpenEdge.Core.ServerConnection.FormatMaskEnum

Access: PUBLIC STATIC

Applies to: OpenEdge.Core.ServerConnection.FormatMaskEnum class

DashSpace property

The DashSpace property resolves to `'-&1 &2'`.

Data type: OpenEdge.Core.ServerConnection.FormatMaskEnum

Access: PUBLIC STATIC

Applies to: OpenEdge.Core.ServerConnection.FormatMaskEnum class

DecisionServiceConnectionParameters property

The DecisionServiceConnectionParameters property contains connection parameters for the Decision Service calls.

Data type: OpenEdge.Core.ServerConnection.IConnectionParameters

Access: PUBLIC

Applies to: OpenEdge.BusinessRules.RulesServerConnectionParameters class

Default property

The Default property defaults to `OpenEdge.Core.ServerConnection.FormatMaskEnum:DashSpace`.

Data type: OpenEdge.Core.ServerConnection.FormatMaskEnum

Access: PUBLIC STATIC

Applies to: OpenEdge.Core.ServerConnection.FormatMaskEnum class

DoubleDashEquals property

The DoubleDashEquals property resolves to `'--&1=&2'`.

Data type: OpenEdge.Core.ServerConnection.FormatMaskEnum

Access: PUBLIC STATIC

Applies to: OpenEdge.Core.ServerConnection.FormatMaskEnum class

DoubleDashSpace property

The DoubleDashSpace property resolves to `'--&1 &2'`.

Data type: OpenEdge.Core.ServerConnection.FormatMaskEnum

Access: PUBLIC STATIC

Applies to: OpenEdge.Core.ServerConnection.FormatMaskEnum class

EffectiveOn property

The EffectiveOn property is an optional property that specifies the effective date for selecting the Decision Service to be invoked. It defaults to an unknown value, which is the latest or the most recent version.

Note: Either the Version or EffectiveOn property can be used at a time, which you can decide when you call the constructor.

Data type: DATETIME-TZ

Access: PUBLIC

Applies to: `OpenEdge.BusinessRules.DecisionService` class

FormatMask property

The FormatMask property must always be set to `FormatMaskEnum:Custom` for WebService and URL connection parameters.

Data type: `OpenEdge.Core.ServerConnection.FormatMaskEnum`

Access: PUBLIC

Applies to: `OpenEdge.BusinessRules.RulesServerConnectionParameters` class; `OpenEdge.Core.ServerConnection.IconnectionParameters` interface

Name property

The Name property specifies the name of the Decision Service to be invoked. This value is mandatory and must be entered as a constructor argument.

Data type: CHARACTER

Access: PUBLIC

Applies to: `OpenEdge.BusinessRules.DecisionService` class; `OpenEdge.Lang.EnumMember` class

NameEquals property

The NameEquals property resolves to `'&1=&2'`.

Data type: `OpenEdge.Core.ServerConnection.FormatMaskEnum`

Access: PUBLIC STATIC

Applies to: `OpenEdge.Core.ServerConnection.FormatMaskEnum` class

None property

The None property does not require a default format mask to be applied.

Data type: `OpenEdge.Core.ServerConnection.FormatMaskEnum`

Access: PUBLIC STATIC

Applies to: `OpenEdge.Core.ServerConnection.FormatMaskEnum` class

Operation property

The Operation property is extracted from the `WebServiceConnectionParameters` object passed in to the class.

Data type: CHARACTER

Access: PUBLIC

Applies to: `OpenEdge.Core.ServerConnection.WebServiceServerConnection` class

PortName property

The PortName property is extracted from the `WebServiceConnectionParameters` object passed in to the class.

Data type: CHARACTER

Access: PUBLIC

Applies to: `OpenEdge.Core.ServerConnection.WebServiceServerConnection` class

Server property

The Server property refers to the actual server. The object acts as a wrapper for handle-based servers. For `OpenEdge.Core.ServerConnection.WebServiceServerConnection` class, the Server property is of type `OpenEdge.Lang.WidgetHandle`.

Data type: `Progress.Lang.Object` class

Access: PUBLIC

Applies to: `OpenEdge.Core.ServerConnection.WebServiceServerConnection` class

ServerConnection property

The value for the Version property is mandatory and must be entered as constructor argument.

Data type: `OpenEdge.Rules.RulesServerConnection`

Access: PROTECTED

Applies to: `OpenEdge.BusinessRules.DecisionService` class

ServiceName property

The ServiceName is extracted from the `WebServiceConnectionParameters` object passed in to the class.

Data type: CHARACTER

Access: PUBLIC

Applies to: `OpenEdge.Core.ServerConnection.WebServiceServerConnection` class

Value property

The Value property is set through a constructor.

Data type: INTEGER

Access: PUBLIC STATIC

Applies to: `OpenEdge.Lang.EnumMember` class; `OpenEdge.Lang.WidgetHandle` class

Version property

The Version property is an optional property that specifies the version of the Decision Service to be invoked. It defaults to an unknown value, which is the latest or the most recent version.

Note: Either the Version or EffectiveOn property can be used at a time, which you can decide when you call the constructor.

Data type: DECIMAL

Access: PUBLIC

Applies to: `OpenEdge.BusinessRules.DecisionService` class

CreateServer() method

The `CreateServer()` method creates a server object. This method is separated from the `Connect()` and `Disconnect()` methods so that a server can be connected and disconnected multiple times.

Return type: VOID

Access: PUBLIC

Applies to: `OpenEdge.Core.ServerConnection.IServerConnection` interface

Syntax

```
CreateServer()
```

Connect() method

The `Connect()` method connects to the specified server based on the ConnectionParameters.

Return type: VOID

Access: PUBLIC

Applies to: `OpenEdge.Core.ServerConnection.IServerConnection` interface

Syntax

```
Connect()
```

DestroyServer() method

The `DestroyServer()` method deletes a server object. This method is separated from the `Connect()` and `Disconnect()` methods so that a server can be connected and disconnected multiple times.

Return type: VOID

Access: PUBLIC

Applies to: `OpenEdge.Core.ServerConnection.IServerConnection` interface

Syntax

```
DestroyServer()
```

Disconnect() method

The `Disconnect()` method disconnects from the server if connected.

Return type: VOID

Access: PUBLIC

Applies to: `OpenEdge.Core.ServerConnection.IServerConnection` interface

Syntax

```
Disconnect()
```

GetConnectionString() method

Return type: CHARACTER

Access: PUBLIC

Applies to: `OpenEdge.BusinessRules.DecisionService` class; `OpenEdge.Core.ServerConnection.IconnectionParameters` interface

The following version of the method overrides and returns the connection string from the DecisionServiceConnectionParameters property on page 253:

```
GetConnectionString()
```

The following version of the method overrides and returns the connection string from the DecisionServiceConnectionParameters property on page 253. If the ConnectionParameters object has a custom format mask, an AppError is returned.

```
GetConnectionString(INPUT pcFormatMask AS CHARACTER)
```

The following version of the method overrides and returns the connection string from the DecisionServiceConnectionParameters property on page 253. If the ConnectionParameters object has a custom format mask, an AppError is returned.

```
GetConnectionString(INPUT poFormatMask AS FormatMaskEnum)
```

GetMessages() method

The `GetMessages()` method returns the messages for the most recent Decision Service invocation. It is an idempotent operation, so a repeated call to this method always returns the same data. The message data is only cleared when a new InvokeService call is made. The RulesMessage table refers to the response data structure used in the `InvokeService()` call. These references may differ from the input application data structure. The `GetMessages()` method always returns at least one row containing the version of the Decision Service that was used (for cases where an EffectiveOn value or no version was specified). The message has a severity of **Info** and displays a message text specifying the version of Decision Service that was invoked. The remaining fields contain unknown values.

Return type: VOID

Access: PUBLIC

Applies to: `OpenEdge.BusinessRules.DecisionService` class

Syntax

```
GetMessages(OUTPUT TABLE RulesMessage)
```

InvokeService() method

Return type: VOID

Access: PUBLIC

Applies to: `OpenEdge.BusinessRules.DecisionService` class

The following version of the method accepts the table handle to be passed to the Decision Service. You must call this method BY-REFERENCE for a shallow copy. The contents of this temp-table are removed and replaced by the results of the Decision Service call. The temp-table passed into this method cannot be part of a ProDataSet, otherwise an AppError is raised.

```
InvokeService(INPUT-OUPUT TABLE-HANDLE phAppData)
```

The following overloaded version of the method accepts the table handle to be passed to the Decision Service. You must call this method BY-REFERENCE for a shallow copy. The results of the Decision Service call are returned in the output parameter without updating the input data. The temp-table passed into this method cannot be part of a ProDataSet, otherwise an AppError occurs. The output table is a copy of the input table. The intent of this API is to allow callers to use the input data as a before-image for comparison purposes. The RulesMessage table returned by the `GetMessages()` method contains a field named **DataKeyValue**.

```
InvokeService(INPUT TABLE-HANDLE phAppData, OUTPUT TABLE-HANDLE phResponseData)
```

The following version of the method accepts the ProDataSet handle to be passed to the Decision Service. You must call this method BY-REFERENCE for a shallow copy. The contents of this ProDataSet are removed and replaced by the results of the Decision Service call.

```
InvokeService(INPUT-OUPUT DATASET-HANDLE phAppData)
```

The following version of the method specifies the ProDataSet handle to be passed to the Decision Service. You must call this method BY-REFERENCE for a shallow copy. The results of the Decision Service call are returned in the output parameter without updating the input data. The output data set is a copy of the input data set. The intent of this API is to allow callers to use the input data as a before-image for comparison purposes. The RulesMessage table returned by the `GetMessages()` method contains a field named **DataKeyValue** that refers to the tables in the response ProDataSet.

```
InvokeService(INPUT DATASET-HANDLE phAppData, OUTPUT DATASET-HANDLE phResponseData)
```

IsServiceAvailable() method

The `IsServiceAvailable()` method determines whether the Decision Service is available or not.

Return type: LOGICAL

Access: PUBLIC

Applies to: `OpenEdge.BusinessRules.DecisionService` class

Syntax

```
IsServiceAvailable()
```

ToString() method

If applied to the `OpenEdge.Lang.EnumMember` class, the `ToString()` method returns the Name property on page 254. If the Name property is unknown, it returns the Value property on page 255.

Return type: CHARACTER

Access: PUBLIC

Applies to: `OpenEdge.Lang.EnumMember` class; `OpenEdge.Lang.WidgetHandle` class

Syntax

```
ToString()
```

8

Learn About ABL Editor

The ABL Editor is customized for working with ABL code. It supports many features to make coding easier, including:

- Code-generation wizards for creating new files and adding code blocks to existing files
- Customizable code-completion assistance and syntax help
- Macros
- Auto-formatting
- Color-coding of syntax elements to improve readability
- Drag-and-drop capability to add schema references to code
- Integration with the OpenEdge Visual Designer (Windows only)

By default, an ABL Editor buffer opens whenever you create an ABL source file or open an existing one (unless the file type is associated with a specialized OpenEdge editor such as the AppBuilder or the Visual Designer). You can have multiple buffers open at the same time, including ABL Editor buffers and other editors.

Preferences

You can control many aspects of the ABL Editor's behavior through preference settings. The available options are in two categories, OpenEdge-specific preferences and standard Eclipse preferences.

OpenEdge-specific preferences

Preferences that apply exclusively to the ABL Editor include options for editing assistance, build behavior, color-coding of syntax elements, and the use of annotations and template (macros).

To view or set these options, select **Window** > **Preferences** > **Progress OpenEdge** > **Editor**

Eclipse preferences

Like all text editors that run in the Eclipse framework, the ABL Editor inherits the Eclipse editor preferences.To view or set these options, select **Window** > **Preferences** > **General** > **Editors**

Note: For information on the Eclipse text editor preferences, see the *Workbench User Guide*, starting with Editors.

For details, see the following topics:

- Concepts
- Tasks
- Reference

Concepts

ABL Resources in Progress Developer Studio for OpenEdge

Progress Developer Studio for OpenEdge provides support for several specialized types of projects and the different ABL source file types that these projects contain. Although you use the ABL Editor when working with all such source files, the nature of the applications you develop affects the way you create projects, files, and content. This topic briefly describe the principal types of ABL code and some guidelines for working with them.

See also

Learn About ABL Editor on page 261

Procedural code

Many different types of OpenEdge projects and applications include ABL persistent procedures. For the purpose of this discussion, however, procedural code refers to non-specialized procedure files (usually named with a `.p` extension) and include files (usually named with a `.i` extension). In Progress Developer Studio for OpenEdge, these resources are referred to as:

- ABL Procedure
- ABL Include

The procedural programming model differs significantly from the object-oriented (class-based) model, but objects of both types can communicate with each other and can coexist in the same application. In general, the run-time nature of procedural coding supports a dynamic coding model more easily than does class-based programming. Class-based programming, on the other hand, supports a simplified program structure that can be easier to maintain and can facilitate reuse of code among objects. Because you can mix procedures and class-based objects in the same application, you can choose the model that best serves a given programming task in your application.

See also

Object-oriented code on page 263
Write ABL code on page 279

Object-oriented code

ABL originated as a procedure-based language. In later releases, extensions were added that allow you to use an object-oriented development model, in which the principal structure is a class rather than a persistent procedure. The object-oriented model includes support for such features as polymorphism, delegation, interfaces, and overloading. Basic object-oriented resources in Progress Developer Studio for OpenEdge are:

- ABL Class
- ABL Interface

Note: GUI for .NET applications use object-oriented ABL code, but Progress Developer Studio for OpenEdge provides specialized tools and menu options for programming them. Therefore, this discussion treats GUI for .NET code as a separate category from basic object-oriented code.

Class-based objects can coexist in the same application and communicate with procedure-based objects (persistent procedures). You can use most ABL syntax within classes, and for the most part, you can use it in just the same way as in procedural code.

Class-based programming supports a simplified program structure that can be easier to maintain than procedural code and can facilitate reuse of code among objects. The run-time nature of procedural coding, on the other hand, generally supports a dynamic coding model more easily than does class-based programming. Because you can mix procedures and class-based objects in the same application, you can choose the model that best serves a given programming task in your application.

For more information on object-oriented extensions, see *OpenEdge Getting Started: Object-oriented Programming* in the Product Documentation section of the Progress Software Developer's Network Web site.

See also

Procedural code on page 262
GUI for .NET code on page 263
Write object-oriented code on page 283

GUI for .NET code (Windows only)

GUI for .NET refers to ABL applications that have a graphical user interface built with .NET forms and controls. To develop such applications in Progress Developer Studio for OpenEdge, you use the Visual Designer, which provides an accurate visualization of the GUI as you design it and greatly simplifies the coding process by automating much of the code generation. The Visual Designer is integrated with the ABL Editor, giving you easy access to both the graphical design tools and the ABL source code.

GUI for .NET resources in Progress Developer Studio for OpenEdge are:

- ABL Form
- ABL Dialog
- ABL MDI Form
- ABL Inherited Control
- ABL User Control

These resources are class files that have the same characteristics and requirements as basic classes. When you create a GUI for .NET resource in Progress Developer Studio for OpenEdge, though, it opens in the Visual Designer. By default, when you edit an existing GUI for .NET class, it also opens in the Visual Designer, although you can explicitly choose to open it in the ABL Editor instead.

The Learn About Visual Designer on page 369 subsection of the Progress Developer Studio for OpenEdge online help explains how to use the tools.

See also

Learn About Visual Designer on page 369
Object-oriented code on page 263
Develop a visual container on page 380
Write object-oriented code on page 283

AppBuilder code

Progress Developer Studio for OpenEdge includes, on Windows only, an OpenEdge AppBuilder perspective, which allows you to run the AppBuilder embedded in an Eclipse view. When you do so, you have access to the AppBuilder design tools, but you use the ABL Editor (rather than the Section Editor) to edit the source code.

AppBuilder resources in Progress Developer Studio for OpenEdge are:

- ABL Structured Procedure
- ABL Structured Include

When you create such resources, Progress Developer Studio for OpenEdge automatically generates default AppBuilder markup. These resource types are supported on non-Windows platforms, even though the AppBuilder itself runs only on Windows.

You have access to the built-in AppBuilder online help while using the ADM tools in Progress Developer Studio for OpenEdge.

See also

AppBuilder properties page (Windows only) on page 77

Excluded resources

In a Progress Developer Studio for OpenEdge project, you can exclude or include compilable resources (like `.p`, `.cls`, or `.htm`) from your project build. **Exclude from Build** excludes the selected resources from the build and **Include in Build** includes the resources that were excluded from the build previously. You can access these options from the context menu of the resource or from the **Source** tab of the **Build** properties page.

Note: See Editor Colors options on page 336 and Editor Build options on page 334 for the list of compilable file extensions defined for your project.

The excluded resources entries are saved to the **Excluded** node on the **Source** tab, and only the entries that are present under the **Source** tab are considered for building. The Progress Developer Studio for OpenEdge compiler checks the exclusion entries before compiling a file. Once a file is excluded, then the r-code of that file is deleted. If the earlier excluded file is now included, then the respective file is compiled and the corresponding r-code for it is created. The project is compiled (**r-code** is generated) only when the relative path of the project being included does not match with any other resource relative path, which is at the top of order on **Source** tab.

When you remove the **ROOT** node or last existing node from the **Source** tab, a warning message appears as Removing all entries from the Source tab results in no resources being built: 'Do you want to continue?'. Only the entries that appear under **ROOT** node on the **Source** tab gets built automatically. However, you can manually compile the files in your project.

See also

Progress OpenEdge properties page on page 75
Build properties page on page 79
PROPATH properties page on page 85
Exclude resources from the build on page 315
Include resources in the build on page 317
Build resources using working sets on page 318
Compile, test, and run ABL programs on page 310

ABL Editor Features

This topic is a summary of the main features that the ABL Editor offers to help you increase productivity and efficiency when developing ABL applications.

See also

Learn About ABL Editor on page 261

Format and display features

The ABL Editor offers several features that help you format your ABL code for readability and consistency. These features include:

- **Code folding** — Code folding temporarily hides sections of your code so that you can more easily scan the broader structure. Examples of code sections that you can fold are include files, internal procedures, functions, and methods.
- **Color coding** — The ABL Editor displays different syntax elements in different colors to make them easy to recognize at a glance. You can use the default color scheme or go to the ABL Editor Preferences page to create your own.
- **Keyword casing** — You can elect to have the ABL Editor display syntax keywords in all uppercase or all lowercase characters, or just as you type them. Your casing preference can be applied as you type, on demand, or when you save the file.
- **Code formatting** — The ABL Editor can help you format the code, when you type or paste it. If you select the specific checkboxes in the code formatter preference tab, you can view the formatted code in the editor in the **Preview** pane and after manually applying it.
- **Keyword expansion** — The ABL Editor can expand abbreviated keywords to their fully spelled equivalents (for example, changing DEF to DEFINE), either as you type or on demand.
- **Indentation and alignment** — The ABL Editor can help you improve readability by automatically indenting lines as you type, when you paste text, or on demand. A separate option (tabular formatting) lets you automatically left-align like elements of statements within a code block, further improving readability.

See also

Format and displaying code on page 294
ABL Editor preferences on page 329
ABL Editor menus on page 343

Navigation features

Available tools and techniques for navigating easily through ABL source files include:

- **Outline view** - This view, part of the default OpenEdge Editor perspective, shows all structural elements of the current file, grouped by category. Clicking on a node in the outline takes you quickly to the corresponding location in the code.
- **Quick outline** - Similar to the Outline view, Quick Outline appears on demand in a pop-up window and offers several options for viewing and navigating the code structure.
- **Opening included files** - The context (right-click) menu in the ABL Editor lets you open an include file declared in the current file. You can also open include files from the Outline view and Quick Outline.
- **Preprocessor view** - This view displays code obtained after all the preprocessors (include files, preprocessor definitions, and logic) are expanded. Syntax coloring and highlighting are applied to the code in the **Preprocessor** view, so it appears the same as the code in the ABL Editor.

See also

Navigate on page 296

Code assistance

The ABL Editor offers several forms of assistance to facilitate writing ABL code. Assistance options are grouped into two categories: context assistance and code-completion assistance.

Context assistance includes the following options:

- **Help as you type** -When you type a keyword followed by a space, a pop-up window shows syntax that is valid to complete the line you are typing.
- **Bracket-matching** - A marker indicates the paired element, such as a bracket or a keyword that begins or ends a code block, corresponding to the element at the current cursor position.
- **Hover help** - When you stop the cursor over an ABL statement, a database field reference, or a system handle, a pop-up window shows relevant syntax help.

Code completion assistance reduces errors and saves typing by automatically entering text. It includes the following options:

- **Syntax completion** - When you press CTRL+SPACE, the ABL Editor shows a list of syntax elements that are valid for the context. You can select a proposal from the list to enter it automatically.
- **Auto-bracketing** - When you type the first of two paired elements, such as an opening parenthesis or bracket, the corresponding closing element is automatically entered.
- **Preprocessor proposals** - Displays proposals for built-in or defined preprocessors. The value of the preprocessors at the selected offset is used to evaluate the proposals.

You set your preferences for these assistance options at the **Editor Preferences** page.

See also

Use assistance features on page 287
Work with preprocessor elements on page 301
Editor Assistance options on page 332

Code annotations

ABL annotations enable you to include meta data in your source code. Among the many uses for ABL annotations are identifying procedures and user-defined functions for use with the Progress Sonic Enterprise Service Bus (ESB), and indexing your code base with the OpenEdge Meta Catalog. The compiler treats annotations as comments, so they do not affect how your code runs.

The ABL Editor provides a wizard that simplifies the task of adding annotations to selected files. The wizard provides templates for ESB and Meta Catalog annotations. You can also add your own custom annotation templates.

See also

Use annotations on page 304
Editor Annotations options on page 331
ABL Annotation content builder on page 699
ABL Annotation syntax on page 700

Code parsing

Many features of the ABL Editor depend on the availability of an accurate in-memory representation of the structure of the ABL code that you are editing. Progress Developer Studio for OpenEdge includes a parser that continuously and automatically analyzes (parses) the code as you edit it. The parser updates the in-memory representation of the code structure. The in-memory representation of the code enables code-completion assistance, an accurate outline in the Outline view, color-coding in the ABL Editor, and many other Progress Developer Studio for OpenEdge features.

The parser performs a new analysis and updates its in-memory representation whenever a change to the code is followed by a specified interval (by default, 300-milliseconds) during which no editing activity occurs. In other words, while you type, delete, or move text in an ABL source file, the parser waits for a pause. As soon as the 300-millisecond interval elapses with no changes, the parser performs an update.

If you are working on large files, you might find that performance improves when you increase the default 300-millisecond interval. You can adjust the interval for re-parsing on the Editor Assistance preference page. From the main menu of Progress Developer Studio for OpenEdge, go to **Window** > **Preferences** > **Progress OpenEdge** > **Editor** > **Assistance**.

See also

Use code-completion features on page 290
Add SQL connection profiles on page 332

Support for structured error handling

Many Progress Developer Studio for OpenEdge file-creation and code-generation tools provide options to include ABL code for structured error-handling features. These options, available in the appropriate wizards and menus, are:

- Include the routine-level error-handling statement `ROUTINE-LEVEL ON ERROR UNDO, THROW` when creating new classes and procedures. This option is selectable in the file-creation wizard.
- Include a `CATCH` block and/or a `FINALLY` block when adding a new function, internal procedure, or method. These options are selectable in the code-generation wizard.
- Add a `CATCH` block and/or a `FINALLY` block surrounding selected code in an existing ABL source file. These commands are available on the **Source** > **Surround With**. The blocks are also included in code-assistance completion proposals where applicable.

See also

Create ABL source files on page 279
Write procedural code on page 281
Write object-oriented code on page 283
Code-generation wizards on page 347

Finding references

Progress Developer Studio for OpenEdge helps you find all occurrences of a specific ABL construct in an ABL file, project, or workspace. It enables you find declarations, references, and occurrences of procedural and object-oriented ABL constructs such as procedures, functions, methods, fields, and variables through editors, menu items, and views.

The references to the following are not found:

- System level members for example, Integer function
- Files that reside on network file paths
- Constructs in r-code
- Constructs in file types other than `.i`, `.w`, `.cls`, or `.p` file, for example, `spring.xml` or `JSON` file
- Constructs in speedscript files
- Dynamic instances such as dynamic casts that use expression values, expressions used as parameters, statements that include pre-processors, and handles.

Progress Developer Studio for OpenEdge lets you find references to the following ABL constructs:

- **Include file**

You can find references to Include file (.i), Procedure file (.p), or class in an Include file in a project or a workspace. The search depends on PROPATH; any path specified in procedure or function is relative to the order of entries of the relevant resource in the PROPATH project. If the path in an Include statement resolves to two resources in PROPATH, the reference to the entry that is listed first in the order is displayed. However, the references are not found if the Include statement has a pre-processor value instead of an include file name in text format, for example, as follows:

```
&SCOPED-DEFINE INCLUDE_FILE_NAME custom.i

/* Include statement with file name */
{custom.i}

/* Include statement with pre-processor value */
{{&INCLUDE_FILE_NAME}}
```

- **Internal procedure or user defined function**

  You can find references to an internal procedure or a User-defined function (**UDF**) defined in a Procedure (.p) file or an Include (.i) file. All the references to the internal procedures in the RUN statement and the function calls in the same file are found. However, the references in the other files that invoke the internal procedure using handle variables and references to a **UDF** that is invoked as a dynamic function using the DYNAMIC-FUNCTION statement are not found. The reference to Procedure (.p) file included as a pre-processor directive is also not found.

  The following example displays the RUN statement with a procedure name and expression:

```
DEFINE VARIABLE procName AS CHARACTER.

procName = "myProcedure".

/* Run with direct internal procedure name */
RUN myProcedure.

/* Run with expression */
RUN value(procName).

/* **********************  Internal Procedures  ********************** */

PROCEDURE myProcedure:

    MESSAGE "Inside Custom.myProcedure"
    VIEW-AS ALERT-BOX.

END PROCEDURE.
```

  The following example shows you how to create a handle:

```
/* HandleTest.p: Invoking an internal procedure using handle*/
DEFINE VARIABLE h AS HANDLE NO-UNDO.

RUN zsource.p PERSISTENT SET h.

RUN intProc in h.
```

  The following example shows you how to create Source.p for the above handle:

```
/* Source.p : Procedure file with an internal procedure */
PROCEDURE intProc:

message "in zSource.p>intProc" VIEW-AS ALERT-BOX.

END PROCEDURE.
```

The following example displays the DYNAMIC-FUNCTION statement:

```
/* h-FuncProc.p -- contains CtoF and other possible useful functions. */
FUNCTION CtoF RETURNS DECIMAL (INPUT dCelsius AS DECIMAL):
RETURN (dCelsius * 1.8) + 32.
END FUNCTION.


/* Custom.p */
DEFINE VARIABLE dTemp     AS DECIMAL NO-UNDO.
DEFINE VARIABLE hFuncProc AS HANDLE  NO-UNDO.
DEFINE VARIABLE func-name AS CHARACTER NO-UNDO INIT "CtoF".

RUN h-FuncProc.p PERSISTENT SET hFuncProc.

REPEAT dTemp = 0 TO 5:
   DISPLAY dTemp LABEL "Celsius"
   /* Invoking function defined in other procedure dynamically */
   DYNAMIC-FUNCTION (func-name IN hFuncProc, dTemp) LABEL "Fahrenheit"
   WITH FRAME f 10 DOWN.
END.

DELETE PROCEDURE hFuncProc.
```

- **External procedure**

  You can find references to an external procedure in a project or a workspace, the functionality evaluates all the ABL resources and invokes the RUN statement. However, if the RUN statement uses an expression to evaluate the external procedure name dynamically, the references are not found.

  The following is an example of the RUN statement with an external procedure name, and path and expression:

```
DEFINE VARIABLE procName AS CHARACTER.
procName = "custom".

/* Run using external procedure name */
RUN custom.p.

/* Run with expression value */
RUN value(procName + ".p")
```

- **Variable**

  You can find references to a variable defined in a procedure or class in the working file. Finding references to SHARED and GLOBAL variables are limited. A SHARED variable is created in a source procedure and accessed by all other procedures. There can be multiple source procedure files for a single consumer procedure, so the value of the variable depends on the source being executed and hence the SHARED variable is found only in the source procedure.

  The following example displays two source procedures, Source1.p and Source2.p that run the consume.p procedure. The value of the SHARED variable sharedVar in consumer.p depends on the source procedure that is being executed.

  The following code shows how to create Source1.p:

```
/* Source1.p : Creating new shared variable */
DEFINE NEW SHARED VARIABLE sharedVar AS CHARACTER.

/* Initialize shared variable */
sharedVar = "This is source1".


/* Statically invoked */
RUN consume.p.
```

The following code shows how to create `Source2.p`:

```
/* Source2.p : Creating new shared variable */
DEFINE NEW SHARED VARIABLE sharedVar AS CHARACTER.

/* Initialize shared variable */
sharedVar = "This is source 2".

/* Statically invoked */
RUN consume.p.
```

The following code shows how the shared variable is used:

```
/* consume.p : Defining shared variable */
DEFINE SHARED VARIABLE sharedVar AS CHARACTER.

/* Accessing shared variable value set in source procedure */
MESSAGE sharedVar
VIEW-AS ALERT-BOX.

sharedVar = "02".
```

- **Temp table or DataSet**

  You can find references to a temp table or a DataSet defined in the current Procedure (`.p`) file, Class (`.cls`) file, AppBuilder (`.w`) file, or in an Include (`.i`) file. If the temp table or DataSet is defined in the Include, Class, or Procedure file then the functionality searches for the reference in all the files including the temp tables and DataSets. However, the references to a shared temp table or DataSet are not found as they are available to other procedures only till the procedure that defined it, runs.

The following example displays temp-item temp table including two fields and two indexes. You can find references to the temp table, fields, or index. For example, if you find references to temp-item, Progress Developer Studio for OpenEdge displays all the references to temp-item including the fields that qualify with the specified temp table.

```
DEFINE TEMP-TABLE temp-item
    FIELD cat-page  LIKE Item.CatPage
    FIELD inventory LIKE Item.Price LABEL "Inventory Value"
    INDEX cat-page IS PRIMARY cat-page  ASCENDING
    INDEX inventory-value     inventory DESCENDING.

DEFINE VARIABLE cutoff      NO-UNDO LIKE item.price.
DEFINE VARIABLE inv-value   NO-UNDO LIKE item.price.
DEFINE VARIABLE report-type AS INTEGER NO-UNDO INITIAL 1.
DEFINE BUTTON ok-butt     LABEL "OK" AUTO-GO.
DEFINE BUTTON cancel-butt LABEL "CANCEL" AUTO-ENDKEY.
FORM  cutoff LABEL "Inventory Lower Cutoff for each Catalog Page"
AT ROW 1.25 COLUMN 2  report-type LABEL "Report Sorted ..."
AT ROW 2.25 COLUMN 2
VIEW-AS RADIO-SET RADIO-BUTTONS "By Catalog Page",   1,
"By Inventory Value",
2 SKIP  ok-butt cancel-butt  WITH FRAME select-frame SIDE-LABELS WIDTH 70
TITLE "Specify

Report ..." VIEW-AS DIALOG-BOX.
FOR EACH Item BREAK BY Item.CatPage:
    ACCUMULATE Item.Price * Item.OnHand (SUB-TOTAL BY Item.CatPage).
    IF LAST-OF(Item.CatPage) THEN
    DO:
        inv-value = ACCUM SUB-TOTAL BY Item.CatPage
        (Item.Price * Item.OnHand).
        CREATE temp-item.
        temp-item.cat-page = Item.CatPage.
        inventory = inv-value.
    END.
END. /* FOR EACH item */
ON CHOOSE OF ok-butt
    DO:
        HIDE FRAME select-frame.
        IF report-type = 1 THEN
            FOR EACH temp-item USE-INDEX cat-page WITH FRAME rpt1-frame:
                IF inventory >= cutoff THEN
                DISPLAY temp-item.cat-page inventory.
            END.
        ELSE
            FOR EACH temp-item USE-INDEX inventory-value WITH FRAME rpt2-frame:
                IF inventory >= cutoff THEN
                DISPLAY temp-item.cat-page inventory.
            END.
        VIEW FRAME select-frame.

    END.
ENABLE ALL WITH FRAME select-frame.
WAIT-FOR CHOOSE OF cancel-butt OR WINDOW-CLOSE OF CURRENT-WINDOW.
```

The following example displays the dsStudent DataSet. When you find references to this DataSet, Progress Developer Studio for OpenEdge displays all the references to the dsStudent DataSet.

```
p/*Temp-table definition*/
DEFINE TEMP-TABLE ttCourse NO-UNDO
    FIELD CourseID   AS CHARACTER
    FIELD CourseName AS CHARACTER
    FIELD Duration   AS INTEGER
    FIELD ClgID      AS CHARACTER
    FIELD prereqId   AS CHARACTER
    INDEX test IS UNIQUE ClgID CourseID.

/*Temp-table definition*/
DEFINE DATASET dsStudent FOR ttCourse
    DATA-RELATION relation FOR ttCourse, ttCourse RELATION-FIELDS
      (CourseID, prereqId) RECURSIVE.

DATASET dsStudent:HANDLE.
DEF VAR i AS INT.
DEF VAR h AS HANDLE.

DO i = 1 TO DATASET dsStudent:num-buffers:
    h = DATASET dsStudent:get-buffer-handle(i).
    MESSAGE
        h:NAME SKIP
        h:PARENT-RELATION SKIP
        h:NUM-CHILD-RELATIONS SKIP
        VIEW-AS ALERT-BOX.
END.
```

- **Buffer**

  You can find references to a buffer in the current Procedure (.p) file, Class (.cls) file, AppBuilder (.w) file, or in an Include (.i) file. If the buffer is defined in the Include, Class, or Procedure file then the functionality searches for the reference in all the files. However, the reference to a shared buffer is not found.

  The following example displays how cust buffer is used in proc1 internal procedure. When you find references to this buffer, Progress Developer Studio for OpenEdge displays all the references to the cust buffer.

```
PROCEDURE proc1:
    /*Buffer declaration for Customer table*/
    DEFINE BUFFER cust FOR Customer.
    FOR EACH cust NO-LOCK BY cust.CreditLimit DESCENDING:
        DISPLAY "Highest:" cust.CustNum cust.Name cust.CreditLimit
            WITH 1 DOWN.
        LEAVE.
    END.
    FOR EACH cust NO-LOCK WHERE cust.State = "NH"
        BY cust.CreditLimit DESCENDING:
        DISPLAY cust.CustNum cust.Name cust.CreditLimit.
    END.

END PROCEDURE.
```

- **ABL class level members**

  You can find references to method and variable and class members of a class depending on the access mode and way the members are defined.

- **Class method**

  You can find references to an instance method depending on the access mode. However, references to the DYNAMIC-INVOKE function, the Progress.Lang.Class.Invoke method, method calls with expression as parameters, or other library files are not found.

The following example displays a sample class including the `sayHello` instance method and `sayHi` class method.

```
METHOD PUBLIC VOID sayHello(  ):

  RETURN.

 END METHOD.

 METHOD PUBLIC STATIC VOID sayHi(  ):

  RETURN.

 END METHOD.

END CLASS.
```

The following class uses the Sample class:

```
CLASS TestClass:

    /*defining variable for Sample class*/
    DEFINE VARIABLE var1 AS Sample NO-UNDO.

/*------------------------------------------------------------------------
  Purpose: Test method which calls instance method and class method.
  Notes:
------------------------------------------------------------------------*/
 METHOD PUBLIC VOID test(  ):
  /*Instance method call*/
  var1:sayHello().
  /*Class level method call*/
  Sample:sayHi().
  RETURN.
 END METHOD.

END CLASS.
```

- **Class and interface types**

  You can find all occurrences of object-oriented ABL (class and interface) types that are used in a procedure file, include file, class, and interface. You can search for user-defined types and types from libraries. The search for object-oriented ABL types depends on the project's PROPATH information. Types are resolved based on the PROPATH entries. Types with same names are resolved by their package name. If the package names are the same, then the types are resolved based on the order of the PROPATH entries.

- **Queries**

  You can find references to all instances of a query definition in a procedure file, include file, class, and interface. If the query definition is in an include file, then you can find references to it in all the files that use it. In case of a procedure, you can find its references in the currently open file. If the query definition is in a class or interface and if the query is declared as a private class, then you can find its references in the currently open file; if it is declared as a protected class, then you can find its references in the hierarchy of that class.

  Limitation: In a procedure file, you can declare a query as a shared query, which can be shared by one or more procedures that are directly or indirectly called by the current procedure. The shared query remains available to the other procedures until the procedure that defines it ends. The procedures that are called by the current procedure must define the query with the same name using the DEFINE SHARED TEMP-TABLE statement. When you try to find references of such shared queries, the ABL editor displays only those references that are in the file where the query is defined; the other procedures directly or indirectly accessing the query are not displayed.

The following example illustrates the limitation for finding references to queries. In the example, `Source.p` and `Consumer.p` share the query (`sharedQry`). When the code is executed to find references to `sharedQry` from `Source.p`, only references from the current file (`Source.p`) are displayed; the references from `Consumer.p` are not displayed.

```
/* Source.p : Creating new shared QUERY */

DEFINE NEW SHARED BUFFER sharedBuf FOR Customer.
DEFINE NEW SHARED QUERY sharedQry FOR sharedBuf.

OPEN QUERY sharedQry FOR EACH sharedBuf NO-LOCK.

/* Statically invoked */
RUN shared_query/Consumer.p.


DEFINE SHARED BUFFER sharedBuf FOR Customer.
DEFINE SHARED QUERY sharedQry FOR sharedBuf.

/*Accessing the QUERY shared by Source.p*/

GET FIRST sharedQry.

/*Displaying the Customer details*/

DO WHILE AVAILABLE sharedBuf:
  DISPLAY sharedBuf.CustNum sharedBuf.Name SKIP
    sharedBuf.Phone SKIP sharedBuf.Address
     VIEW-AS EDITOR SIZE 50 BY 2 SCROLLBAR-VERTICAL
    WITH FRAME ord-info CENTERED SIDE-LABELS TITLE "Order Information".

  PAUSE.
  GET NEXT sharedQry.
END.

/* DO WHILE AVAILABLE records */
```

- **Class and interface types**

  You can find all occurrences of object-oriented ABL (class and interface) types that are used in a procedure file, include file, class, and interface. You can search for user-defined types and types from libraries. The search for object-oriented ABL types depends on the project's PROPATH information. Types are resolved based on the PROPATH entries. Types with same names are resolved by their package name. If the package names are the same, then the types are resolved based on the order of the PROPATH entries.

- **Properties**

  You can find references to the ABL properties in a project or a workspace. You can search for the references to the properties that are defined in the current file or in the hierarchy of the current file. You can also find references to properties accessed statically or through class instances.

- **ABL events**

  You can find references to ABL events in a project or a workspace. You can search for the references to events that are defined in the current file or in the hierarchy of the current file. You can also find references to the events accessed statically or through class instances.

- **Data-sources**

  You can find references to ABL data-sources in a project or a workspace depending on where you defined the data-source. If the data-source is defined in an Include (`.i`) file, all the references to the files including that Include file are found. If it is defined in a Procedure (`.p`) or an AppBuilder (`.w`) file, only the reference to the current file is found. If it is defined in a Class (`.cls`) file, the references to the current class file (if the data-source is declared as private) or class hierarchy (if the data-source is declared as protected) are found.

ABLDoc documentation generation

You can generate API documentation (ABLDoc) in HTML format (default) from ABL source code for your reference to your codes outside OpenEdge. You can generate the ABLDoc documentation for the following source codes:

- Class (`.cls`) files
- Procedure (`.p`) files
- Include(`.i`) files

You can generate the ABLDoc documentation using the Generate ABLDoc wizard or by writing ANT tasks for it.

See also

Generate ABLDoc documentation on page 322
Generate ABLDoc wizard on page 361
Navigate through the ABLDoc Navigation page on page 325
Add comments on page 326
Customize ABLDoc output on page 327

The OpenEdge Editor perspective

The default OpenEdge Editor perspective contains several views. Some are standard Workbench views. Some are specific to Progress Developer Studio for OpenEdge. As with all perspectives, you can add or delete views from the OpenEdge Editor perspective. If you want to reset to the default perspective configuration, choose **Window** > **Reset Perspective**.

By default, the OpenEdge Editor perspective includes the following views:

- **ABL Editor**—A code editor customized for working with ABL. You can have multiple ABL source files open simultaneously in separate editor buffers.
- **Project Explorer**—A hierarchical view of the projects and resources in your Eclipse workspace.
- **Outline**—A list of the structural elements of the file that has focus in the ABL Editor.
- **DB Structure**—An OpenEdge view that displays the schema of connected databases. You can drag and drop schema elements (tables, fields, and others) from this view into a file open in the ABL Editor.
- **Console**—A Workbench view that displays the text output from commands (run-time startup, for example).
- **Problems**—A log of the errors, warnings, and other information associated with a file that has been opened in the ABL editor.
- **Tasks**—A to-do list.

See also

ABL Resources in Progress Developer Studio for OpenEdge on page 262
ABL Editor Features on page 265
Use the Outline view on page 296
Work with databases on page 293
Learn About ABL Editor on page 261

Learn About ABL Editor on page 261

Tasks

Set Editor options

Editor options can be set by:

- Set Eclipse editor preferences on page 277
- Set ABL Editor preferences on page 277
- Associate custom file extensions with the ABL Editor on page 278

Set Eclipse editor preferences

The OpenEdge Editor is the standard Eclipse text editor customized for working with ABL. The OpenEdge Editor inherits behavior from the preferences you set for all text editors.

To set these general editor preferences, choose **Windows** > **Preferences** > **General** > **Editors**. On these preference pages, you can set file associations, tab spacing, line numbers, the Eclipse "Quick Diff" functionality, and other features that affect all text editors in the Workbench. For information on the Eclipse text editor preferences, see the Editors topic in the *Workbench User Guide*.

Eclipse lets you compare text files by selecting the files in the **Project Explorer** view, right-clicking, and selecting **Compare With** from the context menu.

You can choose the font used for the display of the files being compared.

To choose the font:

1. Select **Window** > **Preferences** > **General** > **Appearance** > **Colors and Fonts**.
2. In the list in the right pane, expand the **Text Compare** node and select **ABL Compare Editor** font.
3. Do one of the following:
   - If you want to use the default system font styles, click **Use Style, Font**.
   - If you want to select your own font styles, click **Edit**. The **Font** window appears. Go to Step 4 on page 277.
   - If you want to reset the font settings to default, click **Reset**.
4. Select the font styles and click **OK**.

See also

Set ABL Editor preferences on page 277
Associate custom file extensions with the ABL Editor on page 278
ABL Editor preferences on page 329

Set ABL Editor preferences

Use preference settings to modify the behavior of the OpenEdge ABL Editor.

To modify the behavior of the ABL Editor:

1. Select **Window** > **Preferences**. The **Preferences** window appears.
2. Select the **Progress OpenEdge** > **Editor** node. The Editor options page appears with settings for indentation style, keyword case, and automatic expansion of keywords and schema references. See also Editor options on page 329.
3. Expand the **Editor** node to select from the following pages:
   - **Annotations** — A tool for creating and managing annotation templates
   - **Assistance** — Options for syntax help and code completion
   - **Build** — Options for how the Editor handles files with certain extensions
   - **Code Formatter** — Options for how the Editor handles formatting of codes
   - **Colors** — Options for color-coding of syntax elements
   - **Templates (macros)** — A tool for creating and managing macro definitions for recalling stored strings
4. Once you have made changes to the **Editor** preference settings, click **Apply** to save your changes.

Note: Click **Restore Defaults** to reset **Editor** preferences to their default values.

See also

Set Eclipse editor preferences on page 277
Associate custom file extensions with the ABL Editor on page 278
ABL Editor preferences on page 329

Associate custom file extensions with the ABL Editor

If you use custom file extensions for your OpenEdge files, you need to associate those extensions with the ABL Editor. To do so, you set both general Eclipse editor preferences and OpenEdge-specific Editor preferences:

1. Choose **Window** > **Preferences**. The **Preferences** window appears.
2. Choose **General** > **Editors** > **File Associations**. The **File Associations** page appears.
3. Click **Add for the File types list**. The **New File Type** dialog appears.
4. Type your custom file extension and click **OK**.
5. Select your file extension in the File types list.
6. Click **Add for the Associated editors list**. The **Editor Selection** dialog appears.
7. Select one of the OpenEdge ABL Editor options and click **OK**.

Note: The only difference among these options is the icon used to represent the files that it opens. All the choices are functionally the same.

8. Select **Progress OpenEdge** > **Editor** > **Build** in the **Preferences** window. The **Build** page appears.
9. Add your custom file extension to the appropriate list and click **Apply** to save your changes.

See also

Set ABL Editor preferences on page 277
Set Eclipse Editor preferences on page 277
Editor Build options on page 334

Write ABL code

The details about writing ABL code is mentioned below.

- Create ABL source files on page 279
- Use comments on page 280
- Use templates for easier text entry on page 280
- Compare files on page 281
- Remove AppBuilder markup on page 281
- Write procedural code on page 281
- Write object-oriented code on page 283
- Use assistance features on page 287
- Work with databases on page 293
- Format and displaying code on page 294
- Navigate on page 296
- Work with preprocessor elements on page 301
- Use annotations on page 304
- Work with Organize USING Statements on page 307

Create ABL source files

Progress Developer Studio for OpenEdge provides wizards for creating commonly used ABL file types:

- Class
- Include file
- Interface
- Procedure
- Structured include file (contains AppBuilder markup)
- Structured procedure (contains AppBuilder markup)
- ABL Form (Windows only)
- ABL Dialog (Windows only)
- ABL MDI Form(Windows only)

These wizards create files with placeholders and default values and comments for commonly used code sections, simplifying the process of setting up a variety of source files. If you prefer, you can create a new blank file and enter all of the content yourself. As long as you use a file extension that is associated with the ABL Editor, you can use the ABL Editor functions when working with it.

To create a new source file:

1. Open the OpenEdge project in which you plan to use the file.
2. Choose **File** > **New**. If the desired file type does not appear in the menu, choose **Other** > **Progress OpenEdge** > **Editor**.
3. Select the desired file type and click **Next** to launch the corresponding wizard.
4. Fill in the appropriate information for your new file.
5. Click **Finish**. The file opens in an ABL Editor window.

See also

ABL Resources in Progress Developer Studio for OpenEdge on page 262
Write procedural code on page 281
Write object-oriented code on page 283
Compile, testing, and running ABL programs on page 310
Code-generation wizards on page 347

Use comments

You can quickly "comment out" and uncomment blocks of your code. Commented blocks are ignored by the compiler and not treated as part of the program syntax.

To use this ABL Editor feature:

1. Select the lines that you want to comment or uncomment.
2. Right-click and select **Source** > **Toggle Comment or type CTRL+/** .

   If the selected block is not commented, the comment-delimiter characters (/* and */) are inserted at the beginning and end of the block. If the selected block is commented, the delimiter characters are removed from the beginning and end of the block. In both cases, the ABL Editor changes the text color to match the settings in the Editor Color preferences.

See also

Editor Colors options on page 336

Use templates for easier text entry

Templates are custom character sequences that the ABL Editor automatically expands into ABL statements. Using editor templates, you can facilitate programming tasks by reducing the amount of typing required. For example, you can type "DVCH" to enter a template definition for a character variable into a file: "DVCH" expands to `DEFINE VARIABLE AS CHARACTER NO-UNDO` and positions the cursor after "VARIABLE" to allow you to enter the variable name. The ABL Editor includes predefined macro definitions, referred to as templates in the Eclipse environment, that automatically expand to more complex strings. You can add, modify, and delete macros through the **Templates** preferences page.

1. To use a template (macro) while working in an ABL source file, type the template name and press SPACE to expand it to the defined full string.
2. To manage the set of available templates, go to the **Templates (Macros)** page in Editor preferences:

a) Choose **Window** > **Preferences**. The **Preferences** window appears.

b) Choose **Progress OpenEdge** > **Editor** > **Templates (Macros)**. The **Templates** page appears. The page displays the list of existing templates.

c) To modify a template, click **Edit** and make the desired changes. Click **Apply** to save your changes.

3. At this page, you can also click **New** to create templates, click **Import** to add templates from other workspaces, or click **Export** to make templates available for use in other workspaces.

See also

Use assistance features on page 287
Editor Templates (Macros) options on page 337

Compare files

To compare ABL files in Progress Developer Studio for OpenEdge:

1. Select two files in the **Project Explorer** view.
2. From the context menu, select **Compare With** > **Each Other**. The ABL files appear in the Eclipse Compare Editor. The files are color-coded as in the ABL Editor.

Note: You can compare three files if one file is the common ancestor of the other two.

Remove AppBuilder markup

Files created in AppBuilder contain code that enables it to parse the file. If you remove these statements, you cannot edit the file in AppBuilder. However, if you no longer intend to maintain a file with AppBuilder, these statements serve no further purpose.

You can remove these statements by choosing **Source** > **Strip AppBuilder markup** from the ABL Editor context (right-click) menu.

See also

AppBuilder code on page 264

Write procedural code

Add functions

The OpenEdge Editor provides a wizard that helps you add a new function to an ABL source file. To use this wizard:

1. Choose **Source** > **Add Function**. The **Add Function** dialog appears.
2. If the current file is an ABL procedure file, then go to step 3.

   Otherwise, if the current file is an AppBuilder procedure (adm1 or adm2) file, do one of the following:

   - Select the **Function** option to create a function.
   - Select the **Override** option to have the **Name** field display a list of the user-defined functions that you can override.

Note: The **Override** option is disabled when there are no functions to override.

3. In the **Name** field, specify a function name.

Note: If you have selected the **Override** option, the **Name** field displays a list of user-defined functions that you can override. Select a function that you want to override.

4. Select a return type, and select whether the function is private. Also choose whether to include a `CATCH` block and/or a `FINALLY` block for structured error-handling.
5. Choose an insertion position. The Insertion position field gives you the following options:
   - **Alphabetical order** - Insert a code prototype based on its name. Case is ignored.

     Note: This feature does not sort the procedures, functions, methods, or properties that already exist in the file. If they are already ordered alphabetically by name, insertion of new code will be done at the correct position in the list. Otherwise, insertion will be the first valid alphabetic position found during a top-to-bottom lookup.

   - **Cursor position** - Insert code prototype at the current position of the cursor in the file.
   - **First/Last** - Insert the code prototype as the first or last item
   - **After *name*** - Insert the code prototype after the named procedure.
6. Click **OK**.

The OpenEdge Editor inserts a prototype for the function. You can fill in and modify the prototype as appropriate.

See also

Support for structured error handling on page 268
Add Procedure wizard on page 353
Add Procedure wizard on page 353

Add internal procedures

The OpenEdge Editor provides a wizard that helps you add internal procedures to a procedure file. To use this wizard:

1. Select **Source** > **Add Procedure**. The **Add Procedure** dialog appears.
2. If the current file is an ABL procedure file, then go to Step 3.

   Otherwise, if the current file is an AppBuilder procedure (adm1 or adm2) file, do one of the following:
   - Select the **Procedure** option to to create a procedure.
   - Select the **Override** option to have the **Procedure name** field display a list of the procedures for which you can create overrides.

     Note: This list is the internal procedures of all or Super Procedures defined for the procedure file. This option is disabled when there are no procedures to override.

3. In the **Procedure name** field, specify a procedure name. Also choose whether to include a `CATCH` block and/or a `FINALLY` block for structured error handling.
4. Choose an insertion position.
   - **Alphabetical order** - Insert a code prototype based on its name. Case is ignored.
   - **Cursor position** - Insert code prototype at the current position of the cursor in the file.
   - **First/Last** - Insert the code prototype as the first or last item.
   - **After name** - Insert the code prototype after the named procedure.
5. Click **OK**.

The OpenEdge Editor inserts the internal procedure.

See also

Support for structured error handling on page 268
Add functions on page 281
Add Procedure wizard on page 353

Write object-oriented code

Add constructors

When you create a new class, you can add a default constructor by selecting the **Default constructor** method stub in the **New ABL Class** wizard.

You can add constructors to an existing class as follows:

1. Choose **Source** > **Add Constructor** to launch the **Add Constructor** wizard.
2. Select the appropriate access modifier (**Public**, **Package-Protected**, **Protected**, **Package-Private**, or **Private**).
3. Choose whether to include a CATCH block and/or a FINALLY block for structured error handling.
4. Select the insertion position for the constructor and click **Generate**. The constructor appears at the specified position in your class file.

Note: You can also add a static constructor to an existing class by choosing **Source** > **Add Static Constructor**.

See also

Object-oriented code on page 263
Support for structured error handling on page 268
Add constructors from a super class on page 349
Add a destructor on page 284
Add Constructor wizard on page 348

Add constructors from a super class

The object-oriented extensions of the ABL enable you to overload constructors from a super class. To do so:

1. Choose **Source** > **Add Constructors from super class** to launch the Add Constructors from **Super Class** wizard.
2. Select the constructors to overload from the list of available constructors in the super class.
3. Click **Generate**. The constructors are added to the code at the specified insertion position.

Note: This option is disabled if the super class includes no constructors with parameters.

See also

Object-oriented code on page 263
Add constructors on page 283
Adding a destructor on page 284
Add Constructors from Super Class wizard on page 349

Add a destructor

When you create a new class, you can add a destructor by selecting the **Generate destructor** toggle in the **New ABL Class** wizard. You can add a destructor to an existing file by choosing **Source** > **Add Destructor**. The editor adds the destructor at the current cursor position.

Note: A class can have only a single destructor.

See also

Object-oriented code on page 263
Add constructors on page 283
Add constructors from a super class on page 349

Add methods

You can add methods to a class as follows:

1. Choose **Source** > **Add Method** to launch the **Add Method** wizard.
2. Fill in the appropriate information for the new method. Help text appears in the title pane to describe the purpose of the field that has focus.
3. Click **Generate**. Progress Developer Studio for OpenEdge inserts the method at the place specified in the **Insertion position** field. You have the following options:

   - **Alphabetical order** - Insert the code prototype at a position determined by its name. Case is ignored.

     Note: This feature does not sort the procedures, functions, methods, or properties that already exist in the file. If they are already ordered alphabetically by name, the code is inserted at the correct position in the list. Otherwise, the code is inserted at the first valid alphabetic position found during a top-to-bottom lookup.

   - **Cursor position** - Insert the code prototype at the current position of the cursor in the file.
   - **First/Last** - Insert the code prototype immediately before/after the first/last item currently in the class.
   - **After *name*** - Insert the code prototype after the named item.

See also

Object-oriented code on page 263
Override members on page 286
Code methods implemented via interface or abstraction on page 286
Add Method wizard on page 352

Add events

You can add events to a class as follows:

1. Choose **Source** > **Add Event** to launch the **Add Event** wizard.
2. Fill in the appropriate information for the new event. Help text appears in the title pane to describe the purpose of the field that has focus.
3. Click **Generate**. Progress Developer Studio for OpenEdge inserts the event at the place specified in the **Insertion position** field. You have the following options:

   - **Alphabetical order** - Insert the code prototype at a position determined by its name. Case is ignored.

     Note: This feature does not sort the procedures, functions, methods, or properties that already exist in the file. If they are already ordered alphabetically by name, the code is inserted at the correct position in the list. Otherwise, the code is inserted at the first valid alphabetic position found during a top-to-bottom lookup.

   - **Cursor position** - Insert the code prototype at the current position of the cursor in the file.
   - **First/Last** - Insert the code prototype immediately before/after the first/last item currently in the class.
   - **After *name*** - Insert the code prototype after the named item.

See also

Object-oriented code on page 263
Add Event wizard on page 349

Add properties

You can add properties to a class as follows:

1. Select **Source** > **Add Property** to launch the **Add Property** wizard.
2. Fill in the appropriate information for the new property. Help text appears in the title pane to describe the purpose of the field that has focus.
3. Click **Generate**. The editor inserts the property where you specify. The **Insertion position** field gives you the following options:

   - **Alphabetical order** - Insert the code prototype at a position determined by its name. Case is ignored.

     Note: This feature does not sort the procedures, functions, methods, or properties that already exist in the file. If they are already ordered alphabetically by name, the code is inserted at the correct position in the list. Otherwise, the code is inserted at the first valid alphabetic position found during a top-to-bottom lookup.

- **Cursor position** - Insert the code prototype at the current position of the cursor in the file.
- **First/Last** - Insert the code prototype immediately before/after the first/last item currently in the class.
- **After *name*** - Insert the code prototype after the named item.

See also

Object-oriented code on page 263
Add Property wizard on page 354

Override members

The OpenEdge Editor includes an option to ease the task of finding the correct methods, events, and properties to override in your class hierarchy.

1. Select **Source** > **Override/Implement Members** to launch the **Override/Implement Members** wizard.
2. Select the members to override (or implement) from the list of members available in the class hierarchy.
3. Select the desired insertion position.
4. Click **Generate**. The overrides are added at the specified position in the source file.

Note: A green-triangle decorator appears on the marker bar in the ABL Editor next to any member that is an override or overload.

See also

Object-oriented code on page 263
Add methods on page 284
Add events on page 285
Add properties on page 285
Override/Implement Members wizard on page 361

Code members implemented via interface or abstraction

If you specify one or more interfaces when creating a new ABL class, the class must include implementations for all methods, events, and properties declared in those interfaces; otherwise, the class cannot be compiled. Similarly, if the class inherits one or more abstract members from an abstract super class, those members must be implemented (unless the inheriting class is also abstract).

To help you satisfy these requirements, the ABL Editor automatically generates stubs for such members when you create the class. For existing class files that do not include the required members, you can use the **Override/Implement Members** wizard to add them.

You choose whether method stubs added to the file are to include error code, or default return values.

Method stubs automatically generated in new class files

When you use the **New ABL Class** wizard (or any of the Visual Designer form-creation wizards) to create a class file that implements an interface or inherits from an abstract super class, select one of the following options for the method code:

- **Throw a Not Implemented exception**
- **Return default values**

Note that the wizard automatically creates stubs for all of the applicable members, with the method stubs coded according to the option that you select.

Method stubs generated on demand in existing class files

While editing a class file, you can add stubs for any missing members implemented via interface or inherited from an abstract super class. To do so:

1. Select **Source** > **Override/Implement Members**.

   Note: The tree in the **Override/Implement Members wizard** lists all methods, events, and properties declared in the applicable interfaces and/or in the abstract super class but missing from the source file. The members are selected by default for generating stubs. You can deselect any methods for which you do not want to add stubs at this time.

2. Select either **Generate exceptions for required members** or **Generate default values for required members**.
3. Click **Generate** to add the selected member stubs to the class file.

See also

Object-oriented code on page 263
Override/Implement Members wizard on page 361
New ABL Class wizard on page 355

Use assistance features

Use context assistance

Context assistance is non-interactive information about the ABL code base. It does not offer typing shortcuts as code-completion assistance does.

Show syntax help as you type

To show syntax help, type an ABL keyword followed by a space. A list of phrases valid for the context appears in a pop-up window.

This feature is enabled by default. To turn it off or on:

1. Choose **Window** > **Preferences** to open the **Preferences** window.
2. Choose **Progress OpenEdge** > **Editor** > **Assistance** to display the **Assistance** page.
3. Uncheck or check the **Show syntax help as I type** option.

   Note: You can quickly display full entries from OpenEdge Development: ABL Reference in the Eclipse help viewer by highlighting a keyword or phrase in the ABL Editor and Press **SHIFT+F2** or right-click and choose **Keyword Help** from the context menu.

See also

Code assistance on page 266
Use bracket-matching on page 288

Use hover help on page 289
Editor Assistance options on page 332

Use bracket-matching

Bracket-matching provides visual cues illustrating the location of matched pair elements. With bracket-matching enabled, positioning the cursor on one paired element highlights the matching element in the code sequence.

Bracket-matching works with:

- Double and single quotation marks
- Brackets and parentheses ("{", "[", "(")
- Code blocks
- DO, FOR, REPEAT
- FUNCTION, PROCEDURE, METHOD

The code example below illustrates highlighting of the matching element (in this case, a closing parenthesis):

```
IF DataObject <> '' THEN DO:
  setAppService('').
  startDataObject(DataObject).
  DataSourceHdl = dynamic-function("getDataSource").
END.
ELSE DO:
```

Note: Bracket-matching depends on the parsing of the code being up to date. In some circumstances, notably in the case of very large files or projects connected to remote databases, updating the analysis of the code can take several seconds or more. If the code has not been fully analyzed within a user-specified interval (by default 300 milliseconds), the bracket-matching feature is temporarily disabled automatically. The feature is automatically re-enabled as soon as parsing is up to date again.

With the cursor in or immediately to the right of a paired element, press **CTRL+SHIFT+P** to go to the matching element to jump to a matching element. For example, using this key sequence with the cursor in a DO statement repositions the cursor to the right of the corresponding END statement.

Disabling bracket-matching does not disable jumping to the matching element with **CTRL+SHIFT+P**.

This feature is enabled by default. To turn it off or on:

1. Choose **Window** > **Preferences** to open the **Preferences** window.
2. Choose **Progress OpenEdge** > **Editor** > **Assistance** to display the **Assistance** page.
3. Uncheck or check the **Highlight matching elements in code** option.

See also

Code assistance on page 266
Show syntax help as you type on page 287
Use hover help on page 289
Use code-completion assistance on page 290
Editor Assistance options on page 332

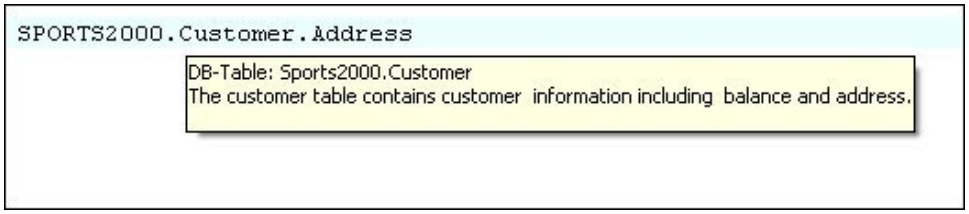
Use hover help

Hover help displays information about database fields, system-handles, and ABL statements when you position the cursor over a particular element in the code.

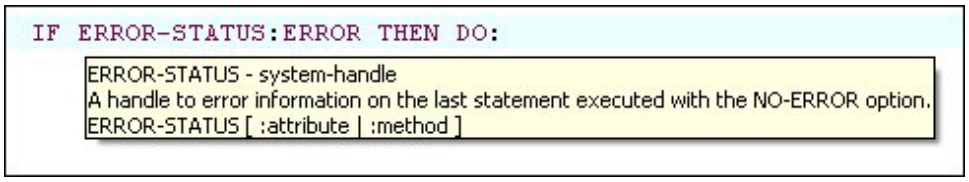
You can disable this feature in OpenEdge Editor Assistance preferences (**Windows** > **Preferences** > **Progress OpenEdge** > **Editor** > **Assistance**).

Note: This feature relies on Progress Developer Studio for OpenEdge's grammar parsing functionality. The text hover appears only for valid syntax. In some cases, a particular use of a keyword might not be indexed separately. Try hovering over another keyword in the statement.

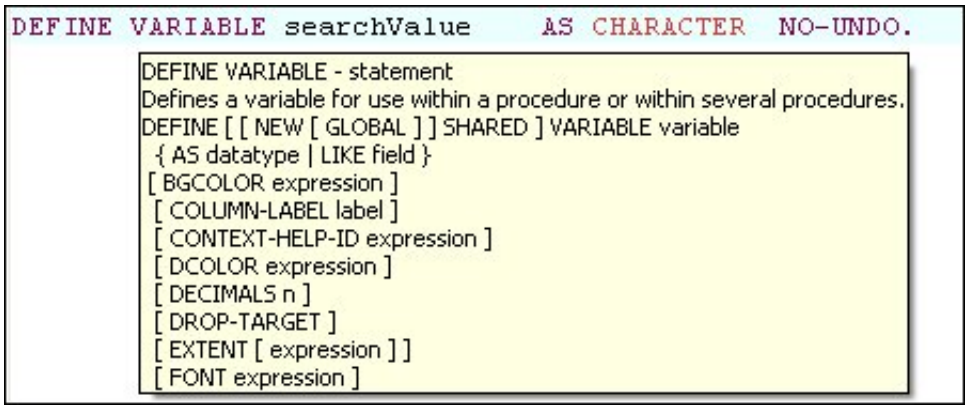
The illustration below provides an example of hover help for a **database** field:



System handles also support hover help, as illustrated below:

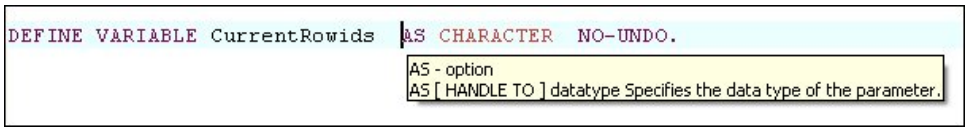


For ABL statements, keywords are treated as multiple parts that together form a statement. For example, DEFINE by itself does not provide hover help; however, when coupled with a type, such as DEFINE VARIABLE, hover help provides additional information:

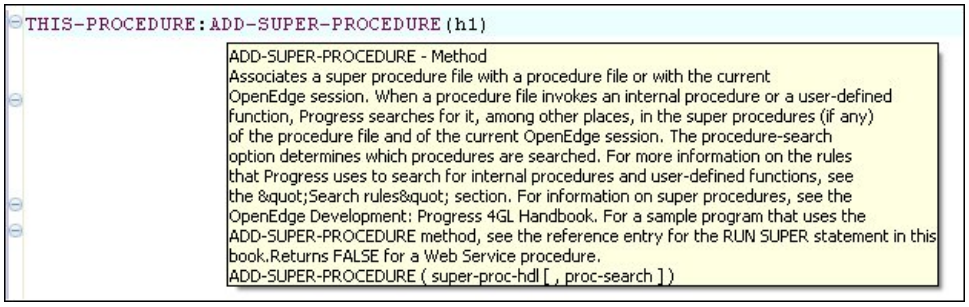


Many optional parameters in ABL statements possess different meanings depending on the statement to which they belong. The hover help for these options and parameters varies based on their use in a particular statement. The **FOR** statement is one such example. This statement can act as a standalone element, or it can serve as an optional parameter for other ABL statements, including **COPY-LOB**, **DEFINE**, **BUFFER**, **DEFINE DATA-SOURCE**, **DEFINE DATASET**, **DEFINE PARAMETER**, **DEFINE QUERY**, **DO**, **FUNCTION**, **OPEN QUERY**, or **REPEAT**.

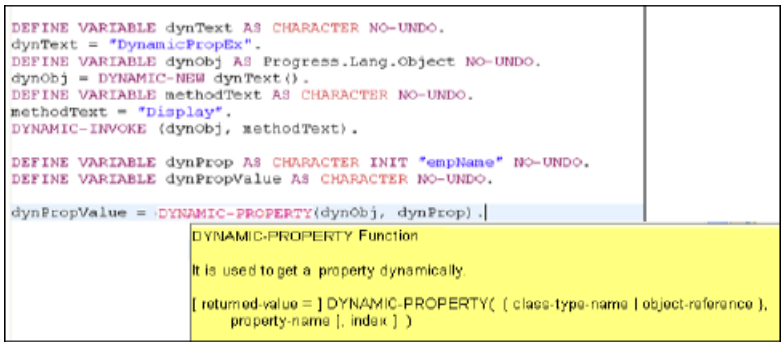
The illustration below shows text hover on an **AS** element in the context of a DEFINE VARIABLE statement:



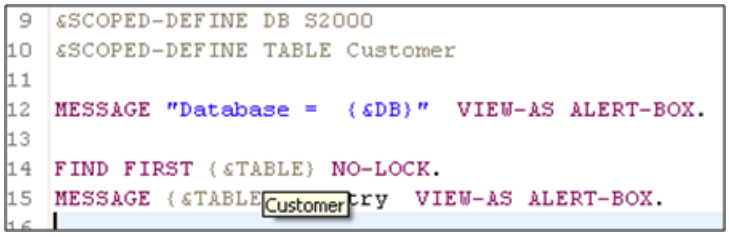
Text hover is also applied on attributes and methods:



The illustration below provides an example of hover pop-up for the DYNAMIC-PROPERTY function:



The illustration below provides an example of hover pop-up for a preprocessor reference:



When you hover over a preprocessor reference, the value of the preprocessor is displayed in a pop-up dialog. For example, in the above illustration, hovering over the preprocessor {&TABLE} displays the current value of preprocessor as Customer in a pop-up dialog. If the preprocessor evaluation is not completed at the time of hovering, no value is displayed in the pop-up dialog.

See also

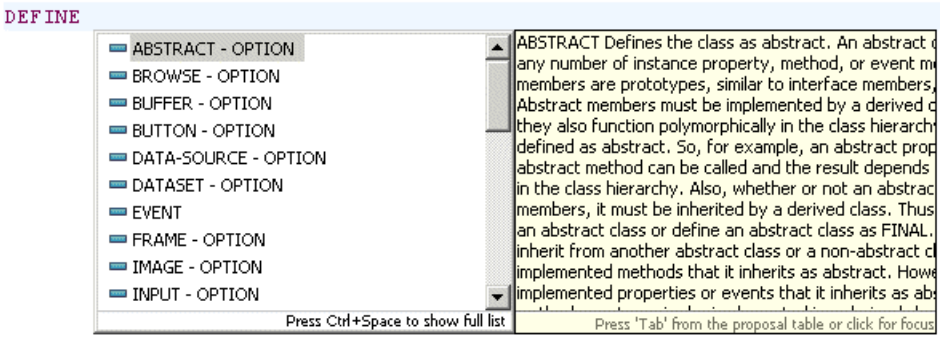
Code assistance on page 266
Show syntax help as you type on page 287
Use bracket-matching on page 288
Editor Assistance options on page 332

Use code-completion assistance

Code-completion assistance can help you save time and reduce typing errors by having the ABL Editor insert syntax elements for you.

Invoke syntax-completion assistance

Syntax-completion assistance proposes syntax to complete the code that you are typing in the ABL Editor. When you press CTRL+SPACE, proposals appear in the left pane of a pop-up window, with reference information about the selected item in the right pane, as in this example:



To insert an element at the current cursor position, select it and double-click or press **ENTER**.

Press CTRL+SPACE to get proposals in any of these contexts:

- ABL keywords
- Object variable and property names that are reserved keywords
- Object references for the CREATE statement
- Procedures names and paths for the RUN statement (based on PROPATH)
- Widget variables and handles
- Parameters of procedures and methods
- Table names for connected databases
- Fields for temp-tables, buffers, and datasets
- Preprocessor names
- Subscripted array references

By default, syntax-completion assistance filters proposals based on context (for example, showing only relevant keywords). Press CTRL+SPACE while the pop-up window is open to toggle between context-filtered proposals and all proposals.

In addition to invoking completion assistance at any time by pressing CTRL+SPACE, you can have the ABL Editor propose completion options automatically when you type a period in a schema reference, or when you type a colon in a handle or object reference. To enable this feature, select the **Automatically propose completion on '.' and ':'** option on the **Editor Assistance Preferences** page.

If you want to see only certain types of syntax-completion proposals, you can suppress the others. Under **Exclude proposals** on the **Editor Assistance Preferences** page, check the categories that you do not want to see.

See also

Code assistance on page 266
Balance code-completion convenience and performance on page 292
Use context assistance on page 287
Editor Assistance options on page 332

Use auto-bracketing

With auto-bracketing enabled, when you entering the first of two paired elements, the matching element is automatically inserted to the right of the cursor. Auto-bracketing works with:

- Double and single quotation marks
- Brackets and parentheses ("{", "[", "(")

Note:

- When you type a single or a double quote mark, the ending quote mark is automatically added. If you start typing in between quote marks and add another ending quote mark, the additional quote mark is not added.
- You can delete an ending character that is automatically added, for example an ending quote mark, by pressing Backspace.
- If you want to insert a quote mark inside existing quote marks, type ~ and add another quote mark.

To enable the insertion of matching elements:

1. Choose **Window** > **Preferences** to open the **Preferences** window.
2. Choose **Progress OpenEdge** > **Editor** > **Assistance** to display the **Assistance** page.
3. Select the **Auto-bracketing** option.

See also

Code assistance on page 266
Balance code-completion convenience and performance on page 292
Use context assistance on page 287
Editor Assistance options on page 332

Balance code-completion convenience and performance

To propose a complete and accurate set of completion options, Progress Developer Studio for OpenEdge must completely analyze all code and schema information in the current ABL Editor buffer. This analysis is an ongoing process, and in many cases the task is completed so rapidly that there is scarcely any noticeable delay between a request for completion assistance and the response to the request. Under certain circumstances, however, the analysis may take several seconds or more, long enough to make waiting for the list of valid options an annoyance. Editing files that are thousands of lines long, and writing code that refers to a database located on a remote system, are examples of situations that can cause an unacceptably slow system response.

Progress Developer Studio for OpenEdge lets you decide how long you are willing to wait for complete, up-to-date code-completion assistance. In Editor Assistance options on page 332, the field labeled **Milliseconds allowed for re-parsing** specifies the maximum amount of time (by default, 300 milliseconds) the ABL Editor will spend updating its analysis before building the list of completion proposals based on the last completed analysis. If this interval elapses before the updated analysis is finished, the completion options that you receive may not be entirely accurate.

The default time allowance of 300 milliseconds should be fine for working on smaller files with local databases, but if your code base requires a relatively long time to be fully parsed, you might want to increase the setting. Note, however, that you cannot enter text while waiting for completion proposals, so a high setting for this value can potentially result in noticeable interruptions to your work.

By default, when the ABL Editor proposes completion options for schema references, it includes field descriptions in the right pane of the pop-up window. In the case of a remote databases, retrieving this information is a time-consuming process that can degrade performance. Therefore, you can choose to disable the inclusion of field descriptions. To do so, deselect the **Show description when proposing schema elements** option in Editor Assistance options on page 332.

See also

Code assistance on page 266
Use context assistance on page 287
Editor Assistance options on page 332

Work with databases

Connecting databases to the project

Most ABL applications work in conjunction with one or more databases, and it is important to define connections between each of your projects and the databases that it will work with. By doing so, you enable the ABL Editor to provide complete syntax checking, code assistance with schema references, and drag-and-drop entry of schema references from the DB Structure view.

To connect a project to a database, follow the procedures detailed in the Progress Developer Studio for OpenEdge's help.

See also

Add existing database connections to a project on page 64
Add a new database connection to a project on page 64
Use the DB Structure view on page 293
Enter schema references on page 294
Database Connections properties page on page 83

Use the DB Structure view

The DB Structure view, included in the default OpenEdge Editor perspective, shows a tree-view outline of the schema of each database connected via a SQL connection profile to the current project. The view includes a separate tab for each database. The nodes are expandable and collapsible.

To enter a schema reference in a source file, select a table or column in the tree view and drag it to the ABL Editor buffer containing the file.

Note: To show the database schema in the DB Structure view, you must use a SQL connection. ABL database connections do not provide this functionality. You can define both an ABL connection and a SQL connection in the connection profile for the database.

If the DB Structure view is not visible in your current perspective, open it by selecting **Window** > **Show View** > **Other** > **Progress OpenEdge Editor** > **DB Structure**.

See also

Connect databases to the project on page 293
Enter schema references on page 294
DB Structure view on page 828

Enter schema references

Several ABL Editor and Progress Developer Studio for OpenEdge features are available to help you enter database schema references in your code:

- **DB Structure view** - Provides a tree-view outline of the schema, with drag-and-drop functionality to enter table and column references in the source code. This feature requires a SQL connection to the database.
- **Expansion of schema element names** - Optionally completes the abbreviated names of tables and columns when you press the space bar. You can turn this feature on or off at the **Editor preferences** page.
- **Prefixing of database names** - Optionally adds the database name when you type a table name. You can turn this feature on or off at the **Editor preferences** page.
- **Schema descriptions in code-completion assistance -** Optionally displays the description for each table or column proposed as a completion phrase. Enabling schema descriptions can have a noticeable performance impact in certain situations, such as the use of a large remote database. You can turn this feature on or off at the **Editor Assistance preferences** page.
- **Hover help** - Optionally shows syntax help when you pause the cursor over a schema reference. You can turn this feature on or off at the **Editor Assistance preferences** page.

See also

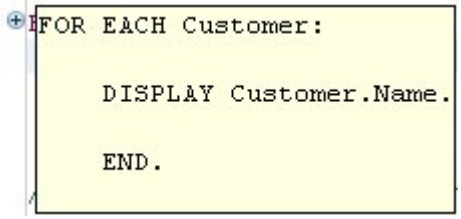
Using the DB Structure view on page 293
Setting ABL Editor preferences on page 277
Editor options on page 329
Editor Assistance options on page 332

Format and displaying code

Use code folding

Code folding temporarily hides sections of your code, such as include files, internal procedures, functions, and methods.

If you can fold a section of code, a ⊖ symbol (minus sign in a blue circle) appears in the **Marker Bar** beside the first line of the section. Click this symbol to collapse the display of the section. When collapsed, you can display the hidden code by hovering the cursor over the icon:



After you fold the code, the first line of the section remains and the symbol changes to ⊕ (plus sign in a blue circle). Click the symbol to expand the section. See Format and display features on page 265 for more details.

Apply keyword casing

To apply your keyword casing preference (upper or lower, as specified at the **Editor preferences** page) to the current file:

1. Optionally, select a block of code to which you want to apply keyword casing. If no text is selected, the entire file will be formatted.
2. Press `CTRL+SHIFT+F` or right-click on the Editor's context menu and select **Source** > **Correct Case**.

Note: At the **Editor preferences** page, you can turn on or off options to have the ABL Editor automatically apply keyword casing as you type and when you save the file.

See also

Format and display features on page 265
Editor options on page 329

Format the Source

The code formatter can be implemented from the Editor's (as specified in the **Editor Code Formatter options** page) context menu.

To apply source code formatting in the current file:

1. Optionally, select a block of code to which you want the formatting to be applied. If no text is selected, the entire souce code will be formatted.
2. Press `CTRL+SHIFT+S` or right-click on the Editor's context menu and select **Source** > **Format Source**.

See also

Format and displaying code on page 265

Expand abbreviated keywords

To expand abbreviated keywords in the current file to their fully spelled equivalents (for example, to change DEF VAR to DEFINE VARIABLE):

1. Optionally, select a block of code in which you want to expand keywords. If no text is selected, the entire file will be formatted.
2. Press `CTRL+SHIFT+1` or right-click on the Editor's context menu and select **Source** > **Expand Keywords**.

Note: At the **Editor preferences** page, you can turn on or off the option to have the ABL Editor automatically expand keywords as you type.

See also

Format and display features on page 265
Editor options on page 329

Indent and align code

To consistently indent lines in the current file for improved readability:

1. Optionally, select a block of code to be indented. If no text is selected, the entire file will be formatted.
2. Press `CTRL+I` or right-click on the Editor's context menu and select **Source** > **Correct Indentation**.

Note: At the **Editor preferences** page, you can turn on or off options to have the ABL Editor automatically indent and align lines as you type and when you paste text, and to enable tabular formatting. The **Correct Indentation** command also applies tabular formatting, if enabled.

See also

Format and display features on page 265
Editor options on page 329

Select display color for code element

You can use the **Colors** page to select the change colors for different code elements in the ABL Editor.

To change color for a code element:

1. From the main menu, select **Window** > **Preferences**. The **Preferences** window appears.
2. Select **Progress OpenEdge** > **Editor** > **Colors**. The **Colors** page appears.
3. Select a display color for a code element by clicking the color button. The **Color** dialog appears.
4. Do one of the following:
   a) Select from the list of available basic or custom colors.
   b) Click **Define Custom Colors** to define a custom color from the color palette.
5. Click **OK** to save your changes.

See also

Format and displaying code on page 265
Editor Colors options on page 336

Navigate

Use the Outline view

The **Outline** view shows the structure of the code in the ABL Editor buffer that currently has focus, and provides an easy way to navigate to specific places in the code. The elements inside the inactive preprocessor regions appear in gray in the **Outline** view. This is similar to include nodes but without the include decorator.

If the **Outline** view is not visible in your current perspective, open it by selecting **Window** > **Show View** > **Outline**.

The **Outline** view supports the following navigation techniques:

- Click an element labeled in black type of position the cursor at the declaration of that element. Black elements are declared in the current file.

  Note: To move to a declaration in the current file, you must enable the **Link with Editor** option. Turn this option on or off by selecting it in the drop-down menu that appears when you click **View Menu** on the **Outline** view toolbar.

- Double-click a black include file name to open that include file.

- Double-click an element labeled in gray type to open the include file and position the cursor at the declaration of that element. Gray elements are declared in include files.

The **Outline** view toolbar contains the following buttons:

	Use **Expand Include File Contents** to display elements in include files. By default, the **Outline** view does not show elements declared in include files. **Note:** When Preprocessing option is enabled, include elements are expanded by default and **Expand Include File Contents** appears as disabled.
	Use **Collapse All** to collapse all expanded tree nodes in the **Outline** view.
	Use **Filters** to hide the elements of the inactive preprocessed regions from the **Outline** view. See also View preprocessors in the Outline view on page 302. Turn this option on or off by selecting (or clearing) it in the drop-down menu that appears when you click **View Menu**  on the **Outline** view toolbar.
	Enable **Link with Editor** to move to a declaration in the current file. Turn this option on or off by selecting (or clearing) it in the drop-down menu that appears when you click **View Menu**  on the **Outline** view toolbar.
	Minimize the **Outline** view.
	Maximize the **Outline** view.

See also

Use Quick Outline on page 298
Open include files on page 297
Use Filter Preferences on page 300

Go to a specific line number

To go to a specific line in the currently active file, press **CTRL+L** and enter the line number.

To display line numbers in the ABL Editor, choose **Window** > **Preferences** > **General** > **Editors** > **Text Editors** and select the **Show line numbers** option.

Note: For more information on the navigation features in the Workbench, see the Navigate menu topic in the *Workbench User Guide*. Also see Set Eclipse editor preferences on page 277

Open include files

There are several methods for opening include files in the ABL Editor:

- Double-click the **include file name** in the **Outline** view.
- Click the **include file name** in Quick Outline.
- Right-click the **include file preprocessor in the code** and select **Open Declaration** from the context menu.
- Press **CTRL** and click the **include file preprocessor in the code**.
- Place the cursor over the **include file preprocessor in the code** and press F3.
- Right-click in the source file and select **Show References** from the context menu. Then select the include file in the **Show References** dialog and click **Open**.

See also

Use the Outline view on page 296
Display Quick Outline on page 298

Use Quick Outline

Quick Outline is a pop-up window that shows a tree view of the ABL code file that currently has focus in the ABL Editor.

See also

Use the Outline view on page 296

Display Quick Outline

Quick Outline is a pop-up window that shows a tree view of the ABL code file which is currently open in the ABL Editor. You can click on a node in the tree view to navigate to a particular section of the file. It similar to the **Outline** view, but it is more convenient to work with.

To display **Quick Outline**:

1. Click anywhere in a file currently open in the ABL Editor.
2. Do one of the following:
   - From the main menu, select **Navigate** > **Quick Outline**.
   - Press **CTRL+O**.
   - Right-click in the source file, and select **Quick Outline** from the context menu.
3. Click anywhere outside the window or press ESC to close the **Quick Outline** window.

Note: **Quick Outline** toolbar contains (**Collapse All**) and (drop-down menu) icons. Use the **Collapse All** icon to collapse all expanded tree nodes in the window.

---

4. The drop-down icon on the **Quick Outline** window contains the following options:

Move	Use this to move the position of the **Quick Outline** window. Select **Move**, drag the window to the required position on your screen, and click to release.
Resize	Use this to resize the **Quick Outline** window. Select **Resize**, drag the window to resize it, and click to release.

Remember Size and Location	Use this to capture the size and position settings of the **Quick Outline** window. If you select this option, the **Quick Outline** window is placed at the same position the next time you open it.
 **Filters**	Use this to show only selected element types in the **Quick Outline** window. See Use Filter Preferences on page 300 on using the filter preferences.
 **Sort Ascending**	Use this to sort the items in ascending alphabetical order.
 **Sort Descending**	Use this to sort the items in descending alphabetical order.
 **Expand Includes**	Use this to display elements in include files.
 **Remember Last Filter Text**	Use this to view the element types specified in the previous filter settings, the next time you open the **Quick Outline** window. **Note:** The same filter settings are applied to the **Outline** view.
Show preprocessors	Use this to display the preprocessors list. The **Quick Outline** is replaced with a table listing preprocessors (with their current values) of the ABL code file which is open in the editor.

See also

Use Quick Outline on page 298
Open include files on page 297
Work with preprocessor elements on page 301

Expand Include files

With Quick Outline open, press `CTRL+I` to display the contents of files included by reference. Press `CTRL+I` again to suppress the display of include files.

See also

Open include files on page 297
Use Quick Outline on page 298

Show inherited members

When using **Quick Outline** in a class file, press `CTRL+O` repeatedly to toggle between showing only members declared in the current class, and showing members inherited from a super class as well. For more information see, Use Quick Outline on page 298.

Show preprocessors list

With **Quick Outline** open, press CTRL+P to view the preprocessors list. The outline tree is replaced with a table listing preprocessors (with their current values) of the ABL code file that is open in the editor. The preprocessors values correspond to the current position of the cursor in the ABL Editor. Press CTRL+P again to hide the preprocessors list display.

See also

Use Quick Outline on page 298
List preprocessors in Quick Outline on page 303

Use Filter Preferences

You can filter the display of the **Quick Outline** window and the **Outline** view to show only specified element types, using the **Outline Filter Preferences** window.

To filter element types from displaying in the view:

1. Do one of the following:
   - From the **Outline** view toolbar, click **View Menu** icon **Filters**.
   - From the **Quick Outline** window, click drop-down icon **Filters**.

   The **Outline Filter Preferences** window appears.
2. Do one of the following to select the element types that you do not want to display in the view:
   - Select **Name filter patterns** checkbox, if you want to filter the element types using patterns. Enter a pattern type in the **text** field.
   - Select the checkbox against the element type, if you want to filter using the element type. The available element types are:

Include file references	Select this to remove all the include file references from the outline.
Variable definitions	Select this to remove all the variable references from the outline.
Data members	Select this to remove references to temp-tables, datasets, and buffers from the outline.
Code sections	Select this to remove references to procedures, functions, methods, and triggers from the outline.
External references	Select this to remove all code structures that are external to the current program.
Function and procedure prototypes	Select this to remove all function and procedure prototypes from the outline.

Using Declarations	Select this to remove all the Using declarations from the outline.
Inactive preprocessed regions	Select this to remove all the nodes for inactive preprocessor regions from the outline.

3. Click **OK** to save your changes.

See also

Using the Outline view on page 296
Using Quick Outline on page 298

Work with preprocessor elements

Enable preprocessor evaluation

You can enable or disable the **preprocessor** option. If the preprocessing is on, the ABL Editor status bar displays the status as Preprocessing on; otherwise, it displays the status as Preprocessing off. This option is available in all OpenEdge perspectives.

By default the **preprocessor** option is enabled meaning that preprocessors are evaluated. The inactive preprocessor regions in the code are displayed in gray in the ABL Editor.

Note: You can use the **Preprocessor inactive** option in the Editor Colors options on page 336 to make the inactive preprocessor regions appear in a different color.

To enable the preprocessor, do one of the following:

- On the main toolbar, click . The evaluation is on for a file.

  Note: To disable the **preprocessor** option, click  on the main toolbar.

- From the main menu, select **OpenEdge** > **Enable Preprocessing**.

Note that when the preprocessor is enabled:

- Content assistance displays proposals for built-in or defined preprocessors. The value of a preprocessor at a selected offset is considered to evaluate the proposals.
- When you hover over a preprocessor reference, the value of the preprocessor appears in a pop-up dialog. See also Use hover help on page 289.
- Outline view displays the elements in inactive regions irrespective of preprocessing enabled or disabled. See also View preprocessors in the Outline view on page 302.
- Quick Outline displays a list of preprocessors and their values. See also List preprocessors in Quick Outline on page 303.

See also

Work with preprocessor elements on page 301
Use hover help on page 289
Use Quick Outline on page 298

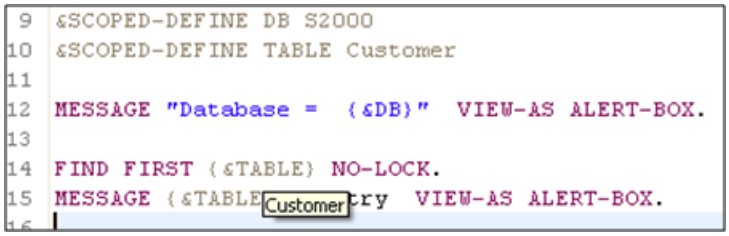
Use the Outline view on page 296
Code assistance on page 266

View preprocessors in ABL source files

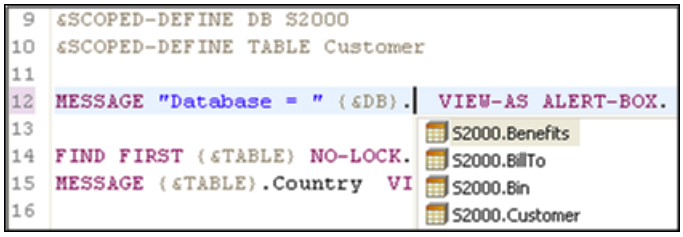
When the preprocessor evaluation is on, inactive preprocessor regions for the file that is currently open are displayed in gray in the ABL Editor. This enables you to evaluate and view the code that is excluded by preprocessor.

Note: You can use the **Preprocessor inactive** option in the Editor Colors options on page 336 to specify a different color for the inactive preprocessor regions.

When you hover over a preprocessor reference, the value of the preprocessor appears in a pop-up dialog. For example, in the following image, hovering over the preprocessor `{&TABLE}` in the ABL Editor displays the current value of preprocessor as `Customer` in a popup dialog. If the preprocessor evaluation is not completed at the time of hovering, no value is displayed in the hover pop-up dialog.



When the preprocessor evaluation is enabled, ABL Editor's code assistance evaluates the value of preprocessors at selected offset and displays the proposals for the defined preprocessor. If the preprocessor option is disabled, a message appears stating `Enable preprocessing to get proposals`. For example, in the following image, when a preprocessor DB is defined, code assistance after `{&DB}` displays tables from the database.



See also

Work with preprocessor elements on page 301
Use hover help on page 289
Code assistance on page 266

View preprocessors in the Outline view

By default, with the preprocessor option on or off, the elements inside the inactive preprocessor regions are visible in the **Outline** view. These elements appear in gray.

Note: You can use the **Outline Filter Preferences** to hide them from the **Outline** view.

To view inactive preprocessor region elements:

1. Open **Outline** view by selecting **Window** from the main menu, and then **Show View** > **Outline**.
2. On the **Outline** view toolbar, select **View Menu** **Filters** . The **Outline Filter Preferences** window appears.
3. Click to clear the **Inactive preprocessed regions** check box.

   Note: To hide the inactive preprocessor elements from the **Outline** view, select the **Inactive preprocessed regions** check box.

4. Click **OK** to save your changes.

See also

Work with preprocessor elements on page 301
Use the Outline view on page 296

List preprocessors in Quick Outline

You can use **Quick Outline** to view all the active preprocessors (and their values) of the file that is open in the ABL Editor. Preprocessor values change based on the cursor position in the ABL Editor.

To display the list of all active preprocessors using Quick Outline:

1. Click in a source file that is open in the ABL Editor.
2. Open Quick Outline by doing one of the following:
   - Press `CTRL+O`.
   - Right-click in the source file, and select **Quick Outline** from the context menu.
   - From the main menu, select **Navigate** > **Quick Outline**.
3. Display the preprocessors list by pressing `CTRL+P`. The outline tree is replaced with a list of preprocessors and their values.

   Note: Press `CTRL+P` to hide the preprocessors list and view **Quick Outline**.

4. Press **ESC** to close the Quick Outline.

See also

Work with preprocessor elements on page 301
Use Quick Outline on page 298

Use the ABL Preprocessor view

The **Preprocessor** view displays code that is obtained after all the preprocessors (include files, preprocessor definitions, and logic) are expanded. It is a read-only view. Syntax coloring and highlighting are applied to the code in the **Preprocessor** view, so it appears the same as the code in the ABL Editor.

The **Preprocessor** view does not appear in the default OpenEdge Editor perspective.

To access the **Preprocessor** view, do one of the following:

- From the main menu, select **Window** > **Show View** > **Preprocessor**.

- Right-click in the ABL Editor and select **Show In** > **Preprocessor** from the context menu.

The **Preprocessor** view toolbar contains the following buttons:

	Update the file displayed in the **Preprocessor** view.
	Link the **Preprocessor** view with the ABL Editor when focus in the ABL Editor changes to another file. By default linking is off.
	Minimize the **Preprocessor** view.
	Maximize the **Preprocessor** view.

For more information, see Work with preprocessor elements on page 301.

Use annotations

Add templates for code annotations

You can add your own templates to the library of annotations that are available for insertion into ABL source files via the Add annotations to source files on page 304.

To add an annotation template:

1. Choose **Window** > **Preferences**.The **Preferences** window appears.
2. Choose **Progress OpenEdge** > **Editor** > **Annotations**. The **Annotation** page appears.
3. Click **Add to launch the New Annotation** dialog.
4. Fill in the new annotation's name and value.
5. Click **OK**.

Note: The templates that ship with the Annotation Generator contain two specially coded preprocessors, `%FILENAME%` and `%MODULE%`. `%FILENAME%` expands to the filename including the extension. `%MODULE%` expands to the name of the directory where the file is stored. These are the only preprocessors the tool can expand. The tool does not support customer-created preprocessors.

See also

Code annotations on page 267
Add annotations to source files on page 304
Add Sonic ESB annotations on page 305
Editor Annotations options on page 331
ABL Annotation content builder on page 699
ABL annotation syntax on page 700

Add annotations to source files

Annotations are metadata contained in source files. Use the **Add Annotation** wizard to add annotations to specified files.

To add an annotation:

1. Open the **Add Annotation** wizard by choosing **Source** > **Add Annotation** from the Progress Developer Studio for OpenEdge main menu.

   Note: In a file that is open in the ABL editor, you can right-click and choose **Source** > **Add Annotation** or **Progress OpenEdge** > **Add Annotation** from the context menu. You can also right-click in the **Project Explorer** view and choose **Progress OpenEdge** > **Add Annotation**.

2. Select an annotation template from the combo-box. If you are adding ESB annotations, the first option in the drop-down list, see the next topic for detailed instructions.
3. You can modify the annotation text of the selected annotation in the text area provided below the annotation.
4. Check the files to which you want to add the annotation in the **Available Resources** tree view. You can use the **Filter** to narrow your choices.

   Note: Class files are not available in the list of resources if the selected annotation template is ESB - Main. The OpenEdge Adapter for Sonic ESB does not support class files.

5. Click **Finish** to add top-level annotations to the selected files. Click **Next** if you want to add annotations to specific procedures or functions.
6. If you click **Next**, you can select available procedures, user-defined functions, and methods from the **Available Resources** tree view. Click **Finish** to add the annotations.

   Note: Select the **Back up selected resources** option to save files prior to applying an annotation. When using this function, you must specify the location of the backup.

See also

Code annotations on page 267
Add templates for code annotations on page 304
Add Sonic ESB annotations on page 305
Add Annotation wizard on page 347
Editor Annotations options on page 331
ABL annotation content builder on page 699
ABL annotation syntax on page 700

Add Sonic ESB annotations

Sonic Enterprise Service Bus (ESB) annotations identify which procedures or user-defined functions in ABL source code will be exported to the Sonic environment. In other words, ESB annotations allow you to expose ABL procedures and user-defined functions as Sonic services. You generate Sonic invocation (.esboe) files from ABL source files that contain ESB annotations. You can import the ESBOE files into Sonic Workbench in order to create ESB processes.

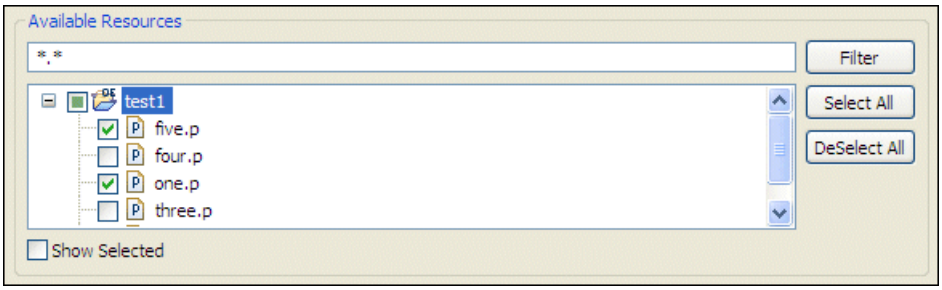
You can add ESB annotations to `.p`, `.i`, or `.w` files. You cannot add ESB annotations to class (.cls) files.

The ABL Editor provides a wizard that helps you add ESB annotations to ABL code files. To use this wizard:

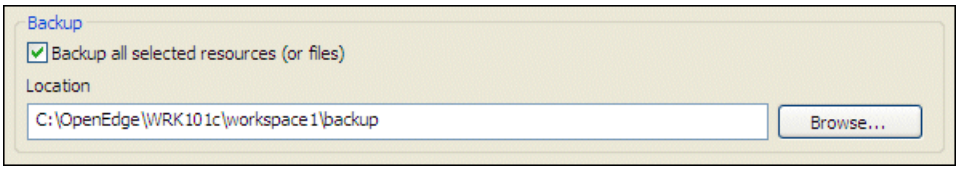
1. Click **Edit** if you want to change the ESB Annotation-Main definition.
2. When you click **Edit**, a dialog appears, which allows you to set:

- **ESBOE file name** - The name of the ESBOE file. By default, the file name is the name of the ABL code file with a `.esboe` extension. The `.p`, `.i`, or `.w` extension is stripped away.
- **Execution mode** - Whether the `.r` file runs externally or persistently. The default is external, but you must change this to persistent if you intend to add ESB annotations to internal procedures or user-defined functions in the file.
- **Use return value** - Whether a return string should be used for procedures. By default this option is not selected
- **Write dataset before image** - Whether before-image data is written when ProDataSet parameters are serialized as XML. By default this option is not selected. This parameter has no effect on invocations that do not return a ProDataSet.

3. Select a project and open a `.p`, `.i`, or `.w` file.
4. Choose **Source** > **Add Annotation** from the Progress Developer Studio for OpenEdge main menu.
5. If the focus is in an open file, you can choose **Source** > **Add Annotation** from the context menu. You can also right-click in the **Project Explorer** view and choose **Progress OpenEdge** > **Add Annotation**.
6. In the **Available Resources** section, select the files where you want to add ESB Annotation-Main. For example: The **Add Annotations** wizard appears.



7. To save a copy of files before annotations are added, select the backup option and specify the save location. For example:



8. Click **Finish** if you do not intend to add ESB annotations to internal procedures or user-defined functions. The wizard adds the ESB Annotation-Main to the top of all selected files.
9. Click **Next** if you intend to add ESB annotations to internal procedures or user-defined functions.

Note: If you have not changed the Execution Mode in the ESB Annotation-Main definition to persistent, the annotation wizard prompts you to make the change. The execution mode must be persistent for internal procedures and user-defined functions to be accessible.

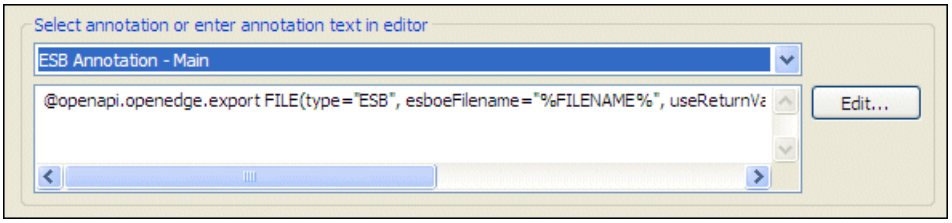
---

10. Choose **ESB Annotation-Detail**, which is the appropriate annotation for internal procedures and user-defined functions, and which is selected by default.
11. Click **Edit** if you want to change the ESB Annotation-Detail definition.

Note: The attributes are similar to ESB Annotation-Main. However, you cannot specify the execution mode, and the default ESBOE filename contains the name of the ABL code file plus the procedure name.

---

12. Choose **ESB Annotation-Main**, which is selected by default. For example:



Note: The ESB Annotation-Main annotation will be added to the top of selected files in your project. You can also add ESB annotations to internal procedures and user-defined functions, but first you must add ESB Annotation-Main to the files that contain the internal procedures and user-defined functions.

13. In the **Available Resources** section, select the files, internal procedures and user-defined functions where you want to add ESB Annotation-Detail annotation. For example:



14. Click **Finish**.

Note: The ESB Annotation-Detail annotation is added to the selected internal procedures and user-defined functions.

15. Right-click on the project name in the Project Explorer view to generate ESBOE files:

Note: If you do not want to generate ESBOE files for every file in the project, you can select individual file names in the Project Explorer view. You can also right-click in a file that is open in the ABL Editor.

16. Choose **Progress OpenEdge** > **Generate Sonic ESB Invocation Files**.

See also

Code annotations on page 266
Add templates for code annotations on page 304
Add annotations to source files on page 304
Editor Annotations options on page 331

Work with Organize USING Statements

Organize USING Statements

The **Organize USING Statements** option allows you to Organize USING Statements in ABL sources through a set of default rules or custom rules that you can define by using a set of preferences. These rules include cleaning, sorting, and grouping USING Statements.

Selecting the Organize USING Statements option removes duplicate and unused USING Statements and sorts the required ones. It expands `.*` to a fully qualified package type. It also prompts you if a referenced type name cannot be mapped uniquely to a type in the current project.

Note: The Organize USING Statements option is not available for SpeedScript files. Also, using this option to organize USING Statements in a preprocessor directive affects the processing of those USING Statements.

To Organize USING Statements, do the following:

1. Select one or more workspace resources.
2. Select **Source** > **Organize USING Statements** from one of the following locations:
   - Main menu bar
   - Project Explorer context menu
   - ABL Editor context menu
   - Outline view context menu

   Note: You can also use the keyboard shortcut `Ctrl+Shift+O` to Organize USING Statements.

If no conflicts are found in the selected resources, Progress Developer Studio for OpenEdge updates the USING Statements for the resources.

If you have selected a single resource and if that resource contains conflicting reference types, a dialog is displayed prompting you to select the correct class for the USING Statement. If you have selected multiple resources and if at least one of those resources contains conflicting reference types, a dialog is displayed listing the resources with conflicts and prompts you to perform the Organize USING Statements operation on each resource separately.

Note: When you use content assistance (by pressing `CTRL+SPACE`) for selecting a class or interface, the fully-qualified type name is added at the current cursor position and a new or existing USING Statement is appended to it based on whether or not a USING Statement already exists.

If the operation is not supported and cannot be performed on the selected resources, a message is displayed stating the same.

To undo an **Organize USING Statements** operation, select **Edit** > **Undo** or press `Ctrl+Z`. To redo, select **Edit** > **Redo** or press `Ctrl+Y`.

The **Include FROM ASSEMBLY/FROM PROPATH option** preference option on the **USING Statements preferences** page allows you to add a FROM ASSEMBLY or FROM PROPATH option to a USING Statement. Adding a FROM ASSEMBLY or FROM PROPATH option to a USING Statement narrows the search for the type definition, depending on whether the USING statement specifies an ABL package-based type or a .NET namespace-based type. When you specify the FROM ASSEMBLY option, ABL assumes that the type is a .NET type and uses the list of .NET assemblies defined in the assembly identification file to search for the type definition. When you specify the FROM PROPATH option, ABL assumes that the type is an ABL type and uses PROPATH to search for the type definition. The Include FROM ASSEMBLY/FROM PROPATH option preference option is selected by default. For more information, see USING Statements options on page 342.

See also

Add USING Statements to ABL resources on page 309
Specify keyword casing for USING Statements on page 309
Set preferences for USING Statements on page 310
USING Statements options on page 342

Source menu on page 343

Add USING Statements to ABL resources

Progress Developer Studio for OpenEdge has different rules for adding USING Statements to ABL resources with AppBuilder markup and ABL resources without AppBuilder markup. ABL resources with AppBuilder markup include: structured include file, structured procedure, AppBuilder file, and CGI wrapper with AppBuilder markup. ABL resources without AppBuilder markup include: classes, interfaces, procedures, include files, and CGI wrapper without AppBuilder markup.

Follow the below rules to add USING Statements to ABL resources with AppBuilder markup:

- If there is an error-handling statement inside the DEFINITIONS block, the location of the error handling statement is used while calculating the insertion position.
- If there is no error-handling statement, USING Statements must always be inside &ANALYZE block.
- If &ANALYZE block exists, then the USING statement must be added to this block only.
- If there is no &ANALYZE block, then a new block must be created and appended to the code, and the USING Statements must be added inside the newly created &ANALYZE block.
- The newly created &ANALYZE block must be placed after the &ANALYZE-SUSPEND_VERSION-NUMBER block, if it exists. Otherwise, it must be the first block in the result document.

Note: The insertion position is also based on the preference options. For more information, see Set preferences for USING Statements on page 310.

Follow the below rules to add USING Statements to ABL resources without AppBuilder markup:

- If there is an error-handling statement, the location of the error handling statement is used while calculating the insertion position.
- If there is no error-handling statement, the first ABL statement is used while calculating the insertion position.
- If there are no existing (child) statements and the first ABL statement starts with type or procedure declarations, then the new USING Statements must be added above the type or procedure declaration. In case of classes and interfaces add the USING Statements above the type declaration and in case of procedures add them just above the first procedure.

Note: The insertion position is also based on the preference options. For more information, see Set preferences for USING Statements on page 310.

Specify keyword casing for USING Statements

You can use the **Editor preferences** page to specify the keyword casing for USING Statements.

To specify keyword casing for USING Statements:

1. Select **Window** > **Preferences** > **Progress OpenEdge** > **Editor**
2. Select one of the following options on the **Editor preferences** page:
   - **No action**: Retains the original keyword casing for all the existing USING Statements, which remain after the **Organize USING Statements** operation is performed, and applies uppercase to keywords in the newly added USING Statements.
   - **Upper**: Applies uppercase to keywords in all the existing USING Statements, which remain after the **Organize USING Statements** operation is performed, and to keywords in the newly added USING Statements.

- **Lower**: Applies lowercase to keywords in all the existing USING Statements, which remain after the **Organize USING Statements** operation is performed, and to keywords in the newly added USING Statements.

Set preferences for USING Statements

You can control the USING Statements' functionality (position, grouping, etc.) in your current workspace by setting preferences on the USING Statements options on page 342.

To set preferences for USING Statements:

1. From the main menu, select **Window** > **Preferences**.

   The **Preferences** page appears.

2. Select **Progress OpenEdge** > **Advanced** > **USING Statements**.

   The **USING Statements** preferences page appears.

3. Set the following preferences for the USING Statements:

   - Position of the statements
   - Grouping and sorting of the statements
   - Style of the statements
   - Inclusion of the FROM ASSEMBLY/FROM PROPATH option
   - Preservation of valid statements

4. Select **Apply**.
5. Click **OK** to save your settings and close the preferences page.

Note: To prevent existing, valid USING Statements from being relocated, they must be preserved in their original form and must not be grouped together. For more information, see the USING Statements options on page 342.

See also

Organize USING Statements on page 307
Add USING Statements to ABL resources on page 309
Specify keyword casing for USING Statements on page 309
USING Statements options on page 342

Compile, test, and run ABL programs

The following set of tasks will explain how to compile, test, and run ABL programs.

- Check syntax on page 311
- Compile ABL code on page 311
- Set breakpoints while editing on page 313
- Clear OpenEdge errors on page 314
- Run and debug programs on page 314
- Exclude resources from the build on page 315
- Include resources in the build on page 317
- Build resources using working sets on page 318
- Find references to ABL constructs on page 321
- Generate ABLDoc documentation on page 322

Check syntax

To check the syntax of the active file in the ABL Editor, press `CTRL+SHIFT+C`, or right-click and select **Check Syntax** from the context menu.

See also

Clear OpenEdge errors on page 314
Compile ABL code on page 311
Use assistance features on page 287

Compile ABL code

By default, Eclipse compiles source files when they are added to the workspace or saved. This is the case unless you disable the **Build automatically** option in Eclipse Workspace preferences (**Window** > **Preferences** > **General** > **Workspace**).

You might choose to disable automatic builds if the contents of your workspace are frequently updated significantly (for example, by copying files from an external source), triggering build processes that block creating or saving resources until they finish. Otherwise, you should enable automatic builds to ensure that up-to-date **r-code** is always available for tools and features that require it.

If you do disable automatic builds, it is recommended that you have Progress Developer Studio for OpenEdge compile ABL source files when you save them. To do so, select the Compile on save if required option in Set ABL Editor preferences on page 277.

At any time, you can explicitly compile your current file by selecting **Compile** from either the Source menu, or the ABL Editor context (right-click) menu, or by pressing `CTRL+ALT+C` on your keyboard.

Note: The compile action performs only on the current file.

Startup parameters for compiler operation

Progress Developer Studio for OpenEdge provides two startup parameters that may affect the way the compiler processes source code: the Compile Warning List (`-cwl`) and the Keyword Forget List (`-k`). These options are briefly described here. For more information, see OpenEdge Deployment: Startup Command and Parameter Reference.

Compile Warning List (-cwl)

The Compile Warning List specifies a set of ABL statements that trigger a warning message at compile time if they are found in the source code. The list can include any ABL statements you choose; it can be an effective way to discourage the use of deprecated statements. The occurrence of warnings does not prevent valid code from compiling.

Each warning appears in the following format:

The `flagged_statement` statement from the compile warning list was found in file file_name at line `line_number`.

If you see one or more such messages when you compile your code, click **OK** to continue, and if necessary, edit the code as appropriate.

Keyword Forget List (-k)

The Keyword Forget List specifies a set of ABL keywords that the compiler should not treat as keywords when processing the source code. This option allows you to avoid compilation errors that might otherwise occur if an upgraded version of Progress Developer Studio for OpenEdge introduces new keywords that are found in existing code as object names (such as tables, fields, frames, variables, streams, and so on).

If you encounter errors of this sort, you can use a Keyword Forget List to disable selected keywords, and thereby allow the code to compile, until you can remove those words from the application.

See also

Go to a specific line number on page 297
Run and debug programs on page 314
Set ABL Editor preferences on page 277
Editor Build options on page 334

Set Compile options preferences

You can set the preferences for Compile options on the workspace level or the project level. If you want to set the default preferences for all the projects, instead of manually configuring each project, you should set the preferences at the workspace level. However, you can override the workspace preference for a particular project by setting the project properties.

To set the preferences at the workspace level, click **Window** > **Preferences** > **Progress OpenEdge** > **Compile**.

To set the project properties, right-click a project and click **Properties** > **Progress OpenEdge** > **Build** > **Compile**.

Note: If you update any compile options in project properties, the options specified in the workspace are overwritten on the **Preference** page.

---

1. Select the **Save r-code (also enables include file tracking)** check box to save `.r` files when you build the code. When this option is enabled, OpenEdge saves compiled `.r` files in the directory you specify in the **Build destination** field; or, if that field is blank, in the same directory as the source file.
2. Enter a key for encrypted source files in the **XCODE key** field. Leave this field blank if you do not use encrypted source code.
3. Specify the procedure that runs prior to compilation in the **Pre-compile callback routine** field.
4. Select the **Create cross-reference files in XML format** check box to save cross references in an XML file. This corresponds to the COMPILE option, XREF-XML.

Note:

Cross-referenced objects include procedure and include files, user-defined functions, classes, methods, tables, fields, variables, frames, and character strings.

5. Specify the path of the folder where cross references are saved in the **XREF XML destination** field..
6. In the **Strict options** section, select a severity level for the following options:
   - **Require full names**—Specifies that all table and field names must be their full unabbreviated names as they appear in the schema.
   - **Require field qualifiers**—Specifies that all buffer references (database tables, temp-tables, and buffers) must be fully qualified.
   - **Require full keywords**—Specifies that all keywords must be their full unabbreviated names as they appear in the schema.
   - **Require return values**—Specifies that all user-defined functions, non-VOID methods, and property getters have RETURN *value* statements for all logical code paths.

   To enable the project level properties, select the **Enable project-specific settings** check box and select the required strict compile options.

   The severity levels are explained below:

   - **Ignore**—Ignores the Compile option. This is the default setting for all the strict compile options.
   - **Warning**—The compiler generates a warning message for each failure of the strict compile options. If the failures encountered during a compilation are from those options, r-code is generated.
   - **Error**—The compiler generates an error message for each failure of the strict compile options. If any failures are encountered during compilation, no r-code is generated.
7. When you click **Apply** after updating the options, the **Compiler settings changed** dialog box opens. Do one of the following:
   - Click **Yes** to invoke the full build of all the projects in the workspace.
   - Click **No** to apply the selected options but the build is not invoked.
   - Click **Cancel** to cancel the changes and the build is not invoked.

Compile files with errors

You can compile the files that have errors for a project or a folder by right-clicking the project or folder or selecting the project from the main menu and selecting the **Recompile files that have errors** option. You can also select **Recompile files that have errors** from the main menu in the **Problems** view to compile all the files with the errors.

Set breakpoints while editing

You can set or remove breakpoints in your code for use in testing and debugging:

1. Position the cursor in the line where you want to add or remove a breakpoint.
2. Right-click and choose **Toggle Breakpoint**.

Note: Alternatively, double-click in the marker bar (the left margin) at the line where you want to insert or remove a breakpoint.

If the selected line was not already marked as a breakpoint, a blue circle appears in the left margin, indicating a breakpoint. If the line was previously marked, the breakpoint is removed, and the blue circle disappears.

See also

Breakpoints on page 458
Run and debug programs on page 314
Use breakpoints on page 470

Clear OpenEdge errors

You can clear any Progress Developer Studio for OpenEdge error messages for a particular file from the Problems view or the marker bar by choosing **Progress OpenEdge** > **Clear OpenEdge Compile Errors** from the ABL Editor context (right-click) menu.

The **Clear OpenEdge Compile Errors** command does not correct the errors. Any unfixed errors are flagged again when you next compile the code.

See also

Check syntax on page 311
Compile ABL code on page 311
Run and debug programs on page 314

Run and debug programs

Running and debugging programs in the Eclipse environment involves the use of launch configurations. Detailed instructions for defining and using launch configurations, as well as for using the Progress Developer Studio for OpenEdge Debugger, are provided in the Progress Developer Studio for OpenEdge help volume Run and Debug ABL Programs on page 451. Refer to that online help to gain a clear understanding of the relevant concepts and procedures.

Learning more about running and debugging is desirable, but in general, you can:

- Run the currently selected program by clicking **Run** on the toolbar.
- Launch the Progress Developer Studio for OpenEdge Debugger and debug the current program by clicking **Run** on the toolbar.

See also

Run and Debug ABL Programs on page 451
Compile, test, and run ABL programs on page 310

Exclude resources from the build

You can exclude compilable resources when you build your project.Excluding resources option is available only for the resources listed in the **Source directory viewer** on the **Source** tab of the **Build properties** page. For example, if the Source directory viewer displays ROOT as the entry, the **Exclude from Build** option is enabled for all the compilable resources (`.p`, `.cls`, `.w`, or `.htm` files, for example) under the project's root folder.

Note: See Editor options on page 329 for the list of compilable file extensions defined for your project.

You can exclude resources using the Build path or the Source tab of the **Build properties** page. When excluding the resources, note the following:

- Excluding a folder also excludes all of its files and folders from the build.
- You can individually select a file or a folder to exclude from the build.
- When you exclude resources (files or folders) from a folder, they remain excluded from the build even if the folder is excluded from the build, and then included at a later point. For example, if you exclude a file called customer.cls under the folder called `SampleApp` from the build, then exclude the folder `SampleApp` from the build, and then include the folder SampleApp, then the `customer.cls` file remains excluded from the build.

Exclude resources from the context menu

Exclude from Build allows you to exclude compilable resources when you build your project. You can exclude files, folders, or both from the build.

To exclude resources using **Exclude from Build**:

1. Open an OpenEdge project.
2. In the Project Explorer view, select the resources that you want to exclude from the build.
3. Right-click the selected resources and select **Progress OpenEdge** > **Exclude from Build** from the context menu.

   Note: The context menu displays either **Exclude from Build** or **Include in Build** depending on whether a resource is included or excluded. The context menu option is disabled when there is a combination of excluded or included resources, there exists a non-compilable resource in the selection list, or the selected resource is not part of the Source tab entries.

   The selected resources are now excluded from the build, and the compiler ignores them when building your project. You can view the excluded resources in the **Source** tab of the **Build properties** page.

See also

Exclude resources from the build on page 315
Include resources in the build on page 317
Compile, test, and run ABL programs on page 310
Build resources using working sets on page 318

Exclude resources using Exclusion Pattern Selection

To exclude resources using **Exclusion Pattern Selection**:

1. Open an OpenEdge project.
2. Open the project properties page by doing one of the following:
   - Selecting a project, and clicking ALT+ENTER.
   - Right-clicking a project, and selecting **Properties** from the context menu.
3. Access the **Excluded** node by doing one of the following:
   - Selecting **Progress OpenEdge** > **Build** > **Source tab** > **Root** node of the project.
   - Selecting **Progress OpenEdge** > **PROPATH** > **Root** node of the project.
4. Select the **Excluded** node, and click **Edit**. The **Exclusion Rules Wizard** appears.

   Note: The **Edit** option is enabled only when you select the **Excluded** node.

5. Click **Add Pattern**. The **Add Exclusion Pattern** appears.
6. In the **Exclusion Pattern** field, enter a file pattern for exclusion. The build looks for the resources that match the file pattern defined, and excludes them from the build. If you want to exclude all the resources of the same file extension, you can use * or ?. For example, to exclude resources of the same file extension as `.cls`, use the pattern: `/SampleApp/openedge/tutorial/UI/*.cls`.
7. Click **OK** to save your changes.

   The resources excluded from the build appear in the **Excluded** node, and are ignored when your project is built.

See also

Exclude resources from the build on page 315
Include resources in the build on page 317
Compile, test, and run ABL programs on page 310
Build resources using working sets on page 318

Exclude resources using Add Resource Exclusions

To exclude resources using **Add Resource Exclusions**:

1. Open an OpenEdge project.
2. Open the project properties by doing one of the following:
   - Selecting a project, and clicking ALT+ENTER.
   - Right-clicking a project, and selecting **Properties** from the context menu.
3. Access the **Excluded** node by doing one of the following:
   - Selecting **Progress OpenEdge** > **Build** > **Source tab** > **Root** node of the project.
   - Selecting **Progress OpenEdge** > **PROPATH** > **Root** node of the project with the **Excluded** node.
4. Select the **Excluded** node, and click **Edit**. The **Exclusion Rules** wizard appears.

   Note: The **Edit** option is enabled only when you select the **Excluded** node.

5. Click **Add Resources**. The **Add Resource Exclusion** appears.
6. Select the files or folders that you want to exclude from the build.
7. Click **OK** to save your changes.

   The resources excluded from the build appear in the **Excluded** node, and are ignored when your project is built.

See also

Exclude resources from the build on page 315
Include resources in the build on page 317
Compile, test, and run ABL programs on page 310
Build resources using working sets on page 318

Include resources in the build

The resources (files or folders) that were excluded from the build can later be included in the build. You can include resources in the build using either the **Build** path or the **Source** tab of the **Build properties** page. When including the resources in the build, note the following:

- Including a folder also includes all of its files or subfolders in the build.
- You can individually select a file or a folder to include in the build.
- You cannot include specific files or folders in the build from an excluded folder instead you must include the top folder to include all of its files or folders in the build.

Include resources using the context menu

You can include the excluded resources (files or folders) to the build using the **Include in Build** option. This option is only available for the files or folders that were excluded from the build.

To include resources using **Include in Build**:

1. Open an OpenEdge project.
2. In the Project Explorer view, select the excluded files or folders that you want to include in the build.
3. Right-click the selected resources and select **Progress OpenEdge** > **Include in Build** from the context menu.

   Note: The context menu displays either **Exclude from Build** or **Include from Build** depending on whether the resources are either included or excluded. The context menu option is disabled when some resources are excluded and some are included.

   The selected resources are now included in the build, and are compiled.

See also

Include resources in the build on page 317
Add SQL connection profiles on page 315
Build resources using working sets on page 318
Compile, test, and run ABL programs on page 310

Include resources using the Source tab

You can include the excluded resources (files or folders) to the build using the **Source** tab of the **Build properties** page. This option is only available for the files or folders that were excluded from the build.

To include resources using the **Source** tab:

1. Open an OpenEdge project.
2. Open the project properties by doing one of the following:
   - Selecting the project, and clicking **ALT+ENTER**.
   - Right-clicking the project, and selecting **Properties** from the context menu.
3. Access the **Excluded** node by doing one of the following:
   - Selecting **Progress OpenEdge** > **Build** > **Source tab** > **Root** node of the project.
   - Selecting **Progress OpenEdge** > **PROPATH** > **Root** node of the project with the **Excluded** node.
4. Include the resources that were excluded from the build by doing one of the following:
   - If you want to include all the resources that were excluded from the build, select the **Excluded** node, and click **Remove**. Go to Step 7 on page 318 .
   - If you want to include selective resources, select the **Excluded** node, and click **Edit**. The **Exclusion Rules** appears. Go to Step 5 on page 318 .

   Note: The **Edit** option is enabled only when you select the **Excluded** node.
5. In **Exclusion Rules**, select the resources that you want to include in the build from the **Manage do-not-compile list** section, and click **Remove**.
6. Click **Finish** to save your changes.
7. Click **OK** to close the project properties page.

   The resources are included in the project build, and the corresponding r-code files for these resources are generated when your project is built the next time.

See also

Include resources in the build on page 317
Exclude resources from the build on page 315
Build resources using working sets on page 318
Compile, test, and run ABL programs on page 310

Build resources using working sets

You can use working sets to group resources so that you can work on a set of resources instead of working with the entire project. When you select a working set, only the resources contained in the defined set appear in the Project Explorer view.

You can use a working set to build a set of resources of your project, instead of building the entire project. To build resources using a working set, you must first Create a new working set on page 319 with the resources that you want to include in the build.

Note: Resources excluded from the build are not considered during the build, even if you add these resources to a working set.

Create a new working set

The **Select Working Set** window allows you to create a new working set to work or build a set of resources of your project.

To create a new working set:

1. Open an OpenEdge project.
2. Do one of the following:
   - On the Project Explorer toolbar, click **View Menu** , and then **Select Working Set**.
   - On the main menu, select **Project** > **Build Working Set** > **Select Working Set**.

   Note: The **Select Working Set** option under **Build Working Set** is enabled only when the automatic build preference (at the project level) is disabled (ensure that **Project menu** > **Build Automatically** is not selected).

   The **Select Working Set** window appears.
3. Click **New**. **New Working Set** appears.
4. From the **Working set type** list, select **Resources**.
5. Click **Next**.
6. In the **Working set name** field, enter a name for the new working set.
7. Add files and folders to the new working set by doing one of the following:
   - If you want to add individual file and folder, select the check box for the file or folder in the **Working set contents** section.
   - If you want to add all the available files and folders, click **Select All**.

   Note: You can use the **Deselect All** option to remove all the resources added to the working set.
8. Click **Finish** to save your changes.

   This creates a working set with the set of resources that you have selected. You can now work or build only the set of resources defined in the working set instead of the entire project.

See also

Resources excluded from the build on page 264
Build resources using working sets on page 318
Exclude resources from the build on page 315
Include resources in the build on page 317

Build a working set automatically

By default, builds are performed automatically when you save resources.

To build a working set automatically:

1. Open an OpenEdge project.
2. View the working sets defined in your project by doing the following:
   - On the Project Explorer toolbar, click **View Menu** .
   - Select **Top Level Elements** > **Working Sets**.

   The working sets defined for your project appear in the Project Explorer view.
3. Select a working set that you want to build automatically.

   Note: You can select more than one working set to build automatically.

4. From the main menu, select **Project** > **Build Working Set Automatically**.

   Note: The **Build Working Set Automatically** option is enabled only when the automatic build preference (at the project level) is disabled (ensure that **Project** > **Build Working Set Automatically** is not selected).

   When you save resources, the selected working set(s) are built. If the working set contains files or folders from different projects, the corresponding project ABL Virtual Machines (AVMs) are used for building the selected working set(s).

See also

Resources excluded from build on page 264
Create a new working set on page 319
Build resources using working sets on page 318
Exclude resources from the build on page 315
Include resources in the build on page 317
Compile, test, and run ABL programs on page 310

Build a working set manually

If you need more control when builds occur of your working sets, you can disable automatic building and then manually invoke builds.

Note: You can build only one working set at a time when you manually invoke builds.

To manually build a working set:

1. Open an OpenEdge project.
2. On the main menu, select **Project** > **Build Working Set**.

Note: The working sets under **Build Working Set** are only available when the automatic build preference is disabled (ensure **Project** > **Build Automatically** is not selected).

3. From the list of available working sets, select a working set that you want to build.

   The selected working set is manually built.

See also

Resources excluded from build on page 264
Creating a new working set on page 319
Building resources using working sets on page 318
Excluding resources from the build on page 315
Including resources in the build on page 317
Compiling, testing, and running ABL programs on page 310

Find references to ABL constructs

To find references to the ABL constructs, right-click the ABL source (`.p`, `.i`, `.w`, or `.cls` file) node from the **Project Explorer** view, select **References**, and **Workspace** or **Project** depending on where you want to search for the references.

Note: You can also select **References** by right-clicking the ABL element in ABL source file in the ABL source editor or right-clicking the ABL source (or the context menu actions) in the **Outline** view. You can also select the code in the editor and press the `Ctrl+Shift+G` key sequence to search references in the workspace.

The result appears in the **Eclipse Search** view.

If you select an invalid ABL element for example USING Statements as in the example below, no result is displayed:

```
USING Batching.someform.
```

Use the Search view

The **Search** view displays the search results of ABL construct references in an ABL file, project, or workspace. You can view it in the following modes:

- **Tree mode:** This is the default mode of the **Search** view and is similar to the **Project Explorer** view. The references found in each file are grouped and displayed under the first code block (method or procedure). Results with more than one matching reference are grouped and displayed as a single node, instead of showing a different node for each matching reference, and the total number of matching references in that node is displayed in the label.
- **List mode:** To change the **Search** view mode to a list mode, select the drop-down arrow on the view's toolbar and select **Show as List**. In this mode, all the matching references are displayed in a list form. The label displays the file in which the match was found, separated with a hyphen.

The **Search** view toolbar has the following controls:

Control	Description
Show Next Match	Displays the next matching reference in the view.

Control	Description
Show Previous Match	Displays the previous matching reference in the view.
Show Previous Searches	Displays the previous search results.
Remove	Deletes the selected entry from the view.
Remove All	Deletes all the entries from the view.
Collapse All	Collapses all the currently expanded entries and displays only the top-level data elements.
Expand All	Expands all the top-level data elements in the view.
Search Again	Starts a new search process.

Generate ABLDoc documentation

Generate the ABLDoc documentation using the Generate ABLDoc wizard

You can generate the ABLDoc documentation from the Generate ABLDoc wizard.

To generate the ABLDoc documentation:

1. Create an OpenEdge project or select an existing one.
2. From the project or editor's context-menu, select **Progress OpenEdge** > **Generate ABLDoc**. The **Generate ABLDoc** wizard appears.
3. In the **Document title** field, specify a name as the title for the generated ABLDoc documentation.
4. In the **Destination** field, add or browse for a default directory to save all output files.
5. In the **Select the files for which you want to generate the ABLDoc** field, select the project and the corresponding files for which you want to generate the ABLDoc documentation.

   Note: The left section displays the projects and their directory structure and the right section displays the ABL elements in the selected directory.

6. In the **Create ABLDoc for members with access mode** field, select **Private**, **Package-Private**, **Protected**, or **Package-Protected** depending upon if you want to include members with visibility other than public. Members with public access only are displayed by default.
7. Click **Finish**.

   The ABLDoc documentation file is created in the specified location for the selected project. If another file with the same name already exists in that location, the file is overwritten.

Generate ABLDoc using Apache Ant

You can use a custom ABLDoc Ant task to generate ABLDoc documentation for ABL sources. The ABLDoc Ant task is part of `ant-abldoc.jar` and is located at:

`%DLC%\java`

To generate ABLDoc using the ABLDoc Ant task, ensure that Apache Ant is installed on your machine and then copy the `ant-abldoc.jar` file to the installation location of Apache Ant.

To run the ABLDoc Ant task, you must meet the following prerequisites:

- Configure the classpath to include the following JAR files:
  - `abldoc-core.jar`
  - `ast.jar ast-dependencies.jar`
  - `velocity-version.jar` (version must specify the version number)
  - `velocity-dep-version.jar` (version must specify the version number)

  These JAR files are available at:
  `%DLC%\oeide\eclipse\plugins\com.progress.openedge.pdt.abldoc.core._version\lib`
  (where version must specify the version number).
- Specify the default location of the required artifacts (which include, style sheets (`.css` files), images, and velocity templates.

  These artifacts are available at:
  `%DLC%\oeide\eclipse\plugins\com.progress.openedge.pdt.abldoc.core._version\abldoc-artifacts`
  (where version must specify the version number).

Note: The directory structure of `abldoc-artifacts` must not change.

ABLDoc task-level properties

You can set the following properties at the ABLDoc Ant task level:

Name	Description
dlc	Specifies the location of your OpenEdge installation.
destdir	(Optional) Specifies the destination directory where the ABLDoc documentation is generated. If not specified, the current working directory is used as the default destination directory.
doctitle	(Optional) Specifies the documentation title. If not specified, **ABLDoc Documentation** is used as the default title.
verbose	(Optional) Enables or disables the verbose mode. The valid values are **true**, **false**, **on**, **off**, **yes**, and **no**. By default, the value is set to **false**; and the verbose mode is off.

Name	Description
includeExtension	(Optional) Specifies a comma separated list of include file extensions. If not specified, `i` is used as the default file extension.
artifactLoc	Specifies the location of the required artifacts.
serializer	(Optional) Specifies the serializer used by the ABLDoc documentation generator. Also, lets you provide a custom serializer. **Note:** If you are using a custom serializer, you must implement the `com.progress.openedge.pdt.abldoc.core.serializer.IdocSerializer` interface. This interface is part of the `abldoc-core.jar` file. If not specified, HTML serializer is used as the default serializer.
tagParser	(Optional) Lets you provide a custom tag parser to parse the comments. **Note:** To use a custom tag parser, you must implement the `com.progress.openedge.pdt.abldoc.core.tag.ITagParser` interface. This interface is part of the `abldoc-core.jar` file.

ABLDoc elements

You can use the following ABLDoc element in the ABLDoc Ant task.

abldocproject element

Represents a set of resources required to generate ABLDoc documentation. Each ABLDoc Ant task can be configured with one more abldocproject elements.

Set the following properties for the **abldocproject** element:

Name	Description
name	(Optional) Specifies the name of the project. It is only used to indicate failure to generate ABLDoc.
sourcepath	Specifies a comma separated list of paths that can be configured with each project where the ABL source files can be found. The **sourcepath** element contains a set of ABL source files for which the ABLDoc documentation is generated. It can be configured with Ant's **pathelement** element or **fileset** element. **Note:** The **sourcepath** element can also be added as an element to the root **abldocproject** element.

Sample ABLDoc Ant task

Below is a sample `build.xml` file (ABLDoc Ant task):

```
<?xml version="1.0" encoding="UTF-8"?>
-<project basedir="." default="main" name="ABLDoc-Ant">
         <!-- Properties used to configure the CLASSPATH and the default artifacts
location -->
      <property name="DLC_HOME" value="$DLC"/><property name="version" value="<release
version>"/>
      <property name="PROJECT_HOME"
value="${DLC_HOME}/oeide/eclipse/plugins/com.progress.openedge.pdt.abldoc.core_${version}"/>

      <property name="lib.dir" value="${PROJECT_HOME}/lib"/>
      <property name="artifacts.dir" value="${PROJECT_HOME}/abldoc-artifacts"/>
         <!-- Target for defining 'taskdef' -->
      -<target name="taskdef">
        -<taskdef name="abldoc" classpath="${DLC_HOME}/java/ant-abldoc.jar"
classname="com.progress.openedge.ant.abldoc.ABLDocTask">
           <!-- Class path for including the dependencies -->
          -<classpath>
             -<fileset dir="${lib.dir}">
               <include name="**/*.jar"/>
             </fileset>
          </classpath>
       </taskdef>
      </target>
         <!-- main task to generate the documentation -->
     -<target name="main" depends="taskdef">
       -<abldoc includeProtected="true" includePrivate="true"
tagParser="com.progress.abldoc.CustomTagParser"
        serializer="com.progress.abldoc.CustomSerializer" artifactLoc="${artifacts.dir}"
 includeExtension="i" verbose="yes" doctitle="ABLDoc Documentation"
         destdir="${basedir}/docs" dlc="${DLC_HOME}">
           <abldocproject name="sample-prj" sourcepath="C:/abldoc/sample-prj"
propath="C:/abldoc/lib" location="C:/abldoc/sample-prj"/>
          -<abldocproject name="project 2" location="C:/abldoc/sample-prj1">
            -<propath>
               <pathelement location="C:/abldoc/lib/"/>
             </propath>
            -<sourcepath>
               <pathelement location="C:/abldoc/sample-prj1/procs"/>
              -<fileset dir="C:/abldoc/sample-prj1/classes">
                  <include name="**/*.cls"/>
               </fileset>
             </sourcepath>
           </abldocproject>
         </abldoc>
       </target>
      </project>
```

Navigate through the ABLDoc Navigation page

The ABLDoc documentation that you generate in HTML format (default) is located in the output directory that you specified in the **Generate ABLDoc** wizard.

To navigate through the ABLDoc navigation page:

1. Double-click the index.html file. The ABLDoc navigation page opens. The document title appears on the top and is what you specified in the **Generate ABLDoc** wizard.
2. Be default, tree structure to list the packages in the project and their folder structure is displayed; click the tree structure toggle button to hide or show the list.

Note: You can search for a file using the **Search** textbox. The search filters the matching class names; it does not search for folder names. The matching class nodes are displayed in the tree structure under the parent folder with the entire root path. You can also search using regular expressions.

3. Select the package that you want to view. It opens in the right pane.
4. Click the link of the element that you want to view. The details of the selected element are displayed.
5. Use the right-arrow and left-arrow buttons to navigate back and forth.

Note: If a particular data type is referred from another data type, it will be hyperlinked to the corresponding document page.

Add comments

You can add comments to your source files so that the comments are published to the ABLDoc document. While adding comments, you can use HTML tags as follows to structure the comments in the generated output:

```
/*------------------------------------------------------------------------
    File        : <h1><i>GenericDataExporter</i></h1>
    Purpose     :
    Syntax      :
    Description :
    Author(s)   : abc
    Created     : <pre>Tue Nov 19 21:16:10 CET</pre>
    Notes       :
  ----------------------------------------------------------------------*/
```

Note: The comments that you add must be in the format that Developer Studio generates. To generate ABLDoc for any other format, use the ABL custom parser. For more information, see Customize tag parser on page 329.

The comment can have a tag section. You can also add tags to comments to add metadata. These tags are applicable only to methods, functions, and internal procedures. Place the tags after the main description. You can add the following tags:

- `@param`: Adds a parameter with a specified name and description.
- `@return`: Adds a return section to the document with the description that you provide.

Add comments to the Overview page:

Each application or set of packages can have an overview comment that applies to the application or all the packages, for example, a description of an application.

1. Open the `Overview_template.vm` in the `DLC%\oeide\eclipse\plugins\com.progress.openedge.pdt.abldoc.core._version\abldoc-artifacts/templates` location.
2. Add your comments to this file. When you generate the ABLDoc documentation, the comment appears at the top of the Overview page.

Add comments to a package

You can add comments to each package in the ABL source code. Each package should have its own .html file for comments. A comment appears as the first sentence on the package summary page.

1. Create an HTML file, assign a name to it (for example package.html), and place the file in the folder that contains the package.
2. Add your comments to the file. A comment should be wrapped in the <body> tag as follows:

```
<HTML>
<BODY>
This comment is used to describe the sample package,
The contents of this <body> tag will be placed in the summary page,


</BODY>
</HTML>
```

Add comments to a file

You can also add comments to a file in the ABL source code by adding comments to the **Purpose** section in the following format:

```
/*------------------------------------------------------------------------
    File        : GenericDataExporter
    Purpose     :
    Syntax      :
    Description :
    Author(s)   : abc
    Created     : Tue Nov 19 21:16:10 CET 2013
    Notes       :
  ----------------------------------------------------------------------*/

USING Progress.Lang.*.

BLOCK-LEVEL ON ERROR UNDO, THROW.

CLASS com.ClassA:
END CLASS.
```

Add comments to elements

You can also add comments for elements in the ABL source code. Add the comment just above the declaration of the element in the following format:

```
/*------------------------------------------------------------------------------
 Purpose:Picks up this comment
 Notes:
@param this is an integer param
@return
------------------------------------------------------------------------------*/

METHOD PUBLIC VOID main( a as int ):
    RETURN.

END METHOD.
```

Customize ABLDoc output

By default, you can generate an ABLDoc documentation in HTML format for your ABL source code. However, you can customize the output for other formats for example, PDF, or customize the look for the HTML output.

Customize templates and .css files

You can customize the default HTML output for your source ABL code by customizing templates. The location of the ABLDoc artifacts is:

%DLC%\oeide\eclipse\plugins\com.progress.openedge.pdt.abldoc.core._version\abldoc-artifacts

(Version is the version number of OpenEdge.)

The HTML files are generated using templates in the %artifact-location%/templates location. You can customize the following templates:

- Navigation_template.vm—To customize the output of the main navigation page.
- Overview_template.vm—To customize the Overview page. You can also add a detailed description of the application to this template.
- Class_template.vm—To customize the output of the class files.
- Procedure_template.vm—To customize the output of the procedure files.
- Fields_summary_template.vm—To customize the structure of Fields Summary section of class and procedure files.
- Fields_detail_template.vm—To customize the structure of Fields Detail section for classes and procedures.
- Copyright_template.vm—Placeholder for copyright information. The information placed in this template is displayed in all pages.

You can customize the .css file and images or add a new .css file in the following location:

%artifact-location%/resources/css

%artifact-location%/resources/images

Note: All the files or folders in the resources folder are copied the output destination directory. If you want any images or source code to be copied to the output destination directory, you can place them in the resources folder.

Add a custom serializer class

To generate a custom format, you can add a custom serializer to the ABLDoc framework. You can use the ABLDoc model to get the file information and serialize it to the format you want. When output is generated, your custom serializer class is called and not the default HTML serializer.

1. Copy the abldoc-core.jar file from {DLC_HOME}\oeide\eclipse\plugins\com.progress.openedge.pdt.abldoc.core_11.5.0.00\lib into an Eclipse project or a folder.
2. Create a class that implements the IDocSerializer interface (available in the abldoc-core.jar file)
3. Override the generateDoc methods and add your logic for generating the custom format.

   Note: The generateDoc method has an argument RootNode that has all the packages and files. All the children of this node can be viewed using NodeVisitor.

4. Compile the class with abldoc-core.jar in the classpath.

Note:

To add a custom serializer from Progress Developer Studio for OpenEdge, go to `DLC_HOME}\oeide\eclipse\plugins\com.progress.openedge.pdt.abldoc.ui`, and edit `abldoc.properties` to add new properties as follows:

`serializer`: fully qualified name of the class

`serializerpath`: the absolute path of the folder where this class is located. If you generate the ABLDoc documentation, the custom serializer that is added, is called.

Customize tag parser

ABLDoc understands the default comment convention (as discussed in the Add comments on page 326 section), if you want to change the format of the comments, you can add a custom tag parser to parse the comments.

1. Copy the `abldoc-core.jar` file from `{DLC_HOME}\oeide\eclipse\plugins\com.progress.openedge.pdt.abldoc.core_11.5.0.00\lib` into an Eclipse project or a folder.
2. Create a class that implements the `ITagParser` interface (available in the `abldoc-core.jar` file)
3. Override the `getHandleTypes` and `populateTags` methods.

Note: `getHandleTypes` method should return the type of object comments (like methods or procedures) that is to be parsed using this parser. All the supported types are available in the `DocType` enum. The populateTags method is called for all the objects that you want to handle (the types returned by the `getHandleTypes`); this method is called back with the `IDocModel` parameter. It has all the information about the program elements such as raw comment parameters.

4. Parse the comment and populate the tag objects (`com.progress.openedge.pdt.abldoc.core.model.Tag`) in the `IDocModel`.

   You can use the populated tags in the templates or custom serializer.

Reference

ABL Editor preferences

Editor options

The **Editor** page (**Progress OpenEdge** > **Editor**) of the **Editor** preferences includes the following options:

Option	Description
Configure tab-space preference	Links to the **Eclipse Text Editor** preference page, where you can specify tab behavior and other options that affect the ABL Editor (and all other text editors running in the Eclipse environment). Two Eclipse settings affect tab behavior: • **Displayed tab width** sets the number of spaces between tab stops. **Note:** In all cases, pressing **Tab** moves the cursor a variable number of spaces to the next tab stop; this number depends on the starting position of the cursor relative to the tab stops. • **Insert spaces for tabs** determines whether white space inserted before a tab stop consists of individual space characters or a single tab character.
Replace content when tab is pressed in overwrite mode	When **Insert spaces for tabs** is selected in **Eclipse Text Editor** preferences, determines whether pressing **TAB** in overwrite mode replaces (with spaces) existing characters between the starting cursor position and the next tab stop. If this option is turned off, the tab spacing is inserted, leaving existing characters unchanged. (When **Insert spaces for tabs** is not selected, pressing **TAB** always inserts tab spacing, whether in insert mode or in overwrite mode.)
Enable smart indent of new lines	Determines whether the ABL Editor automatically indents lines as you type for improved readability.
Enable auto indent on paste	Determines whether code copied and then pasted into the ABL Editor is indented for improved readability.

Enable tabular formatting	Determines whether the correct indentation command aligns.
	Tabular formatting helps you format code in columns. For example, the following shows code before tabular formatting:
	`DEFINE VARIABLE aChar1 AS CHARACTER NO-UNDO.`
	`DEFINE VARIABLE aaChar22 AS CHARACTER NO-UNDO.`
	`DEFINE VARIABLE aaaChar333 AS CHARACTER NO-UNDO.`
	After tabular formatting, the code is much easier to scan:
	`DEFINE VARIABLE aChar1 AS CHARACTER NO-UNDO.`
	`DEFINE VARIABLE aaChar22 AS CHARACTER NO-UNDO.`
	`DEFINE VARIABLE aaaChar333 AS CHARACTER NO-UNDO.`
	Note: Tabular formatting is enabled by default. If you do not want tabular formatting to be applied when you use the **Correct Indentation** command, turn the option off in Editor preferences.

Option	Description
Expand keywords	Automatically expands abbreviated keywords in the current file to their fully spelled equivalents as you type.
Case keywords	Determines whether the ABL Editor immediately applies keyword casing when you type a space following a full or abbreviated keyword.
No action	Retains the original keyword casing for the existing ABL statements in the current file and applies uppercase to keywords in the newly added statements.
Upper	Applies uppercase to keywords in the existing ABL statements in the current file and to keywords in the newly added statements.
Lower	Applies lowercase to keywords in the existing ABL statements in the current file and to keywords in the newly added statements.
Apply keyword casing on save	Determines whether the ABL Editor applies keyword casing when you save the file.
Expand database tables and fields	Determines whether the ABL Editor expands a database table or field name as you type. For example, when selected, the Editor expands "Cust" to "Customer".
Automatically prefix fields and tables with database name	Determines whether the ABL Editor qualifies database tables and fields with the database alias. **Note:** If multiple aliases are defined for a database connection, the first from the list is used.
Enable smart home and end keys	Determines where the **Home** and **End** keys reposition the cursor. When enabled, the **Home** key moves the cursor to the first non-white-space character of the current line. Pressing it again moves the cursor to the very beginning of the line. The **End** key moves the cursor to the first white-space character at the end of the current line. Pressing it again moves the cursor to the very last character of the line.
Apply	Saves your changes to the current workspace configuration.
Restore Defaults	Resets the preferences to the Progress Developer Studio for OpenEdge defaults.

See also

Set ABL Editor preferences on page 277
ABL Editor Preferences on page 329

Editor Annotations options

The **Annotations** page (**Progress OpenEdge** > **Editor** > **Annotations**) of the Editor preferences lets you maintain a list of stored annotations that you can insert into ABL source files.

The page includes the following options:

Annotation names	Lists all stored annotation templates. Refer to Add annotations to source files on page 304 and Add Annotation wizard on page 347 to view the list. To browse through long lists, select a template and then drag the cursor up or down.
Annotation text	Displays the text of the selected template. A template can include more than one annotation. **Note:** The templates that ship with the Annotation Generator contain two specially coded preprocessors, `%FILENAME%` and `%MODULE%`. `%FILENAME%` expands to the file name, including the extension. `%MODULE%` expands to the name of the directory where the file is stored. These are the only preprocessors the tool can expand. The tool does not support customer-created preprocessors.
Add	Launches the New Annotation dialog. **Note:** The New Annotation dialog does not check the syntax of the template you create.
Edit	Launches the Edit Annotation dialog for the selected annotation. **Note:** The Edit Annotation dialog does not check the syntax of the template you create.
Remove	Removes the selected template from the internal template list. If you have exported your templates to a file, the template can be recovered by importing that file.
Import	Overwrites the current annotation templates with the contents of an external `.dat` file.
Export	Saves the current annotation templates to an external `.dat` file.

Apply stores your changes to the current workspace configuration. Restore Defaults resets the preferences to the Progress Developer Studio for OpenEdge defaults.

See also

Learn About Meta Catalog on page 689
Use annotations on page 304
Set ABL Editor preferences on page 277
ABL Editor preferences on page 329

Editor Assistance options

The **Assistance** page (**Progress OpenEdge** > **Editor** > **Assistance**) of the Editor preferences includes the following options:

Show syntax help as I type	If checked, enables display of a pop-up box to prompt for remaining syntax above the line you are typing. This prompt is a brief reminder, not the full syntax shown with text hover.

Highlight matching elements in code	If checked, enables the display of a marker at the position of the paired code element (for example, a bracket or a keyword that begins or ends a code block) corresponding to the element at the current cursor position.
Show description when proposing schema elements	If checked, enables the inclusion of field descriptions in the right pane of the pop-up window when proposing completion options for schema references. See Invoke syntax-completion assistance on page 291 for more information.
For schema	If checked, enables display of a pop-up box identifying schema elements when you leave the cursor over them.
For keyword	If checked, enables display of a pop-up box containing a brief description and the syntax for ABL keywords and statements when you leave the cursor over them.
Milliseconds allowed for re-parsing	Specifies the maximum amount of time the ABL Editor will spend updating its analysis before building the list of completion proposals based on the last completed analysis. See Invoke syntax-completion assistance on page 291 for more information.
Automatically propose completion on "." and ":"	If checked, enables the auto-completion feature to activate whenever you type a period or colon in an appropriate place (in a class path for a period, in a database schema reference for a colon). If you disable this option, you can still access auto-completion by typing **CTRL+SPACE**.
Auto-bracketing	If checked, enables automatic insertion of the proper closing element (auto-bracketing) for any symbols that normally are used in pairs, such as parentheses, brackets, and quotation marks.
Exclude proposals (list)	Lets you selectively suppress specific types of code elements from assistance proposals. In the list, check the elements that you do not want to see.
Order of proposals (list)	Specifies the order in which assistance proposals are presented. To change the sequence, select an element and click **Move Up** or **Move Down**.
Automatically add USING Statements instead of qualified name	If checked, adds the USING Statements instead of qualified name.

Apply stores your changes to the current workspace configuration. **Restore Defaults** resets the preferences to the Progress Developer Studio for OpenEdge defaults.

See also

Use assistance features on page 287
Set ABL Editor preferences on page 277
ABL Editor preferences on page 329

Editor Build options

The **Build** page (**Progress OpenEdge** > **Editor** > **Build**) of the Editor preferences includes the following options:

Compilable file extensions	A comma-separated list of file extensions for file types that the OpenEdge Editor can compile. The default value is **p**,**w**,**cls**,**pgen**.
AppBuilder file extensions	A comma-separated list of file extensions for files to open in the AppBuilder view.The default value is **w**.
Include file extensions	A comma-separated list of file extensions for files that the OpenEdge Editor should treat as include files. The default value is **i**.
SpeedScript extensions	A comma-separated list of file extensions for files that the OpenEdge Editor should treat as SpeedScript files. The default value is **html**.
Static files filter	A comma-separated list of file extensions for static files that are not copied to the static files destination directory when the files change or a build runs. The default value is **project**,**propath**,**dbconnection**.
Compile on save if required	An option to have Progress Developer Studio for OpenEdge compile ABL source files each time you save them. It is recommended that you select this option if you disable the Build automatically option in Eclipse Workspace preferences (**Preferences** > **Window** > **General** > **Workspace**). If automatic builds are enabled (the default setting), the **Compile on save if required** option has no effect. You might choose to disable automatic builds if the contents of your workspace are frequently updated significantly (for example, by copying files from an external source), triggering build processes that block saving of resources until they finish. Otherwise, you should enable automatic builds to ensure that up-to-date r-code is always available for tools and features that require it
Automatically check syntax	An option to have Progress Developer Studio for OpenEdge continuously check syntax and update related messages as you edit the ABL code.
Show all syntax check message summaries	An option to have the **Check Syntax** dialog display all available syntax-check messages, instead of only the first message. With this option enabled, each message includes a link that you can click to go to the applicable line in the source file.

Show help message detail with syntax check messages	An option to automatically include help text with each message listed in the **Check Syntax** dialog. Enabling this option has no effect unless Show all syntax check message summaries is also enabled.
Maximum number of errors reported per build	An integer specifying the number of build errors after which Progress Developer Studio for OpenEdge automatically terminates the build process. To have Progress Developer Studio for OpenEdge attempt to compile all files regardless of the number of errors, enter 0 in this field.

Apply stores your changes to the current workspace configuration. **Restore Defaults** resets the preferences to the Progress Developer Studio for OpenEdge defaults.

See also

Compile, test, and run ABL programs on page 310
Set Editor options on page 277
ABL Editor Preferences on page 329

Editor Code Formatter options

The **Code Formatter** page (**Progress OpenEdge** > **Editor** > **Code Formatter**) of the Editor preferences includes the following options in the **Control Statements** tab:

Keep 'IF...THEN' in one line	This option puts the `THEN` keyword in the same line as `IF`. By default, this option is checked.
Keep 'THEN' in new line	This option puts `THEN` in the new line. This option is disabled by default as its parent condition is selected and they complement each other. To enable, uncheck the parent condition.
Keep 'ELSE IF' in one line	This option puts the `IF` keyword in the same line as ELSE. By default, this option is checked.
Keep 'ELSE' and 'IF' in separate line	This option puts `ELSE` and `IF` in two different lines. This option is disabled by default as its parent condition is selected and they complement each other. To enable, uncheck the parent condition.
Keep simple 'IF...THEN' statement in same line	This option puts simple `IF...THEN` statement in the same line.
Keep simple 'ELSE' statement in same line	This option puts simple `ELSE` statement in the same line as `ELSE` keyword. **Note:** Simple statement refers to just one statement which does not need to be covered by blocks.

When you select these options, the **Preview** pane displays how the control statements appear in the Editor.

Apply stores your changes to the current workspace configuration. **Restore Defaults** resets the preferences to the Progress Developer Studio for OpenEdge defaults.

See also

Set ABL Editor preferences on page 277

Editor Colors options

You can use the **Colors** page to select the display colors for different code elements in the ABL Editor.

The **Colors** page of the Editor preferences includes the following options:

Option	Description
Comment	The color for commented text. Select the **Bold** toggle to make all text in this category bold. Default setting - Green (63, 127, 95)
DataType	The color for datatypes. Select the **Bold** toggle to make all text in this category bold. Default setting - Red (205, 58, 58)
Default	The color for all text not covered by another category. Select the **Bold** toggle to make all text in this category bold. Default setting - Black (0,0,0)
Include	The color for names of included files. Select the **Bold** toggle to make all text in this category bold. Default setting - Pink (255,0,128)
Keyword	The color for ABL keywords. Select the **Bold** toggle to make all text in this category bold. Default setting - Purple (127,0,85)
Literal	The color for hard-coded values, such as numbers and strings. Select the **Bold** toggle to make all text in this category bold. Default setting - Blue (42,0,255)
Preprocessor	The color for preprocessors. Select the **Bold** toggle to make all text in this category bold. Default setting - Brown (139,126,102)
Preprocessor inactive	The color for inactive preprocessor regions. Select the **Bold** toggle to make all text in this category bold. Default setting - Gray (179,166,142)

Option	Description
Schema	The color for schema elements, such as database tables and fields. Select the **Bold** toggle to make all text in this category bold. Default setting - Orange (255,128,0)
SpeedScript	The color for names of SpeedScript files. Select the **Bold** toggle to make all text in this category bold. Default setting - Black (0,0,0)
Color preference page	The syntax coloring page for HTML, CSS, and JavaScript.
Restore Defaults	Resets the preferences to the Progress Developer Studio for OpenEdge defaults.
Apply	Saves your changes to the current workspace configuration.

See also

Set ABL Editor preferences on page 277
Select a display color for code element on page 296
ABL Editor Preferences on page 329

Editor Templates (Macros) options

The **Templates** page lets you manage the set of macros, or templates, available in your workspace. This page appears when you select **Window** > **Preferences** > **Progress OpenEdge** > **Editor** > > **Templates (Macros)**.

This page provides the following options:

Template list	Displays the available templates. Templates that are checked are available for use; those that are not checked are disabled.
Preview	Displays the pattern for the selected template.
New	Launches the New Template dialog to add a template.
Edit	Launches the Edit Template dialog to enable you to edit the definition of the selected template.
Remove	Deletes the selected templates.
Restore Removed	Undoes any deletions.
Revert to Default	Undoes changes to the selected templates, resetting them to their default definitions. This command is available only when all selected entries are predefined templates installed with Progress Developer Studio for OpenEdge.
Import	Imports an XML file of template definitions.

Export	Writes the selected template definitions to an XML file, abbreviations.xml by default.
Restore Defaults	Resets the list of templates to its as-installed state, undoing all modifications.
Apply	Stores your changes to the current workspace configuration.

Default ABL Editor templates

Default ABL Editor templates are listed in the table below. The string `${cursor}` in the pattern is a control sequence that is not expanded, but rather determines where the cursor is positioned after the template is expanded.

Sequence	Description	Associated Pattern
&FR	Frame name	{&FRAME-NAME} ${cursor}
&GL	Global name	&GLOBAL-DEFINE ${cursor}
&SC	Scope defined	&SCOPED-DEFINE ${cursor}
CMT	Comment	/* ${cursor} */
DED	Event with delegate	DEFINE EVENT ${cursor} DELEGATE
DES	Event with signature	DEFINE EVENT ${cursor} SIGNATURE
DVCH	Character variable	DEFINE VARIABLE ${cursor} AS CHARACTER
DVDE	Decimal variable	DEFINE VARIABLE ${cursor} AS DECIMAL
DVDT	Date variable	DEFINE VARIABLE ${cursor} AS DATE
DVHN	Handle variable	DEFINE VARIABLE ${cursor} AS HANDLE
DVIN	Integer variable	DEFINE VARIABLE ${cursor} AS INTEGER
DVLG	Logical variable	DEFINE VARIABLE ${cursor} AS LOGICAL
DVMP	CHAR variable	DEFINE VARIABLE ${cursor} AS MEMPTR
DVRI	ROWID variable	DEFINE VARIABLE ${cursor} AS ROWID
DVWH	Widget variable	DEFINE VARIABLE ${cursor} AS WIDGET
IOPCH	Character INPUT-OUTPUT	DEFINE INPUT-OUTPUT PARAMETER ${cursor} AS CHARACTER

Sequence	Description	Associated Pattern
IOPDE	Decimal INPUT-OUTPUT	DEFINE INPUT-OUTPUT PARAMETER ${cursor} AS DECIMAL
IOPDT	Date INPUT-OUTPUT	DEFINE INPUT-OUTPUT PARAMETER ${cursor} AS DATE
IOPHN	Handle INPUT-OUTPUT	DEFINE INPUT-OUTPUT PARAMETER ${cursor} AS HANDLE
IOPIN	Integer INPUT-OUTPUT	DEFINE INPUT-OUTPUT PARAMETER ${cursor} AS INTEGER
IOPLG	Logical INPUT-OUTPUT	DEFINE INPUT-OUTPUT PARAMETER ${cursor} AS LOGICAL
IOPMP	Memptr INPUT-OUTPUT	DEFINE INPUT-OUTPUT PARAMETER ${cursor} AS MEMPTR
IOPRI	ROWID INPUT-OUTPUT	DEFINE INPUT-OUTPUT PARAMETER ${cursor} AS ROWID
IOPWH	Widget INPUT-OUTPUT	DEFINE INPUT-OUTPUT PARAMETER ${cursor} AS WIDGET
IPCH	Character INPUT	DEFINE INPUT PARAMETER ${cursor} AS CHARACTER
IPDE	Decimal INPUT	DEFINE INPUT PARAMETER ${cursor} AS DECIMAL
IPDT	Date INPUT	DEFINE INPUT PARAMETER ${cursor} AS DATE
IPHN	Handle INPUT	DEFINE INPUT PARAMETER ${cursor} AS HANDLE
IPIN	Integer INPUT	DEFINE INPUT PARAMETER ${cursor} AS INTEGER
IPLG	Logical INPUT	DEFINE INPUT PARAMETER ${cursor} AS LOGICAL
IPMP	Memptr INPUT	DEFINE INPUT PARAMETER ${cursor} AS MEMPTR
IPRI	ROWID INPUT	DEFINE INPUT PARAMETER ${cursor} AS ROWID
IPWH	Widget INPUT	DEFINE INPUT PARAMETER ${cursor} AS WIDGET
MES	Message	MESSAGE ${cursor}
OPCH	Char OUTPUT	DEFINE OUTPUT PARAMETER ${cursor} AS CHARACTER
OPDE	Decimal OUTPUT	DEFINE OUTPUT PARAMETER ${cursor} AS DECIMAL

Sequence	Description	Associated Pattern
OPDT	Date OUTPUT	DEFINE OUTPUT PARAMETER ${cursor} AS DATE
OPHN	Handle OUTPUT	DEFINE OUTPUT PARAMETER ${cursor} AS HANDLE
OPIN	Integer OUTPUT	DEFINE OUTPUT PARAMETER ${cursor} AS INTEGER
OPLG	Logical OUTPUT	DEFINE OUTPUT PARAMETER ${cursor} AS LOGICAL
OPMP	Memptr OUTPUT	DEFINE OUTPUT PARAMETER ${cursor} AS MEMPTR
OPRI	ROWID OUTPUT	DEFINE OUTPUT PARAMETER ${cursor} AS ROWID
OPWH	Widget OUTPUT	DEFINE OUTPUT PARAMETER ${cursor} AS WIDGET

See also

Use templates for easier text entry on page 280
Set ABL Editor preferences on page 277
ABL Editor Preferences on page 329

Class Cache options

The **Class Cache** page (**Window** > **Preferences** > **Progress OpenEdge** > **Advanced** > **Class Cache**) includes the following options:

Class cache	
Limit scope of cache class information to	Define what directories are searched for classes and interfaces when building the cache. With the Workspace option, Progress Developer Studio for OpenEdge caches information only for classes that are in the current workspace. Using the PROPATH option expands the class cache scope and provides more functionality when working with referenced classes and interfaces that are outside the workspace. However, the PROPATH option can make startup of Progress Developer Studio for OpenEdge slower, as building the class cache takes longer.
Scan installation directory at startup for procedure information	Select to search the directory in which OpenEdge is installed for procedures and graphical interface (`.w`) files. If this option is not selected, this directory and its subdirectories are not searched, even if the class cache scope is set to PROPATH.
Cache refresh	

OpenEdge Database	Select to refresh schemas for connected OpenEdge databases whenever **OpenEdge** > **Refresh cache** is selected from the main menu bar of Progress Developer Studio for OpenEdge.
OpenEdge Super Procedures	Select to refresh OpenEdge super procedures whenever **OpenEdge** > **Refresh cache** is selected from the main menu bar of Progress Developer Studio for OpenEdge.

Apply stores your changes to the current workspace configuration. **Restore Defaults** resets the preferences to the Progress Developer Studio for OpenEdge defaults.

See also

Set ABL Editor preferences on page 277
ABL Editor Preferences on page 329

Parsing options

The **Parsing preferences** page provide options which allow you to optimally build the Abstract Syntax Tree (AST) for an include file.

Some of the programs might have many references of the same include file. Such programs cause the Progress Developer Studio for OpenEdge to consume more memory, because each include file has a separate **AST**. The Includes file preferences section on the Parsing preferences page allows you manage the include file references of a program while constructing an **AST**.

You can access the Parsing preferences page by selecting **Window** > **Preferences** > **Progress OpenEdge** > **Advanced** > **Parsing**.

The **Parsing preferences** page includes the following options:

Add file only once	Select this option to construct only one **AST** for an include file reference, even though it has many references in the program. For example, if the same include file has four references in a program, only one **AST** is built for the include file when Add file only once is selected.
Cache the file content	Select this option to cache the include file contents. This stores the contents of an include file in the memory until the program is closed.
Trim the content	Select this option to trim an include file's content. Only the definitions used in the Outline view and the entities (tokens) required to understand the structure of an include file are considered while constructing an **AST**, and other information of an include file is discarded. For example, only the procedure declaration and the parameters of an internal procedure present in an include file are considered while constructing an **AST**. The other statements of an internal procedure are discarded. **Note:** This option is enabled when you select the Cache the file content check box.

See also

Set ABL Editor preferences on page 277

USING Statements options

You can use the USING Statements preferences page to control the USING statements' functionality in your current workspace.

This page provides the following controls:

Control	Description
Display USING statements	Lets you choose whether you want to display USING Statements: • **After the error-handling statement** or, • **Before the error-handling statement**.
Group all USING Statements together	Specifies whether to relocate the existing statements to a new location or not. The relocation is based on the **Display USING Statements** preference. If the **Group all USING Statements together** option is selected, then all the USING Statements (existing and new) are placed before or after the error-handling statement based on the selection. If this option is not selected and there are existing USING Statements, then the new USING Statements are appended to the last USING statement.
Sort statements alphabetically	Sorts all the grouped USING Statements in alphabetical order. **Note:** This option is enabled only when the **Group all USING Statements together** option is selected.
Specify USING statement style	Specifies whether to use individual type names or wildcards as part of the USING declaration. If you select the **Qualified type names** option, then all the existing and new USING Statements are expanded to their fully qualified type. If you select the **Wildcards (.*)** option, then all the existing and new USING Statements use wildcards in the USING declaration. **Note:** For the changes to occur, the **Preserve valid USING Statements** option must not be selected.

Control	Description
Include FROM ASSEMBLY/FROM PROPATH option	Specifies whether or not to add the FROM ASSEMBLY/FROM PROPATH option to USING Statements. If this option is selected, all the existing and newly added USING Statements contain the FROM ASSEMBLY/FROM PROPATH option. If this option is not selected, all the existing USING Statements retain the FROM ASSEMBLY/FROM PROPATH option (if it is already added), but the newly added USING Statements do not include FROM ASSEMBLY/FROM PROPATH option.
Preserve valid USING Statements	Preserves the existing, valid USING Statements in their original form and displays the newly added statements based on whether the style preference is selected as **Qualified type names** or **Wildcards (.*)**.

Note: To prevent existing, valid statements from being relocated, you must not select the **Group all USING Statements together** option and you must select the **Preserve valid USING Statements**.

ABL Editor menus

Source menu

The **Source** menu contains options specific to the ABL Editor. The **Source** menu is available from the **Source** main menu and from the editor's context (right-click) menu.

Check Syntax	Checks the ABL syntax of the current file. This option does not save an r-code version of the file.
Compile	Builds the current file and saves the r-code.
Toggle Comment	Comments or uncomments the selected lines of code.
Correct Case	Applies the user preference for keyword casing for keywords in the current file.
Expand Keywords	Replaces abbreviated keywords in the current file with their fully spelled equivalents.
Correct Indentation	Indents lines in the current file to improve readability.
Organize USING Statements	Organizes USING statements in ABL sources that are currently open or selected. It removes duplicate and unused USING statements and sorts the required ones in alphabetical order. It expands `.*` to a fully qualified package type. It also prompts you if a referenced type name cannot be mapped uniquely to a type in the current project.
Update Function Prototypes	Modifies the signatures of function prototypes in the current file to match the signatures of the corresponding function declarations, as necessary.

Strip AppBuilder markup	Removes the AppBuilder markup code from a file originally created in AppBuilder or by means of the **New ABL Structured Include** or the **New ABL Structured Procedure** wizard. **Caution:** If this code is removed, the file cannot be opened in AppBuilder again.
Add Constructor	Opens the **Add Constructor** wizard to add a constructor to the current class.
Add Static Constructor	Adds a static constructor to the current class.
Add Constructors from Super Class	Opens the **Add Constructors from Super Class** wizard to select any constructors with arguments from the immediate super class to override in the current class.
Add Destructor	Adds a destructor to the current class.
Add Method	Opens the **Add Method** wizard to add a method to the current class.
Add Event	Opens the **Add Event** wizard to add an event to the current class.
Add Property	Opens the **Add Property** wizard to add a property to the current class.
Override/Implement Members	Opens the **Override/Implement Members** wizard to select members from the class hierarchy to override or implement in the current class.
Surround With	Shows a submenu that lets you surround the selected code segment with a CATCH block or a FINALLY block for structured error handling.
Add Procedure	Opens the **Add Procedure** wizard to add an internal procedure to the current procedure.
Add Function	Opens the Add Function wizard on page 350 to add a function to the current procedure.
Add Annotation	Opens the Add Annotation wizard on page 347 to insert ABL annotations in one or more files.
Define Service Interface	Opens the **Define Service Interface** wizard that allows you to publish the selected procedures and functions as a service interface. **Note:** This option is available only in the view source mode.

See also

Write ABL code on page 279
Editor context menu on page 345

ABL Editor context menu

Right-clicking in a file displays the ABL Editor context menu. This menu has the following entries:

Undo	Undo the last action in the current file.
Revert file	Replace the current file with the local saved copy.
Save	Save the current file.
View Design (Windows only)	Show the form in the Visual Designer. Although this command is enabled for all class files, an error results if the file is not a valid OpenEdge GUI for .NET class.
Show In	See the *Workbench User Guide*.
Quick Outline	Open the Use Quick Outline on page 298 window.
Cut	Cut the selected text.
Copy	Copy the selected text.
Paste	Paste the contents of the Clipboard.
Shift Right	Increase the indent of the current line or the highlighted lines.
Shift Left	Decrease the indent of the current line or the highlighted lines.
Source	Display the Progress Developer Studio for OpenEdge **Source** menu.
Check Syntax	Check the ABL syntax of the current file. This does not save an r-code version of the file.
Compile	Compile the current file and save the r-code.
Keyword Help	Open the **Keyword Help** view in the **Console** area, displaying the *OpenEdge Development: ABL Reference* entry for the selected keyword.
Toggle Breakpoint	Set or remove a breakpoint at the current line for the OpenEdge Debugger.
Show References	Open the **References** dialog which displays the external references in the current file.
Open Declaration	Move the cursor to the beginning of the code that defines the variable, function, procedure, or method whose name you are pointing to when you issue the command. The declaration can be in the current file or an external file; if necessary. OpenEdge opens the external file.

Run As	Display the OpenEdge **Run** menu.
Debug As	Display a submenu of appropriate debuggers for the current file.
Team	See the *Workbench User Guide*.
Compare With	See the *Workbench User Guide*.
Replace With	See the *Workbench User Guide*.
Progress OpenEdge	Display a sub-menu of common Progress OpenEdge context menu on page 346 actions.
Preferences	Launch the Preferences window displaying the **General** > **Editors** > **Text Editors preference** page. See the *Workbench User Guide* for more information on these settings.

See also

Write ABL code on page 279
Source menu on page 343

Progress OpenEdge context menu

The Progress OpenEdge menu contains options specific to the ABL Editor and is available from the editor's right-click context menu.

Define Service Interface	Check the ABL syntax of the current file. This option does not save an r-code version of the file.
Exclude from Build	Enables you to Exclude resources from the build on page 315 when you build your project. You can exclude files, folders, or both from the build.
Include in Build	Enables you to Include resources in the build on page 317 to the build. This option is only available for the resources that were excluded from the build.
Add Annotations	Open the **Add Annotation** wizard to insert ABL annotations in one or more files.
Restart OpenEdge AVM	Enables you to restart the OpenEdge AVM (ABL Virtual Machine).
Compile	Enables you to compile the selected project files or folders.
Clear OpenEdge Compile Errors	Clear any OpenEdge error for a particular file or project folder from the Problems view. **Note:** The **Clear OpenEdge Compile Errors** option does not correct the errors. Any unfixed errors are flagged again when you next compile the code.

Generate Sonic ESB Invocation Files	Enables you to generate Sonic `.esboe` file for the OpenEdge procedure file.
Generate REST OE Invocation Files	Enables you to generate REST `.pidl` file for the OpenEdge procedure file.

See also

Write ABL code on page 279
ABL Editor context menu on page 345

Code-generation wizards

This topic provides detailed information about the various wizards available in the ABL Editor for creating ABL source files and code segments.

Add Annotation wizard

The **Add Annotation** wizard lets you add a new or existing ABL annotation to a selected set of ABL procedure and include files in open projects in your workspace.

This wizard appears when you select **Source** > **Add Annotation**> from the main menu bar or the ABL Editor context (right-click) menu, or when you select **Progress OpenEdge** > **Add Annotation** from the context menu for the **Project Explorer** view or the **ABL Editor**. The following controls are available:

Annotation selector	Displays a drop-down list of currently defined annotations available for use. You can manage the contents of this list at the Editor Annotations options on page 331.
Annotation template editor	Displays and lets you edit the content of the annotation to be inserted. The **Edit** button opens a dialog that supports changes specific to ESB annotations; this button is not active for other annotation types.
Available resources filter	Lets you filter the list of resources displayed in the treeview below.
Available resources list	**On the first page of the wizard** - Lets you select the files to which the annotation is to be added. If you finish the wizard without making any entries on the second page, the annotation is inserted at the beginning of each selected file. **Note:** If the selected annotation is ESB - Main, class files do not appear in the resources list because the OpenEdge Adapter for Sonic ESB does not support class files. **On the second page of the wizard** - Lets you select specific points (functions, procedures, and data members within the selected files) where the annotation is to be added.
Show selected	If checked, filters the list of available resources to show only those that you have selected.

Back up selected resources	If checked, enables the **Location** field to let you specify a directory where copies of the original (un-annotated) selected resources are stored.
Location	Optionally specifies a directory for backup copies of the selected resources.

See also

Use annotations on page 304
Editor Annotations options on page 331

Add Constructor wizard

The **Add Constructor** wizard helps you add a constructor method to a class file.

This wizard appears when you select **Source** > **Add Constructor**.

The following controls are available:

Access modifier	Specifies the access mode that applies to the constructor: • **Public** — The constructor can be called from any code that has access to the class instance. • **Package-Protected** — The constructor can be called from the defining class, from a subclass, or from any class within its package. • **Protected** — The constructor can be called from the defining class or a subclass. • **Package-Private** — The constructor can be called from the defining class or any class within its package. • **Private** — The constructor can be called by the defining class or another instance of the same class. **Note:** The Package-Protected and Package-Private modifiers are only available if the class is inside a package.
Insert catch block	If checked, adds a **CATCH** block to the generated method stub to support structured error handling.
Insert finally block	If checked, adds a **FINALLY** block to the generated method stub to support structured error handling.
Insertion position	Determines where the constructor code is inserted in the source file.

See also

Add constructors on page 283
Add constructors from a super class on page 349
Add a destructor on page 284

Write object-oriented code on page 283

Add Constructors from Super Class wizard

The **Override/Implement Members** wizard helps you to:

- Locate inherited data members that you want to override.
- Satisfy the requirement to implement data members declared in interfaces implemented by the current class, and to implement inherited abstract members.

This wizard appears when you select **Source** > **Override/Implement Members**. The following controls are available:

Constructor list	Displays and lets you select constructor methods declared in the parent class from which the current class inherits.
Insertion position	Determines where the constructor code is inserted in the source file.
Generate method comments	If checked, adds a comment block before the inserted method code.

See also

Add constructors on page 283
Add constructors from a super class on page 349
Add a destructor on page 284
Write object-oriented code on page 283

Add Event wizard

The **Add Event** wizard helps you add event code to a class file.

This wizard appears when you select **Source** > **Add Event**.

The following controls are available:

Event name	(Required) Specifies the name of the event. The name must begin with a letter; spaces and most non-alphanumeric characters are not allowed.

Access modifier	Specifies the access mode that applies to the event: • **Public** - The event can be called from any code that has access to the class instance. • **Package-Protected** - The event can be called from the defining class, from a subclass, or from any class within its package. • **Protected** - The event can be called from the defining class or a subclass. • **Package-Private** - The event can be called from the defining class or any class within its package. • **Private** - The event can be called by the defining class or another instance of the same class. **Note:** The Package-Protected and Package-Private modifiers are only available if the class is inside a package.
Abstract	(Enabled only if current class is abstract) If checked, specifies that the event is abstract and cannot be instantiated. An abstract event is designed to be inherited and to be implemented by the inheriting class. Therefore, an abstract event cannot be private, nor can it be static.
Static	If checked, specifies that the event is static. A static event is accessible by every instance of the class and (if public) by clients of the class without the need to create an instance of the class. A static event cannot be abstract.
Delegate	If checked, enables the field to the right in which you can specify a class that serves as the event delegate.
Insertion position	Determines where the event code is inserted in the source file.

See also

Add events on page 285
Write object-oriented code on page 283

Add Function wizard

The **Add Procedure** wizard helps you add a function to an ABL procedure or include file.

This wizard appears when you select **Source** > **Add Function**.

The following controls are available:

Function	(Required) Select this option to create a function. Enter a function name in the **Name** field. **Note:** This option is available only if the current file open in the ABL Editor is an ADM (adm1 or adm2) file.
Override	(Required) Select this option to have the **Name** field display a list of the functions for which you can create overrides. This list is the user-defined functions of all Super Procedures defined for the procedure file (excluding those user-defined functions defined as PRIVATE). This option is disabled when there are no functions to override. **Note:** This option is available only if the current file open in the ABL Editor is an ADM (adm1 or adm2) file.
Name	(Required) Specifies the name of the function.
Insert catch block	If checked, adds a **CATCH** block to the generated procedure stub to support structured error handling.
Return type	Specifies the data type of the value returned by the function.
Extent	If checked, specifies that the value returned by the function is an extent (array) value and enables the adjacent field to the right where you enter the number of elements in the extent.
Insert catch block	If checked, adds a **CATCH** block to the generated function stub to support structured error handling.
Insert finally block	If checked, adds a **FINALLY** block to the generated function stub to support structured error handling.
Private	Specifies the access modifier that applies to a function. If selected, the function cannot called from any other ABL procedure file.
DB-Required	If checked, a preprocessor directive is wrapped around the generated function allowing it to be conditionally excluded from compilation. For more information, see Specify DB-Required code blocks on page 557Specifying DB-Required code blocks. **Note:** A function that is not DB-Required is excluded from a data object's client proxy **r-code** file and only included in the data object's main **r-code** file.
Insertion position	Determines where the function code is inserted in the source file.

See also

Add functions on page 281
Add internal procedures on page 282

Add Method wizard

The **Add Method** wizard helps you add method code to a class file.

This wizard appears when you select **Source** > **Add Method**.

The following controls are available:

Method name	(Required) Specifies the name of the method. The name must begin with a letter; spaces and most non-alphanumeric characters are not allowed.
Access modifier	Specifies the access mode that applies to the method: • **Public** — The method can be called from any code that has access to the class instance. • **Package-Protected** — The method can be called from the defining class, from a subclass, or from any class within its package. • **Protected** — The method can be called from the defining class or a subclass. • **Package-Private** — The method can be called from the defining class or any class within its package. • **Private** — The method can be called by the defining class or another instance of the same class. **Note:** The Package-Protected and Package-Private modifiers are only available if the class is inside a package.
Abstract	(Enabled only if current class is abstract) If checked, specifies that the method is abstract and cannot be instantiated. An abstract event is designed to be inherited and to be implemented by the inheriting class. Therefore, an abstract event cannot be private, nor can it be static.
Static	If checked, specifies that the method is static. A static event is accessible by every instance of the class and (if public) by clients of the class without the need to create an instance of the class. A static method cannot be abstract.
Return type	Specifies the method's return type.
Insert catch block	If checked, adds a **CATCH** block to the generated method stub.

Insert finally block	If checked, adds a **FINALLY** block to the generated method stub.
Insertion position	Determines where the method code is inserted in the source file.

See also

Add methods on page 284
Write object-oriented code on page 283

Add Procedure wizard

The **Add Procedure** wizard helps you add internal procedure code to an ABL procedure or include file.

This wizard appears when you select **Source** > **Add Procedure**.

The following controls are available:

Procedure	(Required) Select this option to create a procedure. Enter a procedure name in the **Procedure name** field. **Note:** This option is available only if the current file open in the ABL Editor is an ADM (adm1 or adm2) file.
Override	(Required) Select this option to have the **Procedure name** field display a list of the procedures for which you can create overrides. This list is the internal procedures of all or Super Procedures defined for the procedure file (excluding those internal procedures defined as **PRIVATE**). This option is disabled when there are no procedures to override. **Note:** This option is available if the current file open in the ABL Editor is an ADM (adm1 or adm2) file.
Procedure name	(Required) Specifies the name of the procedure.
Insert catch block	If checked, adds a **CATCH** block to the generated procedure stub to support structured error handling.
Insert finally block	If checked, adds a **FINALLY** block to the generated procedure stub to support structured error handling.
Private	Specifies the access modifier that applies to a procedure. If selected, the procedure cannot called from any other ABL procedure file.

DB-Required	If checked, a preprocessor directive is wrapped around the generated procedure allowing it to be conditionally excluded from compilation. For more information, see Specify DB-Required code blocks on page 557Specifying DB-Required code blocks. **Note:** A procedure that is not DB-Required is excluded from a data object's client proxy **r-code** file and only included in the data object's main **r-code** file.
Insertion position	Determines where the procedure code is inserted in the source file.

See also

Add internal procedures on page 282
Write procedural code on page 281

Add Property wizard

The **Add Property** wizard helps you add property code to a class file.

This wizard appears when you select **Source** > **Add Property**.

The following controls are available:

Property name	(Required) Specifies the name of the property. The name must begin with a letter; spaces and most non-alphanumeric characters are not allowed.
Access modifier	Specifies the access mode that applies to the property, GET accessor, or SET accessor: • **Public** - The property can be accessed from any code that has access to the class instance. • **Package-Protected** - The property can be accessed from within the class, any class within its package, and from within any subclass that inherits the class. • **Protected** - The property can be accessed from the defining class or a subclass. • **Package-Private** - The property can be accessed from within the class and any class within its package. • **Private** - The property can be accessed by the defining class. An instance can access a private property of another instance if both instances are of the same class. The access modifier for an accessor cannot be less restrictive than the modifier for the property itself. **Note:** The Package-Protected and Package-Private modifiers are only available if the class is inside a package.

Static	If checked, specifies that the property is static. A static property is accessible by every instance of the class and (if public) by clients of the class without the need to create an instance of the class. A static property cannot be abstract.
Abstract	(Enabled only if the current class is abstract) If checked, specifies that the property is abstract and cannot be instantiated. An abstract property is designed to be inherited and to be implemented by the inheriting class. Therefore, an abstract property cannot be private, nor can it be static.
Type	Specifies the property's data type.
Extent	If checked, specifies that the property is an extent (array) value and enables the adjacent field to the right where you enter the number of elements in the extent.
Initial value	If checked, enables the adjacent field to the right where you enter the initial value of the property.
NO-UNDO	If checked, adds the NO-UNDO attribute to the property declaration.
Readable	If checked, specifies that the GET accessor is readable.
Writable	If checked, specifies that the SET accessor is writable.
Insert implementation	If checked, adds an implementation stub for the accessor to the generated code.
Insertion position	Determines where the property code is inserted in the source file.

See also

Add properties on page 285
Write object-oriented code on page 283

New ABL Class wizard

The New ABL Class wizard helps you create a class file.

This wizard appears when you select **File** > **New** > **ABL Class**.

The following controls are available:

Package root	Specifies a currently open project to contain the class code and other project code. Click **Browse** if you want to select a project other than the current one (the default value).
Package	Optionally specifies a package name, corresponding to a sub-folder of the package root, to contain the class file. Click **Browse** or enter the folder path by typing. A period (.) must separate each subfolder from its parent folder in the path name.

Class name	(Required) Specifies the name of the class. The name must begin with a letter; spaces and most non-alphanumeric characters are not allowed. The `.cls` extension will be appended automatically.
Final	If selected, specifies that inheritance from this class is disallowed. A `FINAL` option is included in the generated ABL code. A final class cannot be abstract.
Abstract	If selected, specifies that the class is abstract and cannot be instantiated. An abstract class is designed to serve as a super class from which other classes inherit and implement members. Therefore, an abstract class cannot be final.
Widget pool	If selected, specifies that a USE-WIDGET-POOL option will be included in the generated ABL code.
Serializable	If selected, marks the class as serializable by including the SERIALIZABLE modifier in the generated ABL code. **Note:** If the class inherits from a super class that is not serializable, then it cannot be marked as serializable.
Inherits	Optionally specifies another class in the current project as a super class from which the new class inherits state and behavior. Click **Browse** or enter the class path by typing. A period (.) must separate each node from its parent folder in the path name. **Note:** The super class cannot be generic.
Implements	Lets you optionally specify one or more interfaces in the current project that the class implements. Click **Add** and select the desired interfaces at the Interface Selection dialog. Use the **Remove** button to remove an interface from the list after adding it. **Note:** The class cannot implement a generic interface.
Generate default constructor	If checked, specifies that the class is to include a default constructor method.
Generate destructor	If checked, specifies that the class is to include a destructor method.
Generate super class constructors	If checked, specifies that the class is to include all constructor methods declared in the parent class.

Error-handling statement	Adds one of the following error-handling statements to the generated ABL code: • **Block level**: Includes the BLOCK-LEVEL ON ERROR UNDO, THROW statement in the generated ABL code • **Routine level**: Includes the ROUTINE-LEVEL ON ERROR UNDO, THROW statement in the generated ABL code
Throw a Not Implemented exception	If selected, specifies that "METHOD NOT IMPLEMENTED" error code will be added to stubs for members implemented via interface and stubs for inherited abstract members.
Return a default value	If selected, specifies that default return values will be added to stubs for members implemented via interface and stubs for inherited abstract members.
Description	Lets you optionally enter a description for the class. This text will appear in the file header.
Purpose	Lets you optionally enter an explanation of the purpose of the class. This text will appear in the file header.

See also

Create ABL source files on page 279
Write object-oriented code on page 283
Develope a visual container on page 380

New ABL Include wizard

The **New ABL Include** wizard helps you create an ABL include file.

This wizard appears when you select **File** > **New** > **ABL Include**.

The following controls are available:

Container	Specifies a currently open project or a folder within the project where the include file is to be created. Click **Browse** if you want to select a project other than the current one (the default value).
File name	(Required) Specifies the name of the include file. The `.i` extension is appended automatically.
Description	Lets you optionally enter a description for the file. This text will appear in the file header.
Purpose	Lets you optionally enter an explanation of the purpose of the file. This text will appear in the file header.
Author	Lets you optionally enter the author's name. This text will appear in the file header.

See also

Create ABL source files on page 279
Write procedural code on page 281

New ABL Interface wizard

The **New ABL Interface** wizard helps you create an interface file.

This wizard appears when you select **File** > **New** > **ABL Interface**.

The following controls are available:

Option	Description
Package root	(Required) Specify a currently open project to contain the interface code and other project code. Click **Browse** if you want to select a project other than the current one (the default value).
Package	(Optional) Specify a package name, corresponding to a sub-folder of the package root, to contain the interface file. Click **Browse** or enter the folder path by typing. A period (.) must separate each subfolder from its parent folder in the path name.
Interface name	(Required) Specify the name of the interface. The name must begin with a letter; spaces and most non-alphanumeric characters are not allowed. The .cls extension will be appended automatically.
Inherits	(Optional) Specify one or more interfaces in the current project that the interface implements or inherits. Click **Add** and select the desired interfaces in the **Interface Selection** dialog. Use the **Remove** button to remove an interface from the list.
Description	(Optional) Enter a description for the interface. This text will appear in the file header.
Purpose	(Optional) Enter an explanation of the purpose of the interface. This text will appear in the file header.

See also

Create ABL source files on page 279
Write object-oriented code on page 283
Code-generation wizards on page 347

New ABL Procedure wizard

The **New ABL Procedure** wizard helps you create a procedure file.

This wizard appears when you select **File** > **New** > **ABL Procedure**.

The following controls are available:

Container	Specifies a currently open project or a folder within the project where the procedure file is to be created. Click **Browse** if you want to select a project other than the current one (the default value).
File name	(Required) Specifies the name of the procedure file. The `.p` extension is appended automatically.
Description	Lets you optionally enter a description for the file. This text will appear in the file header.
Purpose	Lets you optionally enter an explanation of the purpose of the file. This text will appear in the file header.
Author	Lets you optionally enter the author's name. This text will appear in the file header.
Error-handling statement	Adds one of the following error-handling statements to the generated ABL code: • **Block level**: Includes the BLOCK-LEVEL ON ERROR UNDO, THROW statement in the generated ABL code • **Routine level**: Includes the ROUTINE-LEVEL ON ERROR UNDO, THROW statement in the generated ABL code

See also

ABL object-oriented extensions on page 263
Create ABL source files on page 279
Add internal procedures on page 282
Write procedural code on page 281

New ABL Structured Include wizard

The **New ABL Structured Include** wizard helps you create an ABL include file with default AppBuilder markup.

This wizard appears when you select **File** > **New** > **Other** > **Progress OpenEdge** > **Editor** > **ABL Structured Include**.

The following controls are available:

Container	Specifies a currently open project or a folder within the project where the include file is to be created. Click **Browse** if you want to select a project other than the current one (the default value).
File name	(Required) Specifies the name of the include file. The `.i` extension is appended automatically.
Description	Lets you optionally enter a description for the file. This text will appear in the file header.

Purpose	Lets you optionally enter an explanation of the purpose of the file. This text will appear in the file header.
Author	Lets you optionally enter the author's name. This text will appear in the file header.

See also

Create new ABL source files on page 279
Write procedural code on page 281
AppBuilder properties page (Windows only) on page 77

New ABL Structured Procedure wizard

The **New ABL Structured Procedure** wizard helps you create an ABL procedure file with default AppBuilder markup.

To view this, select **File** > **New** > **Other**. The **Select a wizard** window is displayed. From the **Select a wizard** window click **Progress OpenEdge** > **Editor** > **ABL Structured Procedure**

The following controls are available:

Container	Specifies a currently open project or a folder within the project where the procedure file is to be created. Click **Browse** if you want to select a project other than the current one (the default value).
File name	(Required) Specifies the name of the include file. The `.p` extension is appended automatically.
Description	Lets you optionally enter a description for the file. This text will appear in the file header.
Purpose	Lets you optionally enter an explanation of the purpose of the file. This text will appear in the file header.
Author	Lets you optionally enter the author's name. This text will appear in the file header.
Error-handling statement	Adds one of the following error-handling statements to the generated ABL code: • **Block level**: Includes the BLOCK-LEVEL ON ERROR UNDO, THROW statement in the generated ABL code • **Routine level**: Includes the ROUTINE-LEVEL ON ERROR UNDO, THROW statement in the generated ABL code

See also

Creating ABL source files on page 279
Writing procedural code on page 281
AppBuilder properties page (Windows only) on page 77

Override/Implement Members wizard

The **Override/Implement Members** wizard helps you to:

- Locate inherited data members that you want to override.
- Satisfy the requirement to implement data members declared in interfaces implemented by the current class, and to implement inherited abstract members.

This wizard appears when you select **Source** > **Override/Implement Members**. The following controls are available:

Tree view	Displays and lets you select data members in the class hierarchy that are eligible to be overridden or implemented.
Insertion position	Determines where the member code is inserted in the source file.
Generate comments	If checked, adds a comment block before the inserted member code.
Throw a Not Implemented exception	If selected, specifies that "METHOD NOT IMPLEMENTED" error code will be added to stubs for members implemented via interface and stubs for inherited abstract members.
Return default values	If selected, specifies that default return values will be added to stubs for members implemented via interface and stubs for inherited abstract members.

See also

Code members implemented via interface or abstraction on page 286
Write procedural code on page 281

Generate ABLDoc wizard

The Generate ABLDoc wizard enables you to generate an **ABLDoc** documentation for a selected project.

Document title	Specifies the name as the title for the generated **ABLDoc** documentation.
Destination	Specifies a default directory to save all output files.
Select the files for which you want to generate the ABLDoc	Specifies the project and the corresponding files for which you want to generate the **ABLDoc** documentation.
Create ABLDoc for members with access mode	Specifies if you want to include members with visibility other than public.

See also

Generate ABLDoc documentation on page 322
Navigate through the ABLDoc Navigation page on page 325
Add comments on page 326
Customize ABLDoc output on page 327

Profiler Viewer

The Profiler Viewer opens when you profile a session in the launch configuration or you click a `.prof` file. It displays the details of the session for which you created the `.prof` file.

Module Details tab

The **Module Details** tab of the **Profiler Viewer** displays the execution time of the modules in the current session. It displays the modules that are calling other modules and also the modules that have been called.

Field	Description
Module Name	Displays the name of the module. **Note:** The row displays the module name and name of the file that contains the module seperated by a space, for example, `Proc1 C:ex/Procedure.p`, where `Proc1` is the name of the module and `C:ex/Procedure.p` is teh name of the file.
Times Called	Displays the number of times the module has been called.
Average Time Per call (sec)	Displays the average of the total time taken to execute and the number of times the module was called. **Note:** Displays in seconds with microsecond precision.
Total Time (sec)	Displays the total time taken by this module to execute. **Note:** Displays in seconds with microsecond precision.
% of Session	Displays the percentage of session that is consumed by the execution of this module. **Note:** The percentage is presented numerically and graphically.

You can select a module in the table above and view the details of the modules that called it or the modules that this module called.

Field	Description
Calling Module	Displays the names of the modules that are being called by the module whose details you are viewing.
Times Calling	Displays the number of times the module was called.

Field	Description
% of Session	Displays the percentage of the session that is consumed when this module is calling the module selected in the **Calling Modules** column.
Called Modules	Displays the name of the module that is called by the module whose details you are viewing.
Times Calling	Displays the number of times the module was called.
% of Session	Displays the percentage of the session that is consumed when this module is calling the module selected in the **Called Modules** column.

AVM Information tab

The **AVM Information** tab of the Profiler Viewer displays the general information about the session and the databases being used by the profiled session.

Field	Description
User Id	Displays the user Id that profiled the session.
Date of profiling	Displays the date and the time when the session was profiled.
Description	Displays the description (`-Description`) that you provided when you enabled the profiling in the **Profiler** tab in the Launch Configuration or added using the `-Description` option from the command line.
Parameters	Displays the parameters that the session passed to the AVM.
Database name	Displays the names of the databases that were used by the session.
Number of tables	Displays the number of tables in the selected database.
PROPATH	Displays the PROPATH used by the session.

Call Tree tab

The **Call Tree** tab of the Profiler Viewer displays the call tree hierarchy of the session. It enables you to evaluate the calls that consume most of the session.

Field	Description
Call Order	Displays the order in which the calls were made to the selected module.
Times Called	Displays the number of times the module called.
Cumulative Time (secs)	Displays the total time taken to execute the call including the time taken to execute the subcalls.
% of Session	Displays the percentage of the session consumed by the call.

Note: The details on the Call Tree tab are displayed only if the session was profiled using the `Tracing-Filter "*"` option.

ABL Scratchpad view

ABL Scratchpad is a multi-tabbed view provided by Progress Developer Studio for OpenEdge. It allows you to write and test the ABL code without having to save it or creating a new file or project. By default, the shared AVM runtime is used for the execution of the code. However, it provides the option of selecting the runtime of any existing OpenEdge projects for execution. This saves time and avoids the need to create a project or document multiple times for testing the code in different runtimes.

To access the ABL Scratchpad view, select **Window** > **Show View** > **ABL Scratchpad** from the main menu or use the keyboard shortcut `CTRL+F9`.

The ABL Scratchpad view toolbar contains the following options:

Open New Tab 	Opens a new tab in the ABL Scratchpad view. You can also access this option from the ABL Scratchpad view context menu or by using the `CTRL+T` keyboard shortcut. The keyboard shortcut for closing a tab is `CTRL+ALT+T`.
Check Syntax 	Verifies the correctness of the code. It checks the syntax of the ABL code written in the ABL Scratchpad view and displays a message stating whether the syntax is correct or not. You can also access this option from the ABL Scratchpad view context menu or by using the `CTRL+SHIFT+C` keyboard shortcut. If the syntax of the code is incorrect, an error is displayed stating the position of the error.
Run 	Executes the ABL code either in a new AVM or the project's AVM. These AVM options are provided in the drop-down menu of the Run button. You can also access this option from the ABL Scratchpad view context menu. To launch in a new AVM, use the `ALT+SHIFT+F11` keyboard shortcut and to launch using the project runtime, use the `ALT+F11` keyboard shortcut. When you execute the code by directly clicking the Run button, the ABL Scratchpad view uses the most recently selected AVM to run the code. If there are any errors while executing the code, an error dialog is displayed.

Save As 	Allows you to save the code in the ABL Scratchpad view as a physical file. You can also access this option from the ABL Scratchpad view context menu or by using the CTRL+ALT+S keyboard shortcut. On invoking this action, the Save As dialog appears. The .sharedavm folder, present in the workspace, is the default location where the file is saved, if it is executed in a shared AVM. If the code is executed in any other OpenEdge project's runtime, then it is saved in the corresponding project's folder in the workspace. However, you can save the file at any location that you like. The default extension in which the file is saved is .p. However, you can choose to save it any format that you like. If the view is closed and reopened for the same session, the tabs and the data present persist. The AVMs selected for each tab also persist. The same applies when you restart Progress Developer Studio for OpenEdge.
Clear 	Clears the entire text present in the ABL Scratchpad view. You can also access this option from the ABL Scratchpad view context menu or by using the CTRL+Q keyboard shortcut.
AVM selection	Specifies the runtime for executing the code in the ABL Scratchpad view. The shared AVM runtime is used as the default runtime for executing the code in the ABL Scratchpad view. However, you can use this drop-down menu to select any OpenEdge project's runtime (if present) in the workspace. Depending on the runtime selected and the database connection associated with that runtime, various features such as color coding, content assist, etc., are provided in the scratchpad. These changes happen dynamically as the runtime changes. Since it is a multi-tabbed view, the runtime selected for each tab is recorded. As you shift across tabs, the runtime changes reflect accordingly.

In addition to the above options, the ABL Scratchpad view provides the following features:

Cut, Copy, and Paste	Implements the general **Cut**, **Copy**, and **Paste** commands. These options are available in the **ABL Scratchpad** view context menu and as shortcut key commands.
Content assistance	Helps you write code faster and more efficiently. It provides a list of accessible keywords such as variable, methods, data types, etc. This feature is similar to that of the corresponding functionality in ABL Editor. It can be invoked with CTRL+SPACE key bindings. If the selected runtime is connected to a database, then the ABL Scratchpad view displays the list of tables present in that database on invoking the CTRL+SPACE command.
Color coding	Differentiates the keywords present in the ABL programming language from the rest of the words, by representing them with different colors that are highlighted. The selection of runtime affects the color coding schema. Color coding in the ABL Scratchpad view is similar to the ABL Editor color coding schema.

Hot keys

Hot keys are useful for frequently used coding functions. The table below lists some of the Editor's default hot keys.

Function	Keyboard sequence
Add Constructor	**ALT+SHIFT+C**
Add Constructors from Super Class	**ALT+SHIFT+S**
Add Destructor	**ALT+SHIFT+0**
Add Function	**ALT+SHIFT+F**
Add Method	**ALT+SHIFT+M**
Add Procedure	**ALT+SHIFT+P**
Add Property	**ALT+SHIFT+Y**
Add Static Constructor	**ALT+SHIFT+T**
Check Syntax	**CTRL+SHIFT+C**
Code-Completion Assistance	**CTRL+SPACE**
Correct Case	**CTRL+SHIFT+F**
Expand Keywords	**CTRL+SHIFT+1**
Fix Indentation	**CTRL+I**
Fix Prototypes	**CTRL+SHIFT+2**
Go to Matching Element	**CTRL+SHIFT+P**
Next Member	**CTRL+SHIFT+DOWN**
Open Declaration	**F3**
Override/Implement Methods	**ALT+SHIFT+O**
Previous Member	**CTRL+SHIFT+UP**
Keyword help	**SHIFT+F2**
Run Program	**CTRL+U**
Find references	**CTRL+SHIFT+G**
Surround With Catch Block	**ALT+SHIFT+Z**, **C**

Function	Keyboard sequence
Surround With Finally Block	**ALT+SHIFT+Z**, **F**
Toggle Comment	**CTRL+/**

See also

Write ABL code on page 279

Line Summary view

Line Summary view displays the module file of the module and the line details of the file that was called.

When you open a .prof file, **Line Summary** view opens. You can also select **Window** > **Show View** > **Profiler** > **Line Summary** from the main menu.

The right section of the **Line Summary** view displays the debug listing content in the right section, only if you selected the **Generate Debug Listing files** check box in the **Profiler** tab of the Run Configuration. The left section displays the following:

Line Number	Displays the line number in the module file that was called.
Times Called	Displays the number of times the line number in the module file that was called.
Average Time (secs)	Displays the average time taken by the line to execute calls.
Total Time (secs)	Displays the total time taken by the line to execute calls.

9

Learn About Visual Designer

The OpenEdge Visual Designer is an editor that helps you develop attractive, powerful graphical user interfaces (GUIs) for ABL applications. Visual Designer users can take advantage of the rich functionality and the look and feel of .NET controls without using any non-ABL language or leaving the Progress Developer Studio for OpenEdge environment.

Note: The Visual Designer is supported only on Windows platforms.

UI visualization and ABL code

With the Visual Designer, you build OpenEdge GUI for .NET forms and dialogs, also referred to as visual containers, by using familiar GUI techniques to place and arrange controls on a Design Canvas. Behind the scenes, the Visual Designer takes care of generating the corresponding ABL code that allows the application to display these .NET forms and controls at run time. This ABL code, in the form of a class (`.cls`) file, is immediately available in the standard ABL Editor, where you can inspect it and add appropriate business logic. Progress Developer Studio for OpenEdge maintains synchronization between the class file and the graphical display of the UI model on the Design Canvas.

Property and event management

When an object is selected on the **Design Canvas**, the **Properties** view displays all properties and events associated with the object and allows you to edit their values.

The Visual Designer simplifies the process of creating event subscriptions and adding the appropriate event logic. For example, suppose you have placed a button on a form and want to define how the application should respond when a user clicks that button. When you simply double-click the event name in the **Properties** view:

- The Visual Designer automatically adds to the class file both a subscription to a button-click event and a method to contain the code defining the application response to the event.
- The ABL Editor displays the class file with the cursor positioned at the newly created event method.

Custom user-defined controls

In addition to the extensive set of commercially published UI controls that the Visual Designer provides, you can create and reuse custom controls that extend or combine existing controls. You can create two types of custom controls:

- **Inherited controls**, which derive properties and events from a super class (that is, a parent control).
- **User controls**, which are composite controls made up of multiple individual controls grouped in a container.

For details, see the following topics:

- Concepts
- Tasks
- Reference

Concepts

Benefits of the Visual Designer

Among the principal benefits that the Visual Designer provides to ABL application developers are the following:

- The OpenEdge GUI for .NET (that is, the application presentation layer developed with the Visual Designer) takes advantage of full-featured, visually compelling .NET controls.
- The Visual Designer supports coding entirely in ABL. There is no need to learn or use any other programming language.
- Controls can be bound to ABL data sources (databases, temp tables, and ProDataSets).
- Use of the Visual Designer facilitates separation of the application presentation layer (UI) from the business logic layer, the recommended approach for promoting efficient maintenance and reuse of application modules.

See also

UI controls on page 375
The Visual Designer tool set on page 378
Develope a visual container on page 380
Learn About Visual Designer on page 369

Code associated with a Visual Designer component

The Visual Designer generates and maintains one class (`.cls`) file for each visual container that you design. This class contains the code needed to allow the ABL Virtual Machine (AVM) to display and enable the visual container. The code includes:

- A constructor and a destructor
- An InitializeComponent method that includes variable value assignments, property settings, and event subscriptions associated with the visual container

- An event method for each subscription
- A DoWait method that suspends program execution pending user action

Progress Developer Studio for OpenEdge synchronizes the ABL code with the Visual Designer display, so that changes made in either editor are immediately reflected in the other. However, it is recommended that you use the Visual Designer tools for all changes to the UI, and edit only application logic (for example, event logic) in the ABL Editor. In this way you can reduce the chance of introducing errors in the UI code.

See also

View and edit the container's source code on page 382

DOT NET assemblies and the Visual Designer

.NET classes, including the forms and controls used to build an OpenEdge GUI for .NET, reside in collections called assemblies. An application that includes .NET classes must have a list of the assemblies in which those classes are stored. This list of references is contained in a file called `assemblies.xml`.

An `assemblies.xml` file is automatically created for your Progress Developer Studio for OpenEdge project when you place a control on a form or manually add an assembly to the project. As you use .NET objects to build UI components, Progress Developer Studio for OpenEdge adds the appropriate assembly references to the file so that the `assemblies.xml` file for a project contains all references needed for that project.

In addition to maintaining the `assemblies.xml` file, Progress Developer Studio for OpenEdge also adds a Referenced Assemblies node to the Project Explorer view, providing a convenient list of the assemblies in use in the project. If your application uses .NET classes other than those you access with the Visual Designer, you can add them to the `assemblies.xml` file through a dialog that is accessible via right-clicking in the Project Explorer view (or via the Progress OpenEdge Properties page).

Note: When you delete a control with the Visual Designer, the assembly reference is not automatically removed from the `assemblies.xml` file or from the Project Explorer view. Although unused assembly references do no harm, if you want to delete them, you must do so manually. Use the **Assemblies** dialog in project properties (**Project** > **Properties** > **OpenEdge** > **Progress** > **Assemblies**) to do this.

Your application must have access to the assemblies at run time. Thus, the run-time environment must include all referenced assemblies.

Location of `assemblies.xml` and controls

By default, Progress Developer Studio for OpenEdge creates the `assemblies.xml` file in the project's root folder. To specify a different location, add `-assemblies` *`directory-path`* to the project startup parameters (**Project** > **Properties** > **Progress OpenEdge**). You can enter the absolute directory path or the path relative to the project working directory.

All controls installed with Progress Developer Studio for OpenEdge are automatically registered in the global assembly cache (GAC), the standard repository for .NET.assemblies that are designed for use by multiple applications running on the local machine. The GAC enables applications to locate and use all of the assemblies that it contains. Any assemblies used by the application that are not registered in the GAC must reside in the same directory as the `assemblies.xml` file. If you use such assemblies, be sure to copy them to that location. This requirement applies both to the run-time environment and to the design-time environment. Failure to keep the `assemblies.xml` file and the assemblies together in the same directory prevents applications from loading the controls at run time, and may cause various design-time issues.

Note: For more information about considerations related to .NET assemblies, see *OpenEdge Deployment: Managing ABL Applications*.

Updating assembly references to use new controls

If you install a new version of an assembly, it is necessary to update existing assembly references in order to use the new controls in applications that you developed previously. OpenEdge provides an Update Assembly References tool to help you accomplish this. The tool runs independently outside of the Eclipse framework, but you can launch it from Progress Developer Studio for OpenEdge by means of an option on the **OpenEdge** > **Migration** menu.

Note: For more information, see Update assembly references on page 413.

Default assemblies

For any ABL application that accesses .NET objects, the AVM automatically loads certain .NET assemblies, including the appropriate versions of:

- `Progress.NetUI.dll` — Assembly where all custom OpenEdge .NET classes reside
- `Mscorlib.dll` — Assembly where all core Microsoft .NET classes reside
- `System.Windows.Forms.dll` — Assembly where all Microsoft form and control classes reside
- `System.Drawing.dll` — Assembly where all Microsoft graphics classes reside

ABL can therefore locate any .NET type that you reference from these assemblies without their being listed in the `assemblies.xml` file.

See also

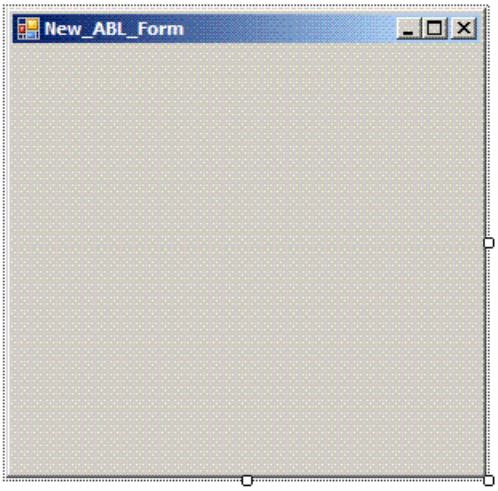
UI controls on page 375
Work with .NET resources on page 412
Add and remove assembly references on page 413
Update assembly references on page 413

Visual container types

As the starting point for building an OpenEdge GUI for .NET, you create a visual container by using one of three Progress Developer Studio for OpenEdge wizards: **New ABL Form**, **New ABL Dialog**, or **New ABL MDI Form**.

ABL Form

The **New ABL Form** wizard creates a blank form.



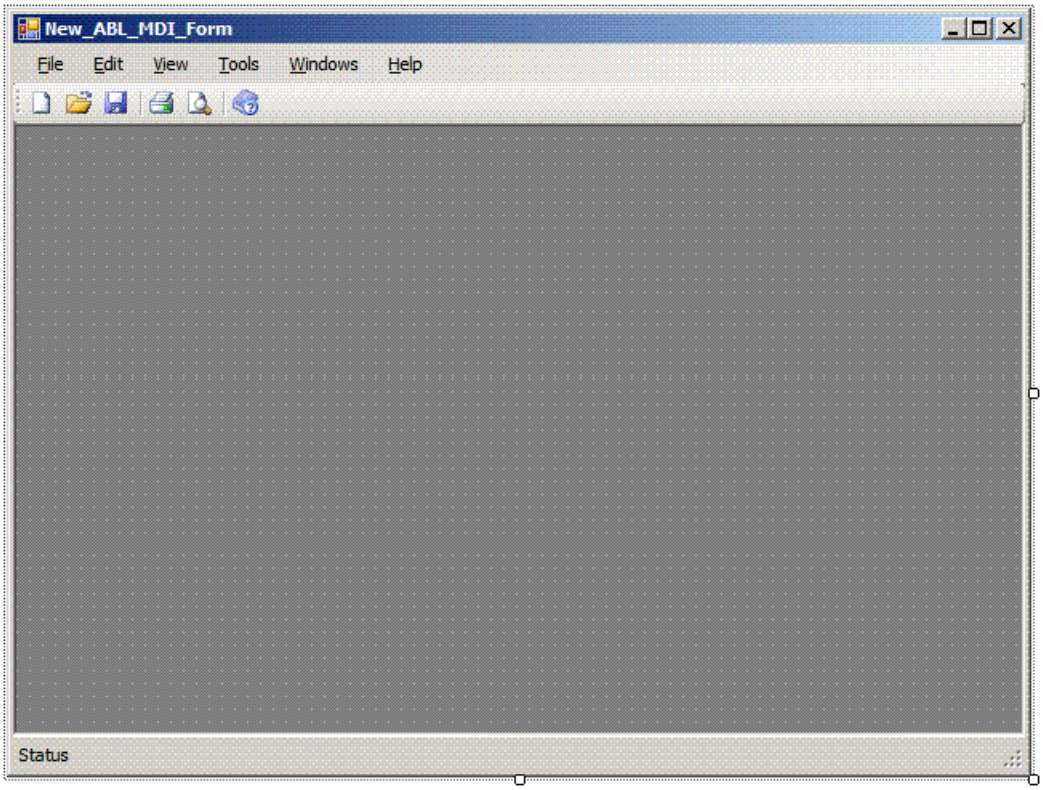
ABL Dialog

The **New ABL dialog** wizard creates a simple dialog with standard **OK** and **Cancel** buttons. An event subscription and event logic for a click are pre-coded for each of these buttons.



ABL MDI Form

The **New ABL MDI form** wizard creates a form enabled for multiple-document interface functionality, meaning that it can be the parent of child forms. The form includes a menu strip and a toolbar containing common menus (**File**, **Edit**, **View**, **Tools**, **Windows**, **Help**) and command buttons (**New**, **Open**, **Save**, **Print**, **Print Preview**, and **Help**) with pre-coded event subscriptions and logic. It also includes a status bar at the bottom.



The menu strip, toolbar, and status bar have special design-time behavior: Any of these default container objects, or any of the controls on them, when clicked, launches an embedded tool that provides an easy way to add new controls. Note that these tools do not appear on the form at run time.

Note: It is possible to embed an ABL application window, such as a window developed with OpenEdge AppBuilder, in any form. For example, you can create an MDI form that includes an ABL window as a child. However, you must manually write the ABL code to do this. The Visual Designer does not support programming tasks related to ABL windows. For instructions on embedding windows in forms, see *OpenEdge Development: GUI for .NET Programming*.

See also

Develop a visual container on page 380
OpenEdge GUI for .NET wizards on page 419

Implement the OpenEdge GUI for .NET in your application

To implement the UI in your application, you write ABL code that instantiates the classes in which the visual containers are defined.

You can add application logic to the class files generated by the Visual Designer where it suits your purposes to do so. In general, however, it is good practice to write separate procedures that are called by UI events. This use of separate layers for business logic and UI can make it easier to maintain and reuse your application code.

See also

Develop a visual container on page 380

Application run-time environment

All .NET assemblies used by the application must be available at run time, either in the Windows Global Assembly Cache (GAC) or in the `Progress\OpenEdge\bin` directory. Therefore, when you set up your run-time environment, you need to ensure that the required assemblies are installed on the end user's machine. In general, the standard Microsoft forms and controls are installed with Windows. OpenEdge Ultra Controls for .NET, however, typically will need to be installed as part of application setup.

The development license for the OpenEdge Ultra Controls for .NET entitles application developers to distribute the controls freely.

See also

.NET assemblies and the Visual Designer on page 371
Work with .NET resources on page 412

UI controls

All Progress Developer Studio for OpenEdge users have access to a standard set of Microsoft .NET controls. These standard controls are included with the **Microsoft .NET** Framework, which the Progress Developer Studio for OpenEdge installation program installs on the host machine if it is not already present.

A separately licensed option allows the use and redistribution of OpenEdge Ultra Controls for .NET, developed by Infragistics, which offer enhanced functionality and ease of use. The set of Progress-supported controls available on your system depends on whether the OpenEdge Ultra Controls for .NET option is installed.

Progress Developer Studio for OpenEdge also installs a trial version of **Telerik UI** for WinForms by default. It includes controls that you can use to build your business applications. If you need a different version of Telerik, you can download it from the Telerik web site.

Note: If you need help on Microsoft, Telerik, or Infragistics controls, press **F1**. The Microsoft web site, Telerik web site or Infragistics web site page opens.

In addition, there may be other third-party controls installed in the development environment. Progress warrants that all .NET-compliant controls can be loaded in the Visual Designer and implemented on OpenEdge GUI for .NET forms. However, with respect to design and function, Progress supports only the set of controls that is enabled by default in the Visual Designer.

Visual and non-visual controls

UI controls fall in one of two basic categories: visual or non-visual.

- Visual controls appear on the application's user interface and generally allow user interaction, display data, or both. Examples include buttons, combo boxes, and data grids.
- Non-visual controls do not appear on the user interface at run time; instead, they support visual controls or provide other services such as logging. Non-visual controls typically hold data, formatting, or other information needed by one or more interactive controls. An example is the ProBindingSource, which serves as an intermediary between an actual ABL data source and the control, such as a grid, that displays the data.

Visual controls can be placed and manipulated on the Design Canvas on page 379. Non-visual controls appear in a separate area at the bottom of the **Design Canvas**; you can select them for the purpose of setting their properties, but since they have no visual characteristics, you cannot resize or format them.

Note: In the context of .NET development, non-visual controls are often referred to as *components*.

See also

The Visual Designer tool set on page 378
Work with UI controls on page 383

Container controls

Some controls are designed as container controls; that is, they can function as the parent to a set of child controls. Typically, child controls are visually contained within the container on a finished UI form. At design time, you simply place the desired child controls on the container.

Container controls appear in the Containers group in the default Toolbox on page 378 configuration. They are also identified in the control summary.

See also

Develop a visual container on page 380
Create a user control on page 386

Data-bound controls

Certain visual controls are capable of displaying data retrieved from a database connected to the application. The Visual Designer simplifies the task of binding the data to the control.

Three objects are required:

- A data-displaying visual control
- A ProBindingSource non-visual control
- An ABL data object (query, temp table, or ProDataSet)

The data object is defined with standard ABL constructs; no special coding is necessary.

See also

Link controls to data on page 400

Custom user-defined controls

You can define two types of custom controls:

- **User control**—A collection of individual controls in a container. For example, you might create a user control called "Address" that includes text box controls for user entry of name, street address, and city; a combo box control that allows the user to select the state; and accompanying label controls that identify these fields.
- **Inherited control**—A control derived from another control. You can set properties and events as appropriate for your purposes. For example, you might created an inherited control called **ContactButton** (derived from

a standard button control) for which you specify the size and color, the text **Contact**, and event logic that responds to a button click by launching a pre-addressed e-mail message.

After you create a custom control, you can add it to your Visual Designer **Toolbox** to make it available for use on any forms you design.

Note: If any of your projects use the Toolbox on page 378, be sure that each such project has all of the other projects on its PROPATH so that custom controls that you add to the **Toolbox** are available in all projects.

See also

Create a user control on page 386
Create an inherited control on page 387
New ABL User Control wizard on page 424
New ABL Inherited Control wizard on page 425

Control properties

Each UI object has a number of properties that define its appearance and behavior. The Visual Designer lets you set these properties in several ways:

- Size and position can be set by clicking and dragging objects on the Design Canvas on page 379.
- Menus provide commands for setting alignment, spacing, front-to-back order, and tab order.
- The Properties view on page 379 lets you edit all available properties of selected objects.

The set of available properties depends on the control. Many controls have built-in wizards or other design aids tailored to the characteristics of that specific control.

See also

Define properties and appearance on page 391
Visual Designer Properties view on page 430

Event behavior

Every control has a set of events that it raises in response to specific user actions or system occurrences. The list of a control's events appears on the **Events** tab in the **Properties** view when the control is selected in the Visual Designer.

To make your application respond to a given UI event, such as a button click, your ABL code must both subscribe to the event and define the desired response. Simply double-clicking an event in the Properties view automatically generates an event subscription and an event method in which you can define the appropriate logic.

See also

Code event logic on page 407
Visual Designer Properties view on page 430

Access to controls

You access the available set of controls through the Toolbox on page 378.

You can customize the **Toolbox** to suit your preferences, arranging the controls in any groups you like. You can also modify the available set by adding or deleting controls.

Note: Progress Software Corporation supports only those controls that are installed with Progress Developer Studio for OpenEdge.

See also

Visual Designer components on page 378
Use the Toolbox on page 383
Share Toolbox settings on page 409
Visual Designer Editor on page 429
Progress OpenEdge properties page on page 75

The Visual Designer tool set

This topic describes the components of the Visual Designer and related tools. They are:

- Visual Designer components on page 378
- The Visual Designer perspective on page 379
- Additional tools on page 379

Visual Designer components

The major components of the Visual Designer are the **Toolbox**, **Design Canvas**, **Properties** view, and **Outline** view.

Toolbox

The **Toolbox** is a list of controls that are available for use in the UI. You select controls that you want to place on the form from this list. You can customize the set of available controls and arrange them in logical groups that you define. Customized settings can be shared with other users or copied to other projects.

By default, each OpenEdge project you create uses a dedicated Toolbox that is specific to that project. Alternatively, you have the option of using the global Toolbox, which is shared among all or a subset of the projects in the workspace. You choose whether to use the global Toolbox when you create a project. For an existing project, you can view and change the setting on the Progress OpenEdge properties page.

Customizations that you apply while working in a project that uses the global Toolbox affect the **Toolbox** for all other such projects. For any projects that do not use the global **Toolbox**, customizations are saved on a per-project basis, enabling you tailor the Toolbox to the particular needs of different projects.

Note: The PROPATH for every project that uses the global Toolbox should include the project directories of all other projects that share the Toolbox. If these projects also share an AVM instance, Progress Developer Studio for OpenEdge automatically updates the PROPATH and takes care of this requirement. However, for any project that does not use the shared AVM option, be sure to manually add the appropriate directories to the PROPATH for each project.

Design Canvas

The Design Canvas is the editing area in which you model the appearance of the UI. It provides an accurate visualization of how the window will appear to the user at run time, with the exception that it does not display actual data. You use the mouse to size objects by dragging their borders, and to position controls on the form.

Properties view

While a Visual Designer editing window has focus, the **Properties** view includes both a **Properties** tab and an **Events** tab, where you can view and edit the visual and behavioral characteristics of the object or objects that are selected on the Design Canvas.

Outline view

While a Visual Designer editing window has focus, the **Outline** view shows each component of the design as a tree node. This hierarchical representation of the form or user control complements the graphical display on the **Design Canvas**. You can use the **Outline** view as an alternative means of selecting, copying, deleting, renaming, and re-parenting controls.

See also

Develop a visual container on page 380
Work with UI controls on page 383
Customize the Visual Designer Toolbox on page 409
Use the Outline view on page 392

The Visual Designer perspective

The **Visual Designer** perspective gives you a handy way to set up your workspace with maximum space allotted to the tools that you typically use most while working on an OpenEdge GUI for .NET project. It includes a large editing area, which displays the **Toolbox** and **Design Canvas** along with any other open file buffers (such as the ABL Editor tab for the class source code). It also includes a window with tabs for the **Properties** view and the **Resources** view. This window is vertically maximized to display as many control properties as possible without requiring scrolling.

In addition, the default **Visual Designer** perspective includes a Fast View shortcut to open the Class Browser.

See also

Learn About Class Browser on page 433
Develop a visual container on page 380

Additional tools

Progress Developer Studio for OpenEdge tools that are not integral to the Visual Designer, but have particular value while you are building an OpenEdge GUI for .NET, include:

- **Class Browser**—The Class Browser offers a tree view that provides detailed information on the classes and .NET assemblies defined in or referred to by your projects.
- **Meta Catalog**—The Meta Catalog enables you to create a comprehensive index of the code base in both your local workspace and your team's shared source code control system.
- **ABL Editor**—The standard OpenEdge code editor is tightly linked to the Visual Designer to allow you to inspect and edit the source code for design classes and related procedures.
- **Outline view**—When a Visual Designer editor buffer has focus, the **Outline** view provides a hierarchical list of the form and its contents, allowing you to select, copy, re-parent, and delete controls.

- **Debugger**—The Debugger provides a full set of tools for testing and debugging ABL code.
- **Update Assembly References**—This tool is needed to update the old assembly references after the installation of new .NET controls. You should complete the update procedure each time you install a new version of any control set.

See also

Learn About Class Browser on page 433
Learn About Meta Catalog on page 689
Use the Outline view on page 392
Progress Developer Studio for OpenEdge Debugger on page 454
Update assembly references on page 413

Tasks

Develop a visual container

Visual containers can be developed in the following ways.

- Create the container on page 380
- Open an existing container on page 381
- Size the container on page 381
- View and edit the container's source code on page 382
- Delete a container on page 382
- Work with UI controls on page 383

Create the container

To create a new visual container class:

1. Select **File** > **New** and then the type of container you want: **ABL Form**, **ABL Dialog**, or **ABL MDI Form**. The **OpenEdge GUI for .NET** wizard for the selected type appears.
2. Enter the appropriate values as described in the OpenEdge GUI for .NET wizards on page 419 reference help. Only the **Package root** and the **Form name** or **Dialog name** fields are required. (The name must begin with a letter; spaces and most non-alphanumeric characters are not allowed.)
3. After entering the desired values, click **OK**. Progress Developer Studio for OpenEdge creates a new class file with the same name that you assigned to the new form and opens it in a Visual Designer editing window. The **Design Canvas** displays the form with its default content, if any.

   Note: Do not change the name of the class file. The class will not compile if its name and that of the file do not match

4. You can now proceed to size the container and add controls to it.

Note: It is possible to embed an ABL application window, such as a window developed with OpenEdge AppBuilder, in any form. For example, you can create an MDI form that includes an ABL window as a child. However, you must manually write the ABL code to do this. The Visual Designer does not support programming tasks related to ABL windows. For instructions on embedding windows in forms, see *OpenEdge Development: GUI for .NET Programming*.

See also

Visual container types on page 372
Size the container on page 381
Work with UI controls on page 383
Create custom controls on page 386
OpenEdge GUI for .NET wizards on page 419

Open an existing container

To open an existing UI design class, right-click the file name in the **Project Explorer** view and select **Open With**. Then, from the sub-menu, select **OpenEdge ABL Editor** to display the source code, or OpenEdge Visual Designer to display the design.

You can also simply double-click the file name in the **Project Explorer** view. Progress Developer Studio for OpenEdge opens the form either in a Visual Designer editing window or in the ABL Editor, whichever you last selected when opening the file with the **Open With** command. If you have not previously used **Open With** for the file, it opens in the Visual Designer.

Note: You cannot open multiple instances of the same file in the Visual Designer. However, multiple instances of the file in the OpenEdge ABL Editor (via the New Editor command) are allowed.

See also

Size the container on page 381
Work with UI controls on page 383

Size the container

You can control or define the size of the form in either of two ways:

1. Click and drag any of the three handles located on the right and bottom edges and the lower right corner of the form, which always remains pinned to the top left corner of the **Design Canvas**.
2. To set precise dimensions in pixels, enter the desired values for the Size property in the **Properties** view.

Note: The **Minimize**, **Maximize**, and **Close** buttons that appear by default in the window control box at the top right corner of the form are run-time features; they are not functional at design time. You can enlarge or maximize the editing window if you need more space for the **Design Canvas**. You can also Use the Toolbox on page 383.

See also

Work with UI controls on page 383

View and edit the container's source code

To display the source code in the OpenEdge ABL Editor while editing a design class in the Visual Designer, do one of the following:

1. Right-click in the **Design Canvas** and select **View Source** from the context menu.
2. Select **Design** > **View Source**.
3. Press **F9**.

   All features of the ABL Editor are available.

Conversely, to display the form in the Visual Designer while editing the source code, do one of the following:

1. Right-click in the **Design Canvas** and select **View Design** from the context menu.
2. Select **Design** > **View Design**.
3. Press **Shift+F9**.

Changes are synchronized when you switch between the design view and the source view, and when you save the file. Thus, changes that you make with either editor are immediately reflected in the other.

Once you have opened the class file in either the Visual Designer or the ABL Editor, it remains open in that editor until you close it.

Note: When editing the ABL code, be careful not to introduce errors in the UI code. It is advisable to use the Visual Designer for all changes to the UI, and edit only application logic (for example, event logic) in the ABL Editor. In particular, do not modify the InitializeComponent method created by the Visual Designer; in doing so, you might cause an error that would not prevent the code from compiling, but would make it impossible for the Visual Designer to open the file.

See also

Code associated with a Visual Designer component on page 370
Code event logic on page 407

Delete a container

To delete a container class, select the .cls file in the **Project Explorer** view and press **Delete**. You cannot delete a class via the Visual Designer, and you cannot delete the container object (the form) from the **Design Canvas**.

When you delete a UI `.cls` file, the corresponding compiled r-code file is also deleted.

Note: For some UI classes that you create, an accompanying RESX file of the same name is created. This file is not automatically deleted when you delete a class file, so you should manually clean up unneeded RESX files. By default, the Resources view does not list RESX files. If you want to see them in the **Resources** view, click , select **Filters**, and uncheck the **.resx entry**.

See also

Delete controls from a container on page 390

Work with UI controls

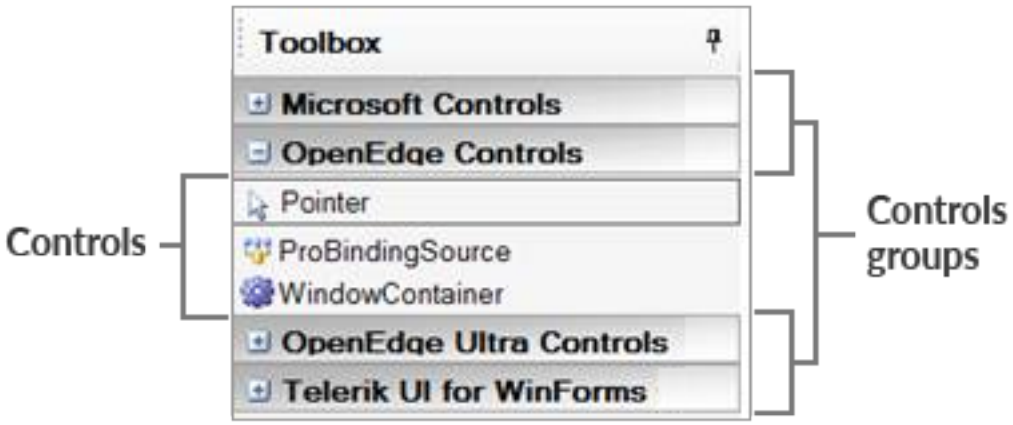
Use the Toolbox

You use the **Toolbox** as the source of all controls that you incorporate in an OpenEdge GUI for .NET design.

By default, the **Toolbox** is docked to the right edge of the editing area. If you wish, you can change the docking position through the Visual Designer Preferences on page 418.

Opening and closing Toolbox sections

Controls in the **Toolbox** are arranged in control groups:



To open or close a control group, click its title bar. You can also right-click and select **Expand All Control Groups** from the context menu. You can have multiple control groups open simultaneously.

Note: You can customize the control groups and controls that appear in the **Toolbox**. In particular, if you create custom controls, you need to add them to the **Toolbox** to make them available for use. See Customize the Visual Designer Toolbox on page 409.

Placement mode and selection mode

You select a control in the **Toolbox** by clicking its name. While a single control is selected in the **Toolbox**, the Visual Designer is in placement mode, meaning that it is ready to place an instance of that control on the **Design Canvas**. When the cursor hovers over the form in placement mode, it appears as blue crosshairs with the icon for the selected control (for example, with the ProBindingSource control selected:). In this mode, clicking or dragging on the form results in adding a control.

Note: You can also perform **Toolbox** customization operations while in placement mode.

To operate on the form or on controls that have already been placed on the form, you must be in selection mode. To put the **Toolbox** in selection mode, click the pointer tool (highlighted in the preceding illustration).

When the cursor hovers over the form in selection mode, it appears as an arrow pointer . In this mode, you can select one or more objects on the **Design Canvas** and move them, edit their properties, or delete them.

Sticky placement mode

By default, the **Toolbox** automatically switches from placement mode to selection mode after you place a control on the **Design Canvas**. When you want to place several instances of a control in succession, you can set the **Toolbox** to remain in placement mode until you are ready to revert back to the default behavior.

To lock the **Toolbox** in placement mode, right-click a control in the **Toolbox** and select **Make Sticky** from the context menu. Repeat this process or select a different control when you want to turn off this option.

Hiding the Toolbox

By default, the **Toolbox** is always visible when a design is open. If you prefer to hide it when it is not needed, click the push pin icon in the top right corner. The **Toolbox** will then slide out of sight when it is not in use.

To display the **Toolbox** when it is hidden, just move the cursor over the **Toolbox** label in the border. The **Toolbox** slides back out and remains visible as long as the cursor is over it. The push pin now appears in a horizontal position; click it to pin the **Toolbox** in place and prevent it from hiding.

See also

Choose controls for the UI on page 388
Customize the Visual Designer Toolbox on page 409
Visual Designer Editor on page 429
Custom user-defined controls on page 376

Get control-specific information

It is beyond the scope of this online help to provide detailed documentation of the numerous controls available in the Visual Designer and their properties. You can view the vendor-supplied help for a specific control by placing an instance of the control on the **Design Canvas**, selecting it, and pressing **F1**. In addition, you can use the following techniques to get useful information about the controls:

Toolbox tool tips

Point the cursor at a control name in the **Toolbox** to display a description of the control's function in a tool tip.

Properties view help text

With an instance of the control selected on the **Design Canvas**, select any property or event in the **Properties** view to display a description of its function at the bottom of the window.

Class Browser

The OpenEdge Class Browser gives you access to extensive information about the structure and content of all ABL and .NET resources, packages or namespaces, and types on your system. This information typically includes summary information about the object. It also includes details about class membership, inheritance, and interface implementation, and gives sample ABL syntax for working with the USING and DEFINE statements.

To navigate quickly to the Class Browser entry for a given object type:

1. Place an instance of the object on the Design Canvas and select it.
2. In the field at the top of the **Properties** view, note the name of the class from which the object is derived. The class name is the string to the right of the colon (:) that follows the instance name. Enter this class name in the **Search** field in the Class Browser and click  to execute the search. The result list appears in the left pane of the **Class Browser**; in this list, select the entry that exactly matches the class name you searched for, and view the available information in the panes to the right.

For example, if you place a single SplitContainer control on the **Design Canvas**, by default the control instance is named splitContainer1. When you select the control, the Properties view shows its name and class thus:

```
splitContainer1 : System.Windows.Forms.SplitContainer
```

Therefore, to search for the class, enter `System.Windows.Forms.SplitContainer` in the **Class Browser Search** field.

You may find it handy to copy the class name from the corresponding DEFINE VARIABLE statement in the ABL source code and paste it into the **Class Browser** search. Copy the string between AS and NO-UNDO. For the preceding example, the variable declaration is:

```
DEFINE PRIVATE VARIABLE splitContainer1 AS System.Windows.Forms.SplitContainer NO-UNDO.
```

See also

Learn About Class Browser on page 433
Use the Properties view on page 398
Get information from the Class Browser on page 413

Use built-in design tools

Many controls have built-in tools that can help you use the control. All of these tools provide alternative ways to set properties, so you can achieve the same results by working exclusively with the Properties view, but the built-in tools can make the process more intuitive.

The options vary among the available controls. They include "Quick Start" wizards, designers, custom property pages, and smart tags.

Quick Start wizards

Built into several OpenEdge Ultra Controls for .NET GUI, **Quick Start** wizards appear when you place the control on the **Design Canvas**. The **UltraGrid** is an example of a control that offers a **Quick Start** wizard. If you prefer not to use the wizard, you can simply click **Finish**. A **Preferences** button on the wizard lets you specify whether you want the wizard enabled and other options.

Designers

Designers assist you in the process of setting up the control. If a designer option is available, a link to it appears at the bottom of the **Properties** view when the control is selected on the Design Canvas. Click this link to open the tool. The **ProBindingSource** is an example of a control with a built-in designer.

Custom property pages

Custom property pages present a subset of the same properties that you can access through the **Properties** view, but in logical groups. If custom property pages are available, a link appears at the bottom of the **Properties** view, and also on the context (right-click) menu. Click this link to open the custom property pages.

SmartTags

SmartTags offer a subset of the most frequently used properties for the control. If **SmartTags** are available, the control has a small right-arrow button at the top right corner when it is selected, as in the example shown below. Click this button to open the **SmartTag** tool.



You can specify on the Visual Designer Preferences on page 418 whether you want smart tags enabled. This option is enabled by default.

See also

Define properties and appearance on page 391

Use the Undo and Redo options

You can undo any editing actions that you perform on the **Design Canvas**, and you can redo any actions that you have previously undone. These options are not available for changes made in the **Properties** view.

To undo an action, select **Edit** > **Undo** or press **Ctrl+Z**. To redo, select **Edit** > **Redo** or press **Ctrl+Y**. (In some cases involving controls that have built-in design tools, you may need to use the Undo command multiple times before you see the desired result.)

The undo/redo stack for the **Design Canvas** is maintained separately from the stack for other Eclipse components. To undo or redo Visual Designer actions, you must have focus on the design window.

Note: Only editing actions that have occurred since the most recent save operation can be undone and redone; you cannot use Undo to return to a state earlier than the latest saved version of the file. To revert to an earlier saved version, right-click the class file in the **Project Explorer** view and select **Replace With** > **Local History** from the context menu.

See also

Choose controls for the UI on page 388

Test a UI design

At any time during the development of a UI design, you can test it by clicking **Run**  on the main Eclipse toolbar while editing the file in the Visual Designer. Save the file first to see the effect of your changes, but it is not necessary to explicitly compile it or to write a startup procedure.

See also

Develop a visual container on page 380
Running ABL code on page 314

Create custom controls

Create a user control

A user control is a composite control consisting of a container with individual controls that you add to it. You select the controls you need, define their properties and event logic, and save the container and its contents as a single entity that you can add to any form.

1. Select **File** > **New** > **ABL User Control**.
2. Enter the appropriate values as described in the New ABL User Control wizard on page 424 reference help. Only the **Package root** and **Control name** fields are required. (The name must begin with a letter; spaces and most non-alphanumeric characters are not allowed.)
3. After entering the desired values, click **OK**. Progress Developer Studio for OpenEdge creates a new class file with the same name that you assigned to the control and opens it in a Visual Designer editing window. The **Design Canvas** displays a blank container with sizing handles that you can drag to define the size and shape of the rectangular container.

   Note: You must fully define the behavior and properties of the individual controls in the container at the time that you design the user control. It is not possible to change these characteristics after placing an instance of the user control on a form. You can resize the container after placing it, however.

   ---

4. Add controls to a container on page 389 the desired controls to the container and define their Define properties and appearance on page 391, Link controls to data on page 400 (as necessary), and Code event logic on page 407.
5. Save the `.cls` file.

After defining the custom control, you must Customize the Visual Designer Toolbox on page 409 to make it available for use in OpenEdge GUI for .NET forms.

Note: If you move the `.cls` file for a user control from its original disk location to a location that is not on the project PROPATH, you must add the new location to the PROPATH. Otherwise, the type is unavailable, and the Visual Designer cannot open the control or any form containing an instance of the control.

See also

Custom user-defined controls on page 376
Size the container on page 381
Work with UI controls on page 383
Define properties and appearance on page 391
Link controls to data on page 400
Code event logic on page 407
Customize the Visual Designer Toolbox on page 409
New ABL User Control wizard on page 424

Create an inherited control

An inherited control is an extension of an existing control class. For example, you might create a custom button with specific properties and behavior that you want to incorporate in multiple UI forms.

1. Select **File** > **New** > **ABL Inherited Control**.
2. Enter a value in the **Control name** field. The name must begin with a letter; spaces and most non-alphanumeric characters are not allowed.
3. In the **Inherits** field, specify the control class on which the new inherited control is to be based. The best way to enter this value is to click **Browse** and select the parent class from the list that appears. Alternatively, you can enter the value by typing.

   Note: The class from which the new control inherits must be or must inherit from `System.Windows.Forms.Control`.

   ---

4. The remaining fields are optional, with the exception of the **Package root** (required). Enter appropriate values as described in the New ABL Inherited Control wizard on page 425 reference help.
5. After entering the desired values, click **OK**. Progress Developer Studio for OpenEdge creates a new class file with the same name that you assigned to the control. A Visual Designer editing window opens.

Note: Depending on the class from which your control inherits, it may not be possible to display a visualization of the design at this stage. In that case, the **Design Canvas** appears with a yellow background and a message supplied by the Microsoft .NET Framework. You can still add content to the **Design Canvas** and use the **Properties** and **Events** tabs to define the characteristics of the inherited control, but you do not see the GUI as it will actually appear. You can also view and edit the ABL source code (right-click in the **Design Canvas** and select **View Source**, or press **F9**).

You might find it helpful to create a "scratch pad" form and place an instance of the parent control on it. You can use this test form to experiment with property settings and see the results. When the control appears the way you want it, you can duplicate the values in the Properties view for your actual inherited control.

6. Add controls to a container on page 389 the desired controls to the container and define their Define properties and appearance on page 391, Link controls to data on page 400 (as necessary), and Code event logic on page 407.
7. Save the `.cls` file.

After defining the custom control, you must Customize the Visual Designer Toolbox on page 409 to make it available for use in OpenEdge GUI for .NET forms.

Note: If you move the `.cls` file for an inherited control from its original disk location to a location that is not on the project PROPATH, you must add the new location to the PROPATH. Otherwise, the type is unavailable, and the Visual Designer cannot open the control or any form containing an instance of the control.

See also

Custom user-defined controls on page 376
Define properties and appearance on page 391
Link controls to data on page 400
Code event logic on page 407
Customize the Visual Designer Toolbox on page 409
New ABL Inherited Control wizard on page 425

Reload the Design Canvas while using custom controls

In the process of designing an inherited control, a user control, or a form that contains such custom controls, you might modify the contents or properties of the controls as you work. Depending on whether the element you modify is more than one hierarchical level removed from the base container, you might not see the changes on the base container until you save and reload the design. For convenience, Progress Developer Studio for OpenEdge provides a **Reload Design Canvas** command, accessible from the **Design** menu or the Visual Designer context menu.

To make sure that changes to hierarchically nested elements appear on the base container, use the following procedure:

1. Save the base container.
2. Make the desired changes to nested elements, directly editing their classes.
3. With focus on the design of the base container, select **Design** > **Reload Design Canvas** or right-click and select **Reload Design Canvas**. You are prompted to save the container class if you have not done so.

Choose controls for the UI

This topic explains how to populate a visual container with controls.

Add controls to a container

There are several ways to place a control on a form on the **Design Canvas**:

- **Clicking** — Select a control in the **Toolbox** and click once on the form at the desired position to place an instance of the control at its default size.
- **Double-clicking** — Double-click a control in the **Toolbox** to add an instance of the control at its default size. The new control overlaps the last control that you operated on, if applicable, or appears at the top left corner of the form.
- **Dragging** — Click a control in the **Toolbox**, hold down the primary mouse button, and drag the control to the desired position on the form. When you release the mouse button, an instance of the control appears at its default size. (Alternatively, you can drag the control to a container node in the Use the Outline view on page 392.)
- **Drawing** — Select a control in the **Toolbox**, point to the desired position on the form, and draw a rectangular outline of the size and shape you want the control to have. When you release the mouse button, an instance of the control appears, occupying the outlined area. (Some controls have shape constraints that prevent them from taking both dimensions of the outlined rectangle.)
- **Copying/cutting and pasting** — Click the pointer tool in the **Toolbox** to activate selection mode. Then select one or more controls on the **Design Canvas**, copy or cut them, and paste new instances onto the form. The **Copy** (**Ctrl+C**), **Cut** (**Ctrl+X**), and **Paste** (**Ctrl+V**) commands are available on the **Edit** menu and on the **Design Canvas** context (right-click) menu. You can also copy a control by pressing **Ctrl** while dragging to the desired location for the duplicate instance. Copy and paste operations are valid between separate UI classes.

Note: When you add certain controls (for example, the **UltraGrid**), a #unique_639/unique_639_Connect_42_QuickStart on page 385 may be launched.

Note: You cannot add a control to a form if the form's **Language** property is set to any value other than **Default**. Attempting to do so results in an error message.

Placing controls inside a container control

In general, when you place a control on the main form, the control becomes a child object of the form. Certain controls (for example, the **Panel control**), however, can contain other controls; in such cases, the container control is the parent of the child objects placed within it. Adding or moving a control within the boundaries of a container control creates a parent-child relationship between the two controls.

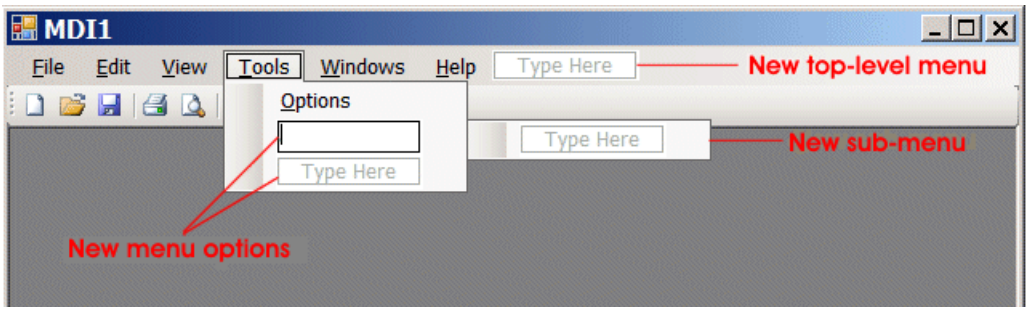
Note: You can use the Use the Outline view on page 392 to make a control the child of a different parent container, without moving the control on the **Design Canvas**.

Adding menu, toolbar, and status bar controls to an MDI Form

The **ABL MDI Form** offers special design-time functionality. When you click anywhere on the default container controls — the menu strip, toolbar, or status bar—an embedded design control is launched. These design controls do not appear on the form at run time. Rather, they serve as an easy way to add controls to those container controls.

Adding menu controls

When you click anywhere on the menu strip, one or more text boxes with drop-down arrows appear that allow you to enter new menus and menu options. If you click a blank area on the menu strip, a single text box appears on the menu strip; typing in that box creates a new top-level menu. If you click an existing menu title, additional boxes appear within the menu structure; typing in them creates new menu options or sub-menus.



In addition to standard menu items, you can add **ComboBox**, **Separator**, and **TextBox** controls. Point the cursor inside the text box to display the down arrow to the right. Click this arrow and select the desired control from the drop-down list.

Adding toolbar controls

When you click anywhere on the toolbar buttons, an **Add Control** button appears. To use this tool to add a standard button, which is the default, just click the button. A new button with a default image appears.

The **Add Control** tool can also add several other control types: **Label**, **SplitButton**, **DropDownButton**, **Separator**, **ComboBox**, **TextBox**, and **ProgressBar**. To add one of these controls, click the down arrow to the right of the image and select the desired control from the drop-down list.

Adding status bar controls

The status bar offers a similar **Add Control** button. Click the button to add the default control, a label. Click the drown arrow to select one of the other control types: **ProgressBar**, **DropDownButton**, or **SplitButton**.

Controls on the Design Canvas

Keep in mind that with the exception of the MDI controls described in the preceding section, the controls shown on the **Design Canvas** are not "live"; they are merely a representation of how the visual container will appear at run time.

See also

Delete controls from a container on page 390
Use the Undo and Redo options on page 385
Use the Outline view on page 392
Customize the Visual Designer Toolbox on page 409
Visual Designer Editor on page 429

Delete controls from a container

To delete one or more objects from the form, select them either on the **Design Canvas** or in the **Outline** view and press **Delete**. Alternatively, right-click and select **Delete** from the context menu.

When a control is deleted from the **Design Canvas**:

- If it is a container control, any child controls that it contains are also deleted.
- All event-handling code related to a deleted control is removed from the class file, provided it is not used by any other control.

The **Undo** option is available to reverse a deletion if necessary.

When you delete a control with the Visual Designer, the assembly reference is not automatically removed from the `assemblies.xml` file or from the **Project Explorer** view. Although unused assembly references do no harm, if you want to delete them, you must do so manually. You can use the **Assemblies** dialog in project properties (**Project** > **Properties** > **Progress OpenEdge** > **Assemblies**). Directly editing the `assemblies.xml` file is not recommended.

Note: You cannot delete the visual container object (the form itself).

See also

Add controls to a container on page 389
Select objects on the Design Canvas on page 391
Use the Outline view on page 392
Use the Undo and Redo options on page 385
Delete a container on page 382

Define properties and appearance

This topic explains the techniques available for editing the appearance and behavior of UI objects that have been placed on the **Design Canvas**.

Select objects on the Design Canvas

When you want to size or move an object, edit its properties, or delete it, you must select it on the **Design Canvas**. You can use the following selection techniques:

- **To select a single object** - Click on the object. Alternatively, select the name of the object from the drop-down list in the field at the top of the **Properties** view.
- **To select multiple objects by clicking** - **Shift+Click** or **Ctrl+Click** each object that you want to select.
- **To select multiple objects by drawing** - Hold down the primary mouse button and draw a marquee on the **Design Canvas** around the objects that you want to select. Then release the mouse button.
- T**o select all objects** - Select **Edit** > **Select All**, or press **Ctrl+A**.

As an alternative to making selections directly on the **Design Canvas**, you can use the **Outline** view. The Visual Designer synchronizes the selection state between the Outline view and the **Design Canvas**.

Selected objects appear with a visible border that includes, in most cases, selection handles at the corners and the middle of each edge. You can drag a selection handle to resize the object. (Not all controls can be resized, and some allow changes to only one dimension; selection handles appear only where they are usable.)

Note: When multiple objects are selected, certain editing operations are not available. Only actions that can be simultaneously applied to all of the selected objects are possible. Similarly, the **Properties** view displays only those properties and events that are common to all selected controls.

Selecting the parent object

You can select the parent object of a control via the context (right-click) menu. For example, for a toolbar button, you can select the toolstrip control that contains it.

When you right-click a control on the form, the context menu has a **Select** option that lists all parent objects of that control. The first-level parent is always the form itself. If the form is the only parent of the control, the form name is shown on the primary context menu (for example **Select Form_1**). If there are one or more lower-level parents, the **Select** option has a sub-menu that lists all parent objects. Use the context menu to choose the one that you want to select.

This selection technique is useful when a parent object is densely populated with child controls, as it can be difficult or impossible to click the parent on the **Design Canvas**. For example, a panel control might fill the form, making it impossible to click the form object. A complex design with a multi-level hierarchy of nested controls can make it difficult to select the controls visually.

Another good method for selecting parent objects is to use the Use the Outline view on page 392.

Deselecting objects

- **To deselect a single object** - **Shift+Click** or **Ctrl+Click** on the object.
- **To deselect all currently selected objects** - Click on an unselected object.

See also

Size objects on page 393
Size the container on page 381
Position objects on a container on page 394
Set tab order on page 397
Use the Properties view on page 398
Use the Outline view on page 392

Use the Outline view

The Outline view of a file that is open in the Visual Designer shows the contents of the Design Canvas and provides an alternative means of selecting, copying, deleting, renaming, and re-parenting controls. To display the Outline view if it is not open, select **Window** > **Show View** > **Outline**.

The Outline view shows a collapsible-expandable hierarchy of the top-level container (form or user control) and all of its controls in a tree structure. Each visual control appears as the child of its parent container. Non-visual controls appear below the tree at the same level as the base container.

Controls appear in the Outline view in the order in which you place them on the Design Canvas.

Selecting controls

You can select a control by clicking it in the tree, and you can use **Ctrl+Click** and **Shift+Click** to select multiple controls. Selecting controls in this way is equivalent to selecting them on the Design Canvas, and vice versa; the Visual Designer synchronizes the selection state between the Outline view and the Design Canvas.

In the case of complex forms, selecting items in the Outline view may be easier than selecting them directly on the Design Canvas. A complex design with a multi-level hierarchy of nested controls can make it difficult to select the controls visually.

Adding controls

As an alternative to placing a new control directly on the Design Canvas, you can select a control in the Toolbox and drag it to a container node in the Outline view. This is a useful technique if the target container is difficult to point to on the Design Canvas.

Re-parenting a control

If the form or user control includes at least one container control, you can re-parent another control - that is, make it the child of a different container - by clicking and dragging in the Outline view. Click the child control, hold down the primary mouse button, and drag the cursor so that it points to the node for the container that is to become the parent container. Then release the mouse button.

Using the context menu commands

You can select one or more controls in the Outline view and use the context (right-click) menu to cut, copy, paste, delete, or rename the selected items. (The **Rename** command is unavailable if more than one control is selected.)

Copying a container control copies all of its child controls as well.

When pasting, first select the target container and point to it while you right-click. If you use the **Paste** command without selecting a target container, the new control becomes a child of the top-level container.

Using the Undo and Redo commands

The **Undo** and **Redo** commands on the **Edit** menu are not available when the Outline view has focus. However, you can switch focus to the Design Canvas and then undo or redo a command that you executed in the Outline view.

See also

Select objects on the Design Canvas on page 391
Positioning objects on a form on page 394
Use the Undo and Redo options on page 385

Size objects

You can change the dimensions of objects on the **Design Canvas** in any of the following ways:

- Dragging selection handles
- Using shifted arrow keys to change dimensions in one-pixel increments
- Explicitly setting the values of the Size property
- Duplicating the dimensions of a specified base object
- Sizing objects to grid dimensions

Note: Certain controls have inherent constraints that prevent one or both of their dimensions from being changed (for example, you cannot change the height of a combo box control; a toolbar button cannot be resized). If you specify a new value for a protected dimension, the change is ignored.

Sizing objects by dragging

To size objects by dragging, select one or more objects that you want to operate on. Click on a selection handle on one of the objects and hold down the primary mouse button while you drag that object to the desired shape. Changes to the dimensions of the dragged object are applied in equal increments to all selected objects.

Once you have sized controls the way you want them, you can lock them to protect against their being resized by dragging. To do so, right-click on the **Design Canvas** and select **Lock Controls**. A locked control shows a small padlock icon at its top left corner when selected. This option does not prevent resizing by setting values in the **Properties** grid, nor does it apply to controls that you add after you invoke the locking option. To turn off the option, select **Lock Controls** from the context menu again.

Changing dimensions by increments of one pixel

To increase or decrease width or height by increments of a single pixel, select one or more objects that you want to operate on. Hold down **Shift** and press an arrow key as follows:

- **Shift + right arrow**—To increase the width by one pixel
- **Shift + left arrow**—To decrease the width by one pixel
- **Shift + down arrow**—To increase the height by one pixel
- **Shift + up arrow**—To decrease the height by one pixel

Sizing objects by setting property values

To size objects explicitly to precise dimensions, select one or more objects that you want to operate on. In the **Properties** view, click the **Properties** tab and find the **Size** property in the grid.

- **When a single object is selected**—The **Size** row of the grid shows the current dimensions (in pixels) in the right (value) column as two comma-separated values, width first followed by height. You can expand this row by clicking the plus symbol (+) to show separate Width and Height properties. You can edit the values in place in any of these three rows.
- **When multiple objects are selected**—The **Size** row of the grid is blank and is not expandable. However, you can enter the desired dimensions (in pixels) in the right column as two comma-separated values, width first followed by height. The dimensions you specify are applied to all selected objects.

Sizing objects by duplicating dimensions

Use this technique when you want to make one or more objects the same size (height, width, or both) as another existing object. Select the base object, that is, the object whose dimension(s) you want to duplicate, select the target objects to which you want to apply the dimension(s) of the base object. Select **Design** > **Size**. From the sub-menu, select **Width**, **Height**, or **Both** to apply one or both dimensions of the base object to the target objects.

Sizing objects to grid dimensions

The **Design Canvas** has an underlying grid (not visible on the form at run time) that is available to help you size and position objects. You can set various options related to use of the grid on the Visual Designer Preferences on page 418. These options include the horizontal and vertical spacing of the grid lines.

The **Size To Grid** option is a quick way to adjust the size of selected objects so that their dimensions are multiples of the specified grid spacing values. The adjustment either enlarges or shrinks each object to the nearest exact multiple. For example, suppose you are using the default grid spacing of eight pixels for both horizontal and vertical dimensions. If you apply the **Size To Grid** command to a control that measures 17 pixels wide by 23 pixels high, the control is resized to 16 pixels wide by 24 pixels high (the nearest exact multiples of 8 to 17 and 23, respectively).

To use this command, select the controls to be resized and then select **Design** > **Size** > **Size To Grid**. Note that this command also snaps the objects to the nearest grid lines.

See also

Select objects on the Design Canvas on page 391
Use the Properties view on page 398

Position objects on a container

The Visual Designer provides several methods of positioning controls relative to the form or container control and to one another. These methods include:

- Directly moving objects by dragging or by using the arrow keys
- Spacing and aligning objects relative to one another or to the grid
- Ordering layers of objects
- Docking

See also

Select objects on the Design Canvas on page 391
Use the Outline view on page 392
Size objects on page 393
Size the container on page 381

Directly moving objects by dragging or by using the arrow keys

You can move a selected object or set of objects either by dragging with the mouse or by using the arrow keys.

Visual Designer preference settings

The precise way the direct-moving techniques work depends on your Visual Designer preference settings. You work in one of two layout modes, **Snap to grid** (the default setting) or **Snap lines**:

- **Snap-to-grid mode**—The grid underlying the **Design Canvas** is activated, and grid-related options become available. These options help you achieve consistent spacing and alignment of controls. If you enable the **Snap To Grid** option, the top left corner of any control that you place or move on the form automatically aligns to the nearest intersection of horizontal and vertical grid lines. See the reference topic on the Visual Designer Preferences on page 418 for details about these options.
- **Snap-lines mode**—The grid is inactive (although its height and width values still have meaning for some spacing commands). When you place or move an object on the form, the object snaps into alignment with the nearest control, and horizontal or vertical lines appear to highlight the aligned reference points (for example, the top edges, the right edges, or the text baselines). You can override the automatic alignment, if you wish, by simply moving the object.

Dragging

To move one or more objects with the mouse, select them and then move the cursor over one of the selected objects. When the cursor appears as a **four-way arrow** , press and hold the primary mouse button, drag to the desired position, and release the mouse button. If the Snap to grid option is enabled, placement of the objects is constrained accordingly. If you are working in snap-lines mode, you may see horizontal or vertical alignment lines as the objects you are moving approach other objects on the form.

Moving with arrow keys

You can also select one or more objects and then use the arrow keys to move them up, down, left, or right. If the **Snap To Grid** option is enabled, each time you press an arrow key, the objects move to the next grid alignment position. Otherwise, each arrow-key press moves the objects one pixel.

Locking control positions

Once you have positioned controls the way you want them, you can lock them to protect against their being moved. To do so, right-click on the **Design Canvas** and select **Lock Controls**. (This option does not apply to controls that you add after you invoke the locking option.) A locked control shows a small padlock icon at its top left corner when selected. To turn off the option, select **Lock Controls** from the context menu again.

See also

Space objects on page 395
Align objects on page 396
Order layers of objects on page 396
Dock objects on page 397

Space objects

The **Design** menu provides commands that facilitate regular spacing and alignment of controls.

Use this procedure to regulate spacing of objects relative to one another. All space calculations are relative to horizontal or vertical edges of the affected objects.

1. Select two or more objects between which you want to adjust spacing. In most cases, the first object that you select - the base object - will not move; the objects that you select subsequently will move in response to the commands you choose. (An exception to this rule may occur with the **Make Equal** command.)
2. Select **Format** > **Horizontal Spacing or Format** > **Vertical Spacing**, and choose the appropriate command:

- **Make Equal** - The outermost objects remain in their original position, while any objects between those objects move so that all are equally spaced.
- **Increase** - Space equal to the grid width or grid height value specified in your Visual Designer Preferences on page 418 is added to the existing space between each pair of objects.
- **Decrease**- Space equal to the grid width or grid height value specified in your Visual Designer Preferences on page 418 is removed from the existing space between each pair of objects.
- **Remove** - All horizontal or vertical space between each pair of objects is removed, so that an edge of each object is horizontally or vertically adjacent to an edge of the next.

See also

Directly moving objects by dragging or by using the arrow keys on page 395
Align objects on page 396
Order layers of objects on page 396
Dock objects on page 397

Align objects

To align objects relative to one another:

1. Select two or more objects that you want to align. The first object that you select - the base object - will not move; the objects that you select subsequently will move in response to the commands you choose.
2. Select **Format** > **Align** and choose the desired alignment method. You can align the left, right, top, or bottom edges, or the horizontal or vertical centers.

To center one or more objects horizontally or vertically on the form, select **Format** > **Center In Form** and choose the desired option.

To align objects to the grid, select **Format** > **Align** > **To Grid**. The top left corner of each object snaps to the nearest intersection of horizontal and vertical grid lines.

See also

Directly moving objects by dragging or by using the arrow keys on page 395
Space objects on page 395
Order layers of objects on page 396
Dock objects on page 397

Order layers of objects

Ordering refers to the relative position of the virtual layers that are created when the boundaries of two or more objects overlap. To make one object appear to be in front of another, you move it forward. To make it appear to be behind the overlapping object, you move it back.

To order objects:

1. Select one or more objects on the form.
2. Select **Design** > **Order** and choose **Send to Back** or **Bring to Front**.

See also

Dock objects on page 397
Align objects on page 396
Space objects on page 395
Directly moving objects by dragging or by using the arrow keys on page 395

Dock objects

Docking locks an object in place along the full length of one edge of its parent object, or causes the object to fill the entire area of the parent object. You can set an object's docking state (the default is None) in the **Properties** view. Docking an object disables the ability to move or align it. You can resize a docked object only by moving the one edge that is not adjacent to an edge of the parent object.

To dock a child object in a parent object:

1. Add the parent object (for example, a Panel control). Skip this step if you are docking a control to the form itself.
2. Place the child object inside the parent object.
3. Select the child object.
4. In the **Properties** view, click the **Properties** tab and find the **Dock** property in the grid.
5. Click in the right column of the row and then click the down arrow that appears at the right edge of the cell. A rectangular diagram appears with buttons representing the possible docking positions:



6. Click the **button** corresponding to the docking option you want. If you choose the large **button** in the center, the docked object will completely fill the parent object.

See also

Order layers of objects on page 396
Align objects on page 396
Space objects on page 395
Directly moving objects by dragging or by using the arrow keys on page 395

Set tab order

You can specify the sequence in which controls on the form receive focus when the user presses the **Tab** key.

Note: Most controls have both an **AcceptsFocus** property and a **TabStop** property, both of which must be set to **True** (as is generally the case by default) to make the control part of the tab sequence. If either of these properties is set to **False**, the control is skipped in the sequence. Toolbars and menu strips items have a default **TabStop** property setting of **False**; the buttons, menu items, and other controls contained in a toolbar or menu strip control have no **TabStop** property.

To set the tab order:

1. Select **Format** > **Tab Order** to activate tab order mode. An index number appears in the top left corner of each control that has a TabStop property. In this mode, you cannot add, select, or move objects.

Note: The index number for a control parented to the form is an integer from 0 to n, where n is one less than the total number of such child controls the form. Controls parented to container controls have a decimal index number that begins with the index of the parent control. The default index numbers correspond to the order in which the controls were added to the design.

2. To change the tab order, change index numbers by clicking on the controls. Each click increments the rightmost decimal place of the control's index by 1, or resets it to 0 when the end of the sequence is reached.

   The system does not validate against duplicate index numbers. In the case of duplicates, precedence is determined by the relative top-to-bottom or left-to-right positions of the controls.

You may want to run the control (click **Run**  on the Workbench toolbar) to test the assigned tab order.

To deactivate tab order mode, press **Esc** or select **Format** > **Tab Order** again.

See also

Select objects on the Design Canvas on page 391

Use the Properties view

The **Properties** view displays all properties defined for the selected UI object and enables you to edit their values. On a separate tab, it also displays all events and helps you quickly create subscriptions and event methods for the ones you want the application to respond to.

Note: When multiple objects are selected, the **Properties** view displays only those properties and events that are common to all of the objects and can be set simultaneously for all of them. Be careful when editing multiple objects simultaneously, making sure that the values you set are appropriate for all of the objects.

See also

Select objects on the Design Canvas on page 391
Code event logic on page 407
Visual Designer Properties view on page 430

View properties and events in the Properties view

The field at the top of the **Properties** view identifies the selected object by its name and the name of the class of which it is an instance. In the case of an inherited object, the name of the parent class appears as a prefix. This field is blank if multiple objects are selected. Properties for the selected object are displayed on the **Properties**tab in a two-column grid. Each row is a name-value pair, with the name of the property on the left and its current value on the right.

Similarly, events are displayed on the **Events** tab in a two-column grid. On this tab, the left column shows the supported events for the selected object, and the right column shows the event method, if any, that is triggered when the event is raised.

When you select a property or event in the grid, by default, a brief description of its purpose appears in a text area at the bottom of the **Properties** view. If you prefer to suppress this feature, right-click anywhere in the view below the toolbar and select **Description** from the context menu. You can toggle the option on again in the same way.

See also

Set Property values in the Properties view on page 399

Sort the property and event list in the Properties view on page 399

Sort the property and event list in the Properties view

You can sort both the property list and the event list either alphabetically or by categories.

To toggle from one setting to the other, right-click in the view and select the sort option from the context menu.

You can also use the buttons on the **Property** view toolbar. Click **Sort by Categories**  or **Sort Alphabetically** .

See also

Set Property values in the Properties view on page 399
View properties and events in the Properties view on page 398

Set Property values in the Properties view

Note: This topic discusses only the **Properties** tab of the **Properties** view. Refer to Code event logic on page 407 for instructions pertaining to event handling.

You edit property values directly in the right column of the grid. The technique for specifying a value depends on the property:

- **Text entry** - Many properties take a user-defined string or integer as a value. To enter a value, you simply click in the cell and type.
- **Selection tool** - Other properties let you use either a drop-down list or a custom editor or browser to select valid options. In these cases, when you click in the value cell, a button with a down arrow  or an ellipsis  appears at the right. Click the button to launch the selection tool.

Depending on the control, one or more custom designers may also be available. If so, by default, the text area at the bottom of the **Properties** view includes links that you can click to launch these tools. If you prefer to suppress these links, right-click anywhere in the view below the toolbar and select **Commands** from the context menu. You can toggle the display of the links on again in the same way.

Values are saved and take effect immediately. Any values that you enter (changing the default setting) appear in bold print, making it easy to see where you have made changes.

Note: If you set the Language property of a form to any value other than Default, you cannot add controls to the form.

Undoing property value changes

The **Undo** and **Redo** options are not available in the **Properties** view. However, after making changes, you can reset properties to their default values. To do so, select the property that you want to reset and click **Reset**  on the **Properties** view toolbar.

See also

Sort the property and event list in the Properties view on page 399
View properties and events in the Properties view on page 398

Link controls to data

Various UI controls are capable of displaying data retrieved from a database at run time. To enable your OpenEdge GUI for .NET to display such data, you add both a visual data-displaying control and a non-visual binding source control to the visual container. You write application code that defines an ABL data source (a query, temp table, or data set) and sets the handle property of the binding source to the query handle.

Create a binding source object

The binding source object, **ProBindingSource**, is a non-visual control whose properties define the schema for the data to be displayed by the accompanying visual control. The **ProBindingSource** control includes a designer tool that helps you define this schema. The tool also gives you the option of importing the schema from an XML schema (`.xsd`) file, or from an ABL source file (like `.p`, `.cls`, `.w`, `.i`, and `.html`).

Note: When designing data-bound controls, it is a good idea to establish a SQL connection to the database, so that you can see its schema in the DB Structure view. You can simplify the design process by dragging and dropping schema elements from the DB Structure view. If you choose to define the schema manually, you can refer to the DB Structure view to determine the correct table names, field names, and character types.

Begin by connecting your project to the database via an ABL connection.

See also

Data-bound controls on page 376
Edit a ProBindingSource control on page 403
Define a recursive relationship between tables on page 405
Bind to an ABL data source on page 403
Data binding example on page 403
ProBindingSource Designer on page 427
Use the Available Schema pane on page 428

Drag-and-drop schema definition

The **ProBindingSource Designer** supports the following drag-and-drop operations:

- You can drag table and column names from the DB Structure view to a form on the **Design Canvas**.
- You can drag an ABL source file containing a schema definition (for example, a **ProDataSet** or a temp table) from the **Project Explorer** view to a form on the Visual Designer **Design Canvas**.

Both of these operations create a new binding source object, which you can then edit if necessary.

In both cases, you can drop the selected schema elements either on a blank area of the form, or on an instance of a data-displaying control. Dropping onto a control automatically sets the new binding source object as the value of the control's DataSource property.

Note: Drag-and-drop operations from the DB Structure view or the **Resources** view are not supported while the **ProBindingSource Designer** is open. This is an inherent limitation of modal dialogs.

Follow these steps:

1. Create or edit the container (ABL Form, ABL Dialog, or ABL MDI Form). Optionally, add the control that is to display the data. (You can add the control later if you prefer.)
2. Select the tables in the **DB Structure** view, or select the ABL source file in the **Resources** view.

   When making selections in the DB Structure view, note the following:

- Selecting a table also selects all of its columns.
- Use **CTRL+click** to select multiple tables.
- You can select individual or multiple columns from the same table or different tables.
-

3. Drag the selection to the Design Canvas and drop it on the container. If the target control already exists, drop the selection on the control. The **ProBindingSource Designer** appears and displays the selected schema elements in the **Available schema** pane.

   If the **Project Explorer** view **Link with Editor**  option is enabled, it might interfere with dragging a currently open source file onto the Design Canvas, because selecting the file in the **Project Explorer** view shifts focus to the editor buffer for the selected file. To avoid this problem, turn off the **Link with Editor** option, split the editing area so that it simultaneously shows both files, or close the source file.

4. In the **Available schema** pane, select the tables and columns that you want to add to the current schema definition. When selecting the tables and columns, note the following:

   - Selecting a table also selects all of its columns.
   - You can select multiple tables. All the selected tables are added to a default top-level table called **Table** in the **Tables** pane.
   - You can select individual columns, either from a single table or multiple tables. In both cases, the selected columns are added to a default top-level table called **Table**.
   - You can partially select tables and its columns. The selected schema elements are added to a default top-level table called **Table** in the **Tables** pane.

5. Click **Add**. The selected tables appear in the **Tables** pane and the columns appear in the **Fields** pane.
6. If necessary, edit the schema by using any of the techniques explained in Manually defining the schema on page 401, starting with Step 4 on page 401 .
7. Click **OK** to save the current schema definition.

See also

Import a schema on page 402
Manually defining the schema on page 401

Manually defining the schema

To create a binding source object and define the schema manually:

1. Create or edit the container (ABL Form, ABL Dialog, or ABL MDI Form).
2. Select the ProBindingSource control in the Toolbox and place an instance of it on the form. An object with the default name bindingSource1 appears in the non-visual control tray at the bottom of the Design Canvas, and the ProBindingSource Designer appears automatically.
3. Click **Add Table** . A top-level table node appears in the **Tables** pane, with one default field node beneath it.
4. Use the toolbar buttons to add, remove, or reorder elements, or drag and drop to change the table hierarchy:

   - To add a table, select the existing table that is to be the parent of the new one, and click .
   - To add a field, select the existing table that is to contain the field, and click .

- To remove a schema element, select it and click . Deleting a table deletes all of its children.
- To change the order of elements, select one or more tables or fields and click  or  to move them up or down. You cannot use this technique to change the hierarchical relationship of elements; you can move them only within their current level. To move multiple tables, you must select only sibling elements (that is, tables that have the same immediate parent).
- To change the table hierarchy, select one or more sibling tables and drag them, pointing the arrow cursor at the table that is to become their parent. Release the mouse button to complete the operation. Dragging columns is not supported.

5. To import the schema, see Import a schema on page 402
6. You can edit the name of a table node, and the name, label, and data type of a field node. To do so, select the element in the **Tables** or **Fields** pane, and change the current values as appropriate by typing directly in the rightmost pane.
7. Click **OK** to save the current schema definition.

See also

Import a schema on page 402
Drag-and-drop schema definition on page 400

Import a schema

You can import a schema definition from any of the following sources:

- A database connected to the current project
- A valid XSD file generated by means of the ABL function WRITE-XMLSCHEMA
- An ABL source file containing a schema definition, such as a ProDataSet

You have the option of either adding the imported schema to the current schema definition, or replacing the current definition with the imported one.

To import a schema definition:

1. Open the ProBindingSource Designer. You can do this by drag-and-drop or by using the Toolbox, as described in the two preceding sections; or you can Edit a ProBindingSource control on page 403.
2. If you want to add an imported schema to the current schema definition, in the tree view in the **Tables** pane, select the table that is to be the parent of the imported schema.
3. Click  to import from a connected database, or click  to import from a file.
   - If importing from a database, select the desired schema elements.
   - If importing from a source file, browse to and select the file.
4. The database schema appears in the **Available Schema** pane on the ProBindingSource Designer.
5. In the **Available Schema** pane, select tables and columns that you want to add to the current schema definition.
6. Click **Add**. The selected tables appear in the **Tables** pane and the columns in the **Fields** pane. You can Define recursive relation on page 405 between tables in the current schema definition.
7. The schema defined using the ProBindingSource Designer appears as a ProBindingSource object in the **Design Canvas**.

See also

Manually defining the schema on page 401
Drag-and-drop schema definition on page 400

Edit a ProBindingSource control

You can use the ProBindingSource Designer to edit the schema and schema properties of an existing binding source object:

1. Open the ProBindingSource Designer by doing one of the following:
   - Select the ProBindingSource control on the **Design Canvas**, click  and then **ProBindingSource Designer**.
   - Double-click **ProBindingSource Designer** on the **Design Canvas**.

   The **ProBindingSource Designer** appears and displays the current schema definition.
2. Add or remove schema elements, or modify their properties, as explained in Manually defining the schema on page 401.
3. To save the schema definition, click **OK**.

Note: You cannot use drag-and-drop techniques to add schema elements to an existing ProBindingSource control from the **Resources** view or the **DB Structure** view.

See also

Data-bound controls on page 376
Create a binding source object on page 400
Bind to an ABL data source on page 403
Define recursive relation on page 405
Use the Available Schema pane on page 428

Bind to an ABL data source

To enable the ProBindingSource object to pass data to the data-displaying control on the UI form, you must write application code (such as a query) that defines an ABL data source for the and sets the handle property of the binding source to the data source handle. You add this code to the form class.

The data-binding example in the next topic includes an example of such a query.

See also

Data-bound controls on page 376
Create a binding source object on page 400
Data binding example on page 403

Data binding example

This topic provides step-by-step instructions for creating a data-displaying control and binding it via a ProBindingSource object to an ABL query. The exercise assumes you want your UI to include a data grid that displays the name, city, and state of all customers in the **Sports2020** database who live in Texas.

To begin, make sure that you have you have configured both an ABL connection and a SQL connection to the Sports2020 database, and that the database is connected to your project. Also make sure that the **DB Structure** view is open (if not, select **Window** > **Show View** > **OpenEdge Editor** > **DB Structure**).

1. To create the data-displaying control, you must create a form and add a control capable of displaying data:
   a) Create a new **ABL Form** container.
   b) In the **Toolbox**, select either a **DataGrid** control or, if you have installed the OpenEdge Ultra Controls for .NET, an UltraGrid. (If you use the UltraGrid, you can just click **Finish** to dismiss the **Quick Start** wizard.)

2. To create a binding source object and associate it with the grid control:
   a) In the **DB Structure** view, expand the nodes of the Sports2020 database tree to show the columns in the **Customer** table.
   b) Select the **Name**, **City**, and **State** columns. Use **CTRL+Click** to select multiple items.
   c) Drag the selection from the **DB Structure** view and drop it on the grid control on the form. (By doing this, you automatically associate the binding source object with the grid.) The **ProBindingSource Designer** appears with the **Customer** table and the three columns that you selected in the Available schema pane on the left.
   d) In the **Available schema** pane, select the **Customer** node check box.
   e) Click **Add**. The Customer table that you selected appears in the **Tables** pane and its three columns appear in the **Fields** pane.
   f) To Define recursive relation on page 405 for the Customer table, select a table name from the **Recursive table** list box in the **Properties** pane. The Customer table is called the base table. Recursive table lists the name of base table and all its parent table in a hierarchical order.
   g) Click **OK** to save the current schema definition. The columns labeled **Name**, **City**, and **State** appear in the DataGrid or UltraGrid control on the form.

   Note: You can open the ProBindingSource Designer again at any time to edit the schema. To do so, select the object on the **Design Canvas** and either click  and then **ProBindingSource Designer**, or click **ProBindingSource Designer** at the bottom of the Properties view.

3. To bind to the ABL data source, define a query to retrieve the records for all customers who live in Texas:
   a) Open the class file for the form in the OpenEdge ABL Editor by right-clicking on the form and selecting View Source.
   b) Define handle variable qh, define the query, and set the binding source handle to the query handle. Here is an example of how your code might look:

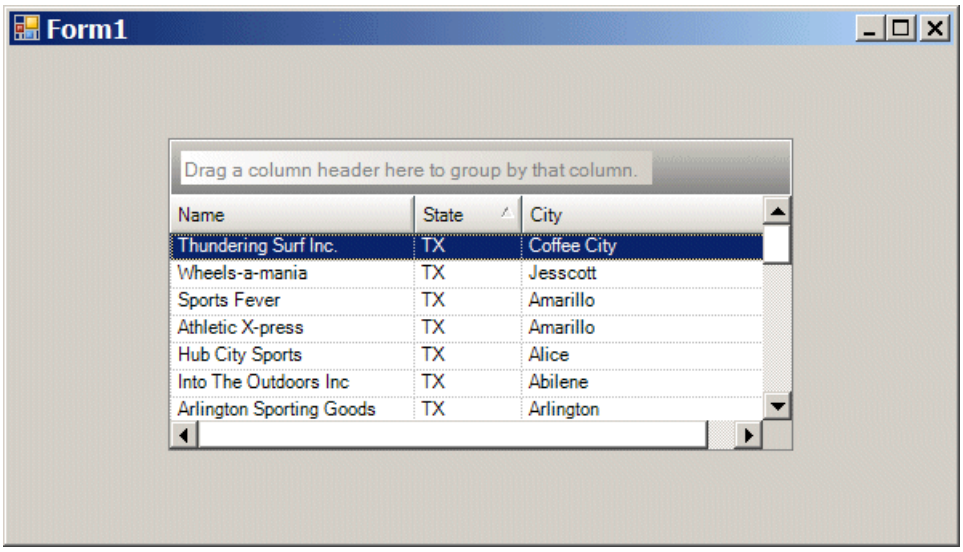
```
DEFINE VAR qh AS HANDLE NO-UNDO.
CONSTRUCTOR PUBLIC Form1 ( ):
    SUPER().
    InitializeComponent ( ).
    CREATE QUERY qh.
    qh:SET-BUFFERS(BUFFER Customer:HANDLE).
    qh:QUERY-PREPARE("FOR EACH customer where customer.state = 'TX'").
    qh:QUERY-OPEN ().
    proBindingSource1:handle= qh.
END CONSTRUCTOR.

DESTRUCTOR Form1 ( ):
    IF VALID-HANDLE(qh) THEN DO:
```

```
            qh:QUERY-CLOSE().
            DELETE OBJECT qh.
        END.
    END DESTRUCTOR.
```

c) Save the class file.

4. To test the data-bound grid control you designed, open the form in the Visual Designer and click **Run** on the main Eclipse toolbar. The control should display the retrieved records from the database:



See also

Data-bound controls on page 376
Create a binding source object on page 400
Edit a ProBindingSource control on page 403
Bind to an ABL data source on page 403
Define recursive relation on page 405

Define recursive relation

The **ProBindingSource Designer** dialog allows you to define recursive relationships between tables using the Recursive table property.

When using the Recursive table property, note of the following:

- **Recursive table** lists the name of the selected table and all its parent tables in a hierarchical order.
- A table can have a recursive relation with either itself or any of the parent table in its hierarchy.
- You can define only one recursive relation in a schema definition.

See also

Data-bound controls on page 376
Create a binding source object on page 400

Edit a ProBindingSource control on page 403
Bind to an ABL data source on page 403
Data binding example on page 403
ProBindingSource Designer on page 427

Define a recursive relation between tables

To define a recursive relation between tables:

1. Open the ProBindingSource Designer by selecting the **ProBindingSource** control on the **Design Canvas**, click  and then **ProBindingSource Designer** or double-clicking **ProBindingSource control** on the **Design Canvas**.

   The **ProBindingSource Designer** dialog appears and displays the current schema definition.
2. In the **Tables** pane, select a table for which you want to define the recursive relation. The selected table is called the base table.
3. In the **Properties** pane, select a table from the **Recursive table** list box with which you want to define a recursive relation to the base table. You can do one of the following:
   - If you want to define a recursive relation with the base table itself, select the base table from the **Recursive table** list box.
   - If you want to define a recursive relation with any of its parent tables, select a parent table listed in a hierarchical order from the **Recursive table** list box.

   Note: Recursive table lists the name of the base table and all its parent table in a hierarchical order. By default, no tables are defined as recursive.
4. If a recursive relation already exists for the selected schema definition, you will receive a warning message `recursive relation already exists on the <table name>`. Do one of the following:
   - To retain the existing recursive relation and cancel the new recursive relation, click **No**.
   - To override the existing recursive relation with the new defined recursive relation, click **Yes**.
5. To save the changes in the selected schema definition, click **OK**.

See also

Rename the recursive relation between tables on page 406
Delete a recursive relation between tables on page 407

Rename the recursive relation between tables

Renaming the recursive relation defined between tables involves changing the table name that is in a recursive relation with the base table. This does not delete the recursive relation defined between these tables.

To rename a recursive relation defined between tables:

1. Open the ProBindingSource Designer by selecting the **ProBindingSource** control on the **Design Canvas**, click  and then **ProBindingSource Designer** or double-clicking **ProBindingSource control** on the **Design Canvas**.

   The **ProBindingSource Designer** appears and displays the current schema definition with the defined recursive definition.
2. In the **Tables** pane, select the table which is in recursive relation with the base table.

3. In the **Name** field in the **Properties** pane, type a different name for the selected table.
4. To save the changes in the selected schema definition, click **OK**.

See also

Delete a recursive relation between tables on page 407
Define a recursive relation between tables on page 406

Delete a recursive relation between tables

To delete a recursive relation defined between tables:

1. Open the ProBindingSource Designer by selecting the **ProBindingSource** control on the **Design Canvas**, click  and then **ProBindingSource Designer** or double-clicking **ProBindingSource control** on the **Design Canvas**.

   The **ProBindingSource Designer** appears and displays the current schema definition with the defined recursive definition.
2. In the **Tables** pane, select the base table for which recursion is defined.
3. From the **Recursive table** field in the **Properties** pane, select **Default**. This resets the Recursive table property to blank and deletes the recursive relation defined between the tables.
4. To save the changes in the selected schema definition, click **OK**.

See also

Rename the recursive relation between tables on page 406
Define a recursive relation between tables on page 406

Code event logic

To make the objects in the UI respond to user interaction or system events, you must subscribe to the appropriate events and write methods for them.

Create event subscriptions

A UI control typically recognizes many events, but the application responds only to the ones it subscribes to.

Most controls and forms have a default event. For example, the default for a button control is the **Click** event, and the default for a form object is the Load event.

- **To subscribe to an object's default event** — Double-click the object on the **Design Canvas**.
- **To subscribe to any event** — Select the object on the **Design Canvas** and double-click the event name on the **Events** tab in the **Properties** view.

When you double-click in either of these ways, the Visual Designer generates the appropriate **SUBSCRIBE** statement in the source code. It also generates an event-handling method. Progress Developer Studio for OpenEdge automatically opens the class file in the ABL Editor (or switches to it if it is already open) and positions the cursor at the method definition.

Note: If you wish, you can disable the automatic generation of event code at the **Visual Designer Preferences** page. Select **Window** > **Preferences** > **Progress OpenEdge** > **Visual Designer** and uncheck the **Generate event handler on double-click** option.

Unsubscribing to events

To delete an event subscription, simply delete the value (the method name) that appears for the event in the right column of the **Events** tab in the **Properties** view.

By default, deleting this event value removes the event-handling method, as well as the event subscription, from the ABL code. If you want to change this behavior so that the method is retained, you can do so either for all events or for specific selected events.

- **To keep all event-handling methods when the corresponding subscription is deleted** - Go to the Visual Designer **Preferences** page and clear the check box labeled **Remove** event handlers when no longer needed.
- **To protect a specific event-handling method from deletion** - Locate the method declaration in the ABL source code. Immediately preceding the method, an annotation appears: `@VisualDesigner`. Delete this line.

Note: Do not change or delete any other annotations added to the ABL code by the Visual Designer. The line preceding an event-handling method is the only Visual Designer annotation that you should modify.

See also

Event behavior on page 377
Coding event methods on page 408
Using the Properties view on page 398
Visual Designer Properties view on page 430

Code event methods

As described in Create event subscriptions on page 407, the quickest way to define an event method is to subscribe to the event by double-clicking in the **Design Canvas** or the **Events** tab. When you do this, you are taken to the automatically generated event-handling method in the ABL code, which is similar to the following:

```
METHOD PRIVATE VOID ultraButton1_Click ( sender AS System.Object, e AS System.EventArgs ):

END METHOD.
```

Add the appropriate event-handling code inside the method definition block.

The double-click technique minimizes typing and mistakes, but you can also use the **Properties** view to associate any method with an event. On the **Events** tab, click in the value cell to the right of the event name. The down-arrow button that appears lets you select from a drop-down list of all methods defined in the source code whose signature matches that of the selected event. Alternatively, you can type a method name in the cell.

Note: If you wish, you can disable the automatic generation of event code at the **Visual Designer Preferences** page. Select **Window** > **Preferences** > **Progress OpenEdge** > **Visual Designer** and uncheck the **Generate event handler on double-click** option.

You can change the name of the event handler method by editing the value on the **Events** tab. The change is reflected in the source code.

See also

Event behavior on page 377
Create event subscriptions on page 407
Visual Designer Properties view on page 430

Customize the Visual Designer Toolbox

You can set up the **Toolbox** to suit the particular needs of each of your OpenEdge projects, and you can select a docking position in the Visual Designer editing area. A **Toolbox** configuration applies to the work you do within a single project. You can use different settings for different projects. You can share your settings for any given project with other users or copy them to other projects in your own workspace.

Share Toolbox settings

If you make changes to the **Toolbox** configuration, the Visual Designer creates a file called `toolbox.xml`, which specifies the new custom settings, in the project root folder. You can copy this file to other projects, or share the file with other users, to duplicate the customized **Toolbox** settings.

If you share a **Toolbox**, make sure all of the controls are installed on all machines. Controls that are specified in the `toolbox.xml` file but are not available on the system appear in the **Toolbox** with a red  icon.

See also

Protect Toolbox customizations on page 411
Restore default Toolbox settings on page 412
Choose the Toolbox docking position on page 412
Visual Designer Editor on page 429

Manage control groups

As installed, the **Toolbox** has the following control groups:

- Microsoft Controls
- OpenEdge Controls
- Telerik UI for WinForms
- OpenEdge Ultra Controls (if installed)

You can add custom control groups. After adding them, you can rename or delete custom control groups. You cannot rename or delete the default groups installed with Progress Developer Studio for OpenEdge.

If you want to save a customized configuration for later use, back up the project's `toolbox.xml` file before making any changes.

- **To add a control group to the Toolbox** — Right-click in the **Toolbox**, select **Add Control Group** from the context menu, and enter a name for the new group in the text box. To cancel the operation, press **Esc**.
- **To rename a control group** — Right-click the control group title bar, select **Rename Control Group** from the context menu, and enter the new name. (You cannot rename the default control groups.)
- **To delete a control group and its contents** — Right-click the control group title bar, select **Delete Control Group** from the context menu, and click **Yes** at the confirmation prompt. (You cannot delete the default control groups.)

Note: Deleting controls from the **Toolbox** does not remove them from your system. You can add them back by restoring the **Toolbox** settings or by using the **Add Controls** command.

See also

Share Toolbox settings on page 409
Protect Toolbox customizations on page 411
Restore default Toolbox settings on page 412
Choose the Toolbox docking position on page 412
Visual Designer Editor on page 429

Manage controls

A control group can contain any number of controls, and the same control can be included in multiple groups. You can add, rearrange, rename, and delete controls. If you want to save a customized **Toolbox** configuration for later use, back up the project's `toolbox.xml` file before making any changes.

Unavailable controls included in Toolbox

Various conditions can result in controls that are included in the **Toolbox** being unavailable on your system. For example, you might add third-party controls to the **Toolbox** and then uninstall the controls; or, another user might give you a `toolbox.xml` file that includes controls you do not have.

A control that is not available appears in the **Toolbox** with a "ban" symbol: . You cannot place the control on a form.

See also

Share Toolbox settings on page 409
Protect Toolbox customizations on page 411
Restore default Toolbox settings on page 412
Choose the Toolbox docking position on page 412
Protect Toolbox customizations on page 431
Visual Designer Editor on page 429

Add controls to a control group

To add controls to the **Toolbox**, you need to have available on your system the assemblies that contain the controls or, for user-defined controls, the `.cls` files that define the controls. You cannot add a second instance of a control that is already in the **Toolbox**, even if multiple versions of the control are installed on your system. To include a control in more than one group, use the **Copy** and **Paste** commands.

Note: Progress Software Corporation does not support controls that are not installed by the OpenEdge installation program.

To add controls to a control group:

1. Right-click in the **Toolbox** and select **Add Controls** from the context menu. The **Add Controls** dialog appears.
2. The **Add Controls** dialog **Browsed Assemblies** tab is initially open. If you have browsed previously during your current Progress Developer Studio for OpenEdge session, the controls available in the last-browsed assembly appear in the list. Select one or more controls from the current list, or generate a new list by clicking **Browse** to locate and select one or more `.dll` or `.exe` files containing UI controls.

   Alternatively, click the **Global Assemblies** tab to see a list of controls available in the global assembly cache, or ABL Controls to see a list of custom user-defined controls.

You can filter the list to display only those controls whose names begin with the characters you enter in the Filter field.

3. Check the control(s) that you want to add to the **Toolbox**. You can select controls on all three tabs.
4. In the field at the top of the dialog, select the control group to which you want to add the controls.
5. Click **OK** to add the selected controls to the **Toolbox**.

Rename controls

To change the name of a control, right-click the control in the **Toolbox**, select **Rename** from the context menu, and enter the new name.

Note: Renaming a control in the **Toolbox** does not affect control instances previously placed on the **Design Canvas**, or controls of the same name in other **Toolbox** control groups.

Delete controls from a control group

To delete one or more controls from the **Toolbox**, select them, using **Ctrl+Click** to select multiple controls. Press **Delete**, or right-click and select **Delete** from the context menu, and click **OK** at the confirmation prompt.

Note: Deleting controls from the **Toolbox** does not remove them from your system. You can add them back by restoring the **Toolbox** settings or by using the **Add Controls** command.

Rearrange controls among groups

Click and drag controls in the **Toolbox** to move them from one group to another, or press **Ctrl** as you drag to copy them to the target group. You can also use the **Cut**, **Copy**, and **Paste** commands, available on the context (right-click) menu.

Disable controls

It is possible to disable, or "blacklist," specific controls that you do not want used. To do this, add an entry for each such control to the following file: `$DLC\Properties\unSupported.xml`

The entry in the `unSupported.xml` file must include several pieces of information about the control in a specific format. The easiest way to create a properly formatted entry is to copy it from `toolbox.xml` and paste it into `unSupported.xml`. If no such `toolbox.xml` file is available, generate it by customizing the **Toolbox** (making sure that it contains the control in question).

You must restart Progress Developer Studio for OpenEdge for the disablement to take effect. OpenEdge removes the disabled controls from all instances of `toolbox.xml` and prevents them from being added to any **Toolbox**. However, existing instances of the controls in previously created designs are not affected.

Protect Toolbox customizations

To prevent changes to your current **Toolbox** settings, right-click in the **Toolbox** and select **Lock Toolbox** from the context menu. Repeat this process to unlock the **Toolbox** and allow changes.

See also

Share Toolbox settings on page 409
Restore default Toolbox settings on page 412

Choose the Toolbox docking position on page 412
Visual Designer Editor on page 429

Restore default Toolbox settings

You can restore the **Toolbox** to its default state after making changes. Doing so has no effect on control instances that have already been placed on a form.

Before restoring the **Toolbox**, back up the project's toolbox.xml file if you want to save the customized configuration.

To restore the **Toolbox** to its default state, right-click in the **Toolbox** and select **Reset Toolbox** from the context menu.

Note: The **Reset Toolbox** command is disabled if the project includes references to any out-of-date assembly versions. This helps prevent the possibility of a version conflict between the controls available in the **Toolbox** and the controls in use in the project.

See also

Share Toolbox settings on page 409
Protect Toolbox customizations on page 411
Choose the Toolbox docking position on page 412
Visual Designer Editor on page 429

Choose the Toolbox docking position

By default, the **Toolbox** is docked at the right edge of the Visual Designer editing area. You can choose a different docking position if you wish.

To specify a persistent docking position for all projects, select **Window** > **Preferences** > **Progress OpenEdge** > **Visual Designer**. Click to select the desired position. Changing the docking preference does not affect currently open Visual Designer editing windows.

To move the **Toolbox** only for your current editing session, position the cursor over the **Toolbox** heading, hold down the primary mouse button, drag to the desired docking position, and release the mouse button. Dragging the **Toolbox** affects only the current file, and when you close and re-open the file, the **Toolbox** reverts to the position specified in the Visual Designer preferences.

See also

Protect Toolbox customizations on page 411
Restore default Toolbox settings on page 412
Visual Designer Editor on page 429

Work with .NET resources

This topic includes the following topics on .NET-related operations outside the context of the Visual Designer. They are:

- Get information from the Class Browser on page 413
- Add and remove assembly references on page 413
- Update assembly references on page 413

Get information from the Class Browser

The Class Browser allows you to view detailed information about properties, data members, constructors, methods, and events for ABL and .NET resources, packages or namespaces, and types.

The Class Browser is included by default in the Visual Designer perspective as a Fast View. To open this view, click  on the Fast View toolbar. To display the Class Browser in any perspective, select **Window** > **Show View** > > **Other** > **OpenEdge Editor** > **Class Browser**.

See also

Learn About Class Browser on page 433
Get control-specific information on page 384

Add and remove assembly references

The Visual Designer automatically adds all required assembly references to the project `assemblies.xml` file when you place controls on the **Design Canvas**. However, there may be cases where your application code calls other .NET objects that are not related to OpenEdge GUI for .NET design, or where the code was manually developed outside the Visual Designer. Progress Developer Studio for OpenEdge provides several convenient ways to manage assembly references that are not automatically maintained by the Visual Designer.

You can use any of the following procedures:

- Right-click the **Referenced Assemblies** node in the **Project Explorer** view and select **Add Assembly References** from the context menu. Use the **Add Assembly References** dialog to select assemblies and add them to the `assemblies.xml` file of the current project.
- Select **Project** > **Properties** > **Progress OpenEdge** > **Assemblies**. At the **Assemblies property** page, you can launch the **Add Assembly References** dialog to add references, and you can remove references that are no longer needed. These editing operations affect only the `assemblies.xml` file for the current project.
- In either the OpenEdge Editor perspective or the OpenEdge Visual Designer perspective, launch the external Assembly References Tool by selecting **OpenEdge** > **Tools** > **Assembly References**. This tool allows you to manage assembly references in any XML file on your system.

See also

.NET assemblies and the Visual Designer on page 371
Update assembly references on page 413

Update assembly references

When you install a new version of .NET controls, assembly references for projects that you developed under the previous version become out of date. If you want these projects to use the newer controls, you must update the references. You use the Update Assembly References tool for this purpose.

You can launch the Update Assembly References tool from Progress Developer Studio for OpenEdge, but the tool actually runs outside the Eclipse framework. This topic provides basic instructions for using the tool; you can access more detailed online help when the tool is running.

It is possible to use multiple versions of controls concurrently. However, the Progress Developer Studio for OpenEdge Visual Designer Toolbox can contain only one version of each control.

When to update assembly references

You should complete the update procedure each time you install a new version of any control set. This recommendation applies whether you install a new release of OpenEdge that includes upgraded controls, a patch from Progress Software Corporation that includes upgraded controls, or a control set that you obtain from any other source. Failure to update assembly references may prevent existing OpenEdge GUI for .NET forms from running, and may also prevent the Progress Developer Studio for OpenEdge Visual Designer from opening existing forms or from functioning properly when you try to develop new forms.

It is not necessary to update assemblies after applying a hot fix from Progress Software Corporation.

Note: It is not necessary to update assemblies after applying a hotfix from Progress Software Corporation.

Automatic update of Progress assembly references

When using Progress Developer Studio for OpenEdge, the first time you open a workspace that includes one or more projects with out-of-date assembly references, a dialog alerts you to the situation and asks whether you want to update the references. If you click **Yes** at this dialog, OpenEdge automatically updates all references to Progress assemblies, including those containing OpenEdge Ultra Controls (Infragistics controls).

If you decline this automatic update, you will not be prompted again to update the current workspace. You should manually run the Update Assembly References tool when you are ready to perform the update.

The automatic update procedure does not affect third-party (non-Progress) assemblies. Run the Update Assembly References tool when you install a new version of any third-party controls.

See also

Add and remove assembly references on page 413

Launch the Update Assembly References tool

You can launch the Update Assembly References tool either from an Progress Developer Studio for OpenEdge menu or from a command prompt.

From Progress Developer Studio for OpenEdge

From within Progress Developer Studio for OpenEdge, select **OpenEdge** > **Migration** > **Update Assembly References**.

From a command prompt

Open a `Proenv` command shell and enter updasmref.exe at the prompt. You can optionally include an argument specifying the assemblies.xml and toolbox.xml files to be updated as follows:

```
updasmref -files <file_paths>
```

Note: `file_paths` is a comma separated list of files.

Choose Files to Update

The Update Assembly References Tool operates on the files `assemblies.xml` and (if you use Progress Developer Studio for OpenEdge) `toolbox.xml`. There can be multiple instances of each of these files on your system. The tool lets you choose the specific instances that you want to update. Files to be updated are listed in the top pane of the **Update Assembly References** window. The file list is pre-populated in either of the following circumstances:

- You #unique_682/unique_682_Connect_42_ArchitectLaunch. In this case, all instances of `assemblies.xml` and `toolox.xml` found in the current workspace appear in the list.

- You #unique_682/unique_682_Connect_42_CommandPromptLaunch and specify the files to be updated as an argument on the command line.

To add a file that is not listed, click **Add** to open a file browser filtered to show XML files. Browse and select the desired file, and click **Open**.

To remove a file from the list, select it and click **Remove**.

The references that each listed file contains appear in the lower pane.

Update References to Progress Assemblies

Updating references to Progress assemblies, including those for OpenEdge Ultra Controls from Infragistics, is easy. This is especially true if you have upgraded to a new version of Progress Developer Studio for OpenEdge, and you simply want to update all references to work with the new version. Note that Progress Developer Studio for OpenEdge offers to perform this update automatically the first time you open a workspace in which it is needed. However, if you decline to perform the automatic update, when you later launch the tool from the **OpenEdge** menu, all instances of assemblies.xml and toolbox.xml in your current workspace automatically appear in the list of files to be updated, and all of the necessary settings are in place by default.

To update references to Progress controls:

1. Launch the Update Assembly References tool on page 414 the Update Assembly References tool. In the lower pane, make sure the **Progress Assemblies** tab is selected.
2. If you want to keep a pre-update copy of each file, check **Back up files before update**. Each backup copy will be created in the same directory as the original, with a `.bak` extension.

   Note: If you launched the tool from Progress Developer Studio for OpenEdge and you just want to update all Progress assembly references to the current version, you can click **OK** now to complete the operation. Otherwise, continue with step 3.

   ---

3. Choose Files to Update on page 414 the `assemblies.xml` and `toolbox.xml` files to update.
4. Confirm that the **Choose new version** field shows the version that you want your assembly references to use. By default, this is the version included with the OpenEdge release you are using. If you also have one or more other versions installed, you can select one of them from the drop-down list in this field.
5. The left column (**Old Assembly Version**) lists all references currently in the selected files. For each reference, the **New Assembly Version** column to the right shows the corresponding reference to the version specified in the **Choose new version** field. If you want to selectively specify a different version for one or more references, refer to point 6 below. Otherwise, to update all references to the selected version, click **OK** now to complete the operation.
6. To specify a different version for a reference, click the row in the table, and then click the magnifying glass  icon that appears in the **Browse** column. The **Select New Assembly** dialog appears and lets you choose any available assembly:

   - On the **Global Assemblies** tab, you can filter the list by entering an initial string in the **Filter** field. Click the desired assembly in the list to select it, and click **OK** to insert the reference.
   - On the **Local Assemblies** tab, a filtered file browser lets you select any DLL file on your system. Browse to the appropriate directory in the left pane, select the file in the right pane, and click **OK** to insert the reference.

Note: If you prefer, you can enter text directly in the **New Assembly Version** column instead of browsing. However, no validation is performed on the value entered.

7. After specifying the new assemblies as necessary, click **OK** to update the references and close the tool. A completion dialog offers the option of restarting Progress Developer Studio for OpenEdge, which is necessary before you can use the new assemblies.

Update References to Telerik Assemblies

You can update references to Telerik assemblies if you have upgraded to a new version of Progress Developer Studio for OpenEdge, and you want to update all references to work with the new version.

Progress Developer Studio for OpenEdge updates the assemblies automatically the first time you open a workspace. However, if you decline to perform the automatic update, later when you launch the tool from the Progress Developer Studio for OpenEdge menu, all instances of assemblies.xml and toolbox.xml in your current workspace automatically appear in the list of files to be updated, and all of the necessary settings are in place by default.

To update references to Telerik controls:

1. Launch the Update Assembly References tool on page 414 the Update Assembly References tool. In the lower pane, make sure the **Telerik Assemblies** tab is selected.
2. If you want to keep a pre-update copy of each file, check **Back up files before update**. Each backup copy will be created in the same directory as the original, with a `.bak` extension.

Note: If you launched the tool from Progress Developer Studio for OpenEdge and you just want to update all Progress assembly references to the current version, you can click **OK** now to complete the operation. Otherwise, continue with step 3.

3. Choose Files to Update on page 414 the `assemblies.xml` and `toolbox.xml` files to update.
4. 4. Select the version that you want your assembly references to use in the **Choose new version** field. By default, it displays the version included with the OpenEdge release that you are using. If you also have one or more other versions installed, you can select one of them from the drop-down list in this field.
5. 5. The left column **(Old Assembly Version)** lists all references currently in the selected files. For each reference, the **New Assembly Version** column to the right shows the corresponding reference to the version specified in the **Choose new version** field. If you want to selectively specify a different version for one or more references, continue with step 6. Otherwise, to update all references to the selected version, click **OK** now to complete the operation.
6. To specify a different version for a reference, click the row in the table, and then click the magnifying glass icon that appears in the **Browse** column. The **Select New Assembly** dialog appears and lets you choose any available assembly:
   - On the **Global Assemblies** tab, you can filter the list by entering an initial string in the **Filter** field. Click the desired assembly in the list to select it, and click **OK** to insert the reference.
   - On the **Local Assemblies** tab, a filtered file browser lets you select any DLL file on your system. Browse to the appropriate directory in the left pane, select the file in the right pane, and click **OK** to insert the reference.

Note: You can enter text directly in the **New Assembly Version** column instead of browsing. However, no validation is performed on the value entered.

7. After specifying the new assemblies as necessary, click **OK** to update the references and close the tool. A completion dialog appears, you can choose to restart Progress Developer Studio for OpenEdge, which is necessary before you can use the new assemblies..

Update References to Third-party Assemblies

To update references to non-Progress assemblies, you must explicitly select the new version for each reference. These references are not included in the automatic update that Progress Developer Studio for OpenEdge offers to perform the first time you open a workspace with out-of-date references.

Note: For Infragistics controls (OpenEdge Ultra Controls), let Progress Developer Studio for OpenEdge perform the automatic update, or use the procedure for Update References to Progress Assemblies on page 415.

To update references to non-Progress controls:

1. Launch the Update Assembly References tool on page 414 the Update Assembly References tool. In the lower pane, select the **Other Assemblies** tab.
2. If you want to keep a pre-update copy of each file, check **Back up files before update**. Each backup copy will be created in the same directory as the original, with a .bak extension.
3. Choose Files to Update on page 414 the `assemblies.xml` and `toolbox.xml` files to update.
4. The left column (**Old Assembly Version**) lists all references currently in the selected files, by simple assembly name only. You can display a tool tip showing the fully qualified name by hovering the mouse pointer over the name.
5. To specify a new version for a reference, click the row in the table, and then click the magnifying glass icon that appears in the **Browse** column. The **Select New Assembly** dialog appears and lets you choose any available assembly:
   - On the **Global Assemblies** tab, you can filter the list by entering an initial string in the **Filter** field. Click the desired assembly in the list to select it, and click **OK** to insert the reference.
   - On the **Local Assemblies** tab, a filtered file browser lets you select any DLL file on your system. Browse to the appropriate directory in the left pane, select the file in the right pane, and click **OK** to insert the reference.

   Note: If you prefer, you can enter text directly in the **New Assembly Version** column instead of browsing. However, no validation is performed on the value entered. References for which you do not choose a new version remain unchanged.
6. After specifying the new assemblies as necessary, click **OK** to update the references and close the tool. A completion dialog offers the option of restarting Progress Developer Studio for OpenEdge, which is necessary before you can use the new assemblies.

Restart and Recompile

After updating assembly references, do the following:

- Restart Progress Developer Studio for OpenEdge, if one or more projects in the current workspace use the updated assembly references.

- Recompile any projects that use the updated assembly references.

Reference

Visual Designer Preferences

The **Visual Designer Preferences** page allows you to set options affecting the appearance and behavior of the **Toolbox** and the **Design Canvas**. To access these settings, select **Window** > **Preferences** > **Progress OpenEdge** > **Visual Designer**.

The following options and controls are available:

Global Toolbox location	Specifies the path of the `toolbox.xml` file that determines the content of the Toolbox shared by projects that use the global **Toolbox** option.
Show SmartTags	Enables or disables the use of **SmartTag** design aids for setting frequently used control properties of various controls. If this option is enabled, controls with **SmartTags** have a small right-arrow button at the top right corner when selected, as in the example shown. Clicking this button opens the **SmartTag** tool. 
Generate event handler on double-click	Enables or disables the automatic generation of an event subscription and event-handler method when a control on the Design Canvas or an event in the Properties view is double-clicked.
Remove event handlers when no longer needed	Enables or disables the automatic deletion of event-handler methods when the corresponding event subscription is deleted.
Toolbox docking position	Specifies whether the Toolbox is docked to the right, left, top, or bottom edge of the **Visual Designer** editing window.
Snap lines or Grid	Specifies whether controls, when placed or moved on the Design Canvas, are aligned relative to other controls or to the design grid. The **Grid** setting takes effect only if the Snap to grid option is enabled.
Height and Width	Specify, in pixels, the vertical and horizontal intervals of the design grid.
Show grid	Enables or disables the visible display of the grid on forms on the **Design Canvas**.
Snap to grid	Enables or disables automatic alignment to the design grid when controls are placed or moved on the **Design Canvas**.

Undo history size	Specifies the number of actions that the **Visual Designer** can undo or redo.
Add untranslatable attribute to all Visual Designer-generated strings	Enables or disables the inclusion of the U (untranslatable) attribute for character strings that the Visual Designer inserts in ABL code. If present, this attribute prevents the string from being processed by the **OpenEdge Translation Manager**.

See also

Work with UI controls on page 383
Use built-in design tools on page 385
Create event subscriptions on page 407
Size objects on page 393
Position objects on a container on page 394

OpenEdge GUI for .NET wizards

New ABL Form wizard

The **New ABL Form** wizard helps you create a basic form to which you can add controls in the Visual Designer. This wizard appears when you select **File** > **New** > **ABL Form**.

The following controls are available:

Package root	Specifies a currently open project to contain the class code and other project code. Click **Browse** if you want to select a project other than the current one (the default value).
Package	Optionally specifies a package name, corresponding to a sub-folder of the package root, to contain the class file. Click **Browse** or enter the folder path by typing. A period (.) must separate each subfolder from its parent folder in the path name.
Form name	(Required) Specifies the name of the class. The name must begin with a letter; spaces and most non-alphanumeric characters are not allowed. The `.cls` extension will be appended automatically.
Final	If checked, specifies that inheritance from this class is disallowed. A FINAL option is included in the generated ABL code.A final class cannot be abstract.
Abstract	If checked, specifies that the class is abstract and cannot be instantiated. An abstract class is designed to serve as a super class from which other classes inherit and implement members. Therefore, an abstract class cannot be final.
Widget pool	If checked, specifies that a **USE-WIDGET-POOL** option will be included in the generated ABL code.

Inherits	Optionally specifies another class in the current project as a super class from which the new class inherits state and behavior. Click **Browse** or enter the class path by typing. A period (.) must separate each node from its parent folder in the path name. **Note:** The super class cannot be generic. Moreover, even though a form can inherit from an abstract super class, the Visual Designer does not support designing such a form. To design a form that inherits from an abstract parent, you must write the code manually.
Implements	Lets you optionally specify one or more interfaces in the current project that the class implements. Click **Add** and select the desired interfaces at the **Interface Selection** dialog. Use the **Remove** button to remove an interface from the list after adding it. **Note:** The class cannot implement a generic interface.
Generate default constructor	Specifies that the class is to include a default constructor method. Because this option is required for OpenEdge GUI for .NET forms, it is automatically checked, and the control is disabled.
Generate destructor	Specifies that the class is to include a destructor method. Because this option is required for OpenEdge GUI for .NET forms, it is automatically checked, and the control is disabled.
Generate super class constructors	If checked, specifies that the class is to include all constructor methods declared in the parent class.
Add routine-level error handling	If checked, specifies that the **ROUTINE-LEVEL ON ERROR UNDO**, **THROW** statement will be included in the generated ABL code.
Throw a Not Implemented exception	If selected, specifies that "`METHOD NOT IMPLEMENTED`" error code will be added to stubs for members implemented via interface and stubs for inherited abstract members.
Return a default value	If selected, specifies that default return values will be added to stubs for members implemented via interface and stubs for inherited abstract members.
Description	Lets you optionally enter a description for the class. This text will appear in the file header.
Purpose	Lets you optionally enter an explanation of the purpose of the class. This text will appear in the file header.

See also

Visual container types on page 372
Develop a visual container on page 380

New ABL Dialog wizard

The **New ABL Dialog** wizard lets you create a dialog with standard **OK** and **Cancel** buttons. An event subscription and event logic for a click are pre-coded for each of these buttons. This wizard appears when you select **File** > **New** > **ABL Dialog**.

The following controls are available:

Package root	Specifies a currently open project to contain the class code and other project code. Click **Browse** if you want to select a project other than the current one (the default value).
Package	Optionally specifies a package name, corresponding to a sub-folder of the package root, to contain the class file. Click **Browse** or enter the folder path by typing. A period (.) must separate each subfolder from its parent folder in the path name.
Dialog name	(Required) Specifies the name of the class. The name must begin with a letter; spaces and most non-alphanumeric characters are not allowed. The `.cls` extension will be appended automatically.
Final	If checked, specifies that inheritance from this class is disallowed. A FINAL option is included in the generated ABL code. A final class cannot be abstract.
Abstract	If checked, specifies that the class is abstract and cannot be instantiated. An abstract class is designed to serve as a super class from which other classes inherit and implement members. Therefore, an abstract class cannot be final.
Widget pool	If checked, specifies that a **USE-WIDGET-POOL** option will be included in the generated ABL code.
Inherits	Optionally specifies another class in the current project as a super class from which the new class inherits state and behavior. Click **Browse** or enter the class path by typing. A period (.) must separate each node from its parent folder in the path name. **Note:** The super class cannot be generic. Moreover, even though a dialog can inherit from an abstract super class, the Visual Designer does not support designing such a dialog. To design a dialog that inherits from an abstract parent, you must write the code manually.
Implements	Lets you optionally specify one or more interfaces in the current project that the class implements. Click **Add** and select the desired interfaces at the **Interface Selection** dialog. Use the **Remove** button to remove an interface from the list after adding it. **Note:** The class cannot implement a generic interface.

Generate default constructor	Specifies that the class is to include a default constructor method. Because this option is required for OpenEdge GUI for .NET forms, it is automatically checked, and the control is disabled.
Generate destructor	Specifies that the class is to include a destructor method. Because this option is required for OpenEdge GUI for .NET forms, it is automatically checked, and the control is disabled.
Generate super class constructors	If checked, specifies that the class is to include all constructor methods declared in the parent class.
Add routine-level error handling	If checked, specifies that the **ROUTINE-LEVEL ON ERROR UNDO**, **THROW** statement will be included in the generated ABL code.
Throw a Not Implemented exception	If selected, specifies that "`METHOD NOT IMPLEMENTED`" error code will be added to stubs for members implemented via interface and stubs for inherited abstract members.
Return a default value	If selected, specifies that default return values will be added to stubs for members implemented via interface and stubs for inherited abstract members.
Description	Lets you optionally enter a description for the class. This text will appear in the file header.
Purpose	Lets you optionally enter an explanation of the purpose of the class. This text will appear in the file header.

See also

Visual container types on page 372
Develop a visual container on page 380

New ABL MDI Form wizard

The **New ABL MDI Form** wizard lets you create a form enabled for multiple-document interface functionality, meaning that it can be the parent of child forms. The form includes a menu strip and a toolbar containing common menus and command buttons with pre-coded event logic, as well as a status bar.

This wizard appears when you select **File** > **New** > **ABL MDI Form**.

The following controls are available:

Package root	Specifies a currently open project to contain the class code and other project code. Click **Browse** if you want to select a project other than the current one (the default value).
Package	Optionally specifies a package name, corresponding to a sub-folder of the package root, to contain the class file. Click **Browse** or enter the folder path by typing. A period (.) must separate each subfolder from its parent folder in the path name.
MDI Form name	(Required) Specifies the name of the class. The name must begin with a letter; spaces and most non-alphanumeric characters are not allowed. The `.cls` extension will be appended automatically.

Final	If checked, specifies that inheritance from this class is disallowed. A FINAL option is included in the generated ABL code. A final class cannot be abstract.
Abstract	If checked, specifies that the class is abstract and cannot be instantiated. An abstract class is designed to serve as a super class from which other classes inherit and implement members. Therefore, an abstract class cannot be final.
Widget pool	If checked, specifies that a **USE-WIDGET-POOL** option will be included in the generated ABL code.
Inherits	Optionally specifies another class in the current project as a super class from which the new class inherits state and behavior. Click **Browse** or enter the class path by typing. A period (.) must separate each node from its parent folder in the path name. **Note:** The super class cannot be generic. Moreover, even though a form can inherit from an abstract super class, the Visual Designer does not support designing such a form. To design a form that inherits from an abstract parent, you must write the code manually.
Implements	Lets you optionally specify one or more interfaces in the current project that the class implements. Click **Add** and select the desired interfaces at the **Interface Selection** dialog. Use the **Remove** button to remove an interface from the list after adding it. **Note:** The class cannot implement a generic interface.
Generate default constructor	Specifies that the class is to include a default constructor method. Because this option is required for OpenEdge GUI for .NET forms, it is automatically checked, and the control is disabled.
Generate destructor	Specifies that the class is to include a destructor method. Because this option is required for OpenEdge GUI for .NET forms, it is automatically checked, and the control is disabled.
Generate super class constructors	If checked, specifies that the class is to include all constructor methods declared in the parent class.
Add routine-level error handling	If checked, specifies that the **ROUTINE-LEVEL ON ERROR UNDO**, **THROW** statement will be included in the generated ABL code.
Throw a Not Implemented exception	If selected, specifies that "`METHOD NOT IMPLEMENTED`" error code will be added to stubs for members implemented via interface and stubs for inherited abstract members.
Return a default value	If selected, specifies that default return values will be added to stubs for members implemented via interface and stubs for inherited abstract members.

Description	Lets you optionally enter a description for the class. This text will appear in the file header.
Purpose	Lets you optionally enter an explanation of the purpose of the class. This text will appear in the file header.

See also

Visual container types on page 372
Develop a visual container on page 380

New ABL User Control wizard

The **New ABL User Control** wizard lets you create a custom set of individual controls grouped in a container that you can add as a single entity to another container. This wizard appears when you select **File** > **New** > **ABL User Control**.

The following controls are available:

Package root	Specifies a currently open project to contain the class code and other project code. Click **Browse** if you want to select a project other than the current one (the default value).
Package	Optionally specifies a package name, corresponding to a sub-folder of the package root, to contain the class file. Click **Browse** or enter the folder path by typing. A period (.) must separate each subfolder from its parent folder in the path name.
User Control name	(Required) Specifies the name of the class. The name must begin with a letter; spaces and most non-alphanumeric characters are not allowed. The `.cls` extension will be appended automatically.
Final	If checked, specifies that inheritance from this class is disallowed. A FINAL option is included in the generated ABL code. A final class cannot be abstract.
Abstract	If checked, specifies that the class is abstract and cannot be instantiated. An abstract class is designed to serve as a super class from which other classes inherit and implement members. Therefore, an abstract class cannot be final.
Widget pool	If checked, specifies that a **USE-WIDGET-POOL** option will be included in the generated ABL code.
Inherits	Optionally specifies another class in the current project as a super class from which the new class inherits state and behavior. Click **Browse** or enter the class path by typing. A period (.) must separate each node from its parent folder in the path name. **Note:** The super class cannot be generic. Moreover, even though a control can inherit from an abstract super class, the Visual Designer does not support designing such a control. To design a user control that inherits from an abstract parent, you must write the code manually.

Implements	Lets you optionally specify one or more interfaces in the current project that the class implements. Click **Add** and select the desired interfaces at the **Interface Selection** dialog. Use the **Remove** button to remove an interface from the list after adding it. **Note:** The class cannot implement a generic interface.
Generate default constructor	Specifies that the class is to include a default constructor method. Because this option is required for OpenEdge GUI for .NET forms, it is automatically checked, and the control is disabled.
Generate destructor	Specifies that the class is to include a destructor method. Because this option is required for OpenEdge GUI for .NET forms, it is automatically checked, and the control is disabled.
Generate super class constructors	If checked, specifies that the class is to include all constructor methods declared in the parent class.
Add routine-level error handling	If checked, specifies that the **ROUTINE-LEVEL ON ERROR UNDO**, **THROW** statement will be included in the generated ABL code.
Throw a Not Implemented exception	If selected, specifies that "`METHOD NOT IMPLEMENTED`" error code will be added to stubs for members implemented via interface and stubs for inherited abstract members.
Return a default value	If selected, specifies that default return values will be added to stubs for members implemented via interface and stubs for inherited abstract members.
Description	Lets you optionally enter a description for the class. This text will appear in the file header.
Purpose	Lets you optionally enter an explanation of the purpose of the class. This text will appear in the file header.

See also

Custom user-defined controls on page 376
Create a user control on page 386

New ABL Inherited Control wizard

The **New ABL Inherited Control** wizard lets you create a custom control class derived from an existing control. This wizard appears when you select **File** > **New** > **ABL Inherited Control**.

The following controls are available:

Package root	Specifies a currently open project to contain the class code and other project code. Click **Browse** if you want to select a project other than the current one (the default value).

Package	Optionally specifies a package name, corresponding to a sub-folder of the package root, to contain the class file. Click **Browse** or enter the folder path by typing. A period (.) must separate each subfolder from its parent folder in the path name.
Inherited Control name	(Required) Specifies the name of the class. The name must begin with a letter; spaces and most non-alphanumeric characters are not allowed. The `.cls` extension will be appended automatically.
Final	If checked, specifies that inheritance from this class is disallowed. A FINAL option is included in the generated ABL code. A final class cannot be abstract.
Abstract	If checked, specifies that the class is abstract and cannot be instantiated. An abstract class is designed to serve as a super class from which other classes inherit and implement members. Therefore, an abstract class cannot be final.
Widget pool	If checked, specifies that a **USE-WIDGET-POOL** option will be included in the generated ABL code.
Inherits	Optionally specifies another class in the current project as a super class from which the new class inherits state and behavior. Click **Browse** or enter the class path by typing. A period (.) must separate each node from its parent folder in the path name. **Note:** The super class cannot be generic. Moreover, even though a control can inherit from an abstract super class, the Visual Designer does not support designing such a control. To design a control that inherits from an abstract parent, you must write the code manually.
Implements	Lets you optionally specify one or more interfaces in the current project that the class implements. Click **Add** and select the desired interfaces at the **Interface Selection** dialog. Use the **Remove** button to remove an interface from the list after adding it. **Note:** The class cannot implement a generic interface. .
Generate default constructor	Specifies that the class is to include a default constructor method. Because this option is required for OpenEdge GUI for .NET forms, it is automatically checked, and the control is disabled.
Generate destructor	Specifies that the class is to include a destructor method. Because this option is required for OpenEdge GUI for .NET forms, it is automatically checked, and the control is disabled.
Generate super class constructors	If checked, specifies that the class is to include all constructor methods declared in the parent class.
Add routine-level error handling	If checked, specifies that the **ROUTINE-LEVEL ON ERROR UNDO**, **THROW** statement will be included in the generated ABL code.

Throw a Not Implemented exception	If selected, specifies that "`METHOD NOT IMPLEMENTED`" error code will be added to stubs for members implemented via interface and stubs for inherited abstract members.
Return a default value	If selected, specifies that default return values will be added to stubs for members implemented via interface and stubs for inherited abstract members.
Description	Lets you optionally enter a description for the class. This text will appear in the file header.
Purpose	Lets you optionally enter an explanation of the purpose of the class. This text will appear in the file header.

See also

Custom user-defined controls on page 376
Create an inherited control on page 387

ProBindingSource Designer

The ProBindingSource Designer lets you define the schema for data, derived from an ABL data source, to be displayed by a data-displaying control. This tool appears in the following situations:

- When you use the **Toolbox** to add a ProBindingSource object to the **Design Canvas**.
- When you select an existing ProBindingSource object and click **ProBindingSource Designer** on the **Properties** view, the context (right-click) menu, or the Smart Tag.
- After you drag a schema element from the **DB Structure** view or an ABL source file from the **Resources** view and drop it on the **Design Canvas**.

The following controls are available:

Available schema (left) pane	Displays the database schema imported from a connected database, a XML Schema (`.xsd`) file or an ABL source file (like `.p`, `.cls`, `.w`, `.i`, and `.html`).
Click to Hide Available Schema	Hides the Available schema pane.
Add	Adds the table and column selected in the Available schema pane to the Tables pane and Fields pane.
Tables pane	Displays a hierarchical representation of the tables defined in the current schema.
Fields pane	Displays the fields (columns) of the currently selected table.
Properties (right) pane	Lets you define the name of each table and field, as well as each field's data type. Select a table or field in the left or middle pane to view and edit its properties. These values must match those of the actual ABL data source. You can also define field labels as you want them to appear in the GUI at run time.
Recursive Table	This is a property for a table, used to define recursive relation between tables.

Add Table	Adds a table node. The new table is a child of the one above it in the tree.
Add Field	Adds a field node. The new field belongs to the table above it in the tree.
Delete	Deletes the selected node and its child nodes, if any.
Move Up	Moves the selected field up in the tree. This button is enabled only when a field node is selected.
Move Down	Moves the selected field down in the tree. This button is enabled only when a field node is selected.
Import from Database	Displays a **Schema Selection** dialog that displays the databases connected to the project and lets you select schema elements to import.
Import from File	Displays a file browser that lets you select an existing XML Schema Definition (`.xsd`) file or ABL source file. After you select the file, a **Schema Selection** dialog appears and lets you select schema elements to import.
	Expand or Collapse the Available Schema pane.
Add	Adds the tables selected from Available Schema to the Tables pane.
OK	Saves the current schema definition. The defined schema appears as a ProBindingSource object in the **Design Canvas**.
Cancel	Closes the **ProBindingSource Designer** dialog without saving the changes to the schema definition.

See also

Data-bound controls on page 376
Link controls to data on page 400

Use the Available Schema pane

The Available Schema pane in the **ProBindingSource Designer** displays the database schema imported from a connected database, a XML Schema (`.xsd`) file, an ABL source file, or a non ABLsource file.

Note: If the file is a non ABL source file , you must add the file type to the **Content Types** page (**Preferences** > **General** > **Content Types**) and the **File Associations Preferences** page (**Preferences** > **General** > **Editor** > **File Associations**).

When selecting the schema elements (tables and columns) in the **Available Schema** pane, note of the following:

- Selecting a table also selects all of its columns.
- You can select multiple tables without selecting their columns. All the selected tables are added to a default top-level root called Table in the **Tables** pane.

- You can select individual columns either from a single table or from multiple tables. In both cases, the selected columns are added to a default top-level root called Table in the **Tables** pane.
- You can partially select the tables and its columns. The selected schema elements are added to a default top-level root called Table in the **Tables** pane.

See also

Data-bound controls on page 376
Create a binding source object on page 400
Link controls to data on page 400

Workspace components

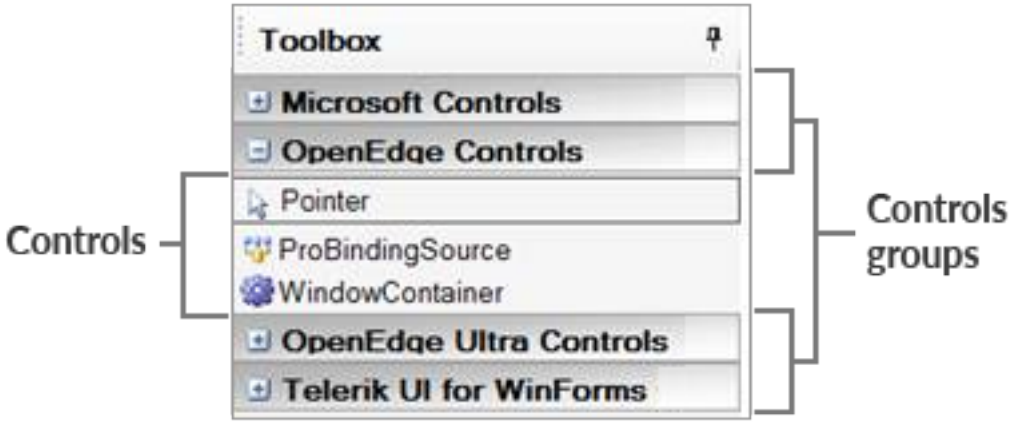
Visual Designer Editor

The **Visual Designer Editor** comprises the **Toolbox** and the Design Canvas.

Toolbox

By default, the **Toolbox** is docked to the right edge of the editing area. If you wish, you can change the docking position by dragging or through the Visual Designer Preferences on page 418.

The **Toolbox** contains controls organized in control groups, as shown in the following illustration:



You can customize the **Toolbox** by adding or removing control groups and controls.

Control groups

A control group is a logical grouping of individual controls. As installed, the **Toolbox** has the following control groups: Microsoft Controls, OpenEdge Controls, Telerik UI for WinForms, and (if installed) OpenEdge Ultra Controls.

A control group can contain any combination of controls, including controls that are also included in other control groups.

Controls

Controls are the objects with which you build the UI. As installed, the **Toolbox** includes all of the controls that Progress Software Corporation supports and that your OpenEdge license allows you to use.

A given control can be included in multiple control groups.

Design Canvas

The **Design Canvas** is the area of the design window that displays the visual container (form) and the controls you add from the **Toolbox**. The white pane at the top contains the WYSIWYG representation of the UI design, including all visual controls that you define. The pale yellow pane at the bottom contains non-visual controls, if applicable; this pane does not appear if no non-visual controls are in use. You can resize these panes by dragging the horizontal separator between them.

On the **Design Canvas**, you can place new controls, position and resize existing controls, and select controls whose properties you want to edit.

See also

Use the Toolbox on page 383
Choose controls for the UI on page 388
Define properties and appearance on page 391
Customize the Visual Designer Toolbox on page 409

Visual Designer Properties view

The **Properties** view displays the full set of properties and events for the currently selected objects on the **Design Canvas**, and allows you to view and edit their values.

This view is included by default in the OpenEdge Visual Designer perspective and most other standard perspectives. To display it if it is not currently open, select **Window** > **Show View** > **Properties**.

The **Properties** view has two tabs, **Properties** and **Events**. Each tab includes a two-column grid that shows the name of the property or event on the left and its value, if defined, on the right.

- **Properties tab**—The technique for editing property values varies according to the specific property and the data type. Click in the right column and edit the value as appropriate. Many properties offer specialized design tools or drop-down selection lists. Many also support direct entry by typing.
- **Events tab**— An event value is the name of the corresponding event-handler method. (Double-clicking an event's name or value column automatically creates an event subscription and a handler method and switches focus to that method in an OpenEdge ABL Editor window.) You can enter or edit an event handler name by direct typing, or you can select a method from the drop-down list (which shows available methods whose signature matches that of the event.

Note: In addition to inherited .NET events, the **Events** tab displays the ABL events that are defined in an ABL-derived .NET class using the DELEGATE or the SIGNATURE clause. The events using the SIGNATURE clause appear in the **Events** tab only if their signature follows the .NET convention for event handler signatures. For more information on the conventions for .NET event handler signatures, see ABL Reference in the *ABL Reference*.

In addition to the name-value grid, the **Properties** view includes the following elements:

Name (unlabeled text box at top of view)	Displays the name of the control or form currently selected on the **Design Canvas**, and the class of which it is an instance. The down-arrow button to the right of the field displays a drop-down list of all objects on the **Design Canvas**, from which you can select a different object. Typing a letter while focus is on the name field selects the first object whose name begins with that letter.
**Sort by Categories**	Displays the grid with entries grouped in categories.

Sort Alphabetically	Displays the grid with entries in alphabetical order.
Reset	Resets the selected property or event to its default value.
Commands panel (below grid)	Provides links to any available design tools or custom property pages for the selected object. You can toggle the display of this panel on or off from the context (right-click) menu.
Description panel (below grid)	Provides help text for the selected property or event. You can toggle the display of this panel on or off from the context (right-click) menu.

See also

Use the Properties view on page 398
Code event logic on page 407

Add Controls dialog

The **Add Controls** dialog lets you select controls from assemblies that are installed on your system and add them to the **Toolbox**. This dialog appears when you right-click in the **Toolbox** and selects **Add Controls** from the context menu.

The **Add Controls** dialog has three tabs:

- **Browsed Assemblies**—Displays the list of controls in the assembly file that you most recently browsed during the current Progress Developer Studio for OpenEdge session.
- **Global Assemblies**—Displays the list of controls in your system's Global Assembly Cache.
- **ABL Controls**—Displays the list of user-defined controls (User Controls and Inherited Controls) in your current PROPATH.

Select one or more controls to add by clicking the check box to the left of the control name. You can sort the list by clicking a column heading.

In addition to the control list, the Add Controls dialog includes the following controls:

Control Group	Lets you choose the **Toolbox** control group to which the selected controls are to be added.
Filter	Lets you enter an initial character sequence by which to filter the control list. Only those controls whose name begins with the specified characters appear in the list.
Clear	Clears the **Filter** field and restores the control list to its unfiltered state.
Browse	Displays a standard file browser that lets you locate and select a `.dll` or `.exe` file containing valid .NET controls.

OK	Closes the **Add Controls** dialog and adds all selected controls to the **Toolbox**.
Cancel	Closes the **Add Controls** dialog without adding any controls to the **Toolbox**.

10

Learn About Class Browser

The Class Browser is a Progress Developer Studio for OpenEdge view that allows you to see the structure and content of the various classes you work with in creating ABL applications. The Class Browser's contents are organized by resources, which are collections of classes (types).

Whether you are developing with ABL or .NET classes, you can use the Class Browser's three-panel display to easily see details about all your ABL and .NET resources, packages or namespaces, and types. By default, the Class Browser displays this information for all resources, whether within or outside of a project in the workspace. For r-code based on class files and Progress procedure libraries within a project, the details the Class Browser displays are derived from the PROPATH associated with each open project in the workspace. (Directories and procedure libraries that do not have r-code classes are not displayed by the Class Browser.) For .NET classes, the details come from the assemblies associated with each project in the workspace. The same level of information can be displayed for external resources you add to the Class Browser.

Depending on which item is in focus in the Class Browser, the details you view can also include information about properties, data members, constructors, methods, and events. The Class Browser displays type information for .NET classes using summary text and ABL syntax.

For ABL classes, you can see type information, as well as similarly helpful details about membership, inheritance, and sample ABL syntax for working with the USING and DEFINE statements. You can also see which ABL classes, events, properties, and methods are abstract.

The Class Browser is an Eclipse view. For quick access, the OpenEdge Editor, OpenEdge AppBuilder, and OpenEdge Visual Designer perspectives include the Class Browser as a Fast View.

Viewing ABL and .NET types

For ABL types, the set of classes to browse are available for each PROPATH and Progress procedure library file for all the projects in the workspace. Conversely, the classes for all .NET types are listed in the assemblies.xml file for each project in the workspace. In the Class Browser, you see the ABL types organized into packages. .NET types are organized into namespaces.

The following assemblies are included by default since they are commonly used by OpenEdge GUI for .NET applications:

- `mscorlib.dll`
- `System.dll`
- `System.Drawing`
- `System.Windows.Forms`

These assemblies are available to each project and can be added to the `assemblies.xml` file. Even when all projects for the workspace are closed, these assemblies appear in the Class Browser view.

Information in the Class Browser view is read-only; however, you can copy and paste code templates to use as program code outside of the view.

Browse modes

You can display information in the Class Browser in either of the following modes:

- Browse by resource - To see an alphabetical list of all resources.
- Browse by project - To see a list of open projects. Within each project node, the resources are displayed alphabetically.

The browse mode you are using when you exit the Class Browser persists for the workspace to the next Progress Developer Studio for OpenEdge session.

External resources

In the Class Browser, you view details about all classes (for the projects in a workspace) that are in the included PROPATHs (procedure libraries and directory paths) and assemblies. The selection of classes whose details you can display is dependent on the Class Cache preference settings you chose in Progress Developer Studio for OpenEdge for the entire workspace. For details, see the description of Class Cache options on page 340 in the ABL Editor online help.

You can also add and then view details about external resources, such as assemblies, Progress procedure library files, and path entries. The assemblies you add can be either local assemblies or assemblies registered in the **Global Assembly Cache (GAC)**.

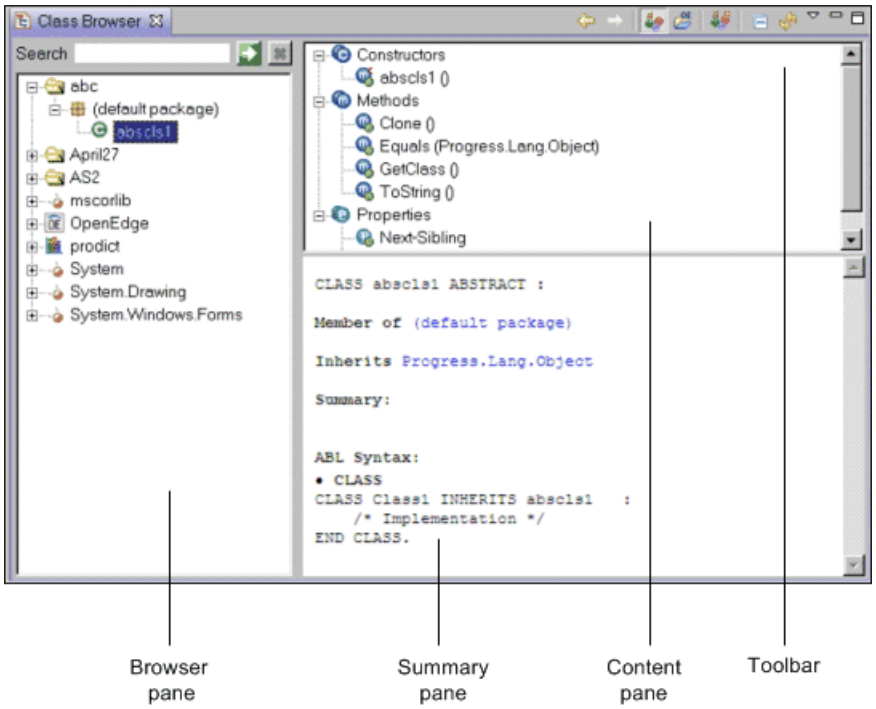
For details, see the following topics:

- Concepts
- Tasks
- Reference

Concepts

The Class Browser view

The Class Browser view comprises three main sections--the **Browser** pane, the **Summary** pane, and the **Content** pane. Like many other views, the Class Browser also includes a toolbar.



The panes display information in the following way:

- The **Browser pane** displays the available resources: assemblies, Progress procedure libraries (provided they contain r-code classes), and paths.
- The **Summary pane** displays a description of the selected resource, package or namespace, type, or member.
- The **Content pane** displays a list of the members contained in a type (in a class or interface, for example).

From the toolbar, you can control whether the Class Browser displays information by resource or project. You can also navigate back or forward; add an external resource (such as a path, Progress procedure library, or assembly); collapse all tree nodes; and filter the member information you want to view.

See also

Learn About Class Browser on page 433
Access the Class Browser on page 436
View information in the Class Browser on page 436
Add external resources on page 439
Browser pane on page 441
Content pane on page 442
Summary pane on page 443
Class Browser toolbar on page 446

External resources and the Class Browser

You can add external resources, such as assemblies, Progress procedure library files, and path entries, to the Class Browser and then view information about their types. You can also add local assemblies or assemblies registered in the Global Assembly Cache (GAC) as external resources. When you add an external resource, the Class Browser writes to the `classBrowser.xml` file for the workspace, updating the file to include details about the new resource.

You add external resources only once to the Class Browser. External resources that you add to the Class Browser persist between sessions of Progress Developer Studio for OpenEdge.

If you close and then reopen the Class Browser during the same Progress Developer Studio for OpenEdge session, the most recently used browse mode is retained.

With the Class Browser in the browse by resource mode, you can remove external resources that you added.

See also

View information in the Class Browser on page 436
Add external resources on page 439
Add external resources dialog on page 448

Tasks

Access the Class Browser

You can access the Class Browser by any of the following methods:

- Click **Class Browser** from the **Fast View** toolbar.
- From the OpenEdge Editor, OpenEdge AppBuilder, OpenEdge Server, or OpenEdge Visual Designer perspective, click **Fast View** . Choose **Class Browser** from the list.
- From any Progress Developer Studio for OpenEdge perspective, press **CTRL+F12**. Depending on the perspective, the Class Browser opens either as a **Fast View** (from the OpenEdge Editor, OpenEdge AppBuilder, OpenEdge Server, or OpenEdge Visual Designer) or as you have configured it as a view.
- From the menu bar, choose **Window** > **Show View** > **Class Browser**.

The Class Browser view opens and displays the most recently used browse mode, either by resource (the default) or project. The **Browser** pane displays all nodes as they existed when the view was last opened, with the most recently selected type in focus. The **Content** pane and the Summary pane are updated with the corresponding information.

If you open the Class Browser as a **Fast View**, you can close it by pressing **ESC**.

See also

The Class Browser view on page 434
View information in the Class Browser on page 436
Browser pane on page 441
Content pane on page 442
Summary pane on page 443
Class Browser toolbar on page 446

View information in the Class Browser

You can use either of two modes to view information in the Class Browser:

- **Browse by Resource:** Displays all resources in an overall view. You are not required to have an OpenEdge project available to browse by resource.
- **Browse by Project:** Displays all resources by project. ABL built-in types and `mscorlib.dll` are also shown for each project node when you browse by project.

  The **Browse by Project** mode does not display external resources.

To browse by resource, click **Browse by Resource** in the Class Browser toolbar; to browse by project, click **Browse by Project** .

See also

The Class Browser view on page 434
Browse by resource on page 437
Browse by project on page 438
Browser pane on page 441
Content pane on page 442
Summary pane on page 443
Class Browser view icons on page 446

Browse by resource

You can browse by resource to see a list of assemblies, procedure libraries, or paths as top-level nodes. When you expand the nodes, the ABL packages or .NET namespaces appear as second-level nodes. Expand these second-level nodes to see the third level of contents -- the types (the classes and/or interfaces).

You are not required to have an OpenEdge project available to browse by resource, which can be helpful if you are browsing external resources.

1. To begin, click **Browse by Resource** on the **Class Browser** toolbar. A list of top-level resources, such as assemblies, procedure libraries, and paths, appears in the **Browser** pane, and the **Content** and **Summary** panes are empty.
2. You can view the second and third levels of a top-level resource in either of the following ways:
   - Click the name of the top-level resource in the **Browser** pane. Its second-level package or namespace nodes appear in a list in the Content pane; summary details about the resource appear in the **Summary** pane. Click a second-level package or namespace node in the **Content** pane to see details about it in the Summary pane.
   - Expand the node of a top-level resource in the **Browser** pane. Its second-level package or namespace nodes appear below it in the Browser pane. Click the name of the package or namespace to view a list of its classes and interfaces in the **Content** pane; or expand the package or namespace to view the class and interface list in the **Browser** pane.
3. Click the name of a class or interface in the **Browser** pane to see its members in the **Content** pane and its summary in the **Summary** pane.

See also

The Class Browser view on page 434
Browse by project on page 438
Browser pane on page 441
Content pane on page 442
Summary pane on page 443

Class Browser view icons on page 446

Browse by project

Browse by project to see a list of open Progress Developer Studio for OpenEdge projects as top-level nodes. (No nodes appear if there are no available projects.) When you expand the nodes, the various resources specified by the project are displayed as second-level nodes. Expanding the second-level resources brings third-level packages and namespaces into the view.

Note: The Browse by Project mode does not display external resources.

1. To begin, click **Browse by Project** in the Class Browser toolbar. A list of available Progress Developer Studio for OpenEdge projects appears in the Browser pane, and the **Content** and **Summary** panes are empty.
2. You can view the contents of a project in either of the following ways:
   - Click the name of the project in the **Browser** pane. Its contents appear in a list in the **Content** pane; summary details about the project appear in the **Summary** pane. Click one of the items in the **Content** pane to see details about it in the **Summary** pane. For the `mscorlib.dll`, for example, the Summary pane identifies it as an assembly and provides its location.
   - Expand the project node in the **Browser** pane. Its contents appear listed as nodes below it in the **Browser** pane. Click the node to view a list of its packages and namespaces in the **Content** pane; or expand the node to see packages or namespaces in the **Browser** pane. Click the package or namespace (in the **Browser** pane or the **Content** pane) to see a list of its classes and interfaces. Click a **class** or interface to see its members. The **Summary** pane provides details for the item in focus.

See also

The Class Browser view on page 434
Browse by resource on page 437
Browser pane on page 441
Content pane on page 442
Summary pane on page 443
Class Browser view icons on page 446

Show members

Each class consists of members. The members differ as follows:

- **Public members**—Can be accessed from any code (in a class or procedure) that has access to the class instance.
- **Package-Protected members**—Can be accessed from the defining class, from a subclass, or from any class within its package.
- **Protected members**—Can be accessed from the defining class or a subclass.
- **Package-Private members**—Can be accessed from the defining class or any class within its package.

In addition, members can also be inherited, meaning they are available from the super class.

1. To choose which members you want the Class Browser to display, do either of the following:
   - From the **Content** pane, right-click to see the context menu.

- From the Class Browser toolbar, click **Menu** .

2. Choose one or more of the available options: **Show Public Members**, **Show Package-Protected Members**, **Show Protected Members**, **Show Package-Private Members**, **Show Inherited Members**. (All options are initially selected by default.)

The **Content** pane displays only those members you have chosen to view. You cannot display private members in the Class Browser, since they cannot be used outside of the defining class.

See also

The Class Browser view on page 434
Browse by resource on page 437
Browse by project on page 438
Browser pane on page 441
Content pane on page 442
Summary pane on page 443
Class Browser view icons on page 446

Add external resources

You can add external resources, such as assemblies, Progress procedure library files, and path entries, to the Class Browser and view their type information. The assemblies you add can be either local assemblies (`.dlls` or `.exes`) or assemblies registered in the **Global Assembly Cache (GAC)**.

You can add an external resource only once to the Class Browser. External resources that you add to the Class Browser persist between sessions of Progress Developer Studio for OpenEdge.

When you add an external assembly reference, the Class Browser automatically updates the `classBrowser.xml` file for the workspace.

Follow the given steps:

1. To add one or more external resources, do one of the following:

   - From the **Browser** pane, right-click and choose **Add External Resources** from the context menu.
   - From the Class Browser toolbar, click **Add External Resources** .

   The Add external resources dialog on page 448 dialog appears.

2. To add a path or a procedure library (`.pl`):

   a) Choose the **R-code path/PLs** tab.

   b) Provide a path or locate the procedure library you want to add. (You can add multiple resources.)

   c) Click **OK**. The **Add External Resources dialog** closes, and the resource is added.

3. To add an assembly from the **GAC**:

   a) Choose the **Global Assemblies** tab. Select one or more (use **CTRL+CLICK**) assemblies to add.

   b) Click **OK**. The **Add External Resources** dialog closes. The resource or resources are added and appear in the **Browser pane**.

4. To add a local assembly:

a) Choose the **Local Assemblies** tab. Provide a path or locate the assembly file or executable file you want to add.

b) Click **OK**.

See also

External resources and the Class Browser on page 435
Remove an external resource on page 440
Add external resources dialog on page 448

Remove an external resource

You can remove an external resource from the Class Browser. To do this, you must be browsing by resource (rather than by project).

If an external resource was also defined by a project, the resource will still be listed in the Class Browser; however, the **Remove External Resources** option will be disabled.

To remove external resources:

1. In the **Browser** pane, select one or more external resources you want to remove.
2. Right-click, and choose **Remove External Resources** from the context menu. A message appears asking you to confirm the removal of the resource(s).
3. Click **OK**. The Class Browser view refreshes, and the external resources are no longer listed.

See also

External resources and the Class Browser on page 435
Add external resources dialog on page 448
Browser pane on page 441

Search in the Class Browser

You can search the Class Browser for types, packages, or namespaces by specifying a partial name. (You cannot search for member information, including events, methods, or property names.)

To search in the Class Browser:

1. From the **Browser** pane, type the text you to want to search for in the **Search** field.
2. Click **Search** . If the search produces results, the matching types with fully qualified names appear in the Browser pane. If the search produces no results, a message appears telling you that no matches were found.

Once a search completes, you can restore the previous content of the **Browser** pane by clearing the **Search** field or clicking **Clear Search** .

The Class Browser does not retain search results between sessions.

See also

Browser pane on page 441

Copy to the Clipboard

You can copy text from the Class Browser view and paste it to the Clipboard for use outside of the Class Browser, as follows:

- From the **Browser** pane, you can copy the qualified name of the selected resource, project, package, namespace, or type.
- From the **Content** pane, you can copy the name of the selected group or member, a method signature, or the signature of an indexed property.
- From the **Summary** pane, you can copy the selected text.

You can copy one or more items at a time.

To copy:

1. Select the text and right-click. To copy more than one item, use `CTRL+CLICK` to select each item.
2. From the context menu, choose **Copy**. (From the **Summary** pane, you can also use `CTRL+C` to copy the selection.) If you selected multiple items, a comma-delimited list of the item names is copied to the Clipboard.

Note: You must have at least one item selected for the **Copy** option to be available.

See also

The Class Browser view on page 434
View information in the Class Browser on page 436
Browser pane on page 441
Content pane on page 442
Summary pane on page 443

Reference

Browser pane

The **Browser** pane displays the selected assemblies, procedure libraries, and paths (resources). The information is organized into three levels:

- Resources
- Packages (ABL) and namespaces (.NET)
- Types (classes or interfaces)

When you expand a resource node, its packages or namespaces are listed. If you expand the package or namespace node, the types contained within are listed. Generic type parameters are listed for the corresponding generic type.

When you select one of these types, the **Content** pane displays its constructors, methods, properties, events, and data members. Generic arguments also appear, as applicable, in the **Content** and **Summary** panes. If you select multiple types in the **Browser** pane, the **Content** pane and the **Summary** pane are empty.

If a type does not have a package or namespace, it is listed under the default package node when package names are displayed in the **Browser** pane.

See also

Class Browser view on page 434
Browse by resource on page 437
Browse by project on page 438
Search in the Class Browser on page 440
Content pane on page 442
Summary pane on page 443

Content pane

The **Content** pane displays a list of the contents of a resource's packages or namespaces, a list of the package or namespace's types, or a list of the type's members. Members are grouped by type and listed in alphabetical order. When you select a type in the **Browser** pane, all member information for the type appears in the **Content** pane. If you select multiple resources in the **Browser** pane, the **Content** pane is empty.

The pane also displays extent or generic information for method parameters. (Extent and generic information does not appear for variables and properties.)

Note: The **Content** pane does not display private members.

For more information about a member method, choose a specific method in the **Content** pane. Details about the method appear in the **Summary** pane.

The **Content** pane's context menu includes five display options: **Show Public Members**, **Show Package-Protected Members**, **Show Protected Members**, **Show Package-Private Members**, and **Show Inherited Members**. All options are selected by default.

When you select this item in the Browser pane...	The Content pane displays...
A project	The resources associated with the selected project
A resource	The packages or namespaces for the types contained in the selected resource
A package or a namespace	The types for the selected package or namespace within the resource
A type	The members of the selected type: data members, constructors, methods, properties, and events

Using the **Copy** option, you can copy the signature of a method or the reference to a property or variable and paste it elsewhere, such as in the ABL Editor.

See also

Class Browser view on page 434
View information in the Class Browser on page 436
Browser pane on page 441
Summary pane on page 443

Summary pane

The **Summary** pane displays a description for the selected resource, package, namespace, type, or member. For members of a type, the pane includes sample ABL syntax that you can use to access the selected member. If there is a mapped data type, it is shown in parentheses.

The pane also displays extent information for methods, properties, and variables that are arrays. In addition, abstract classes, methods, properties, and events are identified as such in the description of the element.

You can select any text in the **Summary** pane and copy it to the clipboard for use outside of the Class Browser. If you select multiple types in the Browser pane or the **Content** pane, the **Summary** pane is empty.

The information that the Summary pane displays for .NET types is extracted from the `.xml` file associated with the assembly file. For example, the documentation for the types in `mscorlib.dll` is included in `mscorlib.xml`.

When you select this item in the Browser pane . . .	The Summary pane displays. . .
An assembly, procedure library, or path entry	• The name of the resource. • The location of (path to) the resource. • For an external resource, internal resource, or if selected by project: a list of project names that reference the resource. • A summary (description) of the resource, if available.
A project	• The name of the project. • Path to the project directory.
A package or a namespace	• The name of the package or namespace. • The list of resources for which the package or namespace is a member. • A summary (description) of the package or namespace.
A type	• The name of the type. • Whether it is FINAL or ABSTRACT. • The list of packages or namespaces for which the type is a member. • The name of the base type it inherits from. • The list of interfaces being implemented. • A summary (description) of the type, if available. • Examples of ABL syntax using the type.

When you select this item in the Browser pane . . .	The Summary pane displays. . .
A data member	• The type of data member. • The name of the data member. • ABL syntax showing the data member definition, which includes access modifier and type. • The name of the type that contains the data member. • A summary (description) of the data member, if available.
A method	• ABL syntax showing the method definition, which includes the access modifier, the method name, the method's parameters, and the return value. • The name of the type that contains the method. • A summary (description) of the method, if available. Also shown if applicable: • A description of the return values of the method (if available). • Parameters (if available).

When you select this item in the Browser pane . . .	The Summary pane displays. . .
An event	• The name of the event, including an indication of whether the event is abstract. • ABL syntax showing the event definition, which includes the access modifier, event name, and the event's parameters, as well as a method definition for a method handler. • The name of the type that contains the event. • A summary (description) of the event, if available. • Examples of ABL syntax using the event. • The signature of the event. The SIGNATURE keyword appears for ABL events that include a signature, and the DELEGATE keyword appears for ABL events that use a delegate. Summary information for .NET events is the same in structure as for ABL events and also shows the signature of the event. Also shown if applicable: • A description of the parameters (if available)
A property	• The name of the property, including an indication of whether the property is abstract. • The data type. • The parameters, if applicable, shown in brackets for an indexed property. • Accessor-access-mode (if valid). • The name of the type that contains the property. • A summary (description) of the property, if available. • A note that indicates if a property is an indexed property. • Examples of ABL syntax using the property. Also shown if applicable: • A description of the parameters (if available).

See also

Class Browser view on page 434
View information in the Class Browser on page 436
Browser pane on page 441
Content pane on page 442

Class Browser toolbar

The Class Browser toolbar allows you to do the following within the Class Browser view:

- Navigate back or forward through recently selected items.
- View information by resource or project.
- Add external resources.
- Collapse all expanded nodes in the Browser pane.
- Refresh the view.
- Choose which members to view.
- Minimize or maximize the view.

The toolbar contains the following buttons:

	Navigate back through recently selected items.
	Navigate forward through recently selected items.
	Browse by resource.
	Browse by project.
	Add one or more external resources.
	Collapse all expanded tree nodes in the Browser pane.
	Refresh the Class Browser view.
	Choose whether to show public, package-protected, protected, package-private, and/or inherited members.
	Minimize the Class Browser view.
	Maximize the Class Browser view.

See also

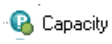
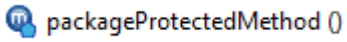
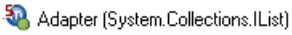
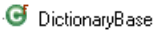
Class Browser view on page 434
View information in the Class Browser on page 436
Browser pane on page 441
Content pane on page 442
Summary pane on page 443

Class Browser view icons

The following icons help you identify items in the Class Browser view:

	Class Browser view.
	Browse by resource.
	Browse by project.
	Add external resources.
	Assembly.
	Progress Procedure Library.
	Path entry.
	ABL built-in types.
	Search.
	Clear search.
	Class.
	Interface.
	Constructor tree.
	Constructor. In this case, the green dot indicates that the constructor is public. See the following table for additional clarification.
	Method tree.
	Method.
	Event tree.
	Event.
	Data member tree.
	Data member.
	Property tree.
	Property.

To help you further distinguish what you see in the Class Browser view, an icon representing an item may be accompanied by one or more additional indicators:

If you see this additional indicator...	The item is...	Example
A green dot	Public	
A blue pentagon	Package-Protected	
A yellow diamond	Protected	
A purple triangle	Package-Private	
The letter S	Static	
The letter C	A constructor	 **Note:** In this example, the green dot indicates that the item is also public.
The letter F	Final	
A red box containing a white letter X	Not available	

See also

Class Browser view on page 434
View information in the Class Browser on page 436
Browser pane on page 441
Content pane on page 442
Summary pane on page 443

Add external resources dialog

The **Add External Resources** dialog appears when you:

- Right-click in the **Browser** pane and choose **Add External Resources** from the context menu.
- Click **Add External Resources**  from the Class Browser toolbar.

From this dialog you can add to the Class Browser view one or more resources from the following categories:

R-code path/PLs	A path or a Progress procedure library
Global Assemblies	An assembly from the **Global Assembly Cache**
Local Assemblies	An assembly or an executable file

See also

Add external resources and Class Browser on page 435
Add external resources on page 439
Remove external resources on page 440
Browser pane on page 441

11

Run and Debug ABL Programs

Progress Developer Studio for OpenEdge provides support for running and debugging programs using launch configurations. A launch configuration determines the characteristics of the ABL Virtual Machine (AVM) session in which the program runs.

For a debugging session, in addition to starting the appropriate launch configuration, Progress Developer Studio for OpenEdge starts its Debugger.

The topics in this help module explain:

- How to manage and use launch configurations
- How to use the Progress Developer Studio for OpenEdge Debugger

For details, see the following topics:

- Concepts
- Tasks
- Reference

Concepts

Launch configurations for running and debugging programs

You can use a launch configuration in the Progress Developer Studio for OpenEdge to:

- Run and debug ABL programs.
- Attach the Debugger to an external AVM.

A launch configuration defines the characteristics of the AVM instance under which the selected program runs. These characteristics include such things as startup parameters, PROPATH settings, and environment settings for the AVM session; database connections; and whether the program uses a dedicated instance of the AVM or the instance under which your OpenEdge project is currently running.

You can use the **Configurations** wizard to define all of a launch configuration's characteristics. Although this wizard contains a large number of fields on multiple tabs, defining a launch configuration need not be a complicated task. In fact, with a single click, you can create and run a launch configuration that uses default settings, and then edit any of these settings, if necessary.

Note: The descriptions of launch configuration behavior in this online help apply to an Eclipse installation created by the OpenEdge installation program, with default preference settings. You can adjust certain aspects of launching behavior by navigating to **Window** > **Preferences** > **Run/Debug/Launching**.

This topic provides some basic information about how launch configurations work.

See also

Run and Debug ABL Programs on page 451

Access launch configuration functions

To open the **Configurations** dialog, create a default launch configuration, or run an existing configuration, you can either use the **Run** and **Debug** buttons on the main toolbar, or use the ABL Editor context (right-click) menu.

Toolbar buttons

The **Run** and **Debug** buttons look like this:

Run	
Debug	

- Clicking the button image itself runs the currently selected program or starts it in the Debugger, creating a default launch configuration if necessary.
- Clicking the drop-down arrow opens a menu from which you can start an existing configuration, create and run a default configuration, or open the **Configurations** wizard for access to all options. For quick access to existing configurations, the top level of this menu includes recently used configurations. You can also choose to add any of your configurations to the **Favorites** section of this menu.

Servers view

The same two buttons appear on the toolbar of the Servers view, where you can use them interchangeably with those on the main toolbar to start the currently selected PAS for OpenEdge instance. The **Servers view** buttons do not include the down arrow, so click the arrow on the main toolbar to open the menu.

Launch configurations > **Run As** > **Context menu** options

- The **ABL Editor** context menu provides **Run As** and **Debug As** options, each of which has a sub-menu from which you can choose one of the following options:

- **Run as** or **Debug as**—Runs or debugs the currently open program, creating a default launch configuration if necessary
- **Run Configurations** or **Debug Configurations**—Opens the **Configurations** wizard for access to all options

See also

Progress Developer Studio for OpenEdge Debugger on page 454
Use Launch Configurations on page 460
Launch Configuration Settings on page 485

Essential launch configuration settings

Of the many options that it is possible to specify for a launch configuration, two have particular importance:

- **Project**—You must associate the configuration with an existing project in your workspace. This setting does not prevent you from using the configuration in other projects.
- **Startup program**—You define the configuration either to run a specific program, or to run the program that currently has focus in your workspace (selected in the **Project Explorer** view or open in the ABL Editor, whichever applies).

OpenEdge uses these two settings to determine the behavior of the **Run (As)** and **Debug (As)** commands, as explained in the next topic.

See also

How OpenEdge creates or reuses a configuration on page 453
Access launch configuration functions on page 452

How OpenEdge creates or reuses a configuration

Although you can explicitly select an existing launch configuration to run or debug a program, in many cases, the easiest approach is simply to click **Run** or **Debug** with focus on the desired startup item. (In most cases, clicking the button produces the same result as opening the menu and selecting **Run As** or **Debug As**.)

When you choose one of these options, OpenEdge determines whether a suitable configuration already exists, and if so, runs that configuration. If a suitable configuration does not exist, OpenEdge creates and runs a new configuration. The basis for identifying a suitable configuration depends on whether the selected item is an ABL source file.

For an ABL program

To determine whether to use an existing configuration to run or debug an ABL program, OpenEdge performs the following tests in sequence:

- If a configuration exists whose **Startup program** setting specifically identifies the selected program and whose **Project** setting matches the project of the selected program, OpenEdge uses that configuration. Otherwise, test 2 is performed.
- If a configuration exists whose **Startup program** setting does not identify a specific program (but instead refers generically to the "selected program") and whose **Project** setting matches the project of the selected program, OpenEdge uses that configuration.

If multiple existing configurations satisfy a test, you are prompted to choose one of those configurations.

If both tests fail, OpenEdge creates and runs a new configuration with default settings. You can edit this configuration as appropriate.

See also

Use Launch Configurations on page 460
Use the OpenEdge Architect Debugger on page 466
Launch Configuration Settings on page 485

Progress Developer Studio for OpenEdge Debugger

The Debugger is an integral component of Progress Developer Studio for OpenEdge. It is an interactive tool that provides a full set of tools for testing and debugging programs. It works directly with the **ABL Editor**, making it easy to identify and fix problems as you work.

The following are the key features of the debug launch configurations provided in the Progress Developer Studio for OpenEdge:

- Attachable Debugger - The debug launch configuration type allows you to attach the Debugger to an external AVM (which can be an ABL client running on the same machine or a remote machine).
- SpeedScript debugging - Progress Developer Studio for OpenEdge allows you to debug .w files that are generated from HTML files in a SpeedScript editor.
- Standalone Debugger functionality - Progress Developer Studio for OpenEdge provides all the debugging features that are available with the standalone OpenEdge Debugger.

You can use the Debugger in Progress Developer Studio for OpenEdge to run multiple debugging sessions. Each session uses a dedicated instance of the OpenEdge runtime engine, and provides these benefits:

- Debugging multiple programs simultaneously, whether the programs are in the same project or in different projects.
- Debugging multiple instances of the same program.
- Editing the source code using all Editor features, while a debugging session is active.
- Stepping through the code, line by line, or stop at specified lines and then resume execution from those points.
- Examining data from the procedure you are running, including the names and contents of variables it defines.
- Attaching the Debugger to a running process.
- Debugging programs running on a remote machine.

The standalone OpenEdge Debugger

In addition to the Debugger provided by Progress Developer Studio for OpenEdge, OpenEdge provides a standalone Debugger that runs with any OpenEdge application.

To launch the standalone OpenEdge Debugger, select Debugger from the Progress OpenEdge program group on the **Windows Start** > **Programs** menu.

For the purposes of this online help, however, all references to "the OpenEdge Debugger" or "Debugger" pertain to the Debugger in Progress Developer Studio for OpenEdge.

The OpenEdge Debugger perspective

In its default state, the Debug perspective partitions the Workbench into four functional areas:

- **Program execution area**—Contains the **Debug** view, which displays session trees with stack traces for each active debugging session. This view also provides the commands for controlling program execution.
- **Editing area**—Contains one or more **ABL Editor** tabs for viewing and modifying the source code.
- **Execution monitoring area**—Contains the **Variables**, **Expressions**, and **Dynamic Objects** views, for tracking the values of data elements as the application runs. The **Breakpoints** view, where you define rules for suspending program execution at specific points, is also found here.
- Information area - Contains the standard Eclipse **Console** and **Task** views.

Note: An Eclipse preference setting lets you control whether every call to an external procedure or include file opens a new **ABL Editor** window to display the file, or whether all called files use the same window. Select **Window** > **Preferences** > **Run/Debug** and check or clear the **Reuse editor when displaying source code** option according to your preference. If you check this option, no more than two **ABL Editor** windows will open automatically during a debugging session -- one window for the initial file, and a second for all called files.

See also

Debug Options on page 457
Use the Progress Developer Studio for OpenEdge Debugger on page 466
Debugger Views on page 512

Prerequisites for using the Debugger

Debugging is automatically enabled for you in Progress Developer Studio for OpenEdge. If debugging has been disabled for some reason, however, you must enable it. You can do so in any of the following ways:

- Run a command-line utility.
- Set an environment variable (at the operating system level).
- Choose to enable debugging when you begin your debugging session.

For details about each of these options, see Enable debugging on page 467.

Additional prerequisites for using the Debugger include:

- You must make compiled r-code available for all files to be debugged. You can specify in your Build properties settings, whether `.r` files are automatically created when you compile code, and where the files are stored.
- You must make sure that the database connections used by your application allow multiple users; that is, that the connection parameters do **not** include the **-1** option. See Add existing database connections to a project on page 64.
- You must have access to the source code for the program running on an external AVM outside Progress Developer Studio for OpenEdge, in order to debug it.

Although optional, it is a good idea to turn on the display of line numbers in the ABL Editor. To do so, select **Window** > **Preferences** > **General** > **Editors** > **Text Editors**, and check the **Show line** numbers option.

See also

Enable debugging on page 467

Configure r-code generation on page 468

OpenEdge Debugger preferences

The OpenEdge Debugger preferences are categorized into two: **General** and **Communication**. You can optionally use these preferences to manage your **Debugger** environment better.

General preferences

- **Enable property evaluation**: This preference gives you the option to choose whether you want the evaluation of properties with accessors to automatically occur. The preference is disabled by default. If you enable this preference, you see the actual value of the property in the **Variables** view. (A property added to the **Expressions** view is always evaluated, whether or not you select this preference.)
- **Always select first matching file upon CRC mismatch**: This preference allows you to choose whether to always select the first matching file and ignore the rest, if there are one or more files with a similar name but none of them match with the **Cyclic Redundancy Check (CRC)** of the program being debugged.

Communication preference

Connection timeout: This value indicates how long, in milliseconds, Progress Developer Studio for OpenEdge waits to connect to the OpenEdge Client. The value is set by default to 20000, but you can modify it to your preference, provided the value is no less than zero and no greater than 3600000 (one hour).

See also

Set Debugger Preferences on page 466
Debug Preferences on page 507

Remote debugging support in Progress Developer Studio for OpenEdge

Remote debugging is the ability to debug server-side procedures and remote-application procedures. This mode prevents debugging any procedure in a client application session. It allows you to debug application code running on a PAS for OpenEdge server independent of the client application invoking it. Remote debugging is useful for debugging remote procedures that are:

- Executed by an Open Client (non-ABL client) application
- Executed by an OpenEdge Web service

Progress Developer Studio for OpenEdge enables you to debug an external AVM (which can be an ABL application instance) remotely by specifying the host name and the port number. You can also step into the remote procedure code on the AVM invoked by the client application. This feature requires that you have access to the ABL source code being executed on the attached AVM broker.

This topic provides some basic information about remote debugging support in Progress Developer Studio for OpenEdge.

Attachable Debugger

You can use a debug launch configuration type in the Progress Developer Studio for OpenEdge to attach the Debugger to a running client process. The client can be an ABL client running on the same machine or a remote machine. The debug launch configuration type allows you to specify the connection type and properties of the remote or local external AVM to which you want to attach the Debugger. For more information, see Progress External OpenEdge AVM settings (Debug Configuration only) on page 502.

To attach the Debugger to an external AVM running on another machine, you can use the debug launch configuration type and specify the host name and the port number of the external AVM. To attach it to a locally running AVM, you can specify its process ID and port number or choose from a list of all the locally running AVM processes that is displayed by the debug launch configuration type. When you attach the Debugger to a local AVM, Progress Developer Studio for OpenEdge uses its process ID and attempts to make the process debug-ready on the specified port, if the AVM is not already running in the debug mode.

To make a successful connection with Progress Developer Studio for OpenEdge, you must start the external AVM in the debug mode on the specified host and port. Only one debug client can connect to the specified AVM at any point of time. Once attached, an entry for that AVM is displayed in the **Debug** view. If Progress Developer Studio for OpenEdge fails to connect to an external AVM, the **Debug** view shows the entry as terminated and displays an appropriate error message indicating connection failure.

The attached AVM notifies Progress Developer Studio for OpenEdge only if a breakpoint is reached. So, in order to debug a file on the attached AVM, you must set a breakpoint in the source file before it is executed by the attached AVM (See Set breakpoints on page 470 for more information). You can add or remove breakpoints during debugging.

Progress Developer Studio for OpenEdge also enables you to specify the source lookup paths on which it searches for the source code of the program being executed by the attached AVM. For more information, see Edit Source Lookup Path dialog on page 511.

You can suspend or disconnect the Debugger from the attached AVM using the options available on the **Debug** view toolbar or the context menu. For more information, see Suspend and disconnect the Debugger from an attached AVM on page 485.

See also

Remote Debugging on page 456
Attach Debugger External AVM on page 469
Suspend and disconnect the Debugger from an Attached AVM on page 485
Progress External OpenEdge AVM Settings on page 502

SpeedScript debugging

Progress Developer Studio for OpenEdge allows you to edit SpeedScript files. Embedded SpeedScript files are HTML files that contain SpeedScript (a subset of ABL) code contained within HTML `SCRIPT` elements. The SpeedScript editor automatically generates `.w` files from the HTML files in the `SpeedScriptGen` folder.

You can debug the SpeedScript code by setting breakpoints in the `.w` files. You can do this in two ways:

- Set the breakpoint on the **Generate ABL** tab where the `.w` file is generated
- Open `.w` the file using the **ABL Editor** and set breakpoints in it

See also

Remote Debugging on page 456

Debug operations

The Debugger provides several ways to control the execution of a program, analyze the results as the program runs, and make both persistent and non-persistent changes to the code while the debugging session is active.

Options for controlling program execution

The key to debugging is the ability to run a program and suspend execution at strategic points so that you can monitor and evaluate the results. To allow you to control the program flow in this manner, the Debugger includes the following features:

- **Breakpoints**—You can insert breakpoints on executable statements anywhere in your source code and in include files that might appear in many different procedures. The Debugger suspends execution at each breakpoint.
- **Code-stepping**—You can discretely execute the next statement, the next statement plus any sub-procedure or trigger called by that statement, or the remainder of the current procedure.
- **Suspend-Resume-Terminate** commands—You can explicitly interrupt or resume execution. You can also suspend and resume an attached external AVM at any time.

These features are more fully described in the following topics.

Breakpoints

Breakpoints are markers that you insert in the source code, or instructions that you define, to stop your application at certain points when it runs in a Debugger session. Used in conjunction with Step through the code on page 474, breakpoints let you fully control when the application runs uninterrupted and when it is suspended.

When the Debugger encounters a breakpoint, it suspends execution and takes control from the application. You can then examine the code as you wish, and continue when you are ready, either by stepping or by resuming and letting the application run until it reaches the next breakpoint.

A breakpoint can be conditional, where evaluation of a logical expression determines whether the interruption occurs. A breakpoint can be based on encountering an error, in which case the Debugger gets control at the next executable line after the line that caused the error.

All breakpoints defined in your workspace are known to the Debugger session. Without deleting any definitions, you can selectively enable only the ones that you want to use. Those breakpoints that you do not enable are ignored.

Types of breakpoints

You can set three different types of breakpoints:

- **At line**—Suspends execution at a specific point in the code. Optionally, you can define a condition that must be satisfied in order for the breakpoint to be honored.
- **On error**—Suspends execution when the program encounters an error condition. You can make the breakpoint apply to all errors, only to unsuppressed errors, or only to a single error condition that you specify.
- **Watchpoint**—Suspends execution when the value of a given variable or parameter changes. Optionally, you can define a condition that must be satisfied in order for the breakpoint to be honored.

Conditional breakpoints

For a conditional "at-line" or "watchpoint" breakpoint, the condition can be any expression that OpenEdge can evaluate to a logical value. The expression can include variables, buffer fields, object methods and attributes, logical operators (such as AND, OR), comparison operators (such as =, <>, EQ, NE), and other code entities.

OpenEdge validates the expression syntax when the breakpoint is added, but does not check variable references. If any variables in the condition are out of scope or nonexistent when the breakpoint is encountered, the Debugger suspends execution as if honoring the breakpoint and displays an error message.

See also

Code-stepping on page 459
Use breakpoints on page 470
Breakpoints view on page 515

Code-stepping

Code-stepping refers to a set of commands that let you run procedures incrementally, suspending the process as each statement or block is executed so that you can evaluate the precise effect of each code segment. Used in conjunction with Breakpoints on page 458, code-stepping commands let you fully control when the application runs uninterrupted and when it is suspended.

Code-stepping options

The following options are available:

- **Step Into**—Causes the Debugger to execute the current line and continue until it reaches the next executable statement, which may be in the current procedure, a subprocedure, or a trigger. That statement becomes the current line, and is not executed until you continue.
- **Step Over**—Causes the Debugger to execute the current line and continue until it reaches either a breakpoint, or the next executable statement in the same procedure. Thus, if the current line calls a subprocedure or causes a trigger to execute, the subprocedure or trigger is executed without interruption unless there is a breakpoint. In other words, the Debugger steps "over," not "into," the subprocedure or trigger.
- **Step Return**—Causes the Debugger to execute the current line and continue either until it reaches a breakpoint, or until the current procedure ends and returns control to the calling procedure.
- **Resume**—Causes the Debugger to execute the current line and continue without interruption until it reaches either a breakpoint or the end of the program.
- **Suspend**—Interrupts execution and gives control to the Debugger. Also, suspends an attached AVM.
- **Terminate**—Interrupts execution and ends the Debugger session.
- **Disconnect**—Disconnects the Debugger from the attached AVM.

Garbage collection in Debugger

The OpenEdge client uses a feature known as garbage collection. Garbage collection refers to the automatic deletion of ABL objects that have no current reference. Since the objects are no longer being used, removing them frees up resources and relieves you of having to explicitly delete each object created during a session.

With regard to the Debugger, garbage collection proceeds as follows:

- If an object is garbage-collected at the end of a statement, the debugger does not step into the destructor for the object (if the object has a destructor) unless there is a breakpoint in the destructor.
- The DELETE OBJECT statement steps into the destructor whether or not it contains a breakpoint.
- When stepping over a statement (as opposed to stepping into a statement), the Debugger stops in the destructor only if it contains a breakpoint, whether the object is deleted due to garbage collection or as the result of executing the DELETE OBJECT statement.

See also

Breakpoints on page 458
Step through the code on page 474
Use the Debug view and stack trace on page 475

Debug view on page 512

Options for monitoring results

During a debugging session, you can use the following views to keep track of current values:

- **Variables view** — Shows the values of all buffers, datasets, parameters, properties, variables, and temp-tables. Class variables, properties of a class type, arrays, buffers, temp-tables, datasets, and handle variables are all expandable in the view.
- **Expressions view** — Shows the values of data elements that you explicitly choose to display, providing a convenient way to monitor a specific set of values that interest you. Class variables, properties of a class type, arrays, buffers, temp-tables, datasets, and handle variables are all expandable in the view.

  The **Expressions** view duplicates and also expands upon information available in the **Variables** view. You can use the **Expressions** view to show ABL data (for example, ACTIVE-WINDOW or SESSION) that is not available in the **Variables** view. (You can also see this level of detail in the **Variable Details** view.)
- **Dynamic Objects view** — Shows information about dynamically created database objects, user interface widgets, XML objects, and other objects that are active at the current state of program execution.

See also

The OpenEdge Debugger Perspective on page 455
Monitor program execution on page 475
Debugger views on page 512

Code changes while debugging

During a debugging session, you may want to make changes to your source code.

You have full access to all **ABL Editor** functions to make persistent changes. These changes do not take effect in your current debugging session; you must recompile and start a new session.

In addition, you can make non-persistent changes, not saved in your source code, to the values of variables and parameters. These changes take effect immediately, without recompiling.

See also

Options for monitoring results on page 460
Change program code on page 483
Set Value dialog on page 508
Variables View on page 513

Tasks

Use launch configurations

You can run and debug your ABL programs from within the Progress Developer Studio for OpenEdge environment. Each time you do so, the program runs a launch configuration, which you can customize to suit the needs of your application and its target implementation.

See also

Launch Configurations for Running and Debugging Programs on page 451
Launch Configuration Settings on page 485

Run or debug a program

To run or debug an ABL program (`.p`, `.w`, or `.cls` file), a PAS for OpenEdge instance that exists in a Progress Developer Studio for OpenEdge project, you need to decide on a launch configuration to use. You have the following options:

- Let OpenEdge launch the program automatically on page 461.
- Select an existing launch configuration on page 462.
- Define and run a new launch configuration on page 462.

See also

Launch configurations for running and debugging programs on page 451
Define a launch configuration on page 463
Create project-standard and program-specific configurations on page 464
Add a configuration to the menu on page 465
Copy and delete launch configurations on page 465
Set launch configuration preferences on page 466
Launch configuration settings on page 485

Let OpenEdge launch the program automatically

When choosing this technique, OpenEdge first tries toHow OpenEdge creates or reuses a configuration on page 453. If no suitable configuration is found, a new one is created specifically for the selected program, using default settings.

1. Select the file in the **Project Explorer** view, or open it in the **ABL Editor**.

   Note: You can also launch a debugging session with focus on an include file.

2. Do one of the following:

   - Click **Run**  or **Debug**  on the main toolbar. Simply clicking the button image is normally sufficient to launch the program. You can also click the down arrow to open the drop-down menu, and select **Run As** or **Debug As**.

- Right-click in the **ABL Editor** window and select **Run As** from the context menu.

The program runs in the configuration chosen or created by OpenEdge. Consider the pros and cons of this approach:

Pros	Cons
1. This is the quickest way to run a program. 2. You can use this technique to create a basic configuration, and then fine-tune the configuration by editing it in the **Configurations** wizard. 3. After using the Configurations wizard to Create project-standard and program-specific configurations on page 464, you can use this technique to run any program in the project under that configuration.	1. The configuration that OpenEdge chooses or creates may not meet all of your needs. 2. Using this technique repeatedly might create a large number of configuration definitions that you do not want to keep, resulting in the need to do some "housekeeping." You can use the **Configurations** wizard to delete unwanted configurations.

See also

Define and run a new launch configuration on page 462

Select an existing launch configuration on page 462

Select an existing launch configuration

With this technique, you choose a launch configuration that you have previously defined.

1. Select the file in the **Project Explorer** view, or open it in the ABL Editor.
2. Click the down arrow on the **Run** button  or the**Debug** button  on the main toolbar to open the drop-down menu.
3. The configuration you want may appear on the top-level menu in the Add a configuration to the menu on page 465, the recent history list, or both. If so, select it from that menu.
4. If the configuration is not offered on the top-level menu, select **Run Configurations**or **Debug Configurations** to open the **Configurations** wizard.
5. In the wizard, select the desired configuration from the tree view in the left pane and then click the **Run** or **Debug** button in the lower right corner.

   The program runs in the selected configuration. If you used the **Debug** command, the Debugger starts; see Launch the Debugger on page 468 for information on how to proceed with the debugging session.

See also

Define and run a new launch configuration on page 462

Let OpenEdge launch the program automatically on page 461

Define and run a new launch configuration

For complete control of the configuration definition, use the **Configurations** wizard.

1. Click the down arrow on the **Run** button  or the **Debug** button  on the main toolbar to open the drop-down menu.
2. Select **Run Configurations** or **Debug Configurations** to open the **Configurations** wizard.
3. Define the configuration. You can add it to the **Run** and **Debug** menus if you wish.
4. Run the configuration either from the **Configurations** wizard or from the **Run** or **Debug** menu.

See also

Select an existing launch configuration on page 462
Let OpenEdge launch the program automatically on page 461

Manage launch configurations

You use a launch configuration every time you run or debug an ABL program in Progress Developer Studio for OpenEdge. The following topics provide instructions for working with launch configurations.

Define a launch configuration

Use the **Configurations** wizard to set all desired options for a new launch configuration or to edit an existing configuration.

1. To open the **Configurations** wizard, click the down arrow on either the **Run** button  or the **Debug** button  on the main toolbar to open the drop-down menu. Then select **Run Configurations** or **Debug Configurations**. Alternatively, right-click in the **ABL Editor** and select **Run As** > **Run Configurations** or **Debug As** > **Debug Configurations**.

   Note: For the purpose of defining a configuration, it makes no difference whether you use a **Run** command or a **Debug** command to open the wizard. In both cases, the wizard gives you access to all existing configuration definitions, and the process of creating or editing a configuration is identical.

   ---

2. Select the desired launch configuration type from the tree view in the left pane. The launch configuration types are: Progress OpenEdge Application settings on page 485, and Progress External OpenEdge AVM settings (Debug Configuration only) on page 502 (for Debug Configurations only).
3. To create a new launch configuration, click  on the wizard toolbar and enter a name for the configuration in the **Name** field.
4. To edit an existing configuration, select it in the tree view in the left pane. The wizard includes tabs labeled Main tab (Application) on page 486, Startup tab (Application) on page 488, PROPATH tab (Application) on page 489, Databases tab (Application) on page 490, ABL tab (Application) on page 491, Culture tab (Application) on page 493, Performance tab (Application) on page 496, Logging tab (Application) on page 498, Environment tab (Application) on page 499, Common tab (Application) on page 500, and Connection tab (Progress OpenEdge External AVM) on page 502. Set values as necessary for options on all tabs. In many cases you need to specify only a few settings, as the default values are appropriate. These defaults are generally copied from settings for the project or the operating system, or from the `startup.pf` file in your OpenEdge root directory.
5. After setting the desired options, click **Apply** to save the configuration. You also have the option of using the configuration immediately by clicking **Run** or **Debug**.

A few things to keep in mind. Be aware of the following considerations:

- **Project selection**—You are required to associate the launch configuration with a project (the first field on the **Main** tab). Doing so does not limit you to using the configuration only in that project. However, your choice affects many of the default values for the configuration. It is also important if you are creating a Create project-standard and program-specific configurations on page 464 to run whenever you select a program in that project and use the **Run/Debug as Progress OpenEdge Application** command.
- **Debug configurations**—The Progress Developer Studio for OpenEdge **Debugger** requires that the target program run under a dedicated instance of the AVM, not under the project AVM. When creating a configuration for debugging, be sure to specify **Start new OpenEdge AVM** on the **Main** tab.
- **Class files**—Similarly, ABL class files must run under a dedicated instance of the AVM, not under the project AVM. When creating a configuration for running classes, be sure to specify **Start new OpenEdge AVM** on the **Main** tab.

See also

Launch configurations for running and debugging programs on page 451
Run or debug a program on page 461
Create project-standard and program-specific configurations on page 464
Add a configuration to the menu on page 465
Copy and delete launch configurations on page 465
Set launch configuration preferences on page 466
Launch configuration settings on page 485

Create project-standard and program-specific configurations

The quickest way to run or debug a program is to use the **Run/Debug** as command, or simply to click **Run**  or **Debug**  on the main toolbar while the program is selected. When you use one of these commands, OpenEdge first looks for a suitable existing launch configuration to use. If none is found, it creates a new one.

For the convenience of running different programs in a project with just a click or two and without the inconvenience of accumulating numerous automatically created configurations that you do not need, it is helpful to understand How OpenEdge creates or reuses a configuration on page 453. You can take advantage of the way this selection process works to define:

- A project-standard configuration that will be used in a given project in all cases where no program-specific configuration exists.
- A program-specific configuration that will supersede the project-standard one if the program is selected when you issue the **Run** or **Debug** command.

Defining a project-standard configuration

To define a project-standard configuration, observe the following guidelines when setting values on the **Main** tab of the **Configurations** wizard:

- **Project setting**—Specify the project in which you want to use the configuration.
- **Startup program setting**—Choose **Run selected program in workspace**.

Defining a program-specific configuration

Using a standard launch configuration does not prevent you from using as many program-specific launch configurations as you need. When defining such a configuration, observe the following guidelines for values on the **Main** tab of the **Configurations** wizard:

- **Project setting**—Specify the project that contains the program.
- **Startup program setting**—Choose **Run this program** and specify the appropriate startup program.

When you select the program in the workspace and use the **Run/Debug as** command, OpenEdge chooses the program-specific configuration over any others that exist. You can also run the specified program from any project by explicitly choosing the associated launch configuration.

See also

Launch configurations for running and debugging programs on page 451
Run or debug a program on page 461
Define a launch configuration on page 463
Add a configuration to the menu on page 465
Copy and delete launch configurations on page 465
Set launch configuration preferences on page 466
Launch configuration settings on page 485

Add a configuration to the menu

For launch configurations that you use frequently, it is helpful to add them to the top-level **Main** or **Debug** menu. These menus have a **Favorites** section (not visible when empty) at the top to which you can add any of your launch configurations. Use one of the following methods:

- **Configurations wizard**—Open the configuration definition in the wizard. On the **Common** tab, check **Run**, **Debug**, or both in the **Display in favorites menu** section.
- **Organize Favorites dialog**—Click the down arrow on either the **Run** button  or the **Debug** button  on the main toolbar to open the drop-down menu. Then select **Organize Favorites** and use the command buttons in the dialog to **Add**, **Remove**, or **Reorganize** menu entries.

See also

Launch configurations for running and debugging programs on page 451
Run or debug a program on page 461
Configurations wizard on page 485

Copy and delete launch configurations

The **Configurations** wizard lets you copy and delete existing configuration definitions. To open the wizard, click the down arrow on either the **Run** button  or the **Debug** button  on the main toolbar to open the drop-down menu. Then select **Run Configurations** or **Debug Configurations**.

- **To copy a configuration**—Select the configuration in the left pane of the wizard and click  on the wizard toolbar. The wizard creates and opens a copy of the selected configuration. The duplicate configuration has the same name as the source, with an incremental number in parentheses appended.
- **To delete a configuration**—Select the configuration in the left pane of the wizard and click  on the wizard toolbar, or press **Delete**.

See also

Launch configurations for running and debugging programs on page 451
Define a launch configuration on page 463
Create project standard and program specificconfigurations on page 464
Add a configuration to the menu on page 465

Set launch configuration preferences on page 466
Launch configuration settings on page 485

Set launch configuration preferences

Both Progress Developer Studio for OpenEdge and the Eclipse framework offer options that affect launch configurations.

- To set Progress Developer Studio for OpenEdge launching preferences, select **Window** > **Preferences** > **Progress OpenEdge** > **Advanced** > **Launching**.

  You can choose the **Configurations** wizard defaults for two important settings on the **Main** tab:

  - **AVM usage**—By default, a new configuration runs under a separate, dedicated instance of the AVM. To change the default behavior so that new configurations use the same instance of the AVM as the project, check Use project AVM for new launch configurations. (In **Debug** mode, however, programs always run in a separate instance of the AVM, irrespective of the preference setting or the setting in the **Configurations** wizard.)
  - **Startup program**—By default, a new configuration definition identifies a specific program to be run. To change the default behavior so that new configurations run whatever program is currently selected, check **Use selection** in workspace for new launch configurations.

Eclipse launching preferences

To adjust various aspects of how the launching mechanism works, select **Window** > **Preferences** > **Run/Debug** > **Launching**.

See also

Launch configurations for running and debugging programs on page 451
Define a launch configuration on page 463
Create project standard and program specific configurations on page 464
Main tab Application on page 486

Use the Progress Developer Studio for OpenEdge Debugger

Set Debugger preferences

To help you better manage your debugger environment, you can set two preferences specific to the operation of the Debugger.

1. Select **Window** > **Preferences** > **Progress OpenEdge** > **Debug**. The Debug Preferences dialog on page 507 dialog appears.
2. Optionally, set the following preferences:

   - **Enable property evaluation** — Check this option if you want the evaluation of properties with accessors to occur. This option is not enabled by default. If you do not select this option, you see **Property evaluation disabled** in the **Variables** view as the property value, instead of the actual value of the property. (A property added to the **Expressions** view is always evaluated, whether or not you select this option.)
   - **Always select first matching file upon CRC mismatch** — Select this option if you want to always select the first matching file and ignore the rest, if there are one or more files with similar name but none of them match with the **CRC** of the program being debugged.

- **Connection timeout (ms)** — Provide the time-out value that you want the Progress Developer Studio for OpenEdge Debugger to use when connecting to an OpenEdge client. This option is enabled with a default value of 20000 milliseconds.

3. Click **Apply** to save any preference changes, or click **Restore Defaults** to return to the original preference setting(s).
4. Click **OK**.

See also

OpenEdge Debugger preferences on page 456
Debug Preferences dialog on page 507

Enable debugging

Debugging is automatically enabled for you in Progress Developer Studio for OpenEdge. If debugging has been disabled, however, you must enable it in one of the following ways:

- By choosing to enable debugging in your first Debugger session. Simply choose **Yes** at the prompt to enable debugging for all OpenEdge clients.
- By running the proDebugEnable command-line utility.
- By setting the `ENABLE_OPENEDGE_DEBUGGER` environment variable.

To run the `proDebugEnable` command-line utility:

1. On the **Windows Start** > **Programs** menu, select **Progress** > **OpenEdge** > **Proenv**. A command shell window opens and displays information about your OpenEdge installation, followed by a command prompt.
2. Enter the following command:

   ```
   prodebugenable -enable-all
   ```

   A confirmation message indicates that debugging is enabled. You set the `ENABLE_OPENEDGE_DEBUGGER` environment variable at the operating system level. When you do so, be sure to set the value of the variable as either **yes** or **true**. For more information about setting environment variables, consult the documentation for your operating system.

Disabling debugging

Debugging remains enabled unless you explicitly disable it. If you did not set the `ENABLE_OPENEDGE_DEBUGGER` environment variable, you can disable debugging simply by entering the following command from the **Proenv** window:

```
prodebugenable -disable-all
```

A confirmation message indicates that debugging is disabled. If you did set the `ENABLE_OPENEDGE_DEBUGGER` environment variable, you must also remove the variable.

See also

Prerequisites for using the Debugger on page 455
Launch the Debugger on page 468

Launch the Debugger

You launch the Debugger by selecting the desired source file and issuing the **Debug** command as explained in Run or debug a program on page 461.

Note: You can also launch a debugging session with focus on an include file.

When you launch the Debugger, you may see either or both of two prompts:

- If you have not enabled debugging, you are prompted to do so before the debug session runs.
- If you are not in the **Debugger** perspective, you may be prompted to confirm a switch to that perspective. Switching is recommended but not required.

A dedicated OpenEdge runtime instance starts for the session in a suspended state, with an ABL stack trace displayed as a tree in the **Debug** view. The current line, which is the first executable statement in the source file, is selected in the stack trace. In an **ABL Editor** window showing the source file, this line is highlighted and includes an execution pointer () in the left margin.

Use any of the program execution commands on the **Debug** view toolbar or context (right-click) menu to proceed.

Debugging class files

When you use an ABL class file as the starting program for the Debugger, a temporary program is created to instantiate the class, using a public default constructor (no parameters). A different temporary program is used for each debugging session, as concurrent debug sessions are allowed. Each temporary program has a unique name relative to the Debugger session. If the class does not have a public default constructor, an error occurs.

See also

Options for controlling program execution on page 458
Launch configurations for running and debugging programs on page 451
Enable debugging on page 467
Configure for r-code generation on page 468
Control program flow on page 470
Monitor program execution on page 475
Close a debugger session on page 484
Define a launch configuration on page 463
Copy and deleting launch configurations on page 465
Set launch configuration preferences on page 466
Manage launch configurations on page 463
Run or debugging a program on page 461
Debugger dialogs on page 507
Debugger views on page 512
Launch configuration settings on page 485

Configure r-code generation

The Debugger operates on compiled r-code. Therefore, you must specify the appropriate build options in your project properties to save `.r` files when you save or compile your code.

1. In the **Project Explorer** view, select your project and open its **Properties** window (right-click and select **Properties**, or select **File** > **Properties** from the menu bar).
2. Select **Progress OpenEdge** > **Build**, and make sure the **Save r-code** option is checked (the default setting). Set other values as appropriate.

Note: The location that you specify for `.r` files must be included in the PROPATH you specified when you created the launch configuration.

For more detailed instructions, see Define a launch configuration on page 463.

See also

Prerequisites for using the Debugger on page 455
Define a launch configuration on page 463

Attach the Debugger to an external AVM

You can use the Progress Developer Studio for OpenEdge Debugger in attachable mode by attaching it to a debug-ready external AVM. The external AVM could be any one of the following:

- An AVM running outside Progress Developer Studio for OpenEdge on the same machine or a remote machine.
- A PAS for OpenEdge agent running on the same machine or a remote machine.

To attach the Debugger to an external AVM:

1. Select a launch configuration under the **External OpenEdge Application** node on the **Debug Configurations** wizard. For more information on selecting a launch configuration, see Run or debug a program on page 461.
2. On the **Connections** tab, select the connection type of the application to which you want to connect.
3. Select one of the following options:
   - **Make debug-ready and attach (local host only)**—Makes a process debug-ready and attaches the Debugger to the process. Select this option only if the external AVM is running on the same machine as the Debugger.
   - **Attach to debug-ready process**—Attaches the Debugger to a process that is debug-ready. Select this option if the external AVM instance is running on a remote machine.
4. On the **Source** tab, specify one or more source lookup paths on which Progress Developer Studio for OpenEdge searches for the source code of the program being executed by the attached AVM. For more information, see Source tab (Progress OpenEdge External AVM) on page 504.

Making a process debug-ready and attaching the Debugger to it

To make a process debug-ready and attach the Debugger to it:

1. Select **Make debug-ready and Attach (local host only)**.
2. In the **Process ID** field, enter the process ID of the process on the local machine you want to debug.

   o list the currently running OpenEdge processes, click **Select Process**. The **Select Process** dialog box appears. For more information, see Select Process dialog on page 510.

3. In the **Port** field, enter a port number which you want to use for communicating with the client process, or leave the default value (0) for the AVM to determine a usable port number.
4. Click **OK**.

Attaching the Debugger to a debug-ready process

To attach the Debugger to a process that is already in a debug-ready state:

1. Select **Attach to debug-ready Process**.
2. Enter the name of the host on which the process is running, or accept the default localhost.

   Note: You must enter a **host name** if the process is not running on the same machine as the Debugger.

3. Enter the **port number** used to make the process debug-ready.
4. Click **OK**.

When you select Debug on the debug launch configuration, Progress Developer Studio for OpenEdge tries to connect to the AVM specified by the host (or process ID) and the port number. Once connected, the Debug view displays the attached AVM.

Note: The external AVM must be in the debug mode on the specified host and port in order to make a successful connection with Progress Developer Studio for OpenEdge. Only one debug client can connect to the specified AVM at a time.

See also

Attachable Debugger on page 456
Connection tab (Progress OpenEdge External AVM) on page 502

Control program flow

Use breakpoints

Breakpoints are markers that you insert in source code, or instructions that you define, to stop your application at certain points when it runs in a Debugger session.

Set breakpoints

You can set three different types of breakpoints:

- **At Line**—suspends execution at a specific point in the code. Optionally, you can define a condition that must be satisfied in order for the breakpoint to be honored.
- **On Error**—suspends execution when the program encounters an error condition. You can make the breakpoint apply to all errors, only to unsuppressed errors, or only to a single error condition that you specify.
- **Watchpoint**—suspends execution when the value of a given variable, buffer field, object attribute, or object reference changes. Optionally, you can define a condition that must be satisfied in order for the breakpoint to be honored.

Breakpoints in ABL files outside workspace

When you use the Attachable Debugger on page 456, the source code for the program being debugged on the external AVM is located outside the Progress Developer Studio for OpenEdge workspace. To debug the file on the attached AVM, you must set a breakpoint in that file before it is executed by the AVM. You can add or remove breakpoints during debugging. The attached AVM notifies Progress Developer Studio for OpenEdge only if a breakpoint is reached.

Note: To set a breakpoint in the file outside the Progress Developer Studio for OpenEdge workspace, you must have access to its source code.

When Progress Developer Studio for OpenEdge receives a breakpoint hit notification from the attached AVM, it performs a source lookup for the notified file name. If it finds a matching file, it opens the file the in **ABL Editor** for debugging. If it does not find the file name, it notifies you accordingly and prompts you to edit the source lookup path. For more information, see Edit Source Lookup Path dialog on page 511.

Note: The breakpoints in files outside the workspace appear only in the **Breakpoints** view. The **Breakpoint** marker (a small blue circle (●) in the vertical rulers section on the left) does not appear for these breakpoints due to a limitation in Eclipse.

Setting breakpoints programmatically

You can use the SET-BREAK and CANCEL-BREAK methods in ABL code to insert and remove breakpoints programmatically. However, the DEBUG and INITIATE methods, as well as the VISIBLE attribute, are ignored for Progress Developer Studio for OpenEdge Debugger sessions. This feature is helpful to control breakpoints at specific points in your code, regardless of how the surrounding code is modified, or to set breakpoints in include files.

Breakpoints and include files

Progress Developer Studio for OpenEdge allows you to set breakpoints in include files that might appear in many different procedures. During remote debugging, the external AVM notifies Progress Developer Studio for OpenEdge of a breakpoint hit in an include file while executing a program that contains the include file. You can also set breakpoints in include files in a program launched from within Progress Developer Studio for OpenEdge, while debugging a local AVM.

See also

Breakpoints on page 458
Attachable Debugger on page 456
Selectively enabling breakpoints on page 473
Manage breakpoints on page 473
Use watch expressions on page 480
Breakpoints view on page 515
New Breakpoint dialog on page 508
Expressions view on page 516
Edit Source Lookup Path dialog on page 511

Set an at-line breakpoint

Setting an at-line breakpoint suspends execution at a specific point in the code. Optionally, you can define a condition that must be satisfied in order for the breakpoint to be honored. To set an at-line breakpoint:

1. To insert an unconditional breakpoint at a specific code line, you can simply double-click in the left margin next to that line in an **ABL Editor** window. Alternatively, with the cursor in the target line, right-click and select **Toggle Breakpoint** from the context menu. When you insert a breakpoint, a small blue circle ( ) appears in the left margin.
2. To set a conditional breakpoint, or to set a breakpoint in a file that is not open for editing, use the **New Breakpoint** dialog as follows:
   a) Open the **New Breakpoint** dialog by right-clicking in the **Breakpoints** view and selecting **Add Breakpoint**.
   b) Select the **At Line** tab.
   c) Enter the name of a procedure file that can be found in the project PROPATH, or the name of an internal procedure found in the project. You can leave the **Procedure Name** field blank if the file to which you are adding the breakpoint is open in the currently selected Editor window.
   d) Enter the line number. You can leave the **Line Number** field blank to add the breakpoint at the first line of the specified procedure.
   e) Optionally, enter a Conditional breakpoints on page 458. The Debugger will suspspend execution at the breakpoint only if the condition is true at that time.

You can go quickly to the breakpoint location in an **Editor** window. Select an at-line breakpoint in the **Breakpoints** view, right-click, and select **Go to File** from the context menu.

See also

Set a watchpoint on page 472
Set an on-error breakpoint on page 472

Set an on-error breakpoint

Setting an on-error breakpoint suspends execution when the program encounters an error condition. You can make the breakpoint apply to all errors, only to unsuppressed errors, or only to a single error condition that you specify. To set an on-error breakpoint:

1. Open the **New Breakpoint** dialog by right-clicking in the **Breakpoints** view and selecting **Add Breakpoint**.
2. Select the **On Error** tab.
3. Select one of the options:

- **On Any Unsuppressed Error** — The breakpoint takes effect only if the error occurs on execution of a statement that does not have the `NO-ERROR` attribute.
- **On Any Error** — The breakpoint takes effect on any error, suppressed or unsuppressed.
- **On Error** — The breakpoint takes effect only on the specific error that you identify in the **Error Number** field.

See also

Set a watchpoint on page 472
Set an at-line breakpoint on page 471

Set a watchpoint

Setting a watchpoint breakpoint suspends execution when the value of a given variable, buffer field, object attribute, or object reference changes. Optionally, you can define a condition that must be satisfied in order for the breakpoint to be honored. To set a watchpoint breakpoint:

1. Open the **New Breakpoint** dialog by right-clicking in the **Breakpoints** view and selecting **Add Breakpoint**.
2. Select the **Watchpoint** tab.
3. In the **Expression** field, enter the name of the data element whose value you want to track.
4. Select the **Add Watch** option if you want to show this expression in the Expressions view on page 516.

   Optionally, enter a Conditional breakpoints on page 458. The Debugger will suspend execution only if the condition is true when the value changes for the specified expression.

See also

Set an on-error breakpoint on page 472
Set an at-line breakpoint on page 471

Selectively enabling breakpoints

1. The **Breakpoints** view lists all breakpoints that are defined for the current workspace and for the files located outside the workspace. Each entry in the list has a checkbox. You can disable any breakpoint by clearing its checkbox, or re-enable it by checking it.
2. The context menu for the **Breakpoints** view provides a **Select All** command and **Enable** and **Disable** commands, which are useful for operating on the multiple breakpoints. Right-click in the **Breakpoints** view and select the appropriate command.
3. As a shortcut for disabling all breakpoints, click **Skip All Breakpoints**  on the **Breakpoints** view toolbar. To re-enable the skipped breakpoints, click this button again. (Those breakpoints that are unchecked in the list remain disabled.)

See also

Breakpoints on page 458
Set breakpoints on page 470
Manage breakpoints on page 473
Breakpoints view on page 515

Manage breakpoints

The **Breakpoints** view lists all breakpoints defined for the current workspace and for the files located outside the workspace. You can edit or delete any breakpoint in the list.

- To edit breakpoints:

  a) You can change the definition of any breakpoint. However, you cannot change its type (**At Line**, **On Error**, or **Watchpoint**); nor can you change the procedure in which an at-line breakpoint is located.

  b) To edit a breakpoint, select it by clicking the text portion of the list entry. Then right-click and select **Edit Breakpoint** to display the **Edit Breakpoint** dialog. Change the values as appropriate and click OK. See Set breakpoints on page 470 for more information.

- To delete breakpoints:

a) To delete a breakpoint, select it by clicking the text portion of the list entry. To delete more than one, select with **Ctrl +click**. Then press **Delete**, or select **Remove Selected Breakpoints** , or right-click and select **Remove**.

b) The context menu for the **Breakpoints** view provides **Select All**, **Remove**, and **Remove All** commands, which are useful for operating on the whole list. Right-click in the **Breakpoints** view and select the appropriate command. **Remove All**  is also available on the toolbar.

Note: You can temporarily disable breakpoints without deleting them. See Selectively enabling breakpoints on page 473.

- To share breakpoints, use the **Export** and **Import** options on the **Breakpoints** view context (right-click) menu to share breakpoint definitions with other users.

See also

Breakpoints on page 458
Set breakpoints on page 470
Breakpoints view on page 515

Step through the code

While a Debugger session is active, use the following commands on the **Debug** view toolbar or context (right-click) menu to execute the program incrementally:

- **Step Into** —Causes the **Debugger** to execute the current line and continue until it reaches the next executable statement, which may be in the current procedure, a subprocedure, or a trigger. That statement becomes the current line, and it is not executed until you continue.
- **Step Over** —Causes the **Debugger** to execute the current line and continue until it reaches either a breakpoint, or the next executable statement in the same procedure. Thus, if the current line calls a subprocedure or causes a trigger to execute, the subprocedure or trigger is executed without interruption unless there is a breakpoint. In other words, the **Debuggers** steps "over," not "into," the subprocedure or trigger.
- **Step Return** —Causes the **Debugger** to execute the current line and continue either until it reaches a breakpoint, or until the current procedure ends, returning control to the calling procedure.
- **Resume** —Causes the **Debugger** to execute the current line and continue without interruption until it reaches either a breakpoint or the end of the program.
- **Suspend** —Interrupts execution following completion of the current instruction and gives control to the **Debugger** at the next executable statement. Also, suspends the attached AVM.
- **Terminate** —Interrupts execution and ends the **Debugger** session.
- **Disconnect** —Disconnects the **Debugger** from the attached (running) external AVM and stops receiving notifications from it.

Note: These commands are enabled only when a **Debugger** session is active and, with the exception of the **Suspend** command, only when an entry in its stack trace is selected.

Garbage collection

For details about the behavior of code-stepping with regard to garbage collection, see Garbage collection in Debugger on page 459.

See also

Code-stepping on page 459
Breakpoints on page 458
Use the Debug view and stack trace on page 475
Use breakpoints on page 470
Debug view on page 512

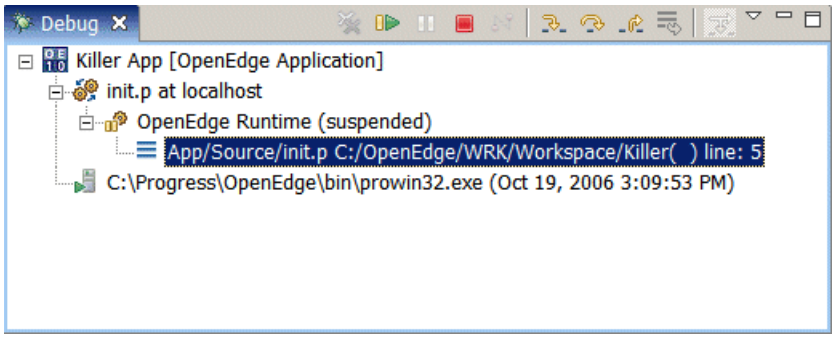
Monitor program execution

Use the Debug view and stack trace

The **Debug** view contains the stack trace and the program execution commands.

Stack trace

For each currently active Debugger session (and any terminated sessions that you have not removed), the Debug view contains one or more session trees. As shown in the example below, a session tree begins with a node that identifies the project as an OpenEdge application and shows its name ("Killer App"). The tree ends with a node identifying the location of the OpenEdge Runtime executable, `prowin.exe`.



Stack entries, such as the highlighted entry in the example, appear marked with ≡ under the **OpenEdge Runtime** node.

Note: Stack entries are visible only when the Debugger is suspended. While the application is running or waiting for a user response (for example, at a message dialog), you cannot see the stack.

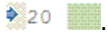
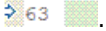
When the Debugger is in a suspended state, the stack trace identifies:

- The current code line. This is the next line of code to be executed, and corresponds to the location of the solid pointer ➧ and the highlighted line in the **Editor** window. The current line appears at the top of the stack.
- All other code lines that participated in the currently active code block, leading to the pending execution of the current line. These entries appear, from top to bottom, in inverse order of execution. That is, the entry for the most recently executed instruction appears first, immediately following the current (pending) instruction.

All visible stack entries belong to a discrete block of code whose execution is not yet complete. Once the block is fully executed, its stack entries are removed, and the stack for the next block appears.

Using the stack for code analysis:

Selecting a stack entry lets you view that line of the source code and the values of variable data elements as they are at that point in the execution of the program. When you click on a stack entry:

- The **ABL Editor** window containing that source file becomes active; the selected line is color-highlighted (or), with an execution pointer (or) in the left margin. When you click the **Editor** tab label, the cursor is positioned at the beginning of that line. You can simply review the code or edit, save, and recompile it as necessary.
  - If the selected line is the current line (the first stack entry), the execution pointer is solid and the highlighting is a darker shade: .
  - If the selected line is a previous line (lower in the stack), the execution pointer is hollow and the highlighting is a paler shade: .
- The **Variables** view and the **Expressions** view show the values that are in effect at the time immediately preceding execution of the selected line. You can make non-persistent changes to these values to test their effect without actually altering the source code.

Note: Selecting a previously executed stack entry does not change the point at which program execution will resume. The current code line, reflected by the entry at the top of the stack, remains the same.

Program execution commands

The **Debug** view toolbar and context (right-click) menu provide commands for controlling program execution during a debugging session. See Step through the code on page 474 for information about using these commands.

See also

Step through the code on page 474
Change program code on page 483
Launch the Debugger on page 468
Debug view on page 512

Use the Variables view

When program execution is suspended during a Debugger session, the **Variables** view displays information about buffers, datasets, parameters, properties, temp-tables, variables, class variables, handles, and properties of a class type. You can see as little or as much of the information as you want, and you can also choose its overall format display.

- To open the **Variables** view if it is not open select **Window** > **Show View** > **Debug** > **Variables**.

See also

Options for monitoring results on page 460
The OpenEdge Debugger perspective on page 455
Use the Debug view and stack trace on page 475
Use the Variable Details dialog on page 479
Change program code on page 483
Use watch expressions on page 480
Variables view on page 513

Select Variables view display information

To select the information you want to see in the **Variables** view:

1. To open the **Variables** view if it is not open select **Window** > **Show View** > **Debug** > **Variables**.
2. Click the drop-down menu  from the **Variables** view toolbar.
3. Choose **Layout** > **Show Columns**. (You cannot select specific columns until you select the **Show Columns** option.)
4. Choose **Layout** > **Select Columns**. The Select Columns dialog on page 508 dialog appears.
5. Select each individual column you want to see in the view, or click **Select All** to see all the columns.

The information shown reflects the state of the data elements at the point immediately preceding execution of the line that is currently selected in the Session tree Debug view on page 512. When there are multiple entries in the stack, you can see how the data elements change at different stages of execution by selecting different stack entries.

Note: Note that you can also see the information provided in the Variables view by hovering the mouse on a variable name in the **Editor** window when the debug session is selected in the **Debug** view.

Expand and collapsing the Variables view list

Buffers, temp tables, datasets, class variables, arrays, and properties of a class type have subordinate elements (fields or tables), which in turn may have subordinate elements of their own (for example, an array index). These hierarchical elements appear in the **Variables** view with a plus symbol (+) before the name.

- To open the **Variables** view if it is not open select **Window** > **Show View** > **Debug** > **Variables**.
- To expand the hierarchy and show the subordinate values, click the plus symbol (+).
- To collapse the hierarchy selectively, clicking the minus sign symbol (-);
- To collapse all entries and show only top-level data elements, click the **Collapse All**  on the toolbar.

Note: Any object reference or handle that has not been initialized cannot be expanded. Arrays, buffers, and temp-tables can be expanded, whether initialized or not.

Evaluate a property in the Variables view

To evaluate a property from the **Variables** view.

- To open the **Variables** view if it is not open select **Window** > **Show View** > **Debug** > **Variables**.
- Select the property, right-click, and select **Evaluate Property** from the context menu.

  This is helpful if you opted not to select the **Enable** property evaluation option in the Set Debugger preferences on page 466, and you now want to see the value of the property in the **Variables** view. (When the preference option is not enabled, you see **"Property evaluation disabled"** instead of the value.)

Filter the Variables view display

You can filter the display in the **Variables** view to show only selected element types.

1. To open the **Variables** view if it is not open select **Window** > **Show View** > **Debug** > **Variables**.
2. Click  on the toolbar and select **Filter** from the drop-down menu.

   The available options you can show are buffers, datasets, parameters, properties, variables, and temp-tables. This filter applies to all instances shown in the top level of the **Variables** view.
3. The submenu shows a check mark next to the options that are currently enabled for display. Click any item to toggle its display option off or on.

Temporarily changing values in the Variables view

You can make non-persistent changes to variable values to test their effect from the current execution point. The new values remain in effect for the duration of the current Debugging session, or until they change programmatically during the current session. To change an element's value:

1. To open the **Variables** view if it is not open select **Window** > **Show View** > **Debug** > **Variables**.
2. Click the current value in the grid to make it editable and enter the replacement value. Alternatively, right-click the element in the **Variables** view and select **Change Value** from the context menu to display the **Set Variable** dialog.
3. Enter the replacement value, and click **OK**.

   In values that you enter in the **Variables** view, the backslash (\) is evaluated as an escape character, which can affect program execution. To be sure of getting the intended results, it is recommended that you enter a double backslash (****) in all cases to represent a single backslash.

   The value you supply must be valid for the declared data type and the current program context. If you enter an invalid value, an error message appears.

Add watch expressions using the Variables view

You can add a watch expression for one or more elements so that you can track their values in the **Expressions** view.

To add a watch expression:

1. To open the **Variables** view if it is not open select **Window** > **Show View** > **Debug** > **Variables**.
2. Select the desired entries in the **Variables** view, right-click, and select **Create Watch Expression** from the context menu

Assign a value to a data member

Since class variables are expandable in the Variables view, data members are shown. These data members can be assigned as if they were variables at the top level of the **Variables** view.

1. To open the **Variables** view if it is not open select **Window** > **Show View** > **Debug** > **Variables**.
2. Assign a value to a data member in any of the following ways:
   - By updating the **Value** column in the **Variables** view.
   - By updating the value in the **Detail** pane.
   - By using the **Change Value** option from the **Variables** view's context menu.

Open the Variable Details dialog

The **Variable Details** dialog provides an alternative way to view information about a single data element at a time. It is particularly useful for examining **HANDLE** objects, because it includes information about attributes and fields.

1. To open the **Variables** view if it is not open select **Window** > **Show View** > **Debug** > **Variables**.
2. To open the **Variables Detail** dialog, you must have an active **Debugger** session and have data displayed in the **Variables** view. Choose one of the following methods to open the **Variable Details** dialog:

   - Right-click the **Variables** view entry that you want to look at, and select **Variable Details** from the context menu.
   - Select a **Variables** view entry, and then select **Variable Details** from the **OpenEdge** menu.

   The dialog opens, showing the current details for the selected data element. Since it is a modal dialog, the **Variable Details** dialog does not provide dynamic updates while you step through the program as does the **Variables** view.

   Information appears on one or more of four tabs: **Attributes**, **Fields**, **Array**, and **Value**. Click a tab to view its contents. On tabs that are not applicable for the selected data element, or for which the information is not currently available, a message indicates that the element is not valid for that tab.

Use the Variable Details dialog

The **Variable Details** dialog displays detailed information about a single selected data element. It includes much of the information that is available in the **Variables** view.

- To open the **Variables Detail** dialog, you must have an active **Debugger** session and have data displayed in the **Variables** view. Choose one of the following methods to open the **Variable Details** dialog:

  - Right-click the **Variables** view entry that you want to look at, and select **Variable Details** from the context menu.
  - Select a **Variables** view entry, and then select **Variable Details** from the **OpenEdge** menu.

  The dialog opens, showing the current details for the selected data element. Since it is a modal dialog, the **Variable Details** dialog does not provide dynamic updates while you step through the program as does the **Variables** view.

  Information appears on one or more of four tabs: **Attributes**, **Fields**, **Array**, and **Value**. Click a tab to view its contents. On tabs that are not applicable for the selected data element, or for which the information is not currently available, a message indicates that the element is not valid for that tab.

Changing the element selection:

To view information for a different data element, enter the element name at the top of the window and click **View**. There are three ways to enter an element name:

- Type the name in the **View** field.
- For a subordinate element of the current selection, click the name in the browse
- Click the down arrow at the right of the **View** field and select an entry from the drop-down list of recently used element names.

Temporarily changing values

You can make non-persistent changes to the values of variables, attributes (writable only), or fields to test the effect of the changes from the current execution point. The new values remain in effect for the duration of the current Debugging session, or until they change programmatically during the current session.

To change an element's value, click the current value in the grid to make it editable, and enter the replacement value. The field is not editable if the data definition or the current program context does not allow the value to be modified.

The value you supply must be valid for the declared data type. If you enter an invalid value, an error message appears.

Note: You cannot make changes on the **Value** tab, only in the **Value** column on other tabs. To modify the entry that appears on the **Value** tab, close the **Variable Details** dialog and edit the value in place in the **Variables** view.

Adding a watch expression

You can add a watch expression for the selected element so that you can track its value in the **Expressions** view. Simply click **Add Watch** to add the expression.

See also

Options for monitoring results on page 460
Use the Variables view on page 476
Change program code on page 483
Use watch expressions on page 480
Variable Details dialog on page 507

Use watch expressions

A watch expression, or watch, is the name of a data element or built-in function whose value appears in the **Expressions** view. You control the content of the **Expressions** view by setting watches on those elements that you want to monitor. The values are dynamically updated as you step through the code or as you select different Session tree Debug view on page 512 entries.

You can expand class variables and properties of a class type, as well as arrays, buffers, temp-tables, datasets, and handle variables in the **Expressions** view. If an object reference or handle has not been initialized, however, you cannot expand it. Arrays, buffers, and temp-tables can be expanded even if they are not initialized.

The **Debugger** perspective provides several shortcuts for adding watch expressions:

- Check the **Add Watch** option when Set a watchpoint on page 472
- Select **Create Watch Expression** from the Add watch expressions using the Variables view on page 478.
- Click **Add Watch** in the Use the Variable Details dialog on page 479.

In addition to using these shortcuts, you can right-click in the **Expressions** view, select **Add Watch Expression**, and enter an expression directly in the **Add Watch Expression** dialog. See #rfi1350488962375/expression-syntax on page 480 below.

The **Add Watch Expression** dialog includes an **Enable** option, which is checked by default. Deselect this option if you want to add the watch but temporarily make it inactive.

Expression syntax:

Valid watch formats are any of the following:

- The name of a variable, field, or parameter
- *handle:attribute*
- *widget-name:attribute* [IN FRAME *frame-name*]

- { FRAME | MENU } *widget-name:attribute*
- { SUB-MENU | MENU-ITEM } *widget-name:attribute* [IN { MENU | SUB-MENU } *menu-name*]

You can chain attribute references. For example, the following attribute reference displays the value of the TITLE attribute for a window containing a fill-in (assuming the fill-in is three levels from the window):

```
FILL-IN-1:PARENT:PARENT:PARENT:TITLE:
```

In addition, the following built-in functions can be watch expressions:

_PCONTROL	FRAME-VALUE	PROGRESS
_SERIAL-NUM	GO-PENDING	PROMSGS
COM	LASTKEY	PROPATH
CURRENT-LANGUAGE	MACHINE-CLASS	PROVERSION
DATASERVERS	MESSAGE-LINES	RETRY
DBNAME	NUM-ALIASES	RETURN-VALUE
ETIME	NUM-DBS	SCREEN-LINES
FRAME-DB	OPSYS	SELF
FRAME-FIELD	OS-DRIVES	TIME
FRAME-INDEX	OS-ERROR	TODAY
FRAME-NAME		TRANSACTION

Managing the expression list:

The **Expressions** view context (right-click) menu includes several commands for modifying or controlling the display. Depending on the element in focus and its context menu options, the commands you see can include the following:

Select All	Lets you select all the expressions in the **Expressions** view.
Copy Expressions	Lets you copy one or more expressions.
Remove and **Remove All**	Let you delete expressions.
Find	Lets you find an element.
Change Value	Lets you enter a new value for an element.
Add Watch Expression	Lets you add a watch expression and optionally enable it.
Reevaluate Watch Expression	Lets you reevaluate an expression.
Disable and **Enable**	Let you control whether or not selected expressions are updated. You might choose to disable some watches to reduce the time needed to update the **Expressions** view, or to reduce screen clutter. Watches are enabled by default when you add them.

Edit Watch Expression	Lets you change the syntax of the selected expression. You can also toggle its enabled/disabled status.
Create Watch Expression	Lets you create a watch expression.

See also

Options for monitoring results on page 460
Set breakpoints on page 470
Use the Variables view on page 476
Expressions view on page 516

Use the Dynamic Objects view

The **Dynamic Objects** view lets you monitor the creation and destruction of dynamic object instances in an ABL application. Use this dialog box to locate dynamic object instances the application has created, no longer needs, and has not yet destroyed. These undeleted object instances might indicate a memory leak.

You must explicitly start dynamic object monitoring if you want to use this view. You can stop and restart monitoring during a debugging session, but each new session begins with monitoring turned off. If you have multiple active debugging sessions, you turn monitoring on or off for each session independently. When you start monitoring, you choose the specific object types to monitor.

When monitoring is turned on, you can filter the **Dynamic Objects** view display to show a subset of the object types that are being monitored. The display includes objects of a given type only if you both enable monitoring of that type and include the type in your filter setting.

See also

Options for monitoring results on page 460
Debug view on page 512
Dynamic Objects view on page 516
Filter Objects dialog on page 510

Start and stop dynamic object monitoring

Each new Debugger session that you launch begins with dynamic object monitoring turned off.

To start dynamic object monitoring:

1. Start the Debugger session and make sure the **OpenEdge Runtime** node, or one of its stack entries, is selected in the **Debug** view.
2. Select **OpenEdge** > **Dynamic Object Monitoring** on the menu bar to display the **Dynamic Object Monitoring** dialog.

   The tree view groups object types in four categories: **Dynamic Objects**, **User Interface Widgets**, **XML Objects**, and **Other Objects**.
3. Expand any of these nodes to see the individual object types in the category. Object types that are selected for monitoring are checked.
4. Click the check boxes to toggle the selections on or off. You can select individual object types, or you can operate on a whole category by clicking the check box for its top-level node.
5. Click **Start Monitoring** and then **Close**.

To change settings during the session, open the **Dynamic Object Monitoring** dialog again. You can modify the selection of object types to be monitored and use the **Stop Monitoring** and **Restart Monitoring** commands.

You can also use **Restart Monitoring** to clear the display in the **Dynamic Objects** view and continue monitoring.

Filter the Dynamic Object view display

You can choose the object types that you want to see in the **Dynamic Objects** view:

1. Make sure that monitoring is turned on for the appropriate types, as explained in Start and stop dynamic object monitoring on page 482.
2. Right-click in the **Dynamic Objects** view and select **Filter Objects** from the context menu.
3. In the **Filter Objects** dialog, object types that are selected for display are checked. Click the check boxes to toggle the selections on or off, and click **OK**.

Change program code

During a debugging session, you can modify the behavior of your application in two ways:

- You can edit your source code, using the standard **ABL Editor**. Changes do not take effect in the current debugging session unless the program subsequently calls the modified procedures.
- You can change variable values temporarily. These changes take effect in the current debugging session but are not saved to the source code.

Making persistent changes by editing the ABL source

During a session, the Debugger opens each source file it processes in an **Editor** window. You can edit the file in that window, using all standard features of the **ABL Editor**, without leaving the **Debug** perspective.

You may want to have access to the tools available in the **OpenEdge Editor** perspective, such as the **Outline** view and the **DB Structure** view, particularly for extensive or complex changes. You can switch to the **OpenEdge Editor** perspective or any other perspective, keeping your debugging session active, and then return to the **Debug** perspective to continue the session.

Changes take effect the next time your application executes the modified code after you recompile.

Temporarily changing variable values

During a running debugging session, you can experiment to see how changes to variable values affect program execution, without modifying the source code. The **Variables** view and the **Variable Details** dialog let you make non-persistent changes, as explained in the topics covering the use of those tools.

See also

Use the Variables view on page 476
Use the Variable Details dialog on page 479

Go to a specific source line

You can use the line number of a debug listing file to go directly to a specific source line in the currently active file in the OpenEdge **ABL Editor**. A debug listing file is a temporary file generated by the Debugger during a debug session. It contains a list of line numbers of a procedure with all the preprocessor directives expanded and all the include files inserted. The debug listing file is removed once the debug session ends.

To go to a specific source line number using the debug listing line number:

- Select **Go to Source Line** from the **Navigate** menu on the main menu bar and enter the debug listing line number of the corresponding file that is currently open in the editor. Alternatively, you can press **ALT+L** to enter the debug listing line number.

  The source file opens in the editor with the cursor positioned at the corresponding source line number. If the source file is not located in the file system, an error occurs and you will be prompted to select the file from a different location.

  Note: The file that is currently open in the editor must have the same name as the file present in the ABL stack trace and it must contain r-code. If the file does not contain r-code, it is automatically compiled and the generated r-code file is removed once the operation is complete.

See also

Go to a specific line number on page 297

Close a Debugger session

At any time during an active session that the Debugger has control (that is, program execution is suspended), you can end the session by clicking **Terminate** on the **Debug** view toolbar or context (right-click) menu. A session terminates automatically when the program completes execution.

To clear the session tree of a terminated session from the **Debug** view, click **Remove**.

The context menu includes several additional shortcuts for terminating, terminating and relaunching, and removing sessions.

See also

Use the Debug view and stack trace on page 475
Step through the code on page 474
Close a remote debugging session on page 484

Close a remote debugging session

To disconnect from a remote debugging session:

- Click **Disconnect** on the **Debug** view toolbar or the context (right-click) menu.

  Upon disconnecting, Progress Developer Studio for OpenEdge cleans up any Debugger communications with the broker and its agents, while they continue to run.

See also

Remote debugging support on page 456
Use the Debug view and stack trace on page 475
Step through the code on page 474
Close a Debugger session on page 484
Debug view on page 512

Suspend and disconnect the Debugger from an attached AVM

- To suspend an attached AVM click **Suspend**  on the **Debug** view toolbar or the context (right-click) menu.

  Suspending an AVM displays its stack trace in the **Debug** view. Upon suspending the AVM, Progress Developer Studio for OpenEdge looks for the source of the program (shown in the top stack frame) in the source lookup path. When it finds the source file, it opens it in the **ABL Editor** and starts debugging it.

- To disconnect the Debugger from the attached AVM, select **Disconnect**  on the **Debug** view toolbar or the context (right-click) menu. Once you disconnect from the AVM, Progress Developer Studio for OpenEdge stops receiving any notifications from it. However, the AVM continues to run.

See also

Attachable Debugger on page 456
Use the Debug view and stack trace on page 475
Step through the code on page 474
Close a Debugger session on page 484
Debug view on page 512

Reference

Launch configuration settings

The topics below describe the available settings and controls related to defining and using Launch configurations for running and debugging programs on page 451.

Configurations wizard

The topics below describe the options and controls available for defining Launch configurations for running and debugging programs on page 451 in the **Configurations** wizard.

Progress OpenEdge Application settings

The topics describe the options and controls available for defining Progress OpenEdge Application Launch configurations for running and debugging programs on page 451 in the **Configurations** wizard.

This wizard appears when you select **Run Configurations** or **Debug Configurations** from:

- The drop-down menu on either the **Run** button  or the **Debug** button , or
- The **ABL Editor** context (right-click) menu

Although the window title includes either "Run" or "Debug," depending on how you open the wizard, in both cases you have access to all launch configurations, and the options are identical.

Various options have the effect of invoking a startup parameter for the AVM session. In such cases, the relevant parameter is shown in the rightmost column of the table.

There is a separate topic for each of the tabs in this section of the wizard.

Main tab (Application)

The **Main** tab in the Progress OpenEdge Application section of the **Configurations** wizard contains the required settings for defining an OpenEdge Application Launch configurations for running and debugging programs on page 451, as well as some other frequently used options for starting an ABL session. See Progress OpenEdge Application settings on page 485 for information about accessing the wizard.

The following controls are available on the **Main** tab:

Control	Purpose	Related parameter (if applicable)
Name (accessible from all tabs)	(Required) Specifies the name of the launch configuration, which appears on menus and in the left pane of the **Configurations** wizard.	
Project	(Required) Specifies the existing OpenEdge project in which the configuration is most often used. You can also use the configuration in other projects. See How OpenEdge creates or reuses a configuration on page 453 for information about how this selection affects launch configuration behavior.	
Run this program/Run selected program in workspace	Controls whether the configuration runs the program that currently has focus (in the Project Explorer view or in the ABL Editor), or the specific program identified in the Startup program field.	
Startup program	(Required if **Run this program** is selected) Specifies the procedure that executes when the configuration runs.	
Working directory	(Required) Specifies the directory in which the AVM starts when the configuration runs.	
Use project AVM/Start new AVM	Controls whether the configuration runs under the instance of the AVM that is already running for the current project, or under a new, dedicated instance of the AVM.	
OpenEdge version	Specifies the currently installed version of OpenEdge under which the configuration runs.	
Use TTY	If checked, causes the configuration to run procedures in a character client window rather than a GUI window (that is, to run `_progres.exe` instead of `_prowin.exe`).	

Control	Purpose	Related parameter (if applicable)
Batch mode	If checked, causes the configuration to run procedures in a batch session, with no terminal interaction.	Batch (-b)
Automatically start this launch configuration	Causes the configuration to start automatically each time you start Progress Developer Studio for OpenEdge.	
Automatically restart this launch configuration	Causes the configuration to restart automatically when a procedure running under it terminates. This option is useful if you need to re-initialize static variables. The configuration restarts automatically only if the previously running instance was started in Run (not Debug) mode, and only if Start new AVM is selected in the ABL Virtual Machine section on this tab. **Note:** It is possible for the configuration to get into an infinite loop of restart cycles. In such a case, edit the configuration definition, deselect this option, and save the configuration.	
Copy project settings	Opens a browser that lets you select a project from which to import the settings for project name, TTY, and working directory.	
Apply	Saves the current launch configuration definition.	
Revert	Discards unsaved changes to the current launch configuration definition.	
Run or Debug	Runs the specified startup program or opens it in the Progress Developer Studio for OpenEdge Debugger.	
Close	Closes the **Configurations** wizard.	

See also

Launch configurations for running and debugging programs on page 451
Use launch configurations on page 460

Startup tab (Application)

The **Startup** tab in the Progress OpenEdge Application section of the Configurations wizard contains many of the most commonly used startup parameters for an ABL application Launch configurations for running and debugging programs on page 451. See Progress OpenEdge Application settings on page 485 for information about accessing the wizard.

The following controls are available on the **Startup** tab:

Control	Purpose	Related parameter (if applicable)
Name (accessible from all tabs)	(Required) Specifies the name of the launch configuration, which appears on menus and in the left pane of the **Configurations** wizard.	
Session startup parameter	Optionally specifies a string to be passed to the AVM as an argument to the `-param` startup parameter when the configuration starts.	Parameter (`-p`)
Ini file	Optionally specifies an initialization file (full path or path relative to the working directory) containing environment settings for the AVM session.	Initialization File (`-ininame`)
Use project settings	If checked, causes the configuration to use the same settings as the project (specified on the **Main** tab) for the assemblies directory and for loading of the **Common Language Runtime**.	
Assemblies directory	Optionally specifies the directory (full path or path relative to the working directory) containing the assemblies.xml file and any third-party .NET assemblies. If this field is blank, the working directory for the specified project is assumed. This field is disabled if Use project settings is checked.	Assemblies (`-asemblies`)
Preload CLR	If checked, causes OpenEdge to load the .NET Common Language Runtime on startup of the configuration.	Preload CLR (`-preloadCLR`)
Enable Progress Dynamics	If checked, enables use of the Dynamics framework under the configuration. Also: • Specify `icfstart.p` as the startup program on the **Main** tab. • Include the `-icfparam` parameter in the **Additional startup parameters** field below.	Dynamics Parameter (`-icfparam`)

Control	Purpose	Related parameter (if applicable)
Configuration file	(Required if Enable Progress Dynamics is selected) Specifies the full or relative (to the working directory) path to the Dynamics `icfconfig.xml` file.	
Session type	Specifies the Dynamics session type to be used under the configuration.	
Additional startup parameters	Optionally specifies any desired parameters (with values) not included elsewhere in this configuration definition. Do not include the `-p` parameter in this field.	
Apply	Saves the current launch configuration definition.	
Revert	Discards unsaved changes to the current launch configuration definition.	
Run or Debug	Runs the specified startup program or opens it in the Progress Developer Studio for OpenEdge Debugger.	
Close	Closes the **Configurations** wizard.	

See also

Launch configurations for running and debugging programs on page 451
Use launch configurations on page 460
Main tab (Application) on page 486

PROPATH tab (Application)

The PROPATH tab in the Progress OpenEdge Application section of the **Configurations** wizard lets you control where OpenEdge searches for files and procedures when the Launch configurations for running and debugging programs on page 451 runs. See Progress OpenEdge Application settings on page 485 for information about accessing the wizard.

The PROPATH tab functions like the PROPATH properties page on page 85 in the Project Properties dialog, with two additional command buttons (Add Project and Copy `.ini` Settings) available:

Control	Purpose
Name (accessible from all tabs)	(Required) Specifies the name of the launch configuration, which appears on menus and in the left pane of the **Configurations** wizard.
Tree view	Shows the current PROPATH definition.

Control	Purpose
Add Project	Opens a browser that lets you select a project from which to import PROPATH settings. OpenEdge copies the PROPATH of the project you choose to the selected location in the launch configuration PROPATH.
Copy ini Settings	Opens a browser that lets you select an INI file from which to import PROPATH settings. OpenEdge replaces the entire existing PROPATH with the PROPATH defined in the selected initialization file.
Other command buttons	Function as described in the PROPATH properties page on page 85 for the Project Properties dialog.
Apply	Saves the current launch configuration definition.
Revert	Discards unsaved changes to the current launch configuration definition.
Run or Debug	Runs the specified startup program or opens it in the Progress Developer Studio for OpenEdge Debugger.
Close	Closes the **Configurations** wizard.

Note: This tab does not support the use of the OpenEdge `@{ROOT}` substitution variable. However, OpenEdge variables such as `@WORK` and `@DLC` are supported. In addition, the Eclipse substitution variables (**Window** > **Preferences** > **Run/Debug** > **String Substitution**) are supported.

See also

Launch configurations for running and debugging programs on page 451
Use launch configurations on page 460
Progress OpenEdge Application settings on page 485
Progress External OpenEdge AVM settings (Debug Configuration only) on page 502

Databases tab (Application)

The **Databases** tab in the Progress OpenEdge Application section of the **Configurations** wizard lets you specify the OpenEdge database connections used by an ABL application Launch configurations for running and debugging programs on page 451. See Progress OpenEdge Application settings on page 485 for information about accessing the wizard.

The **Databases** tab functions like the Database connections preferences on page 35 page in the **Project Properties** dialog, with two additional controls (Use project database connections and Show from project) available:

Control	Purpose
Name (accessible from all tabs)	(Required) Specifies the name of the launch configuration, which appears on menus and in the left pane of the **Configurations** wizard.
Use project database connections	Causes the configuration to use those connections that are used by the project specified on the **Main** tab for the configuration. Choosing this option disables filtering and selecting from the list.

Control	Purpose
Show selected/Show all/Show from project	Filters the database connection list to show: only those connections that are currently used by the configuration; all available connections; or only those connections that are used by the project specified on the Main tab for the configuration.
Database connection list	Lists available OpenEdge database connections, filtered according to the Show selected/Show all/Show from project selection. The launch configuration uses those entries that are checked.
Other controls	Function as described in the Database connections preferences on page 35 for the **Project Properties** dialog.
Apply	Saves the current launch configuration definition.
Revert	Discards unsaved changes to the current launch configuration definition.
Run or Debug	Runs the specified startup program or opens it in the Progress Developer Studio for OpenEdge Debugger.
Close	Closes the **Configurations** wizard.

See also

Launch configurations for running and debugging programs on page 451
Database connection profiles on page 19
Use launch configurations on page 460
Progress OpenEdge Application settings on page 485
Progress External OpenEdge AVM settings (Debug Configuration only) on page 502

ABL tab (Application)

The **ABL** tab in the Progress OpenEdge Application section of the **Configurations** wizard lets you set various options affecting ABL behavior of a Launch configurations for running and debugging programs on page 451. See Progress OpenEdge Application settings on page 485 for information about accessing the wizard.

The following controls are available on the **ABL** tab:

Control	Purpose	Related parameter (if applicable)
Name (accessible from all tabs)	(Required) Specifies the name of the launch configuration, which appears on menus and in the left pane of the **Configurations** wizard.	
Use system alert message boxes	If checked, causes system messages to be displayed in alert boxes, rather than in the message area, when the configuration runs.	

Control	Purpose	Related parameter (if applicable)
Use application alert message boxes	If checked, causes application messages to be displayed in alert boxes, rather than in the message area, when the configuration runs.	
Enable debug alert message boxes	If checked, allows users access (via a **Help** button in an alert box and/or a client log) to ABL stack trace information when programs running under the configuration encounter errors.	Debug Alert (`-debugalert`)
Use error stack	If checked, allows error objects to save the ABL call stack in the CallStack property.	Error Stack (`-errorstack`)
Reread nolock	If checked, causes the AVM to use the most recent cached copy, when multiple copies exist of the same database record (fetched with the `NO-LOCK` option.)	Reread Nolock (`-rereadnolock`)
Enable use of widget IDs	If checked, allows use of application-defined IDs for ABL widgets.	Use Widget ID (`-usewidgetid`)
Expand browse columns	If checked, causes the AVM to turn on the `EXPANDABLE` and `FIT-LAST-COLUMN` options for browses created in the session.	Expand Browse (`-expandbrow`)
Filter OCX events	If checked, causes the AVM session for the configuration to limit the conditions under which asynchronous COM events are handled.	Filtering Asynchronous COM Events (`-filterocxevents`)
Number of databases	Optionally specifies the maximum number of databases that can be connected during the AVM session.	Number of Databases (`-h`)
Nested blocks	Optionally specifies the maximum number of nested blocks that an application running under the configuration can contain without raising a warning	Nested Blocks (`-nb`)
Input characters	Specifies the maximum number of characters allowed in a single ABL statement.	Input Characters (`-inp`)
Statement tokens	Specifies the maximum number of tokens allowed in a single ABL statement.	Token (`-tok`)
Allow special characters in names	If checked, allows ABL code to use variables or fields whose names contain special characters such as underscores. Enabling this option is required for Dynamics.	

Control	Purpose	Related parameter (if applicable)
Use dictionary expressions	If checked, causes ABL to use dictionary and help validation for all fields in all frames when you compile an application.	Dictionary Expressions (`-dictexps`)
Keyword forget file	Optionally specifies a file (full path or path relative to the working directory) containing a list of ABL keywords that the AVM is to treat as non-keywords.	Keyword Forget List (`-k`)
Apply	Saves the current launch configuration definition.	
Revert	Discards unsaved changes to the current launch configuration definition.	
Run or Debug	Runs the specified startup program or opens it in the Progress Developer Studio for OpenEdge Debugger.	
Close	Closes the **Configurations** wizard.	

See also

Launch configurations for running and debugging programs on page 451
Use launch configurations on page 460
Progress OpenEdge Application settings on page 485
Progress External OpenEdge AVM settings (Debug Configuration only) on page 502

Culture tab (Application)

The **Culture** tab in the Progress OpenEdge Application section of the **Configurations** wizard lets you set various internationalization options affecting ABL behavior of a Launch configurations for running and debugging programs on page 451. See Progress OpenEdge Application settings on page 485 for information about accessing the wizard.

The following controls are available on the Culture tab:

Control	Purpose	Related parameter (if applicable)
Name (accessible from all tabs)	(Required) Specifies the name of the launch configuration, which appears on menus and in the left pane of the **Configurations** wizard.	
Use defaults	If checked, disables all other fields on this tab and causes the AVM to use the values in the startup parameter file(s) used by the configuration.	

Control	Purpose	Related parameter (if applicable)
Use OS locale	If checked, causes the configuration to use Windows locale settings for numeric and date formats. Any conflicting settings elsewhere on this tab override this setting.	Use OS Locale (`-useOsLocale`)
Language	Optionally specifies the initial return value for the `CURRENT-LANGUAGE` function.	Language (`-lng`)
Case table	Specifies the case table used by the configuration. Available selections come from the file identified in the Conversion map file field or from the default `convmap.cp` file.	
Collation table	Specifies the collation table used by the configuration. Available selections come from the file identified in the **Conversion map file** field or from the default `convmap.cp` file.	
Date format	Specifies the date-display format used by the configuration.	Date Format (`-d`)
Year offset	Specifies the first year of the 100-year period within which two-digit year values are assumed to fall.	Century Year Offset (`-yy`)
Fractional separator	Identifies the numeric value (as specified in the selected Internal code page) for the character used as a decimal point in formatted text.	Fractional Separator (`-numdec`)
Thousands separator	Identifies the numeric value (as specified in the selected Internal code page) for the character used as a thousands separator in formatted text.	Thousands Separator (`-numsep`)
Use 4-digit year	If checked, causes the `EXPORT`, `MESSAGE` and `PUT UNFORMATTED` statements use four-digit values for all years.	Four Digit Year Default (`-yr4def`)
Internal code page	Specifies the Internal code page used by the configuration. Available selections come from the file identified in the **Conversion map file** field or from the default `convmap.cp` file.	Internal Code Page (`-cpinternal`)

Control	Purpose	Related parameter (if applicable)
Log file code page	Specifies the Log File code page used by the configuration. Available selections come from the file identified in the **Conversion map file** field or from the default `convmap.cp` file.	Log File Code Page (-cplog)
R-code in code page	Specifies the R-code Ocode page used by the configuration. Available selections come from the file identified in the **Conversion map file** field or from the default `convmap.cp` file.	R-code In Code Page (-cprcodein)
Terminal code page	Specifies the Terminal code page used by the configuration. Available selections come from the file identified in the **Conversion map file** field or from the default `convmap.cp` file.	Terminal Code Page (-cpterm)
Stream code page	Specifies the Stream ccode page used by the configuration. Available selections come from the file identified in the **Conversion map file** field or from the default `convmap.cp` file.	Stream Code Page (-cpstream)
Print code page	Specifies the Print ccode page used by the configuration. Available selections come from the file identified in the **Conversion map file** field or from the default `convmap.cp` file.	Print Code Page (-cpprint)
R-code out code page	Specifies the R-code Out code page used by the configuration. Available selections come from the file identified in the **Conversion map file** field or from the default `convmap.cp` file.	R-code Out Code Page (-cprcodeout)
Conversion map file	Optionally specifies the conversion map file (full path or path relative to the working directory) used by the configuration. The default `convmap.cp` file is used if this field is blank.	
Apply	Saves the current launch configuration definition.	
Revert	Discards unsaved changes to the current launch configuration definition.	

Control	Purpose	Related parameter (if applicable)
Run or Debug	Runs the specified startup program or opens it in the Progress Developer Studio for OpenEdge Debugger.	
Close	Closes the **Configurations** wizard.	

See also

Launch configurations for running and debugging programs on page 451
Use launch configurations on page 460
Progress OpenEdge Application settings on page 485
Progress External OpenEdge AVM settings (Debug Configuration only) on page 502

Performance tab (Application)

The **Performance** tab in the Progress OpenEdge Application section of the **Configurations** wizard lets you set various options affecting performance of applications running under a Launch configurations for running and debugging programs on page 451. See Progress OpenEdge Application settings on page 485 for information about accessing the wizard.

The following controls are available on the Performance tab:

Control	Purpose	Related parameter (if applicable)
Name (accessible from all tabs)	(Required) Specifies the name of the launch configuration, which appears on menus and in the left pane of the **Configurations** wizard.	
Use defaults	If checked, disables all other fields on this tab and causes the AVM to use default values or values specified elsewhere in the configuration definition.	
Temporary files directory	Optionally specifies the directory (full path or path relative to the working directory) for storage of temporary files. The default is the working directory.	
Enforce startup parameter limits	If checked, causes the specified values for directory size, local buffer size, maximum memory, and nested blocks to be enforced as hard limits.	Hardlimit (`-hardlimit`)
Schema field cache size	Optionally specifies the number of entries in the schema field cache.	Schema Field Cache Size (`-fc`)
Record buffer size	Optionally specifies the size, in bytes, of the standard buffer for database records.	Record Buffer Size (`-Mr`)

Control	Purpose	Related parameter (if applicable)
Stack size	Optionally specifies the size, in kilobytes, of the internal memory area used by ABL program modules.	Stack Size (`-s`)
Local buffer size	Optionally specifies the size, in kilobytes, of the local buffer in which the AVM stores all variables, work files, and records that are in use at one time for a user .	Local Buffer Size (`-l`)
Directory size	Optionally specifies the number of compiled procedure directory entries.	Directory Size(`-D`)
Stash blocks	Optionally specifies the number of 1KB blocks to allocate to the stash area, which OpenEdge uses as temporary storage for modified index fields.	Stash Area (`-stsh`)
Temp-table buffer pool size	Optionally specifies the number of buffers in the temporary table database pool.	Number of Buffers for Temporary Tables (`-Bt`)
Speed sort block size	Optionally specifies the block size, in kilobytes, to allocate when sorting records for reports and when rebuilding indexes.	Speed Sort (`-TB`)
Speed sort merge streams	Optionally specifies the number of blocks or streams to be simultaneously merged during the sort process.	Merge Number (`-TM`)
Async queue size	Optionally specifies the total number of bytes allowed for all buffers allocated when asynchronous requests are queued on behalf of a client.	Async Queue Size (`-asyncqueuesize`)
Maximum memory	Optionally specifies the initial amount of memory, in kilobytes, allocated for r-code segments.	Maximum Memory (`-mmax`)
PROLIB memory	If checked, causes the AVM for the configuration to allocate a 512-byte cache for a standard library directory.	PROLIB Memory (`-pls`)
PROLIB swap		
Apply	Saves the current launch configuration definition.	
Revert	Discards unsaved changes to the current launch configuration definition.	

Control	Purpose	Related parameter (if applicable)
Run or Debug	Runs the specified startup program or opens it in the Progress Developer Studio for OpenEdge Debugger.	
Close	Closes the **Configurations** wizard.	

See also

Launch configurations for running and debugging programs on page 451
Use launch configurations on page 460
Progress OpenEdge Application settings on page 485
Progress External OpenEdge AVM settings (Debug Configuration only) on page 502

Logging tab (Application)

The **Logging** tab in the Progress OpenEdge Application section of the **Configurations** wizard lets you set various options affecting logging of ABL applications running under a Launch configurations for running and debugging programs on page 451. See Progress OpenEdge Application settings on page 485 for information about accessing the wizard.

The following controls are available on the **Logging** tab:

Control	Purpose	Related parameter (if applicable)
Name (accessible from all tabs)	(Required) Specifies the name of the launch configuration, which appears on menus and in the left pane of the **Configurations** wizard.	
Enable logging	If checked, makes other fields on this tab editable, allowing you to set client logging options.	
Logging level	Specifies the level at which entries are written to the client log file.	Logging Level (`-logginglevel`)
Logging file count	Specifies the number of log files, including the current one, to be kept on disk. A value of 0 means no limit on the number of log files.	Number of Log Files to Keep (`-numlogfiles`)
Logging size threshold	Specifies the maximum size, in bytes, for log files. When this threshold is reached, the AVM creates a new log file	Log Threshold (`-logthreshold`)
Append to log file	If checked, causes OpenEdge to add logging information to the most recent existing log file. Deselect this option to create a new log file for each client session.	Record Buffer Size (`-Mr`)

Control	Purpose	Related parameter (if applicable)
Clear log files	If checked, causes OpenEdge, when the session starts, to delete existing log files matching the specified client log file name.	Clear Log (`-clearlog`)
Log file	Specifies a name and location (full path or path relative to the working directory) for the client log file.	Client Logging (`-clientlog`)
Log entry list	Specifies the types of events to be logged. In the **Log Entry Type** column, check the items to be included. For each such entry type, click in the **Log Entry Level** column and select the logging level.	
Apply	Saves the current launch configuration definition.	
Revert	Discards unsaved changes to the current launch configuration definition.	
Run or Debug	Runs the specified startup program or opens it in the Progress Developer Studio for OpenEdge Debugger.	
Close	Closes the **Configurations** wizard.	

See also

Launch configurations for running and debugging programs on page 451
Use launch configurations on page 460
Progress OpenEdge Application settings on page 485
Progress External OpenEdge AVM settings (Debug Configuration only) on page 502

Environment tab (Application)

The **Environment** tab in the Progress OpenEdge Application section of the **Configurations** wizard lets you define the environment variables used by a Launch configurations for running and debugging programs on page 451. You can use the variables defined on this tab either in addition to or in place of those defined for the operating system. See Progress OpenEdge Application settings on page 485 for information about accessing the wizard.

The following controls are available on the **Environment** tab:

Control	Purpose
Name (accessible from all tabs)	(Required) Specifies the name of the launch configuration, which appears on menus and in the left pane of the **Configurations** wizard.
Variables grid	Lists the names and values of environment variables currently defined for the configuration.

Control	Purpose
New	Opens a dialog that lets you define a name/value pair as a new environment variable, which is added to the current list in the grid.
Select	Opens a browser that lets you copy selected environment variables in use by the operating system. Check the desired entries and click **OK** to add them to the list in the grid.
Edit	Opens a dialog that lets you modify the name/value of the environment variable currently selected in the grid.
Remove	Deletes the currently selected environment variable from the grid.
Append environment to native environment/Replace native environment with specified environment	Tells the configuration to use the environment variables specified on this tab either in addition to or in place of those defined for the operating system.
Apply	Saves the current launch configuration definition.
Revert	Discards unsaved changes to the current launch configuration definition.
Run or Debug	Runs the specified startup program or opens it in the Progress Developer Studio for OpenEdge Debugger.
Close	Closes the **Configurations** wizard.

See also

Launch configurations for running and debugging programs on page 451
Use launch configurations on page 460
Progress OpenEdge Application settings on page 485
Progress External OpenEdge AVM settings (Debug Configuration only) on page 502

Common tab (Application)

The **Common** tab in the Progress OpenEdge Application section of the **Configurations** wizard allows you to set options for specifying where an ABL application Launch configurations for running and debugging programs on page 451 is saved, how it is accessed, and how it runs. See Progress OpenEdge Application settings on page 485 for information about accessing the wizard.

The following controls are available on the **Common** tab:

Control	Purpose
Name (accessible from all tabs)	(Required) Specifies the name of the launch configuration, which appears on menus and in the left pane of the **Configurations** wizard.
Local file/Shared file	Notifies Progress Developer Studio for OpenEdge to save the configuration definition either in the `metadata\plugins` directory in your workspace (local file), or in a selected project folder (shared file).

Control	Purpose
Favorites menu selector	Causes the configuration to appear as an option at the top level of the **Run** menu, the **Debug** menu, or both. Check the desired options. **Note:** You can also manage these menu options on via **Organize Favorites** on the **Run** and **Debug** menus.
Encoding: Default/Other	Specifies the code page used for program output to the Eclipse console, either the default or a selected non-default code page.
Allocate Console	If checked, allows program output to appear in the Eclipse console.
File	If checked, redirects program output to the specified file.
Append	If checked, notifies Progress Developer Studio for OpenEdge to append redirected program output to the specified file. Otherwise, the file is overwritten.
Launch in background	If checked, lets you perform other tasks while the configuration runs.
Apply	Saves the current launch configuration definition.
Revert	Discards unsaved changes to the current launch configuration definition.
Run or Debug	Runs the specified startup program or opens it in the Progress Developer Studio for OpenEdge Debugger.
Close	Closes the **Configurations** wizard.

See also

Launch configurations for running and debugging programs on page 451
Use launch configurations on page 460
Progress OpenEdge Application settings on page 485
Progress External OpenEdge AVM settings (Debug Configuration only) on page 502

Profiler tab (Application)

The **Profiler** tab in the **Progress OpenEdge Application** section of the **Configurations** wizard contains the options to the run the profiler for any session. See Progress OpenEdge Application settings on page 485 for information about accessing the wizard.

The following controls are available on the **Profiler** tab:

Control	Description	Related parameter (if applicable)
Enable profiling	Enables profiling for the selected session	`-profile`

Control	Description	Related parameter (if applicable)
Profiler output folder	Specifies a common location for the output folder for a profiled output file and a listing file.	`-OUTFILE` for the location for profiler output file and -LISTING for listing the files directory location
Description	Specifies a description for the session profiling.	`-description`
Generate debug listing files	Generates the debug listing files in the profiler output directory. This file provides a detailed line information in the **Line summary** view. If you do not add this option, no information is displayed in the **Line summary** view.	`-LISTING`
Enable tracing	Generates a detailed tracing data that is used to generate call tree in the profiler viewer. If you do not add this option, no information is displayed in the **Call Tree** tab. **Note:** It generates a very large output file.	`-TRACE-FILTER`

Note: When you click **Apply**, the session is profiled and the .prof file opens in the editor.

Progress External OpenEdge AVM settings (Debug Configuration only)

The topics below describe the options and controls available for defining debug Launch configurations for running and debugging programs on page 451 for an external OpenEdge AVM. These launch configurations are available in the Progress External OpenEdge AVM section of the **Debug Configurations** wizard.

To access this wizard, select **Debug Configurations** from:

- The drop-down menu on the **Debug** button 
- The **ABL Editor** context (right-click) menu

Various options have the effect of invoking a startup parameter for the AVM session. In such cases, the relevant parameter is shown in the rightmost column of the table.

There is a separate topic for each of the tabs in this section of the wizard.

Connection tab (Progress OpenEdge External AVM)

The **Connection** tab in the Progress OpenEdge External AVM section of the **Debug Configurations** wizard contains the required settings for defining an external AVM debug Launch configurations for running and debugging programs on page 451, as well as some other frequently used options for debugging an external AVM. See Progress External OpenEdge AVM settings (Debug Configuration only) on page 502 for information on accessing the **Debug Configurations** wizard.

The following controls are available on the **Connection** tab:

Control	Purpose
Name (accessible from all tabs)	(Required) The name of the launch configuration, which appears on menus and in the left pane of the **Configurations** wizard.
Connection type	Specifies the connection type of the application to be debugged.
Make debug-ready and attach (local host only)	Makes a process debug-ready and attaches the **Debugger** to the process. Select this option only if the process is running on the same machine as the **Debugger**.
Process ID	Specifies the ID of the process on the local machine which you want to debug.
Select Process	(Optional) Displays the list of currently running OpenEdge processes on the same machine as the **Debugger**, in the Select Process dialog on page 510.
Port	(On local machine) Specifies the port number which you want to use for communicating with the client process. The default value (0) instructs the AVM to determine a usable port number.
Attach to debug-ready process	Attaches the **Debugger** to a process you have already made debug-ready. Select this option if the AVM instance is running on a remote machine.
Host	Specifies the name of the host on which the process is running. You can accept the default `localhost`. You must enter a host name if the process is not running on the same machine as the **Debugger**.
Debug Port	(On remote machine) Specifies the port number which was used to make the process debug-ready.
Application Name	Specifies the name of the application. **Note:** This applies only to PAS for OpenEdge.
Enable SSL	Specifies that all connections must use TLS tunneling.
Certificate Path	Specifies the certificate location of the client that is attached to the **Debugger**.
Apply	Saves the current launch configuration definition.
Revert	Discards unsaved changes to the current launch configuration definition.
Debug	Debugs the specified external OpenEdge AVM.
Close	Closes the **Configurations** wizard.

See also

Attachable Debugger on page 456
Launch configurations for running and debugging programs on page 451
Run and Debug ABL Programs on page 451
Attach the Debugger to an external AVM on page 469
Manage launch configurations on page 463
Progress External OpenEdge AVM settings (Debug Configuration only) on page 502
Progress OpenEdge Application settings on page 485
Select Process dialog on page 510

Source tab (Progress OpenEdge External AVM)

The **Source** tab in the Progress OpenEdge External AVM section of the **Debug Configurations** wizard contains the required settings for defining an external OpenEdge AVM debug Launch configurations for running and debugging programs on page 451, and some other frequently used options for debugging an external AVM. See Progress External OpenEdge AVM settings (Debug Configuration only) on page 502 for information on accessing the **Debug Configurations** wizard.

You can use the **Source** tab to add, edit, and remove source lookup entries.

The following controls are available on the **Source** tab:

Control	Purpose
Name (accessible from all tabs)	(Required) The name of the launch configuration, which appears on menus and in the left pane of the Configurations wizard.
Source Lookup Path	Specifies one or more source lookup paths where Progress Developer Studio for OpenEdge searches for the source code of the program being executed by the attached AVM. The default source lookup path includes `$DLC\src` and all the workspace project folders in alphabetical order. **Note:** Progress Developer Studio for OpenEdge searches for the source file in the source lookup paths in the order in which they are displayed.
Add	Launches the **Add Source** dialog where you can add custom source lookup paths. See Add Source dialog on page 511 for more information.
Edit	Changes the value of the current entry.
Remove	Deletes an entry from the list.
Up, Down	Changes the position in the list of a current entry, and thus changes the search order.
Restore Default	Resets the source lookup path entries to default.
Search for duplicate source files on the path	Includes source files with duplicate names while searching in the source lookup paths.

Control	Purpose
Apply	Saves the current launch configuration definition.
Revert	Discards unsaved changes to the current launch configuration definition.
Debug	Debugs the specified external OpenEdge AVM.
Close	Closes the Configurations wizard.

See also

Attachable Debugger on page 456
Launch configurations for running and debugging programs on page 451
Run and Debug ABL Programs on page 451
Attach the Debugger to an external AVM on page 469
Manage launch configurations on page 463
Progress External OpenEdge AVM settings (Debug Configuration only) on page 502
Progress OpenEdge Application settings on page 485
Select Process dialog on page 510

Common tab (Progress OpenEdge External AVM)

The **Common** tab in the Progress OpenEdge External AVM section of the **Configurations** wizard allows you set options for specifying where the external AVM Launch configurations for running and debugging programs on page 451 is saved, how it is accessed, and how it runs. See Progress External OpenEdge AVM settings (Debug Configuration only) on page 502 for information about accessing the wizard.

The following controls are available on the **Common** tab:

Control	Purpose
Name (accessible from all tabs)	(Required) The name of the launch configuration, which appears on menus and in the left pane of the Configurations wizard.
Local file/Shared file	Notifies Progress Developer Studio for OpenEdge to save the configuration definition either in the `metadata\plugins` directory in your workspace (local file), or in a selected project folder (shared file).
Favorites menu selector	Causes the configuration to appear as an option at the top level of the **Run** menu, the **Debug** menu, or both. Check the desired options. **Note:** You can also manage these menu options on via **Organize Favorites** on the **Run and Debug** menus.
Encoding: Default/Other	Specifies the code page used for program output to the Eclipse console, either the default or a selected non-default code page.
Allocate Console	If checked, allows program output to appear in the Eclipse console.

Control	Purpose
File	If checked, redirects program output to the specified file.
Append	If checked, notifies Progress Developer Studio for OpenEdge to append redirected program output to the specified file. Otherwise, the file is overwritten.
Launch in background	If checked, lets you perform other tasks while the configuration runs.
Apply	Saves the current launch configuration definition.
Revert	Discards unsaved changes to the current launch configuration definition.
Debug	Debugs the specified external OpenEdge AVM.
Close	Closes the Configurations wizard.

See also

Launch configurations for running and debugging programs on page 451
Run and Debug ABL Programs on page 451
Manage launch configurations on page 463
Progress External OpenEdge AVM settings (Debug Configuration only) on page 502
Progress OpenEdge Application settings on page 485

Launch preferences

The **Launching** page (**Progress OpenEdge** > **Advanced** > **Launching**) of the OpenEdge lets you select the default behavior of new launch configurations with respect to two key options. It includes the following controls:

Use project AVM for new launch configurations	If checked, causes new launch configurations to use the instance of the AVM that is running for the OpenEdge project. Deselect this option to have each new launch configuration run under a separate, dedicated AVM instance. You can edit this setting for specific configurations on the Main tab (Application) on page 486 of the **Configurations** wizard.
Use selection in workspace for new launch configurations	If checked, causes new launch configurations to run the ABL program that is selected in the workspace or open in the **ABL Editor**. Deselect this option to have each new launch configuration run a specific program. You can edit this setting for specific configurations on the Main tab (Application) on page 486 of the **Configurations** wizard.

See also

Launch configurations for running and debugging programs on page 451

Manage launch configurations on page 463
Launch configuration settings on page 485

Debugger dialogs

Debug Preferences dialog

The **Debug Preferences** dialog lets you enable the evaluation of properties with accessors and set the timeout value for the Debugger connection to the OpenEdge Client. This dialog appears when you select **Window** > **Preferences** > **Progress OpenEdge** > **Debug**.

You can set the following preferences:

Enable property evaluation	Enables the evaluation of properties with accessors. When you disable this preference, the actual value does not appear for the property in the **Variables** view. Instead, the message "`**Property evaluation disabled**`" appears. This preference is disabled by default.
Always select first matching file upon CRC mismatch:	Always selects the first matching file and ignores the rest, if there are one or more files with a similar name but none of them match with the CRC of the program being debugged.
Connection timeout (ms)	Sets the time-out used by the Debugger to connect to the OpenEdge Client. The default value is 20000 ms.

See also

OpenEdge Debugger preferences on page 456
Set Debugger preferences on page 466

Variable Details dialog

The **Variable Details** dialog displays information about a single data element. It is particularly useful for viewing information about the attributes and fields of `HANDLE` objects.

This dialog appears when you select an entry in the **Variables** view and select **Variable Details** from either the context (right-click) menu or the OpenEdge menu.

Information appears on one or more of four tabs: **Attributes**, **Fields**, **Array**, and **Value**. In the **Value** column (but not on the **Value** tab), in-place editing is supported where valid.

The following controls are available:

View field	The name of the data element.
View command	To update the display after changing the entry in the View field.

Add Watch command	To add the current element to the list being monitored in the Expressions view.
Close command	To dismiss the dialog.

See also

Options for monitoring results on page 460
Use the Variable Details dialog on page 479
Use the Variables view on page 476
Expressions view on page 516

Select Columns dialog

The **Select Columns** dialog lets you choose which information appears in the **Variables** view:

Name	The name of the variable.
Declared Type	The way the type is defined.
Value	The value of the variable.
Actual Type	The type object associated with the handle variable (handle:TYPE) and the actual class for class variables. If the variable has not been initialized, the value shows as a question mark, indicating it is unknown.

This dialog appears when you click the drop-down menu in the **Variables** view, select **Layout**, and choose **Select Columns**. (You must also have chosen the **Show Columns** option for the **Select Columns** option to appear.)

See also

Use the Variables view on page 476
Variables view on page 513

Set Value dialog

The **Set Value** dialog lets you change the value of a selected variable for the current debugging session without modifying the source code.

This dialog appears when you select an entry in the **Variables** view, right-click, and select **Change Value** from the context (right-click) menu.

See also

Change program code on page 483
Variables view on page 513

New Breakpoint dialog

The **New Breakpoint** dialog lets you define all types of breakpoints (**at-line**, **on-error**, **watchpoint**), including conditional breakpoints.

This dialog appears when you right-click in the **Breakpoints** view and select **Add Breakpoint**.

See also

Breakpoints on page 458
Set breakpoints on page 470
Breakpoints view on page 515

Edit Breakpoint dialog

The **Edit Breakpoint** dialog lets change the definition of an existing breakpoint. You cannot change the breakpoint type (**at-line**, **on-error**, or **watchpoint**).

This dialog appears when you select an entry in the **Breakpoints** view, right-click, and select **Edit Breakpoint**.

See also

Breakpoints on page 458
Set breakpoints on page 470
Breakpoints view on page 515

Add Watch Expression dialog

The **Add Watch Expression** dialog lets you define a watch to be monitored in the **Expressions** view.

This dialog appears when you right-click in the **Expressions** view and select **Add Watch Expression**.

Select or deselect the **Enabled** option to control whether monitoring is active for the watch. The expression appears in the **Expressions** view whether or not it is enabled.

See also

Options for monitoring results on page 460
Use watch expressions on page 480
Expressions view on page 516

Edit Watch Expression dialog

The **Edit Watch Expression** dialog lets you change an existing watch expression.

This dialog appears when you select an entry in the **Expressions** view, right-click, and select **Edit Watch Expression**.

Select or deselect the **Enabled** option to control whether monitoring is active for the watch. The expression appears in the **Expressions** view whether or not it is enabled.

See also

Options for monitoring results on page 460
Use watch expressions on page 480
Expressions view on page 516

Dynamic Object Monitoring dialog

The **Dynamic Object Monitoring** dialog lets you turn on monitoring of selected types of dynamically created objects so that you can track their state in the Dynamic Objects view.

This dialog appears when you select **OpenEdge** > **Dynamic Object Monitoring** on the menu bar.

The following controls are available:

Object type tree	The expandable/collapsible list of dynamic object types that can be monitored, with check boxes for selecting.
Start Monitoring command	To turn on monitoring for the selected object types. This button changes to **Restart Monitoring** when you click it.
Restart Monitoring command	To restart or continue monitoring for the selected object types, clearing the current contents of the **Dynamic Objects** view.
Close command	To dismiss the dialog.

See also

Options for monitoring results on page 460
Use the Dynamic Objects view on page 482
Dynamic Objects view on page 516

Filter Objects dialog

The **Filter Objects** dialog lets you control which of the dynamic object types that are currently being monitored appear in the **Dynamic Objects** view.

This dialog appears when you right-click in the Dynamic Objects view and select **Filter Objects** from the context menu.

Information appears in the Dynamic Objects view about dynamic objects of the checked types.

See also

Options for monitoring results on page 460
Use the Dynamic Objects view on page 482
Dynamic Objects view on page 516

Select Process dialog

The **Select Process** dialog allows you to obtain the list of currently running OpenEdge processes on the same machines as the Progress Developer Studio for OpenEdge Debugger. To access this dialog, click **Select Process** on the **Connection** tab in the Progress External OpenEdge Application section of the **Debug Configurations** wizard. For more information, see Connection tab (Progress OpenEdge External AVM) on page 502.

See also

Attachable Debugger on page 456
Attach the Debugger to an external AVM on page 469
Connection tab Progress OpenEdge External AVM on page 502

Add Source dialog

The **Add Source** dialog lets you add custom source lookup paths to the entries on the **Source** tab. To access this dialog, select **Add** on the **Source** tab. For more information, see Source tab (Progress OpenEdge External AVM) on page 504.

You can choose from the following containers to add to the source lookup path entries:

- **File System Directory**
- **OpenEdge Project**
- **Workspace Folder**

See also

Attachable Debugger on page 456
Attach the Debugger to an external AVM on page 469
Suspend and disconnect the Debugger from an attached AVM on page 485
Edit Source Lookup Path dialog on page 511

Edit Source Lookup Path dialog

The **Edit Source Lookup Path** dialog allows you to add source lookup paths for the file being debugged. You can access this dialog by selecting the **Edit Source Lookup Path** option. This option displays in the **ABL Editor** when Progress Developer Studio for OpenEdge fails to find a matching source file in the specified source lookup paths during debugging.

The following options and controls are available on the **Edit Source Lookup Path** dialog:

Source lookup path	Specifies one or more source lookup paths where Progress Developer Studio for OpenEdge searches for the source code of the program being executed by the attached AVM. The default source lookup path includes `$DLC\src` and all the workspace project folders in alphabetical order. **Note:** Progress Developer Studio for OpenEdge searches for the source file in the source lookup paths in the order in which they are displayed.
Add Workspace Directory	Adds a directory from the current workspace.
Add External Directory	Adds a directory from the file system.
Edit	Changes the value of the current entry.
Remove	Deletes an entry from the list.
Move Up, **Move Down**	Changes the position in the list of a current entry, and thus changes the search order.

Note: Any source lookup path updates on this dialog reflect in the Source tab of the corresponding debug launch configuration.

See also

Attachable Debugger on page 456
Attach the Debugger to an external AVM on page 469
Suspend and disconnect the Debugger from an attached AVM on page 485

Debugger views

Debug view

One or more **Debug** views are shown for each active Debugger session. For more information, see **Session tree Debug view** section below. It also displays all the running agents on the broker which is attached to the Progress Developer Studio for OpenEdge Debugger during remote debugging. It changes dynamically as agents are added or removed from the attached broker.

The **Debug** view also provides the **Program execution commands** that you use to step through the code.

The **Debug** perspective includes the **Debug** view by default. If the view is not open, select **Window** > **Show View** > **Debug** from the **Debugger** perspective to display it.

Session tree Debug view

The session shows the contents of the ABL stack trace (lines marked with) for the currently executing procedure in each active debugging session. In its initial state, the session tree shows the following entries:

```
Project name[OpenEdge Application]
  Source file name at localhost
    OpenEdge Runtime (suspended)
      Source file path and current line number
  OpenEdge-install-dir\bin\prowin.exe date and time
```

The stack trace changes dynamically as you step through the code, adding and removing entries that indicate the execution sequence of the current procedure. The current line appears at the top of the stack.

You can investigate the code associated with a line of the stack trace by clicking on the stack trace line. The **ABL Editor** window containing that code becomes active, and the **Variables** view, the **Expressions** view, and the **Dynamic Objects** view show data values as they are immediately preceding execution of the selected line.

See Use the Debug view and stack trace on page 475 for more information.

Program execution commands

The following commands are available on the **Debug** view toolbar and context (right-click) menu:

Command	Action
Step Into 	Execute the current line and continue until reaching the next executable statement, which may be in the current procedure, a subprocedure, or a trigger. That statement becomes the current line, and it is not executed until you continue. See also the information about garbage collection in Code-stepping on page 459.
Step Over 	Execute the current line and continue until reaching either a breakpoint, or the next executable statement in the same procedure. Thus, if the current line calls a subprocedure or causes a trigger to execute, the subprocedure or trigger is executed without interruption unless there is a breakpoint. In other words, step "over," not "into," the subprocedure or trigger.
Step Return 	Execute the current line and continue either until reaching either a breakpoint, or until the current procedure ends and returns control to the calling procedure.
Resume 	Execute the current line and continue without interruption until reaching either a breakpoint or the end of the program.
Suspend 	Interrupt execution following completion of the current instruction and give control to the Debugger at the next executable statement. Also, suspend the attached AVM.
Terminate 	Interrupt execution and end the Debugger session.
Remove All Terminated Launches 	Clear the **Debug** view of session trees that are no longer active.
Disconnect 	Disconnect from the attached AVM and stop receiving notifications from the running external AVM.

See also

The OpenEdge Debugger perspective on page 455
Code-stepping on page 459
Options for monitoring results on page 460
Use the Debug view and stack trace on page 475
Step through the code on page 474

Variables view

The **Variables** view shows current information about buffers, datasets, parameters, properties, variables, and temp-tables while program execution is suspended during a Debugger session. It is synchronized with the stack trace, so that you can examine values at different points of execution. The **Variables** view allows you to make non-persistent changes to values and also allows you to Evaluate a property in the Variables view on page 477.

By Select Variables view display information on page 477, you can choose how you want the information to appear and how much of it you want to see. The following information appears by default (although you can opt not to see these details by modifying the layout):

- **Name**—The name of the variable
- **Value**—The value of the variable

You can choose to see the following information in the layout as well:

- **Declared Type**—The way the type is defined.
- **Actual Type**—The type object associated with the handle variable (handle:TYPE) and the actual class for class variables. If the variable has not been initialized, the value shows as a question mark, indicating it is unknown.

You can toggle whether properties of a class type are displayed or not in the **Variables** view by working with the **Filter** option in the view's context menu. Settings are remembered through multiple Progress Developer Studio for OpenEdge sessions. The filters apply only to items in the **Variables** view and apply to all instances shown in the top level of the **Variables** view.

Handle variables, class variables, and properties of a class type are expandable in the **Variables** view, provided they have been initialized. Arrays, buffers, and temp-tables can be expanded even if they are not initialized.

Private data members and properties will be displayed for ABL objects. However, private data members and properties of .NET objects are not displayed.

The **Debug** perspective includes the **Variables** view by default. To display it if is not open, select **Window** > **Show View** > **Debug** > **Variables**.

The following commands are available:

Collapse All 	To collapse the display of all hierarchical data elements in the list, leaving only the top-level entities visible.
	To open a drop-down menu that provides options for customizing the appearance of the view. The **Filter** option lets you select the data element types that you want to include in the **Variables** view.

The drop-down menu provides these options:

Layout	Lets you choose to display the information in the following ways: • Vertical View Orientation • Horizontal View Orientation • Variables View only When a Debug session is selected in the **Debug** view, the **Show Columns** and **Select Columns** options are also available.
Filter	Show buffers, datasets, parameters, properties, variables, and/or temp-tables.

See also

Options for monitoring results on page 460
Attachable Debugger on page 455
Use the Variables view on page 476

Use the Variable Details dialog on page 479
Variable Details dialog on page 507

Breakpoints view

The **Breakpoints** view lists all breakpoints that are defined for the current workspace, including those set in procedures and projects that are not related to the application that you are debugging and for the files located outside the workspace. You can selectively enable or disable breakpoints for the current debugging session.

The **Debug** perspective includes the **Breakpoints** view by default. To display it if is not open, select **Window** > **Show View** > **Debug** > **Breakpoints**.

Each entry label shows the definition of a breakpoint. If the breakpoint is at an include file reference or is conditional, that information is appended to the label.

The following commands are available:

Remove Selected Breakpoints 	To permanently delete currently selected breakpoints.
Remove All Breakpoints 	To permanently delete all breakpoints defined for the workspace.
Skip All Breakpoints 	To disable all breakpoints without deleting them.

The following commands are available only if the breakpoints are grouped:

Expand All 	To expand all the items in the view.
Collapse All 	To collapse all the items in the view.

The drop-down menu provides these options:

Group By	Breakpoints Breakpoint Types Breakpoint Working Sets Files Projects Resource Working Sets Advanced

See also

Options for controlling program execution on page 458
Options for monitoring results on page 460
The OpenEdge Debugger perspective on page 455
Use Breakpoints on page 470
New Breakpoint dialog on page 508
Edit Breakpoint dialog on page 509

Expressions view

The **Expressions** view lists the values of variables that you have explicitly selected by creating watch expressions. It is synchronized with the stack trace, so that you can examine values at different points of execution. The **Breakpoints** view, the **Variables** view, and the **Variable Details** dialog include facilities for creating watch expressions.

Class variables and properties of a class type are expandable in the **Expressions** view. Arrays, buffers, temp-tables, datasets, and handle variables can also be used in the **Expressions** view and are expandable.

An object reference or handle not initialized cannot be expanded. Arrays, buffers, and temp-tables can be expanded even if they have not been initialized.

Private data members and properties are displayed for ABL objects. However, private data members and properties of .NET objects are not displayed.

The **Debug** perspective includes the **Expressions** view by default. To display it if is not open, select **Window** > **Show View** > **Expressions**.

Each entry label shows the expression and its current value, "Unavailable," or "(disabled)."

The following commands are available:

Collapse All 	To collapse the display of all hierarchical data elements in the list, leaving only the top-level entities visible.
Remove 	To delete currently selected watch expressions.
Remove All 	To delete all watch expressions defined for the workspace.

The drop-down menu provides these options:

Layout	Lets you choose to display the information in the following ways: • Vertical View Orientation • Horizontal View Orientation • Expression View Only

See also

Options for monitoring results on page 460
The OpenEdge Debugger perspective on page 455
Use watch expressions on page 480
Set breakpoints on page 476
Use the Variable Details dialog on page 479
Add Watch Expression dialog on page 509
Edit Watch Expression dialog on page 509

Dynamic Objects view

The **Dynamic Objects** view lets you monitor the creation and destruction of dynamic object instances. You must explicitly start dynamic object monitoring for specific object types if you want to use this view.

The **Debug** perspective includes the **Dynamic Objects** view by default. To display it if is not open, select either **Window** > **Show View** > **Dynamic Objects** or **Window** > **Show View** > **Other** > **Progress OpenEdge Debugger** > **Dynamic Objects**.

While the Debugger is monitoring active object instances, the following information is displayed in the **Dynamic Objects** view:

- The object type.
- The name of the procedure file in which the dynamic object was created.
- The line number at which the object was created.
- Any relevant attribute values (such as the value of the object's **Name** attribute) or other object-specific information.
- The path.

See also

Options for monitoring results on page 460
The OpenEdge Debugger perspective on page 455
Use the Dynamic Objects view on page 482
Dynamic Object Monitoring dialog on page 509
Add Watch Expression dialog on page 509
Filter Objects dialog on page 510

12

Learn About ABL GUI Designer

The new improved seamless AppBuilder integration makes Developer Studio a one-stop solution for developing and maintaining ABL GUI applications.

The AppBuilder integration introduces a new design editor for designing AppBuilder GUI applications called **ABL UI Designer**. This design editor allows developers to draw widgets and generate source code, similar to the Visual Designer that is used to build GUI for .NET applications.

The following OpenEdge AppBuilder capabilities can be accessed from within the Developer Studio:

- OpenEdge AppBuilder perspective to build AppBuilder GUI applications within an OpenEdge project.
- AppBuilder options available as AppBuilder preferences and project properties in the Developer Studio. These options allow developers to control the behavior of AppBuilder and ABL UI Designer such as **Dynamics**, **Editor**, **Grid Units**, and **Widget ID** settings.
- ABL GUI applications are OpenEdge project-aware. That is, developer can set common properties for all the ABL GUI applications defined in an OpenEdge project using AppBuilder properties.
- AppBuilder templates and wizards to develop new ABL GUI applications. Stand-alone AppBuilder templates and wizards run embedded in Eclipse standard wizards from within the Developer Studio.
- Design ABL GUI applications using the ABL UI Designer editor which extends the native AppBuilder functionality such as dock-able widget palette, look and feel of **Visual Designer** editor, hierarchical widget **Outline** view, and synchronization between the AB UI Designer and ABL Editor.
- Improved ABL Editor to make sections of the AppBuilder-generated code read-only and foldable. This ensures that developers do not inadvertently modify the AppBuilder-generated code while editing the ABL application code is the ABL Editor.
- **AppBuilder Section Editor** to view specific block of code using the object nodes created in the **Outline** view. You can use the **Section Editor Toggle** button to enable or disable the **Section Editor** capability.

- Progress Dynamics features such as **Open Dynamics Object**, **Register to Repository**, **Save Dynamics Object as Static**, **Save Static Object as Dynamic**, and **Open Associate Procedure**.
- **PRO*Tools** utilities categorized into these three menu options: **General PRO*Tools**, **AppBuilder PRO*Tools**, and **ADM2 PRO*Tools**.

The OpenEdge AppBuilder can either run embedded in Progress Developer Studio for OpenEdge or as a standalone application.

For details, see the following topics:

- Concepts
- Tasks
- Reference

Concepts

This topic includes the following:

- Introducing the ABL GUI Designer
- OpenEdge AppBuilder perspective
- Benefits and limitations of GUI Designer
- Code analysis in GUI Designer
- Coding conventions to generate AppBuilder code
- Read-only code sections of AppBuilder-generated code
- About SmartObjects
- SmartObject instance
- SmartObject master
- Paging in SmartObjects
- Layout
- About Method Library
- Common capabilities of SmartObjects
- About custom object file

Learn About AppBuilder

The AppBuilder is a multi-purpose application development environment. You can use it as a visual programming environment to create character- or GUI-based client/server applications. The AppBuilder comes installed with Progress Developer Studio for OpenEdge.

Detailed online help for all the AppBuilder features is available from the main **Help** menu and from **Help** buttons on most dialog boxes. Also, see *OpenEdge Application Server: Developing AppServer Applications* for more information about using the AppBuilder.

See also

OpenEdge AppBuilder perspective
Access the AppBuilder perspective
AppBuilder perspective components

OpenEdge AppBuilder perspective

The OpenEdge AppBuilder perspective includes various tools and views that you can use to build and develop AppBuilder applications in Progress Developer Studio for OpenEdge.

A new GUI Designer editor gives Progress Developer Studio for OpenEdge the ability to design GUI for ABL user interfaces using the native AppBuilder functionality to draw the widgets and to parse and generate source code, similar to how the Visual Designer uses Visual Studio to build GUI for .Net user interfaces.

The GUI designer will reuse common behavior like the ability to jump back and forth between visual layout and source editing.

The GUI Designer has a new dockable Palette that extends Eclipse's existing Palette and is populated with components from the AppBuilder's customizable configuration files.

See also

Learn About ABL GUI Designer on page 519
Access the AppBuilder perspective on page 530
AppBuilder perspective components on page 558

Benefits and limitations of GUI Designer

There are certain benefits and limitations of GUI Designer (AppBuilder in Progress Developer Studio for OpenEdge environment) over standalone AppBuilder, which are as follows:

- The GUI Designer project properties are changed as part of the integration. The GUI Designer project properties are stored as OpenEdge project properties. Some of the .ini or registry settings that are used by standalone AppBuilder is ignored when running in Progress Developer Studio for OpenEdge (Developer Studio).
- The GUI Designer preferences are changed as part of the integration. The GUI Designer preferences are stored as OpenEdge preferences and are workspace level settings. The `.ini` or registry settings that are used by standalone AppBuilder are ignored when running in OpenEdge. See AppBuilder preferences on page 559.

  Note: The Progress Developer Studio for OpenEdge stores the GUI Designer preferences settings in Eclipse preference store, and sends these settings to standalone AppBuilder to synchronize the preferences settings.

- You can open multiple GUI Designer procedure file (`.w`) windows. See Work with ABL procedure files on page 534.
- **Cue Cards** appear as a view in AppBuilder perspective in Developer Studio. In standalone AppBuilder, you can control the display of **Cue Cards** from the Preferences page. See ABL Cue Cards view on page 686.
- Recent Messages feature is not available with GUI Designer in Developer Studio. You can access this feature from the **Help** menu in the standalone AppBuilder.

- The **Toggle on/off to change window on-top setting**  option on the **Dynamic Properties** window does not work in Developer Studio environment. This option only works when the **Dynamics Properties** window is opened in the standalone AppBuilder environment.

  Note: The **Dynamic Properties** window opens and runs in a window outside of the Progress Developer Studio Eclipse framework. Online help is available from the utility's **Help** button or **F1** key

- Non Visual AppBuilder files, including Web Objects such as **HTML Mapping Objects** will open in the ABL UI Designer in the same tree view and have the same behavior as in standalone AppBuilder, with the exception that clicking on the **Code Section** nodes is procedure/function nodes. There is no wizard support to create AppBuilder web objects in Developer Studio.

See also

OpenEdge AppBuilder perspective on page 521

Code analysis in GUI Designer

The &ANALYZE directives are commands understood by the OpenEdge Analyzer, a component of the OpenEdge Compiler. The Analyzer's main purpose is to make information about static objects available to the AppBuilder. The activities of the Analyzer are completely transparent, except for the &ANALYZE directives that appear in your code. You can use the GUI Designer effectively without knowing anything about the Analyzer, but if you want to know more about the directives appearing in your code, continue reading.

There are two main &ANALYZE directives: &ANALYZE-SUSPEND and &ANALYZE-RESUME. The &ANALYZE-SUSPEND directive causes the Analyzer to suspend analysis of ABL code. The &ANALYZER-RESUME directive causes the Analyzer to resume analysis.

The Analyzer performs its work when the GUI Designer opens a `.w` file. When the GUI Designer opens a `.w` file, the Analyzer builds a temporary file that contains:

- A summary table of information about the static objects created with the GUI Designer. User-supplied object definitions, whether static or dynamic, are not analyzed.
- Exact copies of any user-supplied code (triggers, variable definitions, etc.).
- Exact copies of any AppBuilder -generated code that is not analyzed (such as CREATE WINDOW statements).

The GUI Designer then reads contents of the temporary file into memory, storing the information in temporary tables.

The summary table is the Analyzer's most important output and is the Analyzer's main purpose. This table contains all of the relevant information about the `.w` file's static objects, including their dimensions. The format of the summary table is one that the GUI Designer can easily parse. Using information in this table, the GUI Designer creates design-time representations of the static objects. These representations are what you physically manipulate within the design window.

The Analyzer cannot provide summary information about dynamic objects. Dynamic objects are created at run time, not defined at compile time. The GUI Designer must examine all unanalyzed code, extracting information it requires to create design windows and dialog boxes.

See also

Code conventions to generate AppBuilder code on page 523
View and edit the source code on page 543

Code conventions to generate AppBuilder code

The following describes the conventions the GUI Designer uses when generating code:

Absolute Positioning

The GUI Designer uses absolute positioning in all of its generated ABL code. You must take this into consideration before building your application.

ABL offers two alternative syntaxes for positioning objects within frames:

- This syntax allows you to place an object at a specific location within a frame. This syntax supports absolute positioning. That is, you position objects at a specific X or Y location, or at a specific COLUMN or ROW.
- This syntax supports relative positioning. That is, you place objects relative to each other in a frame using offsets.

For more information about these two types of syntax, see *OpenEdge Development: ABL Handbook and OpenEdge Development: Programming Interfaces*.

Absolute Field References

When referencing database fields, the GUI Designer does not fully qualify the database field names with their respective database names. If you want database field names to be absolute (specifying the database name, the table name, and the field name), you can override the default by selecting the Qualify database fields with database name check box in the AppBuilder properties page (Windows only) on page 77 page.

Character Units

To specify object dimensions and positions, the GUI Designer uses character units. You can override this default on an object-by-object basis within the object's advanced Property Sheet. The alternative to character units is PIXELS.

See also

Code analysis in GUI Designer on page 522
View and edit the source code on page 543

Read-only code sections of AppBuilder-generated code

You can make the sections of the AppBuilder-generated code read-only and foldable in the ABL Editor. This ensures that users do not modify the AppBuilder-generated code while editing the ABL procedure (`.w`) file in the ABL Editor. Editing the AppBuilder-generated code might make the AppBuilder procedure (`.w`) file corrupt, and display errors when trying to open in the ABL GUI Designer.

The default display color for the read-only code is gray. You can set the display options of AppBuilder-generated code in the ABL Editor using the **Editor preferences** page. See Editor preferences on page 560.

Note: The **Find/Replace** option will not work with the read-only or auto-generated code of an AppBuilder procedure file. You cannot rename an internal procedure or function name which is part of the auto-generated or read-only code section.

There are two main &ANALYZE directives in an AppBuilder (`.w`) file: &ANALYZE-SUSPEND and &ANALYZE-RESUME. The &ANALYZE-SUSPEND directive causes the Analyzer to suspend analysis of ABL code. The &ANALYZER-RESUME directive causes the Analyzer to resume analysis. See Code analysis in GUI Designer on page 522.

The identifiers that define the read-only rules are the &ANALYZE-SUSPEND and &ANALYZE-RESUME statement directives. When an ABL procedure (.w) file is opened in the GUI Designer, the &ANALYZE-SUSPEND and &ANALYZE-RESUME directives code are parsed to mark the code sections within these directives as read-only and foldable in the ABL Editor.

Here is a list of sample illustrations with the code snippets marking the code section or block within the &ANALYZE directives as read-only or editable:

- The following code snippet specifies that the code generated inside the &ANALYZE block is read-only except the definition section which is editable:

```
&ANALYZE-SUSPEND _UIB-CODE-BLOCK _CUSTOM _DEFINITIONS wWin
/*------------------------------------------------------------------------

  File:
  Description: from cntnrwin.w - ADM SmartWindow Template
  Input Parameters:
  Output Parameters:

------------------------------------------------------------------------*/
/*          This .W file was created with the Progress AB.              */
/*------------------------------------------------------------------------*/

/* Create an unnamed pool to store all the widgets created
     by this procedure. */

CREATE WIDGET-POOL.

/* ***************************  Definitions  ************************** */

/* Local Variable Definitions ---                                       */

{src/adm2/widgetprto.i}

/* _UIB-CODE-BLOCK-END */
&ANALYZE-RESUME
```

- Any code which is not surrounded by &ANALYZE-SUSPEND and &ANALYZE-RESUME is read-only.
- An &ANALYZE-SUSPEND statement which does not have _UIB-CODE-BLOCK or _QUERY-BLOCK as the second token is read-only.
- An &ANALYZE-SUSPEND _UIB-CODE-BLOCK _CUSTOM _DEFINITIONS block is editable.
- The following code snippet specifies how triggers and the main block are editable:
- An &ANALYZE-SUSPEND _UIB-CODE-BLOCK _CUSTOM _DEFINITIONS block is not read-only.
- An &ANALYZE-SUSPEND _UIB-CODE-BLOCK with _CONTROL as the third token is not read-only, but the first line inside the block is read-only.

```
&ANALYZE-SUSPEND _UIB-CODE-BLOCK _CONTROL wWin wWin
ON END-ERROR OF wWin /* <insert SmartWindow title> */
OR ENDKEY OF {&WINDOW-NAME} ANYWHERE DO:
  /* This case occurs when the user presses the "Esc" key.
     In a persistently run window, just ignore this.  If we did not, the
     application would exit. */
  IF THIS-PROCEDURE:PERSISTENT THEN RETURN NO-APPLY.
END.

/* _UIB-CODE-BLOCK-END */
&ANALYZE-RESUME

&ANALYZE-SUSPEND _UIB-CODE-BLOCK _CONTROL wWin wWin
ON WINDOW-CLOSE OF wWin /* <insert SmartWindow title> */
DO:
  /* This ADM code must be left here in order for the SmartWindow
     and its descendents to terminate properly on exit. */
  APPLY "CLOSE":U TO THIS-PROCEDURE.
  RETURN NO-APPLY.
END.

/* _UIB-CODE-BLOCK-END */
&ANALYZE-RESUME
```

- The following code snippet specifies how procedures can be both read-only and editable, and the functions as editable. Note that the END PROCEDURE and END FUNCTION are editable:

```
&ANALYZE-SUSPEND _UIB-CODE-BLOCK _PROCEDURE exitObject wWin
PROCEDURE exitObject :
/*------------------------------------------------------------------------------
  Purpose:  Window-specific override of this procedure which destroys
            its contents and itself.
    Notes:
------------------------------------------------------------------------------*/

  APPLY "CLOSE":U TO THIS-PROCEDURE.
  RETURN.

END PROCEDURE.

/* _UIB-CODE-BLOCK-END */
&ANALYZE-RESUME

&ANALYZE-SUSPEND _UIB-CODE-BLOCK _FUNCTION getCurrent wWin
FUNCTION getCurrent RETURNS CHARACTER
  (pcMode as character) :
/*------------------------------------------------------------------------------
  Purpose:
    Notes:
------------------------------------------------------------------------------*/

  RETURN "current".   /* Function return value. */

END FUNCTION.
/* _UIB-CODE-BLOCK-END */
&ANALYZE-RESUME
```

- An &ANALYZE-SUSPEND _UIB-CODE-BLOCK _PROCEDURE with five tokens is not read-only.
- An &ANALYZE-SUSPEND _UIB-CODE-BLOCK _PROCEDURE with six tokens is read-only , unless the sixth token is _FREEFORM.
- An &ANALYZE-SUSPEND _UIB-CODE-BLOCK _FUNCTION is editable. The data-type of the function must be editable.
- When you add Extended Features (XFTR) block to a procedure or template, then the code becomes editable.
- The following code snippet specifies how free form query elements inside a &ANALYZE-SUSPEND _QUERY-BLOCK section are editable:

```
&ANALYZE-SUSPEND _QUERY-BLOCK QUERY QUERY-3
/* Query rebuild information for QUERY QUERY-3
     _START_FREEFORM
OPEN QUERY {&SELF-NAME} FOR EACH Employee WHERE TRUE NO-LOCK INDEXED-REPOSITION.
     _END_FREEFORM
     _START_FREEFORM_DEFINE
DEFINE QUERY QUERY-3 FOR
                Employee SCROLLING.
     _END_FREEFORM_DEFINE
     _Options          = "NO-LOCK INDEXED-REPOSITION"
     _Design-Parent    is FRAME fMain @ ( 15.05 , 72 )
*/  /* QUERY QUERY-3 */
&ANALYZE-RESUME
```

- An &ANALYZE-SUSPEND _UIB-CODE-BLOCK is editable between _START_FREEFORM and _END_FREEFORM or _START_FREEFORM_DEFINE and _END_FREEFORM_DEFINE tokens. These tokens are inside of comments.
- The following code snippet specifies how a browser definition for a free form query is editable, allowing you to edit the field lists:

```
DEFINE BROWSE BROWSE-4
&ANALYZE-SUSPEND _UIB-CODE-BLOCK _DISPLAY-FIELDS BROWSE-4 wWin _FREEFORM
  QUERY BROWSE-4 NO-LOCK DISPLAY
      Customer.Address FORMAT "x(35)":U
      Customer.Address2 FORMAT "x(35)":U
      Customer.Balance FORMAT "->,>>>,>>9.99":U
      Customer.City FORMAT "x(25)":U
      Customer.Comments FORMAT "x(80)":U
      Customer.Contact FORMAT "x(30)":U
      Customer.Country FORMAT "x(20)":U
      Customer.CreditLimit FORMAT "->,>>>,>>9":U
      Customer.CustNum FORMAT ">>>>9":U
  ENABLE
      Customer.Address
      Customer.Address2
      Customer.Balance
      Customer.City
      Customer.Comments
      Customer.Contact
      Customer.Country
      Customer.CreditLimit
      Customer.CustNum
/* _UIB-CODE-BLOCK-END */
&ANALYZE-RESUME
```

- An &ANALYZE-SUSPEND _UIB-CODE-BLOCK _DISPLAY-FIELDS section is editable when the sixth token is _FREEFORM.

See also

Using code folding on page 522
Editor preferences on page 560

About SmartObjects

SmartObjects are external procedures that encapsulate standard UI and functionality. The set of SmartObjects provided with the Application Development Model (ADM) are useful for typical database applications. For example, most database applications view data, so the ADM provides a SmartV8Viewer object. A SmartV8Viewer's main purpose is to display data.

Each of these SmartObjects represents a component part of a typical database application.

Each SmartObject must know how to interact with other SmartObjects. For example, the SmartV8Query and SmartV8Viewer work together in predefined ways. The SmartV8Query tells the SmartV8Viewer what records to display on the application screen. Each of these objects expects the other to behave in specific ways; each has responsibilities to the other.

As a developer, you can quickly assemble SmartObjects together to build many different application screens. If a SmartObject behaves in way that you don't like, you can customize it or override its default behaviors. If the set of available SmartObjects does not suit your needs, you can create new SmartObjects, giving them different behaviors better suited to the role you assign them in your application.

Each SmartObject has information (attributes) that it stores internally. A given SmartObject accesses this information by running internal procedures in another SmartObject.

Each SmartObject is capable of performing specific actions. These actions are represented as internal procedures. Conceptually, there are two types of actions that a SmartObjects can perform: actions made available to other SmartObjects (methods), and default actions that govern how the SmartObjects behaves at critical moments in an application (ADM events).

See also

Common capabilities of SmartObjects on page 529
SmartObject controls on page 566
Open SmartObject dialog on page 663

SmartObject instance

SmartObject instance is a copy of a SmartObject master running in memory. Many SmartObject instances can be created from a single SmartObject master file.

See also

About SmartObjects on page 526
Insert SmartObjects on page 551

SmartObject master

SmartObject master is a SmartObject with specific data and UI. Generally, you create a SmartObject master from a SmartObject template. You can add data and UI elements to the template and then save the file. The saved file then becomes a SmartObject master. You can use a master as a template for other masters, which in turn add more specific details.

See also

About SmartObjects on page 526
Insert SmartObjects on page 551

Paging in SmartObjects

Every SmartContainer (SmartWindow, SmartFrame, and SmartDialog) gives you the ability to organize sets of SmartObjects into logical pages. The primary purpose of the paging mechanism is to give you control over when these sets of objects are initialized and displayed.

This allows you to make the best use of limited screen space, and to keep the attention focused my limiting the amount of information displayed at one time.

The SmartFolder provides a convenient way to reserve screen space and control the display of logical pages. The GUI Designer also allows you to manage pages in other ways. For example, you can use the paging mechanism to create multiple-window applications.

Special pages

There are three page designations that have special meaning in the paging system:

Page 0	Page 0 is the default page in every SmartContainer. If you create a SmartContainer and add objects to it without changing any of the paging settings, then all the objects are on Page 0. Also, any basic objects (widgets) you add directly to a SmartContainer are placed on Page 0 regardless of the Design Page setting. Objects placed on Page 0 are always displayed in addition to any objects on any other pages that have been selected for display.

Startup page	You have the option of designating one page, in addition to Page 0, to be displayed at the time the SmartContainer is run. This is called the Startup Page. Page 0 is the default Startup Page. Unless you explicitly specify a non-zero page number as the Startup Page, only the objects placed on Page 0 will display when you run the SmartContainer. For example, if you are using a SmartFolder to organize the viewing and hiding of pages, you would typically designate Page 1 (which always corresponds to the leftmost folder tab) as the Startup Page. If you leave the Startup page set to Page 0 when you are using a SmartFolder, then the area within the folder object will be blank when the application starts up. You set the **Startup Page** in the **Pages** dialog box, which you invoke from the **Procedure Settings** dialog.
Design page	This is the page you are working in at any given time while you are building the application. As the name suggests, the Design Page setting is relevant only in design mode. It is ignored when the SmartContainer is running. The Design Page setting is indicated in the status bar of the GUI Designer window. You can set the Design Page by double-clicking the **Page Number** field in the GUI Designer main window, or by choosing the **Design** button in the **Pages** dialog box.

Paging system limited to SmartObjects

It is important to note that only SmartObjects can be placed on pages other than Page 0.

Only SmartObjects are capable of responding to SmartLinks, and a SmartContainer controls the paging system by means of a set of special SmartLinks. When you assign a SmartObject to Page n, the GUI Designer automatically creates a SmartLink of type Pagen from the SmartContainer to the SmartObject. For more information see, About SmartObjects on page 526

Layout

Layout is a collection of basic objects, SmartObject instances, and associated attribute settings. These attribute settings determine how the layout appears when you run the application. Each layout has a name and an associated run-time expression.

When you run a procedure file, it determines whether to use a layout by evaluating the layout's run-time expression. If the expression evaluates to TRUE, the file uses that layout. When the file determines that it uses a particular layout, the file executes a CASE statement entry for that layout. This CASE statement contains all of the attribute settings assigned for the layout.

At design time, a layout is visually manifested in the design window. You can switch between layouts in the design window, and the AppBuilder alters the appearance of the design window to match the characteristics of the new layout.

About Method Library

The Method Library functionality allows you to add one or more include files into the generated code. The include file is inserted after all the definitions, and before any procedures and functions. Thus, allowing you to use include files that references the definitions or uses the preprocessors generated by the AppBuilder.

The term Method Libraries originally refers to the special type of include files that contains the methods for the various type of components of the ADM1 (Application Development Model) framework. The method libraries provide code reuse and ensure that each instance of an ADM1 class have the same logic being compiled into the r-code.

The ADM2 also uses the method libraries, but in this case the reusable code and class hierarchy are implemented in super-procedures. The method library defines the class of the instance, but contain very few methods, instead they initiate and bootstrap the class super procedure and super procedure hierarchy to the instance. They also include some variable definitions and preprocessors directives to control what to include in the compilation unit. But, the preprocessors generated by the GUI Designer are rarely used as compiler directives, but typically passed to the super procedures as property values.

See also

Add method library reference on page 553
Modify method library reference on page 553
Method Libraries dialog on page 655

Common capabilities of SmartObjects

All SmartObjects have common capabilities which allow them to interact in an application. All SmartObjects can:

- Initialize and destroy themselves
- Get and set attributes
- Add and remove SmartLinks
- Communicate using the Application Data Models (ADM) standard communication interface (mainly using the notify and dispatch methods)

These capabilities provide a standard interface for creating and destroying SmartObject instances and for making SmartObjects interact. Unless a procedure object has these capabilities, it is not a SmartObject.

See also

About SmartObjects on page 526
Open SmartObject dialog on page 663

About custom object file

An external text file or files in which you define custom objects using a specific syntax. Custom object files normally have a .cst extension in their filenames. OpenEdge includes two custom object files for you to use: `progress.cst` and `smart.cst`. Both files reside in `DLC/src/template`.

Custom object files let you control how three AppBuilder interface components ¾ the Object Palette, New dialog box, and Choose dialog box ¾ present objects to the user for selection. By editing a custom object file or by creating your own, you can prepare the presentation of your own set of objects.

See also

Working with custom object files on page 554

Tasks

Access the AppBuilder perspective

To open the OpenEdge AppBuilder perspective:

1. Choose one:
   - Click **Open Perspective**  on the Workbench toolbar.
   - Select **Window** > **Open Perspective** menu.
2. Select **OpenEdge AppBuilder**, if it is listed. If it is not listed, select **Other**. Select **OpenEdge AppBuilder** from the **Open Perspective** dialog, and then click **OK**.

Note: To view the OpenEdge AppBuilder perspective if it is open but not in view, click **OpenEdge AppBuilder**  from the Workbench toolbar.

See also

Learn About ABL GUI Designer on page 519
OpenEdge AppBuilder perspective on page 521
Create ABL GUI procedure files on page 532
AppBuilder perspective components on page 558
AppBuilder preferences on page 559

Set AppBuilder preferences

Use preference settings to modify the behavior of the GUI Designer in Progress Developer Studio for OpenEdge.

To modify the behavior of the GUI Designer:

1. Select **Window** > **Preferences**. The **Preferences** window appears.
2. Select the **Progress OpenEdge** > **AppBuilder** node. The **AppBuilder options** page appears with settings for behavior when double-clicking an object, default function data type, and display of Progress Advisors. See also AppBuilder preferences on page 559.
3. Expand the **AppBuilder** node to select from the following pages:
   - **Editor** - Options for how AppBuilder-generated code must appear in the ABL Editor
   - **Grid Units** - Options to set grid display options of the designer window
   - **Widget ID** - Options to set Widget ID options
4. Once you have made changes to the AppBuilder preference settings, click **Apply** to save your changes.

Note: Click **Restore Defaults** to reset AppBuilder preferences to their default values.

See also

Access the AppBuilder perspective on page 530
Preferences page on page 559

Set AppBuilder properties

You can use the AppBuilder Properties page to you to set the behavior of the ABL GUI procedure (`.w`) files in the currently selected OpenEdge project.

To set the AppBuilder project properties:

1. In the Project Explorer view, right-click on your project, and then select **Properties** from the right-click context menu. The **Properties** page appears.
2. Select **Progress OpenEdge** > **AppBuilder**. The **AppBuilder Properties** page appears. The AppBuilder Properties page provides the following:
   - General information related to database
   - Character Terminal Simulator color
3. Make the changes as required, and click **OK**.

See also

Access the AppBuilder perspective on page 530
Set AppBuilder preferences on page 530

Create an AppBuilder project

To create an OpenEdge project specialized for AppBuilder application development:

1. Select **File** > **New** > **OpenEdge Project** from the Progress Developer Studio for OpenEdge main menu bar or the **Project Explorer** view context (right-click) menu. The New OpenEdge Project wizard opens and displays the Create an OpenEdge Project page on page 71.
2. Type a name in the **Project name** field.

   The root folder for the new project is created in your current Eclipse workspace, unless you specify a different location.
3. To choose a different location for the project, click and clear the **Use default** check box. Then either browse to, or enter the path to the desired location.
4. Select **Client** from the left section.
5. Select the **Desktop Application** option button and select the **AppBuilder** option button.
6. Click **Next**. The Select AVM and layout options page on page 72 appears.
7. Specify the OpenEdge AVM options and the Project layout options (or leave the default settings) and click **Next**. The Define PROPATH page on page 74 appears.
8. Leave the default settings or modify the PROPATH entries to be used by the project and click **Next**. The Select database connections page on page 74 appears.
9. Select the database connections to be used by the project and click **Finish**.

You will see your project and its resources in the **Project Explorer** view.

See also

Create a new OpenEdge project on page 58
Create an OpenEdge Project page on page 71
Project Facets page on page 75
Select AVM and layout options page on page 72
Define PROPATH page on page 74
Select database connections page on page 74

Work with AppBuilder procedure files

The ABL UI Designer editor is the default design editor and ABL Editor is the default source editor for the valid procedure `.w` files. The valid `.w` files means the procedure files which are created using the standalone AppBuilder or GUI Designer using OpenEdge AppBuilder perspective in Progress Developer Studio for OpenEdge.

Note: You must be in the OpenEdge AppBuilder perspective to work with the `.w` files created in the GUI Designer or standalone AppBuilder application.

The procedure `.w` files created with the GUI Designer or standalone AppBuilder are indicated with an AppBuilder  icon in the Project Explorer view.

Note: There may be `.w` files in an OpenEdge project that are not created using the GUI Designer or standalone AppBuilder. Such `.w` files do not open with the GUI Designer editor, instead open with the ABL Text editor.

Create ABL GUI procedure files

The **New ABL UI Design** wizard allows you to create ABL GUI procedure files in your OpenEdge project. These files have the file extension as `.w`.

To create a new ABL GUI procedure (`.w`) file:

1. Do one of the following:
   - From the **File** > **New** New menu, select **Other**.
   - In the **Project Explorer** view, right-click a project and then select **New** > **Other**.

   The **Select a Wizard** dialog appears.
2. In the **Wizards** field, type ABL UI Design.

   Note: The **ABL UI Design** type is present under the **Progress OpenEdge** > **AppBuilder** node.

   ---

3. Click **Next**. The **New ABL UI Design** wizard appears.
4. By default, the **Container** field displays the selected project under which the new file is created. If you want to add the new procedure file to another project, do the following:

a) Click **Browse** to open the **Folder Selection** dialog.

b) From the **Select new file container** list, select a project.

c) Click **OK**.

5. Do one of the following:

   - From the **Object Type** list, select a container or **SmartObject** type.

     Note: If you select a non-supported template, a warning message appears stating: Selected template is not supported in Progress Developer Studio. The wizard will be started outside of the workbench when you press **Finish**. Go to step 8 on page 533 .

   - If you want to create the new ABL procedure file using a template, then click **Template**: the **Choose Other Template** dialog appears. The selected template is added to a **Template** node. See Choose Template dialog on page 631 dialog.

   The **Template** field displays the relative path and the **Description** field provides a description of the object type you select from the list.

6. In the **File name** field, enter a name for the ABL GUI procedure file or accept the default name.

7. Do one of the following:

   - If you have selected a regular container template, go to 8 on page 533.
   - If you have selected a SmartObject template, click **Next** and follow the wizard.

8. Click **Finish**.

   This creates the ABL GUI procedure file and adds it to the selected OpenEdge project.

See also

Work with AppBuilder procedure files on page 532
Run ABL procedure files on page 552
Choose Template dialog on page 631

Open ABL GUI procedure files

You can open an existing ABL GUI procedure (`.w`) file with the ABL UI Designer or ABL Editor.

To open an ABL GUI procedure (`.w`) file:

1. In the **Project Explorer** view, right-click a procedure file name and select **Open With** from the context menu.

2. Choose one:

   - **OpenEdge ABL Editor** to display the source code.
   - **ABL UI Designer** to display the design editor.

   Alternatively, you can simply double-click the procedure file in the Project Explorer view. Progress Developer Studio for OpenEdge opens the procedure file either in a ABL UI Designer editing window or in the ABL Editor, whichever you last selected when opening the file with the **Open With** command. If you have not previously used **Open With** for the file, by default it opens in the ABL UI Designer.

Note: You cannot open multiple instances of the same file in the ABL UI Designer.

See also

Create ABL GUI procedure files on page 532
Run ABL procedure files on page 552

Edit ABL procedure files

A `.w` file opened in the AppBuilder is displayed graphically in the GUI Designer design canvas. In addition, the code within the `.w` file is displayed in the ABL editor. The ABL editor allows full editing of the valid `.w` file. The textual and graphical views of the `.w` file are synchronized.

A modified marker * appears on both the views when you make a change in any of the view. The changes are synchronized when you switch views, and when you save the file. Thus, changes that you make in one view are immediately reflected in the other.

Synchronization is not performed immediately. The synchronization is performed when:

- Focus changes from the design window to view source editor.
- The ABL Editor loses focus.

It is possible that an analyzer error or a syntax error in the ABL Editor might make synchronization with the AppBuilder impossible. In this case, the window corresponding to the `.w` file in the AppBuilder closes. It is no longer valid, and cannot be modified. However, you can still use the ABL Editor to edit the `.w` file.

Once the file in the ABL Code Editor is updated, and synchronization takes place, the AppBuilder tries to load the `.w` file and the window opens if there are no errors.

The **Edit** > **Undo** feature or the local history feature can be used to recover a version of the file that will not cause an error while loading in the AppBuilder.

See also

Create ABL GUI procedure files on page 532
View and edit the source code on page 543

Work with ABL procedure files

The GUI Designer editor is the default editor for the procedure `.w` files created with the GUI Designer or standalone AppBuilder application. This editor is used to edit the ABL code of these valid `.w` files.

Note: You must be in the OpenEdge AppBuilder perspective to work with the `.w` files created in the GUI Designer or standalone AppBuilder application.

The `.w` files created with the GUI Designer or standalone AppBuilder are indicated with an **AppBuilder**  icon in the Project Explorer view.

There can be `.w` files in an OpenEdge project that are not created using the GUI Designer or standalone AppBuilder. Such `.w` files do not open with the GUI Designer editor, instead open with only the ABL Text editor.

Opening `.w` files

Open `.w` files by using one of the following methods:

- Drag and drop the .w file from the Project Explorer view onto the GUI Designer window.
- Double-click on a .w file in the Project Explorer view.
- Choose **File** > **Open** from the main menu in the OpenEdge AppBuilder perspective.

See View and edit the source code on page 543.

Editing .w files

A .w file opened in the AppBuilder is displayed graphically in the GUI Designer design canvas. In addition, the code within the .w file is displayed below the design canvas in the GUI Designer editor. The editor allows full editing of the .w file. The textual and graphical views of the .w file are synchronized. A change in one view causes a change in the other view.

Synchronization is not performed immediately. The synchronization is performed when:

- Focus changes from the AppBuilder to the ABL Editor.
- The ABL Editor loses focus.

It is possible that an analyzer error or a syntax error in the ABL Editor might make synchronization with the AppBuilder impossible. In this case, the window corresponding to the .w file in the AppBuilder closes. It is no longer valid, and cannot be modified. However, you can still use the ABL Editor to edit the .w file.

Once the file in the ABL Code Editor is updated, and synchronization takes place, the AppBuilder tries to load the .w file and the window opens if there are no errors.

The **Edit** > **Undo** feature or the local history feature can be used to recover a version of the file that will not cause an error while loading in the AppBuilder.

Note: Currently, templates for adding procedures, functions and triggers to .w files are not available. However, the .w files can be edited as long as the new code follows the structure of a .w file. In addition, there is an **Insert** > **Trigger** option available from the **Edit** menu in AppBuilder.

Saving .w files

You can save a file opened in the AppBuilder by selecting **File** > **Save or File** > **Save As** from the **AppBuilder** menu bar. If the file is part of a project, the **Save** and **Save As** operations map to the **Save** and **Save As** options in Progress Developer Studio for OpenEdge . You can also use the **Save** and **Save As** options directly from within Progress Developer Studio.

If a file opened in the AppBuilder is not a project file, the **Save** and **Save As** options can be used to save the file into the project directory.

Running a .w file

You can run a .w file by clicking the **Run** button  on the AppBuilder main window or  on the Progress Developer Studio for OpenEdge toolbar.

When you use the AppBuilder **Run** button, AppBuilder runs whatever file has focus in the design window. It runs the file just as you see it in the design window, even if the file has not been saved.

When you select **Run** from the Progress Developer Studio for OpenEdge toolbar, Progress Developer Studio runs the last saved version of whatever file has focus in the code editor. To run a file from the Progress Developer Studio toolbar that was changed in the design window, you have to save the file in the code editor.

Closing .w files

A project file opened in the AppBuilder can be closed either from the AppBuilder or from the ABL Editor.

Work with objects

You can work with objects in multiple ways:

- Access property sheets on page 536
- Use the Undo and Redo options on page 536
- View and edit code of an object on page 536
- Choose objects for the design window on page 537
- Define properties and appearance on page 538

Access property sheets

There are two basic ways to access the **Property Sheet** dialog for a selected object:

- Double-click the selected object. You must set the AppBuilder preferences on page 559 to open the **Property Sheet** dialog on double-clicking an object.
- Select an object in the design window, and then click **Property Sheet**  icon on the toolbar.

For more information, see Property Sheet dialogs on page 578

Use the Undo and Redo options

You can undo any editing changes that you perform on the design window, and you can redo any changes that you have previously undone.

To undo a move, resize, align, or delete performed on an object in the design window, select **Undo** from the **Edit** menu or press `Ctrl+Z`. To redo an action, select **Redo** from the **Edit** menu or press `Ctrl+Y`.

The undo or redo changes are specific to the current design window. To undo or redo the actions, you must have focus on the design window.

Note: Only editing actions that have occurred since the most recent save operation can be undone and redone; you cannot use **Undo** to return to a state earlier than the latest saved version of the file. To revert to an earlier saved version, right-click the class file in the **Project Explorer** view and select **Replace With** > **Local History** from the context menu.

For more information, see Choose objects for the design window on page 537.

View and edit code of an object

You might want to view the code section of an object instead of the complete code of the (`.w`) procedure file, when working with objects on the design window. This will be useful when you want to quickly add or edit a function, procedure, or trigger to an object.

Note: You cannot edit the auto-generated code of an AppBuilder file. The auto-generated code is read-only. See Read-only code sections of AppBuilder-generated code on page 523.

To view the code section of an object, double-click the object on the design window. The source view opens with the focus to the default trigger or event defined for the selected object. You can edit it.

If there is no trigger defined for an object, a default trigger section is created. You can define a trigger for an object.

Note: You must set the preferences to **Edit source code** in the **AppBuilder Preferences** page to open source view when you double-click an object. See AppBuilder preferences on page 559.

Alternatively, you can use the Outline view to go to specific places in the code. See Outline view on page 683.

See also

View and edit the source code on page 543
Rename an internal procedure or function on page 545
Use the Find/Replace dialog on page 547
Add Function wizard on page 350
Add Procedure wizard

Choose objects for the design window

This topic explains how to populate an ABL UI Designer with objects.

Add objects to the design window

Placing objects on the design window

There are several ways to place the objects from the **Object Palette** onto the design window:

- **Clicking** — Select an object in the **Palette** and click once on the design window at the required position to place an instance of the object as it default size.
- **Double-clicking** — Double-click an object on the **Palette** to add an instance of the object at its default size. The new object overlaps the last object that you operated on, if applicable, or appears at the top left corner of the design window. You will need to click **Pointer** icon in the **Palette** to be able to select other object in the **Palette**.
- **Drawing** — Select a basic object or **OCX** control on the **Palette**, point to the desired position on the design window, and draw a rectangular outline of the size and shape you want the object to have. When you release the mouse button, an instance of the object appears, occupying the outlined area.
- **Copying/cutting and pasting** — Click the **Pointer** tool on the **Palette** to activate selection mode. Then select one or more objects on the design window, copy or cut them, and paste new instances onto the design window. The Copy (`Ctrl+C`), Cut (`Ctrl+X`), and Paste (`Ctrl+V`) commands are available on the **Edit** menu. This option only works with basic objects and **OCX** controls.

Placing controls inside a container control

In general, when you place an object on the design window, the object becomes a child object of the design window. Certain controls (for example, the Frame object), however, can contain other objects; in such cases, the Frame object is the parent of the child objects placed within it.

Note: Deleting the parent object deletes all its child objects placed within it.

Placing database objects

To place database objects on the design window, select Table Selector dialog on page 632, Query Builder Dialog Box -- Join Mode on page 636, and/or Query Builder Dialog Box -- Join Mode on page 636 objects from the Widgets section in the Palette.

Placing pop-up menu or menu bar

Use the **Popup Menu** or **Menu Bar** dialog to create a pop-up menu or menu bar for a selected object. See Insert Popup Menu or Menu Bar on page 552.

Placing OCX controls

Use the **OCX** icon from the **OCX** section in the **Palette** to add **OCX** controls to the design window. See Choose Control dialog on page 631.

Placing SmartObjects

Use the **Open SmartObject** dialog to insert **SmartObject** instances on the design window. See Insert SmartObjects on page 551.

See also

Choose objects for the design window on page 537
Object Palette on page 562

Delete objects from the design window

To delete one or more objects from the design window, select them on the design window and press the **Delete** key. Alternatively, right-click on the design window and select **Delete** from the context menu.

When a control is deleted from the design window:

- If it is a container control, any child controls that it contains are also deleted.
- All code related to a deleted control is removed from the `.w` procedure file.

Note: If you want to restore a deleted object, select **Undo** option from the **Edit** menu

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For more information, see Choose objects for the design window on page 537

Define properties and appearance

This topic explains the techniques available for editing the appearance and behavior of the objects that have been placed on the design window.

Edit object properties

Each ABL object has its set of properties. You can modify the properties of a selected object using the **Property Sheet** dialog.

To edit the object properties:

1. Select an object on the design canvas, and click **Property Sheet**  icon on the GUI Designer toolbar. The **Property Sheet** dialog for the selected object appears.
2. Make the necessary changes to the object properties. See Property Sheet dialogs on page 578.
3. Click **OK**.

See also

Access property sheets on page 536
Property Sheet dialogs on page 578

Change color of an object

Use the **Choose Color** dialog to change the background and foreground color of the design window or an object.

To change the color:

1. Do one of the following:
   - Click the **Color**  icon from the GUI Designer toolbar.
   - Double-click an object on the design window to change the color of an object, and then click the **Color** icon on the **Property Sheet** dialog.

   The **Choose Color** dialog appears.
2. Select the foreground and background colors on the **Choose Color** dialog.
3. Click **OK** to save your changes.

Note: For more information, see Choose Color dialog on page 629

Change font for an object

To edit font for an object, follow these steps:

1. In the design window, double-click on the object whose font you want to modify. The objects **Property Sheet** dialog appears.

   Note: Ensure that the **Open object properties** dialog option is selected in AppBuilder preferences page to open the object's **Property Sheet** dialog on double-clicking an object. See AppBuilder preferences on page 559.

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2. Click **Fonts**  icon. The **Choose Font** dialog appears.
3. From the available fonts list, select a font.

   Note: You can customize an available font, by selecting the font and clicking **Edit**. Font zero through seven are OpenEdge reserved fonts. You can customize only fonts eight through 255.

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4. Click **Save Font Settings** to save custom font selections for future sessions.
5. Click **OK** to close the **Choose Font** dialog.
6. Choose **OK** to close the object's **Property Sheet** dialog.

   The object now displays the font you selected.

See also

Define properties and appearance on page 538
Choose Font dialog on page 630

Create an Alternate Layout

The **Alternate Layout** dialog is used to create and maintain layouts. Standard layout is an alternate layout with pre-defined run-time expressions.

To create an alternate layout:

1. Open a valid procedure file (`.w`) from the Project Explorer view.
2. Select **Alternate Layout** from the Layouts menu. The **Alternate Layout** dialog appears.
3. Do one of the following:
   - Select a standard layout from the **Layout** drop-down. Standard layout is an alternate layout with pre-defined run-time expressions.
   - If you want to create a new layout, click **New**. The **New Layout Name** dialog appears. Enter a name for the layout in the **New Layout Name** field.
4. Click **OK**. The **Alternate Layout** dialog reappears.
5. Do one of the following:
   - Select **GUI** to display the layout as graphical at design time.
   - Select **Character** to display the layout as character at design time.
6. Select the **Activate Layout** check box to activate the new alternate layout.

   Note: The **Activate Layout** option does not appear when you select layout type as Master Layout from the **Layout** drop-down in step-2.

7. Do one of the following:
   - If you want to test a run-time expression, enter the run-time expression in the **Run-time Expression** field. Click **Check Syntax** to check the syntax of the expression.
   - If you do not want to test a run-time expression, select the **Don't use Run-time Expression** check box.

   Note: Any legal expression is acceptable, as long as it resolves to a LOGICAL value. However, if you use a character string within the expression, place the string in single quotes (' ') not in double quotes (" "). If you need to use embedded quotation marks, replace the quotation marks with the tilde (~) character. This convention helps the AppBuilder generate code that avoids Compiler ambiguities.

8. Enter a comment in the **Comment** field. This describes the alternate layout.
9. Click **OK** to save your changes.

   The GUI Designer reloads your design window. The name of the alternate layout appears on the top of the design window.

See also

Select standard or alternate layout on page 541
Layout menu options on page 569

Select standard or alternate layout

To select a standard or alternate layout:

1. Open a procedure file (`.w`) in an OpenEdge project from the **Project Explorer** view.
2. Select **Alternate Layout** from the **Layouts** menu. The **Alternate Layout** dialog appears.
3. Select one of the following:
   - **Standard layout** — If you select a standard layout, you cannot change the expression or name of the layout.
   - **Alternate layout** — If you select a user defined alternate layout, you can modify the expression and name.
4. Click **OK** to save the changes.

See also

Create an Alternate Layout on page 540
Layout menu options on page 569

Align objects

Use the Align submenu to align basic objects and SmartObject instances in the design window. Align function works only on selected objects or SmartObject instances that are parented to a common object.

To align objects:

1. In the design window, select an object or group of objects.
2. Select **Align** from the **Layout** menu. The **Align** submenu appears.
3. Select any of the following options:

Colons	Aligns the label colons (:) of the selected basic object or SmartObject instance.
Left Sides	Aligns the left sides of the selected basic object or SmartObject instance to the left edge of the leftmost basic object or instance.
Vertical Centers	Aligns the vertical midpoints of all selected basic objects and SmartObject instances.
Right Sides	Aligns the right sides of the selected basic object or SmartObject instance to the right edge of the rightmost basic object or instance.
Top Edges	Aligns the selected object or SmartObject instances to the top edge of the topmost basic object or instance.

Horizontal Centers	Aligns the horizontal midpoints of all selected objects and SmartObject instances.
Bottom	Aligns the selected basic object or SmartObject instance to the bottom edge of the bottom-most basic object or instance.

See also

Work with objects on page 536
Layout menu options on page 569

Set tab order

The **Tab Editor** dialog is used to change the tab order of an object in a selected frame. The Tab Editor lists the tab order of tabbable objects which are child objects of the selected frame, and allows you to change the order.

You can change the tab order of objects within a child frame by selecting the child frame before opening the Tab Editor.

Note: The Tab Editor does not support dynamic objects (ABL widgets that you create with the CREATE Widget statement). You must use the appropriate ABL methods and attributes to program the tab order of dynamic widgets at run-time.

To change the tab order of objects:

1. Open **Tab Editor** by doing one of the following:
   - Select **Tab Order** from the Layout menu.
   - Click **Tab Order** icon in the object's **Property Sheet** dialog.
   - Right-click the object and select **Tab Order** from the context menu.
2. Select a tabbing option on the Tab Editor dialog on page 574.
3. Click **OK** to save the changes.

See also

Work with objects on page 536
Tab Editor dialog on page 574
Layout menu options on page 569

Select translation attributes for an object

The **String Attributes** dialog helps you to set translation attributes for the selected object.

Translation attribute is specifying the translation format characteristics (justification and maximum length) for an object's label, title, help, or display format. The OpenEdge Translation Manager uses these settings when translating the character string into another language.

To set translation attributes for an object:

1. From the object's **Property Sheet** dialog, click the **Translation Attributes**  icon. The **String Attributes** dialog appears.
2. Specify an attribute value for the object's characteristics such as Label.

   Note: The attribute must have one of L, R, T, or C and/or a U and/or one integer value. For example, R1 as the attribute value for Label.

3. Click **OK** to save your changes.

   Note: For more information, see String Attributes dialog on page 657

Resize the design window

You can control or define the size of the design window in either of two ways:

- Click and drag the arrow handles located on the right and bottom edges of the design window.
- To set precise dimensions in pixels, enter the height and width values in the **Property Sheet** dialog. See Property Sheet for Window on page 578.

See also

Open ABL GUI procedure files on page 533
Work with objects on page 536

Work with the code

You can work with code in multiple ways:

- View and edit the source code on page 543
- Add triggers on page 544
- Rename an internal procedure or function on page 545
- Use the Outline view on page 546
- Toggle to the Section Editor mode on page 546
- Use the Find/Replace dialog on page 547
- Select a display color for the read-only code on page 548

View and edit the source code

The OpenEdge ABL Editor is the default design editor for a valid procedure `.w` files. The valid `.w` files are the procedure files that are created using GUI Designer or standalone AppBuilder. This editor is used to edit the ABL code of such valid (`.w`) files.

Note: You cannot edit the auto-generated code of an AppBuilder file. The auto-generated code is read-only. See Read-only code sections of AppBuilder-generated code on page 523.

To display the source code editor while editing a design window in the ABL UI Designer, do one of the following:

- Select the **View Source**  icon from the toolbar.
- Press F9.
- Right-click in the design window, and then select **View Source** from the context menu.

This displays the source code of the complete procedure file. If you want to view only the section of the code of an object, see View and edit code of an object on page 536.

Conversely, to display the design window while editing the source code, do one of the following:

- Right-click in the design window and select **View Design** from the context menu.
- Press Shift+F9.

An asterisk * icon appears on the design view and the source view (if opened), when you make changes to either of the views. The changes are synchronized when you switch between the design canvas and the source view, and when you save the file. Thus, changes that you make with either editor are immediately reflected in the other.

Once you have opened the procedure file in either the source editor or design window, it remains open in that editor until you explicitly close it.

Note: When editing the code in the source view, make sure that you do not introduce errors in the UI code. It is advisable to use the design window for all changes to the UI, and edit only application logic in the source editor.

See also

Code analysis in GUI Designer on page 522
Code conventions to generate AppBuilder code on page 523
Edit ABL procedure files on page 534
Add Function wizard on page 350
Add Procedure wizard on page 353

Add triggers

The **Add Trigger** dialog helps you to associate an event (also called as a trigger) with an object in the AppBuilder (.w) file. An event is an action associated with a trigger and on an object.

Note: The **Add Trigger** option is available only with the AppBuilder (.w) files.

To add trigger for an object:

1. Open the .w procedure file in the ABL Editor.
2. Open the **Add Trigger** dialog by doing one of the following:
   - From the **Source** menu, select **Add Trigger**.
   - From the right-click context menu, select **Source** > **Add Trigger**.

   The **Add Trigger** dialog appears.
3. From the **Widget** drop-down, select an object. This drop-down contains all the objects that are present in the current design window.

4. From the **Event category** drop-down, select an event category. For details on the event categories, see Add Trigger dialog on page 633.
5. If you select an event category other than **Keyboard Event** from the **Event category** drop-down, go to step 6 on page 545. If you select **Keyboard Events** as the event category, follow these steps:
   a) In the **Key label** field, enter a label for the keyboard event such as **F1** or **F2**.
   b) The **Key function** displays the pre-defined function associated with the key label such as **Help** for **F1** or **GO** for **F2**. If there is no pre-defined function associated with the **Key** label, then the same key label text is displayed in the **Key** function field.
   c) For the **Generate code by** option, select either **Key** function or **Key** label.
   d) Go to step 7 on page 545.
6. From the **Event** drop-down, select an event. This drop-down contains all the events based on the object and event category you have selected.
7. Click **Generate**.

   The ABL Editor inserts the trigger code for the selected object in the (`.w`) procedure file.

See also

Adding functions on page 281
Adding procedures on page 282
Add Trigger dialog on page 633

Rename an internal procedure or function

The **Rename** option allows you to rename an internal procedure or function which is defined in an AppBuilder (`.w`) procedure file. You can rename only a user-defined function or procedure. This option is applicable only with an AppBuilder (`.w`) procedure file.

While renaming a function or procedure, you must follow these rules:

- Name must be alphabetic or alpha-numeric.
- Name must start with an alphabet (Name cannot start with numeric or special character).
- Name cannot include special characters.

Note: You cannot rename a function or procedure which is auto-generated by AppBuilder.

To rename an internal procedure or function:

1. Open an AppBuilder (`.w`) procedure file with the ABL Editor.
2. Select a function or procedure name that you want to rename, and then right-click on the selection.
3. Do one of the following:
   - From the right-click context menu, select **Refactor** > **Rename**.
   - From the **Source** menu, select **Refactor** > **Rename**.

   Note: The function or procedure name is highlighted with a message stating as: Enter a new name, and press **Enter** to rename.

   ---

4. Enter a name in the selection area.
5. Press **Enter**.

   All the references of the selected function or procedure are updated with the specified name, including the instances which are part of the read-only code sections.

See also

View and edit the source code on page 543
Use the Find/Replace dialog on page 547

Use the Outline view

You can use the Outline view to easily navigate to a specific place in the code or widget in the design window. This view shows a tree view of the widgets or structural code elements of your AppBuilder procedure (`.w`) file that is currently open.

Note: If the Outline view is not visible in the OpenEdge AppBuilder perspective, open it by selecting **Window** > **Show View** > **Outline**.

The Outline view displays elements depending on the currently open view of your procedure file, such as:

- When you work with source, this view lists all the structural elements of the procedure file such as Definitions, Main Block, Variables, Triggers, Procedures, Function Prototypes, and Function Implementations.
- When you work with UI designer, this view lists all the widgets present in the design window in a hierarchical tree structure. For example, Frame widget is shown as the parent node and all the widgets added to the Frame widget as its child nodes.

To navigate using the Outline view:

- Do one of the following:
  - Click on a node to take you to the corresponding location in the code or design window.
  - Double-click a widget to open its **Property Sheet** dialog. See AppBuilder preferences on page 559 to set to open **Property Sheet** dialog when you double-click an object.

See also

Access the AppBuilder perspective on page 530
Open ABL GUI procedure files on page 533
Outline view on page 683

Toggle to the Section Editor mode

The Section Editor mode enables you to view a block of code of an AppBuilder (`.w`) procedure file while navigating to specific places in the code in the Outline view, instead of displaying the entire code of the procedure file.

Note: The Outline view is not available with the design view. The Outline view lists all the structural elements of a procedure file only when the file is opened with the ABL Editor.

To toggle the Section Editor mode:

1. Open an AppBuilder procedure (.w) file in the ABL Editor.
2. In the Outline view, click the **Section Editor Toggle**  icon.

See also

Outline view on page 683
View and edit code of an object on page 536

Use the Find/Replace dialog

The **Find/Replace** dialog allows you to search and replace a string in the current (.w) procedure file. This option works in both the View Source and Section Editor modes.

When working in the Section Editor mode, the search is limited to only the code section that is open. The search does not run through the complete code of the procedure file.

Note: You can search for a string through both the read-only and editable code of an AppBuilder file, but the replace options are available only with the editable sections of the code.

To use the find and replace option:

1. Open an AppBuilder procedure (.w) file in the source view.
2. Open the **Find/Replace** dialog by doing one of the following:
   - From the main menu, click **Edit** > **Find/Replace**.
   - Press CTRL+F.

   Note: The **Find/Replace** option is not available with the read-only or auto-generated code sections of the AppBuilder procedure file.

   The **Find/Replace** dialog appears with a list of search and replaces options.
3. In the **Find** field, enter a search string. This is an instance of code or text you want to search in the procedure file.

   Note: You can also select text in the procedure file, and then click CTRL+F. The **Find/Replace** dialog appears with the selected text in the **Find** field.

   ---

4. In the **Replace with** field, enter a replacement string. This is the code or text you want to use to overwrite one or all instances of the search string.
5. In the **Direction** section, select one of the following:
   - **Forward** — to search from the insertion point to the end of the file.
   - **Backward** — to search for the string from the insertion point toward the beginning of the file.
6. In the **Scope** section, select one of the following:
   - **All** — to search the entire/through all the code sections in a procedure file.
   - **Selected lines** — to search in a selected section of code in a procedure file.
7. In the **Options** section, select any of the following check boxes:

- **Case sensitive** — to search only occurrences of the text that match the case of the string specified in the **Find** field.
- **Wrap search** — to continue searching from the beginning to the end of the file, once it reaches the end (depending on the search direction).
- **Whole word** — to look for the entire specified search string.
- **Incremental** — to progressively search and filter through text in the active editor. As you type the search expression, it will incrementally jump to the previous exact match in the active editor.
- **Regular expressions** — to search using wildcards or regular expressions. If you select this check box, you can specify whether the search will include wildcards or regular expressions, in the **Find** field.

8. Click **Find** to start searching for the string specified in the **Find** field. After an item is found, click one of the following buttons:

   - **Replace** — to replace only the current instance of search string.
   - **Replace/Find** — to replace the current occurrence of the search string and find the next occurrence.
   - **Replace All** — to replace all occurrences of the search string in the current (`.w`) procedure file.

9. Click **Close**.

See also

View and edit the source code on page 543
Rename an internal procedure or function on page 545
Toggle to the Section Editor mode on page 546

Select a display color for the read-only code

The **Colors** page allows you to change the background color of the AppBuilder-generated read-only code sections in the ABL Editor.

To change the background color of the AppBuilder-generated read-only code:

1. Access the **Color** page by following these steps:
   a) From the main menu, select **Window** > **Preferences** . The **Preferences** window appears.
   b) Select **Progress OpenEdge** > **AppBuilder** > **Editor**. The **Editor** page appears.
2. Click the color icon beside the **Read-only code background color** option. The **Color** dialog appears.
3. Do one of the following:

   - Select from the list of available basic or custom colors.
   - Click **Define Custom Colors** to define a custom color from the color palette.

4. Click **OK** to save your changes.

See also

Read-only code sections of AppBuilder-generated code on page 523
Editor preferences on page 560

Work with objects Palette

Choose the Palette docking position

By default, the Palette is docked at the right edge of the ABL UI Designer editing area. You can choose to dock the Palette at the right or left edge of the ABL UI Designer, as needed.

To specify a docking position for the Palette, right-click on the Palette title and select **Dock On** > **Left** or **Dock On** > **Right** from the context menu.

Alternatively, you can drag-and-drop the Palette on either the right or left edge of the ABL UI Designer editing area.

Note: The specified docking position will be persistent the next time you open Progress Developer Studio for OpenEdge.

See also

Work with objects Palette on page 549
Object Palette on page 562

Change the Palette settings

The Palette Settings dialog enables you to modify the display of the objects in the Palette.

To change the Palette settings:

1. Right-click on the Palette and select **Settings** from the context menu. The **Palette Settings** dialog appears.
2. Click **Change** to open the **Font** dialog. This dialog allows you to change the font of the controls available on the Palette.

   Note: If you want to restore the default font settings for the Palette controls, select **Restore Defaults**.

   ---

3. Select the layout type for the **Palette** options from the **Layout** section.
4. Select **Use Large Icons** check box to increase the size of the controls available on the Palette.
5. Select the drawer type from the Drawer options section. The drawer options allow you to set the layout of the sections (Widgets, OCX, and SmartObjects) in the Palette. The following options are available:

   - Always close when opening another drawer
   - Close automatically when there is not enough room
   - Never close

6. Click **OK**.

See also

Work with objects Palette on page 549
Choose Palette layout on page 550
Object Palette on page 562

Choose Palette layout

You can change the layout of the **Object Palette** by specifying how the widgets must appear in the **Palette**.

To choose a layout:

1. Right-click on the **Object Palette**.
2. From the right-click context menu, select **Layout**. The following layout options are available:
   - **Columns** — select to display the objects in a column format.
   - **List** — select to display the objects in a list format.
   - **Icons Only** — select to display the objects as only icons without the names of the objects.
   - **Details** — select to display the objects in bold.

Note: Alternatively, you can change the layout of the **Object Palette** using **Palette Settings** dialog. See Change the Palette settings on page 549.

See also

Work with objects Palette on page 549
Object Palette on page 562

Customize the Object Palette

In addition to providing a variety of display options for the **Object Palette**, the AppBuilder allows you to customize the **Palette** contents using custom object files.

The custom object file is an external text file in which you define custom objects using a specific syntax. Custom object files have `.cst` extension in their filenames. OpenEdge includes default custom object files for you to use such as `progress.cst`, `smart.cst`, `activex.cst`, and `shared.cst`. These files reside at `DLC/src/template`.

However, you can create your own custom object files, and add them to the **Object Palette**. For example, if you create new **SmartObject** templates, you can add them to the **Object Palette**. You can also change certain default settings for the standard **SmartObject** templates.

The **Use Custom** dialog allows you to add to or modify the files that determine the **Object Palette's** behavior and appearance.

To customize the **Object Palette**:

1. Right-click on the **Object Palette**, and then select **Use Custom** from the context menu. The **Use Custom** dialog appears which allows you to perform the following:
   a) Click **Add** to add a custom object file.
   b) Click **Modify** to modify an existing custom object file.
   c) Click **Remove** to delete an existing custom object file from the list.
   d) Click **Move Up** or **Move Down** to change the order of a selected custom object file in the list.
2. Click **OK** to save your changes.

Note: The Object's Palette behavior and appearance changes based on the modifications you have done.

See also

Add custom object files on page 554
Modify custom object files on page 554
Use Custom dialog on page 564

Work with PRO*Tools

Add user-defined utilities

In the standalone AppBuilder, you can add any user-defined executable ABL program using `protools.dat`. The `protools.dat` file contains all the programs information to display the **PRO*Tools** palette in the standalone AppBuilder. Any modifications to the `protools.dat` file will not be available with AppBuilder in Progress Developer Studio for OpenEdge.

Alternatively, you can add any user-defined executable ABL program as a menu/toolbar action in Progress Developer Studio for OpenEdge, using **OpenEdge Customization Editor**. You can access **OpenEdge Customization Editor** by selecting the menu: **OpenEdge** > **Tools** > **Customization Editor**.

For more information on adding a menu/toolbar item using **Customization Editor**, see Use the Customization Editor on page 754 and Menu/Toolbar Entries or Editor Context Menu on page 765.

Note: Any new `PRO*Tools` utility added in Progress Developer Studio for OpenEdge will not be available with standalone AppBuilder.

For more information, see PRO*Tools utilities on page 571

Show or hiding toolbar buttons and menu items

You can show or hide the AppBuilder and PRO*Tools actions which are visible on the toolbar and from the menu in your project perspective, using the **Customize Perspective** dialog.

You can access the Customize Perspective dialog from the menu by clicking **Windows** > **Customize Perspective**. Use the **Tool Bar Visibility** and **Menu Visibility** tabs in the dialog to hide or show the toolbar buttons and menu items visible in your project perspective.

See also

Work with PRO*Tools on page 551
Toolbar and menu options on page 568
PRO*Tools utilities on page 571

Insert SmartObjects

The **Open SmartObject** dialog allows you to select SmartObject master on page 527 to use to create a SmartObject instance on page 527 to insert on the design window.

To build a SmartObject, using the **Open SmartObject** dialog, create a SmartObject instance, insert the SmartObject instance into a SmartContainer, and link the SmartObject to other SmartObjects, as needed.

To create SmartDataBrowsers, SmartDataObjects, and SmartDataViewers:

1. From the **File** menu, select **New** > **Other**.

   The **New** wizard appears.

2. From the list, select **ABL UI Design** as the file type in the **Progress OpenEdgeAppBuilder** node and click **Next**.

   The **New ABL UI Design** wizard appears.

3. From the **Object Type** list, select the object you want to create.

4. Click **Finish** and follow the wizard.

   The selected Smart object is created and opens with the design window.

See also

Create ABL GUI procedure files on page 532
SmartObjects on page 566
Open SmartObject dialog on page 663

Run ABL procedure files

Progress Developer Studio for OpenEdge provides support for running and debugging ABL procedure (`.w`) files using launch configurations. A launch configuration determines the characteristics of the ABL Virtual Machine (AVM) session in which the program runs. See Run and Debug ABL Programs on page 451.

To run an ABL procedure (`.w`) file:

1. Open a procedure (`.w`) file that you want run with ABL UI Designer. See Open ABL GUI procedure files on page 533.

2. Do one the following:

   - Run the currently selected procedure file by clicking **Run**  on the toolbar.
   - Launch the Progress Developer Studio for OpenEdge Debugger and debug the current procedure file by clicking **Run**  on the toolbar.

See also

Run and Debug ABL Programs on page 451
Create ABL GUI procedure files on page 532
Run or debug a program on page 461

Insert Popup Menu or Menu Bar

The **Popup Menu** or **Menu Bar Property Sheet** dialogs allow you to create pop-up menu or menu bar for a selected object.

To create a pop-up menu or menu bar:

1. Double-click an object for which you want to create a menu. The **Property Sheet** dialog for the selected object appears.
2. Choose the **Popup Menu**  icon or the **Menu Bar**  icon on the object **Property Sheet** dialog. The **menu Property Sheet** dialog for that object appears.
3. In the **Title** field, enter a title for the menu.
4. In the **Label** field, enter a name for the menu.

   Note: The other fields are optional. You can edit the attributes on this dialog, if required.

5. Click **OK**.

See also

Create ABL GUI procedure files on page 532
Types of objects on page 565
Property Sheet dialogs on page 578

Work with method library reference

Add method library reference

Use the **Add Method Library Reference** dialog to add a method library to the procedure.

To add a method library to the procedure:

1. Click **Add** on the **Method Libraries** dialog.

   The **Add Method Library Reference** dialog appears.
2. Do one of the following:
   - Enter the name of a method library in the **Include Reference** field.
   - Click **Files** to browse and select a method library.
3. Click **OK** to save the changes.

See also

About Method Library on page 528
Modify method library reference on page 553
Method Libraries dialog on page 655

Modify method library reference

Use the **Modify Method Library Reference** dialog to modify a method library to the procedure.

To modify a method library added to the procedure:

1. On the **Method Libraries** dialog, select a method library from the Method Library Include References list.
2. Click **Modify**. The **Modify Method Library Reference** dialog appears.
3. Do one of the following:
   - Enter the name of a method library in the **Include Reference** field.
   - Click **Files** to browse and select a method library.
4. Click **OK** to save the changes.

See also

About Method Library on page 528
Add method library reference on page 553
Method Libraries dialog on page 655

Work with custom object files

Add custom object files

The **Add Custom Object File** dialog allows you to add a custom object file to the list of custom object files used by the GUI Designer.

The custom object files normally have a .cst extension in their filenames.

To add a custom object file:

1. Click **Add on the Use Custom** dialog.

   The **Add Custom Object File** dialog appears.
2. Do one of the following:
   - Enter a file name of the custom object file in the **File Name** field.
   - Click **Files** to open the **Find File** dialog, and then browse directories to select a custom object file.
3. Click **OK** to save your changes.

See also

Modify custom object files on page 554
Use Custom dialog on page 564

Modify custom object files

The **Modify Custom Object File** dialog allows you to modify the file names of the custom object files available in the **Custom Object Files** list.

To modify a custom object file:

1. Select a custom object file from the **Custom Object Files** list.
2. Click **Modify**. The **Modify Custom Object File** dialog appears.
3. Do one of the following:

- Edit the custom object file name in the **File Name** field.
- Click **Files** to select a different custom object file, by browsing the directories.

4. Click **OK** to save your changes.

See also

Add custom object files on page 554
Use Custom dialog on page 564

Modify custom object files

The **Modify Custom Object File** dialog allows you to modify the file names of the custom object files available in the **Custom Object Files** list.

To modify a custom object file:

1. Select a custom object file from the **Custom Object Files** list.
2. Click **Modify**. The **Modify Custom Object File** dialog appears.
3. Do one of the following:
   - Edit the custom object file name in the **File Name** field.
   - Click **Files** to select a different custom object file, by browsing the directories.
4. Click **OK** to save your changes.

See also

Add custom object files on page 554
Use Custom dialog on page 564

View ABL messages

The ABL Messages view enables you to look up information about the ABL error messages in Progress Developer Studio for OpenEdge.

Note: The **ABL Messages** option is available with only the OpenEdge projects.

To view an OpenEdge message:

1. From the Help menu, click **ABL Messages**. The **ABL Messages** window appears as a view in the AppBuilder perspective.
2. In the **Enter message number** field, enter an error number.
3. Click **Go to locate** and display the message text for the error number entered above.

   The Search result section displays the synopsis, category, and description for the error message ID. For example, when you type the error number as 104 in the **Enter message number** field and click **Go**, the **Search result** section displays the message description as: Invalid characters were replaced with blanks. (104). The PROGRESS editor does not allow non-printing control characters or tabs, and replaces them with blanks. For more information, see ABL Messages view on page 686.

Open AppBuilder Properties view

The **AppBuilder Properties** view displays the attributes of one or more selected widgets. When more than one object is selected, this window makes available the cross-section of the attributes of the selected objects. This view allows you do the following:

- Modify an attribute of one or more selected widgets.
- Change widget type of an existing widget such as change Fill In widget to Editor.

To open the **AppBuilder Properties** view:

- From the main menu, choose **Window** > **Show View** > **AppBuilder Properties**.

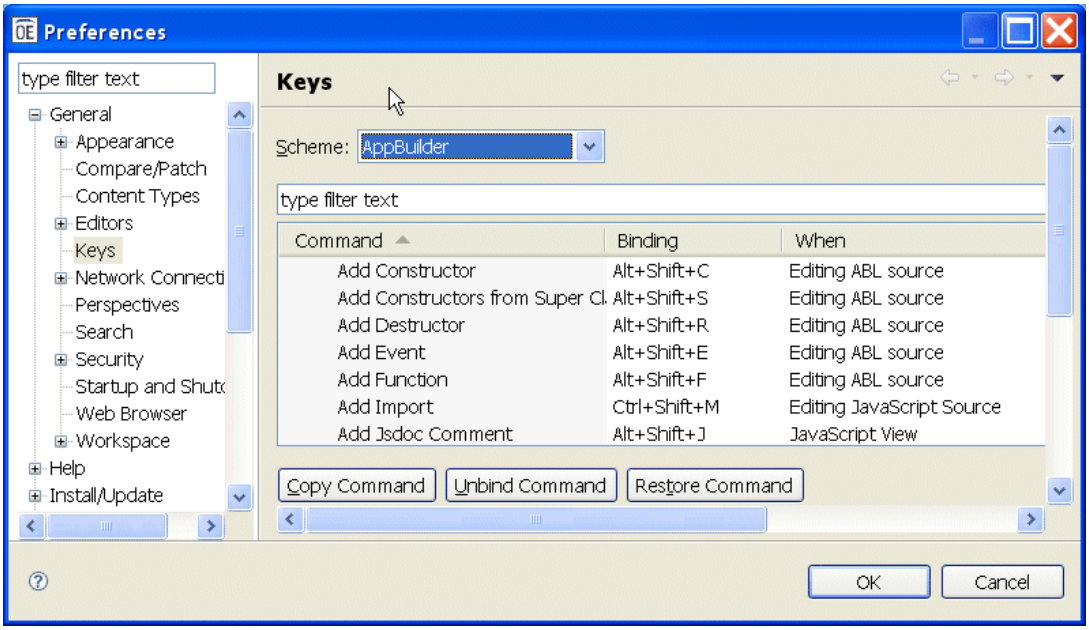
Enable AppBuilder shortcut keys

Most of the shortcut keys in Progress Developer Studio for OpenEdge (Developer Studio) differ from AppBuilder shortcut keys. If you want to use standalone AppBuilder shortcut keys in the integrated environment of AppBuilder (in Developer Studio), you can apply many of the AppBuilder key bindings by setting a single workspace preference.

For more information on general behavior of keys, see the **Keys** topic in the Workbench User Guide.

To enable AppBuilder shortcut keys:

1. Open the **Preferences** window by choosing **Window** > **Preferences** from the main menu bar.
2. Expand the **General** node in the tree view.
3. Select **Keys**.
4. Select AppBuilder in the **Scheme** box. For example:



Notice that the **Keys preference** page lists the commands, the key bindings, and the context where the key binding is in effect. It also allows you to customize individual key bindings.

Note: Not all AppBuilder shortcut keys are enabled. For example, **F5** for previewing code is not implemented because it is unnecessary. Code is always displayed in the ABL editor when you open a `.w` file with AppBuilder embedded in Progress Developer Studio for OpenEdge.You can check the bindings for a particular key, key sequence or command by typing in the type filter text box. For example, typing `F5` will show all the key sequences that use the `F5` key.

5. Click **OK**.
6. If you are running Progress Developer Studio for OpenEdge in an external Eclipse workbench (an Eclipse workbench other than the one that ships with Progress Developer Studio for OpenEdge), some configuration is required before you can enable AppBuilder shortcut keys:
   a) In Windows Explorer, navigate to `DeveloperStudio-install-dir/eclipse/plugins` (the default folder for Progress Developer Studio plugins).
   b) Copy the folder `com.openedge.keybinding.hook` and the file `com.openedge.keybinding.hook_1.0.0.jar` to the `../eclipse/plugins` folder of the external Eclipse workbench.
   c) Open `../eclipse/configuration/config.ini` in the additional Eclipse installation with a text editor.
   d) Set `osgi.framework.extensions=com.openedge.keybinding.hook`.

Note: When you restart the external Eclipse workbench, you can enable AppBuilder shortcut keys.

Specify DB-Required code blocks

The DB-Required option is used in data objects that need to support both a connected and disconnected mode. Specifying DB-Required wraps the code block in a conditional preprocessor directive allowing it to be excluded from the compilation conditionally.

Data aware objects (SDO, SBO, and Data Logic Procedures) are automatically created with a client version and full (server) version, where the client version defines the preprocessor directive that excludes all DB-Required code blocks.

The DB-Required setting must be specified when a code block contains database field or table references that require the data object to be connected to appropriate databases at run-time in order for the code block to execute. This will ensure that this code is excluded from the client proxy r-code, All code blocks that are not DB-Required, are compiled into both r-code files.

Note: In Progress Developer Studio for OpenEdge new internal procedures and functions are not DB-Required by default. This is different from the standalone AppBuilder, which default to add the DB-Required option to new procedures and functions.

To change a procedure or function's DB-Required setting:

1. From the **Outline** view, select an internal function or procedure.
2. Toggle the DB-Required option in the view.

This adds or removes the DB-Required block generated for the selected function or procedure, depending on the toggle option you have selected on the context menu.

See also

Outline view context menu options on page 684

Edit a Freeform Query

When you create Freeform queries for Query Builder widget using the Freeform Query option, the nodes in the Outline view are represented by decorator icon to differentiate it from the other nodes.

Note: You can edit the Freeform query for the workspace files only.

You can edit a freeform query as follows:

1. Open the `.w` file in the source view.
2. Right-click the **Query** widget in the **Outline** view and select **Edit Freeform Query**.

   The **Edit Freeform Query** dialog box opens.
3. Edit as required and click **OK**.

Caution: If you are not connected to the database, content assist and color coding will not work as expected.

Reference

AppBuilder perspective components

The major components of the OpenEdge AppBuilder perspective are the Project Explorer View, Design Window, Object Palette, PRO*Tools utilities, Outline View, ABL Messages View, and ABL Cue Cards View.

Project Explorer View

The Project Explorer view provides a hierarchical view of the projects and resources in your workspace. From here, you can add new AppBuilder procedure (`.w`) files to your OpenEdge project or open them for editing.

Design Window

Design window serves as a working area where you insert basic objects, SmartObject, and OCX (ActiveX) controls while building your application user interfaces. It provides an accurate visualization of how the window will appear at run time. You can use the mouse to size objects by dragging their border, and to position controls on the form.

Object Palette

The GUI Designer has a new dockable Palette which contains controls with which you build the UI. Use the Palette to insert basic objects, SmartObjects, and OCX (ActiveX) on the design window.

The Palette makes available all the component objects supplied with GUI Designer. Use the Palette to insert basic objects, SmartObjects, and OCX (ActiveX) to the design canvas.

Note: Only the major organizers (windows, dialogs, SmartFrame) are not on the Palette. Create them from the list in the ABL UI Design dialog (**File** > **New** > **ABL UI Design**).

PRO*Tools Utilities

The PRO*Tools are a set of utility programs that you might need while developing your applications. The PRO*Tools utilities are available from the OpenEdge menu and as toolbar buttons in your OpenEdge AppBuilder perspective.

Outline View

A list of the structural elements of the AppBuilder procedure (`.w`) file that is currently open in the ABL Editor or ABL UI Designer. You can use the Outline view as an alternative means of selecting, copying, deleting, and renaming widgets.

ABL Messages View

The ABL Message view enables you to look up information about the OpenEdge error messages in Progress Developer Studio for OpenEdge. This view is available with only the OpenEdge projects.

ABL Cue Cards View

The ABL Cue Card view displays help information for a specific SmartObject type. When you create a new SmartObject master, the Cue Card associated with the SmartObject type is also opened. The Cue Card provides a basic definition of the SmartObject type, along with information about how to create and use the object.

See also

Learn About ABL GUI Designer on page 519
OpenEdge AppBuilder perspective on page 521
Access the AppBuilder perspective on page 530

Preferences page

AppBuilder preferences

The **AppBuilder preferences** page allows you to set general options of AppBuilder in Progress Developer Studio for OpenEdge.

This page includes the following options:

Option	Description
When double-click on object	Specify to open the object **Properties Sheet** dialog or the **Edit code editor**, when you double-click an object. **Note:** On double-clicking a **SmartObject**, the **Properties Sheet** dialog opens even though the **Edit code editor** option is selected.

Option	Description
Default function data type	Specify a data type to a new function. The default value is **Character**.
Display these Advisors	Control the display of **Progress Advisors**. The following options are available: • **Currently activated** — display only those Progress Advisors for which the **Don't tell me this again** check box is not selected. • **All** — display all Progress Advisors. • **None** — do not display any Progress Advisors. This is the default selected option.
Restore Defaults	Reset the preferences to the default values.
Apply	Apply the changes you made to the current workspace configuration.

See also

Set AppBuilder preferences on page 530
Preferences page on page 559

Editor preferences

The **AppBuilder Editor preferences** page provides options to control the display behavior of AppBuilder-generated code in the ABL Editor.

Note: You can make the sections of the AppBuilder-generated code read-only in the ABL Editor. Thereby, you can ensure that the AppBuilder-generated code is not overwritten. Editing the AppBuilder-generated code might make the AppBuilder procedure (`.w`) file corrupt, and display errors when trying to open with the ABL UI Designer.

This page includes the following options:

Option	Description
Make AppBuilder generated code read-only	Select this check-box to mark the AppBuilder-generated code as read-only in the ABL Editor. **Note:** By default, the **Make AppBuilder-generated code read-only** check-box is selected.
Read-only code background color	Display the Select a display color for the read-only code on page 548 dialog, which allows you to select a display color for the read-only code blocks in the ABL Editor. The default display color is gray. **Note:** This option is enabled when the **Make AppBuilder generated code read-only** check-box is selected.

Option	Description
Restore Defaults	Restore the preferences to the default values.
Apply	Apply the changes you made to the current workspace configuration.

See also

Read-only code sections of AppBuilder-generated code on page 523
Set AppBuilder preferences on page 530
Preferences page on page 559

Grid Units preferences

The **Grid Units preferences** page allows you to set grid display options of the designer window. Grid is a framework of lines used to align objects within frames.

This page includes the following options:

Option	Description
Display grid	Allow you to show grid on the design window.
Snap to grid	Allow you to move and resize objects only from grid point to grid point.
Grid layout unit size (Graphical Windows only)	Specify the width and height of the grid unit. **Note:** Units of measure (characters or pixels) is specified by the **Layout Units** option.
Layout units	Specify the units to set the height and width of the grid size. The value must be specified in Character or Pixel.
Grid units between major lines	Specify the number of grid units to set the space between horizontal and vertical grid lines. This value must be an integer.
Restore Defaults	Reset the preferences to the default values.
Apply	Apply the changes you made to the current workspace configuration.

See also

Set AppBuilder preferences on page 530
Preferences page on page 559

Widget ID preferences

The **Widget ID preferences** page allows you to set **Widget ID** options.

The options on this page control two different methods for assigning widget-ids. The Static widgets widget-id assignment group affects how the AppBuilder assigns widget-ids to non-Smart, static widgets. The Runtime widget-id group affects only how the **Runtime WIDGET-ID Assignment PRO*Tool** works.

This page includes the following options:

Option	Description
Static widget ID assignment	This group affects how the GUI Designer assigns widget IDs to non-Smart and static widgets. The following options are available in this group: • **Automatically assign widget IDs** — The GUI Designer assigns WIDGET-ID attribute values by default when static widgets are created. • **Starting widget ID for frames** — Defines the value for the first frame in a container when the GUI Designer assigns the WIDGET-ID attribute. • **Frame widget ID increment** — Defines the amount by which the GUI Designer increases the value for each additional frame in a container.
Runtime widget ID	This group affects only how the **Runtime WIDGET-ID Assignment PRO*Tool** works. The following options are available in this group: • **Save widget ID file name** — Assigns a value to the widgetIDFileName property when you first save a container. This setting has no effect after the first time you save the container. The GUI Designer stores the value in the static code. • **Default** — Defines the `widgetIDFileName` property as the default value, `\`. For example, the default XML file for the `window wCust.w` is `wCust.xml`. • **Custom XML file** — Displays an input field in which you can specify an alternate name for the XML file.
Restore Defaults	Reset the preferences to the default values.
Apply	Apply the changes you made to the current workspace configuration.

See also

Set AppBuilder preferences on page 530
Preferences page on page 559

Object Palette

Palette options

Use the object Palette to insert basic objects, ActiveX objects, and SmartObject instances. You can also create SmartObject masters.

You can resize the Object Palette with your mouse, and you can also add custom basic objects and SmartObjects to the Palette.

Note: The object's Palette is available only with procedure `.w` file open in the ABL UI Designer window.

The object Palette includes the following controls:

 Hide Palette	Collapses the Palette pane.
 Show Palette	Expands the Palette pane. **Note:** This option is available when you hide the object Palette.
 Pointer	Enables you to select an object on the design canvas and perform actions like resizing or double-clicking an object. When you make a selection on the Palette, the insertion mode is activated and displays the pointer as an icon representing the basic object or SmartObject type being selected. In insertion mode, the mouse pointer can only be used to draw and insert basic objects, SmartObject instances, and OCXs controls on the design canvas. In insertion mode, when the pointer is located on the design canvas, the GUI Designer displays the pointer as an icon corresponding to the object being inserted. You can lock an icon in insertion mode by double-clicking on an object icon in the Palette.
Widgets	Includes the Basic static objects on page 565 that you can insert on the design canvas.
OCX	Includes the ActiveX objects on page 566. The OCX controls are usually referred to as ActiveX controls.
SmartObjects	Includes the SmartObjects on page 566 which allows you to create SmartObject instances.

See also

Change the Palette settings on page 549
Types of objects on page 565
Use Custom dialog on page 564
Palette context menu on page 563

Palette context menu

Right-clicking on the Palette displays the Palette context menu. This menu has the following options:

Resize	Resizes the **Palette** pane. Select **Resize**, drag the **Palette** to resize it, and click to release.
Dock On	Determines the docking position of the **Palette**. You can dock the **Palette** to the right-side or left-side of the design canvas.

Layout	Changes the layout of the controls in the **Palette**. The Layout options are: • Columns — Displays the controls on the **Palette** in a column layout. • List — Displays the controls on the **Palette** in a list layout. • Icons Only — Displays the controls as icons on the **Palette** without the control text. • Details — Displays the controls with a description on the **Palette**.
Use Large Icons	Uses large icons for the controls on the **Palette**.
Settings	Displays the Change the Palette settings on page 549 dialog which allows you to set the **Palette** display settings.
Use Custom	Displays the Use Custom dialog on page 564 which allows you to update the list of custom object files used by the GUI Designer.

Note: The **Resize** and **Dock On** options are available from the right-click context menu on the **Palette** title. The **Layout**, **Use Large Icons**, **Settings**, and **Use Custom options** are available from the right-click context menu on anywhere in the **Palette**.

See also

Change the Palette settings on page 549
Object Palette on page 562
Use Custom dialog on page 564

Use Custom dialog

The **Use Custom** dialog enables you to update the list of custom object files used by the GUI Designer.

The objects on the **Palette** refreshes when you add, modify, or remove a custom object file. The custom object files normally have a .cst extension in their filenames.

Access this dialog by clicking **Use Custom** from the right-click context menu on the **Palette**.

This dialog includes the following options:

Custom Object Files	Displays the custom object files currently used by the GUI Designer.
Add	Displays the **Add Custom Object File** dialog which allows you to add a custom object file to the Custom Object Files list.
Modify	Displays the **Modify Custom Object File** dialog which allows you to modify the custom object file selected in the Custom Object Files list.
Remove	Removes the selected custom object file from the Custom Object Files list.
Move Up	Moves the selected custom object file one position up in the Custom Object Files list.
Move Down	Moves the selected custom object file one position down in the Custom Object Files list.

See also

About custom object file on page 529
Add custom object files on page 554
Modify custom object files on page 554
Object Palette on page 562

Types of objects

Basic static objects

The widgets section in the Palette contains the basic static ABL objects which you can add to the design canvas. Basic objects are usually referred to as user-interface components.

The Widgets section includes the following objects:

Pointer	Enables you to select, rearrange, or resize objects on the design canvas.
DB Fields	Displays the Table Selector dialog on page 632which allows you to insert database fields.
Query	Displays the Query Builder Dialog Box -- Table Mode on page 639 which allows you to insert a query.
Browse	Displays the Query Builder Dialog Box -- Table Mode on page 639. An object which displays the results of a database query.
Frame	Inserts a frame. Use the frame to group other objects on the design canvas.
Rectangle	Inserts a rectangle. Use rectangle to group other objects on the design canvas.
Image	Inserts an image.
Radio Set	Inserts a set of three radio buttons. You can change the number of buttons in the set after adding the object.
Toggle Box	Inserts a check box.
Slider	Inserts a slider control. You can select to adjust the widget vertically or horizontally.
Button	Inserts a button.
Selection List	Inserts a selection list. A Selection List presents a list scrollable set of items displayed as character strings.
Editor	Inserts a multi-line text editor.
Combo Box	Inserts a drop-down with a list of elements to display on the design canvas.

Fill In	Inserts a single-line text editor.
Text	Inserts a text field which holds static text.

For more information see, Types of objects on page 565.

ActiveX objects

The OCX controls are usually referred to as ActiveX controls. These controls are self-contained units of functionality and content that are independent of the application in which they are used.

An ActiveX Control is defined in a special dynamic link library with an OCX extension or Object Component Extension. The ActiveX Controls include a wide variety of user interface components that are not available as native ABL widgets, such as spin box, enhanced combo box, and various dialog, meter, Internet-enabled, and picture controls.

The OCX section includes the following options:

OCX	Displays the Choose Control dialog on page 631 which allows you to select an ActiveX control from the list.
CSSpin	Inserts an ActiveX spin control. Spin control allows you to set an Integer value. You can choose the upper or lower bounds of the range and the increment or decrement value.
CSCombo	Inserts an ActiveX combo box.
PSTimer	Inserts a timer that generates an event at some regular interval that you specify.

For more information, see Types of objects on page 565

Note: Progress Developer Studio for OpenEdge on 64-bit Windows supports only the ActiveX control PSTimer. So Progress Software recommends that you continue to use the 32-bit version of Progress Developer Studio for OpenEdge if you extensively use other OCX controls such as CSCombo or CSList in your AppBuilder projects.

SmartObjects

The **SmartObjects** in the **Palette** allows you to create a **SmartObject** instance.

SmartObject instance is a copy of a **SmartObject** master running in memory. Many **SmartObject** instances can be created from a single **SmartObject** master file.

The **SmartObjects** section includes the following objects:

SmartObject type	Description
SmartDataObject	A SmartObject that holds a query and associated data update logic. It is supplied in two forms: a customizable template, and a pre-compiled dynamic object.
DataView	Inserts a DataView instance or a DataView master.
Simple SmartObject	A SmartObject that serves as a basis for new SmartObject types you might create.

SmartObject type	Description
 SmartFolder	A SmartObject that holds folders to support a tab-folder application.
 SmartPanel	A SmartObject that holds a related set of buttons, such as navigation buttons or update buttons.
 SmartDataBrowser	A SmartObject that connects to a SmartDataObject and holds a browse object to view database records and to update them through the SmartDataObject.
 SmartDataViewer	A SmartObject that holds a frame to preview and possibly update specific database fields. Database field values are obtained from a SmartDataObject or a SmartDataBrowser.
 SmartDataField	A SmartObject that displays a single data field in a SmartDataViewer. There are two types of static SmartDataFields: SmartSelect and Time Field.
 SmartLOBField	Inserts a SmartLOBField instance.
 SmartFilter	A SmartObject that displays data fields in a frame, filtered by user-specified selection criteria.
 SmartToolBar	A SmartObject that provides a toolbar and/or a menu interface to application commands.
 SmartContainer	A SmartObject that contains other SmartObjects (including possibly other SmartContainers). There are four types of SmartContainer: SmartWindows, SmartDialogs, SmartFrames, and Simple SmartContainers.
 SmartBusinessObject	A specialized container that can integrate up to 20 SmartDataObjects. It allows you to perform complex updates in a single server-side transaction.
 SmartProducer	A message-interface object that creates and sends messages using the SonicMQ system.
 SmartConsumer	A message-interface object that extracts incoming messages from the SonicMQ system and hands them off for processing.
 SmartRouter	A utility object that routes incoming messages to the appropriate SmartB2BObject for processing.
 SmartB2BObject	A specialized message-handling object. It creates or consumes formal, schema-based XML messages.
 SmartSender	A messaging object that creates messages, possibly by transforming data in some way that you define.
 SmartReceiver	A messaging object that consumes messages, possibly by transforming their content in some way that you define.
 SmartTreeview	A SmartObject that provides a tree view control interface to display information hierarchically.

Note: You are prompted to connect to a database, if the database connection is not configured with your current project. When you click **OK**, the Database connections properties page on page 83 page appears.

See also

About SmartObjects on page 526
Add objects to the design window on page 537
Types of objects on page 565
Open SmartObject dialog on page 663

Toolbar and menu options

GUI Designer toolbar

GUI Designer toolbar contain actions that apply only to the ABL procedure (`.w`) files or GUI Designer perspective. The toolbar are available and enabled only when the AppBuilder perspective or an ABL GUI procedure (`.w`) file is opened.

Note:

You can use the **Customize Perspective** dialog to show or hide the toolbar buttons which are visible in your perspective. Access this dialog by selecting **Windows menu** > **Customize Perspective**.

The toolbar contains the following buttons:

Option	Description
 Procedure Settings	Opens the Procedure Settings dialog box on page 575 for the current procedure file. This dialog allows you to modify characteristics for the current procedure.
 View Source (F9)	Opens the source editor for the current design window.
 Property Sheet	Opens the Property Sheet dialogs on page 578 dialog for a selected object. This dialog allows you to define and modify characteristics for the selected object.
 Dynamic Properties	Opens the **Dynamic Properties** window which allows you to edit repository-based attributes and events for one or more master objects or object instances registered in the **Repository**. **Note:** The **Dynamic Properties** window opens and runs in a window outside of the Progress Developer Studio Eclipse framework. Online help is available from the utility's Help button or **F1** key.

Option	Description
 Choose Color	Opens the Choose Color dialog on page 629 which allows you to set foreground and background colors for the selected objects in the design window.
 Go To Page	Allows you to change the current design page. You can go to the selected design page from the current design page. This option is enabled when the current design window is a SmartContainer. See Paging in SmartObjects on page 527.

See also

AppBuilder perspective components on page 558
Show or hiding toolbar buttons and menu items on page 551

Layout menu options

Use the Layout menu to change the layout, order, and alignment of basic objects and SmartObject instances in a frame. The Layout menu is available only when the AppBuilder perspective or an ABL procedure (`.w`) file is opened.

The Layout menu includes the following options:

Alternate Layout	Allows you to change to an Create an Alternate Layout on page 540.
Center Left-to-Right in Frame	Aligns the selected object horizontally in a frame.
Center Left-to-Bottom in Frame	Aligns the selected object horizontally in a frame.
Even Spacing Left-to-Right	Adjusts the horizontal spacing of the selected objects.
Even Spacing Left-to-Bottom	Adjusts the vertical spacing of the selected objects.
Move-to-Top	Makes the selected basic object or SmartObject instance overlay other basic objects or SmartObject instances of its type.
Move-to-Bottom	Makes the selected basic object or SmartObject instance underlay other basic objects or SmartObject instances of its type.
Align	Align objects on page 541 the selected basic object or SmartObject instances within the Design window.
Tab Order	Allows you to specify the Set tab order on page 542 of objects in a frame.

Customization priority	Opens the **Customization Priority Editor**. The **Customization priority** menu option is available with only Dynamics.
Goto Page	Allows you to change the current design page. You can go to a selected design page from the current design page. This option is enabled when the current design window is a SmartContainer object. For more information, see Goto Page dialog on page 655.

See also

Select standard or alternate layout on page 541
Tab Editor dialog on page 574

GUI Designer context menu

Right-clicking on the design window displays the GUI Designer context menu. This menu has the following options:

Menu option	Description
Undo	Undo the last action performed on the design window.
Cut	Cut the selected widget.
Copy	Copy the selected widget.
Paste	Paste the selected widget.
Duplicate	Create a copy of the selected widget.
Delete	Delete a selected widget.
View Source	Open the source code editor.
Run	Run the current AppBuilder procedure (`.w`) file.
Compile	Compile the current AppBuilder procedure (`.w`) file.
Add Function	Open the Add Function wizard on page 350 wizard to add a function to the current procedure.
Add Procedure	Open the Add Procedure wizard on page 353 wizard to add an internal procedure to the current procedure.
Add Trigger	Open the Add Trigger dialog on page 633 wizard to add a trigger for a selected object.
Copy to File	Open the Copy To File dialog on page 646 dialog which allows you to copy basic objects and SmartObject instances and their associated internal procedures, functions, and triggers to an export (`.w`) file.
Insert from File	Opens the Choose From File dialog on page 643 dialog which allows you to locate and insert a particular filename or image.

Menu option	Description
Tab Order	Open the Tab Editor dialog on page 574 dialog which allows you to change the tab order of the widgets or objects present on the current design window.
Goto Page	Open the Goto Page dialog on page 655 dialog which provides the ability to organize sets of SmartObjects into logical pages.

See also

Create ABL GUI procedure files on page 532
Open ABL GUI procedure files on page 533

SmartObjects context menu

Right-clicking a SmartObject instance on the design window displays SmartObject context menu. This menu has the following options:

Menu option	Description
Properties	Open the **Property Sheet** dialog to edit the attributes of the selected SmartObject instance.
Instance Properties	Open the **SmartObject instance properties** dialog to view the available properties and their corresponding values.
SmartInfo	Open the **SmartInfo** dialog to view SmartLink information supported by the selected SmartObject instance.
SmartLinks	Open the **SmartLinks** dialog to view, add, modify, and remove SmartLinks between SmartObject instances in the current design window.
Edit Master	Open the SmartObject master in the design window to edit the SmartObject master.
Delete Instance	Delete a selected SmartObject instance.

See also

Inserting SmartObjects on page 551
Choose SmartObject dialog on page 663

PRO*Tools utilities

PRO*Tools is now available from within the Progress Developer Studio for OpenEdge. PRO*Tools is a set of utility programs which help you develop and run OpenEdge applications. These utilities are available on the toolbar and from the menu (**OpenEdge** > **General ProTools**) in your perspective.

You can use the **Customize Perspective** dialog to show or hide the PRO*Tools menu items and toolbar buttons which are visible in your perspective. Access this dialog by selecting **Windows** > **Customize Perspective**.

The PRO*Tools utilities are grouped into General, AppBuilder, and ADM2 categories.

General PRO*Tools utilities

The General PRO*Tools utilities are available with all the OpenEdge perspectives. These utilities are available on the toolbar and from the menu (**OpenEdge** > **General PRO*Tools**) in your perspective.

Note: Each of these PRO*Tools utilities opens and runs in a window outside of the Progress Developer Studio Eclipse framework. Online help is available from the utility's menu bar or **Help** button.

The General PRO*Tools include the following utilities:

General PRO*Tools utility	Description
Config Info	Opens the **Configuration File** dialog that lists all the Progress product installation information and their corresponding serial numbers.
Color Changer	Opens the **Color Changer** dialog that enables you to change the Progress system colors 0 through 15.
OS Prompt	Opens a new MS-Windows DOS console.
Procedure Viewer	Opens the **Procedure Object Viewer** that displays a list of running persistent procedures in the current session. This viewer also displays a list of any super procedures for the selected persistent procedure. Use the **Procedure Object Viewer** when you debug an application to verify the existence of and to edit persistent procedures and super procedures and test their internal methods.
Propath Search	Opens the **Propath File Search** dialog that allows you to specify a file you want to locate in Propath. Progress displays the full path of each occurrence in Propath order. Click **Open File** to open any source file from the search result. (r-code file cannot be opened.)
Session Settings	Opens the **Session Attributes** dialog that lists all the attributes and their corresponding values for their Progress SESSION handle.
Protogen	Opens the **Prototype Generator** dialog that generates an include file for the specified super procedure containing the prototypes of all internal procedures and user-defined functions.
PRO*Spy	Opens the **PRO*Spy Plus** dialog. PRO*Spy Plus is a debugging and diagnostic tool used to track call stack information from within an ABL application.
WebClient Application Assembler	Opens the **WebClient Application Assembler** dialog that enables you to define and assemble the client of an ABL application for deployment as a version controlled WebClient application.
WebClient Deployment Packager	Opens the **WebClient Deployment Packager** dialog that enables you easily modify the deployment configuration of an application that you have previously generated with the WebClient Application Assembler. It extracts information from an existing .prowcapc file and makes it editable.

See also

Add user-defined utilities on page 551
Show or hiding toolbar buttons and menu items on page 551
PRO*Tools utilities on page 571

AppBuilder PRO*Tools utilities

The AppBuilder PRO*Tools utilities are available only with the AppBuilder perspective. These utilities are available on the toolbar and from the menu (**OpenEdge** > **AppBuilder PRO*Tools**) in your AppBuilder Perspective.

Note: Each of these PRO*Tools utilities opens and runs in a window outside of the Progress Developer Studio Eclipse framework. Online help is available from the utility's menu bar or Help button.

The AppBuilder PRO*Tools include the following utilities:

AppBuilder PRO*Tools utility	Description
Screen Scaling Utility	Opens the **Screen Scaling** window that assists in scaling the size and changing the position of objects in AppBuilder-generated procedures.
COM Object Viewer	Opens the **COM Object Viewer** window. The COM Object Viewer displays the contents of Type Libraries and the Progress syntax you would use to programmatically create ActiveX automation objects and controls and manipulate their methods, properties, and events.
Static Widget ID Assignment	Opens the Widget ID Assignment Utility window that allows you to assign widget IDs to multiple containers without opening them individually. Widget IDs are application-defined IDs for widgets or objects that aid testing with third-party tools. With the WIDGET-ID attribute, you can specify a unique ID for a widget. The unique ID provides a means for third-party testing tools to consistently identify the widget across sessions. You can use the AppBuilder Preferences dialog to enable the AppBuilder to automatically add widget IDs to widgets as they are created. See AppBuilder preferences on page 559.
Runtime Widget ID Assignment	Opens the Runtime WIDGET-ID Assignment Tool window that allows you to assign widget IDs in ADM2 applications that cannot store widget IDs in their code as static widgets. Use the Runtime Widget ID Assignment utility to assign widget IDs to the following: • Widgets in dynamic objects, for example, a dynamic SmartDataViewer. • Dynamically-rendered widgets in SmartObjects, for example, a SmartSelect. • Multiple instances of a SmartObject in the same run-time container.

See also

Adding new PRO*Tools utilities on page 551
Show or hiding toolbar buttons and menu items on page 551

PRO*Tools utilities on page 571

ADM2 PRO*Tools utilities

The **ADM2 PRO*Tools** utilities are available only with the AppBuilder Perspective. These utilities are available on the toolbar and from the menu (**OpenEdge** > **ADM2 PRO*Tools**) in your AppBuilder Perspective.

Note: Each of these **PRO*Tools** utilities opens and runs in a window outside of the Progress Developer Studio Eclipse framework. Online help is available from the utility's menu bar or Help button.

The **ADM2 PRO*Tools** include the following utilities:

ADM2 PRO*Tools utility	Description
SmartObject Upgrade Utility	Opens the **ADM1** to **ADM2 SmartObject Conversion Utility** window that facilitates the process of upgrading (loading and saving) **SmartObjects** from version 8.1 to 9.0 and later. **Note:** The application database must be connected for you to use this utility.
Service Parameter Maintenance	Opens the **Service Parameter Maintenance** window that enables you to define instances of application partitions that you can implement in AppBuilder procedures. The tool supports Java Message Service (JMS) Server partitions.
XML Schema Mapping	Opens the **XML Schema Mapping** window that enables you to create and update schema-based XML mapping files for the use of the **SmartB2BObject**.

See also

Add user-defined utilities on page 551
Show or hiding toolbar buttons and menu items on page 551
PRO*Tools utilities on page 571

GUI Designer dialogs

AppBuilder dialogs

Tab Editor dialog

The **Tab Editor** dialog includes the following options:

Tabbing Options	Default is the default tabbing option for all frames. **Note:** The **Move First**, **Move Up**, **Move Down**, and **Move Last** options are not available when you select this option.
	Custom allows tabbing using the **Tab Editor Move** buttons.
	Left-To-Right By Column allows tabbing to move top to bottom in each column from left to right. Columns are identified by the left-most coordinates of each tabbable object.
	Left-To-Right By Row allows tabbing to move left to right in each row from top to bottom.
	Right-To-Left By Column allows tabbing to move top to bottom in each column from right to left. Columns are identified by the right-most coordinates of each tabbable object.
	Right-To-Left By Row allows tabbing to move right to left in each row from top to bottom.
Tabbable Objects	Lists the objects in the currently selected frame that you can access with the **TAB** key.
Move First	Moves the selected object to the top of the tabbable objects list and makes it the first object in the tab order for the frame.
Move Up	Moves the selected object up one place in the tabbable objects list.
Move Down	Moves the selected object down one place in the tabbable objects list.
Move Last	Moves the selected object to the bottom of the tabbable objects list and makes it the last object in the tab order for the frame.

See also

Set tab order on page 542
Work with objects on page 536

Procedure Settings dialog box

Use the **Procedure Settings** dialog to modify certain characteristics of a GUI Designer procedure, which is a special class of an OpenEdge procedure generated by the AppBuilder. AppBuilder procedures include window procedures, SmartObject masters, method libraries, structured includes, and structured procedures.

Access the dialog by clicking the **Procedure Settings**  icon on the GUI Designer toolbar.

The **Procedure Settings** dialog includes the following options:

Type	Displays the type of the selected procedure.
File Name	Displays the filename of the selected procedure.
Description	Displays a description of the selected procedure.

OCX Binary	Select a file to use as the **OCX** binary file.
Compile in	Select the directory where the GUI Designer saves the compiled (`.r-code`) version of the current procedure file. By default, the compiled file is saved in the same directory as the procedure file.
External Tables	Displays the external tables associated with the procedure. You can modify this declaration.
Add/Modify	Displays the Table Selector dialog on page 632 that allows you to add an external table to the current procedure.
Run Persistent from AppBuilder	Select this option to run the procedure persistently. **Note:** You must deactivate this toggle for a **SmartDialog** and the main window of an application.
Compile on Save	Select this option for the GUI Designer to automatically generate the `.r-code` file when compiling the current procedure. By default, this option is selected for all new master files based on the basic templates for windows, dialog boxes, and structured procedures. **Note:** Activating this toggle improves AppBuilder performance when running SmartObjects, because the AppBuilder does not have to compile the master file to create an instance.
Method Libraries	Opens the Method Libraries dialog on page 655 that allows you to add, remove, or modify the procedure's method libraries.
Custom Lists	Opens the Custom Lists dialog box on page 661 that allows you to change the names of the preprocessor lists.
Temp-Table Maintenance	Opens the Temp-Table Maintenance Dialog Box on page 658.
SmartLinks	Opens the SmartLinks dialog on page 680 that allows you to modify the **SmartLinks** associated with the selected procedure. **Note:** This option is only available when working with a **SmartObject** procedure.
Pages	Opens the **Pages** dialog that allows you to control on which page in the procedure is displayed.

Declarative Statements	Opens the **Edit Declarative Statements** dialog. Use this dialog to add statements (such as, USING and ROUTINE LEVEL ON ERROR UNDO, and THROW) that must come before any definition and executable statement for proper compilation. These statements are generated into a new section in the source code. This topic is written before the optional temp-table definitions include.
Advanced	Opens the **Advanced Procedure Settings** dialog that allows you to edit additional settings for the procedure.

For more information, see GUI Designer toolbar on page 568

Advanced Procedure Settings Dialog Box

The **Advanced Procedure Settings** dialog is used to set advanced procedure settings for a GUI Designer procedure file.

You can access this dialog by clicking **Advanced** in the **Procedure Settings** dialog.

The **Advanced Procedure Settings** dialog includes the following options:

Procedure Type	Select a procedure type for the current procedure. Choose a procedure type from the list.
New	Select this option to add a new procedure type.
Window	Select this option to allow the addition of a window to the procedure.
Frames	Select this option to allow the addition of frames to the procedure.
One Only	Select this option to allow the addition of only one frame to the procedure. This option is enabled only when Frames is selected.
Multiple	Select this option to allow the addition of multiple frames to the procedure. This option is enabled only when Frames is selected.
Smart Objects	Select this option to allow the addition of SmartObjects to the procedure.
Basic Objects	Select this option to allow the addition of basic objects to the procedure.
Database Fields	Select this option to allow the addition of database fields to the procedure.
Browses	Select this option to allow the addition of browses to the procedure.
Queries	Select this option to allow the addition of queries to the procedure.
Supported SmartLinks	Displays a list of the SmartLink types which the procedure currently supports.
Add	Displays the **Add Supported Link** dialog that allows you to add a SmartLink type to the Supported SmartLinks list.
Remove	Allows you to remove the SmartLink type currently selected in the Supported SmartLinks list.

Add fields to	This topic has the following options: • **Frame Query** — Select this option to add new fields to the frame query. • **External Tables** — Select this option to add new fields to external tables. • **Neither** — Select this option if you do not want to enable addition of new fields to the frame query or external tables.
File Type	Select the file type for the procedure. Valid file types are `.w`, `.i`, and `.p`.
Template	Select this option to change a Master file to a template; clear this option to change a template to a Master file.
Run option	Select the **Persistent Only** option to specify that the procedure can only be run persistently.

For more information, see Procedure Settings dialog box on page 575

Property Sheet dialogs

The **Property Sheet** dialog allows you to modify the properties of a selected object. Access this dialog by selecting the object on the design canvas, and clicking **Property Sheet**  icon on the GUI Designer toolbar.

Property Sheet for Window

The **Property Sheet - Window** dialog allows you to modify the window properties.

This dialog includes the following options:

Object	Enter a new name for the window.
Title	Enter a new title for the window.
Icon Image	Displays the **Choose Image** dialog which allows you to select an image `.ico` file. Enter the filename of the 32x32 icon for the window when minimized. For MS-Windows this can only be a `.ico` file.
Small Icon Image	Displays the **Choose Image** dialog which allows you to select an image. Enter the filename of the 16x16 icon for the window when minimized.
Column	Displays the column value (in character units) where the window is placed from upper left corner on the design canvas. **Note:** This option is enabled when the **Explicit Position** check box is selected in the **Other Settings** section

Row	Displays the row value (in character units) where the window is placed from upper left corner on the design canvas. **Note:** This option is enabled when the **Explicit Position** check box is selected in the **Other Settings** section.
Width	Enter a value (in character units) to specify the width of the window.
Height	Enter a value (in character units) to specify the height of the window.
Virtual Width	Enter the maximum and virtual width (in character units) of the window.
Virtual Height	Enter the maximum and virtual height (in character units) of the window.
Other Settings section of Property Sheet dialog on page 599	This topic allows you to select run-time attributes and other ABL related options.
 Color	Displays the **Choose Color** dialog which allows you to change window background and foreground colors
 Font	Displays the **Choose Font** dialog which allows you to change the font displayed in the window status bar.
 Popup Menu	Displays the **Property Sheet - Popup Menu** dialog which allows you to create a pop-up menu for the window.
 Translation Attributes	Displays the **String Attributes** dialog which allows you to enter translation attributes for the window title.
 Menu Bar	Displays the **Property Sheet - Menu Bar** dialog which allows you to create a menu bar for the window.
Advanced	Displays the Advanced properties for Window on page 607 dialog which allows you to edit advanced properties for the selected window.

For more information, see Property Sheet dialogs on page 578

Property Sheet for Dialog Box

The **Property Sheet - Dialog Box** dialog allows you to modify the properties of dialog box.

This dialog includes the following options:

Object	Enter a new name for the dialog box.
Title	Enter a new title for the dialog box.
Query	Displays the database query for the dialog box. You can edit the query by clicking Query, which opens the Query Builder dialog.

Column	Displays the column value (in character units) where the dialog box is placed from upper left corner on the design canvas. **Note:** This option is enabled when the **Explicit Position** check box is selected in the **Other Settings** section. This attribute only takes effect at run time.
Row	Displays the row value (in character units) where the window is placed from upper left corner on the design canvas. **Note:** This option is enabled when the **Explicit Position** check box is selected in the **Other Settings** section. This attribute only takes effect at run time.
Width	Enter a value (in character units) to specify the width of the dialog box.
Height	Enter a value (in character units) to specify the height of the dialog box.
Other Settings	This topic allows you to select run-time attributes and other ABL related options or accept the defaults.
Color	Displays the **Choose Color** dialog which allows you to change dialog box background color and foreground color for field-level objects in the dialog box.
Font	Displays the **Choose Font** dialog which allows you to change the font for field-level objects in the dialog box.
Popup Menu	Displays the **Property Sheet - Popup Menu** dialog which allows you to create a pop-up menu for the dialog box.
Translation Attributes	Displays the **String Attributes** dialog which allows you to enter translation attributes for the dialog box title.
Tab Order	Displays the **Tab Editor** dialog which allows you to change the tab order of objects in the dialog.
Advanced	Displays the **Advanced Properties** dialog which allows you to edit advanced properties for the selected dialog-box.

For more information, see Property Sheet dialogs on page 578

Property Sheet for Menu Bar or Popup Menu

The **Property Sheet - Menu Bar** or **Popup Menu** dialog allows you to specify the attributes while creating a menu bar and popup menu.

This dialog includes the following options:

Menu	Enter a name for the menu.

Delete Menu	Allows you to delete the menu from the design window.
Title	Enter a title for the menu. **Note:** This option is available for pop-up menus only.
Label	Enter a label for the menu element.
: <fill-in>	Enter valid character-string attributes for the menu element label.
Object	Enter a name for the menu element.
Accelerator	Displays the accelerator key bound to the menu.
Key	Opens the Record Menu Accelerators dialog on page 656 which allows you to define an accelerator key to bind to the menu element.
Clear	Allows you to delete any accelerator key bound to the menu element.
Disabled	Allows you to disable a menu element.
Toggle-Box	Allows you to define the menu element as a toggle box.
Insert	Allows you to insert a new menu element.
Delete	Allows you to delete the selected menu element.
Rule	Allows you to create a rule line in the pull-down or pop-up menu (menu-items only).
Skip	Allows you to add blank lines to the pull-down or pop-up menu (menu-items only).
Up	Allows you to move the selected menu element one position up.
Down	Allows you to move the selected menu element one position down.
<<	Allows you to remove a dash from left side of the selected menu element. This dash indicates the menu element position in the menu hierarchy.
>>	Allows you to add a dash to the left side of the current menu element. This dash indicates the menu element position in the menu hierarchy.
New Menu Element	Allows you to create a new menu element at the same level as the selected menu element.

For more information, see Property Sheet dialogs on page 578

Property Sheet for Browse

The **Property Sheet - Browse** dialog allows you to modify the browse attributes.

This dialog includes the following options:

Object	Enter a new name for the browse.
ToolTip	Allows you to enter text for tool tip help.
Help	Enter a Help Identifier associated with this field. This field is used only in `.HLP` help files to support What's This? context-sensitive help.
Widget ID	Enter a widget ID for the browse.
Title	Enter a new title for the browse.
Query	Displays the database query for the browse. You can edit the query by clicking Query, which opens the Query Builder dialog.
Fields	Displays the **Column Editor** dialog which allows you to add fields to the database query for the browse.
Locked Columns	Enter a number of columns to lock in the browse view. As you scroll horizontally, these locked columns remain freeze in the view, with the remaining columns scrolling horizontally.
Max Data Guess	Enter an estimate for the number of records in the browse query. The browse uses this number to visually depict query location (set the thumb position) in the vertical scroll.
Column	Enter a window column value (in character units) where you want to place the browse upper left or right corner. This depends upon the position setting. For example, if Left-Align is chosen, the value in Column refers to the browse upper left corner.
Row	Enter a window row value (in character units) where you want to place the browse upper left or right corner. This depends upon the position setting. For example, if Left-Align is chosen, the value in Row refers to the browse upper left corner.
Width	Enter a value (in character units) to specify the width of the browse.
Height	Enter a value (in character units) to specify the height of the browse.
Left-Align	Select this option to position the browse left edge along the column position specified.
Right-Align	Select this option to position the browse right edge along the column position specified.
Other Settings section of Property Sheet dialog on page 599	This topic allows you to select the run-time attributes and other ABL related options or accept the defaults.
 Color	Displays the **Choose Color** dialog which allows you change browse background and foreground colors.

Font	Displays the **Choose Font** dialog which allows you to change the browse font at run-time.
Popup Menu	Displays the **Property Sheet - Popup Menu** dialog which allows you to create a pop-up menu for the browse.
Translation Attributes	Displays the **String Attributes** dialog which allows you to enter translation attributes for the browse.
Advanced	Displays the **Advanced Properties** dialog which allows you to edit advanced properties for the selected browse.

For more information, see Property Sheet dialogs on page 578

Property Sheet for Button

The **Property Sheet - Button** dialog allows you to modify the button properties.

This dialog includes the following options:

Object	Enter a new name for the button or accept the default.
Label	Enter text for the button label. The GUI Designer displays the text on the button unless you define an up image.
ToolTip	Enter text for tool tip help.
Help	Enter a Help Identifier associated with this field. This field is used only in .HLP help files to support What's This? context-sensitive help.
Up	Displays the Choose Image dialog which allows you to select an image for the button in its up state (image displayed when the button is not depressed with the mouse). **Note:** The GUI Designer adds the selected image as the IMAGE-UP option to the DEFINE BUTTON statement.
Down	Displays the **Choose Image** dialog which allows you to select an image for the button in its down state (image displayed when the button is depressed with the mouse). A down image has no effect unless you have defined an up image. **Note:** The GUI Designer adds the selected image as the IMAGE-DOWN option to the DEFINE BUTTON statement.

Insensitive	Displays the **Choose Image** dialog which allows you to select an image for the button in its insensitive (disabled) state. An insensitive image has no effect unless you have defined an up image. **Note:** The GUI Designer adds the selected image as the IMAGE-INSENSITIVE option to the DEFINE BUTTON statement.
Column	Enter a window column value (in character units) where you want to place the button upper left or right corner. This depends upon the position setting. For example, if Left-Align is chosen, the value in Column refers to the button upper left corner.
Row	Enter a window row value (in character units) where you want to place the button upper left or right corner. This depends upon the position setting. For example, if Left-Align is chosen, the value in Row refers to the button upper left corner.)
Width	Enter a value (in character units) to specify the width of the button.
Height	Enter a value (in character units) to specify the height of the button.
Left-Align	Select this option to position the button left edge along the column position specified.
Right-Align	Select this option to position the button right edge along the column position specified.
Other Settings section of Property Sheet dialog on page 599	This topic allows you to select the run-time attributes and other ABL related options or accept the defaults.
Color	Displays the **Choose Color** dialog which allows you change background and foreground colors on the button.
Font	Displays the **Choose Font** dialog which allows you to change the font of the button text.
Popup Menu	Displays the **Property Sheet - Popup Menu** dialog which allows you to create a pop-up menu for the button.
Translation Attributes	Displays the **String Attributes** dialog which allows you to enter translation attributes for the button.
Advanced	Displays the **Advanced Properties** dialog which allows you to edit more attributes for the button.

For more information, see Property Sheet dialogs on page 578

Property Sheet for Combo Box

The **Property Sheet - Combo Box** dialog allows you to modify the combo box properties.

This dialog includes the following options:

Object	Enter a new name for the combo box or accept the default. **Note:** If you make the combo box a database field, the combo box uses the database field name.
Tooltip	Allows you to enter text for tool tip help.
Help	Enter a Help Identifier associated with this field. This field is used only in `.HLP` help files to support What's This? context-sensitive help.
Label	Enter a new label for the combo box or accept the default. **Note:** If you make the combo box a database field, the combo box uses the database field label. If you want to suppress the combo box label, select the **No-Label** check box. GUI Designer adds the **No-Label** option to the Frame phrase.
List-Items	Enter items to display in the list component of the combo box.
Inner Lines	Enter the number of items visible at one time in the list component of the combo box.
Define As	Select a data type for the combo box.
Format	Enter a display format for the combo box. You can enter a display format for the combo box by clicking **Format** that opens **Format Assistant** dialog.
Column	Enter a window column value (in character units) where you want to place the combo box upper left or right corner. This depends upon the position setting and whether the combo box has a label. For example, if Left-Align is chosen, the value in Column refers to the combo box upper left corner.
Row	Enter a window row value (in character units) where you want to place the combo box upper left or right corner. This depends upon the position setting and whether the combo box has a label. For example, if Left-Align is chosen, the value in Row refers to the combo box upper left corner.
Width	Enter a value (in character units) to specify the width of the combo box.
Height	Enter a value (in character units) to specify the height of the combo box.
Left-Align	Select this option to position the combo box left edge (or label left edge) along the column position specified.

Colon-Align	Select this option to position the combo box label colon (:) along the column position specified. **Note:** If there is no label, then the GUI Designer aligns the combo box as if it had a label.
Right-Align	Select this option to position the combo box right edge along the column position specified.
Other Settings	This topic allows you to select run-time attributes and other ABL related options or accept the defaults.
Color	Displays the **Choose Color** dialog which allows you to change combo box background and foreground colors.
Font	Displays the **Choose Font** dialog which allows you to change the combo box font (excluding combo box label).
Popup Menu	Displays the **Property Sheet - Popup Menu** dialog which allows you to create a pop-up menu for the combo box.
Translation Attributes	Displays the **String Attributes** dialog which allows you to enter translation attributes for the combo box label, title, and display format.
Database Field	Displays the **Field Selector** dialog which allows you to connect a database field to the combo box.
Advanced	Displays the **Advanced Properties** dialog which allows you to edit advanced properties for the combo box.

For more information, see Property Sheet dialogs on page 578

Property Sheet for Editor

The **Property Sheet - Editor** dialog allows you to modify the editor properties. You can select Character or LongChar as a data type for an editor.

This dialog includes the following options:

Object	Enter a new name for the editor or accept the default.
Define As	Select a data type for the editor from the list. You can select either Character or LongChar. You must make an editor LongChar to display a large character object (CLOB). **Note:** When you select **LongChar**, the **Large** option in the **Other Settings** section is selected, and will be disabled to modify.
Maximum Characters	Enter a value to specify the maximum number of characters that can be contained in the editor.

Tooltip	Enter text for tool tip help.
Help	Enter a Help Identifier associated with this field. This field is used only in `.HLP` help files to support What's This? context-sensitive help.
Widget ID	Enter a widget ID for the editor.
Column	Enter a window column value (in character units) where you want to place the editor upper left or right corner. This depends upon the position setting. For example, if Left-Align is chosen, the value in Column refers to the radio set upper left corner.
Row	Enter a window row value (in character units) where you want to place the editor upper left or right corner. This depends upon the position setting. For example, if Left-Align is chosen, the value in Row refers to the radio set upper left corner.
Width	Enter a value (in character units) to specify the width of the editor.
Height	Enter a value (in character units) to specify the height of the editor.
Left-Align	Select this option to position the editor left edge along the column position specified.
Right-Align	Select this option to position the editor right edge along the column position specified.
Other Settings section of Property Sheet dialog on page 599	This topic allows you to select run-time attributes and other ABL related options or accept the defaults.
 Color	Displays the **Choose Color** dialog which allows you to change editor background and foreground colors.
 Font	Displays the **Choose Font** dialog which allows you to change the editor font.
 Popup Menu	Displays the **Property Sheet - Popup Menu** dialog which allows you to create a pop-up menu for the editor.
 Translation Attributes	Displays the **String Attributes** dialog which allows you to enter translation attributes for editor help.
 Database Field	Displays the **Field Selector** dialog which allows you to connect a database field to the editor.
Advanced	Displays the Advanced properties for Editor on page 622 dialog which allows you to edit more attributes for the editor.

For more information, see Property Sheet dialogs on page 578

Property Sheet for Fill In

The **Property Sheet - Fill In** dialog allows you to modify the fill-in properties.

This dialog includes the following options:

Object	Enter a new name for the fill-in or accept the default. **Note:** If you make the fill-in a database field, the fill-in uses the database field name.
Label	Enter a new label for the fill-in or accept the default. **Note:** If you make the fill-in a database field, the fill-in uses the database field label. If you want to suppress the fill-in label, select the **No-Label** check box. GUI Designer adds the No-Label option to the Frame phrase.
Define As	Select a data type for the fill-in from the list.
Format	Enter a display format for the fill-in. You can enter a display format for the combo box by clicking Format that opens Format Assistant dialog.
Tooltip	Allows you to enter text for tool tip help.
Help ID	Enter a Help Identifier associated with this field. This field is used only in `.HLP` help files to support What's This? context-sensitive help.
Column	Enter a window column value (in character units) where you want to place the fill-in upper left or right corner. This depends upon the position setting and whether the fill-in has a label. For example, if Left-Align is chosen, the value in Column refers to the fill-in upper left corner.
Row	Enter a window row value (in character units) where you want to place the fill-in upper left or right corner. This depends upon the position setting and whether the fill-in has a label. For example, if Left-Align is chosen, the value in Row refers to the fill-in upper left corner.
Width	Enter a value (in character units) to specify the width of the fill-in.
Height	Enter a value (in character units) to specify the height of the fill-in.
Left-Align	Select this option to position the fill-in left edge (or label left edge) along the column position specified.

Colon-Align	Select this option to position the fill-in label colon (:) along the column position specified. **Note:** If there is no label, then the GUI Designer aligns the fill-in as if it had a label.
Right-Align	Select this option to position the fill-in right edge along the column position specified.
Other Settings	This topic allows you to select run-time attributes and other ABL related options, or accept the defaults.
Color	Displays the **Choose Color** dialog which allows you to change fill-in background and foreground colors .
Font	Displays the **Choose Font** dialog which allows you to change the fill-in font (excluding fill-in label).
Popup Menu	Displays the **Property Sheet - Popup Menu** dialog which allows you to create a pop-up menu for the fill-in.
Translation Attributes	Displays the **String Attributes** dialog which allows you to enter translation attributes for the fill-in label, title, and display format.
Database Field	Displays the **Field Selector** dialog which allows you to connect a database field to the fill-in.
Advanced	Displays the **Advanced Properties** dialog which allows you to edit more attributes for the fill-in.

For more information, see Property Sheet dialogs on page 578

Property Sheet for Frame

The **Property Sheet - Frame** dialog allows you to modify the frame properties.

This dialog includes the following options:

Object	Enter a new name for the frame.
Title	Enter a new title for the frame.
Query	Displays the database query for the frame. You can edit the query by clicking Query, which opens the Query Builder dialog.
Column	Enter a value (in character units) where you want to place the frame upper left corner relative to the design window
Row	Enter a value (in character units) where you want to place the frame upper left corner relative to the design window.
Width	Enter a value (in character units) to specify the width of the frame.

Height	Enter a value (in character units) to specify the height of the frame.
Virtual Width	Enter the maximum and virtual width (in character units) of the frame. **Note:** This field is enabled when you select the **Scrollable** check box in the **Other Settings** section.
Virtual Height	Enter the maximum and virtual height (in character units) of the frame. **Note:** This field is enabled when you select the **Scrollable** check box in the **Other Settings** section.
Other Settings section of Property Sheet dialog on page 599	This topic allows you to select the run-time attributes and other ABL related options or accept the defaults.
Color	Displays the **Choose Color** dialog which allows you to change frame background color and foreground color for field-level objects in the frame.
Font	Displays the **Choose Font** dialog which allows you to change the font for field-level objects in the frame.
Popup Menu	Displays the **Property Sheet - Popup Menu** dialog which allows you to create a pop-up menu for the frame.
Translation Attributes	Displays the **String Attributes** dialog which allows you to enter translation attributes for the frame title.
	Displays the **Choose Title Color** which allows you to change the frame title color
Tab Order	Displays the **Tab Editor** dialog which allows you to change the tab order of field-level objects in the frame.
Advanced	Displays the Advanced properties for Frame on page 611 dialog which allows you to edit advanced properties for the selected frame.

For more information, see Property Sheet dialogs on page 578

Property Sheet for Image

The **Property Sheet - Image** dialog allows you to modify the image properties.

This dialog includes the following options:

Object	Enter a name for the image.
Image	Displays the **Choose Image** dialog which allows you to select an image (`.ico` file) for the image.
Tooltip	Allows you to enter text for tool tip help.

Widget ID	Allows you to enter a widget ID for the image.
Column	Enter a window column value (in character units) where you want to place the image upper left corner relative to the design canvas.
Row	Enter a window row value (in character units) where you want to place the image upper left corner relative to the design canvas.
Width	Allows you to enter a value in character units to specify the width of the image.
Height	Allows you to enter a value in character units to specify the height of the image.
Left-Align	Select this option to position the image left edge along the column position specified.
Right-Align	Select this option to position the image right edge along the column position specified.
Other Settings	This topic allows you to select run-time attributes and other ABL related options or accept the defaults.
 Translation Attributes	Displays the **String Attributes** dialog which allows you to enter translation attributes for the image.
Advanced	Displays the **Advanced Properties** dialog which allows you to edit advanced properties for the selected image.

For more information, see Property Sheet dialogs on page 578

Property Sheet for Radio Set

The **Property Sheet - Radio Set** dialog allows you to modify the radio set attributes.

This dialog includes the following options:

Object	Enter a new name for the radio set or accept the default.
Buttons	Enter the label for each radio button or accept the default. Radio buttons are a comma separated list. For example, "item-string", value, "item-string", value. Item strings must be enclosed within quotes and must be appropriate to the data type. The GUI Designer adds these values to the RADIO-SET phrase.
Define As	Select a data type for the radio set from the list.
Tooltip	Enter text for tool tip help.
Help	Enter a Help Identifier associated with this field. This field is used only in `.HLP` help files to support What's This? context-sensitive help.
Widget ID	Enter a widget ID for the radio set.

Column	Enter a window column value (in character units) where you want to place the radio set upper left or right corner. This depends upon the position setting. For example, if Left-Align is chosen, the value in Column refers to the radio set upper left corner.
Row	Enter a window row value (in character units) where you want to place the radio set upper left or right corner. This depends upon the position setting. For example, if Left-Align is chosen, the value in Row refers to the radio set upper left corner.
Width	Enter a value (in character units) to specify the width of the radio set.
Height	Enter a value (in character units) to specify the height of the radio set.
Left-Align	Select this option to position the radio set left edge along the column position specified.
Right-Align	Select this option to position the radio set right edge along the column position specified.
Other Settings	This topic allows you to select run-time attributes and other ABL related options or accept the defaults.
 Color	Displays the **Choose Color** dialog which allows you to change radio set background and foreground colors.
 Font	Displays the **Choose Font** dialog which allows you to change the radio set font (excluding radio set label).
 Popup Menu	Displays the **Property Sheet - Popup Menu** dialog which allows you to create a pop-up menu for the radio set.
 Translation Attributes	Displays the **String Attributes** dialog which allows you to enter translation attributes for radio set help.
 Database Field	Displays the **Field Selector** dialog which allows you to connect a database field to the radio set.
Advanced	Displays the **Advanced Properties** dialog which allows you to edit more attributes for the radio set.

For more information, see Property Sheet dialogs on page 578

Property Sheet for Rectangle

The **Property Sheet - Rectangle** dialog allows you to modify the rectangle properties.

This dialog includes the following options:

Object	Enter a name for the rectangle widget.
Edge Pixels	Allows you to enter the width of the rectangle border (in pixels). The rectangle foreground color is used for its edge.

Tooltip	Allows you to enter text for tool tip help.
Widget ID	Allows you to enter a widget ID for the rectangle.
Column	Enter a window column value (in character units) where you want to place the rectangle upper left or right corner. This depends upon the position setting. For example, if Left-Align is chosen, the value in Column refers to the rectangle upper left corner.
Row	Enter a window row value (in character units) where you want to place the rectangle upper left or right corner. This depends upon the position setting. For example, if Left-Align is chosen, the value in Row refers to the rectangle upper left corner.
Width	Allows you to enter a value in character units to specify the width of the rectangle.
Height	Allows you to enter a value in character units to specify the height of the rectangle.
Left-Align	Select this option to position the rectangle left edge along the column position specified.
Right-Align	Select this option to position the rectangle right edge along the column position specified.
Other Settings	This topic allows you to select run-time attributes and other ABL related options or accept the defaults.
 Color	Displays the **Choose Color** dialog which allows you to change rectangle background color and foreground color. **Note:** When the **Filled** check box is not selected in the **Other Settings** section, the rectangle will have no background color.
 Translation Attributes	Displays the **String Attributes** dialog which allows you to enter translation attributes for the rectangle title.
Advanced	Displays the Advanced properties for Rectangle on page 612 dialog which allows you to edit advanced properties for the selected rectangle.

For more information, see Property Sheet dialogs on page 578

Property Sheet for Selection List

The **Property Sheet - Selection List** dialog allows you to modify the selection list properties.

This dialog includes the following options:

Object	Enter a new name for the selection list or accept the default.
Tooltip	Enter text for tool tip help.

Help	Enter a Help Identifier associated with this field. This field is used only in `.HLP` help files to support What's This? context-sensitive help.
List Items	Enter items to display in the selection list.
Column	Enter a window column value (in character units) where you want to place the selection list upper left or right corner. This depends upon the position setting. For example, if Left-Align is chosen, the value in Column refers to the selection list upper left corner.
Row	Enter a window row value (in character units) where you want to place the selection list upper left or right corner. This depends upon the position setting. For example, if Left-Align is chosen, the value in Row refers to the selection list upper left corner.
Width	Enter a value (in character units) to specify the width of the selection list.
Height	Enter a value (in character units) to specify the height of the selection list.
Left-Align	Select this option to position the selection list left edge along the column position specified.
Right-Align	Select this option to position the selection list right edge along the column position specified.
Other Settings section of Property Sheet dialog on page 599	This topic allows you to select run-time attributes and other ABL related options or accept the defaults.
Color	Displays the **Choose Color** dialog which allows you to change selection list background and foreground colors.
Fonts	Displays the **Choose Font** dialog which allows you to change the selection list font.
Popup Menu	Displays the **Property Sheet - Popup menu** dialog which allows you to create a pop-up menu for the selection list.
Translation Attributes	Displays the **String Attributes** dialog which allows you to enter translation attributes for selection list help.
Database Field	Displays the **Field Selector** dialog which allows you to connect a database field to the selection list.
Advanced	Displays the Advanced properties for Selection List on page 621 dialog which allows you to edit more attributes for the selection list.

For more information, see Property Sheet dialogs on page 578

Property Sheet for Slider

The **Property Sheet - Slider** dialog allows you to modify the slider properties.

This dialog includes the following options:

Object	Enter a name for the toggle box or accept the default.
Min Value	Enter a minimum integer value for the slider. The minimum value cannot be less than -32,768.
Max Value	Enter a maximum integer value for the slider. The maximum value cannot exceed 32,767.
Tic Marks	Select to display tick marks on the slider, and select the position of the marks: Top/Left, Bottom/Right, or Both. The default option is None, which indicates no marks are displayed on the slider.
Frequency	Enter the value frequency (in integer) for each tick mark. **Note:** This option is enabled when when any value except "None" is selected from the Tic Marks list.
ToolTip	Enter text for the tool tip help.
Help	Enter a Help Identifier associated with this field. This field is used only in `.HLP` help files to support What's This? context-sensitive help.
Widget ID	Enter a widget ID for the toggle box.
Column	Enter a window column value (in character units) where you want to place the toggle box upper left or right corner. This depends upon the position setting. For example, if Left-Align is chosen, the value in Column refers to the toggle box upper left corner.
Row	Enter a window row value (in character units) where you want to place the toggle box upper left or right corner. This depends upon the position setting. For example, if Left-Align is chosen, the value in Row refers to the toggle box upper left corner.
Width	Enter a value (in character units) to specify the width of the slider.
Height	Enter a value (in character units) to specify the height of the slider.
Left-Align	Select this option to position the slider left edge along the column position specified.
Right-Align	Select this option to position the slider right edge along the column position specified.

Other Settings section of Property Sheet dialog on page 599	This topic allows you to select run-time attributes and other ABL related options, or accept the defaults.
Color	Displays the Choose Color dialog which allows you to change slider background and foreground colors.
Font	Displays the Choose Font dialog which allows you to change the slider font (excluding toggle box label).
Popup Menu	Displays the Property Sheet - Popup Menu dialog which allows you to create a pop-up menu for the slider.
Translation Attributes	Displays the String Attributes dialog which allows you to enter translation attributes for the slider help.
Database Field	Displays the Field Selector dialog which allows you to connect a database field to the slider.
Advanced	Displays the Advanced properties for Slider on page 618 dialog which allows you to edit more attributes for the slider.

For more information, see Property Sheet dialogs on page 578

Property Sheet for Text

The **Property Sheet - Text** dialog allows you to modify the text properties.

This dialog includes the following options:

Text	Enter text you want to display for the selected text widget.
ToolTip	Allows you to enter text for tool tip help.
Column	Enter a window column value (in character units) where you want to place the text object upper left or right corner. This depends upon the position setting. For example, if Left-Align is chosen, the value in Column refers to the text string upper left corner.
Row	Enter a window row value (in character units) where you want to place the text object upper left or right corner. This depends upon the position setting. For example, if Left-Align is chosen, the value in Row refers to the text string upper left corner.
Width	Enter a value (in character units) to specify the width of the text object.
Height	Enter a value (in character units) to specify the height of the text object.
Left-Align	Select this option to position the text object left edge along the column position specified.
Right-Align	Select this option to position the text object right edge along the column position specified.

Color	Displays the **Choose Color** dialog which allows you to change text object background and foreground colors.
Font	Displays the **Choose Font** dialog which allows you to change the text object font.
Translation Attributes	Displays the **String Attributes** dialog which allows you to enter translation attributes for the selected text widget.
Advanced	Displays the **Advanced Properties** dialog which allows you to edit advanced properties for the selected text widget.

For more information, see Property Sheet dialogs on page 578

Property Sheet for Toggle Box

The **Property Sheet - Toggle Box** dialog allows you to modify the toggle box properties.

This dialog includes the following options:

Object	Enter a name for the toggle box or accept the default.
Label	Enter a label for the toggle box.
ToolTip	Enter text for tool tip help.
Help	Enter a Help Identifier associated with this field. This field is used only in `.HLP` help files to support What's This? context-sensitive help.
Widget ID	Enter a widget ID for the toggle box.
Column	Enter a window column value (in character units) where you want to place the toggle box upper left or right corner. This depends upon the position setting. For example, if Left-Align is chosen, the value in Column refers to the toggle box upper left corner.
Row	Enter a window row value (in character units) where you want to place the toggle box upper left or right corner. This depends upon the position setting. For example, if Left-Align is chosen, the value in Row refers to the toggle box upper left corner.
Width	Enter a value (in character units) to specify the width of the toggle box.
Height	Enter a value (in character units) to specify the height of the toggle box.
Left-Align	Select this option to position the toggle box left edge along the column position specified.
Right-Align	Select this option to position the toggle box right edge (or label right edge) along the column position specified.

Other Settings section of Property Sheet dialog on page 599	This topic allows you to select run-time attributes and other ABL related options, or accept the defaults.
Color	Displays the **Choose Color** dialog which allows you to change toggle box background and foreground colors.
Font	Displays the **Choose Font** dialog which allows you to change the toggle box font (excluding toggle box label).
Popup Menu	Displays the **Property Sheet - Popup Menu** dialog which allows you to create a pop-up menu for the toggle box.
Translation Attributes	Displays the **String Attributes** dialog which allows you to enter translation attributes for the toggle box label and help.
Database Field	Displays the **Field Selector** dialog which allows you to connect a database field to the toggle box.
Advanced	Displays the Advanced properties for Toggle Box on page 616 dialog which allows you to edit more attributes for the toggle box.

For more information, see Property Sheet dialogs on page 578

Property Sheet for OCX

The **Property Sheet - OCX** dialog allows you to modify the OCX control frame properties..

This dialog includes the following options:

Object	Enter a new name for the **OCX** control frame or accept the default.
Help ID	Enter a Help Identifier associated with this field. This field is used only in `.HLP` help files to support What's This? context-sensitive help.
Widget ID	Enter a widget ID for the **OCX** control frame.
Column	Enter a window column value (in character units) where you want to place the control frame upper left corner.
Row	Enter a window row value (in character units) where you want to place the **OCX** control frame upper left corner.
Width	Enter a value (in character units) to specify the width of the **OCX** control frame.
Height	Enter a value (in character units) to specify the height of the **OCX** control frame.
Other Settings	This topic allows you to select the run-time attributes and other ABL related options or accept the defaults.
Advanced	Displays the **Advanced Properties** dialog which allows you to edit advanced properties for the **OCX** control frame.

For more information, see Property Sheet dialogs on page 578

Property Sheet for SmartObjects

The **Property Sheet - SmartObjects** dialog allows you to modify the properties for a SmartObject instance.

This property sheet includes the following options:

Object	Enter a new name for the SmartObject instance or accept the default.
Type	Displays the SmartObject type for the selected SmartObject instance.
Master File	Displays the name of the master file from which the selected SmartObject instance is created.
File	Displays the **Modify Master File Name** dialog which allows you to change the name of the master file from which the selected SmartObject instance is created.
Instance Properties	Displays the instance properties for the selected SmartObject instance.
Edit	Allows you to view the available properties and their corresponding values for the selected SmartObject. This option displays the **SmartObject Properties** dialog.
Parameterize as Variable	Activate to use the selected SmartObject instance as a placeholder. If you check this box, you must also add code to load the proper object at run time.
Variable	Select a variable name to use when parameterizing the selected SmartObject instance. This field is only displayed when Parameterize as Variable is selected.
 SmartLinks	Opens the **SmartLinks** dialog that enables you to view, add, and remove SmartLinks between SmartObject instances in the current design window.
 SmartInfo	Opens the **SmartInfo** dialog that enables you to view information on the SmartLinks supported by the selected SmartObject instance, and the database tables used and supplied the SmartObject instance.

For more information, see Property Sheet dialogs on page 578

Other Settings section of Property Sheet dialog

You can activate various toggles in the **Other Settings** section of an object **Property Sheet** to govern the object's run-time characteristics. Below is an alphabetical compilation of object run-time attributes and other object property options displayed as toggle boxes in the **Other Settings** section.

3-D	Activate for objects (including dialog boxes and frames) to have a uniform three-dimensional look. The AppBuilder sets the 3-D attribute to **TRUE**. (Windows only)
Auto-End-Key	Activate to make the button act like **ENDKEY** when chosen. The AppBuilder sets the **AUTO-END-KEY** attribute for the button to **TRUE**.

Auto-Go	Activate to make the button act like **GO** when chosen. The AppBuilder sets the **AUTO-GO** attribute for the button to **TRUE**.
Auto-Indent	Activate to make each new line of text typed in the editor object automatically indent to line up with the preceding line. The AppBuilder sets the **AUTO-INDENT** attribute for the editor object to **TRUE**.
Auto-Resize	Activate to make the object automatically resize when its contents are changed. The AppBuilder sets the **AUTO-RESIZE** attribute for the object to **TRUE**.
Auto-Return	Activate to set the **AUTO-RETURN** attribute for the fill-in to **TRUE**. When the last character is typed in a field, users automatically leave the field as if they had pressed **RETURN**.
Blank	Activate to set the **BLANK** attribute for the fill-in or text object to **TRUE**. Any current value or characters typed in a fill-in are not echoed to the screen.
Cancel Button	Activate to specify the button as the one chosen for all **ESC** key label events for the frame or dialog box. The AppBuilder adds the **CANCEL-BUTTON** attribute to the frame or dialog box. Choosing this attribute supersedes any existing cancel button defined for the frame.
Column-Scrolling	Activate to enable horizontal scrolling of the browse object by column at run time. The AppBuilder sets the **COLUMN-SCROLLING** attribute for the browse object to **TRUE**. (Deactivate to enable horizontal scrolling by character.) (Windows only)
Control-Box	Activate to enable the maximize and minimize buttons at the right end of the Window's title bar and the close button at the left end. (Windows only)
Convert-3D-Colors	Activate to convert image colors to corresponding platform-specific system colors. This often produces an unwelcome effect. (Windows only)
Deblank	Activate to remove leading blanks from **CHARACTER** fill-ins enabled for input after a change to its **SCREEN-VALUE** attribute during input. The AppBuilder sets **DEBLANK** attribute for the object to **TRUE**.
Default-Button	Activate to specify the button as the one chosen for all **RETURN** key function events, whether or not it has focus (unless there is another object in the frame or dialog box that normally takes a **RETURN** key function event). The AppBuilder adds the **DEFAULT-BUTTON** attribute to the frame or dialog box. Choosing this attribute supersedes any existing default button defined for the frame.

Default-Style	Activate for the AppBuilder to add an extra margin around the button to make it a default style button (default button margins are platform-specific). The AppBuilder adds the **DEFAULT** option to the **DEFINE BUTTON** statement.
Disable-Auto-Zap	Activate to prevent the Fill-in from automatically clearing its input field whenever it gets the focus.
Display	Activate to **DISPLAY** the variable value in the default enabling procedure. (You do not need to activate Display to make the object visible. Display causes the enabling procedure to populate the object with the variable data value.)
Down	Activate for the AppBuilder to allow multiple iterations of the frame if there's room in the frame.
Drag-Enabled	Activate to set the **DRAG-ENABLED** attribute for the selection list to **TRUE**. The user can simultaneously hold down the mouse select button and drag the mouse through the list. As the drag passes over an item, the item is highlighted. When the user releases the select button, the highlighted item becomes the selected item.
Drop-Target	Activate to generate an event when some object is dragged and dropped onto a window. You can write code to intercept and respond to such events under program control.
Enable	Activate to enable the field-level object for input. The AppBuilder includes the object in the **ENABLE** list in the default enabling procedure (enable_UI).
Expand	Activate to specify each button in a radio set to fill the radio set bounding box. The AppBuilder sets the **EXPAND** attribute to **TRUE**. (Horizontal must be activated for Expand to apply.)
Expandable	Activate to set a browse's **EXPANDABLE** attribute to **TRUE**, the right-most browse-column is extended horizontally to the browse's right edge, if necessary, to cover any white space that might appear there. The right-most browse-column expands only when there is no horizontal scroll bar.
Explicit-Position	Activate to position the window or dialog box at the screen location indicated by the values in the Column and Row fields at run time. The AppBuilder adds the **COLUMN** and **ROW** attributes to the **CREATE WIDGET** statement. (When deactivated the AppBuilder removes the Column and Row attributes: windows are placed by the program manager. Dialog boxes are centered over their parent windows.)
Filled	Activate to fill the rectangle with the background color.

Flat	Activate to display a button with a two-dimensional border that indicates the area where the user can click the button. When the cursor is positioned inside this area, a 3D border appears. (Windows only)
Graphic-Edge	Activate to draw the rectangle edge with a graphic line drawing character (thin line) in character environments. The AppBuilder sets the **GRAPHIC-EDGE** attribute to **TRUE**. When you specify values for **EDGE-PIXELS** greater than three, Graphic Edge is automatically deactivated and the rectangle edge is drawn with a character cell block. See conventions for rules dictating how Graphic-Edge relates to the Edge Pixels field on the **RECTANGLE Property Sheet**.
Hidden	Activate to set the **HIDDEN** attribute to **TRUE** for windows, frames, dialog boxes, and field-level widgets.
Horizontal	Activate to set the orientation of the slider or of radio buttons in the radio set to horizontal. The AppBuilder sets the **HORIZONTAL** attribute to **TRUE**.
Keep-Frame-Z-Order	Activate to disable frames automatically moving-to-top when receiving input focus at run time. The AppBuilder sets the **KEEP-FRAME-Z-ORDER** attribute to **TRUE** in the **CREATE WIDGET** statement.
Keep-Tab-Order	Activate to maintain the existing tab order of field-level objects. The AppBuilder adds the **KEEP-TAB-ORDER** option to the Frame phrase. You can manually override **KEEP-TAB-ORDER** for a particular field-level object with the **MOVE-AFTER-TAB-ITEM** and **MOVE-BEFORE-TAB-ITEM** methods.
Large	Activate to set the editor object to edit unlimited text (the limit is your system's memory). The AppBuilder sets the LARGE attribute to **TRUE**. The small editor provides a limit of 20 KB. (Windows only)
Large–To–Small	Activate to reverse the default order of values in the slider. When this toggle box is selected, values slide form higher to lower values. By default, values slide from lower to higher.
Max-Button	Activate to display the maximize button at the right end of the Window's title bar. (Windows only)
Message-Area	Activate to add a message area to the selected window. The AppBuilder sets the **MESSAGE-AREA** attribute to TRUE in the **CREATE WIDGET** statement. (In character environments, all windows have a message area.)
Min-Button	Activate to display the minimize button at the right end of the Window's title bar. (Windows only)

Multiple-Selection	Activate to allow the user to choose multiple entries in selection lists and browse objects. The AppBuilder sets the **MULTIPLE** attribute to **TRUE**. **Note:** The user must use row markers to multi-select a browse that has an enabled field. By default, **NO-ROW-MARKERS** are specified by the AppBuilder. Therefore, you must explicitly turn **ROW-MARKERS** on to take advantage of the multiple selection feature in an editable browse.
Native	Activate to make the fill-in behave like a native fill-in field under the current user interface (such as Windows). Otherwise, the field behaves like a default OpenEdge fill-in field under any interface. The AppBuilder adds the **NATIVE** option to the **VIEW-AS** phrase.
No-Assign	Activate to prevent data assignments to updatable fields from being automatically written back to the database when the user moves to a different row (record). The ABL programmer can write data assignments to the database manually.
No-Auto-Validate	Activate to turn off, for all field-level objects in the dialog box, the automatic validation defined in the Data Dictionary.
No-Box	Activate to display no box around the frame. If you do not use this option, a box displays around the frame you are displaying. The AppBuilder adds the **NO-BOX** option to the Frame phrase.
No-Current-Value	Activate to display the current value represented on the slider. By default, this toggle box is not selected. (NO CURRENT VALUE = FALSE).
No-Focus	Activate to prevent a button from taking focus when the mouse is clicked on it. (Windows only)
No-Help	Activate to disregard all help strings specified in the Data Dictionary for fields entered in the frame. The AppBuilder adds the **NO-HELP** option to the Frame phrase.
No-Hide	Activate to suppress the automatic hiding of the frame (when the block where the frame is scoped iterates). The AppBuilder adds the **NO-HIDE** option to the Frame phrase.
No-Labels	Activate to disable any labels from being displayed in the frame or browse. The AppBuilder adds **NO-LABELS** to the **DEFINE FRAME** statement for frames and **NO-LABELS** to the browse phrase of the **DEFINE BROWSE** statement for browse. (You get column labels when you deactivate **NO-LABELS** and **SIDE-LABELS**.)
No-Row-Markers	Activate to prevent row markers from being displayed in an editable browse. The AppBuilder adds the **NO-ROW-MARKERS** option to the **DEFINE BROWSE** statement.

No-Tab-Stop	Activate to remove the SmartDataBrowser from the applicable tab-traversal list. In Windows, removing the object from the traversal list has some effects that might confuse the user.
No-Underline	Activate if you do not want to underline labels that appear above fields. The AppBuilder adds the **NO-UNDERLINE** option to the Frame phrase.
No-Undo	Activate for the AppBuilder to add the **NO-UNDO** option to the **DEFINE VARIABLE** statement for the object. The value of the variable is not restored to its prior value during a backed out transaction or a sub-transaction. **NO-UNDO** variables are often much more efficient, and you should carefully consider when you can do without the default undo service.
No-Validate	Activate to disregard all validation conditions specified in the Data Dictionary for the fields entered in this frame. The AppBuilder adds the **NO-VALIDATE** option to the Frame phrase.
Open-the-Query	Open a query and populate the frame or browse object in the default enabling procedure.
Overlay	Activate for the frame to overlay any other frame that does not use the **TOP-ONLY** option. If you do not use this option, the frame you are using will cause overlapping frames to be hidden. The AppBuilder adds the **OVERLAY** option to the Frame phrase.
Read-Only	Activate for the AppBuilder to set the **READ-ONLY** attribute to **TRUE**. Editor objects cannot be enabled for input.
Remove-from-Layout	Activate for the object not to appear in a custom layout.
Resize	Activate to allow users to resize the window. The AppBuilder sets the **RESIZE** attribute to **TRUE** in the **CREATE WIDGET** statement.
Retain-Shape	Activate to indicate that the image should retain its aspect ratio (expand or contract equally in both dimensions). Can be set only if **Stretch to Fit** is set. Does not apply to images that take the `.ico` file extension.
Return-Inserted	Activate to cause a **RETURN** key function event insert a hard return at the cursor position, breaking the current line. The AppBuilder sets the **RETURN-INSERTED** attribute to **TRUE**. (Windows only)
Run-Persistent	Activate to run and create (instantiate) the selected window as a persistent procedure. The AppBuilder runs the window with the **PERSISTENT** option of the **RUN** statement.

Scroll-Bars	Activate to add scroll bars to the selected window. The AppBuilder sets the **SCROLL-BARS** attribute to **TRUE** in the **CREATE WIDGET** statement. **Note:** In Windows, the scroll bars only appear if needed. (When the virtual size of the window exceeds the viewport size.)
Scrollable	Activate to add scroll bars to the frame. The AppBuilder sets the **SCROLLABLE** attribute to **TRUE**.
Scrollbar-Horizontal	Activate to add a horizontal scrollbar to a selection list or to an editor object. The AppBuilder sets the **SCROLLBAR-HORIZONTAL** attribute to **TRUE** and adds the **SCROLLBAR-HORIZONTAL** option to the Selection List phrase or to the Editor phrase.
Scrollbar-Vertical	Activate to add a vertical scrollbar to a selection list or to an editor object. The AppBuilder sets the **SCROLLBAR-VERTICAL** attribute to TRUE and adds the **SCROLLBAR-VERTICAL** option to the Selection List phrase or to the Editor phrase.
Sensitive	Activate to allow the user to the give input focus to the object. The AppBuilder sets the **SENSITIVE** attribute for the object to **TRUE**.
Separators	Activate to add rules between rows and columns in a browse. The AppBuilder adds the **SEPARATORS** option to the **DEFINE BROWSE** statement.
Shared	Activate to share the object among several procedures. Depending upon the object type, the AppBuilder adds {&NEW} SHARED to the object definition.
Show-in-Taskbar	Activate to make the Window icon appear in the taskbar and in the task-switching window. (Windows only)
Side-Labels	Activate to specify side labels for the fields in the frame. The AppBuilder adds the **SIDE-LABELS** option to the Frame phrase. When deactivated, column labels are displayed above their corresponding fields.
Size-to-Fit	Activate to specify that the frame be sized just large enough to fit the basic objects and **SmartObject** instances it contains. The AppBuilder removes the explicit definition of the frame size from the Frame phrase. A change to this attribute will only be noted upon saving and reloading the design window, or at runtime.
Small-Title	Activate to reduce the size of the Window's title bar to the minimum needed for the title, as well as disable the maximize and minimize buttons at the right end of the title bar. Windows with small title bars do not have maximize or minimize buttons; they only have close buttons.

Sort	Activate to insert all items in the selection list in sorted order (overriding any other sort methods: **ADD-FIRST**, **ADD-LAST**, **INSERT**, and **REPLACE**). The AppBuilder sets the **SORT** attribute to **TRUE**.
Status-Area	Activate to add a status area to the selected window. The AppBuilder sets the STATUS-AREA attribute to TRUE in the CREATE WIDGET statement. (In character environments, all windows have a status area.)
Stretch-to-Fit	Activate to stretch the image to fit the available space. If Retain Shape is also set, the stretched image will maintain its original aspect ratio, even at the expense of fitting the space. Does not apply to images that take the `.ico` file extension.
Suppress Window	Activate to convert the window to "frame-only." When run, frames appear in the **CURRENT-WINDOW**. The AppBuilder comments out the **CREATE WINDOW** statement.
Title-Bar	Activate to specify a title for frames, dialog boxes, browse objects, and pop-up menus. The AppBuilder adds the **NO-BOX** option to the Frame phrase.
Transparent	Activate to make the background color of an image transparent, thus revealing whatever is underneath it. The background color is determined by the color of the pixel in the lower-left corner of the image. Does not apply to images that take the `.ico` file extension.
Use-Dict-Exps	Activate to ensure that validation expressions and help strings from the Data Dictionary are compiled into the application for all objects in the frame. The AppBuilder adds the **USE-DICT-EXPS** option to the Frame phrase.
View	Activate to cause the frame to be viewed at startup. (This toggle box is useful only when you have set the frame to **HIDDEN**.)
View-As-Text	Activate to make the fill-in field a read-only TEXT object. In a graphical environment, a text field takes up less space on the screen because it does not have the decorations associated with a native fill-in field. The AppBuilder adds the **TEXT** option to the **VIEW-AS** phrase.
Visible	Activate to set the **VISIBLE** attribute to **TRUE**.
Word-Wrap	Activate to make the editor object automatically break lines at any word that crosses the word wrap margin of the text area. The AppBuilder sets the **WORD-WRAP** attribute to **TRUE**.

Note: See the ABL Reference help for information about the statements, attributes, and phrases listed above.

Advanced Properties Sheet dialogs

The **Advanced Properties** dialog allows you to modify the advanced properties of a selected object. Access this dialog by clicking **Advanced** on the **Property Sheet** dialog.

Advanced properties for Window

The **Advanced Properties** dialog allows you to set advanced properties for the selected window.

This dialog includes the following options:

Private Data	Enter private data about the selected window. Private data is an annotation containing any character data that you can attach to an object. This annotation is only informational and not used by the code. The GUI Designer reads and writes private data as comments in the Run-time Attribute and AppBuilder Settings section of procedure files.
Characters	Select this option to write window size and position in character units. The GUI Designer writes the values entered in Column, Row, Width, and Height on the WINDOW Property Sheet in character units in the CREATE WIDGET statement.
Pixels	Select this option to express window size and position in pixel units. The GUI Designer writes the values entered in X, Y, Width Pixels, and Height Pixels in pixel units in the CREATE WIDGET statement.

Custom Lists	Select the custom list check box to add the window name to the selected custom list. For example, select the {&List-1} check box to add the window name to custom list &List-2.
	One of six user-defined, alphabetical lists of space-delimited object names represented by the preprocessor names (&List-1, &List-2, &List-3,&List-4, &List-5, &List-6). You can use custom lists in ABL code whenever you need to represent object names, as in the following example:
	`ENABLE ALL EXCEPT {&LIST-1} WITH FRAME {&FRAME-NAME}.`
	`HIDE {&LIST-2} WITH FRAME {&FRAME-NAME}`
	The GUI Designer adds an object name to a custom list whenever you activate one of the list toggles on the object's Advanced Property Sheet. Objects that are cut or deleted from a procedure file are automatically removed from the appropriate list.

X	Enter a value in pixels from your monitor left edge where you want to place the window upper left corner.
Y	Enter a value in pixels from your monitor top edge where you want to place the window upper left corner.
Width Pixels	Enter a value for the number of pixel units wide to make the window.
Height Pixels	Enter a value for the number of pixel units high to make the window.
Virtual Width Pixels	Enter the maximum and virtual width (in pixel units) of the window.
Virtual Height Pixels	Enter the maximum and virtual height (in pixel units) of the window.

Current Layout	Displays the current layout used to display the window.
Sync With Master	Displays the Sync with Master dialog on page 657 dialog which allows you to overwrite the current layout with the window default properties. **Note:** The **Sync With Master** option is enabled if you have defined a master layout.

For more information, see Property Sheet dialogs on page 578.

Advanced properties for Dialog Box

The **Advanced Properties** dialog allows you to set advanced properties for the selected dialog box.

This dialog includes the following options:

Private Data	Enter a private data about the selected dialog box. Private data is an annotation containing any character data that you can attach to an object. This annotation is only informational and not used by the code. The GUI Designer reads and writes private data as comments in the Run-time Attribute and AppBuilder Settings section of procedure files.
Characters	Select this option to write dialog box size and position in character units. The GUI Designer writes the values entered in Column, Row, Width, and Height on the DIALOG-BOX Property Sheet in character units using the Size phrase in the DEFINE FRAME statement.
Pixels	Select this option to express dialog box size and position in pixel units. The GUI Designer writes the values entered in X, Y, Width Pixels, and Height Pixels in pixel units using the Size and At phrases in the DEFINE VARIABLE and DEFINE FRAME statements.

Custom Lists	Select the custom list check box to add the dialog box name to the selected custom list. For example, select the {&List-1} check box to add the dialog box name to custom list &List-2.
	One of six user-defined, alphabetical lists of space-delimited object names represented by the preprocessor names (&List-1, &List-2, &List-3,&List-4, &List-5, &List-6). You can use custom lists in ABL code whenever you need to represent object names, as in the following example:
	`ENABLE ALL EXCEPT {&LIST-1} WITH FRAME {&FRAME-NAME}.`
	`HIDE {&LIST-2} WITH FRAME {&FRAME-NAME}.`
	The GUI Designer adds an object name to a custom list whenever you activate one of the list toggles on the object's Advanced Property Sheet. Objects that are cut or deleted from a procedure file are automatically removed from the appropriate list.

X	Enter a window column value (in pixel) where you want to place the dialog box upper left corner relative to the default AppBuilder run-time window. This option is enabled only when the Explicit Position toggle box on the DIALOG-BOX Property Sheet is selected. **Note:** This attribute only takes effect at run time.

Y	Enter a window row value (in pixels) where you want to place the dialog box upper left corner relative to the default AppBuilder run-time window. This option is enabled only when the Explicit Position toggle box on the DIALOG-BOX Property Sheet is selected. **Note:** This attribute only takes effect at run time.
Width Pixels	Enter a value for the number of pixel units wide to make the dialog box.
Height Pixels	Enter a value for the number of pixel units high to make the dialog box.
Box-Selectable	Select this option to choose one or more objects in the frame or dialog box by stretching a select box around the objects at run-time. The GUI Designer sets the for the frame or the dialog box to TRUE.
Current Layout	Displays the current layout used to display the dialog box.
Sync With Master	Displays the Sync with Master dialog on page 657 which allows you to overwrite the current layout with the dialog box default properties. **Note:** The **Sync With Master** option is enabled if you have defined a master layout.

For more information, see Property Sheet dialogs on page 578

Advanced properties for Browse

The **Advanced Properties - Browse** dialog allows you to set advanced properties for the selected browse widget.

This dialog includes the following options:

Help	Enter a help string for the selected browse widget. The GUI Designer displays the help string in the run-time window status bar whenever the browse has input focus.
Private Data	Enter any private data about the selected browse widget. Private data is an annotation containing any character data that you can attach to an object. This annotation is only informational and not used by the code. The GUI Designer reads and writes private data as comments in the Run-time Attribute and AppBuilder Settings section of procedure files.
Characters	Select this option to write browse size and position in character units. The GUI Designer writes the values entered in Column, Row, Width, and Height on the BROWSE Property Sheet in character units using the Size and At phrases in the DEFINE BROWSE and DEFINE FRAME statements.
Pixels	Select this option to write browse size and position in pixel units. The GUI Designer writes the values entered in X, Y, Width Pixels, and Height Pixels in pixel units using the Size and At phrases in the DEFINE BROWSE and DEFINE FRAME statements.

Custom Lists	Select the custom list check box to add the browse name to the selected custom list. For example, select the {&List-1} check box to add the browse name to custom list &List-2.
	One of six user-defined, alphabetical lists of space-delimited object names represented by the preprocessor names (&List-1, &List-2, &List-3,&List-4, &List-5, &List-6). You can use custom lists in ABL code whenever you need to represent object names, as in the following example:
	`ENABLE ALL EXCEPT {&LIST-1} WITH FRAME {&FRAME-NAME}.`
	`HIDE {&LIST-2} WITH FRAME {&FRAME-NAME}.`
	The GUI Designer adds an object name to a custom list whenever you activate one of the list toggles on the object's Advanced Property Sheet. Objects that are cut or deleted from a procedure file are automatically removed from the appropriate list.

X	Enter a value in pixels from the window left edge where you want to place the browse upper left or right corner. **Note:** Depends upon the position setting. For example, if Left-Align is chosen, the value in X refers to the browse upper left corner.
Y	Enter a value in pixels from the window top edge where you want to place the browse upper left or right corner. **Note:** Depends upon the position setting. For example, if Left-Align is chosen, the value in Y refers to the browse upper left corner.
Width Pixels	Enter a value for the number of pixel units wide to make the browse.
Height Pixels	Enter a value for the number of pixel units high to make the browse height.
Row Height Pixels	Enter a value for the number of pixel units high to make the row height in the selected browse.
Left-Align	Select this option to position the browse left edge along the column / X position specified.
Right-Align	Select this option to position the browse right edge along the column / X position specified.
Advanced Settings	This topic allows you to select advanced run-time properties and other ABL related options for the selected browse widget.

Current Layout	Displays the current layout used to display the browse.
Sync with Master	Displays the Sync with Master dialog on page 657 dialog which allows you to overwrite the current layout with the browse default properties. **Note:** The **Sync With Master** option is enabled if you have defined a master layout.

For more information, see Property Sheet dialogs on page 578.

Advanced properties for Frame

The **Advanced Properties** dialog allows you to modify the advanced properties for the selected frame.

This dialog includes the following options:

Private Data	Enter any private data about the selected frame widget. Private data is an annotation containing any character data that you can attach to an object. This annotation is only informational and not used by the code. The GUI Designer reads and writes private data as comments in the Run-time Attribute and AppBuilder Settings section of procedure files.
Characters	Select this option to write frame size and position in character units. The GUI Designer writes the values entered in Column, Row, Width, and Height on the EDITOR Property Sheet in character units using the Size and At phrases in the DEFINE FRAME statement.
Pixels	Select this option to express frame size and position in pixel units. The GUI Designer writes the values entered in X, Y, Width Pixels, and Height Pixels in pixel units using the Size and At phrases in the DEFINE FRAME statement.

Custom Lists	Select the custom list check box to add the frame name to the selected custom list. For example, select the {&List-1} check box to add the frame name to custom list &List-2.
	
	One of six user-defined, alphabetical lists of space-delimited object names represented by the preprocessor names (&List-1, &List-2, &List-3,&List-4, &List-5, &List-6). You can use custom lists in ABL code whenever you need to represent object names, as in the following example:
	
	`ENABLE ALL EXCEPT {&LIST-1} WITH FRAME {&FRAME-NAME}.`
	
	`HIDE {&LIST-2} WITH FRAME {&FRAME-NAME}.`
	
	The GUI Designer adds an object name to a custom list whenever you activate one of the list toggles on the object's Advanced Property Sheet. Objects that are cut or deleted from a procedure file are automatically removed from the appropriate list.

X	Enter a value in pixels from the window left edge where you want to place the frame upper left or right corner. **Note:** Depends upon the position setting. For example, if Left-Align is chosen, the value in X refers to the browse upper left corner.
Y	Enter a value in pixels from the window top edge where you want to place the frame upper left or right corner. **Note:** Depends upon the position setting. For example, if Left-Align is chosen, the value in Y refers to the browse upper left corner.
Width Pixels	Enter a value for the number of pixel units wide to make the frame.
Height Pixels	Enter a value for the number of pixel units high to make the frame height.
Virtual Width Pixels	Enter a value for the number of pixel units wide to make the row width in the selected frame.
Virtual Height Pixels	Enter a value for the number of pixel units high to make the row height in the selected frame.
Advanced Settings	This topic allows you to select advanced run-time properties and other ABL related options for the selected frame.
Current Layout	Displays the current layout used to display the frame.
Sync with Master	Displays the Sync with Master dialog on page 657 dialog which allows you to overwrite the current layout with the frame default properties. **Note:** The **Sync With Master** option is enabled if you have defined a master layout.

For more information, see Property Sheet dialogs on page 578.

Advanced properties for Rectangle

The **Advanced Properties** dialog allows you to set advanced properties for the selected rectangle.

This dialog includes the following options:

Private Data	Enter any private data about the selected browse widget. Private data is an annotation containing any character data that you can attach to an object. This annotation is only informational and not used by the code. The GUI Designer reads and writes private data as comments in the Run-time Attribute and AppBuilder Settings section of procedure files.

Characters	Select this option to write rectangle size and position in character units. The AppBuilder writes the values entered in Column, Row, Width, and Height on the BUTTON Property Sheet in character units using the Size and At phrases in the DEFINE RECTANGLE and DEFINE FRAME statements.
Pixels	Select this option to write rectangle size and position in pixel units. The AppBuilder writes the values entered in X, Y, Width Pixels, and Height Pixels in pixel units using the Size and At phrases in the DEFINE RECTANGLE and DEFINE FRAME statements.

Custom Lists	Select the custom list check box to add the rectangle name to the selected custom list. For example, select the {&List-1} check box to add the rectangle name to custom list &List-2.
	One of six user-defined, alphabetical lists of space-delimited object names represented by the preprocessor names (&List-1, &List-2, &List-3,&List-4, &List-5, &List-6). You can use custom lists in ABL code whenever you need to represent object names, as in the following example:
	`ENABLE ALL EXCEPT {&LIST-1} WITH FRAME {&FRAME-NAME}.`
	`HIDE {&LIST-2} WITH FRAME {&FRAME-NAME}.`
	The GUI Designer adds an object name to a custom list whenever you activate one of the list toggles on the object's Advanced Property Sheet. Objects that are cut or deleted from a procedure file are automatically removed from the appropriate list.

X	Enter a value in pixels from the window left edge where you want to place the rectangle upper left or right corner. **Note:** Depends upon the position setting. For example, if Left-Align is chosen, the value in X refers to the rectangle upper left corner.
Y	Enter a value in pixels from the window left edge where you want to place the rectangle upper left or right corner. **Note:** Depends upon the position setting. For example, if Left-Align is chosen, the value in X refers to the rectangle upper left corner.
Width Pixels	Enter a value for the number of pixel units wide to make the rectangle.
Height Pixels	Enter a value for the number of pixel units high to make the rectangle.
Left-Align	Select this option to position the rectangle left edge along the column / X position specified.
Right-Align	Select this option to position the rectangle right edge along the column / X position specified.
Advanced Settings	This topic allows you to select advanced run-time properties and other ABL related options for the selected rectangle.

Current Layout	Displays the current layout used to display the rectangle.
Sync with Master	Displays the Sync with Master dialog on page 657 dialog which allows you to overwrite the current layout with the rectangle default properties. **Note:** The **Sync With Master** option is enabled if you have defined a master layout.

For more information, see Property Sheet dialogs on page 578.

Advanced properties for Image

The **Advanced Properties** dialog allows you to set advanced properties for the selected image.

This dialog includes the following options:

Private Data	Enter any private data about the selected image. Private data is an annotation containing any character data that you can attach to an object. This annotation is only informational and not used by the code. The GUI Designer reads and writes private data as comments in the Run-time Attribute and AppBuilder Settings section of procedure files.
Characters	Select this option to write image size and position in character units. The AppBuilder writes the values entered in Column, Row, Width, and Height on the EDITOR Property Sheet in character units using the Size and At phrases in the DEFINE IMAGE and DEFINE FRAME statements.
Pixels	Select this option to write image size and position in pixel units. The AppBuilder writes the values entered in X, Y, Width Pixels, and Height Pixels in pixel units using the Size and At phrases in the DEFINE FRAME statement.

Custom Lists	Select the custom list check box to add the image name to the selected custom list. For example, select the {&List-1} check box to add the image name to custom list &List-2.
	
	One of six user-defined, alphabetical lists of space-delimited object names represented by the preprocessor names (&List-1, &List-2, &List-3,&List-4, &List-5, &List-6). You can use custom lists in ABL code whenever you need to represent object names, as in the following example:
	
	`ENABLE ALL EXCEPT {&LIST-1} WITH FRAME {&FRAME-NAME}.`
	
	`HIDE {&LIST-2} WITH FRAME {&FRAME-NAME}.`
	
	The GUI Designer adds an object name to a custom list whenever you activate one of the list toggles on the object's Advanced Property Sheet. Objects that are cut or deleted from a procedure file are automatically removed from the appropriate list.

X	Enter a value in pixels from the window left edge where you want to place the image upper left corner.
Y	Enter a value in pixels from the window top edge where you want to place the image upper left corner.

Width Pixels	Enter a value for the number of pixel units wide to make the image.
Height Pixels	Enter a value for the number of pixel units high to make the image.
Left-Align	Select this option to position the image left edge along the column / X position specified.
Right-Align	Select this option to position the image right edge along the column / X position specified.
Advanced Settings	This topic allows you to select advanced run-time properties and other ABL related options for the selected image.
Current Layout	Displays the current layout used to display the image.
Sync with Master	Displays the Sync with Master dialog on page 657 dialog that allows you to overwrite the current layout with the image default properties. **Note:** The **Sync With Master** option is enabled if you have defined a master layout.

For more information, see Property Sheet dialogs on page 578.

Advanced properties for Radio Set

The Advanced Properties dialog allows you to set advanced properties for the selected radio set.

This dialog includes the following options:

Initial Value	Enter an initial value for the radio set. The GUI Designer writes this value to the DEFINE VARIABLE statement for the radio set.
Help	Enter a help string for the radio set. The GUI Designer displays the help string in the run-time window status bar whenever the radio set has input focus.
Private Data	Enter any private data about the radio set. Private data is an annotation containing any character data that you can attach to an object. This annotation is only informational and not used by the code. The GUI Designer reads and writes private data as comments in the Run-time Attribute and AppBuilder Settings section of procedure files.
Characters	Select this option to write radio set size and position in character units. The AppBuilder writes the values entered in Column, Row, Width, and Height on the BUTTON Property Sheet in character units using the Size and At phrases in the DEFINE VARIABLE and DEFINE FRAME statements.
Pixels	Select this option to write radio set size and position in pixel units. The AppBuilder writes the values entered in X, Y, Width Pixels, and Height Pixels in pixel units using the Size and At phrases in the DEFINE VARIABLE and DEFINE FRAME statements.

Custom Lists	Select this option to add the radio set name to the selected custom list. For example, select the {&List-1} check box to add the radio set name to custom list &List-2. One of six user-defined, alphabetical lists of space-delimited object names represented by the preprocessor names (&List-1, &List-2, &List-3,&List-4, &List-5, &List-6). You can use custom lists in ABL code whenever you need to represent object names, as in the following example: ENABLE ALL EXCEPT {&LIST-1} WITH FRAME {&FRAME-NAME}. HIDE {&LIST-2} WITH FRAME {&FRAME-NAME}. The GUI Designer adds an object name to a custom list whenever you activate one of the list toggles on the object's Advanced Property Sheet. Objects that are cut or deleted from a procedure file are automatically removed from the appropriate list.
X	Enter a value in pixels from the window left edge where you want to place the radio set upper left or right corner. **Note:** Depends upon the position setting. For example, if Left-Align is chosen, the value in X refers to the radio set upper left corner.
Y	Enter a value in pixels from the window top edge where you want to place the radio set upper left or right corner. **Note:** epends upon the position setting. For example, if Left-Align is chosen, the value in Y refers to the radio set upper left corner.
Width Pixels	Enter a value for the number of pixel units wide to make the radio set.
Height Pixels	Enter a value for the number of pixel units high to make the radio set.
Left-Align	Select this option to position the radio set left edge along the column / X position specified.
Right-Align	Select this option to position the radio set right edge along the column / X position specified.
Advanced Settings	This topic allows you to select advanced run-time properties and other ABL related options for the selected radio set.
Current Layout	Displays the current layout used to display the radio set.
Sync With Master	Displays the Sync with Master dialog on page 657 dialog which allows you to overwrite the current layout with the radio set default properties. **Note:** The **Sync With Master** option is enabled if you have defined a master layout.

For more information, see Property Sheet dialogs on page 578.

Advanced properties for Toggle Box

The **Advanced Properties** dialog allows you to set advanced properties for the selected toggle box.

This dialog includes the following options:

Initial Value	Enter an initial value for the toggle box. The GUI Designer writes this value to the DEFINE VARIABLE statement for the toggle box.
Help	Enter a help string for the toggle box. The GUI Designer displays the help string in the run-time window status bar whenever the toggle box has input focus.
Private Data	Enter any private data about the toggle box. Private data is an annotation containing any character data that you can attach to an object. This annotation is only informational and not used by the code. The GUI Designer reads and writes private data as comments in the Run-time Attribute and AppBuilder Settings section of procedure files.
Characters	Select this option to write toggle box size and position in character units. The GUI Designer writes the values entered in Column, Row, Width, and Height on the TOGGLE-BOX Property Sheet in character units using the Size and At phrases in the DEFINE VARIABLE and DEFINE FRAME statements.
Pixels	Select this option to write toggle box size and position in pixel units. The GUI Designer writes the values entered in X, Y, Width Pixels, and Height Pixels in pixel units using the Size and At phrases in the DEFINE VARIABLE and DEFINE FRAME statements.

Custom Lists	Select this option to add the toggle box name to the selected custom list. For example, select the {&List-1} check box to add the toggle box name to custom list &List-2.
	One of six user-defined, alphabetical lists of space-delimited object names represented by the preprocessor names (&List-1, &List-2, &List-3,&List-4, &List-5, &List-6). You can use custom lists in ABL code whenever you need to represent object names, as in the following example:
	`ENABLE ALL EXCEPT {&LIST-1} WITH FRAME {&FRAME-NAME}.`
	`HIDE {&LIST-2} WITH FRAME {&FRAME-NAME}.`
	The GUI Designer adds an object name to a custom list whenever you activate one of the list toggles on the object's Advanced Property Sheet. Objects that are cut or deleted from a procedure file are automatically removed from the appropriate list.

X	Enter a value in pixels from the window left edge where you want to place the toggle box upper left or right corner. **Note:** Depends upon the position setting. For example, if Left-Align is chosen, the value in X refers to the toggle box upper left corner.
Y	Enter a value in pixels from the window top edge where you want to place the toggle box upper left or right corner. **Note:** Depends upon the position setting. For example, if Left-Align is chosen, the value in Y refers to the toggle box upper left corner.
Width Pixels	Enter a value for the number of pixel units wide to make the toggle box.
Height Pixels	Enter a value for the number of pixel units high to make the toggle box.

Left-Align	Select this option to position the toggle box left edge along the column / X position specified.
Right-Align	Select this option to position the toggle box right edge along the column / X position specified.
Advanced Settings	This topic allows you to select advanced run-time attributes and other ABL related options for the selected toggle box.
Current Layout	Displays the current layout used to display the toggle box.
Sync With Master	Displays the Sync with Master dialog on page 657 dialog which allows you to overwrite the current layout with the toggle box default properties. **Note:** The **Sync With Master** option is enabled if you have defined a master layout.

For more information, see Property Sheet dialogs on page 578.

Advanced properties for Slider

The **Advanced Properties** dialog allows you to set additional properties for the selected slider.

This dialog includes the following options:

Initial Value	Enter an initial value for the slider. The GUI Designer writes this value to the DEFINE VARIABLE statement for the slider.
Help	Enter a help string for the slider. The GUI Designer displays the help string in the run-time window status bar whenever the slider has input focus.
Private Data	Enter a private data about the slider. Private data is an annotation containing any character data that you can attach to an object. This annotation is only informational and not used by the code. The GUI Designer reads and writes private data as comments in the Run-time Attribute and AppBuilder Settings section of procedure files.
Characters	Select this option to write slider size and position in character units. The GUI Designer writes the values entered in Column, Row, Width, and Height on the SLIDER Property Sheet in character units using the Size and At phrases in the DEFINE VARIABLE and DEFINE FRAME statements.
Pixels	Select this option to write slider size and position in pixel units. The GUI Designer writes the values entered in X, Y, Width Pixels, and Height Pixels in pixel units using the Size and At phrases in the DEFINE VARIABLE and DEFINE FRAME statements.

Custom Lists	Select this option to add the slider name to the selected custom list. For example, select the {&List-1} check box to add the slider name to custom list &List-2.
	One of six user-defined, alphabetical lists of space-delimited object names represented by the preprocessor names (&List-1, &List-2, &List-3,&List-4, &List-5, &List-6). You can use custom lists in ABL code whenever you need to represent object names, as in the following example:
	`ENABLE ALL EXCEPT {&LIST-1} WITH FRAME {&FRAME-NAME}.`
	`HIDE {&LIST-2} WITH FRAME {&FRAME-NAME}.`
	The GUI Designer adds an object name to a custom list whenever you activate one of the list toggles on the object's Advanced Property Sheet. Objects that are cut or deleted from a procedure file are automatically removed from the appropriate list.

X	Enter a value in pixels from the window left edge where you want to place the slider upper left or right corner. **Note:** Depends upon the position setting. For example, if Left-Align is chosen, the value in X refers to the slider upper left corner.
Y	Enter a value in pixels from the window top edge where you want to place the slider upper left or right corner. **Note:** Depends upon the position setting. For example, if Left-Align is chosen, the value in Y refers to the slider upper left corner.
Width Pixels	Enter a value for the number of pixel units wide to make the slider.
Height Pixels	Enter a value for the number of pixel units high to make the slider.
Left-Align	Select this option to position the slider left edge along the column / X position specified.
Right-Align	Select this option to position the slider right edge along the column / X position specified.
Advanced Settings	This topic allows you to select advanced run-time attributes and other ABL related options.
Current Layout	Displays the current layout used to display the slider.
Sync With Master	Displays the Sync with Master dialog on page 657 dialog which allows you to overwrite the current layout with the slider default properties. **Note:** The **Sync With Master** option is enabled if you have defined a master layout.

For more information, see Property Sheet dialogs on page 578

Advanced properties for Button

The **Advanced Properties** dialog allows you to set advanced properties for the selected button.

This dialog includes the following options:

Help	Enter a help string for the button. The GUI Designer displays the help string in the run-time window status bar whenever the button has input focus.
Private Date	Enter any private data about the button. Private data is an annotation containing any character data that you can attach to an object. This annotation is only informational and not used by the code. The GUI Designer reads and writes private data as comments in the Run-time Attribute and AppBuilder Settings section of procedure files.
Character	Select this option to write button size and position in character units. The GUI Designer writes the values entered in Column, Row, Width, and Height on the BUTTON Property Sheet in character units using the Size and At phrases in the DEFINE BUTTON and DEFINE FRAME statements.
Pixels	Select this option to write button size and position in pixel units. The GUI Designer writes the values entered in X, Y, Width Pixels, and Height Pixels in pixel units using the Size and At phrases in the DEFINE BUTTON and DEFINE FRAME statements.

Custom Lists	Select this option to add the button name to the selected custom list. For example, select the {&List-1} check box to add the button name to custom list &List-2.
	One of six user-defined, alphabetical lists of space-delimited object names represented by the preprocessor names (&List-1, &List-2, &List-3,&List-4, &List-5, &List-6). You can use custom lists in ABL code whenever you need to represent object names, as in the following example:
	`ENABLE ALL EXCEPT {&LIST-1} WITH FRAME {&FRAME-NAME}.`
	`HIDE {&LIST-2} WITH FRAME {&FRAME-NAME}.`
	The GUI Designer adds an object name to a custom list whenever you activate one of the list toggles on the object's Advanced Property Sheet. Objects that are cut or deleted from a procedure file are automatically removed from the appropriate list.

X	Enter a value in pixels from the window left edge where you want to place the button upper left or right corner. **Note:** Depends upon the position setting. For example, if Left-Align is chosen, the value in X refers to the button upper left corner.
Y	Enter a value in pixels from the window top edge where you want to place the button upper left or right corner. **Note:** Depends upon the position setting. For example, if Left-Align is chosen, the value in Y refers to the button upper left corner.
Width Pixels	Enter a value for the number of pixel units wide to make the button.
Height Pixels	Enter a value for the number of pixel units high to make the button.
Left-Align	Select this option to position the button left edge along the column / X position specified.

Right-Align	Select this option to position the button right edge along the column / X position specified.
Advanced Settings	This topic allows you to select advanced run-time attributes and other ABL related options.
Current Layout	Displays the current layout used to display the button.
Sync With Master	Displays the Sync with Master dialog on page 657 dialog which allows you to overwrite the current layout with the button default properties. **Note:** The **Sync With Master** option is enabled if you have defined a master layout.

For more information, see Property Sheet dialogs on page 578.

Advanced properties for Selection List

The **Advanced Properties** dialog allows you to set advanced properties for the selected selection list.

This dialog includes the following options:

Initial Value	Enter an initial value for the selection list. The GUI Designer writes this value to the DEFINE VARIABLE statement for the selection list.
Help	Enter a help string for the selection list. The GUI Designer displays the help string in the run-time window status bar whenever the selection list has input focus.
Private Data	Enter any private data about the selection list. Private data is an annotation containing any character data that you can attach to an object. This annotation is only informational and not used by the code. The GUI Designer reads and writes private data as comments in the Run-time Attribute and AppBuilder Settings section of procedure files.
Characters	Select this option to write selection list size and position in character units. The GUI Designer writes the values entered in Column, Row, Width, and Height on the SELECTION-LIST Property Sheet in character units using the Size and At phrases in the DEFINE VARIABLE and DEFINE FRAME statements.
Pixels	Select this option to write selection list size and position in pixel units. The GUI Designer writes the values entered in X, Y, Width Pixels, and Height Pixels in pixel units using the Size and At phrases in the DEFINE VARIABLE and DEFINE FRAME statements.

Custom Lists	Select this option to add the selection list name to the selected custom list. For example, select the {&List-1} check box to add the select list name to custom list &List-2.
	One of six user-defined, alphabetical lists of space-delimited object names represented by the preprocessor names (&List-1, &List-2, &List-3,&List-4, &List-5, &List-6). You can use custom lists in ABL code whenever you need to represent object names, as in the following example:
	`ENABLE ALL EXCEPT {&LIST-1} WITH FRAME {&FRAME-NAME}.`
	`HIDE {&LIST-2} WITH FRAME {&FRAME-NAME}.`
	The GUI Designer adds an object name to a custom list whenever you activate one of the list toggles on the object's Advanced Property Sheet. Objects that are cut or deleted from a procedure file are automatically removed from the appropriate list.

X	Enter a value in pixels from the window left edge where you want to place the selection list upper left or right corner. **Note:** Depends upon the position setting. For example, if Left-Align is chosen, the value in X refers to the selection list upper left corner.
Y	Enter a value in pixels from the window top edge where you want to place the selection list upper left or right corner. **Note:** Depends upon the position setting. For example, if Left-Align is chosen, the value in Y refers to the selection list upper left corner.
Width Pixels	Enter a value for the number of pixel units wide to make the selection list.
Height Pixels	Enter a value for the number of pixel units high to make the selection list.
Left-Align	Select this option to position the selection list left edge along the column / X position specified.
Right-Align	Select this option to position the selection list right edge along the column / X position specified.
Advanced Settings	This topic allows you to select advanced run-time attributes and other ABL related options.
Current Layout	Displays the current layout used to display the selection list.
Sync With Master	Displays the Sync with Master dialog on page 657 dialog which allows you to overwrite the current layout with the selection list default properties. **Note:** The **Sync With Master** option is enabled if you have defined a master layout.

For more information, see Property Sheet dialogs on page 578.

Advanced properties for Editor

The **Advanced Properties** dialog allows you to set advanced properties for the selected editor.

This dialog includes the following options:

Initial Value	Enter an initial value for the editor. The GUI Designer writes this value to the DEFINE VARIABLE statement for the editor.
Help	Enter a help string for the editor. The GUI Designer displays the help string in the run-time window status bar whenever the editor has input focus. By default the AppBuilder uses help you define here unless you are using a database variable that has help defined in the schema.

Private Data	Enter any private data about the editor. Private data is an annotation containing any character data that you can attach to an object. This annotation is only informational and not used by the code. The GUI Designer reads and writes private data as comments in the Run-time Attribute and AppBuilder Settings section of procedure files.
Characters	Select this option to write editor size and position in character units. The GUI Designer writes the values entered in Column, Row, Width, and Height on the EDITOR Property Sheet in character units using the Size and At phrases in the DEFINE VARIABLE and DEFINE FRAME statements.
Pixels	Select this option to express editor size and position in pixel units. The GUI Designer writes the values entered in X, Y, Width Pixels, and Height Pixels in pixel units using the Size and At phrases in the DEFINE FRAME statement.

{&List-1}	Select this option to add the editor name to the selected custom list. For example, select the {&List-1} check box to add the editor name to custom list &List-2.
	One of six user-defined, alphabetical lists of space-delimited object names represented by the preprocessor names (&List-1, &List-2, &List-3,&List-4, &List-5, &List-6). You can use custom lists in ABL code whenever you need to represent object names, as in the following example:
	`ENABLE ALL EXCEPT {&LIST-1} WITH FRAME {&FRAME-NAME}.`
	`HIDE {&LIST-2} WITH FRAME {&FRAME-NAME}.`
	The GUI Designer adds an object name to a custom list whenever you activate one of the list toggles on the object's Advanced Property Sheet. Objects that are cut or deleted from a procedure file are automatically removed from the appropriate list.

X	Enter a value in pixels from the window left edge where you want to place the editor upper left or right corner. **Note:** Depends upon the position setting. For example, if Left-Align is chosen, the value in X refers to the editor upper left corner.
Y	Enter a value in pixels from the window top edge where you want to place the editor upper left or right corner. **Note:** Depends upon the position setting. For example, if Left-Align is chosen, the value in Y refers to the editor upper left corner.
Width Pixels	Enter a value for the number of pixel units wide to make the editor.
Height Pixels	Enter a value for the number of pixel units high to make the editor.
Left-Align	Select this option to position the editor label left edge along the column / X position specified.
Right-Align	Select this option to position the editor right edge along the column / X position specified.

Advanced Settings	This topic allows you to select advanced run-time attributes and other ABL related options.
Current Layout	Displays the current layout used to display the editor.
Sync With Master	Displays the Sync with Master dialog on page 657 dialog which allows you to overwrite the current layout with the editor default properties. **Note:** The **Sync With Master** option is enabled if you have defined a master layout.

For more information, see Property Sheet dialogs on page 578.

Advanced properties for Combo Box

The **Advanced Properties** dialog allows you to set advanced properties for the selected combo box.

This dialog includes the following options:

Initial Value	Enter an initial value for the combo box. The GUI Designer writes this value to the DEFINE VARIABLE statement for the combo box.
Help	Enter a help string for the combo box. The GUI Designer displays the help string in the run-time window status bar whenever the combo box has input focus. By default the AppBuilder uses help you define here unless you are using a database variable that has help defined in the schema.
Private Data	Enter any private data about the combo box. Private data is an annotation containing any character data that you can attach to an object. This annotation is only informational and not used by the code. The GUI Designer reads and writes private data as comments in the Run-time Attribute and AppBuilder Settings section of procedure files.
Characters	Choose to write combo box size and position in character units. The AppBuilder writes the values entered in Column, Row, Width, and Height on the COMBO-BOX Property Sheet in character units using the Size and At phrases in the DEFINE VARIABLE and DEFINE FRAME statements.
Pixels	Choose to express combo box size and position in pixel units. The AppBuilder writes the values entered in X, Y, Width Pixels, and Height Pixels in pixel units using the Size and At phrases in the DEFINE VARIABLE and DEFINE FRAME statements.

Custom Lists	Select this option to add the combo box name to the selected custom list. For example, select the {&List-1} check box to add the combo box name to custom list &List-2.
	One of six user-defined, alphabetical lists of space-delimited object names represented by the preprocessor names (&List-1, &List-2, &List-3,&List-4, &List-5, &List-6). You can use custom lists in ABL code whenever you need to represent object names, as in the following example:
	`ENABLE ALL EXCEPT {&LIST-1} WITH FRAME {&FRAME-NAME}.`
	`HIDE {&LIST-2} WITH FRAME {&FRAME-NAME}.`
	The GUI Designer adds an object name to a custom list whenever you activate one of the list toggles on the object's Advanced Property Sheet. Objects that are cut or deleted from a procedure file are automatically removed from the appropriate list.

X	Enter a value in pixels from the window left edge where you want to place the combo box upper left or right corner. **Note:** Depends upon the position setting. For example, if Left-Align is chosen, the value in X refers to the combo box upper left corner.
Y	Enter a value in pixels from the window top edge where you want to place the combo box upper left or right corner. **Note:** Depends upon the position setting. For example, if Left-Align is chosen, the value in Y refers to the combo box upper left corner.
Width Pixels	Enter a value for the number of pixel units wide to make the combo box.
Height Pixels	Enter a value for the number of pixel units high to make the combo box.
Left Align	Select this option to position the fill-in left edge (or label left edge) along the column / X position specified.
Colon-Align	Select this option to position the fill-in label colon (:) along the column / X position specified. (If there is no label, then the AppBuilder aligns the fill-in as if it had a label.)
Right-Align	Select this option to position the fill-in right edge along the column position / X specified.
Advanced Settings	This topic allows you to select advanced run-time attributes and other ABL related options.
Current Layout	Displays the current layout used to display the combo box.
Sync With Master	Displays the Sync with Master dialog on page 657 dialog which allows you to overwrite the current layout with the combo box default properties. **Note:** The **Sync With Master** option is enabled if you have defined a master layout.

For more information, see Property Sheet dialogs on page 578.

Advanced properties for Fill In

The **Advanced Properties** dialog allows you to to set advanced properties for the selected fill-in.

This dialog includes the following options:

Initial Value	Enter an initial value for the fill-in. The GUI Designer writes this value to the DEFINE VARIABLE statement for the fill-in.
Help	Enter a help string for the fill-in. The GUI Designer displays the help string in the run-time window status bar whenever the fill-in has input focus. By default the AppBuilder uses help you define here unless you are using a database variable that has help defined in the schema.

Private Data	Enter any private data about the fill-in. Private data is an annotation containing any character data that you can attach to an object. This annotation is only informational and not used by the code. The GUI Designer reads and writes private data as comments in the Run-time Attribute and AppBuilder Settings section of procedure files.
Characters	Select this option to write fill-in size and position in character units. The GUI Designer writes the values entered in Column, Row, Width, and Height on the EDITOR Property Sheet in character units using the Size and At phrases in the DEFINE VARIABLE and DEFINE FRAME statements.
Pixels	Select this option to express fill-in size and position in pixel units. The GUI Designer writes the values entered in X, Y, Width Pixels, and Height Pixels in pixel units using the Size and At phrases in the DEFINE FRAME statement.

Custom Lists	Select this option to add the fill-in name to the selected custom list. For example, select the {&List-1} check box to add the fill-in name to custom list &List-2.
	One of six user-defined, alphabetical lists of space-delimited object names represented by the preprocessor names (&List-1, &List-2, &List-3,&List-4, &List-5, &List-6). You can use custom lists in ABL code whenever you need to represent object names, as in the following example:
	`ENABLE ALL EXCEPT {&LIST-1} WITH FRAME {&FRAME-NAME}.`
	`HIDE {&LIST-2} WITH FRAME {&FRAME-NAME}.`
	The GUI Designer adds an object name to a custom list whenever you activate one of the list toggles on the object's Advanced Property Sheet. Objects that are cut or deleted from a procedure file are automatically removed from the appropriate list.

X	Enter a value in pixels from the window left edge where you want to place the fill-in upper left or right corner. **Note:** Depends upon the position setting and whether the fill-in has a label. For example, if Left-Align is chosen, the value in X refers to the fill-in upper left corner.
Y	Enter a value in pixels from the window top edge where you want to place the fill-in upper left or right corner. **Note:** Depends upon the position setting. For example, if Left-Align is chosen, the value in Y refers to the fill-in upper left corner.
Width Pixels	Enter a value for the number of pixel units wide to make the fill-in.
Height Pixels	Enter a value for the number of pixel units high to make the fill-in.
Left-Align	Select this option to position the fill-in left edge (or label left edge) along the column / X position specified.
Colon-Align	Select this option to position the fill-in label colon (:) along the column / X position specified. (If there is no label, then the AppBuilder aligns the fill-in as if it had a label.)
Right-Align	Select this option to position the fill-in right edge along the column position / X specified.

Advanced Settings	This topic allows you to select advanced run-time attributes and other ABL related options.
Current Layout	Displays the current layout used to display the fill-in.
Sync With Master	Displays the Sync with Master dialog on page 657 dialog which allows you to overwrite the current layout with the fill-in default properties. **Note:** The **Sync With Master** option is enabled if you have defined a master layout.

For more information, see Property Sheet dialogs on page 578.

Advanced properties for Text

The **Advanced Properties** dialog allows you to to set advanced properties for the selected text object.

This dialog includes the following options:

Characters	Select this option to write text object size and position in character units. The GUI Designer writes the values entered in Column, Row, Width, and Height on the TEXT Property Sheet in character units using the Size and At phrases in the DEFINE FRAME statement.
Pixels	Select this option to write text object size and position in pixel units. The GUI Designer writes the values entered in X, Y, Width Pixels, and Height Pixels in pixel units using the Size and At phrases in the DEFINE FRAME statement.
X	Enter a value in pixels from the window left edge where you want to place the text object upper left or right corner. **Note:** Depends upon the position setting. For example, if Left-Align is chosen, the value in X refers to the text object upper left corner.
Y	Enter a value in pixels from the window top edge where you want to place the text object upper left or right corner. **Note:** Depends upon the position setting. For example, if Left-Align is chosen, the value in Y refers to the text object upper left corner.)
Width Pixels	Enter a value for the number of pixel units wide to make the text object.
Height Pixels	Enter a value for the number of pixel units high to make the text object.
Left-Align	Select this option to position the text object left edge along the column / X position specified.
Right-Align	Select this option to position the text object right edge along the column / X position specified.
Current Layout	Displays the current layout used to display the text object.

For more information see, Property Sheet dialogs on page 578

Advanced properties for OCX

The **Advanced Properties** dialog allows you to set advanced properties for the selected OCX control frame.

This dialog includes the following options:

Help	Enter a help string for the OCX control frame. The AppBuilder displays the help string in the run-time window status bar whenever the button has input focus.
Private Data	Enter any private data about the OCX control frame.
Characters	Select this option to write the control frame size and position in character units. The GUI Designer writes the values entered in Column, Row, Width, and Height on the OCX Control Frame Property Sheet in character units in the CREATE CONTROL-FRAME statement.
Pixels	Select this option to write OCX control frame size and position in pixel units. The GUI Designer writes the values entered in X, Y, Width Pixels, and Height Pixels in pixel units in the CREATE CONTROL-FRAME statement.

Custom Lists	Select this option to add the OCX control frame name to the selected custom list. For example, select the {&List-1} check box to add the OCX control frame name to custom list &List-2.
	One of six user-defined, alphabetical lists of space-delimited object names represented by the preprocessor names (&List-1, &List-2, &List-3,&List-4, &List-5, &List-6). You can use custom lists in ABL code whenever you need to represent object names, as in the following example:
	`ENABLE ALL EXCEPT {&LIST-1} WITH FRAME {&FRAME-NAME}.`
	`HIDE {&LIST-2} WITH FRAME {&FRAME-NAME}.`
	The GUI Designer adds an object name to a custom list whenever you activate one of the list toggles on the object's Advanced Property Sheet. Objects that are cut or deleted from a procedure file are automatically removed from the appropriate list.

X	Enter a value in pixels from the window left edge where you want to place the control frame upper left or corner.
Y	Enter a value in pixels from the window top edge where you want to place the OCX control frame upper left corner.
Width Pixels	Enter a value for the number of pixel units wide to make the OCX control frame.
Height Pixels	Enter a value for the number of pixel units high to make the OCX control frame height.
Current Layout	Displays the current layout used to display the OCX control frame.
Sync With Master	Displays the Sync with Master dialog on page 657 dialog which allows you to overwrite the current layout with the OCX control frame default properties. **Note:** The **Sync With Master** option is enabled if you have defined a master layout.

For more information, see Property Sheet dialogs on page 578.

Choose Color dialog

The **Choose Color** dialog helps you to customize the background and foreground colors of objects and frame in the design window.

The color numbers displayed are logical representations of either OpenEdge reserved RGB values or customized RGB values. Colors zero through 15 are OpenEdge reserved colors. You can customize only colors 16 through 255.

You can access this dialog by clicking on the **Color**  icon on the object's Property Sheet dialogs on page 578 or Column Editor dialog (for Browse) on page 644.

The **Choose Color** dialog includes the following options:

Sample	Displays an example of currently selected background and foreground colors.
Foreground Colors	Select a foreground color. The foreground color you select appears in the Sample field. The question mark (?) represents the default color for the object, which is determined by its parent.
Background Colors	Select a background color. The background color you select appears in the Sample field. The question mark (?) represents the default color for the object, which is determined by its parent.
	Displays the previous sixteen colors in the palette.
	Displays the next sixteen colors in the palette.
Edit	Displays the **Color** dialog that allows you to edit the selected foreground or background color.
Save Color Settings	Select to save your current color selections for future sessions.

See also

Change color of an object on page 539

Character Terminal Simulator Colors dialog

The **Character Terminal Simulator Colors** dialog allows you to customize the background and foreground colors for your OpenEdge session. The color numbers displayed are logical representations of either OpenEdge reserved RGB values or customized RGB values.

This dialog includes the following options:

Sample	Displays an example of currently selected background and foreground colors.
Foreground Colors	Select a foreground color. The foreground color you select appears in the Sample field. The question mark (?) represents the default color for the object, which is determined by its parent.

Background Colors	Select a background color. The background color you select appears in the Sample field. The question mark (?) represents the default color for the object, which is determined by its parent.
	Displays the previous sixteen colors in the palette.
	Displays the next sixteen colors in the palette.
Edit	Displays the Color dialog that allows you to select and edit color. Colors zero through 15 are OpenEdge reserved colors. You can customize only colors 16 through 255.
Save Color Settings	Select to save your current color selections for future sessions.

For more information, see AppBuilder properties page (Windows only) on page 77 page.

Choose Font dialog

The **Choose Font** dialog helps you to choose or customize the fonts for your OpenEdge session.

The font numbers displayed are logical representations of either OpenEdge reserved system fonts or customized system fonts.

You can access this dialog by clicking on the **Font**  icon on the object's Property Sheet dialogs on page 578 or Column Editor dialog (for Browse) on page 644.

The **Choose Font** dialog includes the following options:

Sample	Displays an example of currently selected font.
	Select to display the previous four available fonts.
	Select to display the next four available fonts.
Edit	Opens the Font dialog that allows you to edit the selected font. **Note:** Font zero through seven are OpenEdge reserved fonts. You can customize only fonts eight through 255.
Save Color Settings	Select to save your current font selections for future sessions.
OK	Select to save your changes and exit the dialog.
Cancel	Select to ignore your changes and exit the dialog.

See also

Column Editor dialog (for Browse) on page 644
Choose Color dialog on page 629

Choose Control dialog

The **Choose Control** dialog allows you to insert an OCX control on the design window.

Access this dialog box by selecting OCX from the OCX section on the Palette.

This dialog includes the following options:

Option	Description
Available Controls	List of the registered ActiveX controls available on your system, and the three controls provided with OpenEdge: CSComboBox, CSSpin, and PSTimer. **Note:** You can also access the three controls provided with OpenEdge directly from the GUI Designer Palette. When you select a control, a preview of the control appears below the Available Controls list along with its corresponding complete path and filename.
Browse	Open the browse dialog to search for a control by filename from other directories on your system.
OK	Insert the selected OCX control on the design window.

For more information, see ActiveX objects on page 566

Choose Template dialog

The **Choose Other Template** dialog allows you to select GUI Designer procedure file as a template and place it in the objects list for the current GUI Designer session. You can use the template to create an ABL GUI procedure file.

Access this dialog by clicking **Template** on the **Create an ABL GUI procedure** wizard.

This dialog includes the following options:

File	Enter a file name, or select a file from files list.
File List	Lists the files from the directory specified in the Directory and File Type drop-down.
File Type	Select a type of file to display in the files list.
Directory	Specify the directory to search for files. All the files present in the selected directory appears in the files list.
Source	If the **Preview** check box is selected, displays the contents of the selected file from the files list. This is a read-only editor.
Preview	Select this check box to display the contents of the selected file in the source editor.
Code/Image	When preview is selected, this radio set indicates the type of file being previewed.

Edit Path	Displays the **Edit Path** dialog which allows you to add or remove the source directories.
Browse	Displays the **Browse Files** dialog which allows you to search entire system for directories and files.

For more information, see Create ABL GUI procedure files on page 532

Table Selector dialog

The **Table Selector** dialog allows you to select a table for the operation you are performing.

This dialog includes the following options:

Databases	Lists all the connected databases, and allows you to select a database from the list.
Tables	Lists all the tables of the selected database, and allows you to select a table.

For more information, see Multi-Field Selector dialog on page 632

Field Selector dialog box

Use the **Field Selector** dialog box to choose fields for the operation you are performing.

Option	Description
Databases	Choose a database. Displays all the connected databases.
Tables	Choose a table. Displays all the tables of the selected database.
Fields	Choose fields. You can choose more than one field by pressing and holding CTRL while you select the field names with the mouse. Displays all the fields of the selected table. (Fields only displays when a table is selected.)

See also

Property Sheet for Slider on page 594

Multi-Field Selector dialog

The **Multi-Field Selector** dialog allows you to select fields for the operation you are performing.

This dialog includes the following options:

Available Fields	Lists the fields of the table selected from the **Table Selector** dialog. Highlight one or more fields to add to the **Selected Fields** list.
Selected Fields	Lists the fields that you add from the **Available Fields** list. Highlight one or more fields to remove, move up, or move down in this list.

Add >>	Add fields to the **Selected Fields** list. Moves the highlighted fields in the **Available Fields** list (left list) to the **Selected Fields** list (right list).
<< Remove	Removes fields from the **Selected Fields** list. Moves the highlighted fields in the **Selected Fields** list (right list) to the **Available Fields** list (left list)
Move UP	Moves the highlighted fields in the **Selected Fields** list (right list) one position up in the list
Move Down	Moves the highlighted fields in the **Selected Fields** list (right list) one position down in the list.

For more information, see Table Selector dialog on page 632

Add Trigger dialog

The **Add Trigger** dialog helps you associate an event (also called a trigger) with an object in the AppBuilder (`.w`) file. This option is available only with the AppBuilder (`.w`) files.

You can access this wizard from the **Source menu** > **Add Trigger** > or right-click on the ABL Editor and select **Source** > **Add Trigger** from the context menu.

The **Add Trigger** wizard includes the following controls:

Widget	Select an object from the drop-down to which you want to add trigger. This list contains all the objects that are present on the current design window.
Event category	Select an event category from the drop-down. This lists contains the following event categories: • **Common Events** – Select this to display all common events for the selected object. • **Direct Manipulation Events** – Select this to display the direct manipulation events. These are explicit actions a user performs on objects with a keyboard or a mouse such as selecting, highlighting, moving, and resizing. • **Portable Mouse Events** – Select this to display the portable mouse events. These are mouse events based on a conceptual four-button mouse model with select, menu, move, and extend buttons. • **Three-Button Mouse Events** – Select this to display the three-button mouse events. These are mouse events based on three-button mouse model with left, middle, and right buttons. • **Developer Events** – Select this to display the developer events. There are ten system-supplied events (U1 to U10) that you can apply to objects with the APPLY statement. • **Keyboard Events** – Select this to record keystrokes and bind them to events. When you select this option **Key label**, **Key function**, and **Generate code** by options will be available and grouped under **Event name** section.
Event name	Select an event name from the drop-down. This list contains the event names based on the selection you make in the **Widget** and **Event category** drop-downs.

Define key (Key label)	Enter a label for the keyboard event such as **F1** or **F2**. **Note:** This option is available when you specify Keyboard Events in the **Event category** drop-down.
Key function	Displays the pre-defined function name associated with the key label you have entered in the **Key label** field such as **Help** for **F1** or **GO** for **F2**. If there is no pre-defined function associated with the specified key label, then the same key label text is displayed in the **Key function** field. **Note:** This option is available when you specify Keyboard Events in the **Event category** drop-down.
Generate code by	Allows you to generate the trigger code by either the **Key label** or **Key function**. **Note:** This option is available when you specify Keyboard Events in the **Event category** drop-down.
Generate	Generates the trigger code for the selected object and inserts in the (`.w`) procedure file.
Cancel	Select to ignore your changes and exit the trigger wizard.

See also

Connecting to a database on page 544
Add Function wizard on page 350
Add Procedure wizard on page 353

New ADM Class dialog

The **New ADM Class** dialog allows you to create a new ADM2Class.

ADM class is a collection of files that define properties and run-time routines for a particular SmartObject or family of SmartObjects.

You can access this dialog from the **File** menu, by choosing **New ADM Class**.

Note: The first step in creating a new ADM2Class is to specify a class name in the **Name** field. Once you provide a class name, all of the file names are automatically generated. This is done to provide (or at least to suggest) a standard file–naming convention that is consistent with the standard ADM classes. The files can then be renamed if needed, but once the new class is saved they can no longer be changed.

The **Basic** tab on the **New ADM Class** dialog includes the following fields:

Field name	Description
Name	Specify a name for the ADM 2 class. This name serves as a base name for the name of all the files. This is a mandatory field.
Class Definition File	Specify a file that references the components of a class. The extension must be `.cld`. This is a mandatory field.
Source Directory	Specify the path where the source files will be generated. Click **Browse** to select a different path. This is a mandatory field.
Rcode Directory	Specify the path where the r-code for the super procedure is generated. Click **Browse** to select a different path. This is a mandatory field.
Template Directory	Specify the location of the template file. Click **Browse** to select a different location. This is a mandatory field, if a template file name is provided in the **Template** field.
Derive From Class	Class definition file (`.cld`) to subclass. Click **Class** to browse and select a class definition file.
Method Library	Specify a file that defines the class name, references a property file, and starts the super procedure. The extension must be `.i`. This is a mandatory field.
Property File	Specify a file that defines class properties. The extension must be `.i`. This is a mandatory field.
Super Procedure	Specify a file that defines get/set functions for readable/writable properties. It defines new behavior for the class. The extension must be `.p`. This is a mandatory field.
Prototype File	Specify a file that references functions and internal procedures of a super procedure. The extension must be .i. The contents of this file can be generated by using the General PRO*Tools utilities on page 572 tool from the PRO*Tools toolbar. This is a mandatory field.
Template	Specify a name of the template file. References the method library of the class.
Copy From Template	Specify a template file to copy from. Click **File** to browse and select a template file.
Open files in the AppBuilder once generated	Select this option to open the generated files in AppBuilder.

The **Custom Files** tab on the **New ADM Class** dialog lists the files to be generated to allow customization of the new class you have created. The fields available on this tab are read-only fields.

For more information, see AppBuilder dialogs on page 574

Progress Advisor dialog

You use the **Freeform Query** option to build queries using temporary tables, extra buffers, and preprocessor statements. Once you choose the **Freeform** option, you cannot return to using the Query Builder to maintain freeform queries, and can only maintain the query (and browse fields if the query is for a BROWSE object) through the Source view or Source Editor.

Choose from the radio set whether to change the selected query to a freeform query or cancel the operation.

Query Builder dialogs

Query Builder Dialog Box -- Join Mode

The **Query Builder** dialog in the Join mode allows you to create custom joins in ABL for the selected query.

Access this dialog by selecting **Join** option on the **Query Builder** dialog.

This dialog includes the following options:

Join	Specify which join in the query being built to customize. Select the query from the **Join** list.
Fields	Displays the **Column Editor** dialog which allows you to specify which fields to display in the browse on the design canvas. **Note:** This option is only available when editing a query associated with a browse widget.
(table)	Displays all the fields for table on the left of the selected join. Use to add fields to the**Join Criteria** editor.
(table)	Displays all the fields for the table on the right of the selected join. Use to add fields to the **Join Criteria** editor.
= (Equal)	Select this option to construct an equal (=) comparison between fields. This generates the comparison in ABL code in the **Join Criteria** editor.
<> (Not Equal)	Select this option to construct a not equal (<>) comparison between fields. This generates the comparison in ABL code in the **Join Criteria** editor.
< (Less Than)	Select this option to construct a less than (<) comparison between fields. This generates the comparison in ABL code in the **Join Criteria** editor.
> (Greater Than)	Select this option to constructs a greater than (>) comparison between fields. This generates the comparison in ABL code in the **Join Criteria** editor.
<= (Less Than or Equal)	Select this option to construct a less than or equal (<=) comparison between fields. This generates the comparison in ABL code in the **Join Criteria** editor.

>= (Greater Than or Equal)	Select this option to construct a greater than or equal (>=) comparison between fields. This generates the comparison in ABL code in the**Join Criteria** editor.
AND	Select this option to construct an AND conjunction between two logical expressions in the ABL code in the **Join Criteria** editor.
OR	Select this option to construct an OR conjunction between two logical expressions in the ABL code in the **Join Criteria** editor.
Customize Join	Select this option to change the default join criteria using the WHERE clause. By default, the GUI Designer attempts to join tables using OF.
Join Criteria	Displays the join you are creating. You may also edit the query directly in this editor when it has focus.
Undo	Select this option to undo the last edit made to the Join Criteria editor.
Check Syntax Now	Select this option to have the compiler check the syntax of the query in its current state.
Check Syntax On OK	Select this option to have the compiler check the syntax of the query when you click **OK**.
Freeform Query	Displays the **PROGRESS Advisor** dialog which allows freeform editing of the query using the GUI Designer editor.

See also

Query Builder Dialog Box -- Table Mode on page 639
Query Builder Dialog Box -- Where Mode on page 640
Query Builder Dialog Box -- Sort Mode on page 638
Query Builder Dialog Box -- Options Mode on page 637

Query Builder Dialog Box -- Options Mode

The **Query Builder** dialog in **Options** mode allows you to modify the query attributes listed below and query tuning parameters for the selected query.

Note: Query tuning parameters are used to fine-tune query performance. This option is available only with non-OpenEdge databases. Please refer to your data server documentation for more information on this topic.

Access this mode by selecting **Options** on the **Query Builder** dialog.

This dialog includes the following options:

Fields	Displays the **Column Editor** dialog which allows you to specify which fields to display in the browse. **Note:** This option is only available when editing a query associated with a browse widget.

Table	Lists the current tables in the selected query.
Find	Lists the find parameter for table in the selected row. Use to the set the find parameter for a table to **FIND EACH**, **FIND FIRST**, or **FIND LAST**. The default is **FIND EACH**. You can double-click in this field to cycle through the valid choices or press '**E**', '**F**' or '**L**' to select **Find Each**, **Find First** or **Find Last**, respectively.
Join	Lists whether the joins for the tables in the selected row are inner joins or outer joins. Use to set the join type for a table to inner or outer. The default join type is inner. You can double-click to cycle through the valid choices or press '**I**' for Inner or '**O**' for Outer.
Returned	Lists what fields the selected query will return for each table. Use to set the fields in the Field-List for a table to **All Fields** or **Fields Used**. When you select Fields Used, the query returns only those fields in the FIELDS-IN-QUERY preprocessor list. The default is **All Fields**. You can double-click to cycle through the valid choices or press '**A**' for All Fields or '**F**' for Fields Used.
Query Tuning Options	Enter ABL code in this editor to specify query tuning parameters for the selected query. It is recommended to reference an include file so that all queries in an application can be easily modified by modifying the contents of the include file instead of referencing this dialog for each query.
Key-Phrase	Select this check box to add the Key-Phrase preprocessor variable to the query definition.
SortBy-Phrase	Select this check box to add the SortBy-Phrase preprocessor variable to the query definition. If you use select this option, you cannot directly modify the Sort from the Query Builder.
Check Syntax Now	Select this option to have the compiler check the syntax of the query in its current state.
Check Syntax On OK	Select this option to have the compiler check the query syntax when you click **OK** .
Freeform Query	Displays the **PROGRESS Advisor** dialog which allows freeform editing of the query using the GUI Designer editor.

See also

Query Builder Dialog Box -- Join Mode on page 636
Query Builder Dialog Box -- Where Mode on page 640
Query Builder Dialog Box -- Sort Mode on page 638
Query Builder Dialog Box -- Table Mode on page 639

Query Builder Dialog Box -- Sort Mode

The **Query Builder** dialog in the Sort mode allows you to generate a **SORT** clause in ABL for the selected query.

Access this mode by selecting the **Sort** option on the **Query Builder** dialog.

This dialog includes the following options:

Table	Select table for the sort clause from the list of available tables.
Fields	Displays the **Column Editor** dialog. which allows you to specify which fields to display in the browse on the design canvas. **Note:** This option is only available when editing a query associated with a browse widget.
Available Fields	Displays all the fields for the selected table. Select a field with which to specify sort criteria.
Selected Fields	Displays the fields selected to include in the sort criteria.
Add >>	Select this option to add fields to the **Selected Fields** list. Moves the highlighted fields in the **Available Fields** list to the **Selected Fields** list.
<< Remove	Select this option to remove fields from the **Selected Fields** list. Moves the highlighted fields in the **Selected Fields** list to the **Available Fields** list.
Move Up	Select this option to move the highlighted fields one position in the **Selected Fields** list.
Move Down	Select this option to move the highlighted field one position down in the **Selected Fields** list.
Ascending	Select this option to sort the fields in ascending order. This is the default sort option.
Descending	Select this option to sort the fields in descending order.
Sort Criteria	Displays the sort criteria you are creating.
Freeform Query	Displays the **PROGRESS Advisor** dialog which allows freeform editing of the query using the GUI Designer editor.

Query Builder Dialog Box -- Table Mode

The **Query Builder** dialog in the Table mode allows you to add and remove tables to the selected query.

Access this mode by selecting the **Table** option on the **Query Builder** dialog.

This dialog includes the following options:

Database	Select a database from the list of connected databases.
Fields	Displays the **Column Editor** dialog which allows you to specify which fields to display in the browse on the design canvas. **Note:** This option is only available when editing a query associated with a browse widget.

Available Tables	Displays the tables of the selected database. You can select tables to add to the **Selected Tables & Joins** section.
Add >>	Allows you to add selected tables to the **Selected Tables & Joins** list. These tables are included in the query that the GUI Designer creates.
<< Remove	Allows you to remove tables from the **Selected Tables & Joins** list.
Selected Tables & Joins	Displays the tables that are selected from the **Available Tables** with their join partners that you have created.
Lock-Type	Allows you to select the table access mode for the defined query. The available options are: No-lock (the default), Share-lock, or Exclusive-lock.
Switch Join Partners	Select this option to change the table in the highlighted join.
Query	Displays the query you are creating.
Indexed-Reposition	Select this option to enable INDEXED-REPOSITION. If you specify this option, OpenEdge attempts to optimize subsequent REPOSITION TO RECID operations on the query. (Only available for single table queries.)
Check Syntax Now	Select this option to have the compiler check the syntax of the query in its current state.
Check Syntax On OK	Select this option to have the compiler check the syntax of the query when you click **OK** .
Freeform Query	Displays the **PROGRESS Advisor** dialog which allows freeform editing of the query using the GUI Designer editor.

See also

Query Builder Dialog Box -- Join Mode on page 636
Query Builder Dialog Box -- Where Mode on page 640
Query Builder Dialog Box -- Sort Mode on page 638
Query Builder Dialog Box -- Options Mode on page 637

Query Builder Dialog Box -- Where Mode

The **Query Builder** dialog in the Where mode allows you to generate a WHERE clause to specify search criteria in ABL for the selected query.

Access this mode by selecting the Where option on the **Query Builder** dialog.

This dialog includes the following options:

Table	Select table for the where clause from the list of available tables.

Fields	Displays the Column Editor dialog. which allows you to specify which fields to display in the browse on the design canvas. **Note:** This option is only available when editing a query associated with a browse widget.
(table)	Displays all the fields for the selected table. Select to add fields to the Where Criteria editor.
=(Equal)	Select this option to construct an equal (=) comparison between fields. This generates the comparison in ABL code in the Where Criteria editor.
<>(Not Equal)	Select this option to construct a not equal (<>) comparison between fields. This generates the comparison in ABL code in the Where Criteria editor.
< (Less Than)	Select this option to construct a less than (<) comparison between fields. This generates the comparison in ABL code in the Where Criteria editor.
>(Greater Than)	Select this option to construct a greater than (>) comparison between fields. This generates the comparison in ABL code in the Where Criteria editor.
<= (Less Thanor Equal)	Select this option to construct a less than or equal (<=) comparison between fields. This generates the comparison in ABL code in the Where Criteria editor.
>= (Greater Thanor Equal)	Select this option to construct a greater than or equal (>=) comparison between fields. This generates the comparison in ABL code in the Where Criteria editor.
AND	Select this option to construct an AND conjunction between two logical expressions in ABL code in the Where Criteria editor.
OR	Select this option to construct an OR conjunction between two logical expressions in ABL code in the Where Criteria editor.
Begins	Select this option to create a BEGINS construction for character fields in the Where Criteria editor.
Contains	Select this option to create a CONTAINS construction for word index fields in the Where Criteria editor.
Matches	Select this option to create a MATCHES construction for character fields in the Where Criteria editor.
List	Select this option to create a LIST construction for fields in the Where Criteria editor.
Range	Select this option to create a RANGE construction for fields in the Where Criteria editor.
Where Criteria	Displays the where criteria you are creating. You may also edit the query directly in this editor when it has focus.
Undo	Choose to undo the last edit made to the Where Criteria editor.

Check Syntax Now	Select this option to have the compiler check the syntax of the query in its current state.
Check Syntax On OK	Select this option to have the compiler check the syntax of the query when you click **OK**.
Freeform Query	Displays the PROGRESS Advisor dialog which allows freeform editing of the query using the GUI Designer editor.

See also

Query Builder Dialog Box -- Table Mode on page 639
Query Builder Dialog Box -- Join Mode on page 636
Query Builder Dialog Box -- Sort Mode on page 638
Query Builder Dialog Box -- Options Mode on page 637

Other AppBuilder dialogs

Add Directory to Path dialog

The **Add Directory to Path** dialog allows you to add a pathname that can be accessed from the **Choose From File** dialog.

Access this dialog by clicking **Add** on the Edit Path dialog on page 647.

This dialog includes the following options:

Option	Description
Directory	Enter a valid pathname on your system from which you can access files using the Choose From File dialog on page 643.
OK	Add the specified pathname to list of accessible paths and return to the **Edit Path** dialog.

For more information, see Edit Path dialog on page 647

Calculated Field Editor dialog

The **Calculated Field Editor** dialog allows you to construct a calculated field expression to add to your database browse.

You can access this dialog by clicking **Calculated Field** or **Edit** in the Column Editor dialog (for Browse) on page 644.

The **Calculated Field Editor** dialog includes the following options:

Expression	Displays the calculated fields expression you build using the options on this dialog box. **Note:** You can also edit any expression in this editor. To see help for a particular language element, highlight the ABL keyword and press Help.

Check Syntax	Select to delete the path highlighted in the list.
Insert	Select to insert the options selected from Fields, Functions, or Operators into the **Expression** editor.
Tables	Select a database table from the drop-down.
Fields	Select a field to insert into the **Expression** field.
Functions	Select a function (double-clicking or pressing **ENTER**) to insert into the **Expression** field.
Paste Function Arguments	Select this check box to insert argument of the function highlighted in the Functions list. For example, "num" in ABSOLUTE.
Operators	Select an operator to insert into the **Expression** field.

For more information, see Column Editor dialog (for Browse) on page 644

Choose From File dialog

The **Choose From File** dialog allows you to locate and insert a particular filename or image.

Access this dialog by selected **Insert from File** from the right-click context menu on the design window.

You can also access the dialog from the main menu by clicking on **Edit > Insert from File**.

This dialog includes the following options:

Option	Description
File	Specify a file name or select from the file list.
File List	List displays the files from the directory specified in Directory. **Note:** If you do not specify a file name in the File field, you can select a file from this list.
File Type	Select the type of files to display in the file list.
Directory	Specify the directory to search for files.
Source (read-only editor)	If the **Preview** check-box is selected, displays the contents of the selected file.
Preview	Select this check-box to display contents of the selected file in the Source field.
Code/Image	Indicate the type of file being previewed. **Note:** The **Code** and **Image** options are available only when the **Preview** check-box is selected.

Option	Description
Edit Path	Open the Edit Path dialog on page 647 to add, modify, or reorder the paths listed in the **Directory** field.
Browse	Open the **Browse Files** dialog to search for directories and files.

For more information, see GUI Designer context menu on page 570

Code Sections Selector dialog

The **Code Sections Selector** dialog allows you to select a function, internal procedure, or trigger to copy.

Access this dialog by clicking **Code** on the **Copy To File** dialog.

This dialog includes the following options:

Option	Description
Available	List the functions, internal procedures, and triggers associated with the selected basic objects and SmartObject instances. Select one or more entries to copy. The selected functions, internal procedures, and triggers move to the **Selected** list.
Selected	List the functions, internal procedures, and triggers that you have selected from the **Available** list to copy. **Note:** You can select one or more fields to remove by clicking **<<Remove**.
Add >>	Move the selected functions, internal procedures, and triggers from **Available** list to the **Selected** list.
<<Remove	Move the selected functions, internal procedures, and triggers from the **Selected** list to **Available** list.
OK	Save your changes and return to **Copy To File** dialog.

For more information, see Copy To File dialog on page 646

Column Editor dialog (for Browse)

The **Column Editor** dialog allows you to add and remove columns associated with database fields, to the selected browse widget.

Access this dialog by clicking **Fields** on the **Query Builder** dialog.

This dialog includes the following options:

Fields in Browse	Displays the fields currently defined for the selected browse.
Add	Select to add fields to the browse definition (accesses the **Multi-Field Selector** dialog box.)

Remove	Select to remove the highlighted fields in the **Fields in Browse selection** list from the browse definition.
Move Up	Select to move the highlighted fields in the **Fields in Browse selection** list one line position higher in the list.
Move Down	Select to move the highlighted fields in the **Fields in Browse selection** list one line position lower in the list.
Disable-autozap	Select to enable the user to type in the field without the browse automatically clearing the initial value. When unselected, the initial value is erased as soon as the user begins typing in the field.
Column-Read-Only	Select to enable the user to tab to the column without enabling it for editing.
Auto-Return	Select to have the browse automatically act as if the user had pressed RETURN after typing the last allowable character in the field.
Enable	Activate to enable the highlighted fields in the **Fields in Browse selection** list.
Visible	Select to make the column visible.
Auto-Resize	Select to enable the browse to automatically resize the column when its FORMAT attribute changes at runtime.
Enable All	Enables all the fields in the **Fields in Browse selection** list.
Disable All	Disables all the fields in the **Fields in Browse selection** list.
Calculated Field	Displays the **Calculated Field Editor** dialog that allows you to add a calculated field to the browse definition.
Edit	Displays the **Calculated Field Editor** dialog that allows you to add a calculated field to the browse definition.
 Color	Select to change the foreground and background colors for the browse column associated with the highlighted field in the **Fields in Browse selection** list.
 Font	Select to change the font for the browse column associated with the highlighted field in the **Fields in Browse selection** list.
 Translation Attributes	Select to enter translations for the column label and help.
 View-as	Select to change the visualization of the column to a combo-box or toggle-box.
Label	Enter a label for the browse column associated with the highlighted field in the **Fields in Browse selection** list.

Label Color	Select to change the foreground and background colors for the browse column label associated with the highlighted field in the **Fields in Browse selection** list.
Label Font	Select to change the font for the browse column label associated with the highlighted field in the **Fields in Browse selection** list.
Format	Enter the display format for the browse column associated with the highlighted field in the **Fields in Browse selection** list.
Format Help	Select to access the **Format** dialog box for assistance in setting the column display format.
Width	Enter the maximum characters for the column.
Column Help	Enter a help string for the browse column associated with the highlighted field in the **Fields in Browse selection** list. At run time, this help string will be displayed in the window status area whenever the browse column is selected.

See also

Choose Color dialog on page 629
Choose Font dialog on page 630
String Attributes dialog on page 657
View-as attributes dialog on page 659
Calculated Field Editor dialog on page 642

Copy To File dialog

The **Copy To File** dialog allows you to copy basic objects and SmartObject instances and their associated internal procedures, functions, and triggers to an export (`.wx`) file.

Access this dialog by selecting **Copy to File** from the right-click context menu on the design window.

You can also access the dialog from the main menu by clicking on **Edit > Copy to File**.

This dialog includes the following options:

Option	Description
Items to Copy	List basic objects and SmartObject instances selected in the current design window.
Code	Open the Code Sections Selector dialog on page 644 which allows you to select internal procedures associated with the selected objects to copy.
OK	Save your changes and return to the design window.

For more information, see GUI Designer context menu on page 570

Data Dictionary window

The Data Dictionary is a tool that lets you create and modify database schema information including table, field, sequence, index, and trigger definitions.

Note: If you started the Data Dictionary without connecting to a database, only the Databases icons, an empty Database selection list, and the Create Database button are displayed. has functionality that is similar to DB Navigator. Consider using Learn About Progress DB Navigator on page 775 since it is integrated with Progress Developer Studio and is therefore more accessible to your project.

To start the Data Dictionary, select **OpenEdge** > **Admin** > **Data Dictionary** from the menu of any OpenEdge perspective except DB Navigator and Debug.

When started, the Data Dictionary runs in a window outside the Progress Developer Studio Eclipse framework. Online help is available from the tool's menu bar.

Edit Path dialog

The **Edit Path** dialog allows you to to add, remove, or reorder the paths listed in the **Directory** field on the **Choose From File** dialog.

Access this dialog by clicking **Edit Path** on the **Choose From File** dialog.

This dialog includes the following options:

Option	Description
List	Lists the paths displayed in the **Directory** field on the **Choose From File** dialog.
Add	Open the Add Directory to Path dialog on page 642 which allows you to add new paths to the list.
Remove	Delete the selected path from the list.
Move Up	Choose to move the selected path one line position up in the list.
Move Down	Choose to move the selected path one line position down in the list.
OK	Save your changes and return to **Choose From File** dialog.

For more information, see Choose From File dialog on page 643

Enter Constant dialog

The **Enter Constant** dialog allows you to input a value constant for an operation.

This dialog includes the following option:

Enter data-type Value	Enter a valid value. You must enter a value of the data type for the field to accept the value.

For more information, see Query Builder Dialog Box -- Join Mode on page 636

Enter Constant Range dialog

The **Enter Constant Range** dialog allows you to input the range for an operation.

This dialog includes the following options:

Enter Lower Bound	Enter a smaller value for the range. You must use the proper data type for the field to accept the value.
Enter Upper Bound	Enter a larger value for the range. You must enter a value of the data type requested for the field to accept the value.
Inclusive	Select this check box to include the boundary conditions.

For more information, see Query Builder Dialog Box -- Join Mode on page 636

Enter Contain String dialog

The **Enter Contain String** dialog allows you to query fields that have word indexes.

This dialog includes the following option:

Enter String Value	Enter a valid search-expression with which to construct a CONTAINS phrase for the selection criteria in the Where Builder dialog box. The search-expression specifies one or more words to search for. It must evaluate to a string with the following syntax: "`word[[&|||!|^] word]...`" In the syntax above, all metasyntax characters are in bold. Do not type metasyntax characters when entering a search expression. Each word is a word to search for. The ampersand (&) represents a logical AND; the vertical line (|), exclamation point (!), or caret (^) represent a logical OR. **Note:** See also the WHERE clause of the Record phrase.

See also

Query Builder dialog on page 636

Enter List of Constants dialog

The **Enter List of Constants** dialog allows you to input a list of values for an operation.

This dialog includes the following options:

Enter data-type value	Enter a value. You must use the proper data type for the field to accept the value.
Add	Append the value entered in the **Enter (data-type) Value** field to the list of values for the operation.
Change	Modify a entry highlighted in the selection list with the value entered in the **Enter (data-type) Value** field.
Remove	Delete an entry highlighted in the selection list above.

List	Displays the entered values. Highlight a value to change or to remove.
Inclusive	Select this check box to display only the records that equal the criteria displayed in the list.

For more information, see Query Builder Dialog Box -- Join Mode on page 636

Folder Selection dialog

The Folder Selection dialog allows you to select an OpenEdge project to which you want to add the new ABL GUI procedure (`.w`) file.

Access this dialog by clicking **Browse** on the Create an ABL GUI procedure wizard.

This dialog includes the following options:

Select new file container	Displays the list of projects present in your current workspace.
OK	Saves the selected project and returns you to the **Create an ABL GUI procedure** wizard.

For more information, see Create ABL GUI procedure files on page 532

Format dialog for Character field

The **Format** dialog helps you to format the selected **Character** field.

You can access this dialog by clicking **Format Help** in the Column Editor dialog (for Browse) on page 644.

The **Format** dialog for **Character** field includes the following options:

Character Format	Displays a valid display format for the selected field.
Width	Displays the character width for the selected field. You can change the value by entering a different width value.
Allow Any Character	Select to allow any character in the string format. (including special characters.)
Allow Letters and Numbers Only	Select to allow only numbers and letters in the string format.
Allow Letters Only	Select to allow only letters in the string format.
Allow Letters and Convert to Caps	Select to allow only letters and display them in uppercase in the string format.
Allow Numbers Only	Select to allow only numbers in the string format.
Standard	Select to format the selected field to the default ABL format for strings, X(8).

See also

Format dialog for Logical field on page 653
Format dialog for Numeric field on page 653
Format dialog for Date Time field on page 652

Format dialog for Date Time-Tz field on page 650
Format dialog for Date field on page 650

Format a Date field

The **Format** dialog helps you to format the selected Date field.

You can access this dialog by clicking **Format Help** in the Column Editor dialog (for Browse) on page 644.

The **Format** dialog for **Date** field includes the following options:

Date Format	Enter a valid display format for the selected date field.
99/99/99	Select to display the date in two-byte segments delimited by a backslash (/). This is the standard format.
99-99-99	Select to display the date in two-byte segments delimited by a hyphen (-).
99.99.99	Select to display the date in two-byte segments delimited by a period (.).
99/99/9999	Select to display the date in two-byte segments for the month and day and display the year in four-bytes. Delimit with a backslash (/).
99-99-9999	Select to display the date in two-byte segments for the month and day and display the year in four-bytes. Delimit with a hyphen (-).
99.99.9999	Select to display the date in two-byte segments for the month and day and display the year in four-bytes. Delimit with a period (.).
999999	Select to display the date in six bytes with no delimiter character.
99999999	Select to display the date in eight bytes with no delimiter character.
Standard	Select to format the selected field to the default ABL format for dates, 99/99/99.

See also

Format dialog for Character field on page 649
Format dialog for Numeric field on page 653
Format dialog for Date Time field on page 652
Format dialog for Date Time-Tz field on page 650
Format dialog for Logical field on page 653

Format a Date Time-Tz field

The **Format** dialog helps you to format the selected **Date Time-Tz** field.

You can access this dialog by clicking **Format Help** in the Column Editor dialog (for Browse) on page 644.

The **Format** dialog for **Date Time-Tz** field includes the following options:

Format	Enter a valid display format for the selected **Date Time-Tz** field.

99/99/99	Select to display the date portion of the **Date Time-Tz** field. in two-byte segments delimited by a backslash (/). This is the standard format.
99-99-99	Select to display the date portion of the **Date Time-Tz** field in two-byte segments delimited by a hyphen (-).
99.99.99	Select to display the date portion of the **Date Time-Tz** field in two-byte segments delimited by a period (.).
99/99/9999	Select to display the date portion of the **Date Time-Tz** field in two-byte segments for the month and day and display the year in four-bytes. Delimit with a backslash (/).
99-99-9999	Select to display the date portion of the **Date Time-Tz** field in two-byte segments for the month and day and display the year in four-bytes. Delimit with a hyphen (-).
99.99.9999	Select to display the date portion of the **Date Time-Tz** field in two-byte segments for the month and day and display the year in four-bytes. Delimit with a period (.).
999999	Select to display the date portion of the **Date Time-Tz** field in six bytes with no delimiter character.
99999999	Select to display the date portion of the **Date Time-Tz** field in eight bytes with no delimiter character.
Include Time	Select this option when you want to include the time portion in the format.
Time Format	Specify a time format. The option you select determines how the time portion of the format appears. You can select: • HH - Displays only the hour. • HH:MM - Displays the hour and minutes. • HH:MM:SS - Displays the hours, minutes, and seconds. **Note:** These options are only available when you select **Include time**.
Decimal Places for Seconds	Select the number of decimal places you want for the second's portion of the time format. You can select 0, 1, 2, or, 3. **Note:** These options are only available when you select **Include time**.
12 hour format (AM/PM)	Select to specify a 12 hour time format. When you select this format hours are displayed using AM or PM.
Include Time Zone	Select when you want to include a time zone in the format.
Standard	Select to format the selected field to the default ABL DateTime-Tz format: 99/99/9999 HH:MM:SS.SSS+HH:MM.

See also

Format dialog for Character field on page 649
Format dialog for Numeric field on page 653
Format dialog for Date Time field on page 652
Format dialog for Logical field on page 653
Format dialog for Date field on page 650

Format a Date Time field

The **Format** dialog helps you to format the selected **Date Time-Tz** field.

You can access this dialog by clicking **Format Help** in the Column Editor dialog (for Browse) on page 644.

The **Format** dialog for **Date Time-Tz** field includes the following options:

Format	Enter a valid display format for the selected **Date Time-Tz** field.
99/99/99	Select to display the date portion in two-byte segments delimited by a backslash (/). This is the standard format.
99-99-99	Select to display the date portion in two-byte segments delimited by a hyphen (-).
99.99.99	Select to display the date portion in two-byte segments delimited by a period (.).
99/99/9999	Select to display the date portion in two-byte segments for the month and day and display the year in four-bytes. Delimit with a backslash (/).
99-99-9999	Select to display the date portion in two-byte segments for the month and day and display the year in four-bytes. Delimit with a hyphen (-).
99.99.9999	Select to display the date portion in two-byte segments for the month and day and display the year in four-bytes. Delimit with a period (.).
999999	Select to display the date portion in six bytes with no delimiter character.
99999999	Select to display the date portion in eight bytes with no delimiter character.
Include Time	Select when you want to include the time portion in the format.
Time Format	Specify a time format. The option you select determines how the time portion of the format appears. You can select: • HH - Displays only the hour. • HH:MM - Displays the hour and minutes. • HH:MM:SS - Displays the hours, minutes, and seconds. **Note:** These options are only available when you select **Include time**.

Decimal Places for Seconds	Select the number of decimal places you want for the second's portion of the time format. You can select 0, 1, 2, or, 3. **Note:** These options are only available when you select **Include time**.
12 hour format (AM/PM)	Select to specify a 12 hour time format. When you select this format hours are displayed using AM or PM.
Include Time Zone	Select when you want to include a time zone in the format.
Standard	Select to format the selected field to the default ABL DateTime format: 99/99/9999 HH:MM:SS.SSS+HH:MM.

See also

Format dialog for Character field on page 649
Format dialog for Numeric field on page 653
Format dialog for Logical field on page 653
Format dialog for Date Time-Tz field on page 650
Format dialog for Date field on page 650

Format dialog for Logical field

The **Format** dialog helps you to format the selected **Logical** field.

You can access this dialog by clicking **Format Help** in the Column Editor dialog (for Browse) on page 644.

The **Format** dialog for **Logical** field includes the following options:

Logical Format	Enter a valid display format for the selected logical field (True or False).
Display This When TRUE	Enter a string to display when the field contains a TRUE value such as Yes.
Display This When FALSE	Enter a string to display when the field contains a FALSE value such as No.
Standard	Select to format the selected field to the default ABL format for logicals, yes/no.

See also

Format dialog for Character field on page 649
Format dialog for Numeric field on page 653
Format dialog for Date Time field on page 652
Format dialog for Date Time-Tz field on page 650
Format dialog for Date field on page 650

Format dialog for Numeric field

The **Format** dialog helps you to format the selected **Numeric** field.

You can access this dialog by clicking **Format Help** in the Column Editor dialog (for Browse) on page 644.

The **Format** dialog for **Numeric** field includes the following options:

Number Format	Enter a valid display format for the selected numeric field (->,>>>,>>9 is the default).
Total Number of Digits	Enter the total number of digits allowed for the selected field (7 is the default).
Number of Decimal Places	Enter the number of decimal places to the right of the decimal character to display for the field value.
Use Thousand's Separator	Select to display a comma (,) as the thousands separator character for the field value (default).
Suppress Leading Zeros	Select to suppress any leading zeros in the field value.
Show as Zero	Select to display zero values in the field as blank.
Show as Asterisk	Select to display an asterisk (*) as the leading sign for the field value.
Leading Text String	Enter a text string to display before the number, such as a currency sign.
Trailing Text String	Enter a text string to display after the number, such as a currency sign.
Show Leading Sign Always	Select to display all values with a leading sign.
Show Leading Sign on Negative Only	Select to display only negative values with the leading sign (default).
Show Trailing Sign Always	Select to display all values with a trailing sign.
Show Trailing Sign on Negative Only	Select to display only negative values with the trailing sign.
Show Negative Numbers in Parentheses	Select to display negative values between parentheses '()'.
Show Negatives With Trailing 'CR'	Select to display negative values with the string "CR" after it.
Show Negatives With Trailing 'DB'	Select to display negative values with the string "DB" after it.
Show Negatives With Trailing 'DR'	Select to display negative values with the string "DR" after it.
Show Negatives With Trailing 'cr'	Select to display negative values with the string "cr" after it.
Show Negatives With Trailing 'db'	Select to display negative values with the string "db" after it.
Show Negatives With Trailing 'dr'	Select to display negative values with the string "dr" after it.

Allow Positive Numbers Only	Select to allow positive numbers only.
Standard	Select to format the selected field to the default ABL format for numbers, which is: ->,>>>,>>9, 7 total digits, comma as thousands separator, and show leading sign on negatives only.

See also

Format dialog for Character field on page 649
Format dialog for Date field on page 650
Format dialog for Date Time field on page 652
Format dialog for Date Time-Tz field on page 650
Format dialog for Date field on page 650

Goto Page dialog

The **Goto Page** dialog allows you to display change the page displayed in the design window.

A page is a logical grouping of SmartObjects which are manipulated in unison. When you view a given page, the ADM automatically hides all other pages.

Note: The Main page, page 0, is always displayed along with the selected page.

Pages provide an easy to use mechanism for viewing and hiding objects, and also conserve screen real estate. All SmartContainers can manage application pages. You can dispatch any ADM method to the entire group.

Access this dialog by selecting **Goto Page** from right-click context menu on the design window. Alternatively, you can use the **Page** option from the main toolbar.

This dialog includes the following options:

Option	Description
Display Page Number	Enter a page number to display in the design window. **Note:** The "Main" page (page 0) is always displayed in the design window, in addition to the page selected here.
OK	Add the selected page to the SmartObject instance on the design window.

See also

Paging in SmartObjects on page 527
GUI Designer context menu on page 570

Method Libraries dialog

The **Method Libraries** dialog allows you to add, remove, or modify references to method libraries of the procedure.

You can access this dialog by clicking the **Method Libraries** icon on the **Procedure Settings** dialog.

This dialog includes the following options:

Method Library Include References	Displays the method libraries included with the procedure. **Note:** The nested method libraries are not displayed in the selection list.
Add	Displays the **Add Method Library Reference** dialog which allows you to add a reference to a method library.
Modify	Displays the **Modify Method Library Reference** dialog which allows you to change a reference to a method library.
Remove	Deletes a reference to a method library.
Move Up	Moves the selected method library reference one position up in the list.
Move Down	Moves the selected method library reference one position down in the list.

See also

About Method Library on page 528
Add method library reference on page 553
Modify method library reference on page 553

Record Menu Accelerators dialog

The **Record Menu Accelerators** dialog allows you to record accelerator keys for menu commands. Accelerator key is a key or key combination which when pressed invokes an associated command.

When the dialog is first opened, you are in record mode. The keystrokes you enter are recorded as the accelerator key for the displayed menu command. You can use **Stop Record/Record** alternately to stop and to start recording an accelerator key.

Access this dialog by clicking **Key** on the **Popup Menu or Menu Bar** dialog.

The **Record Menu Accelerators** dialog includes the following options:

Option	Description
Accelerator Key	Enter a key or key combination. Displays the accelerator keys you just defined for the menu command displayed in the Menu Item field.
Cancel	Discard any menu accelerator keys recorded and close the dialog box. You can also choose Cancel to stop recording and to close the dialog box.
Menu Item	Displays the menu command for which you are recording an accelerator key.
Stop Record/Record	Select alternately to stop and to start recording an accelerator key.

For more information, see Property Sheet for Menu Bar or Popup Menu on page 580

String Attributes dialog

The **String Attributes** dialog helps you to set translation attributes for the selected object.

Note: The controls displayed on this dialog is based on the selected object.

You can access this dialog by clicking on the **Translation Attributes**  icon on the object's Property Sheet dialogs on page 578 or Column Editor dialog (for Browse) on page 644.

The **String Attributes** dialog includes the following options:

Title	Displays the title of the selected object.
Tooltip	Displays the tooltip assigned to the selected object.
Label	Displays the label for the selected object.
Format	Displays the display format for the selected object.
Help	Displays the help string for the selected object.
Attribute	Displays valid character-string attributes for each of the object's characteristics such as Title, Tooltip, Label, Format, or Help.
OK	Select to save your changes and exit this dialog.
Cancel	Select to ignore your changes and exit this dialog.

For more information, see Select translation attributes for an object on page 542.

Sync with Master dialog

The **Sync with Master** dialog allows you to re-establish connections between the master and alternate layouts.

Access this dialog by clicking **Sync with Master** on the selected object's **Advanced Properties** dialog.

This dialog includes the following options:

List	A tabular list of all the attribute discrepancies between the master layout and the alternate layout for the selected object.
Master Updates to Alternate Value	Select this option to have the master layout adopt the attributes of the alternate layout.
Alternate Reverts to Master Value	Select this option to have the alternate layout adopt the attributes of the master layout.

For more information, see Create an Alternate Layout on page 540

Temp-Table Maintenance Dialog Box

Use this dialog box to add, remove, and modify Temp-table definitions within the current procedure file. You can select tables in your TEMP-DB or tables in any existing database. You can also modify existing table schema by adding optional fields and indexes. (Access this dialog box by choosing the Temp-Tables icon in the **Procedure Settings** dialog.)

Note: All items on the Temp-tables Maintenance box are grayed out until you select a table using the **Add** button.

Add	Displays the **Table Selector** dialog. From this box select any tables not yet selected for the current procedure. After you select a table, the AppBuilder displays it in the Temp-Tables Maintenance box and activates the other options **Note:** The AppBuilder uses the ABL "LIKE" syntax to define the Temp-Table. Defining the Temp-Table like an existing table causes the Temp-Table definition to be stored in ther–code during compilation, but does not require the TEMP-DB to be connected at run time. This is necessary because Temporary Tables do not exist until run–time.
Remove	Removes a table definition from the current procedure after you highlight it in the display box. To apply table properties or other options to a table, highlight it from the displayed list, then select items as described below.
New Global Shared	Establishes a global shared Temporary Table. The scope of a global shared Temporary Table is the session.
New Shared	Establishes a shared Temporary Table. The scope of a shared Temporary Table is the scope of the procedure that established it.
Shared	Allows the procedure to access an established shared Temporary Table.
Local	Allows access only from this procedure. This is the default selection.
Buffer	Defines an extra buffer for the table instead of defining a Temporary Table. As with the Temporary Table, the scope of the buffer is determined by your selection from the properties listed above. For example, if you select "New Shared" and "Buffer", you are defining a new shared buffer.
NO-UNDO	Increases update performance for Temporary Table. If you deselect this button, changes made to the Temporary Table during a transaction are logged to the local before image (LBI) file.
Table Name	Allows you to rename your Temporary Table. The new name is updated in the Temp-Tables list as soon as you leave the fill–in.

Additional Fields	Allows you to add extra fields to a defined Temp-Table. For example, you might want to maintain the schema of an existing database table, but add one or two extra fields. You can also use this fill–in to override the primary index for the table. **Note:** Fields entered in Additional fields will not be available for selection in the Query Builder and other AppBuilder schema pickers. Additional Fields is reserved for less visible data, such as ROWID or a time stamp. Fields that you want available from the schema pickers should be defined in the Data Dictionary.
Check Syntax	Checks the syntax of any entries in Additional Fields prior to running or saving your procedure.

View-as attributes dialog

The **View-as attributes** dialog allows you to change the default visualization of a column in a browser widget.

Note: This dialog behaves differently depending on whether you are working with a static or dynamic SmartDataBrowser.

You can access this dialog by clicking on the **View-as**  icon on the object's Property Sheet dialogs on page 578 or Column Editor dialog (for Browse) on page 644.

The **View-as attributes** dialog includes the following options:

Field	Displays the field selected in the **Field in Browse** list on the **Column Editor** dialog. This drop-down is a selection list of the columns in the browse widget. **Note:** The **Field** drop-down is enabled only with SmartDataBrowser that is linked to a data object.
View-as	Specify how the selected field must appear in the browse widget. The options available are: **Fill-in** and **Combo-box**. **Note:** Fill-in is the default value.
List-Item	Select one of the following option: • **List-Items** - to display single items in the combo-box such as Item1 and Item2. • **List-Item-Pairs** - to display items in pairs in the combo-box such as Item1, Item2 and Item3, Item4. **Note:** These options are available when you select combo-box from the **View-as** drop-down.

List-Item Editor	Enter the items to display in the combo-box. **Note:** This option is available when you select combo-box from the **View-as** drop-down.
Type	Select either **DROP-DOWN-LIST** or **DROP-DOWN**. **Note: DROP-DOWN-LIST** is the default value.
Printable	This is delimiter type. When you select this option, you must enter a printable key such as a comma.
Non-printable	This is delimiter type. When you select this option, you must enter the CHR number for that character such as 1 for CHR(1).
Delimiter	The character that separates values input to or output from the combo-box. The valid values for this field depend on the delimiter type setting: Printable or Non-printable.
Inner Lines	Enter a value that specifies the number of items visible at one time in the list. **Note:** This option is available when you select combo-box from the **View-as** drop-down.
Maximum Characters	The maximum number of characters for an item or item-pair. **Note:** This option is available when you select **DROP-DOWN** from the **Type** list.
Sort	Select this check-box to insert all items in the combo-box in the sorted order. **Note:** This option is available when you select **Combo-box** in the **View-as** drop-down.

Auto-Completion	Select this check-box to automatically complete keyboard input to the first match to items in the combo-box. **Note:** This option is available when you select **DROP-DOWN** from the **Type** list.
Unique-Match	Select this check-box to automatically complete the keyboard input when it finds a unique match to items in the combo-box. **Note:** This option is available when you select the **Auto-Completion** check-box.

For more information, see Column Editor dialog (for Browse) on page 644

Progress Advisor (Link Conflict)

You see the Progress Advisor because you are trying to add a SmartLink that is unsupported in the Target object.

Choose from the radio set whether to disregard the Advisor warning and create the SmartLink, or cancel creation of the SmartLink.

See also

SmartLinks dialog on page 680

Custom Lists dialog box

Use the **Custom Lists** dialog box to change the names of the list preprocessor names. To change a name, overwrite the old name and choose **OK**.

Field name	Description
List-1	Enter a name for the List-1 preprocessor list.
List-2	Enter a name for the List-2 preprocessor list.
List-3	Enter a name for the List-3 preprocessor list.
List-4	Enter a name for the List-4 preprocessor list.
List-5	Enter a name for the List-5 preprocessor list.
List-6	Enter a name for the List-6 preprocessor list.

See also

Procedure Settings dialog box on page 575

External Tables dialog box

Use the **External Tables** dialog box to add external tables to a SmartObject.

An external table supplies records to a query that the query need to complete its search criteria. For example, a query on Order OF Customer requires the external table Customer.

Option	Description
(Editor)	Displays the list of selected tables in the connected database. (The form shown is database-name.table-name.)
Add	Choose to add an external table to the SmartObject. You go to the **Table Selector** dialog box.
Delete	Choose to remove the highlighted tables from the SmartObject.
Move Up	Choose to move the highlighted table one line position higher in the list.
Move Down	Choose to move the highlighted table one line position lower in the list.

See also

Table Selector dialog box on page 632

Record Menu Accelerators dialog box

Use the **Record Menu Accelerators** dialog box to record accelerator keys for menu commands. Accelerator key is a key or key combination which when pressed invokes an associated command.

When this dialog is first opened, you are in record mode. The keystrokes you enter are recorded as the accelerator key for the displayed menu command. You can **Stop Record/Record** alternately to stop and to start recording an accelerator key.

Option	Description
Accelerator Key	Enter a key or key combination. Displays the accelerator keys you just defined for the menu command displayed in the **Menu Item** field.
Cancel	Discard any menu accelerator keys recorded and close the dialog box. You can also choose **Cancel** to stop recording and to close the dialog box.
Menu Item	Displays the menu command for which you are recording an accelerator key.
Stop Record/Record	Choose alternately to stop and to start recording an accelerator key.

See also

Property Sheet for Popup Menu dialog box on page 580

SmartObject dialogs

Open SmartObject dialog

The **Open SmartObject** dialog allows you to select a SmartObject master to use to create and insert a SmartObject instance on the design canvas.

Access the **Open SmartObject** dialog by selecting a SmartObject from the SmartObjects section in the Palette.

This dialog includes the following options:

Option	Description
Master File	Select a master file from a selection list or enter a name of the SmartObject master file you want to use to create a SmartObject instance.
Preview	Enable you to view the selected SmartObject master in the Preview SmartObject dialog box on page 683, where the GUI Designer runs the SmartObject.
List	Display a list of SmartObject master files.
Browse	Open the browse files dialog that allows you to search and select a SmartObject master file in other directories.
New	Select to create a new SmartObject master of the type selected.
File Filter	Display the file filter used to display the filenames shown in the Master File field. You can select another file filter by highlighting one from the drop-down list.
Directory	Display the pathname containing the SmartObject master files. You can select another directory by highlighting one from the drop-down.

See also

About SmartObjects on page 526
Insert SmartObjects on page 551
List of SmartObjects on page 566

SmartDataObject Wizard

The **SmartDataObject** Wizard allows you to create a SmartDataObject (SDO) object. You can use the wizard to define a query to retrieve data from the connected database, and define a set of field values to make available with the SmartDataObject you create.

Access the SmartDataObject wizard by choosing **SmartDataObject** in the **Object Type** list on the **Create an ABL GUI procedure** dialog.

The **SmartDataObject Wizard** is a five page wizard and includes the following options:

Option	Description
SmartDataObject Wizard - Page 1 of 5	
>Next	Move to the next page of the wizard.
SmartDataObject Wizard - Page 2 of 5	
Use SDO logic procedure	Select to specify the SmartDataObject's logic procedure that will contain the business logic.
Generate new DLP	Select to generate a new Data Logic Procedure (DLP) and associate with the SmartDataObject. **Note:** In the **Logic procedure file name** field, specify a path where you want to save the new DLP.
Attach existing DLP	Select to associate an existing DLP with the SmartDataObject. **Note:** In the **Logic procedure file name** field, specify the path of an existing DLP.
Logic procedure file name	Specify a path for the new DLP or a path of an existing DLP. Click **Browse** to select a different path for the new DLP or select for an existing DLP.
Use template	Specify a relative directory and filename for the new generated DLP. **Note:** The **Use template** field is enabled only when the **Generate new DLP** option is selected.
Use NO-UNDO for RowObject	Select this option when defining RowObject temp table. It must be defined NO-UNDO, if BLOB or CLOB fields are included in the SmartDataObject.
SmartDataObject Wizard - Page 3 of 5	
Define Temp-Tables	Open the Temp-Table Maintenance Dialog Box on page 658 dialog which allows you to add, remove, and modify Temp-table definitions within your current procedure file. You can select tables in your TEMP-DB or tables in any existing database. You can also modify existing table schema by adding optional fields and indexes.

Option	Description
Define Query	Open the Query Builder Dialog Box -- Table Mode on page 639 dialog which allows you to define a query that you want to use in the SmartDataObject. **Note:** If the query involves temp-tables, you must define them first using Define Temp-Tables.
Help on Queries	Open the help on the AppBuilder Queries on page 682.
SmartDataObject Wizard - Page 4 of 5	
Add Fields	Open the Column Editor dialog (for Browse) on page 644 dialog which allows you to add a list of fields to the SmartDataObject to make available to visualization objects.
Help on DataObject	Open the help on Help on Fields dialog on page 682.
SmartDataObject Wizard - Page 5 of 5	
Finish	Complete the wizard to create a SmartDataObject.

For more information, see Create ABL GUI procedure files on page 532.

SmartDataBrowser Wizard

The SmartDataBrowser Wizard allows you to create a SmartDataBrowser (SDB) object. The wizard allows you to first choose a DataSource to supply data to SmartDataBrowser, and then you specify columns that will be displayed in the SmartDataBrowser object.

Access the SmartDataBrowser wizard by choosing SmartDataBrowser in the Object Type list on the Create an ABL GUI procedure dialog.

The SmartDataBrowser Wizard is a four page wizard and includes the following options:

Option	Description
SmartDataBrowser Wizard - Page 1 of 4	
Next	Move to the next page of the wizard.
SmartDataBrowser Wizard - Page 2 of 5	
Data definition source	Specify a DataObject (SmartDataObject or SmartBusinessObject) or an include file that provides data definitions for the SmartDataBrowser. Click **Browse** to select either a SmartDataObject, a SmartBusinessObject, or an Include file.
Help on definition source	Open the help on to Help on DataObject on page 682.
SmartDataBrowser Wizard - Page 3 of 4	

Option	Description
Add Fields	Open the Multi-Field Selector dialog on page 632 dialog which allows you to add a list of fields from the selected DataObject to the SmartDataBrowser to make available to visualization objects.
Help on Fields	Open the help on the **Fields** dialog.
SmartDataBrowser Wizard - Page 4 of 4	
Finish	Complete the wizard to create a SmartDataBrowser.

For more information, see Create ABL GUI procedure files on page 532

SmartDataViewer Wizard

The **SmartDataViewer Wizard** allows you to create a SmartDataBrowser (SDV) object. The wizard allows you to first choose a DataObject to supply data to SmartDataViewer, and then you specify columns that will be displayed in the SmartDataBrowser object.

Access the SmartDataBrowser wizard by choosing **SmartDataBrowser** in the **Object Type** list on the **Create an ABL GUI procedure** dialog.

The **SmartDataBrowser Wizard** is a four page wizard and includes the following options:

Option	Description
SmartDataViewer Wizard - Page 1 of 4	
Next	Move to the next page of the wizard.
SmartDataViewer Wizard - Page 2 of 5	
Data definition source	Specify a DataObject (SmartDataObject or SmartBusinessObject) or an include file that provides data definitions for the SmartDataBrowser. Click **Browse** to select either a SmartDataObject, a SmartBusinessObject, or an Include file.
Help on definition source	Open the help on Help on DataObject on page 682.
SmartDataViewer Wizard - Page 3 of 4	
Add Fields	Open the Multi-Field Selector dialog on page 632 dialog which allows you to add a list of fields from the selected DataObject to the SmartDataBrowser to make available to visualization objects.
Help on Fields	Open the help on the Help on Fields dialog on page 682 dialog.
SmartDataViewer Wizard - Page 4 of 4	
Finish	Complete the wizard to create a SmartDataViewer.

For more information, see Create ABL GUI procedure files on page 532.

Property Sheet for SmartObjects

The **Property Sheet** dialog allows you to edit the attributes of a selected SmartObject instance.

This dialog includes the following options:

Option	Description
Object	Specify a name for the selected SmartObject instance or accept the default name.
Type	Displays the SmartObject type for the selected SmartObject instance.
Master File	Displays the name of the master file from which the selected SmartObject instance is created.
File	Opens the **Modify Master File Name** dialog which allows you to change the name of the master file from which the selected SmartObject instance is created.
Instance Properties	Displays the instance properties for the selected SmartObject instance.
Edit	Allows you to modify the instance properties of the selected SmartObject instance.
Parameterize as Variable	Select this check box to use the selected SmartObject instance as a placeholder.
Variable	Specify a variable name to use when parameterizing the selected SmartObject instance. **Note:** The **Variable** field is only displayed when the **Parameterize as Variable** check box is selected.
SmartLinks	Opens the **SmartLinks** dialog which allows you to view, add, and remove SmartLinks between SmartObject instances in the current design window.
SmartInfo	Opens the **SmartInfo** dialog which allows you to view information on the SmartLinks supported by the selected SmartObject instance, as well as the database tables used and supplied by the SmartObject instance.

See also

Inserting SmartObjects on page 551
Choose SmartObject dialog on page 663
SmartObject context menu on page 571

SmartObject Properties dialog

The **SmartObject Properties** dialog allows you to view the available properties and their corresponding values for the selected SmartObject.

Access this dialog by clicking **Properties** on the **SmartInfo** dialog.

The **SmartObject Properties** dialog includes the following options:

Option	Description
Property	Displays the name of the property.
Value	Displays the current value of the property.

For more information, see Property Sheet for SmartObjects on page 667

SmartDataObject Instance Properties dialog

The **SmartDataObject Instance Properties** dialog allows you to view the available properties and their corresponding values for the currently selected SmartDataObject.

Access this dialog by choosing **Instance Properties** on the **SmartObject** right-click context menu.

The instance properties dialog includes the following options:

Option	Description
Partition	Select a partition name from the drop-down.
Read data in batches	Specify the number of rows in the **Rows** field, to be retrieved from the database and stored by the client. The default value is 200. **Note:** The **Rows** field will be enabled only when the **Read data in batches** check box is selected.
Rebuild dataset on Reposition	Select to rebuild the temp-table starting with the specified record.
Open query on initialization	Select to open the query when the SmartDataObject initializes. This check box is selected by default.
Instance name	The identifier of this object instance, used by SmartBusinessObjects and in similar contexts to distinguish one SmartDataObject from another. The default value is the filename root without the file path and extension. You can change it to some other value.
Check current changed	Select to check on update that records in the database have not been changed since they were retrieved by this instance of the SmartDataObject.
Activate/deactivate DataTargets on view/hide	Defines whether or not the SmartDataObject retrieves records needed by objects that are currently hidden. **Note:** By default, the **Activate/deactivate DataTargets on view/hide** check box is selected.

Option	Description
Prompt on delete	Select to display confirmation prompt for record deletions. **Note:** By default, the **Prompt on delete** check box is selected.
Display fields for prompt	Select which field values display when prompting to confirm record deletions. Select any one of the following options: • **None** – to display no field values. • **All** – to display all field values. • **Select Fields** – to display only the selected field values.
Edit display field list	Opens the **Multi-Field Selector** dialog which allows you to select the fields. The selected field values are displayed for record deletion prompts. **Note:** The **Edit display field list** button is enabled only when you choose **Select Fields** in the **Display** fields for prompt section.

See also

Inserting SmartObjects on page 551
SmartObjects context menu on page 571

DataView Instance Properties dialog

The **DataView Instance Properties** dialog allows you to configure the behavior of your DataView instance.

Access this dialog by choosing **Instance Properties** on the DataView right-click context menu.

The **DataView Instance Properties** dialog includes the following options:

Option	Description
Business entity	The logical name of the business entity on which the DataView operates. **Note:** This is the logical name. The physical business entity name must be realized by the service before the DataView can function.
Read data in batches	Specify the number of rows in the **Rows** field, to be retrieved from the database and stored by the client. The default value is 200. **Note:** The **Rows** field will be enabled only when the **Read data in batches** check box is selected.

Option	Description
Rebuild dataset on Reposition	Select to rebuild the temp-table starting with the specified record.
Open query on initialization	Select to open the query when the DataView object initializes. This check box is selected by default.
Instance name	The instance name of the DataSet. The default value is the business entity name. Specifying a different value enables separate instances of the same business entity to run in a container.
Data table	Select a data table in the business entity. You can edit and navigate through the selected table.
View	Lists any other tables associated with the selected table. For each listed table, you can set the following options: • **View** – Determines if data from this table is available for display by visual objects linked to the data table. Only tables that are directly linked to the data table can be part of the data table's view. The table's records must also be uniquely identifiable from the data table. • **Join** – Determines if this table can be browsed, sorted, or filtered. Only tables that are inner-joined with the data table should be selected. **Note:** The parent table in the DataSet cannot be included through the **Join** option.
Sort by	Lists the fields used to sort the results.
Edit Sort	Enables you to add fields to the **Sort by** list and arrange their order.
Ascending/Descending	Enables you to specify the sort order for the currently selected field in the **Sort by** list.
Inst. name	The name of the DataView instance.
Activate/deactivate DataTargets on view/hide	Defines whether or not the DataView retrieves records needed by objects that are currently hidden. **Note:** By default, the **Activate/deactivate DataTargets on view/hide** check box is selected.
Prompt on delete	Select to display confirmation prompt for record deletions. **Note:** By default, the **Prompt on delete** check box is selected.

Option	Description
Display fields for prompt	Select which field values display when prompting to confirm record deletions. Select any one of the following options: • **None** – to display no field values. • **All** – to display all field values. • **Select Fields** – to display only the selected field values.
Edit display field list	Opens the **Multi-Field Selector** dialog which allows you to select the fields. The selected field values are displayed for record deletion prompts. **Note:** The **Edit display field list** button is enabled only when you choose **Select Fields** in the **Display fields for prompt** section.

See also

Inserting SmartObjects on page 551
SmartObjects context menu on page 571

SmartFolder Instance Properties dialog

The **SmartFolder Instance Properties** dialog allows you to modify the attributes of a selected SmartFolder instance.

Access this dialog by choosing **Instance Properties** on the **SmartFolder** right-click context menu.

The **SmartFolder Instance Properties** dialog includes the following options:

Option	Description
Tab Labels	Displays the tab labels. If a tab label is left blank, no tab is generated for that position.
Insert	Add a label for the tabs on the SmartFolder.
Remove	Delete a selected tab label.
Use Fixed Tabs	Specify the width of the tabs on the SmartFolder instance. The width of the tabs can be either 110 pixels or 72 pixels per tab. The default value is 110 pixels per tab.
Font	Opens the **Choose Folder Font** dialog which allows you to select a font for the text appearing on the SmartFolder.

See also

Inserting SmartObjects on page 551
SmartObjects context menu on page 571

SmartPanel Instance Properties dialog

The **SmartPanel Instance Properties** dialog allows you to configure the behavior of SmartPanel instances.

Access this dialog by choosing **Instance Properties** on the **SmartPanel** instance right-click context menu.

The instance properties dialog includes the following options:

Option	Description
Show Border	Determines whether the decorative rectangle is shown. The default is "YES." If set to "NO," the Edge Pixels is forced to "0."
Edge Pixels	Sets the EDGE-PIXELS attribute which determines whether the SmartPanel has a decorative rectangle and, if so, the number of pixels used as an edge width. The default is "2." Setting this to "0" has the effect of removing the rectangle.
TableIO SmartPanel Type	Set the SmartPanel Type attribute which determines which mode (save or update) the update panel is in. By default, this is set to "**Save**." (This attribute is supported for the Standard Update panel only).
Behavior of Add Button	Set the **AddFunction** attribute which determines whether the **SmartPanel Add** button prompts you for a single new record or multiple new records. By default, this is set to "One-Record." You can also set it to "Multiple-Records." (This attribute is supported for the Standard Update panel only).

See also

Inserting SmartObjects on page 551
SmartObjects context menu on page 571

SmartDataViewer Instance Properties dialog

SmartDataViewer Instance Properties dialog

The **SmartDataViewer Instance Properties** dialog allows you to modify the attributes and layout of a selected SmartDataViewer instance when it is created at run time. You can also specify which non-database objects with DataFields you want to disable.

Access this dialog by choosing **Instance Properties** on the SmartFolder right-click context menu.

The instance properties dialog includes the following options:

Option	Description
Object Name	Displays the name of the Viewer instance.
Behavior during Initialize	
Enable	Determines whether the Viewer instance is initially shown when it is created at run time.
View	Determines whether the Viewer instance is initially shown when it is created at run time. This toggle box sets the Hide-on-Init attribute to YES or NO. The default setting is YES, meaning that the object is initially visible when it is created at run time.

Option	Description
Layout	If you defined multiple layouts for the Viewer master, lets you select which layout you want to use for this instance. Sets the apply-layout instance attribute.
Which objects should be disabled with data fields?	This topic only applies to non-database objects that you have defined as Enabled in the master object.
Some	Disables all non-database objects with DataFields.
All	Leaves all non-database objects enabled.
None	Lets you select which non-database objects you want to disable with DataFields. When you select this option, you can then check which non-database objects you want to disable.
Which fields should set DataModified on change?	This topic lets you specify which fields to use to set DataModified.
Some	Let you select the fields that can set DataModified. When you select this option, you can then check which fields you want used to set DataModified.
All	All enabled fields should set DataModified. This is the default option.
Data Fields	Only fields that are enabled in the data source should set DataModified.
Updatable	Only enabled fields that can be updated in the data source should set DataModified.
None	No fields should set DataModified.

See also

Inserting SmartObjects on page 551
SmartObjects context menu on page 571

SmartFilter Instance Properties dialog

The **SmartDataObject Instance Properties** dialog allows you to select the fields from the filter target to display in the SmartFilter, and to specify field properties, style, and appearance.

Access this dialog by choosing **Instance Properties** on the **SmartFilter** right-click context menu.

The instance properties dialog includes the following options:

Option	Description
Data Section	
Target	Displays the name of the filter target (a SmartDataObject or a SmartDataBrowser based on a database).

Option	Description
Fields	Displays a list of the selected fields in the filter target in the order they will be displayed in the SmartFilter.
Edit Field List	Opens the **Multi-Field Selector** dialog to select, deselect, or rearrange fields.
Remove	Deletes the selected field from list of available fields without starting up the Multi-Field selector.
Field Properties Section	
Label	Displays label of the selected field.
Filter Target	When checked, the label used is the same as that used in the filter target. When unchecked, you can specify a different label for the selected field.
Width	Displays width of the selected field.
Use Default	When checked the width field displays the default width specified in the filter class. When unchecked, you can specify a different width.
ToolTip	Allows you to enter text for tool tip help.
Help ID	Enter an identifier for the Help topic associated with this field.
View as Range Fields	Use to override the style specified for all fields in the Style section. Check to specify that the selected field will have the same style as the Range specification would give to all fields.
Explicit Operator	Use to override the style specified for all fields in the Style section. Check to specify that the selected field will have the same style as the Explicit specification would give to all fields.
Style Section	
Implicit	Select to generate a single list of fields of correct data type, into which the user can enter filter data. Specify the implicit operator by selecting it from the combo box to the right.
Explicit	Select to display a selection of operators with the filter field, so that the user can choose an explicit operator at run time. (The visualization of the display is determined in the Operator View as section below.)
Range	Select to allow the user to specify a range of inclusive values for each field.
Inline	Select to generate a single list of fields into which the user can enter the operator "inline" with the filter data. All fields are character fields to allow the typing of the operator. If no operator is specified, the default is EQUALS, unless BEGINS is specified in the String Operator section below.
String Operator Section	

Option	Description
BEGINS	Select to specify that filter data in character fields are evaluated with BEGINS. This overrides options specified in the Implicit and Inline styles.
Operator View as Section	
Combo-box	Select to specify that the explicit operator is visualized as a combo-box.
Radio-set	Select to specify that the explicit operator is visualized as a radio-set.

See also

Inserting SmartObjects on page 551
SmartObjects context menu on page 571

SmartBusinessObject Instance Properties dialog

The **SmartBusinessObject Instance Properties** dialog allows you to modify the attributes of a SmartBusinessObject instance.

Access this dialog by choosing **Instance Properties** on the **SmartBusinessObject** instance right-click context menu.

The instance properties dialog includes the following options:

Option	Description
Partition	Select the partition to be associated with this instance. If there are no partitions defined, use the **Service Parameter Maintenance PRO*Tool** to define one or more.
Cascade on Browse	By default, this check box is selected. Clearing this check box will cause navigation changes to propagate only until more than one record is returned in a dataset.
Place SDOs in order	You must arrange the list of SmartDataObjects to reflect the synchronization hierarchy. The synchronization hierarchy is defined by the direction and order of the **DATA SmartLinks** you use to connect the objects. Use the Move Up/Down buttons to change the position of the current item. **SmartDataObjects** whose DATA links come from the same source are on the same level, and their order here is not significant.

See also

Inserting SmartObjects on page 551
SmartObjects context menu on page 571

SmartProducer Instance Properties dialog

The **SmartProducer Instance Properties** dialog allows you to configure the behavior of your SmartProducer instances.

Access this dialog by choosing **Instance Properties** on the SmartProducer instance right-click context menu.

The instance properties dialog includes the following options:

Option	Description
JMS Session section	
Domain	Defaults to **Publish-and_Subscribe. Choosing Point-to-Point** causes the message to be deleted from the queue by the first entity reading it. In contrast, every subscriber can read every message under the **Publish-and-Subscribe** system.
JMS Partition	Select a a partition from the list. If there are none defined, create at least one using the **Service Parameters Maintenance PRO*Tool**.
Ping Interval	Defaults to 0 (no pinging). You can enter an integer value representing seconds here. If the value is non-zero, the **SmartProducer** will ping the SonicMQ Broker at that interval throughout the session.
JMS User	Type the user identifier to be used at login. This is a mandatory field if security is on.
JMS Password	Type the password of the JMS user. This is a mandatory field if security is on.
JMS Client	Type identifier unique to this client. This is a mandatory field if security is on, and the User and Password values are not unique to this client.
Prompt for JMS Login	Select this check box to cause the human user to be prompted at startup. This is a mandatory field when security is on.
Message Delivery Defaults section	
Priority	Defaults to 4. Read whenever a new message is sent. Set to some value in the range 0 (lowest) to 9 (highest). Modifiable under program control.
Time to Live	Defaults to 0 (no expiration). Set to some value in milliseconds (1000 milliseconds = 1 second). Determines how long a message can remain unread without being discarded as stale. Modifiable under program control.
Persistency	Defaults to PERSISTENT (message stored in broker's database). Other values supported are NON_PERSISTENT (message not stored), NON_PERSYSTENT_ASYNC, and UNKNOWN.
Message Type	Defaults to TextMessage. Other types supported are **BytesMessage**, **HeaderMessage**, **XMLMessage** (do not use with **SmartB2Bobject**), **MapMessage**, **StreamMessage**.

See also

Inserting SmartObjects on page 551
SmartObjects context menu on page 571

SmartConsumer Instance Properties dialog

The **SmartConsumer Instance Properties** dialog allows you to configure the behavior of SmartConsumer instances.

Access this dialog by choosing **Instance Properties** on the SmartConsumer instance right-click context menu.

The instance properties dialog includes the following options:

Option	Description
JMS Session section	
Publish and Subscribe	Defaults to **Publish-and_Subscribe. Choosing Point-to-Point** causes the message to be deleted from the queue by the first entity reading it. In contrast, every subscriber can read every message under the **Publish-and-Subscribe** system.
JMS Partition	Select a a partition from the list. If there are none defined, create at least one using the **Service Parameters Maintenance PRO*Tool**.
Ping Interval	Defaults to 0 (no pinging). You can enter an integer value representing seconds here. If the value is non-zero, the SmartProducer will ping the SonicMQ Broker at that interval throughout the session.
Log File	Defaults to empty. Set this field to the pathname of the log file to be used in batch mode.
Shutdown	Defaults to empty. Set this field to the identifier of the Topic/Queue to be used for shutting down this object in batch mode.
JMS User	Type the user identifier to be used at login. This is a mandatory field if security is on.
JMS Password	Type the password of the JMS user. This is a mandatory field if security is on.
JMS Client	Type identifier unique to this client. This is a mandatory field if security is on, and the User and Password values are not unique to this client.
Prompt for JMS Login	Select this check box to cause the human user to be prompted at startup. This is a mandatory field when security is on.
Destinations section	
Destination (list)	Lists the destinations this object will monitor for traffic.
Destination (fill-in)	Set to the identifier of the Topic/Queue to be monitored.
Message Selector	Defaults to empty. Enter the boolean expression (for example: ‘priority < 5’) to be used when filtering incoming messages. Messages that fail the test will be discarded without notice.
Durable Subscription	Select this check box will cause the subscription to persist across sessions.

Option	Description
Subscription Name	Type in an identifier for this durable subscription. **Note:** This is enabled only when the **Durable Subscription** check box is selected.
Unsubscribe on Close	Select this check box to cancel the subscription at the end of the session.

See also

Inserting SmartObjects on page 551
SmartObjects context menu on page 571

SmartRouter Instance Properties dialog

The **SmartRouter Instance Properties** dialog allows you to configure the behavior of **SmartRouter** instances.

Access this dialog by choosing **Instance Properties** on the **SmartRouter** instance right-click context menu.

The instance properties dialog includes the following options:

Option	Description
External Reference	Enter the URL of the schema file for a document type that this **SmartRouter** instance must recognize. Note that the actual filename must be the same as the filename of the local copy, though the rest of the path will almost certainly be different.
Internal Reference	Enter the PROPATH-relative path to the map file for this document type.

See also

Inserting SmartObjects on page 551
SmartObjects context menu on page 571

SmartSender Instance Properties dialog

The **SmartSender Instance Properties** dialog allows you to configure the behavior of SmartRouter instances.

Access this dialog by choosing **Instance Properties** on the SmartSender instance right-click context menu.

The instance properties dialog includes the following options:

Option	Description
Destination	Enter the identifier of the SonicMQ Topic or Queue to which messages created by this object will be sent.

Option	Description
Reply Requested	Defaults to clear. Select this check box to indicate message recipients to be notified that you want a reply.
Reply Selector	Defaults to empty. You can enter a boolean expression here (for example "priority <= 5") that refers to reply-header fields. Every reply will be tested against that expression and replies failing the test will be discarded without processing or notice.

See also

Inserting SmartObjects on page 551
SmartObjects context menu on page 571

Visual SmartObject dialog

The **Visual SmartObject** dialog allows you to specify certain Visual SmartObject instance properties.

Access this dialog by choosing **Instance Properties** on the SmartObject instance right-click context menu.

The instance properties dialog includes the following options:

Option	Description
Enable	Determines whether the SmartObject instance is initially disabled when it is created at run time. This toggle box sets the Disable-on-Init attribute to YES or NO. The default setting is NO, meaning that the SmartObject is initially enabled when it is created at run time.
View	Determines whether the SmartObject instance is initially hidden when it is created at run time. This toggle box sets the Hide-on-Init attribute to YES or NO. The default setting is NO, meaning that the SmartObject is initially visible when it is created at run time.
Layout	The names of any alternate layouts you have created in the SmartObject's master file appear in this combo-box, along with the [default] option. The AppBuilder sets the Layout property to the value you select. The [default] option does not set the Layout attribute to any value.

See also

Inserting SmartObjects on page 551
SmartObjects context menu on page 571

SmartInfo dialog

The **SmartInfo** dialog allows you to view **SmartLink** information about the current **SmartObject**.

A **SmartLink** establishes how one **SmartObject** relates to another **SmartObject** and what sort of behavior it can expect from the other **SmartObject**. A **SmartLink** is bi-directional association of two **SmartObjects**.

Access this dialog by clicking the **SmartInfo**  icon on the **Property Sheet -SmartObject instance** dialog.

The **SmartInfo** dialog includes the following options:

Option	Description
Master File	Displays the master file name of the selected **SmartObject** instance.
Type	Displays the **SmartObject** type for the selected **SmartObject** instance.
ADM Supported Links	Displays the **SmartLinks** supported by the ADM for the current **SmartObject**.
Requires Record-Source for these Tables	Displays a list of tables for which the current **SmartObject** requires a RECORD-SOURCE.
Can Send Records in these Tables	Displays a list of tables for which the current **SmartObject** can act as RECORD-SOURCE.
Properties	Displays the SmartObject Properties dialog on page 667 dialog.

For more information, see Property Sheet for SmartObjects on page 667.

SmartLinks dialog

The **SmartLinks** dialog allows you to view, add, modify, and remove **SmartLinks** between **SmartObjects** in the current design window.

Access this dialog by clicking **SmartLinks**  icon on the **Property Sheet -SmartObject** instance dialog.

The **SmartLinks** dialog includes the following options:

Option	Description
Source	Displays the source object for the link relationship.
Link Type	Displays the type of link relationship.
Target	Displays the target object for the link relationship.
Filters	Provides the filter options such as source object, link type, and target object.
Show	Select any of the following options: • **All Links** – to display all SmartLinks in the design window. • **To/From** – to display only those **SmartLinks** that have a specific **SmartObject** as a source or target. Use the drop-down to select a **SmartObject**. **Note:** The **SmartObject** drop-down is enabled only when the **To/From** option is selected.
Sort Order	Select any of the following options: • **Source** — to sort the SmartLinks on the design window based on source objects. • **Link** — to sort the SmartLinks on the design window based on the link types. • **Target** — to sort the SmartLinks on the design window based on the target objects.

Option	Description
Add	Opens the **Add a SmartLink** dialog which allows you to add a **SmartLink** between two SmartObjects in the current design window.
Modify	Opens the **Modify a SmartLink** dialog which allows you to edit the currently selected link.
Remove	Deletes a selected **SmartLink**.
Check Links	Validates the links added on the currently design window.

For more information, see Property Sheet for SmartObjects on page 667.

Add a SmartLink dialog

The **Add a SmartLink** dialog allows you to add a **SmartLink** between two **SmartObjects**.

Access this dialog by clicking **Add** on the **SmartLinks** dialog.

The **Add a SmartLink** dialog includes the following options:

Option	Description
Source	Displays all of the **SmartObjects** in the current design window.
Link Type	Displays the allowed link types for the source object selected in the **Source** column.
Target	Displays all of the **SmartObjects** in the current design window.
Info on Source	Displays SmartInfo dialog on page 679 for the selected source object.
Info on Target	Displays SmartInfo dialog on page 679 for the selected target object.

For more information, see SmartLinks dialog on page 680

Modify a SmartLink dialog

The **Modify a SmartLink** dialog allows you to modify the **SmartLink** between two **SmartObjects**.

Access this dialog by clicking **Modify** on the **SmartLinks** dialog.

The **Modify a SmartLink** dialog includes the following options:

Option	Description
Source	Displays all of the **SmartObjects** in the current design window.
Link Type	Displays the allowed link types for the source object selected in the **Source** column.
Target	Displays all of the **SmartObjects** in the current design window.
Info on Source	Displays SmartInfo dialog on page 679 for the selected source object.
Info on Target	Displays SmartInfo dialog on page 679 for the selected target object.

For more information, see SmartLinks dialog on page 680

Modify Master File Name dialog

The **Modify Master File Name** dialog allows you to select the master file for the selected **SmartObject** instance.

Access by dialog by clicking **File** on the **Property Sheet - SmartObject instance** dialog.

The **Modify Master File Name** dialog includes the following options:

Option	Description
File Name	Specify the name of the file to use as the master file for the selected **SmartObject** instance.
Files	Choose to browse directories and select a master file.

For more information, see Property Sheet for SmartObjects on page 667

Help on Fields dialog

Choose Multi-Field Selector dialog on page 632 to display a dialog where you can select which fields from the SmartDataObject or database you want to include in your report. Note that you might not want to display all the fields that are part of your query or the SmartDataObject.

See also

SmartDataBrowser Wizard on page 665
SmartDataViewer Wizard on page 666

AppBuilder Queries

A set of instructions used to find the contents of one or more tables in your database. Creating a query consists of selecting the following:

- Tables that comprise the query
- Criteria you want to use to process the information in the query
- SmartV8Query

A SmartV8Query is a Version 8 SmartObject that defines a set of records to fetch from a database. A SmartV8Query usually has no run-time visualization (unless you specifically add a frame to it).

For more information, see SmartDataObject Wizard on page 663.

Help on DataObject

A SmartDataObject is a Version 9 SmartObject that holds a query and associated data update logic. It has at its back end a database query and at its front end an open interface to visual objects.

It can serve as a data source and a data target for other SmartObjects, such as SmartDataBrowsers and SmartDataViewers. A SmartDataObject performs update for its related visual objects and can provide validation.

SmartDataBrowser is a Version 9 SmartObject that connects either to the database or to a SmartDataObject and holds a browse object to view database records and to update them through the SmartDataObject.

SmartDataViewer is a Version 9 SmartObject that holds a frame to preview and possibly update specific database fields. Database field values are obtained from a SmartDataObject or a SmartDataBrowser.

See also

SmartDataObject Wizard on page 663
SmartDataBrowser Wizard on page 665
SmartDataViewer Wizard on page 666

Preview SmartObject dialog box

Use the **Preview SmartObject** dialog box to view a SmartObject.

Option	Description
Master File	Displays the pathname of the SmartObject master file (a SmartObject with specific data and UI) for the selected SmartObject.
Type	Displays the type of the selected SmartObject.

See also

About SmartObjects on page 526
Open SmartObject dialog box on page 663

Views

Outline view

Toolbar buttons

The Outline view toolbar buttons are available only when you have an AppBuilder procedure file open in view source mode.

The toolbar contains the following buttons:

Control	Description
 Section Editor Toggle	Switch to the Section Editor view. See Toggle to the Section Editor mode on page 546.
 Collapse All	Collapse all expanded tree nodes in the Outline view.
 Expand Include File Contents	Display elements in include files.

Control	Description
 Filters	Display only selected element types in the Outline view. See Use Filter Preferences on page 300.
 Link with Editor	Enable this option to move to a declaration in the current file. Turn this option on or off by selecting (or clearing) it in the drop-down menu that appears when you click  icon on the Outline view toolbar. **Note:** To navigate to a specific place in the code from the Outline view, you must enable the **Link with Editor** option.

See also

Use the Outline view on page 546
Context menu on page 684

Context menu

Right-clicking a node in the **Outline** view displays the context menu. Depending on the node, this menu displays the following entries:

Note: The right-click context menu options are not available for the elements that are part of read-only code sections.

Option	Description
Cut	Cut the selected node. **Note:** This option is not supported for **Edit Freeform Query**.
Copy	Copy the selected node.
Paste	Paste the selected node. **Note:** This option is not supported for **Edit Freeform Query**.
Duplicate	Create a copy of the selected widget. **Note:** This option is available only for widgets present on the design window open.

Option	Description
Delete	Delete a selected node. **Note:** This option is not supported for **Edit Freeform Query**.
Enable DB-Required / Disable DB-Required	Toggle switch to add or remove DB-Required block generated for a function and procedure. See the Specify DB-Required code blocks on page 557.
Move-to-Top	Makes the selected basic object or **SmartObject** instance overlay other basic objects or **SmartObject** instances of its type.
Move-to-Bottom	Makes the selected basic object or **SmartObject** instance underlay other basic objects or **SmartObject** instances of its type.
Properties	Opens the **Property Sheet** dialog for the selected widget. **Note:** This option is available only with widgets present on the design window open.
Add Trigger	Opens the Add Trigger dialog on page 633 that allows you to add a new trigger for the selected widget. The **Add Trigger** menu option is disabled for the **SmartObject** instances nodes in the **Outline** view. **Note:** This option is available only with the design window open.
Define Service Interface	Opens the **Define Service Interface** wizard that allows you to publish the selected procedures and functions as a service interface. **Note:** This option is available only with the view source mode.
Edit Freeform Query	Opens the **Edit Freeform Query** dialog box that allows you to edit the code of the Query. **Note:** This option is available with the view source mode only. **Caution:** If you are not connected to the database, content assist and color coding will not work as expected.

See also

Use the Outline view on page 546

Outline view toolbar buttons on page 683

ABL Cue Cards view

The **ABL Cue Card** view displays help information for a specific SmartObject type. When you create a new SmartObject master, the Cue Card associated with the SmartObject type is also opened. The Cue Card provides a basic definition of the SmartObject type, along with information about how to create and use the object.

This view lists details of all the active Cue Cards in your current AppBuilder session.

Note: The **ABL Cue Cards** is the default view and is available only with the OpenEdge AppBuilder perspective.

To retrieve the **ABL Cue Cards** view that you close, choose **Help** > **ABL Cue Cards** from the main menu.

See also

Outline view on page 683
ABL Messages view on page 686

ABL Messages view

You can use the **ABL Messages** view to look up information about ABL error messages.

Note: The **ABL Messages** view is the default view in OpenEdge AppBuilder perspective.

This view includes the following options:

Option	Description
Enter message number	Enter an error message number.
Go	Click to locate and display the message text for the error message number entered in the **Enter message number** field.
Search result	Displays the synopsis, category, and description for the error message number.

For more information, see View ABL messages on page 555

Other OpenEdge Tools

From Progress Developer Studio for OpenEdge, you can also access the Procedure Editor, Data Dictionary, and many other OpenEdge tools that are not Eclipse applications.

Most of these tools do not run within Progress Developer Studio for OpenEdge, however. When started, they run in a window outside the Eclipse framework.

The exception is OpenEdge Explorer, which runs in an embedded browser.

Online help for these tools is available from a tool's user interface and not from Progress Developer Studio's help menu.

Audit Policy Maintenance Tool (Windows only)

The Audit Policy Maintenance Tool is a utility that enables you to create and maintain audit policies for database events, application events, and internal (to OpenEdge) system events.

To start the Audit Policy Maintenance Tool, select **OpenEdge** > **Admin** > **Audit Policy Maintenance** from the menu bar in any Progress Developer Studio for OpenEdge perspective except the Progress DB Navigator and the OpenEdge Debugger.

When started, the Audit Policy Maintenance tool runs in a window outside of the Progress Developer Studio for OpenEdge Eclipse framework. Online help is available from the tool's menu bar.

For more information, see Other OpenEdge Tools on page 686

Temp-DB Maintenance Tool

The Temp-DB Maintenance tool opens the **Connect Database** dialog. This dialog prompts you for the connection parameters and provides a scrolling area for additional connection parameters.

To start the Temp-DB Maintenance tool, select **OpenEdge** > **Tool** > **Temp-DB** > **Maintenance** from the main menu in your OpenEdge AppBuilder perspective.

When started, the Temp-DB Maintenance tool runs in a window outside the Progress Developer Studio Eclipse framework. Online help is available from the tool's menu bar.

For more information, see Other OpenEdge Tools on page 686

Database Administration Tool

The Database Administration Tool is tool used for dumping and loading data and definitions, exchanging definition information from non-OpenEdge data sources, defining application security and permissions, and importing and exporting data from a variety of sources.

To start the Database Administration Tool, select **OpenEdge** > **Admin** > **Database Administration** from the menu bar in any OpenEdge perspective except DB Navigator and Debug.

When started, the Database Administration tool runs in a window outside the Progress Developer Studio Eclipse framework. Online help is available from the tool's menu bar.

For more information, see Other OpenEdge Tools on page 686

Data Dictionary tool

The Data Dictionary is a tool that lets you create and modify database schema information including table, field, sequence, index, and trigger definitions.

Note: The Data Dictionary has functionality that is similar to DB Navigator. Consider using Learn About Progress DB Navigator on page 775 since it is integrated with Progress Developer Studio and is therefore more accessible to your project.

To start the Data Dictionary, select **OpenEdge** > **Admin** > **Data Dictionary** from the menu bar of any OpenEdge perspective except DB Navigator and Debug.

When started, the Data Dictionary runs in a window outside the Progress Developer Studio Eclipse framework. Online help is available from the tool's menu bar.

For more information, see Other OpenEdge Tools on page 686

OpenEdge Explorer Tool

OpenEdge Explorer is a tool for managing OpenEdge servers and other products.

To start OpenEdge Explorer, select **OpenEdge** > **Admin** > **OpenEdge Explorer** from the menu bar of any Progress Developer Studio for OpenEdge perspective except Progress DB Navigator and OpenEdge Debugger.

When started, OpenEdge Explorer prompts for an administrator user name and password. The default is `admin` for both. After login, it runs in a browser embedded in the active perspective. For online help, click one of the help buttons in OpenEdge Explorer.

For more information, see Other OpenEdge Tools on page 686

Procedure Editor tool

The Procedure Editor is an OpenEdge ABL code editor.

Use one of the following methods to open the Procedure Editor:

- Click the Procedure Editor icon  in the toolbar.
- Select **OpenEdge** > **Tools** > **Procedure Editor** from the menu bar.

If you have a file selected in the Project Explorer view, the selected file opens in the Procedure Editor.

When started, the Procedure Editor runs in a window outside the Progress Developer Studio Eclipse framework. Online help is available from the tool's menu bar.

For more information, see Other OpenEdge Tools on page 686

Results Tool

The Results tool is used to create and modify queries. A query is a set of instructions that tells Results to find the contents of one or more tables in your database. Creating a query consists of selecting the following:

- The view you want to use to process the information in tables that comprise the query.
- The query.
- Fields you want to display.

To start the Results tool, select **OpenEdge** > **Tool** > **Results** from the main menu in your OpenEdge AppBuilder perspective.

Note: You are prompted to connect to a database when you start Results tool, if the database connection is not configured with your current project. When you click **OK**, the **Connect Database** dialog appears.

When started, the Results tool runs in a window outside the Progress Developer Studio Eclipse framework. Online help is available from the tool's menu bar.

For more information, see Other OpenEdge Tools on page 686

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Learn About Meta Catalog

The Progress Developer Studio for OpenEdge's Meta Catalog is an index that enables you to find where elements are used in your application. You can find where a temp-table is defined and where it is used in your application. You can find all the procedures and functions in your application. You can find where those procedures and functions are called. You can also add your own annotations to the code and have them included in the index. You can use this index to simplify analyzing the impact of proposed changes and carrying out those changes.

You can configure different catalogs for different tasks. You might want to have the data for each project in a different catalog. Alternately, you might want a catalog that stores data on function and procedure calls for all your projects together. You can also configure a master catalog linked to your software code management (SCM) system to provide a complete view of all your applications.

The Meta Catalog is a design-time tool. A catalog never stores any data that cannot be extracted from the source code by the content builders. Any time the catalog has stale data in it, you can eliminate the stale data by replacing the catalog. For example, if you remove files from a project and no longer want data from those files in the catalog, just rebuild the catalog using the catalog's definition from the Meta Catalog preferences.

The Meta Catalog uses content builders to extract the data from source files. The Progress Developer Studio for OpenEdge provides several predefined content builders.

There are two tools for searching through a catalog's data. The Meta Catalog Explorer provides a treeview representation of the data. The Meta Catalog Search allows you to create and save queries on the data. You can open files for editing from either the treeview or the Meta Catalog Search results view.

Related Concepts

For details, see the following topics:

- Concepts
- Tasks

- Reference

Concepts

ABL Annotations

ABL annotations enable you to include meta data in your source code. The compiler treats annotations as comments, so they do not affect how your code runs. The ABL Annotation content builder extracts annotations from your source code and loads them into the Meta Catalog.

You can assign almost any name to an annotation.

You can insert annotations manually in your source code. You can also use the Annotation Generator to insert the same annotation into multiple files at once. The Annotation Generator always inserts the annotations either at the top of the file or, for structured procedures, in the definitions section at the start of the file.

See also

Adding annotations to source files on page 304
Adding Sonic ESB annotations on page 305
ABL Annotation content builder on page 699
ABL annotation syntax on page 700
Annotation Generator on page 707

Access to catalog data

The Meta Catalog provides two tools for examining the data in a catalog. The Meta Catalog Explorer view provides a treeview approach to searching a catalog. The Meta Catalog Search allows you to write queries on the catalog content's and displays the results in a search view.

See also

Learn About Meta Catalog on page 689
Access Meta Catalog Explorer on page 692
Search Meta Catalog on page 697
Meta Catalog Explorer view on page 710
Meta Catalog Search view on page 715

Content builders

Content builders extract data from the source code and store it in the Meta Catalog. Each content builder looks for specific code segments, called content types, and retrieves matching data from the source code.

Progress Developer Studio for OpenEdge provides several predefined content builders. A content builder extracts data for one or more content types for storage in the Meta Catalog.

Predefined content builders installed with Progress Developer Studio for OpenEdge

Progress Developer Studio for OpenEdge provides the following predefined content builders:

Predefined Content Builders	Description
ABL Annotation	Extracts annotations that you either manually add to the source code or included through the Annotation Generator.
ABL Application Schema	Extracts data on temp-tables and ProDataSets.
ABL Reference	Extracts data on procedures, functions, methods, and where they are called.

See also

Learn About Meta Catalog on page 689
Add custom file extensions to content builders on page 692
ABL Annotation content builder on page 699
ABL annotation syntax on page 700
ABL Application Schema content builder on page 700
ABL Reference content builder on page 704

Local and master catalogs

In many development environments, you do not have the complete application source code on your local machine. Environments that include a source code management (SCM) system are like this. However to gain the most advantage from a catalog, it should incorporate information on your entire application.

The OpenEdge Meta Catalog supports linking catalogs to your workspace in two modes:

Mode	Description
Local	A local catalog is specific to your workspace. It includes information only from the projects you specify in that workspace. You can update the contents of a local catalog at any time. You can create more than one catalog in a workspace, using each to store information for a particular project, content builder, or other criteria.
Master	A master catalog exists outside your workspace. You have read-only access in this mode. Changes to your local files do not affect the contents of a master catalog. A group of developers can all use the same master catalog. A good use for a master catalog is to index all resources in a SCM system. Each developer can perform impact analysis across an entire application without needing all the source-code locally. The catalog could update its contents each time a changed file is checked into the SCM or at scheduled times. The SCM administrator builds a catalog database and then sets up scripts to update it appropriately using the Meta Catalog command-line utility.

See also

Learn About Meta Catalog on page 689
Build a master catalog on page 693
Link to a master catalog on page 696

OECATALOG utility on page 716

Tasks

Access Meta Catalog Explorer

Accessing the Meta Catalog Explorer

1. Choose **Window** > **Show View** > **Other...** to display the **Show View** dialog box.
2. Choose **Progress OpenEdge Meta Catalog** > **Meta Catalog Explorer**.
3. Choose **OK**.

The Meta Catalog Explorer appears, displaying all the catalogs defined for your workspace.

Note: If you want access to a catalog that is defined in a different workspace, you must define it as a master catalog in your workspace.

See also

Access to catalog data on page 690
Access to catalog data on page 690
Use Meta Catalog Explorer on page 698

Add custom file extensions to content builders

By default, the content builders run against files with the standard OpenEdge extensions (*.cls, *.i, *.p, and *.w). You can configure them to run against other files with custom extensions. For example, if you use .t as the file extension for your ABL trigger source code, you should add the .t extension to the list of extensions to ensure that the content builder runs against your trigger source code.

1. Choose **Window** > **Preferences**. The **Preferences** dialog appears.
2. Select **Progress OpenEdge** > **Meta Catalog** > **Content Builders**. The **Content Builders** page appears.
3. Select a content builder in the browse.
4. Choose **Edit**. The **Edit Content Builder** dialog appears.
5. Add your custom extension to the list in the **Extensions field**.
6. Choose **OK**.
7. Choose **Apply** to save your changes to the internal Meta Catalog definition file.

Note: The content builder definitions are also stored when you export catalog definitions to a file. Importing an existing definition file will overwrite any changes you made to the content builder definitions. If you do not want that to happen, you should export the catalog definitions again to overwrite the old file.

See also

Change catalog definitions on page 690
Set Meta Catalog preferences on page 697
Meta catalog preferences on page 711

Add new files to a catalog

You can add new source files to a catalog without rebuilding the entire catalog. You can also use this technique to force the content builders to rescan a file and update the catalog with any new information.

1. Select a file in the **Project Explorer** view.
2. Right-click and choose **Meta Catalog** > **Add Selected Resource** from the pop-up menu.

Note: The data from the file is added to all local catalogs associated with the workspace.

See also

Change catalog definitions on page 694
Rebuild a local catalog on page 696

Build a master catalog

The **OECATALOG** command-line utility's **-build** option does not create the physical database. That option only creates the tables and populates them with data. To create a new master catalog, you MUST run the **New Catalog** wizard on the physical database before using the **OECATALOG** command-line utility.

Building a master catalog on a server is a multi-stage process:

1. Create an empty database and database server on the server.
   a) Start a PROENV session on the machine where you want the master catalog.
   b) Create a directory to hold the master catalog.
   c) Use the PRODB utility to create an Empty database in that directory.
   d) Create a database server with the appropriate connection parameters for the master catalog using OpenEdge Management or OpenEdge Explorer. Remember that the database server has to support SQL.
   e) Start the database server.
2. Run the New Catalog wizard
   a) Start a Progress Developer Studio for OpenEdge session on your local machine in a workspace that has no catalogs defined.
   b) Choose **File** > **New** > **Other** . The **New** dialog box appears.
   c) Choose **OpenEdge** > **Meta Catalog** > **Meta Catalog** and click **Next**. The **Create Meta Catalog** wizard appears.
   d) Enter the empty database's name for the Meta Catalog name and click **Next**.
   e) Click **Next** on the this page. You have already created the database.

f) On the **Meta Catalog Connection** page, enter the connection information for the empty database and click **Next**.

g) Continue creating the catalog definition as usual.

h) When you have set all the options correctly for your master catalog, deselect the Load content from selected projects toggle and click **Finish**.

Your master catalog now has the Meta Catalog tables.

3. Transfer the catalog definition from your local machine to the server.

   Before you can use the **OECATALOG** utility on your master catalog, you need a catalog definition file for it.

   a) Choose **Windows** > **Preferences**. The Preferences dialog box appears.

   b) Choose **OpenEdge** > **Meta Catalog**. The **Meta Catalog** browser appears.

   c) Click **Export All**.

   d) Save the catalog definition file with a unique name.

   e) Copy the catalog definition file to the master catalog's directory on the server.

      You now have a master catalog database and a catalog definition file for it.

4. Run the **OECATALOG** command-line utility to populate the master catalog using the catalog definition file. For example: `oecatalog -build -catalog masterCatalog.xml -root C:\wrk`

   Note: The `-root` setting should match where the resources are stored on the master catalog's machine, not where your local copies are are.

You can now use the **OECATALOG** utility to populate and rebuild the master catalog as needed. The master catalog does not contain any data yet, because the content builders have not run against the source files yet.

See also

Local and master catalogs on page 691
Create a local catalog on page 695
Link to a master catalog on page 696
OECATALOG utility on page 716

Change catalog definitions

After creating a catalog, you can change its definition at any time through the Meta Catalog Preferences.

1. Choose **Window** > **Preferences**. The **Preferences** dialog appears.
2. Select **Progress OpenEdge** > **Meta Catalog** > **Catalog Databases**. The **Catalog Databases** page appears.
3. Select a catalog in the **Catalog Name** combo-box. The tab folder displays the catalog's definition.
4. Make your changes to the definition.
5. Choose **Apply** to store the changes to the internal Meta Catalog definition file. You might need to restart your session for some changes to take effect.

Note: If you have exported the previous catalog definition to a file, you can import that file to revert to the previous definition. If you do not want that to happen, you should export the catalog definitions again to overwrite the old file.

See also

Add custom file extensions to content builders on page 692
Rebuild a local catalog on page 696
Meta Catalog Preferences on page 711

Create a local catalog

1. Choose **File** > **New** > **Other** to display the **New** dialog box.
2. Choose **OpenEdge** > **Meta Catalog** > **Meta Catalog**.
3. Choose **Next** to launch the **Create Meta Catalog** wizard.
4. Fill in a Meta Catalog name and choose **Next**.

   All catalog names must be unique and are case-sensitive. If you want to use a master catalog, you cannot have a local catalog with the same name.
5. Select the **Create new database** toggle box and fill in the information for the new database.
6. If you want to create a catalog with the default settings, choose **Finish**. Otherwise, choose **Next** to step through the remaining wizard pages and customize the catalog.

You can change the definition of a catalog later through the **Preferences** window.

See also

Local and master catalogs on page 691
Add new files to a catalog on page 693
Build a master catalog on page 693
Change catalog definitions on page 694
Rebuild a local catalog on page 696
Meta Catalog preferences on page 711

Create templates for Annotation Generator

Creating templates for the Annotation Generator

1. Choose **Window** > **Preferences**.
2. Choose **Progress OpenEdge** > **Editor** > **Annotations**.
3. Choose **Add**. The **New Annotation** dialog appears.
4. Type an annotation name for the new template.
5. Type an annotation for the Annotation Value. You can create multi-line templates.

   The dialog does not check the syntax of the template.
6. Choose **OK** to save the template.

See also

ABL annotations on page 690
Add annotations to source files on page 304
Add Sonic ESB annotations on page 305
ABL Annotation content builder on page 699
ABL annotation syntax on page 700
Annotation Generator on page 707

Link to a master catalog

Linking to a master catalog

1. Choose **File** > **New** > **Other** to display the **New** dialog box.
2. Choose **OpenEdge** > **Meta Catalog** > **Meta Catalog** to link to Master.
3. Choose **Next** to launch the **Add Meta Catalog** wizard.
4. Fill in a Meta Catalog name and choose **Next**. The **Meta Catalog Connection** page appears.

   All catalog names must be unique and are case sensitive. You cannot have a local catalog with the same name as the master catalog.
5. Fill in the connection information for the master catalog.
6. Choose **Finish**.

Note: Your workspace cannot automatically start a master catalog.

See also

Local and master catalogs on page 691
Add new files to a catalog on page 693
Build a master catalog on page 693
Change catalog definitions on page 694
Rebuild a local catalog on page 696
Meta Catalog preferences on page 711
OECATALOG utility on page 716

Rebuild a local catalog

If you delete files from a project, the catalog might contain obsolete data from those files. If you move code from one file to another file, the catalog might still have records pointing to the old location. Catalogs are designed to be disposable. Whenever necessary, you can rebuild a catalog from its definition.

1. Choose **Window** > **Preferences** to open the **Preferences** window.
2. Choose **Progress OpenEdge** > **Meta Catalog** in the treeview. The **Meta Catalog** page appears.
3. Select a catalog from the browse.
4. Choose **Rebuild**.

The process deletes the existing database and rebuilds it from the definition.

See also

Local and master catalogs on page 691
Content builders on page 690
Add new files to a catalog on page 693
Create a local catalog on page 695
Meta Catalog preferences on page 711

Search Meta Catalog

Searching the Meta Catalog

1. Choose **Search** to open the Search view.
2. Select the **Meta Catalog Search** tab.
3. Select the projects whose contents you want to search from the Projects to search list.
4. Select the catalogs whose contents you want to search from the Catalogs to search list.
5. Define your search in the Search criteria browse. You can define the search in the following ways:
   a) Select a previously created query in the Query criteria combo-box. You can alter the saved criteria before running the search.
   b) Create a new query by selecting entries from the combo-boxes that make up the Query criteria browse.
6. Choose **Search**. The search results appear in a treeview.
   If there is a name in the **Query criteria** combo-box, a prompt appears asking if you want to save the current criteria under that name.
7. Double-click an item in the search results. The file opens in the Editor view positioned at the line containing the item.

If the same file's contents have been loaded into two catalogs, the search results show duplicate entries for that data.

See also

Access to catalog data on page 690
Access the Meta Catalog Explorer on page 692
Use the Meta Catalog Explorer on page 698
Meta Catalog Search view on page 715

Set Meta Catalog preferences

1. Choose **Window** > **Preferences** to open the **Preferences** window.
2. Choose **Progress OpenEdge** > **Meta Catalog** in the treeview.
3. Expand the **Meta Catalog** node to access all the preference pages.

The Meta Catalog preferences appear on the following pages:

- **Catalog List**—A browse listing all the catalogs in your workspace.
- **Catalog Databases**—A tab folder for viewing and editing catalog definitions.

- **Content Builders**—A browse of all the content builders registered in your workspace.

See also

Learn About Meta Catalog on page 689
Change catalog definitions on page 694
Add custom file extensions to content builders on page 692
Meta Catalog preferences on page 711

Use Meta Catalog Explorer

Using the Meta Catalog Explorer

1. Open the **Meta Catalog Explorer** view. The treeview displays a node for each catalog defined in the workspace.
2. Select a **CATALOG** node and expand it. The treeview displays a node for each root path in the catalog.

   Note: The first line in the browse always shows the node's type. These are the values you use when constructing queries in the Meta Catalog Search. The rest of the browse displays the other database fields that define the node in the catalog.

3. Expand a **ROOT PATH** node. The treeview displays a node for each project stored on that root path.
4. Expand a **PROJECT** node. The treeview displays nodes for project relative paths and individual resources.

   Note: If you select the **Create complete folder structure** option while importing files into a project, the structure is stored as a PROJECT RELATIVE PATH in the catalog. All the resources in a folder structure display under the PROJECT RELATIVE PATH. If there is no relative path for a particular resource, the resource displays directly under the PROJECT node.

5. Expand a **RESOURCE** node. The treeview displays nodes for each content type that a content builder extracted from the file.
6. Expand a **CONTENT TYPE** node. The treeview displays various **ENTRY TYPE** nodes, depending on which content builders extracted the data and what was in the file. For more information on the finer levels of the tree view, see the description of each content builder.

Note: The treeview is recursive when displaying Parent Entries and Child Entries nodes. If you expand a Child Entries node, you see a Parent Entries node. If you expand a Parent Entries node, you see a Child Entries node. These nodes will loop infinitely.

See also

Access to catalog data on page 690
Access Meta Catalog Explorer on page 692
Search Meta Catalog on page 697
ABL Annotation content builder on page 699
ABL Application Schema content builder on page 700
ABL Reference content builder on page 704
Meta Catalog Explorer view on page 710

Reference

ABL Annotation content builder

The ABL Annotation content builder extracts ABL annotations from source files. The content builder searches for the "at" symbol (@) at the beginning of a line. When it finds the symbol, it parses the line as an annotation. The content builder first ensures that the catalog database contains the necessary records to specify the source file (catalog, root path, project, project relative path, and resource). It then records the following data in the catalog database:

Data	Value
Content type	ANNOTATION
Entry type	ANNOTATION
Entry	The annotation name
Attributes	ATTRIBUTES
Attribute	The attribute name
Attribute value	The attribute's value

The content builder assigns IDs to each unique Entry and Attribute. It also stores the location of these elements in the file, either as a line number or as characters from the file's beginning.

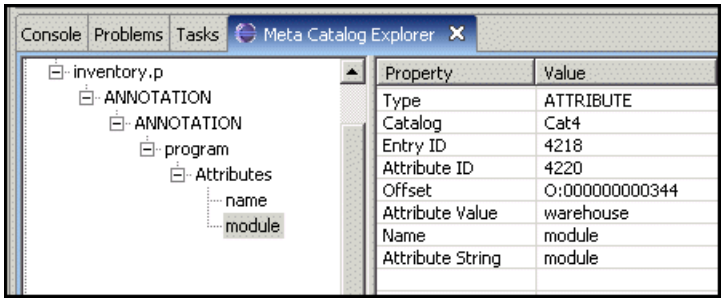
For example, the following annotation was created from one of the templates in the Annotation Generator:

```
@program (name = "inventory.p", module = "warehouse").
```

When the content builder analyzes this statement, it adds the following information to the database:

Data	Value
Content type	Annotation
Entry type	Annotation
Entry	program
Attributes	Attributes
Attribute	name
Attribute value	inventory.p
Attribute	module
Attribute value	warehouse

In the Meta Catalog Explorer, you would see the following structure:



See also

Content builders on page 690
ABL Annotations on page 690
Add custom file extensions to content builders on page 692
Create templates for the Annotation Generator on page 695
Add annotations to source files on page 304
Add Sonic ESB annotations on page 305
ABL Annotation Syntax on page 700
Annotation Generator on page 707

ABL annotation syntax

ABL annotations are always on a separate line from other code. The compiler treats any line that starts with the "at" symbol (@) as a ABL annotation.

Note: Annotation syntax must begin with a non-numeric.

The ABL Annotation syntax is as follows: `@annotation[(attribute = "value"[,attribute = "value"]...)].`

`annotation`: The annotation's name can be any character string that you choose.

`attribute`: The attribute's name can be any character string that you choose. Attribute/value pairs are optional.

`value`: The value can be any character string that you choose. Attribute/value pairs are optional.

See also

Content builders on page 690
ABL annotations on page 690
Create templates for the Annotation Generator on page 695
Add annotations to source files on page 304
Add Sonic ESB annotations on page 305
ABL Annotation content builder on page 699
Annotation Generator on page 707

ABL Application Schema content builder

ABL Application Schema content builder

The ABL Application Schema content builder extracts data on temp-tables and ProDataSets from source files. The content builder first ensures that the catalog database contains the necessary records to specify the source file (catalog, root path, project, project relative path, and resource). Then it analyzes the code to extract the specific information.

The content builder creates parent and child records to describe the full schemas:

Entry type	Child entry types	Child entry types
TEMP-TABLE	FIELD	
	INDEX	INDEX-FIELD
DATASET	BUFFER	
	DATA-RELATION	RELATION-FIELD

Any entry that has parent or child entries displays them as subnodes in the **Meta Catalog Explorer** view.

The content builder records the following data in the catalog:

Content type	Entry type	Entry
APPSCHEMA	TEMP-TABLE	The temp-table's name.
	FIELD	The name of a temp-table field.
	INDEX	The name of a temp-table index.
	INDEX-FIELD	The name of a field in a temp-table index.
	DATASET	The ProDataSet's name.
	BUFFER	The name of a ProDataSet buffer.
	DATA-RELATION	The name of a ProDataSet data relationship.
	RELATION-FIELD	The name of a field in a ProDataSet data relationship.

Depending on the entry type, the content builder also extracts the following attribute information for each entry:

Entry type	Attribute	Value
TEMP-TABLE	NO-UNDO	TRUE or FALSE.
	GLOBAL	TRUE if a global temp table.
	SHARED	TRUE if a shared temp table.
	LIKE	TRUE if defined with the LIKE option.
FIELD	DATA-TYPE	The data type.
	LIKE	TRUE if defined with the LIKE option.
	EXTENT	TRUE if extents exist.
	FORMAT	The format, if any.
	LABEL	The label, if any.
	INITIAL	The initial value, if any.
INDEX	PRIMARY	TRUE if a primary index.
	UNIQUE	TRUE if a unique index
	WORD-INDEX	TRUE if a word index.
INDEX-FIELD	SORT	ASCENDING or DESCENDING.
DATASET	SHARED	TRUE if a shared ProDataSet.
DATA-RELATION	REPOSITION	TRUE if applicable.

The content builder assigns IDs to each unique Entry and Attribute. It stores the location of these elements in the file, either as a line number or as characters from the file's beginning. The content builder also stores pointers to any parent or child entries.

For example, take the following temp-table definition:

- DEFINE SHARED TEMP-TABLE ttOrd
- FIELD OrderNum AS DECIMAL
- FIELD CustName AS CHARACTER LABEL "Name"
- FIELD OrderDate LIKE Order.OrderDate
- INDEX OrderNum IS PRIMARY UNIQUE OrderNum
- INDEX CustOrder IS UNIQUE CustName OrderNum
- INDEX OrderDate OrderDate.

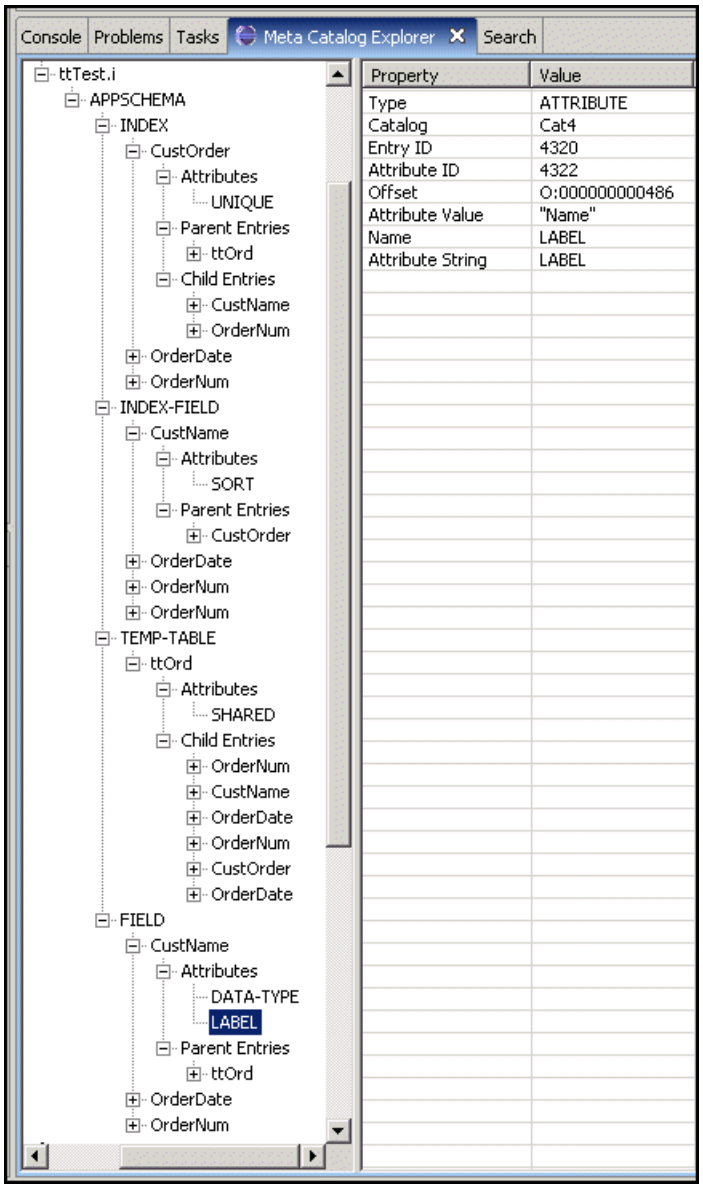
When the content builder analyzes this statement, it adds the following information to the database:

Content Type	Entry type	Entry	Attributes	Attribute values
APPSCHEMA	TEMP-TABLE	ttOrd	SHARED	TRUE
	FIELD	OrderNum	DATA-TYPE	DECIMAL
		CustName	DATA-TYPE	CHARACTER
			LABEL	"Name"
		OrderDate	LIKE	TRUE
	INDEX	OrderNum	PRIMARY	TRUE
			UNIQUE	TRUE
		CustOrder	UNIQUE	TRUE
		OrderDate		
	INDEX-FIELD	CustName	SORT	ASCENDING
		OrderDate	SORT	ASCENDING
		OrderNum	SORT	ASCENDING
		OrderNum	SORT	ASCENDING

There are two OrderNum entries because two indexes use it.

As mentioned previously, the content builder also stores the data on any parent or child relationships for each entry.

When displayed in the Meta Catalog Explorer, you would see the following structure:



See also

Content builders on page 690
Add custom file extensions to content builders on page 692

ABL Reference content builder

The ABL Reference content builder extracts data on procedures, functions, and methods. The content builder first ensures that the catalog database contains the necessary records to specify the source file (catalog, root path, project, project relative path, and resource). The content builder analyzes the code to find where procedures, functions, and methods are defined, what their parameters are, and where they are used.

Each parameter is stored as a child record for the appropriate procedure, function, or method. Any entry that has parent or child entries displays them as subnodes in the Meta Catalog Explorer view.

The content builder records the following data in the catalog:

Content type	Entry type	Entry
ABLREFERENCE	PROCEDURE	The procedure name.
	FUNCTION	The function name.
	METHOD	The method name.
	PARAMETER	The parameter name.
	PROCEDURE-REF	The name of the referenced procedure.
	FUNCTION-REF	The name of the referenced function.
	METHOD-REF	The name of the referenced method.

Depending on the entry type, the content builder also extracts the following attribute information for each entry:

Entry type	Attribute	Value
PROCEDURE	ACCESS-MODIFIER	PRIVATE
PARAMETER	PARAMETER-TYPE	INPUT, OUTPUT, or INPUT/OUTPUT.
	DATA-TYPE	The parameter's data type.
	LIKE	TRUE if defined with the LIKE option.
	EXTENT	The extents, if any.
	NO-UNDO	TRUE if set.
FUNCTION	RETURN-DATA-TYPE ACCESS-MODIFIER	The data type returned by the function. PRIVATE
METHOD	RETURN-DATA-TYPE ACCESS-MODIFIER	The data type returned by the function. PUBLIC, PROTECTED, or PRIVATE

Entry type	Attribute	Value
FUNCTION-REF	DYNAMIC	TRUE if call uses DYNAMIC-FUNCTION.
PROCEDURE-REF	PERSISTENT	TRUE if procedure is run persistently.

The content builder assigns IDs to each unique Entry and Attribute. It stores the location of these elements in the file, either as a line number or as characters from the file's beginning. The content builder also stores pointers to any parent or child entries.

For example, take the following procedure:

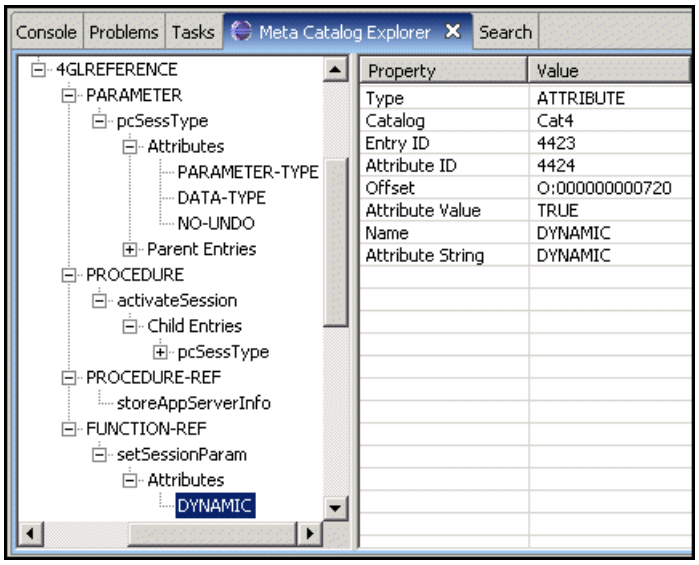
```
PROCEDURE activateSession :
DEFINE INPUT PARAMETER pcSessType AS CHARACTER NO-UNDO.
RUN storeAppServerInfo IN TARGET-PROCEDURE
("":U).
DYNAMIC-FUNCTION("setSessionParam":U IN TARGET-PROCEDURE,
        "client_SessionType":U,
        pcSessType).
END PROCEDURE.
```

When the content builder analyzes this statement, it adds the following information to the database:

Content Type	Entry type	Entry	Attributes	Attribute values
ABLREFERENCE	PROCEDURE	activateSession		
	PARAMETER	pcSessType	PARAMETER-TYPE	INPUT
			DATA-TYPE	CHARACTER
			NO-UNDO	TRUE
	PROCEDURE-REF	storeAppServerInfo		
	FUNCTION-REF	setSessionParam	DYNAMIC	TRUE

As mentioned previously, the content builder also stores the data on any parent or child relationships for each entry.

When displayed in the Meta Catalog Explorer, you would see the following structure:



See also

Content builders on page 690
Add custom file extensions to content builders on page 692

Annotation Generator

The Annotation Generator enables you to insert basic annotations into multiple files. The Annotation Generator always inserts the annotations either at the first line of the file or, for AppBuilder structured files, in the definitions section at the top of the file. This placement means that it is appropriate for adding annotations that apply to the entire file, rather than a particular piece of the file. For example, you might use the tool to insert annotations for who wrote the code, when it was created, or the sort of deployments in which it is used.

The Annotation Generator has two pieces, the Annotations preference page and the Add Annotations dialog. The Annotations preference page enables you to create and store annotation templates. The Add Annotations dialog enables you to insert annotations into multiple files, using either stored annotation templates or custom written annotations.

Annotation Generation preference page

You can access the preference page by choosing**Window** > **Preferences** and then selecting the **Progress OpenEdge** > **Editor** > **Annotations node**.

Annotation names	Lists all stored annotation templates. To browse through long lists, select a template and then drag the cursor up or down.
Annotation text	Displays the text of the selected template. A template can include more than one annotation. The templates that ship with the Annotation Generator contain two specially coded preprocessors, %FILENAME% and %MODULE%. %FILENAME% expands to the filename including the extension. %MODULE% expands to the name of the directory where the file is stored. These are the only preprocessors the tool can expand. The tool does not support customer-created preprocessors.
Add	Launches the New Annotation dialog. The New Annotation dialog does not check the syntax of the template you create.
Edit	Launches the Edit Annotation dialog for the selected annotation. The Edit Annotation dialog does not check the syntax of the template you create.
Remove	Removes the selected template from the internal template list. If you have exported your templates to a file, the template can be recovered by importing that file.
Import...	Overwrites the current annotation templates with the contents of an external .dat file.
Export...	Saves the current annotation templates to an external .dat file.

Add Annotations dialog

You can access dialog by choosing **File** > **New** > **Other** and then selecting the **OpenEdge** > **Editor** > **Annotation Generation** node.

Select annotation template combo-box	Select an existing annotation template. The annotation text displays in the editor and can be customized.

Annotation text editor	Displays the text of a selected annotation template. You can customize the annotation. You can also bypass the templates and type an annotation directly into the editor. You can type more than one annotation line into the editor. This enables you to write a set of standard annotations to multiple files in a single operation. NOTE: The editor does not check the syntax of the annotation.
Available Resource filter	Enables you to filter the Available Resource treeview. Choose the Filter button to apply a filter.
Available Resource treeview	Displays all the resources in the current workspace, limited by any filter you applied. Check the toggle for all the files into which you want the annotation inserted. Checking a directory selects all its subordinate resources.
Backup all selected resources toggle	When selected causes files to backup before applying the annotation. By default, this option is turned on.
Location	The directory where the backup files are stored. NOTE: If you do not select a new backup location each time you run the tool, you might overwrite the original backup of a file.
Finish	Starts the Annotation Generator using the selected options.

See also

ABL Annotations on page 690
Add annotations to source files on page 304
Add Sonic ESB annotations on page 305
ABL Annotation content builder on page 699
ABL annotation syntax on page 700

Meta Catalog database

Each catalog exists as a separate OpenEdge RDBMS database. The database is built and accessed through SQL commands.

When you have a large number of files in a catalog, you might want to consider the following options to increase performance:

- Start the catalog database with a higher value for the Blocks in Database Buffer (-B) parameter. The larger buffer allows more records to be in memory which reduces disk access.
- Start the catalog database with a higher value for the Minimum Clients per Server (-Mi) parameter. SQL servers can support multiple connections and reduce memory usage when this parameter is increased.
- Consider using Asynchronous Page Writers if there are a lot of updates to the catalog database.

A catalog database stores no data that cannot be extracted from the source code by the content builders. You can manually delete the database files and rebuild the same catalog from its definition. The content builders can extract two types of data:

- Meta data that you include in the source code as 4GL annotations.
- Data that can be read from the code without compiling it, information that you can parse from simple string comparison operations.

Because the content builders do not compile the source code, they cannot make substitutions. Content builders cannot expand preprocessors. Content builders cannot read and analyze the contents of included files. Content builders cannot expand a LIKE phrase to show the attributes a field inherits from another field. You might need to consider this behavior when creating search queries. For example, if you had to check all fields using the LONGCHAR data type, you might want the search query to also return all field records that have the LIKE attribute in the catalog.

A catalog database is specific to the workspace in which it is created. In order to add a source file into a catalog, you must first import that file into the workspace associated with the catalog.

Caution: The catalog database's schema is subject to change without notice in future releases. Any custom code created against the current schema might not function in future releases.

See also

Learn About Meta Catalog on page 689
Local and master catalogs on page 691
Change catalog definitions on page 694
Rebuild a local catalog on page 696
Add new files to a catalog on page 693

Meta Catalog Explorer view

The Meta Catalog Explorer view presents the data from all the catalogs defined in your workspace. You can access the view by choosing **Window** > **Show View** > **Other** and then selecting the **Progress OpenEdge Meta Catalog** > **Meta Catalog Explorer** node.

The left-hand pane contains a treeview to navigate through the data.

The right-hand pane contains a browse that displays details of the selected node, as follows:

Property	Lists the database fields that describe the selected node.
Value	The value of the corresponding database field.

See also

Access to catalog data on page 690

Access the Meta Catalog Explorer on page 692
Use the Meta Catalog Explorer on page 698
ABL Annotation content builder on page 699
ABL Application Schema content builder on page 700
ABL Reference content builder on page 704
Meta Catalog Search view on page 715

Meta Catalog preferences

You can access the Meta Catalog Preferences by choosing **Window** > **Preferences** and then selecting **Progress OpenEdge** > **Meta Catalog**.

The Meta Catalog preferences consist of the following pages:

- **Catalog list** - A browse listing all the catalogs in your workspace.
- **Catalog Databases**- A tab folder for viewing and editing catalog definitions.
- **Content Builders** - A browse of all the content builders registered in your workspace.

Catalog List page

Meta Catalog browse	Lists all catalogs currently defined in the current workspace. Shows each catalog's name, its update mode, whether it is a local or master catalog, and whether it is configured to start automatically. **Note:** A master catalog always shows "false" in the Auto start column, because it does not start when you open your workspace. If the administrator has not started a database server for it, you cannot access it.
New	Launches the Create Meta Catalog wizard that steps you through creating a new local catalog to your workspace. **Note:** Each catalog must have a unique name.
Add Master	Launches the Add Meta Catalog wizard that steps you through adding connection information for a master catalog to your workspace. **Note:** You cannot define a master catalog with the same name as a local catalog.
Remove	Removes a catalog definition from your workspace. If you choose a local catalog, you can choose to also remove the physical database files. If you choose a master catalog, you can only remove the definition.

Import	Imports a set of catalog and content builder definitions into your workspace. Any current definitions are discarded, even if there is no matching entry in the imported definitions. If a matching database is not found for an imported local catalog definition, you are given the option to rebuild the missing databases. **Note:** All the designated content builders run to recreate the content from the source code. This can take some time depending on the number of catalogs being built and the number of resources from which data is extracted.
Export All	Exports the current set of catalog and content builder definitions to an XML file. By default, the definitions are stored in the catalog.xml file.
Rebuild	Rebuilds the selected catalog. This option is disabled for master catalogs. **Note:** This process deletes the physical database. All the designated content builders run to recreate the content from the source code. This can take some time if there are a lot of resources to extract data from.

Catalog Databases page

Main page	Catalog Name combo-box	The catalog definition to view or edit. The label to the right of the combo box indicates whether it is a local or master catalog.
	Update for open projects only toggle box	If selected, when a rebuild is launched for this catalog, only the resources in open projects are run through the content builders.
	Update catalog radio set	Method for updating a local catalog's content, as follows: • On save of element - Appropriate content builders run each time a changed resource is saved. The data is written to all local catalogs whose definitions include the changed resource. This is the default setting. • On rebuild - The catalog updates its contents only when it is rebuilt. You can do this with the Rebuild button on the Catalog List page or by using the command-line utility.
	Restore Defaults	Loads the last catalog definition that was saved.
	Apply	Saves any edits for the selected catalog to the internal version of the catalog.xml file in Progress Developer Studio for OpenEdge.

Database information	Local database toggle box	When selected, this indicates that the physical catalog database is on the local machine, rather than a remote machine. By default, local catalogs are assumed to be on the local machine.
	Meta Catalog database path	The full path of the physical catalog database, including the filename.
	Service/Port for server (-S)	The connection port or service name for the catalog's database server.
	Additional server parameters	Any necessary startup parameters for the database.
	Automatically start/stop server toggle box	Whether the catalog's server should automatically start or stop when you enter or leave this workspace.
Connection information	Host	Name of the host where the catalog is.
	Service/Port	The connection port or service for the catalog's database server.
	Database	The logical name of the database.
	User	The user name to use connecting to the database. **Note:** Because the catalog database is created with SQL, for local catalogs, you need to connect as a user with proper access to update the database.
	Password	The password to use connecting to the database.
Mapping of root path	Root path	The root path for a resource as it was originally read into the catalog. If you have resources on different paths loaded into the same catalog, each root path displays on a separate line of the browse.
	Local path	The path to your local copies of the resources in a master catalog.
	Edit	Launches a dialog box where you can map a root path to a local path. When there is a mismatch between your local path and a master catalog's root path for the same resource, setting this mapping between the paths produces the appropriate search results.

Content Builders	Code	Lists the codes for content builders that are defined in this workspace. Checking the toggle box beside a code indicates that the content builder supplies data to this catalog.
	Description	The description of the content builder.
Projects	Project name	Lists the names of all projects in this workspace. Checking the toggle box beside a project indicates that data from that project's resources should be added to this catalog whenever an appropriate content builder runs.

Content Builders page

Code	The content builder's code.
Description	The description of the content builder.
Class	The Java class for the content builder.
Extensions	The file extensions against which the content builder should run.
New...	Launches a dialog for entering a new content builder definition.
Edit...	Launches a dialog for editing a content builder definition. For example, you might add a custom file extension to the existing extensions.
Remove	Removes a content definition from this workspace. This does not delete the content builder class file.
Restore Defaults	Deletes the current definitions and replaces them with the default definitions of the predefined content builders that ship with Progress Developer Studio for OpenEdge.
Apply	Saves any edits for the selected content builder to internal version of the catalog.xml file in Progress Developer Studio for OpenEdge.

Note: Changes to a content builder definition affect all catalogs in the workspace that use that content builder. You cannot change how a content builder behaves for a single catalog.

See also

Learn About Meta Catalog on page 689
Local and master catalogs on page 691
Change catalog definitions on page 694
Create a local catalog on page 695
Add custom file extensions to content builders on page 692
Set Meta Catalog preferences on page 697

Meta Catalog Search view

You can access the Meta Catalog Search by choosing **Search** > **Search** and selecting the **Meta Catalog Search** tab.

Projects to search	Lists all projects in your workspace. Select the projects whose contents you want to search.
Catalogs to search	Lists all catalogs defined for your workspace. Select the catalogs whose contents you want to search.
Search criteria	Use this browse to construct the search query. All of the fields are combo-boxes that populate based on the projects and catalogs against which you are searching.
(	Enables you to insert up to 3 levels of parenthesis in your search criteria.
Content Type	Select an available content type. Content types match up with specific content builders. A content type is only available if one of the selected catalogs uses the corresponding content builder.
Entry Type	Select an available entry type. Entry types are classes of data extracted by a content builder. The available choices depend on what the content builders extracted from the source code and stored in the selected catalogs.
Entry	Select an available entry. An entry is a specific instance of an entry type. The available choices depend on what the content builders extracted from the source code and stored in the selected catalogs.
Attribute	Select an available attribute. Attributes are classes of data that are children of certain entry types. The available choices depend on what the content builders extracted from the source code and stored in the selected catalogs.
Attribute Value	Select an available attribute value. An attribute value is a specific instance of an attribute. The available choices depend on what the content builders extracted from the source code and stored in the selected catalogs.
AND/OR	Enables you to insert either the AND or the OR logical operators in your search criteria.
)	Enables you to insert up to 3 levels of parenthesis in your search criteria.
Add	Adds a line to the bottom of the criteria in the browse.
Insert	Inserts a line above the currently selected line in the browse.

Remove	Removes the selected line in the browse.
Saved Criteria	Select a previously saved set of search criteria. The Search criteria browse will populate with the saved criteria. You can also type in a new name to save the current search criteria.
Save	Saves the current search criteria under the name in the Saved Criteria combo-box.
Remove	Removes a saved criterion from the file.
Search	Launches the search. Note: The search first prompts you to ask if you want to save the search criteria. If you chose a named set of saved criteria as your starting point, you are given the choice to overwrite the saved criteria.

See also

Access to catalog data on page 690
Search the Meta Catalog on page 697
Meta Catalog Explorer view on page 710

OECATALOG utility

The OECATALOG utility is used to administer a master catalog. You might use this command-line utility as part of the build process on the server hosting a source code management system. You can use the utility in a batch script or shell script on Windows, UNIX, and Linux platforms.

Full syntax

```
oecatalog -set |
-build
-catalog <configuration-file> [<catalog-name> ...]
-root <root-path>[=<new-path>] [<root-path-2>[=<new-path-2>] ...]
 [-resource <resource-path> [<resource-path-2> ...]
 [-project <project> [<project-2> ...]]
 [-type <content-type> [<content-type-2>] ...]
```

Where:

`<configuration-file>`

The catalog definitions file, usually called catalog.xml.

`<catalog-name>`

The name of a specific definition in the definitions file.

`<root-path>`

The root path of a project in the catalog.

`<new-path>`

The new root path where the project has been moved.

`<resource-path>`

The path, either absolute or relative to the -root, where the resource that you want to scan exists.

`<project>`

The project that you want to scan.

`<content-type>`

is the content type (ANNOTATION, APPSCHEMA, or ABLREFERENCE) for a content builder that you want to use on the resource.

Note:

- Use spaces, not commas, to delimit multiple arguments for an option.
- Use double quotes (") to escape spaces in paths.
- You must specify the `-catalog` and the `-root` option, and specify either the `-set` or the `-build` option.
- The `-set` option is used to change root paths in the catalog database.
- The `-build` option is used to update content in the catalog database.
- The `-resource`, `-project`, and `-type` options are optional.
- You can specify the `-set`, `-build`, `-catalog`, `-root`, `-resource`, `-project` in any order.
- You can specify multiple root paths. The projects are assumed to be the directories at the root path location.
- The `-resource` and `-project` options are equivalent if a relative path is used. The `-project` option can validate that the parameters are valid project names.
- If `-resource` or `-project` are not specified, then all the projects associated with the catalog in the definition file are processed.
- If `-type` is not specified, all the content builders associated with a catalog is used.
- When the `-type` option is specified, it overrides the association of content builders with the catalog. Since the `-project` and `-resource` option are equivalent, and it is similar to doing **Meta Catalog** > **Add** from within Progress Developer Studio for OpenEdge, a project or resource is added to a catalog only if the project is associated with the catalog.
- If you do not supply the full path in the `-catalog` option, the utility looks for the file in the local directory.

Examples

The following command would add content using all the content builders from all resources in `C:\wrk` and its subdirectories to all catalogs defined in the catalog definition file:

```
oecatalog -build -catalog "c:\eclipse\my workspace\catalog.xml"
   -root c:\wrk
```

The following command would only add content from the ABL Annotation content builder to the AnnoteCat catalog defined in the file:

```
oecatalog -build -catalog "c:\eclipse\my workspace\catalog.xml"
  AnnoteCat -root c:\wrk -type ANNOTATION
```

The following command would add content from a single project to all catalogs defined in the file:

```
oecatalog -build -catalog "c:\eclipse\my workspace\catalog.xml"
   -root c:\wrk -project myProject
```

The following command would change the root path to `$DLC\wrk` for all resources that were originally on `C:\wrk`:

```
oecatalog -set -catalog "c:\eclipse\my workspace\catalog.xml"
   -root "c:\wrk=$DLC\wrk"
```

Note: Because of the way Windows batch files handle equal signs (=), you should enclose any argument that contains an equal sign in double quotes (").

See also

Local and master catalogs on page 691
Build a master catalog on page 693

14

Learn About Business Logic Tools

Tools for Business Logic in Progress Developer Studio for OpenEdge let you build models that represent ABL application modules as logical components. Using a graphical editor called the Component Designer, you diagram components, adding elements such as tables, columns, indexes, and relationships. As you build your components, OpenEdge stores them in a component model file or in a database.

An OpenEdge view called the Application Schema Explorer simplifies the process of finding and reusing existing code and model elements. This view lets you browse your code base and your existing model database for available elements.

After defining the logical structure of a component, you can generate the corresponding ABL source code. You can include this in an existing application, using the OpenEdge editor to modify it as necessary. You can also reverse this process, creating model components by extracting them from existing ABL source code.

For details, see the following topics:

- Concepts
- Tasks
- Reference

Concepts

Application modeling

In the context of Progress Developer Studio for OpenEdge, modeling is the process of creating visual representations of application components and their associated relationships, and storing these components in a format that makes it easy to share and reuse them. The tool used for this process is the Component Designer, a graphical editor.

With Tools for Business Logic, you can use two basic approaches:

- Model-to-code (forward engineering)—You begin by using the Component Designer to create a visual diagram of a component. Tools for Business Logic can generate the ABL code corresponding to the diagram on demand.
- Code-to-model (reverse engineering)—You use Tools for Business Logic to derive component diagrams from existing ABL code. You can then edit the diagrams with the Component Designer, and store and reuse the components.

The results of the design process are captured in two forms:

- A diagram, which is the visual representation of a single component and its subcomponents. This is the resource that you directly edit. The diagram file simply stores the information needed to render the picture that appears in the Component Designer.
- A component model, which stores detailed information about the structure and relationships of all components in a project. You assign each diagram to a specific component model, and although you may have many models in your workspace, each component belongs to only one model. When you save a diagram, or when you derive a diagram from existing code, its associated model is automatically updated. The component model is stored either in a OpenEdge database or as an XMI (EMF Ecore) file.

Two entities govern the creation of Tools for Business Logic components and the generation of the corresponding ABL code:

- Component definition file—An Ecore file that contains the rules of component structure. The component definition file determines what types of components you can create and what options are available in the Component Designer for constructing each type.
- Template—A JET (Java Emitter Template) file that specifies how the structure of a valid component is defined in ABL code. There is one template for each component type.

Progress Developer Studio for OpenEdge provides a standard model definition file and templates for the supported component types. Customization of these files requires advanced knowledge of Java and JET concepts and syntax, and working knowledge of EMF. If you choose to customize any of these files, be sure to keep backup copies of the original versions.

See also

Learn About Business Logic Tools on page 719
Design output on page 723
Model storage options on page 724
Model components on page 729
Generate code from a diagram on page 737
Create diagrams from code on page 737

Design principles and the OpenEdge Reference Architecture

Tools for Business Logic offer the greatest benefit to those developers who adhere to the principles of the OpenEdge Reference Architecture (OERA), an application-design methodology based on maximizing re-usability and ease of maintenance by keeping data access, business logic, and user interface code in separate components. Progress Software Corporation encourages developers to become familiar with OERA concepts and to apply them to the extent possible in their own applications. However, you need not follow OERA guidelines to use the tools.

For links to more information about OERA go to the Architecture, SaaS, & Cloud Computing page on the Progress Communities Web site.

See also

Application modeling on page 720
Component types on page 721

The Business Logic tool set

Two Progress Developer Studio for OpenEdge tools are associated with Tools for Business Logic:

- **Component Designer**—The graphical editor with which you create and edit components.
- **Application Schema Explorer**—A specialized browsing view that helps you locate available building blocks for designing components.

In addition, the Tools for Business Logic perspective in its default state includes several views associated with other perspectives:

- **DB Structure view**—Lets you browse a database schema. You can drag and drop tables and fields into the Component Designer. (Associated with the DB Navigator perspective).
- **Connections view**—Lets you start and stop database sessions. In this view, you select the database to appear in the DB Structure view. The Connection Info view, showing detailed information about connected databases, is also included. (Associated with the DB Navigator perspective).
- **Outline view**—Lets you examine the structure of a model. You can drag existing elements from the model and drop them into the Component Designer for reuse. (Standard Eclipse view adapted for component models.)
- **Problems view**—Shows errors detected by the model validation process. (Standard Eclipse view.)

See also

Component Designer on page 738
Application Schema Explorer on page 739
Model components on page 729
Component Designer on page 738
Application Schema Explorer on page 739
Outline view for diagrams on page 740

Component types

You can use Tools for Business Logic to create and edit Temp tables and ProDataSets.

Temp tables

A temp table is a set of fields (columns) that temporarily stores multiple rows of data during a session. It generally exists only for the duration of the procedure that defines it, or at most for the duration of a session. A field in a temp table can be a direct copy of a field in a persistent database table, or it can be derived from other fields or data sources.

For information on defining and using temp tables, see *Develop ABL Applications*. You can find links to OpenEdge manuals on the OpenEdge Product Documentation Web site.

With the Component Designer, you can add the following elements to a temp table diagram:

- Columns
- Indexes
- Annotations
- Note
- Note links

See also

Application modeling on page 720
The Business Logic tool set on page 721
Model components on page 729
Component Designer on page 738

ProDataSets

A ProDataSet is a pre-defined view of data usually from multiple data sources (such as temp tables and database buffers) that are related to each other via data relationships. It is a potentially complex in-memory data structure that can be passed as a single parameter with a single handle from one procedure to another, within a single OpenEdge session or between sessions.

For information on designing, coding, and using temp tables, see OpenEdge Development: ProDataSets. You can find links to OpenEdge manuals on the OpenEdge Product Documentation Web site.

With the Component Designer, you can add the following elements to a ProDataSet diagram:

- Temp tables
- Buffers
- Columns
- Indexes
- Relationships
- Annotations
- Notes

See also

Temp tables on page 722
Application modeling on page 720

The Business Logic tool set on page 721
Model components on page 729
Component Designer on page 738

Design output

Creating a component in the Component Designer yields two forms of stored output:

- A component diagram.
- An application model.

Note: You must explicitly generate the ABL source code for your application. Code is produced on demand, not automatically.

Component diagrams

The diagram is the resource that you directly edit with the Component Designer. It is stored as a file with an extension of .dgm.

Each diagram represents a single component and its subcomponents. For example, a ProDataSet diagram can include any number of temp tables and buffers, but only one ProDataSet. The diagram may also include hierarchical relationships between a component and its subcomponents, and two-way (peer-to-peer) relationships between elements.

The diagram file stores only information about the picture displayed on the Component Designer canvas, such as size, position, and color of the elements. It does not contain any schema definitions or application logic; that information is stored in the component model.

See also

Component models on page 723
Model components on page 729

Component models

The component model stores the logic and schema definitions for all components in a project. When you create a component, you assign it to a model. Each time you save a component diagram, that component's model is automatically updated.

While you are editing a diagram, the Outline view displays the structure of the associated models, allowing you to browse the contents of all components. You can reuse components, either within one model or in separate models, by dragging them from the Outline view to the canvas.

You have a choice between two model storage formats:

- XMI file (EMF Ecore file format)
- OpenEdge database

Be sure to read the next topic, "Model storage options on page 724," to understand the advantages and limitations of each of these formats.

See also

Model storage options on page 724

Component diagrams on page 723
Model components on page 729

Model storage options

You must choose one of two formats for storage of your component models:

- XMI (EMF Ecore file)
- OpenEdge database

You set your own preference for your local workspace, a global setting that applies to all projects. In a typical collaborative environment, all users should select the same format. This topic explains the implications of both choices.

XMI storage

XMI is an XML-based file format that is gaining acceptance as a standard application modeling persistence and transport mechanism (see http://www.eclipse.org/emf/ for more information). Advantages of this format include:

- You can maintain multiple model files and assign each individual components to the model of your choice.
- The file format is readily usable with UML modeling tools.

Limitations of the XMI format include:

- Because the model is a flat file, only one user can have write access to it at any given time.
- Complex models result in very large files that can be relatively difficult to share.
- The Application Schema Explorer does not support the display of XMI model content. If using XMI storage, you must generate source code, and update a Meta Catalog with that code, before you can see the content in the Application Schema Explorer. (See the Meta Catalog volume in Progress Developer Studio for OpenEdge help.)

Database storage

If you use database storage, you are limited to a single model. All components that you create belong to that model. However, database storage offers the following advantages:

- Multiple users can access the model concurrently.
- The Application Schema Explorer displays the model content with no requirement to generate code.

See also

Application modeling on page 720
Set Tools for Business Logic preferences on page 725

Tasks

Set Tools for Business Logic preferences

Tools for Business Logic preferences determine your model storage format and certain characteristics of the Component Designer. In addition, if you select database storage, you can create a new model database or specify an existing one. Preference settings apply to all projects in your workspace.

To view or edit preference settings, select **Window** > **Preferences**. In the left pane of the **Preferences** window, expand **Progress OpenEdge** and then **Tools for Business Logic**.

Choose a background color

You can control the background color of the Component Designer canvas:

1. Select **Window** > **Preferences**.
2. In the left pane of the **Preferences** window, expand **Progress OpenEdge** and select **Tools for Business Logic**.
3. Click the **Diagram background color** button to open a color palette, select the desired color, and click **OK**.

See also

The Business Logic tool set on page 721
Set Tools for Business Logic preferences on page 725
Tools for Business Logic options on page 741

Control automatic linking

You have an option to have the Component Designer automatically create default relationships between certain components. For example, when you add a temp table to a ProDataSet diagram, a "contains" relationship, linking the ProDataSet to the table, can be automatically created.

This option is enabled by default. To change the setting:

1. Select **Window** > **Preferences**.
2. In the left pane of the **Preferences** window, expand **Progress OpenEdge** and select **Tools for Business Logic**.
3. Click the **Auto link components** check box to toggle the option off or on.

See also

The Business Logic tool set on page 721
Add relationships on page 734
Set Tools for Business Logic preferences on page 725
Tools for Business Logic options on page 741

Determine how models are stored

You can store your component model in either of two formats:

- XMI (Ecore EMF) file
- DB (OpenEdge database)

The default setting is XMI.

If you select XMI model storage, you can choose whether to use advanced features:

- Advanced features disabled (default) - When you create components, you are not prompted to specify a model. All components are stored in a single model file named appModel.t4bl, located in the project root folder.
- Advanced features enabled - When you create components, you specify one or more model files. You control the name and location of your models.

To set model storage options:

1. Select **Window** > **Preferences**.
2. In the left pane of the **Preferences** window, expand **Progress OpenEdge** and select **Tools for Business Logic**.
3. Select either **XMI** or **DB** in the **Persistence** area.
4. Click the **Disable advanced wizard features** check box to toggle advanced features off or on.

See also

Model storage options on page 724
Create a model database on page 726
Edit database settings on page 728
Tools for Business Logic options on page 741

Model database management

This topic explains how to create a model database, edit its settings, and share connection information.

Create a model database

If you choose the database storage option for your models, you must create a model database on your local machine, or specify a remote database:

1. Start the **Create Component Model Database** wizard by either of two methods:
   - Select **File** > **New** > **Other** > **OpenEdge** > **Tools for Business Logic** > **Create Component Model Database**.
   - Select **Window** > **Preferences**. In the left pane of the **Preferences** window, expand **Progress OpenEdge** and then **Tools for Business Logic**, and select **Component Model Database**. Then click **New**.
2. In the **Component Model Database** dialog, click **New**.
3. Enter a logical name for the database and click **Next**.
4. If creating a new database on your local machine, click **Create new database** to make the fields writable.

Note: If specifying a remote database, leave the **Create new database** field unchecked, and skip to step 10.

5. In the **Component model database path** field, enter the complete file path to the .db file that you want to create. You can either type the path and file name; or, click **Browse**, navigate to the directory where you want to create the database, enter a file name with a .db extension, and click **Save** to insert the path.
6. Enter a service name or port number for the database server.
7. Enter any additional parameters for the database server.
8. If you want the database server to start automatically when you start Progress Developer Studio for OpenEdge and to stop when you quit, click the check box.
9. If you want to create the database with default settings, click **Finish**. OpenEdge creates the database, assigning administrator privileges to your login name, with no password. No projects are associated with the database. You can associate projects and, if necessary, change the login values in the Edit database settings on page 728 dialog.
10. Click **Next** if any of the following apply:
    - You are specifying a remote database.
    - You want to add a password for the administrator's login to a local database.
    - You want to specify projects for which component models will be stored in the database.

    Note: If you clicked **Next** in the preceding step, you see fields for database connection settings. Any values that you entered on the preceding page appear. If you are creating a new local database, you need not make any changes on this dialog. Your login name is proposed by default as the DBA user; you can optionally change this User value and/or add a DBA password. If you specified no values on the preceding page, enter a remote host name, service name or port number, a valid database user name, and the user's password if necessary.
11. Click **Finish** if you want to create the database without associating projects, or click **Next** to specify projects for which component models will be stored in the database.
12. If you clicked **Next** in the preceding step, you see the **Tools for Business Logic Project Association** dialog. To associate all projects with this database, click **Add All**. To associate projects selectively, click those projects for which you plan to store component models, and click **Add**. Then click **Finish** to complete the database creation process.

    Note: Progress Developer Studio for OpenEdge does not support the use of multiple component model databases. You can create only one per workspace.

See also

Model storage options on page 724
Edit database settings on page 728
Set Tools for Business Logic preferences on page 725
Create Component Model Database wizard on page 744

Share remote database settings

If two or more people need to use the same model database that is located on a remote host, exporting and importing the settings simplifies the process of setting up connection parameters and project associations on multiple machines.

1. To export database information:
   a) Define the remote connection parameters, and optionally the project associations, as explained in Create a model database on page 726 page.
   b) Select **Window** > **Preferences** > **Progress OpenEdge** > **Tools for Business Logic** > **Component Model Database**.
   c) Click **Export**.
   d) At the **Export Component Database file browser**, navigate to the location where you want to save the exported setting, enter a file name with a .xml extension, and click **Save**.

   Note: Other developers can then import the exported settings.

2. To import exported database settings:
   a) Select **Window** > **Preferences** > **Progress OpenEdge** > **Tools for Business Logic** > **Component Model Database**.
   b) Click **Import**.
   c) At the **Import Component Database file browser**, navigate to the location of the exported .xml file. Select the file and click **Open**.

See also

Model storage options on page 724
Create a model database on page 726

Edit database settings

After creating a component model database, you may need to review or modify some of the settings that you used when you created it. To do so:

1. Select **Window** > **Preferences** > **Progress OpenEdge** > **Tools for Business Logic** > **Component Model Database** > **Database Settings**.
2. Click the **Database information**, **Connection information**, and **Projects** tabs to view the settings and make any desired changes.
3. Click **Apply** or **OK** to save any changes.

See also

Model storage options on page 724
Creating a model database on page 726
Database settings on page 743

Model components

This topic explains the process of creating Business Logic components. Refer to the points below for more details.

- Create a new component on page 729
- Edit a component on page 730

Create a new component

1. Complete the following steps to create a new Business Logic component:
   a) Select **File** > **New** > **Other** > **OpenEdge** > **Tools for Business Logic** > **Business Logic Component** and click **Next**.
   b) Enter a folder in your workspace as the location for the component diagram.
   c) In the Component name field, enter a file name with a .dgm extension.
   d) Select one of the valid component types.
   e) Click **Finish** or **Next**, whichever button is enabled.

   Note: If you click **Finish**, the diagram file opens in the Component Designer and is associated with your model database or with the default appModel.t4bl file, as applicable. You can proceed to edit the diagram. If you click **Next**, a dialog opens where you must specify a component model file as explained in the next step.

2. You must populate the list of T4BL model files with one or more file names. Your new component will be added to the model at the top of the list. If more models are listed, they will be included in the Outline view, from which you can drag components to the diagram of the component that you are creating. Use this feature to associate the component with related models to which you want to have access while building the component.
3. Use one or more of the following methods to populate the model list:
   a) Click **Create**. Then specify the name and location of a new .t4bl file, and click **OK**.
   b) Click **Browse Workspace** to open a browser for your current workspace. Navigate to and check one or more folders or .t4bl files (check a folder to select all .t4bl files in that folder and its subfolders; click the folder name to view and select individual .t4bl files contained in that folder). Click **OK** to add all selected .t4bl files to the list.
   c) Click **Browse File System** to open a standard file browser with a *.t4bl filter. Navigate to and select a .t4bl file anywhere on your file system, and click **Open** to add it to the list.
4. To remove a model from the list, select it and click **Remove**.
5. When the list shows the model files in the desired order, click **Finish** to create the diagram file that you specified in step 2. The file opens in the Component Designer, ready to have subcomponents or other elements added.

See also

Component types on page 721
Application modeling on page 720
The Business Logic tool set on page 721

Design output on page 723
Edit a component on page 730
Create diagrams from code on page 737
Determine how models are stored on page 726
Outline view for diagrams on page 740

Edit a component

The next topics explain how to define the content of a component.

Add new data structures

To add a new data structure to the component you are editing:

1. Click an item in the New Components drawer of the palette.
2. Move the cursor to the area of the canvas where you want to place the item, and click again.

   Depending on the component type, you must place it either inside a component rectangle (for example, when adding a column to a table) or on a blank area of the canvas (for example, when adding a temp table to a ProDataSet.) The cursor appears as an arrow when it is over a valid area to place the component.
3. New components appear in the diagram with default names. To change the name of a component, click the name once to select it, click it again to make it editable, and type the new name. Alternatively, select the component whose name you want to change, and edit its Name value in the Properties view.

Editing indexes

In the Properties view for an index component, you can specify the columns to be indexed and other attributes.

To edit the values:

1. Select the index in the diagram.
2. Open the Properties view and click in the Value column to the right of IndexProperties (under Attributes). An ellipsis button () appears at the right side of the column. Click this button to open the Index Properties dialog.
3. Enter the index name in the field at the top.
4. Either click Word, or click one or both of Primary and Unique, to specify the type of index.
5. Select one or more columns in the Available Columns list on the left and click Add to add them to the index and move them to the Selected Columns list on the right.
6. Select columns on the right and use the Ascending and Descending radio buttons to specify sorting order; use the Move Up and Move Down buttons to change the sequence.

See also

The Business Logic tool set on page 721
Use existing data structures on page 731
Add relationships on page 734
Add diagram notes on page 735
Add annotations on page 735
Delete components on page 736
Component Designer on page 738

Use existing data structures

As you build new components, Progress Developer Studio for OpenEdge tools let you easily copy or reuse existing data structures from several sources. You can copy and reuse data sets, tables, and columns from a component model, a database, or source code.

See also

The Business Logic tool set on page 721
Identify application schema elements on page 733
Component Designer on page 738
Outline view for diagrams on page 740

Copy from a component model

You can use the Outline view for diagrams on page 740 or the Component Designer on page 738 to reuse elements found in a component model in your workspace.

Note: In both of these cases, reusing a table results in a proxy object appearing in your diagram. You cannot modify a proxy object; any changes must be made to the source object. A proxy object appears in the diagram with a broken-line border rather than the solid border that signifies an editable object.If you want to edit the source object, right-click the proxy and select **Open Diagram** from the menu. The source object diagram opens in the Component Designer, and you can edit it. After you save your changes, they are reflected in the proxy object.

---

1. To use the **Outline view**:
   a) In the **Component Designer**, open the diagram to which you want to add existing elements.
   b) In the **Outline view**, browse to locate the desired element.
   c) Select the element, hold down the left mouse button, and drag to the area of the canvas where you want to place the item. Then release the mouse button.

   Note: Depending on the component type, you must place it either inside a component rectangle (for example, when adding a column to a table) or on a blank area of the canvas (for example, when adding a temp table to a ProDataSet.) The cursor appears as an arrow when it is over a valid area to place the component.

   ---

2. To use the palette:
   a) Click an item in the **Existing Components drawer of the palette**.
   b) Move the cursor over the canvas. A filtered instance of the **Outline view** appears, showing all available elements of the selected type. To find a specific element, type the first one or more characters of its name in the **Name** field at the top of the window; the view shows only those elements that begin with that string.
   c) Select the element that you want to use, and click **OK**. The view window closes.
   d) Move the cursor to the area of the canvas where you want to place the item, and click again.

Note: Depending on the component type, you must place it either inside a component rectangle (for example, when adding a column to a table) or on a blank area of the canvas (for example, when adding a temp table to a ProDataSet.) The cursor appears as an arrow when it is over a valid area to place the component.

See also

The Business Logic tool set on page 721
Identify application schema elements on page 733
Component Designer on page 738
Outline view for diagrams on page 740

Copy from a database

To copy from a database, you can add components to a diagram from the List item. on page 721:

1. In the **Connections view**, connect to the database from which you want to copy data structures.
2. In the **DB Structure view**, browse to the desired table; expand the table node and the Columns node below it to display fields.
3. Select the element, hold down the left mouse button, and drag to the area of the canvas where you want to place the item. Then release the mouse button.

Note: For more information about the **DB Structure view**, see the Database Navigator volume in Progress Developer Studio for OpenEdge help.

See also

The Business Logic tool set on page 721
Identify application schema elements on page 733
Component Designer on page 738
Outline view for diagrams on page 740

Copy from source code

To copy from source code, add components to a diagram from the source code that defines them, by dragging elements from the code outline to the Component Designer.

Note: If you want to copy a component defined in code to a diagram of the same component type (for example, copy a temp table to a new temp table or a ProDataSet to a new ProDataSet), you must complete the procedure below before adding any other elements to the new component.

1. To use this technique, you need to split the editing area so that it shows both the source file and the diagram. You do not need to view the source code in the Editor, but you need to put editing focus on the source file without blocking the diagram from view.

a) Open both files.

b) Point to the tab of the currently visible file, hold down the left mouse button, and drag toward the bottom of the editing area until a horizontal line appears bisecting the editing area. Then release the mouse button. You now see both editor instances.

c) You can click and drag the border between the two editing panes to increase the size of the Component Designer pane.

d) Put focus on the source file by clicking its tab. The structure of the code now appears in the Outline view.

2. In the Outline view, browse to locate the desired element.
3. Select the element, hold down the left mouse button, and drag to the area of the canvas where you want to place the item. Then release the mouse button.

Note: Depending on the component type, you must place it either inside a component rectangle (for example, when adding a column to a table) or on a blank area of the canvas (for example, when adding a temp table to a ProDataSet.) The cursor appears as an arrow when it is over a valid area to place the component.

See also

The Business Logic tool set on page 721
Identify application schema elements on page 733
Component Designer on page 738
Outline view for diagrams on page 740

Identify application schema elements

You can use the Application Schema Explorer to locate schema elements that do not exist in the physical database but rather are created at runtime by program execution. These application schema elements include:

- ProDataSets
- Temp tables
- Fields defined in temp tables

Application schema elements appear in the Application Schema Explorer if they are defined in either or both of two places:

- code that is indexed in an OpenEdge Meta Catalog accessible to your workspace. The Application Schema Explorer includes available schema elements from all of your local catalogs and any master catalogs that you link to. (See the OpenEdge Meta Catalog help volume for more information.)
- Your application model database. (The Application Schema Explorer does not support the display of models stored in XMI format.)

Using the Application Schema Explorer

1. To open the Application Schema Explorer, select **Window** > **Show View**. In the **Show View** window, expand the **OpenEdge Tools for Business Logic** folder and select **Application Schema Explorer**.
2. The tree in the **Application Schema Explorer** has two expandable top-level nodes, Catalogs and Models. Expand these nodes to display nodes for your available catalogs and models.
3. Expand any catalog or model node and its sub-nodes to see schema elements that are available in each category.

4. To determine the location of an element, use the information in the node labels and in the property viewer in the right pane.
5. After locating an element in the **Application Schema Explorer**, you can reuse in a component diagram by copying it from:
   - The Copy from a component model on page 731 for catalog-based elements.
   - The Copy from source code on page 732 for model-based elements.

See also

Use existing data structures on page 731
Application Schema Explorer on page 739
Outline view for diagrams on page 740

Add relationships

You can add links between components in a diagram to indicate relationships.

Note: By default, certain links are automatically created when you add components. For example, when you add a temp table to a ProDataSet diagram, a hierarchical "contains" link is created. You can disable automatic link creation in Set Tools for Business Logic preferences on page 725.

---

1. Create a diagram or edit an existing one.
2. In the **Connections drawer of the Component Designer** palette, click **Two-way Reference**.
3. In the diagram, click one component, and then click the component to be linked. A broken line appears between the two components, with a text label identifying the relationship type.
   - **Relationship names**: Each relationship has a name, by default the same as the relationship type. If you want to change the default name, select the link on the diagram and then open the **Properties view**. Click twice on the **Name** value in the right column, making the field editable, and enter the name of your choice. This name now appears on the diagram, preceded by a plus sign (+).
   - **Adjusting link lines**: You can alter the shape and position of the line that depicts a relationship. Select the line and then position the cursor over the break node that appears at the midpoint. When the cursor appears as a cross, you can click and drag to reshape the line as desired. Each time you move a break node, a new node appears on either side of it, making it possible to shape the line in any way you wish.

   Note: The component type definition determines the types of elements that can be linked, and you cannot place a link that is not allowed by the type definitions of both elements. In the case of a hierarchical relationship such as that between a data set and a table, you must click first on the parent element and then on the child. For example, you must click first on the ProDataSet and then on the temp table.

See also

Component types on page 721
Control automatic linking on page 725
Component Designer on page 738

Add diagram notes

You can add notes to a diagram for clarification or any other purpose. Notes appear only on the diagram; they are not stored in the model or in generated code.

1. Create a diagram or edit an existing one.
2. In the **Other drawer of the Component Designer** palette, click **Diagram Note**.
3. Click on the canvas where you want to place the note.
4. Click once in the note rectangle to make the text editable, and enter the text of the note. You can resize the rectangle by dragging its borders.
5. Optionally, you can add a link to associate the note visually with a component in the diagram. Click **Note Link** in the **Relationships drawer** of the **Component Designer** palette. Click the note first, and then click the component that you want to link the note to. A broken line connects the two entities.

See also

Component Designer on page 738

Add annotations

You can add annotations to a temp table or ProDataset component in a diagram so that the annotations will be included in the generated code.

Annotations are used to store metadata that allows the source code to be indexed in one or more catalogs. See the Meta Catalog volume in Progress Developer Studio for OpenEdge help for detailed information about catalogs and annotations.

- To add an annotation to a component:
  a) Create or edit a diagram.
  b) In the Other drawer of the Component Designer palette, click **New Annotation**.
  c) Click on the temp table or ProDataset to which you want to add the annotation.

  The annotation is added to the diagram with placeholder values for the annotation name and the name-value pair for a single attribute. Annotation syntax is:

  ```
  @annotation_name [(attribute = "value"[,attribute = "value"]...)]
  ```

- To edit the values:
  a) Select the annotation in the diagram.
  b) Open the **Properties view** and click in the Value column to the right of Annotation Properties (under Attributes). An **ellipsis** button () appears at the right side of the column. Click this button to open the **Annotation Properties** dialog.
  c) Enter the annotation name in the field at the top.
  d) Click the text in the **Key column** and enter the attribute name.
  e) Click the text in the **Value column** and enter the attribute value.
  f) Use the **New entry and Remove entry** buttons to add more attributes or to delete previously entered attributes.
  g) Click **OK**.

See also

Generate code from a model on page 737

Delete components

When you delete diagram components, you can choose whether to delete them from both the model and the diagram, or from the diagram only.

To delete components:

1. Select one or more components.
2. To delete the selected components from the diagram only, press the Delete key.
3. To delete the components from both the model and the diagram, press Shift +Delete.

Note: You cannot delete the base component of the diagram. You can delete only those elements that you add after creating the base component.

See also

Component diagrams on page 723
Component models on page 723
Edit a component on page 730
Component Designer on page 738

Match diagrams to ABL code

You can generate the source code that defines the components in a diagram. You can also create diagrams from existing source code.

Refer to the below points for more details.

- Validate a component diagram on page 736
- Generate code from a diagram on page 737
- Create diagrams from code on page 737

Validate a component diagram

You can validate a component to make sure no errors, such as missing required attributes, will prevent generated source code from being usable.

To validate a component:

1. Edit the component diagram in the Component Designer.
2. Right-click on the canvas and select **Validate Component** from the menu.
3. You see either a success message or a failure message. If validation fails, look at the Problems view to see what errors occurred.

See also

Generate code from a diagram on page 737
Component Designer on page 738

Generate code from a diagram

You can produce source code that defines the model represented in a component diagram.

By default, Progress Developer Studio for OpenEdge generates separate include files for a ProDataSet and for each temp table contained in a ProDataSet component. Each include file has the same name as the corresponding component, and a .i extension. You can change this behavior by editing the component's property settings.

- To generate code from a diagram:
  a) Edit the component diagram in the **Component Designer**.
  b) Right-click on the canvas and select **Generate Code** from the menu.
  c) Progress Developer Studio for OpenEdge validates the component, and if no errors are found, creates the source files in the same folder as the diagram. These files open in the Editor.

  If validation fails, you have the option of canceling or proceeding with the code generation. Look at the Problems view to see what errors occurred.

- To customize code generation, in the **Properties view**, you can edit the Code Generation settings for a component to control the following aspects of code generation:
  - Location of generated file - Edit the ContainerName property.
  - File name - You can specify a prefix to be added to the name of the diagram. Enter a value for the FileNamePrefix property.
  - Extension - Edit the FileExtension property.
  - Single file versus separate files - For a component contained in a parent component, such as a temp table in a ProDataSet, you can generate a separate file or include the code in the definition of the parent component. Edit the GenerateSeparateFile property.

See also

Validate a component diagram on page 736
Create diagrams from code on page 737
Component Designer on page 738

Create diagrams from code

Progress Developer Studio for OpenEdge can extract component definitions from existing source code and create the corresponding component diagrams. Use the following procedure:

1. In the **Resources view**, right-click the source code file.
2. From the menu, select **Tools for Business Logic** > **Code to Model**. The **Code to Model Component** wizard starts.
3. The wizard shows all eligible components found in the source code, and proposes the source file as the location for the new diagrams. For each component, you can:

a) Check or clear the box in the **ObjectName column** to specify whether you want a diagram created for the component.

b) Edit the name of the diagram file.

Note: You can also control where the diagrams are created by changing the directory path in the Location field.

---

4. Click **Finish** to create the selected component diagrams. The diagrams open in the Component Designer

See also

Component diagrams on page 723
Generate code from a diagram on page 737
Code to Model Component wizard on page 740

Reference

Component Designer

The Component Designer is the primary tool for developing application models. It opens when you create or edit a diagram (`.dgm` file).

The Component Designer features:

- An editing canvas that displays a diagram of the component and subcomponents that you are editing. Rectangles represent the components and contain text labels indicating their content. Lines connecting components represent relationships.
- A palette from which you select elements to add to the diagram. The list of available elements depends on the model definition for the component type. You click on the desired element type and then on the canvas to place the element.

The visual representation that you create is stored as a diagram file with a `.dgm` extension. Each time you save a diagram, the logical elements that it depicts are automatically stored in the associated model.

Using the palette

By default, the palette is at the right edge of the Component Designer window and is closed. It opens when you position the cursor over the Palette bar, stays open as long as the cursor is inside the palette area, and closes when you move the cursor outside the area.

If you prefer to keep the palette open, click the **left arrow** () At the top of the Palette bar. The symbol becomes a **right arrow** (), which you can click to close the palette again.

To move the palette to the opposite side of the Component Designer window, open it, move the cursor to the title bar at the top, left-click and drag across the window, and release the mouse button.

Elements that you can add from the palette are organized in labeled sections called drawers. You open a drawer by clicking its label (for example, New Components). By default, only one drawer is open at one time; if you open a new drawer, the other closes. To keep a drawer open, click the **pin symbol** () at the right edge of the label; click the pin again to let the drawer close.

Selection tools

At the top of the palette are two cursor options that offer different methods for selecting objects on the canvas:

- Select - Lets you select single objects by pointing and clicking, or multiple objects, one at a time, by shift-clicking. When this tool is active, the cursor appears as an arrow.
- Marquee - Lets you drag a temporary rectangle to enclose the objects that you want to select. When this tool is active, the cursor appears as a pair of crosshairs.

Click to choose one of these cursors. When you click an element in a palette drawer, the select cursor is automatically activated.

Placing elements on the canvas

To add an element to the diagram, click its label (for example, New Column) in the drawer, and then click the area of the canvas where you want to place it. Some elements must be placed inside existing elements on the canvas; for example, a column must be placed inside a table. Others must be placed outside any other elements; for example, a table must be placed directly on a blank area of the canvas.

The appearance of the cursor indicates whether an element can be placed at the current position. An arrow with a plus sign indicates that the element can be placed. A circle with a diagonal bar through it indicates an ineligible area of the canvas.

If you click an element in a drawer and then decide not to place it, press **Esc** or click another element.

You can reposition a rectangular object, such as a table, on the canvas. Select one or more objects by clicking or shift-clicking any non-text area of the rectangle with the arrow cursor, or by enclosing them with the marquee cursor. Then, using the select cursor, click and drag the selection to the desired position.

See also

The Business Logic tool set on page 721
Model new components on page 729

Application Schema Explorer

The Application Schema Explorer helps you locate existing logical elements that you can reuse in new models. For example, it can show you all available ProDataSets.

The Application Schema Explorer appears when you select **Window** > **Show view** > **Other** > **OpenEdge Tools for Business Logic** > **Application Schema Explorer**.

The Application Schema Explorer includes:

- A tree-style browser that groups valid element types under separate nodes that you expand to show available elements. You can expand and collapse nodes by clicking the + and - symbols.
- A property viewer that displays useful information about the selected tree node.

To find the location of a specific element, such as a temp table, select its node in the browser and note the path properties in the viewer.

Application Schema Explorer content

This view displays information about elements found in one or both of the following sources:

- Meta catalog - If you have one or more local or master catalogs configured for your workspace, all eligible elements defined in the indexed code base are available under the Catalogs node of the browser. See the Meta Catalog volume in Progress Developer Studio for OpenEdge help for more information.

- Component model database - If you use the database storage option for your component models, all eligible elements that you create in the Component Designer are available under the Models node of the browser as soon as you save the diagram. The Application Schema Explorer does not support the display of models stored in XMI format.

Note: If you use XMI model storage, only the Catalogs node shows content. The components that you create with Tools for Business Logic are added to catalogs only after you generate ABL code from your component diagrams.

See also

Model storage options on page 724
Application modeling on page 720
Component types on page 721
Identify application schema elements on page 733
Generate code from a model on page 737

Outline view for diagrams

When the Component Designer is active (that is, you are editing a .dgm file), the Outline view displays the contents of one or more component models, as follows:

- The model that actually contains the component you are currently editing. If you are using database storage, the outline contains only one model.
- If you are using XMI storage, any other models that you associated with the component when you created it.

The Tools for Business Logic perspective includes the Outline view by default. To display it if is not open, select **Window** > **Show view** > **Basic** > **Outline**.

The Outline shows a first-level node for each model. If multiple model files are shown, the one that contains the component you are editing appears first. To expand a node to display its content, click the dot to the left of the label at the right angle of the vertical and horizontal branch lines ( ). Expand nodes to browse the model structure.

You can drag elements from the outline to the canvas to add them to the current component, provided the context allows it. For example, you can drag a table to a ProDataSet, or a column into a temp table.

See also

The Business Logic tool set on page 721
Use existing data structures on page 731
Model components on page 729
Component Designer on page 738

Code to Model Component wizard

The **Code to Model Component** wizard lets you select from a list of component definitions found in an ABL source file the components for which you want to create diagrams. The wizard opens when you right-click a source file in the Resources view and select **Tools for Business Logic** > **Code to Model**.

The following fields and commands are available:

Fields	Resource	The source code file selected in the Resources view.
	Location	The folder in which diagram (.dgm) files are to be created.
	Object Name	The component name as defined in the source file. Use the check box preceding the name to select or deselect the component for diagram creation.
	Component Type (read-only field)	The type of Business Logic component.
	Component Name	The name of the diagram file to be created (editable).
Commands	Browse	To open a standard file browser that you can use to specify a location for the diagram files.
	Select All	To select all components.
	Deselect All	To deselect all components.
	Finish	To create diagrams for the selected components.
	Cancel	To close the wizard without creating any new components.

See also

Component diagrams on page 723
Component types on page 721
Configure a JDBC driver on page 720
Create diagrams from code on page 737
Create a new component on page 729

Tools for Business Logic options

This topic explains the pages of the **Preferences** dialog. To access these settings, select **Window** > **Preferences** > **OpenEdge** > **Tools for Business Logic**.

Component Designer options

These options govern basic behavior of the Component Designer. You open this dialog by selecting **Window** > **Preferences** > **Progress OpenEdge** > **Tools for Business Logic**.

The following fields and commands are available:

Fields	Component Directories	Not currently used; do not modify.
	Persistence	Radio buttons for selecting the storage format for component models.
	Auto-link components	An option to have the Component Designer automatically create default relationships between certain components.
	Disable advanced wizard features	An option to skip selection of a model file when creating a new component with XMI storage in effect. If this option is selected, the component is stored in the default appModel.t4bl file in the project root folder.
	Diagram background color	An option to select a color for the Component Designer canvas.

See also

Design output on page 723
Set Tools for Business Logic preferences on page 725
Add relationships on page 734
Component Designer on page 738

Database list

This dialog identifies your component model database, if any. You open the dialog by selecting **Window** > **Preferences** > **Progress OpenEdge** > **Tools for Business Logic** > **Component Model Database**.

The following fields and commands are available:

Fields	Component database name	The logical name for the database.
	Auto-start	The setting (true or false) of the option to start the database server automatically when you launch Progress Developer Studio for OpenEdge and stop it when you quit.

Commands	New	Starts the **Create Component Model Database** wizard (available only when no model database is currently defined).
	Remove	To delete the model database from disk, if it is local to your machine, and disassociate it from your component models.
	Import	To read settings for a remote database from an exported XML file and apply them for use with your projects, replacing any settings currently in use.
	Export	To create an XML file containing your current database settings, allowing other users to import the file and apply the same settings for a shared database.
	OK	To save all current values and close the Preferences dialog.
	Cancel	To close the **Preferences** dialog without saving any changes.

See also

Model storage options on page 724
Model database management on page 726

Database settings

The **Database Settings** dialog shows the current information about the name, location, connection parameters, and project associations of the component model database, if defined, and lets you make changes to these settings. This dialog appears when you select **Window** > **Preferences** > **Progress OpenEdge** > **Tools for Business Logic** > **Component Model Database** > **Database Settings**.

Settings appear on three tabs: Database information, Connection information, and Projects.

Database information tab

The following fields are available:

Fields	Component database name (read-only field)	The logical name for the database.
	Component model database path	The complete path name for the database .db file.
	Service/port for server (-S)	The name or port of the database server.
	Additional server parameters	Currently defined database startup parameters.
	Automatically start/stop server	An option to have the database server start automatically when you start Progress Developer Studio for OpenEdge and stop when you quit.

Connection information tab

The following fields are available:

Fields	Host	The name of the remote database host machine, or localhost for a local database.
	Service/Port	The name or port for the database server.
	Database	The logical name of the database.
	User	A valid database user name.
	Password	The password for the specified user, if required.

Projects tab

The table lists the projects in your workspace. Projects with a check mark are associated with the model database, meaning that components created in those projects are stored in the database.

Command buttons

The following commands are available on all tabs:

Commands	Restore Defaults	To discard changes to database settings and revert to default values.
	Apply	To save the current database settings and keep the **Preferences** dialog open.
	OK	To save all current values and close the **Preferences** dialog.
	Cancel	To close the **Preferences** dialog without saving any changes.

See also

Component models on page 723
Model storage options on page 724
Create a model database on page 726

Create Component Model Database wizard

The Create Component Model Database wizard lets you create a database to store your component model. To start the wizard, select **File** > **New** > **Other** > **OpenEdge** > **Tools for Business Logic** > **Create Component Model Database** and click **Next**.

Database name

The **Component Database Name** dialog is the first step in creating a new model component database. You open this dialog by selecting **File** > **New** > **Other** > **OpenEdge** > **Tools for Business Logic** > **Create Component Model Database**. (You can also start the **Create Component Model Database** wizard by clicking **New** at the **Component Model Database** page in the **Tools for Business Logic preferences** section.)

The following fields and commands are available:

Field	Component database name	A logical name for the database. This need not be the same as the name of the .db file.
Commands	Next	To proceed to specify a path, server, and other parameters for the database.
	Cancel	To close the Create Component Model Database wizard without creating a database.

See also

Application models on page 723
Model storage options on page 724
Create a model database on page 726
Component Designer options on page 741

Local database path and server

Specifying a database file and server parameters is the second step in creating a new model component database. You open this dialog by clicking Next after entering a name for the database.

The following fields and commands are available:

Fields	Create new database	A flag to make the other fields writable. If creating a local database, click this checkbox; if using a remote database, leave the field unchecked.
	Component model database path	The complete path name for the database .db file.
	Service/port for server (-S)	The name or port to use for the database server.
	Additional server parameters	Any valid database startup parameters.
	Automatically start/stop server	An option to have the database server start automatically when you start Progress Developer Studio for OpenEdge and stop when you quit.

Commands	Back	To return to the preceding page of the Create Component Model Database wizard.
	Next	To proceed to specify database connection parameters.
	Finish	To create the local database with default connection parameters and without associating projects.
	Cancel	To close the **Create Component Model Database** wizard without creating a database.

See also

Application models on page 723
Model storage options on page 724
Create a model database on page 726
Component Designer options on page 741

Database connection parameters

Database connection parameters

Database connection parameters are required for a remote database. Entering or changing values on this page is optional when you create a local component model database. You open this dialog by clicking Next at the dialog for specifying a local database path.

The following fields and commands are available:

Fields	Host	The name of the remote database host machine, or localhost for a local database.
	Service/Port	The name or port for the database server.
	Database	The logical name of the database.
	User	A valid database user name. For a local database, your login name is used by default.
	Password	The password for the specified user, if required.
Commands	Back	To return to the preceding page of the **Create Component Model Database** wizard.
	Next	To proceed to associate projects with the model database.
	Cancel	To close the **Create Component Model Database** wizard without saving any changes.

See also

Application models on page 723
Model storage options on page 724
Create a model database on page 726
Component Designer options on page 741

Project association

You must explicitly associate with your model database those projects in which you intend to create Tools for Business Logic components. You can do so at the last page of the Create Component Model Database wizard. This dialog opens when you click Next at the dialog for specifying database connection parameters.

The following fields and commands are available:

Fields	Available Projects	The list of your existing projects in the current workspace.
	Selected Projects	The list of projects that you have selected to associate with the model database.
Commands	Add	To move the projects selected in the **Available Projects** field to the **Selected Projects** field.
	Remove	To move the projects selected in the **Selected Projects** field to the **Available Projects** field.
	Remove All	To move all projects in the Selected Projects field to the **Available Projects** field.
	Add All	To move all projects in the Available Projects field to the **Selected Projects** field.
	Back	To return to the preceding page of the **Create Component Model Database** wizard.
	Finish	To complete the creation of the model database.
	Cancel	To close the **Create Component Model Database** wizard without creating a database.

See also

Application models on page 723
Model storage options on page 724
Create a model database on page 726
Component Designer options on page 741

New Business Logic Component wizard

The **New Business Logic Component** wizard lets you create a new component in the Component Designer. To start the wizard, select **File** > **New** > **Other** > **OpenEdge** > **Tools for Business Logic** > **Business Logic Component** and click **Next**.

New component name and location

The first page of the New Business Logic Component wizard lets you specify a name for the component, the component type, and a location within your project.

The following fields and commands are available:

Fields	Location	The folder in which the resource is to reside; this must be the project root folder or one of its subfolders.
	Component name	The file name of the diagram (.dgm) file
	Select a Component Type	Radio buttons for specifying the type of Business Logic component to create (Temp table or ProDataSet).
Commands	Back	To return to the wizard selection menu.
	Next	(Available only when XMI storage is in use and advanced wizard features are enabled) To proceed to select a model file for the component.
	Finish	(Available only when advanced wizard features are disabled or when DB storage is in use) To create the specified component diagram and associate it with the default model file, appModel.t4bl, or with your component model database.
	Cancel	To close the wizard without creating a new component.

See also

Component types on page 721
Design output on page 723
Create a new component on page 729
Determine how models are stored on page 726
Create a model database on page 726
Component Designer options on page 741

Model file selection

If you use the XMI model storage option and you have not disabled advanced wizard features, you must specify a new or existing .t4bl file for each component that you create. You open this dialog by clicking **Next** after specifying the component name, type, and location.

The following field and commands are available:

Field	T4BL model files	A list of available .t4bl files from which you select one to associate with the new component you are creating. This list is not populated until you complete a Create or Browse command. If there are multiple .t4bl files listed on completion of this dialog, the first model in the list is the one to which the component will be added. Subsequent models in the list will also appear in the Outline view, allowing you to reuse their components in the new diagram that you are creating.
Commands	Create	To display the **Create File** dialog, where you can specify a name and location for a new model file.
	Browse Workspace	To display a Resource Selection dialog, where you can specify a folder in your workspace to search for all .t4bl files.
	Browse File System	To display a standard file browser with a *.t4bl filter, enabling you to browse for and select a model anywhere in your file system.
	Remove	To remove the .t4bl file selected in the T4BL model files field from the list (but not from the file system).
	Back	To return to the preceding page of the **New Business Logic Component** wizard.
	Finish	To create the specified component diagram and associate it with the specified model file.
	Cancel	To close the wizard without creating a new component.

See also

Component types on page 721
Design output on page 723
Create a new component on page 729
Component models on page 723
Determine how models are stored on page 726
Component Designer options on page 741

15

Learn About Developer Studio Customization

You can customize the following aspects of your Progress Developer Studio for OpenEdge environment:

- **Menu and toolbar options**—You can add commands that run ABL procedures (typically custom tool applications) to a menu or the toolbar in the OpenEdge Editor perspective, or to the context (right-click) menu of the ABL Editor.
- **Code-generation templates**—You can add custom templates, or override those that are installed with Progress Developer Studio for OpenEdge, to define menu options and the output generated when those options are used.
- **Startup routines**—You can define ABL procedures that run automatically when Progress Developer Studio for OpenEdge starts.
- **Event subscription**—Progress Developer Studio for OpenEdge publishes events when various operations, such as opening or saving a file, occur. You can write ABL procedures that subscribe to and respond to these events.
- **Custom project types**—You can create project types with customized folder layouts and PROPATH settings.

Note: OpenEdge stores the customized menus, toolbars, templates, and project types in the com.openedge.pdt.extensibility.user Eclipse plugin. You can specify a different plugin for this purpose, if necessary, on the Set customization preferences on page 753.

For details, see the following topics:

- Concepts
- Tasks

- Reference

Concepts

Menu and toolbar customization

You can customize your environment so that any executable ABL procedure can be launched from:

- An OpenEdge Editor perspective menu that is reserved for user-defined commands. You determine the name of this menu.
- A submenu of the context menu that appears when you right-click in an ABL Editor window.
- A button on the OpenEdge Editor perspective toolbar.

To change menus or the toolbar in these ways, you use the Customization Editor.

See also

Learn About Developer Studio Customization on page 751
Use the Customization Editor on page 754
Customization Editor on page 763

Template customization

Templates are the basis for new source code elements. When you use the **File** > **New** menu to create a new resource, or when you right-click in the **ABL Editor** and use the **Source** submenu, an underlying template determines the content of the file that is generated.

Progress Developer Studio for OpenEdge provides standard templates for the files and code segments available from these menus. You can create your own templates and use the Customization Editor to change the installed options as follows:

- You can add options to the **File** > **New** menu. For each template that you add, Progress Developer Studio for OpenEdge automatically creates a menu entry and a corresponding wizard. When the entry is chosen, the wizard generates a new file containing the custom code.
- You can override the standard templates used by the wizards launched from the **File** > **New** menu or the **Source** submenu. The wizards then generate code based on your custom templates instead of the standard ones.
- You can associate the templates to custom project types.

Note: You must have access to the JET templates that you use and they must be in your Java class path. On the Customization Preferences page on page 772, you can easily add template directories to your class path.

Information resources for JET templates

The following are some useful sources of information about templates:

- OpenEdge Architect: Working with Custom Templates
- Introduction to JET(Eclipse Corner Article)

- EMFT JET Developer Guide

Startup customization

You can write an ABL procedure to run automatically when you start Progress Developer Studio for OpenEdge. For example, you might create a startup procedure that subscribes to Event subscription on page 753.

See also

Customize project startup on page 759

Event subscription

Progress Developer Studio for OpenEdge publishes a named event each time any of several system operations (for example, opening or closing a file) occurs. By using the subscribe statement in ABL code, you can capture these events and respond to them programmatically.

See also

Subscribe to OpenEdge Architect Events on page 760

Custom project types

Progress Developer Studio for OpenEdge allows you to create a custom project type which is a combination of different project types added to a single project. In a custom project type, you can specify the folder layout, the default files in each folder, and the PROPATH settings for folders in each project. You can also share these custom project types with other developers. The custom project types you create can be used as templates for new projects.

For more information on the options for creating a custom project type, see Customization Editor on page 763.

Note: OpenEdge stores the details of the custom project types in the com.openedge.pdt.extensibility.user Eclipse plugin. So, if you are running Progress Developer Studio for OpenEdge in multiple Eclipse environments, you must ensure that the required projects are available for each Eclipse environment.

See also

Use the Customization Editor on page 754
Customization Editor on page 763

Tasks

Set customization preferences

To open the Customization preferences page, select **Window** > **Preferences** > **Progress** > **OpenEdge** > **Advanced** > **Customization**. On this page, you can:

- Specify the Eclipse plugin containing the custom menu and toolbar definitions to be used. Generally, there is no need to change the default.
- Identify the locations in which you store custom templates.

Customization plugin

By default, menu, toolbar, template, and project type customizations are stored in a plugin named com.openedge.pdt.extensibility.user. It is possible to create and maintain additional plugins with different customization definitions. If you have multiple plugins, specify in the Customization plugin Id field the one in which you want to store changes that you make with the Customization Editor. The value in this field must correspond to a valid Eclipse plugin.

If multiple customization plugins are present, specifying one on the Customization preferences page does not disable the others. It just identifies the plugin in which subsequent changes are saved. The potential exists for conflicts in settings. To avoid problems, consider making only one customization plugin available to Eclipse at any given time.

Template directories

The location of any custom template you want to use must be in your Java class path. Selecting All open project directories, entering a specific location in the Template folder field, or both causes the specified directories to be added automatically to your class path. You cannot specify multiple directories in the Template folder field.

See also

Menu and toolbar customization on page 752
Template customization on page 752
Customization Preferences dialog on page 772

Use the Customization Editor

Add menu and toolbar commands

You use the Customization Editor to add ABL programs to the OpenEdge Editor perspective menu bar or toolbar, or to the ABL Editor context (right-click) menu. After adding options, you can also use this tool to edit or remove them.

Follow these steps to add a program to the menus or toolbar:

1. In the OpenEdge Editor perspective, open the Customization Editor by selecting **OpenEdge** > **Tools** > **Customization Editor**.
2. In the **Available Extension Points** tree view, click either **Menu/Toolbar** Entries or **Editor Context** Menu.

   If you select Menu/Toolbar Entries, you can change the menu label, which by default is Extensibility. This is the label that will appear on the menu bar. To designate a character in the label as a shortcut key in combination with the Alt key, enter an ampersand (&) before that character. (For example, if you keep the default value, Extensibility, pressing Alt+Y opens the menu.)
3. Click **Add**. As a shortcut to skip steps 2 and 3, click  or  on the Customization Editor toolbar to add a menu/toolbar entry or a context menu entry, respectively
4. Enter the appropriate values for the fields that appear under Action Details. See the Customization Editor on page 763 reference help for detailed information about these fields.
5. If you want the program to run as a persistent procedure, check the **Run** persistent option at the bottom.
6. If you selected Menu/Toolbar Entries in step 2, click the appropriate radio button in the Action appearance section to indicate whether the option should be placed on the menu, the toolbar, or both.

7. Save your changes (Select **File** > **Save** or click ).
8. To make the newly added option available immediately, click  (rightmost on the Customization Editor toolbar) to reset the OpenEdge Editor perspective. Then, click **Yes** in the restart prompt that appears. Your changes do not take effect until you restart Progress Developer Studio for OpenEdge.

See also

Menu and toolbar customization on page 752
Edit and delete options on page 758
Customization Editor on page 763

Customize code templates

You can use the Customization Editor to add to the **File** > **New** menu, file-creation wizards that use custom Java Emitter Templates (JET templates) and Editor templates.

You must have access to custom JET templates for creating ABL code to be able to add file-creation wizards that use these templates.

You can also override the standard templates used by the options on that menu or the ABL Editor context (right-click) menu. After defining template customizations, you can use the Customization Editor to edit or remove them. You can also associate these templates to custom project types.

For information about creating JET templates, see OpenEdge Architect: Working with Custom Templates in the Product Documentation section of the Progress Software Developers Network Web site.

Your template files must be in your Java class path. You can specify template directories to be added to your class path in Set customization preferences on page 753.

Begin by opening the Customization Editor. In the OpenEdge Editor perspective, select **OpenEdge** > **Tools** > **Customization Editor**.

1. Follow these steps to add a new JET template entry to the **File** > **New menu**:
   a) In the **Available Extension Points** tree view, click **New JET Templates**.
   b) Click **Add**.
   c) Enter a name, and optionally an image file for an accompanying icon, to appear on the **File** > **New** menu.
   d) In the **Template** file field, enter the name of the Java class file containing the compiled JET template.
   e) **Save** your changes.
2. Follow these steps to add a new Editor template entry to the **File** > **New** menu:
   a) In the **Available Extension Points** tree view, click **Editor Templates**.
   b) Click **New**.
   c) Enter the appropriate values for the fields that appear in the New Template dialog. See Editor Templates options on page 767 for detailed information about these fields.
   d) **Save** your changes.
   e) You can also edit, remove, import, and export Editor templates. See Editor Templates options on page 767 for detailed information about these operations.
3. Follow these steps to specify a template for use in place of a standard Progress Developer Studio for OpenEdge template:

a) In the **Available Extension Points** tree view, click **Template Overrides**.

b) Click **Add**.

c) In the **Template** field, select the standard template that you want to override from the drop-down list.

d) In the **Template** file field, enter the name of the Java class file containing the compiled JET template to be used instead.

e) **Save** your changes.

4. After adding or overriding template definitions:

a) Save your changes by selecting **File** > **Save** or clicking .

b) To make the changes take effect, click  (rightmost on the Customization Editor toolbar) to reset the OpenEdge Editor perspective. Then, click **Yes** in the restart prompt that appears. Your changes do not take effect until you restart Progress Developer Studio for OpenEdge.

See also

Template customization on page 752
Edit and delete options on page 758
Set customization preferences on page 753
Customization Editor on page 763

Work with custom project types

You can use the Customization Editor to create, edit, remove, import, and export custom project types.

See also

Custom Project Types on page 753
Customization Editor on page 763

Create custom project types

You can use the Customization Editor to create custom project types. Once you create the custom project types, you can use this tool to edit, remove, import, and export them. The custom project types that you create appear on the Create an OpenEdge Project page on page 71 of the **New OpenEdge Project** wizard.

Follow these steps to create a custom project type:

1. In the OpenEdge Editor perspective, open the Customization Editor by selecting **OpenEdge** > **Tools** > **Customization Editor**.
2. In the **Available Extension Points** tree view, click **OpenEdge Custom Projects**.
3. Click **Add**.

Note: Optionally, you can click  on the Customization Editor toolbar to create a custom project type.

---

4. Enter the appropriate values for the fields that appear under Project Type Configuration. See the Customization Editor on page 763 reference help for detailed information about these fields.

5. **Save** your changes (Select **File** > **Save** or click ).
6. **Restart** Progress Developer Studio for OpenEdge to make your changes take effect.

Note: The Customization Editor displays a warning message each time you make changes to a custom project.

See also

Custom project types on page 753
Edit and remove custom project types on page 757
Import and export custom project types on page 758
Customization Editor on page 763

Edit and remove custom project types

Once you create custom project types using the Customization Editor, you can use the same tool to edit or remove them. To do so, follow these steps:

1. In the OpenEdge Editor perspective, open the Customization Editor by selecting **OpenEdge** > **Tools** > **Customization Editor**.
2. In the **Available Extension Points** tree view, expand the OpenEdge Custom Projects node by clicking the plus symbol (**+**), and select the entry you want to change.
3. Make the required changes in the **Project Type Configuration** section, or click **Remove** to delete the entry.

Note: To remove a custom project type, you must uninstall it from all its associated OpenEdge projects that are currently open in the workspace. Otherwise, an information dialog appears with the names of all the associated OpenEdge projects and prompts you to uninstall the associations. This dialog appears only for the projects open in the current workspace. If there are multiple workspaces using the same Progress Developer Studio for OpenEdge, you must ensure that the custom project type is removed from all projects in all the applicable workspaces.

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4. **Save** your changes (Select **File** > **Save** or click ).
5. Restart Progress Developer Studio for OpenEdge to make your changes take effect. When you open or import an OpenEdge project associated with a project type that has been removed or not yet configured in the current workspace, a warning message appears in the Project Facets project properties page.

   To remove the project type association with the OpenEdge project, you must remove the custom project entry from the `org.eclipse.wst.common.project.facet.core.xml` file located in the .settings folder of the project.

Note: Removing this entry from the XML file does not remove the artifacts created by the project type. You must remove them manually.

See also

Custom Project Types on page 753
Create Custom project Types on page 756

Import and Exporting Custom Project Types on page 758
Customization Editor on page 763

Import and export custom project types

OpenEdge stores the details of custom project types that you create in the com.openedge.pdt.extensibility.user Eclipse plugin (you can specify a different plugin, if necessary, on the Set customization preferences on page 753). The details of custom project types created by other users are stored in similar user plugins. You can import these custom project types using the Customization Editor. You can also export the custom project types that you create.

1. To import custom project types:
   a) In the OpenEdge Editor perspective, open the Customization Editor by selecting **OpenEdge** > **Tools** > **Customization Editor**.
   b) In the **Available Extension Points** tree view, click OpenEdge Custom Projects.
   a) Click **Import**.
   a) Select a plugin folder of another user from the list of directories. The **Import Custom Project Types** dialog appears with a list of custom projects available in that plugin folder.
   a) Select the custom project types you want to import.

   Note: The dialog displays an error if you select a project type that already exists in the workspace.

2. To export custom project types:
   a) In the OpenEdge Editor perspective, open the Customization Editor by selecting **OpenEdge** > **Tools** > **Customization Editor**.
   a) In the **Available Extension Points** tree view, click **OpenEdge Custom Projects**.
   b) Select the project types that you want to export on the Export Custom Project Types dialog.
   a) Click **Export**. The dialog creates a user plugin with the details of the selected custom project types that can be used by other users.

See also

Custom project types on page 753
Create custom project types on page 756
Edit and remove custom project types on page 757
Customization Editor on page 763

Edit and delete options

After adding custom options with the Customization Editor, you can use the same tool to edit or remove them. Follow these steps:

1. In the OpenEdge Editor perspective, open the Customization Editor by selecting **OpenEdge** > **Tools** > **Customization Editor**.
2. In the **Available Extension Points** tree view, expand the appropriate node by clicking the plus symbol (**+**), and select the entry you want to change.

3. Make the desired changes in the Details section, or click **Remove** to delete the entry.
4. Save your changes (Select **File** > **Save** or click ).
5. To make the changes effective, click  (rightmost on the Customization Editor toolbar) to reset the OpenEdge Editor perspective. Then, click **Yes** in the restart prompt that appears. Your changes do not take effect until you restart Progress Developer Studio for OpenEdge.

See also

Add menu and toolbar commands on page 754
Customize code templates on page 755
Customization Editor on page 763

Share customization settings

To share custom menu, toolbar, and template settings with another user, do the following:

1. You must provide to that user:
   a) An archive such as a .ZIP file containing your customization plugin directory and all of its contents. The default customization plugin is:

   ```
   OpenEdge-install-dir\OpenEdge\oeide\eclipse\plugins\com.openedge.pdt.extensibility.user_version_number
   ```

   b) Copies of all custom templates.
2. The other user should then do the following:
   a) Extract the contents of the plugin archive to the same location on her or his own machine, and confirm that the value of the Controls available in all contexts on page 764 in the Customization Editor matches the version number in the directory name.
   b) Save the custom templates in the desired location, and make sure that location is in the Set customization preferences on page 753.

See also

Menu and toolbar customization on page 752
Template customization on page 752
Customization Preferences page on page 772

Customize project startup

When you open a Progress Developer Studio for OpenEdge project, the OpenEdge Runtime searches the project's PROPATH for a file named `_idestartup.p`. If that file is found, any procedures that it contains are automatically executed. Therefore, you can implement a custom startup routine by creating the `_idestartup.p` procedure.

For example, you might write a startup procedure that subscribes to Subscribe to OpenEdge Architect events on page 760.

Reference

Subscribe to OpenEdge Architect events

Each time a Progress Developer Studio for OpenEdge operations takes place, a named event, oeide_event, is published. This enables you to develop procedures that use the ABL SUBSCRIBE statement to capture and respond to Progress Developer Studio for OpenEdge events.

Output parameters for oeide_event

The following output parameters are published:

Event Name	Output Parameters
eventName	One of the following values: • Open-file • Close-file • Before-save • After-save • Before-compile • After-compile • Before-run • After-run • Before-debug • After-debug • Project-startup • Project-shutdown • Get-focus
projectName	The name of the project in which the event occurs.
programName	The file name of the resource operated on, if applicable.
eventData	(Not currently used.)

Note: In certain circumstances, event publishing is suppressed so as not to interfere with a running process. For example, opening or closing a file while running the Progress Developer Studio for OpenEdge Debugger does not trigger publication of an event. Also, note that the Before-compile and After-compile notifications do not apply to Tools for Business Logic, as models are only saved and not compiled.

AppBuilder events

When AppBuilder runs in Progress Developer Studio for OpenEdge, most of its events are published by both OpenEdge Studio and Progress Developer Studio for OpenEdge. Whenever possible, it is recommended that you use the Progress Developer Studio for OpenEdge events, rather than the corresponding OpenEdge Studio events. However, the following OpenEdge studio events do not have Progress Developer Studio for OpenEdge counterparts:

- New
- Before-Open
- Before-Close
- Before-Check-Syntax
- Check-Syntax
- Before-Check-Syntax-Partial
- Check-Syntax-Partial

Note: The AppBuilder in Progress Developer Studio for OpenEdge does not have a **Compile** option. If the **ABL Editor** is opened for an AppBuilder file, then the compile notifications will be sent only if the file is saved under OpenEdge Projects.

Named event publishing for AppServers in Progress Developer Studio for OpenEdge

Progress Developer Studio for OpenEdge currently publishes events on the AVM for certain events, such as starting a project, stopping a project, and compiling.

The following events are new in this release:

Event Name	Description
before-server-publish	Sent to all OpenEdge projects that contribute one or more modules to a server. This event is published when the server starts to publish.
after-server-publish	Sent to all OpenEdge projects that contribute one or more modules to a server. This event is published when the server finishes publishing.
before-module-publish	Sent to all OpenEdge projects that contribute one or more modules to a server. This event is published when the server begins to publish a specific module.
after-module-publish	Sent to all OpenEdge projects that contribute a specific module to a server. This event is published after the server publishes a specific module.
server-starting	Sent when an OpenEdge server is known to be starting (typically when the launch for a particular server has started). This event is published only to projects that contribute one or more modules to the server.

Event Name	Description
server-started	Sent when an OpenEdge server is known to have started from within a Progress Developer Studio for OpenEdge launch configuration. This event is published from both the launch configuration (after it detects that the server has started) and from the server process that monitors the server state. This event is published only to projects that contribute one or more modules to the server.
server-stopping	Sent when an OpenEdge server is stopping. This event is published: • Only to projects that contribute one or more modules to the stopped server • Whenever the framework detects that the server is stopping
server-stopped	Sent when an OpenEdge server is stopped. This event is published: • Only to projects that contribute one or more modules to the server • Whenever the framework detects that the server has stopped This event is called from both the stop process job and the server process that monitors the state of the server.

Each event is published in the AVM with four parameters. The following table shows the value of each parameter for each event:

Event	Project name	Program name	Event data
before-server-publish	Project name of module owner	<blank>	Server name
after-server-publish	Project name of module owner	<blank>	Server name
before-module-publish	Project name of module owner	Module name	Server name
after-module-publish	Project name of module owner	Module name	Server name
server-starting	Project name of module owner	<blank>	Server name
server-started	Project name of module owner	<blank>	Server name
server-stopping	Project name of module owner	<blank>	Server name
server-stopped	Project name of module owner	<blank>	Server name

Sample event-subscription startup routine

The following example shows a Startup customization on page 753, `_idestartup.p`, that subscribes to Progress Developer Studio for OpenEdge events and runs event_alert.p as a persistent procedure:

```
/*------------------------------------------------------------------
    File        : _idestartup.p
    Purpose     : Subscribe to Progress Developer Studio for
                  OpenEdge events, call event_alert.p
  ----------------------------------------------------------------------*/
DEFINE VARIABLE mySubscribehandle AS HANDLE  NO-UNDO.
RUN event_alert.p PERSISTENT SET mySubscribeHandle.
SUBSCRIBE PROCEDURE mySubscribeHandle TO "oeide_event" ANYWHERE.
```

Each time an event occurs, `event_alert.p` displays an alert with the values of the three `oeide_event` parameters:

```
/*------------------------------------------------------------------
  File        : event_alert.p
  Purpose     : Display alerts for Progress Developer Studio for
                OpenEdge events
  ----------------------------------------------------------------------*/
PROCEDURE oeide_event.
DEFINE INPUT PARAMETER eventName AS CHARACTER.
DEFINE INPUT PARAMETER projectName AS CHARACTER.
DEFINE INPUT PARAMETER programName AS CHARACTER.
DEFINE INPUT PARAMETER eventData AS CHARACTER.
MESSAGE "Event name: "     eventName SKIP
   "Project name: "  projectName SKIP
   "Program name: "  programName SKIP
VIEW-AS ALERT-BOX.
END PROCEDURE.
```

See also

Startup customization on page 753

Launch configurations for running and debugging programs on page 451

Customization Editor

You use the Customization Editor to:

- Define custom entries on the OpenEdge Editor perspective Menu/Toolbar Entries or Editor Context Menu on page 765.
- Define custom entries on the ABL Editor Menu/Toolbar Entries or Editor Context Menu on page 765.
- Associate custom JET templates with New JET Templates options on page 766 to be added to the**File** > **New** menu.
- Associate standard code-generation wizards (those installed with Progress Developer Studio for OpenEdge) with custom JET templates, Template Overrides options on page 767 their association with standard installed templates.
- Create, edit, remove, import, and export OpenEdge Custom Project options on page 768.

You open the Customization Editor in the OpenEdge Editor perspective by selecting **OpenEdge** > **Tools** > **Customization Editor**.

The controls available in the Editor depend on the selection context - that is, the current selection in the Available Extension Points tree view.

See also

Menu and toolbar customization on page 752

Template customization on page 752
Launch configurations for running and debugging programs on page 451
Custom project types on page 753

Controls available in all contexts

Controls	Description
Available Extension Points	A tree view in which you select the type of customization entry to add or an existing entry to edit.
 Add Program to Menu/Toolbar	Displays the form for a new entry under the Menu/Toolbar Entries node.
 Add Program to Editor Menu	Displays the form for a new entry under the Editor Context Menu node.
 Add Custom Template	Displays the form for a new entry under the New Templates node.
 Add Template Override	Displays the form for a new entry under the Template Overrides node.
 Add Custom Project	Displays the form for a new entry under the OpenEdge Custom Projects node.
 Refresh Customization Options	Resets the OpenEdge Editor perspective after editing and prompts you to restart Progress Developer Studio for OpenEdge for the changes to take effect. You are first prompted to save changes if necessary.
Add	Displays the form for a new entry of the type selected in the tree view.
Remove	Deletes the currently selected entry.
Version	A string that must match the version extension of the customization plugin name. This field is disabled if a non-default plugin (that is, any other than com.openedge.pdt.extensibility.user) is in use. If you change the version number here, a copy of com.openedge.pdt.extensibility.user is created with this version number. **Note:** There is no need to change this value, and you should not do so, unless you are very familiar with Eclipse plugin management and are using advanced plugin configuration techniques.

See also

Menu and toolbar customization on page 752
Template customization on page 752

Custom project types on page 753
Use the Customization Editor on page 754

Menu/Toolbar Entries or Editor Context Menu

The following controls are available for this extension point:

Controls	Description
Menu label	(Available only when top-level Menu/Toolbar Entries node is selected) The text to appear on the menu bar as the name of the custom menu. Optionally, an ampersand (&) before a character in this string makes that character a shortcut key (pressing Alt plus the shortcut key opens the menu).
Name	The name of the option. If you are adding a menu option, this is the text that will appear on the menu.
Accelerator	(Optional) A key sequence that can be used to activate the program without use of the mouse. You can use Ctrl, Alt, or both, plus a shifted or unshifted character or function key. You must type the key names, separated with + (no spaces). The following examples are valid accelerator sequences: Ctrl+Shift+Z Alt+S Ctrl+Alt+ Shift+F10 If you are adding a menu option, the assigned key sequence will appear on the menu along with the program name. The sequence must not be assigned to another function. If you specify an accelerator that is already in use, it will be disabled for both operations. To view existing assignments, select **Window** > **Preferences** > **General** > **Keys**.
Icon	(Optional) An image to appear on the menu and/or toolbar button. The image file must be in the icons directory of the extensibility plugin (by default, com.openedge.pdt.extensibility.user), or a subdirectory in that path. An image size of 16x16 pixels is recommended for best results. If you add a toolbar option without specifying an icon, the program name appears on the toolbar.
Tooltip	(Optional) Text to appear in a popup window when the user rests the mouse pointer over the toolbar button. If you leave this field blank, the option name is used. Tootips have no effect in menus.

Controls	Description
Program name	The executable ABL program (.p, .w, or .r file) to run when the menu or toolbar option is chosen. If the file is not in your Propath, include the full path. The value of this field works in conjunction with the value of the Configuration field, as follows: • If you want this program to run externally, also choose a launch configuration in the Configuration field. The program you enter overrides the initial program specified in the configuration definition. • If you simply want the menu or toolbar option to launch an external configuration and run the initial program as specified in the configuration definition, choose the appropriate entry in the Configuration field and leave the Program name field blank.
Parameters	(Optional) The parameters, if any, with which the program is to run.
Configuration	The drop-down list for this field shows the launch configurations defined for your workspace. Choose the launch configuration under which you want the menu or toolbar option to run the program. (See the instructions above for the Program name field.)
Action appearance	(Available only when adding an entry under Menu/Toolbar Entries) A radio button set that lets you specify whether the option is to appear on the menu, the toolbar, or both.
Run persistent	An option to run the specified program as a persistent procedure.

See also

Menu and toolbar customization on page 752
Launch configurations for running and debugging programs on page 451
Using the Customization Editor on page 754

New JET Templates options

The following controls are available for this extension point:

Controls	Description
Name	The name of the wizard. This text will appear on the **File** > **New menu**.
Icon	(Optional) An image to appear on the menu. The image file must be in the icons directory of the extensibility plugin (by default, com.openedge.pdt.extensibility.user), or a subdirectory in that path. An image size of 16x16 pixels is recommended for best results.
Template file	The name of the Java class file containing the template that the new wizard is to use for code generation. The file must be in your Java class path.

See also

Template customization on page 752

Use the Customization Editor on page 754

Editor Templates options

The Customization Editor allows you to create, edit, and remove Editor templates. You can associate these templates to the custom project types using the Code-generation Templates options on page 771. Associating an Editor template to a custom project type creates a New File option in the **File** > **New** menu, which you can use to create a new file with the selected template pattern.

When you select the Editor Templates node, the Customization Editor displays the New Editor Templates section in its right pane. In this topic, you can create, edit, remove, import, and export Editor templates.

The following controls are available in the New Editor Templates section:

Controls	Description
New	Opens the **New Template** dialog that allows you to create a new Editor template.
Edit	Allows you to edit the currently selected Editor template options in the **New Template**dialog and change the name of the template. When you change the name of the template, an Edit Template dialog appears, asking if you want to add a new template with that name or modify an existing one.
Remove	Deletes the currently selected entry.
Import	Allows you to import Editor templates from the file system.
Export	Allows you to export Editor templates to the file system.

Controls available for the New Template dialog

Controls	Description
Name	Allows you to specify the name of the template.
Context	Determines where the template can be used and the set of available predefined template variables.
Description	Specifies the template description.
Pattern	Specifies the template pattern.
Insert Variables	Display the list predefined context specific variables.

See also

Template customization on page 752
Use the Customization Editor on page 754

Template Overrides options

The following controls are available for this extension point:

Controls	Description
Template	The name of the standard Progress Developer Studio for OpenEdge template to be overwritten.
Template file	The name of the Java class file containing the template to be used in place of the standard template. The file must be in your Java class path.

See also

Template customization on page 752
Use the Customization Editor on page 754

OpenEdge Custom Project options

The following controls are available for this extension point:

Controls	Description
Add	Creates a custom project type and displays the Project Type Configuration section in the right pane of the Customization Editor. See Controls available for Project Type Configuration on page 768. This option is also available on the Customization Editor toolbar ().
Remove	Deletes the currently selected entry. **Note:** To remove a custom project type, you must uninstall it from all its associated OpenEdge projects that are currently open in the workspace. Otherwise, an information dialog appears with the names of all the associated OpenEdge projects and prompts you to uninstall the associations. This dialog appears only for the projects open in the current workspace. If there are multiple workspaces using the same Progress Developer Studio for OpenEdge, you must ensure that the custom project type is removed from all projects in all the applicable workspaces.
Import	Allows you to import custom project types from other extensibility user plugins.
Export	Allows you to export custom project types that you create to other users.

Controls available for Project Type Configuration

You can use the Project Type Configuration section to configure the properties related to the custom project types that you create.

Following are the controls available for this topic.

Controls	Description
Name	Allows you to specify the name of the custom project type. Displays an error if you specify a name that already exists.

Controls	Description
Icon	(Optional) Allows you to browse and select an image that appears on the Project Facets project properties page. The image file must be in the icons directory of the extensibility plugin (by default, com.openedge.pdt.extensibility.user), or a subdirectory in that path. An image size of 16x16 pixels is recommended for best results.
Description	(Optional) Allows you to add a brief description of the custom project type. This description is displayed on the Project Facets project properties page.
Perspective	(Optional) Allows you to choose from a list of available OpenEdge perspectives. This perspective is activated after creating an OpenEdge project that is associated with the current custom project type. The default perspective is OpenEdge Editor.
Required facet	Allows you to select a project type from a list of all the project types and custom project types (other than itself) in Progress Developer Studio for OpenEdge. The project type you select here is displayed on the Project Facets project properties page along with the default OpenEdge project type which is a required facet for every project type. **Note:** If the OpenEdge project type is not selected on the Project Facets project properties page for a custom project type, an error is displayed indicating the missing dependency.
OpenEdge runtime	Allows you to select the runtime for the current project as either GUI or TTY. The default value is based on the selected project type. **Note:** The GUI client is supported only on Windows. Therefore, on non-Windows platforms, **TTY**is automatically selected and cannot be changed. It does not change according to the type of project you select.

Each custom project type node contains the following nodes:

- Folder Layout options on page 770: Allows you to specify the default folder structure of the project and the files in the folder. Also, allows you to add the folder to PROPATH. Clicking this node displays the Folder Layout section and the PROPATH section on the right pane of the Customization Editor.
- Code-generation Templates options on page 771: Allows you to create a set of default templates and associate them to the custom projects. Associating the template to a custom project creates a New File option in the **File** > **New** menu, which you can use to create a new file with the selected template pattern.

See also

Custom project types on page 753
Template customization on page 752
Use the Customization Editor on page 754
Folder Layout options on page 770
Code-generation Templates options on page 771

Folder Layout options

Selecting the Folder Layout node under a custom project type displays a Folder Layout section and a PROPATH section on the right pane of the Customization Editor.

Controls available for the Folder Layout section

The Folder Layout section displays the folders and files that you add in a tree format. The default parent node for all the folders and files is <Project Root>. The folders that can be added to PROPATH are displayed with a different icon.

Note: The modifications to the folder layout are saved by default as these operations (adding and removing) are done on file system directly.

The following controls are available for this topic:

Control	Description
Add	Allows you create a file or folder using the **Add File/Folder** dialog. It is enabled when you select a single folder or an item under the <Project Root> node.
Edit	Displays the **Edit File/Folder** dialog which allows you to edit the file or folder options that you select in the **Add File/Folder** dialog.
Remove	Deletes the currently selected entry.
Add to PROPATH	Adds the currently selected file or folder to PROPATH. The files or folders that you add here appear in the PROPATH section (on the right pane of the Customization Editor). **Note:** The Add to PROPATH option is enabled only for the folder(s) that do not have a PROPATH entry and .pl file(s). To remove PROPATH entries, click Edit.

Controls available for Add File/Folder and Edit File/Folder

The Add File/Folder dialog allows you to add files or folders to a custom project type. You can edit the file or folder options that you select on this dialog using the Edit File/Folder dialog (contains the same options).

The following controls are available on these dialogs:

Control	Description
Folder	Enables options for adding a folder to the custom project type.
File	Enables options for adding a file to the custom project type.
Folder name	(Is enabled only when you select Folder) Specifies the name of the folder.

Control	Description
Copy content from existing folder	(Is enabled only when you select Folder) Allows you to load folder(s)/file(s) from the file system. **Note:** The content under the specified folder is copied to the folder layout. The changes in the actual directory are not reflected automatically.
Include sub-folders	(Is enabled only when you select Copy content from existing folder) Loads content from all levels of the files/folders under the selected folder.
Path	(Common for Folder and File) Specifies the location of the folder or file in the file system.
Add to PROPATH	(Common for Folder and File) Adds the currently selected file or folder to PROPATH. The files or folders that you add here appear in the PROPATH section (on the right pane of the Customization Editor).

Controls available for the PROPATH section

The PROPATH section displays the PROPATH entries that you add by using the Add to PROPATH option in the **Folder Layout** section. The default entry displayed in this topic is `@{ROOT}` and it represents the project root folder. When you add a folder or file to PROPATH, that entry is added below `@{ROOT}`.

Move Up, Move Down	Changes the position of the current entry in the list and thus specifies the order of the PROPATH entries.
Remove	Deletes the currently selected entry and updates the corresponding folder or file image.

See also

Custom project Types on page 753
Template Customization on page 752
Use the Customization Editor on page 754
OpenEdge Custom Project Options on page 768

Code-generation Templates options

Selecting the Code-generation Templates node under a custom project type displays a list of the templates associated with the custom project type in the Templates section (appears in the right pane of the Customization Editor).

The following controls are available for this topic:

Control	Description
Add	Opens the Add Template Association dialog. This dialog allows you to specify the name of the template and choose the type of the template you want to associate to the custom project. The Add Template Association dialog provides two template options: New JET templates and Editor Templates options on page 767.
Edit	Allows you to edit the template options that you select in the Add Template Association dialog and change the name of the template.
Remove	Deletes the currently selected entry.

See also

Custom project types on page 753
Template customization on page 752
Use the Customization Editor on page 754
OpenEdge Custom Project options on page 768

Customization Preferences page

The Customization Preferences page lets you:

- Specify the Eclipse plugin that is used for customizations.
- Automatically append template directories to your Java class path.

You open the Customization Preferences page by selecting **Window** > **Preference** > **Progress OpenEdge** > **Advanced** > **Customization**.

The following controls are available:

Controls	Description
Customization plugin Id	The name of the plugin in which menu and toolbar customizations are stored. The value in this field must correspond to a valid Eclipse plugin.
Template search locations	Options to append all open project directories and/or a specific template directory to your Java class path when Progress Developer Studio for OpenEdge starts.
Restore Defaults	Sets the value of the Customization plugin Id to com.openedge.pdt.extensibility.user and clears the Template search locations fields.
Apply	Saves changes and leaves the Preferences dialog open.
OK	Saves changes and closes the Preferences dialog.
Cancel	Closes the Preferences dialog without saving changes.

See also

Template customization on page 752
Customize code templates on page 755

16

Learn About Progress DB Navigator

Progress DB Navigator is a graphical tool you can use to view the schema of a database, browse the data in tables, view and analyze application data, and issue SQL commands. DB Navigator connects to any SQL-compliant database through a JDBC driver.

If you are working with an OpenEdge database, you can use schema wizards to create, modify, and delete tables, columns, indexes, and other database objects. You can also view triggers and sequences. You cannot, however, perform administrative tasks, like dumping and loading data.

(For OpenEdge databases only) OpenEdge databases provide multi-tenant features that allow you to create, edit, and delete multi-tenant tables and sequences.

If you are working with a Microsoft SQL Server database or an Oracle database, you can view extended schema elements such as triggers, functions, and stored procedures.

For details, see the following topics:

- Concepts
- Tasks
- Reference

Concepts

DB Navigator perspective

In Eclipse, perspectives define the layout of the initial set of views in the Workbench window. DB Navigator includes the DB Navigator perspective. This perspective contains a number of different views that allow you to perform multiple activities, such as creating a SQL Connection profile used in connecting to a database, viewing database schema, and running SQL queries.

In support of these various activities, the DB Navigator perspective includes the following views:

- Connection Info view on page 827—A read-only display of SQL connection information for the database, shown as property/value pairs.
- Connections view on page 827—A display of all available SQL connection profiles and all active sessions.
- DB Structure view on page 828—A tree view display of the database schema structure.
- DB Details view on page 829—A read-only display of information specific to the selected node in the DB Structure view.
- SQL Results view on page 831—The results of a SQL query run from the SQL Editor.
- SQL History view on page 832—A list of all executed SQL queries.

The DB Navigator perspective also provides access to the SQL Editor on page 830, which allows you to write and execute SQL scripts.

(Progress Developer Studio for OpenEdge only) The DB Navigator perspective in Progress OpenEdge Developer Studio provides a toolbar button for launching OpenEdge Explorer, a tool for configuring databases. See Launch OpenEdge Explorer (Progress Developer Studio for OpenEdge only) on page 779 for more information.

See also

SQL connection profiles on page 776
Access the DB Navigator perspective on page 779
Launch OpenEdge Explorer (Progress Developer Studio for OpenEdge only) on page 779
Components of the DB Navigator perspective on page 826

SQL connection profiles

DB Navigator uses SQL connections defined in profiles to store information needed to connect to a database. Each profile contains all the information necessary to establish this connection, such as the specific JDBC driver to use and the connection parameters (connection name, user name, password, host name, port number, and so on).

You create a connection profile in either of the following ways:

- From the Connections view on page 827 using the **Add Connection Profile** wizard.
- From the **Window** > **Preferences** > **Progress Databases** > **DB Navigator** SQL Connection profile preferences on page 852 page.

See also

Add SQL connection profiles on page 782
SQL Connection profile preferences on page 852

JDBC drivers

JDBC (Java Database Connectivity) drivers allow Java-based applications to connect to SQL-compliant databases.

DB Navigator includes several JDBC drivers that allow connections to supported databases. You can see the list of all available drivers in the JDBC Drivers preferences on page 853 page, which you can access by choosing **Window** > **Preferences** > **Progress Databases** > **DB Navigator** > **JDBC Drivers**. You can also add other JDBC drivers.

Note: Since JDBC drivers execute SQL statements, you must start databases that can service SQL clients. Also note that for an OpenEdge database, ABL access is required for trigger maintenance. Therefore, define database servers with the client type of Both 4GL and SQL (which is the default).

See also

SQL connection profiles on page 776
Configure a JDBC driver on page 780
Connect a database on page 781

Multitenancy (Progress OpenEdge databases only)

Multitenancy refers to a principle in database architecture where a single instance of database runs on a server that serves multiple client organizations (tenants). DB Navigator provides multi-tenant features for OpenEdge databases.

You can use DB Navigator's multi-tenant features of to do the following:

- Create, edit, identify, and delete multi-tenant tables.
- Convert tables to multi-tenant tables.
- Create, edit, and delete multi-tenant sequences.
- Share data definition files (schema changes) across Progress OpenEdge developers.

Note: These features are limited to Progress OpenEdge databases and do not impact other databases like Oracle, SQL, etc.

See also

Work with multi-tenant tables on page 803
Work with multi-tenant sequences on page 815

Table partitioning in Progress OpenEdge databases

A partition is a division of a logical database into distinct independent parts. Database table partitioning allows you to make horizontal partitions of the table data based on a value or a range of one or more database table fields. This partitioning increases performance because the search involves limited views of data, while maintaining availability and security.

Note: A database must be enabled for table partitioning, by either using the PROUTIL command or from the OpenEdge Management console, to be able to partition the tables.

OpenEdge databases that are enabled for partitioning are categorized into two groups:

- Partitioned tables with partition policies defined on them
- Partitioned tables without any partition policies defined on them

You can use the **DB Structure** view to manage partitioned tables in the same way as the other OpenEdge database tables.

See also

Work with partitioned tables on page 806

Tasks

Common tasks for supported databases

This topic describes the tasks that are commonly performed when you use Progress DB Navigator to work with a SQL-compliant database.

See also

Add a SQL connection profile for an MS SQL Server database on page 789
Add a SQL connection profile for an OpenEdge database on page 793
Add a SQL connection profile for an Oracle database on page 821

Set preferences

You set the preferences for Progress DB Navigator by selecting **Window** > **Preferences**. Expand the **Progress DB Navigator** tree view node to see the following preference options:

- SQL Connection profile preferences on page 852 - Configure SQL connections to databases.
- Databases>OpenEdge Schema Editing - Set preferences associated with the schema wizards for OpenEdge databases.
- JDBC Drivers preferences on page 853 - Configure aspects of the JDBC driver.
- SQL Editor preferences on page 854 - Configure SQL Editor preferences.

See also

Connect a database on page 781
Add SQL connection profiles on page 782
Configure a JDBC driver on page 780
SQL Editor on page 830

Access the DB Navigator perspective

To open the DB Navigator perspective:

1. Click **Open Perspective** on the **Workbench toolbar**.

   Note: You can also select **Window** > **Open Perspective**.

2. Select **DB Navigator** from the drop-down menu if it is listed. If it is not listed, choose **Other**. Then choose **DB Navigator** from the **Open Perspective** dialog.

   Note: If you have already opened the DB Navigator perspective in a workspace, you can access it again by choosing DB Navigator from the perspective bar. The location of the perspective bar is configurable. By default, the perspective bar is located on the left side of the workbench. You might need to click the chevron (>>) to expand the list of available perspectives. Alternatively, you can display more perspective tabs by dragging the tab folder to the left.

3. Connect to a database. See Connect a database on page 781 for more information.

   Note: For more information on using perspectives, toolbars, and menu bars, see the Workbench User Guide in the Eclipse help system.

Launch OpenEdge Explorer (Progress Developer Studio for OpenEdge only)

1. To launch OpenEdge Explorer (a tool for configuring databases) from Progress OpenEdge Developer Studio's DB Navigator perspective, click the **OpenEdge Explorer** toolbar button .
2. When started, OpenEdge Explorer prompts for an administrator user name and password. The default value is admin for both user name and password. You must change the password after the initial login. After you log in, OpenEdge Explorer runs in a browser embedded in the active perspective. For online help, click one of the help buttons in OpenEdge Explorer.
3. Change the default user name and password after logging in. You can also change the default URL on the PAS for OpenEdge server preferences on page 121 page.

   Note: To be able to access OpenEdge Explorer, you must enable it while installing OpenEdge. Also, make sure that the admin server is running. PAS for OpenEdge server preferences on page 121 page.

Configure a JDBC driver

DB Navigator requires a JDBC driver in order to connect to a database and supplies JDBC drivers for various database types. In most cases, the driver is installed and configured automatically during installation of DB Navigator. If the driver is not configured correctly, you must edit its configuration.

Among the supplied drivers is the JDBC ODBC Bridge. Although the bridge allows you to use predefined ODBC data sources, its use is typically not recommended, as it is a less efficient connection option.

To verify that the JDBC driver you need is configured correctly and is available for a database connection, choose **Window** > **Preferences** > **Progress DB Navigator** > **JDBC Drivers**. A list of drivers appears in the JDBC Drivers preferences on page 853 page.

The JDBC drivers that are already successfully configured are tagged with a blue ✓ icon. If a driver is tagged with a red ⊗ icon, however, the driver is not configured. You must configure the driver before it can be loaded to connect to a database.

To configure a JDBC driver from the **JDBC Drivers Preferences** page:

1. Select the driver, and click **Edit**. The **Edit Driver** dialog appears.
2. Verify the driver name in the **Name** field and the URL in the **Example URL** field. This URL entry forms the default URL when you create a new SQL connection. If the URL contains an IPv6 address, be sure to include an opening bracket before and a closing bracket after the address; for example, [thehostmachine]. (See the documentation for the driver for more information.)
3. Verify that any entries listed in the **Extra Class Path** tab point to a valid driver. Click **Add** to add a driver to the list, or click **Delete** to delete an existing driver from the list.
4. Verify the **Driver Class Name** for the selected driver. You can also select the driver and then click **List Drivers** to retrieve a list of available names. (If no driver class name appears automatically, you can type one in the **Driver Class Name** field.)
5. Click **OK**.

Note: The listed drivers have definitions that assume that the JDBC driver classes are in the current class path or are in your JRE extensions directory (for example `C:\Program Files\Java\jdk1.8.0_101\jre\lib\ext`). Consult the documentation for your Java implementation for more information. If this is not the case, you must modify the driver definition to point to the jar file or the directory that contains these classes.

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6. If you successfully configure the driver, a blue ✓ icon appears next to its name in the list of drivers. If the red ⊗ icon still appears next to the driver's name, perform troubleshooting for the particular driver, as follows, to review the configuration:
   - Troubleshoot the MS SQL Server JDBC driver on page 790
   - Troubleshoot the Progress OpenEdge JDBC driver on page 794
   - Troubleshoot the Oracle JDBC driver on page 822

See also

JDBC drivers on page 777
Connect a database on page 781

Connect a database

You can connect DB Navigator to multiple databases. Here is an overview of how to connect DB Navigator to a database (follow the links for more information about the tasks). Obtain or create a user account for the database. You must provide a login to access a SQL database. When you try to connect to a database in DB Navigator, you are prompted for a user ID and password. For other details about the specific database you are working with, see the relevant database documentation.

Note: (For OpenEdge databases only) If no user accounts have been established, you can use the Windows login name of the person who created the database as the user ID.

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1. **Configure a JDBC driver on page 780**—DB Navigator requires a JDBC driver in order to connect to a database and supplies JDBC drivers for various database types. In most cases, the driver is installed and configured automatically during installation of DB Navigator. If, however, the JDBC driver for your database requires driver configuration, see Configure a JDBC driver on page 780 for more troubleshooting information.
2. **Start the database server**—You cannot connect to a standalone database. You must start a database server before connecting to the database. To start OpenEdge databases, you can use either OpenEdge Management or OpenEdge Explorer, or the OpenEdge proserve command.

   Note: Since JDBC drivers execute SQL statements, you must start databases that can service SQL clients. For OpenEdge databases, ABL access is required for trigger maintenance. Therefore, create a server with a client type of Both 4GL and SQL (which is the default).

   ---

3. **Open and close SQL connections on page 783**—You can select and open an existing SQL connection, or you can Add SQL connection profiles on page 782 and open it. Connection profiles contain connection information, which includes, among other details, the name of the driver, a URL expression, a user name, and a password.
4. **DB Structure view on page 828 view**—When you open a connection profile for a database, the schema for the database appears in the DB Structure view on page 828 view.

See also

SQL connection profiles on page 776
JDBC drivers on page 777
Configure a JDBC driver on page 780
Add SQL connection profiles on page 782
Open and close SQL connections on page 783
Connections view on page 827
Connection Info view on page 827
DB Structure view on page 828

Work with SQL connection profiles

You can add, edit, display, open, and close SQL connection profiles using the DB Navigator. To know more, refer to the points below.

- Add SQL connection profiles on page 782
- Edit SQL connection profiles on page 782
- Display SQL connection profiles on page 783
- Open and close SQL connections on page 783

See also

SQL connection profiles on page 776

Add SQL connection profiles

You must have a SQL connection profile created for each Add a SQL connection profile for an MS SQL Server database on page 789, Add an SQL connection profile for an OpenEdge database on page 793, and Add an SQL connection profile for an Oracle database on page 821 (or any other SQL-compliant database) whose schema you want to view in DB Navigator.

DB Navigator uses SQL connection profiles to store information needed to connect to a database. Each profile contains all the information necessary to establish this connection, such as the specific JDBC driver to use and the various connection parameters required.

Before you can add a SQL connection profile, you must have a JDBC drivers on page 777 for the database. Typically, the driver is installed and configured automatically during installation of DB Navigator. You may, however, find that you need to Configure a JDBC driver on page 780, and you can do so from the **Window** > **Preferences** > **Progress Databases** > **DB Navigator** > **JDBC Drivers preferences** page.

Once you have the JDBC driver configured, you can create a SQL connection profile for your SQL-compliant database.

See also

SQL connection profiles on page 776
Configure a JDBC driver on page 780
Connect a database on page 781
SQL Connection profile preferences on page 852

Edit SQL connection profiles

To edit an existing SQL connection profile in the Connections view on page 827:

1. Select the connection profile you want to edit. Right-click to display the context menu.
2. Choose **Edit Connection Profile**.
3. In the **Edit Connection Profile** dialog, modify those aspects of the connection you want to change
4. Click **OK**.

Note: You can click **Test Connection** to verify database connectivity.

See also

SQL connection profiles on page 776
Add SQL connection profiles on page 782
SQL Connection profile preferences on page 852

Display SQL connection profiles

Displaying SQL connection profiles

You can access a list of SQL connection profiles by using either of the following methods:

- Select **Window** > **Preferences** > **Progress Databases** from the main menu bar, and then select the **DB Navigator node** from the **preference** tree. Select **Connection Profiles** in the expanded tree view.
- From the Connections view on page 827, expand the **Connection Profiles** node.

See also

SQL connection profiles on page 776
Add SQL connection profiles on page 782
Edit SQL connection profiles on page 782
Open and close SQL connections on page 783
SQL Connection profile preferences on page 852

Open and close SQL connections

Opening and closing SQL connections

1. To open (start) a connection:
   a) Select **Window** > **Show View** > **Connections** to access the Connections view on page 827 in DB Navigator.
   b) Double-click a connection profile beneath the **Connection Profiles** node. (Or, select a connection profile and click **Open Connection** .) The **Connection** dialog appears.

      Note: If you selected the **Auto-Login** on **connect** option when you created the connection profile, the system attempts to connect to the database, displaying the schema in the DB Structure view on page 828. Otherwise, the **Connection** dialog appears.

   c) Enter the user ID and, optionally, a password for an account. The **User** and **Password** fields default to the values defined, if any, in the connection profile.

      Note: If you intend to view data in or modify an OpenEdge database, the user account must have DBA privileges.

   d) Choose either **AutoCommit** or **Commit On Close** in the **Connections view** tool bar. **AutoCommit**, which is the default, applies changes immediately after a transaction—a SQL statement that updates the database—completes. **Commit On Close** saves changes and applies them when the session closes.
   e) Click OK.

      Note: When the connection is made, the connection profile name appears in the Connections view beneath the Active Connections node. The schema of the database appears in the DB Structure view.

2. To close a connection:

a) Access the Connections view on page 827 in DB Navigator.

b) Select the connection profile of the connection you want to close, located under the **Active Connections** node.

c) Click **Close Connection** . (Alternatively, click **Close All Connections** .)

See also

SQL connection profiles on page 776
JDBC drivers on page 777
Configure a JDBC driver on page 780
Add SQL connection profiles on page 782
Connections view on page 827
Connection dialog on page 826

SQL scripting

DB Navigator contains a SQL Editor that allows you to write and execute SQL scripts. It also has a SQL Results view on page 831 that displays the results for any executed SELECT statement. You can also save SQL scripts in your project.

For more details, refer to the below points.

- Start the SQL editor on page 784
- Generate SQL queries on page 785
- Copy and paste on page 786
- Generate a create table script on page 786
- Save SQL scripts on page 787

Start the SQL editor

When you are connected to a database, you can use one of the following methods to start the SQL Editor:

- Select the database in the Connections view on page 827, and then click **New SQL Editor** from the **Connections view** tool bar.

  Note: If you create a new file in the SQL Editor, the script will not automatically be saved when you exit the editor. For new files, you will not be prompted to save the script when you exit the editor. You can save new scripts by choosing either **File** > **Save As** before you exit the editor or **Save** from the context menu in the SQL Editor.

- Choose **Generate Select in SQL Editor** from the context menu of the DB Structure view on page 828. This option is available when you have a table selected and generates a simple query of all the columns in the table. You can modify the generated code before running it.
- Choose **Create Table Script** from the context menu of the DB Structure view on page 828. This option is available when you have a table selected and generates a table creation script based on the schema of the selected table. You can modify the generated code before running it
- Open an existing file from the **Navigator** view.
- Open an item in the SQL Editor from the **New SQL File** wizard. This method creates a script that is a resource in an existing project (and you are prompted to save when you exit the editor).

- Follow these steps:
  1. Choose **File** > **New** > **Other**.
  2. Select **Progress DB Navigator** > **SQL Editor**.
  3. Enter the name of a project folder in the **Enter or select the parent folder** field, and type a script filename in the File name field. The filename must be unique: You cannot enter the name of an existing file. However, you can load the contents of an existing file by selecting **Link to file in the file system** under the **Advanced** options.
  4. Click **Finish**.

See also

Copy and paste on page 786
Generate SQL queries on page 785
Generate a create table script on page 786
Save SQL scripts on page 787
SQL Editor on page 830
SQL Editor preferences on page 854
SQL History view on page 832
SQL Results view on page 831

Generate SQL queries

To automatically generate a SQL query for an individual table:

1. Select a table in the DB Structure view on page 828. Right-click to display the context menu.
2. Choose **Generate Select in SQL Editor**. The SQL Editor opens with a `SELECT` statement that contains all the columns of the table.
3. Click **Execute SQL**  to execute the query. The results appear in a browse in the SQL Results view on page 831.

Note: If you select a table whose field names begin with an underscore (as is the case in a system table), you need to ensure that every field name is enclosed in quotes. Otherwise, the SQL statement fails. You can modify the Set preferences on page 778 so that **Copy To Clipboard** has the **Enclose** in single quotes option selected to ensure that all field names are quoted.

See also

Start the SQL editor on page 784
Copy and paste on page 786
Generate a create table script on page 786
Save SQL scripts on page 787
SQL Editor on page 830
SQL Editor Preferences on page 854
SQL History view on page 832
SQL Results view on page 831

Copy and paste

Copying and pasting

A **Copy Name** option is available from most context menus in the **DB Structure view** and some context menus in the DB Details view on page 829. **Copy Name** copies all selected node labels to the clipboard.

The SQL Results view on page 831 contains a **Copy to Clipboard**  icon in its toolbar. It also allows the data to be pasted to the clipboard.

The copied contents can be pasted into the **SQL Editor**, the **OpenEdge Editor**, or any other Windows-compliant application.

Settings in the DB Navigator preferences on page 851 page allow you to specify the following variations when pasting:

- **Append table name to column** - Select this option to automatically append table names to column names when they are pasted.
- **Enclose in quotes** - Select this option to automatically enclose column names in quotes when they are pasted or when generating a select in SQL Editor.
- **Delimiter** -Provide the delimiter you want to use when multiple columns are selected. (The default is a comma.)

See also

Start the SQL editor on page 784
Generate SQL queries on page 785
Generate a create table script on page 786
Save SQL scripts on page 787
SQL Editor on page 830
SQL Editor preferences on page 854
SQL History view on page 832
SQL Results view on page 831

Generate a create table script

When you select a table node in the DB Structure view on page 828 and right-click, the context menu contains an option for running a SQL script that creates a table. When you select **Create Table Script** from the context menu, a script appears in the SQL Editor on page 830. You can use the script to generate the SQL code needed to create a copy of the schema of the selected table.

Note: If you try to execute the script as it is, it fails because the table already exists. At the very least, you must make the name unique for the new table before you execute the script.(For OpenEdge database tables only) Be aware that Create Table Script does not generate the extended SQL syntax for defining OpenEdge attributes such as Format or Label.

See also

Start the SQL editor on page 784
Copy and pasting on page 786
Generate SQL queries on page 785
Save SQL scripts on page 787
SQL Editor on page 830

SQL Editor preferences on page 854
SQL History view on page 832
SQL Results view on page 831

Save SQL scripts

What you need to do to save scripts depends on how you start the **SQL Editor**.

When you start the **SQL Editor** from the **New SQL File** wizard, or when you open a SQL script that is a project resource and then you modify the script, you can save by choosing **File** > **Save**. The editor also prompts you to save when you exit the editor after making changes to the file.

If you start the **SQL Editor** in any other way, you must choose **File** > **Save As** before you exit the editor. You are prompted to name the file and to add it to an existing project. Then, you can save.

See also

Start the SQL editor on page 784
Copy and pasting on page 786
Generate a SQL query on page 785
Generate a create table script on page 786
SQL Editor on page 830
SQL Editor preferences on page 854
SQL History view on page 832
SQL Results view on page 831

Work with application data

To view application schema using **DB Navigator**, you must have READ access privileges. To edit application schema, you must have WRITE access privileges.

Note: (For OpenEdge databases) Users with DBA privileges can view and edit application schema.

See also

View application data on page 787
Edit application data on page 788

View application data

From DB Navigator, you can preview a limited set of table records and see the default arrangement of the data, or you can view all data in a table.

1. To preview a limited set of records:
   a) Select a table name in the DB Structure view on page 828.
   b) Select the **Preview** tab in the DB Details view on page 829.

   Note: By setting the **Preview** row limit in the DB Navigator preferences on page 851, you can adjust the number of rows displayed in the **Preview** tab.

2. To view all data in a table:

a) Select a table name in the **DB Structure view**.

b) Right-click on the table and choose **Generate Select in SQL Editor** to open a **SQL editor** containing the generated SELECT statement.

c) Click **Execute SQL**  to open a **SQL Results view** containing a browse with the first batch of records. To retrieve the next batch of records, click **Retrieve more rows**; to get all the records, click **Retrieve All Rows**. You can add a `WHERE` clause to the SQL SELECT statements to further refine the data retrieved. You can also modify the text and remove any columns.

Note: By default, the system retrieves 100 records at a time. You can change this value in the DB Navigator preferences on page 851.

Edit application data

To edit the data in a table:

1. Select a table name in the DB Structure view on page 828. Right-click to display the context menu.
2. Choose **Edit Table Data**.

   The **Editing** dialog appears, displaying the data from the selected table.

Note: The browse expands automatically to the maximum size of the row.

You can set the number of rows displayed in the **SQL Results row limits** field of the DB Navigator preferences on page 851. You can also filter the rows displayed by entering a `SQL WHERE` statement. For example, in this image, statement displays only those rows in which the value in the Balance column is greater than 10000. 

Both editing errors and SQL syntax errors appear at the bottom of the view.

Note: (For OpenEdge databases only) ABL triggers do not execute when you modify data in the **Editing** dialog. For example, if you use a trigger to prompt for user confirmation before committing a change, the trigger does not execute. However, since DB Navigator uses the OpenEdge SQL interface, Java triggers do execute.

Work with MS SQL Server databases

Working with an MS SQL Server database using DB Navigator allows you to set preferences, add SQL connection profiles, troubleshoot the MS SQL Server JDBC driver, and view the database schema.

Set preferences

You set the preferences for Progress DB Navigator by selecting **Window** > **Preferences**. Expand the **Progress DB Navigator** tree view node to see the following preference options:

- SQL Connection profile preferences on page 852 - Configure SQL connections to databases.
- Databases>OpenEdge Schema Editing - Set preferences associated with the schema wizards for OpenEdge databases.

- JDBC Drivers preferences on page 853 - Configure aspects of the JDBC driver.
- SQL Editor preferences on page 854 - Configure SQL Editor preferences.

See also

Connect a database on page 781
Add SQL connection profiles on page 782
Configure a JDBC driver on page 780
SQL Editor on page 830

Add a SQL connection profile for an MS SQL Server database

To add a SQL connection profile:

1. Click **Add Connection Profile**  in the Connections view on page 827.
2. Type a unique name in the **Name** field.
3. Select the **Microsoft SQL Server JDBC Driver(DataDirect)** from the driver selection list. You can click **New Driver** if you need to Configure a JDBC driver on page 780. In most cases, however, the correct driver is installed and configured automatically during installation of DB Navigator. SQL can have multiple JDBC connections. Notice that the format for the selected driver's URL appears in the **URL** field. If necessary, you can edit the text in the **URL** field to include the appropriate information for your system.
4. To edit a URL:
   a) Deselect the **Specify URL Details** checkbox (by default, this checkbox is selected, preventing you from editing the URL field).
   b) Supply a hostname (use localhost if the host is local to the system). If you are using an IPv6 address, insert a bracket before and after the address; for example, [thehostmachine].
   c) Type the port number.
   d) Type the database name.

   Note: Since the format of the URL and the required information can vary from driver to driver, see the documentation for your driver if you need more information.

5. Type the user name and, optionally, a password.

   Note: You must specify the user ID when creating a SQL connection.

6. Choose **Open on Eclipse startup** if you want the connection to open when Eclipse starts (provided the database server is already started). Note that you still must enter a valid user ID (and optionally a password). Also, be aware that this option slows the startup of Eclipse.
7. Choose **Auto-Login** on connect to automatically log into the database when connecting.
8. Type the name of the Host.
9. Type the correct value in the **Port** field.
10. Type the name of the database in the **Database** field.
11. Add any additional JDBC connection properties in the **Additional parameters** field, delimited by semicolons in the format key1=value; key2=value. (Refer to the documentation for your JDBC driver for a list of supported parameters.)

12. Click **Test Connection**. If the connection succeeds, a Connection succeeded message appears. If the connection does not succeed, an error message appears.
13. Click **OK**.

See also

Troubleshoot the MS SQL Server JDBC driver on page 790

Troubleshoot the MS SQL Server JDBC driver

DB Navigator requires a JDBC driver in order to connect to a database and supplies JDBC drivers for various database types. In most cases, the driver is installed and configured automatically during installation of DB Navigator.

If the driver is configured properly, the driver is tagged with a blue ✓ icon in the JDBC Drivers preferences on page 853 page. If the driver is tagged with a red icon, however, the driver is not configured and cannot be loaded to connect to a database. If the JDBC driver is not properly configured, you see an error message when you try the database connection.

To troubleshoot the JDBC driver configuration, begin by verifying that the URL specified in the database's connection profile is correct, and then verify several other driver configuration options. These steps are as follows:

1. From the Connections view on page 827, select the database connection in the **Connection Profiles** list.
2. Right-click, and choose **Edit Connection Profile**.
3. Check the **URL** in the **Connection Profile** dialog.

Note: For the Microsoft SQL Server JDBC Driver (DataDirect), the URL should look similar to

```
jdbc:progress:sqlserver://hostname:port;DatabaseName=name
```

in which `port` is the port number of the database server and name is the logical database name. If the URL contains an IPv6 address, be sure to include an opening bracket before and a closing bracket after the address; for example, [thehostmachine].

---

4. Close the **Edit Connection Profile** dialog once you confirm that the URL is correct.
5. Choose **Preferences** > **Window** > **Progress Databases** > **DB Navigator** > **JDBC Drivers** to open the JDBC Drivers preferences on page 853 page.
6. Select the driver you want to configure from the list, and then choose **Edit**. The **Edit Driver** dialog appears.
7. In the **Edit Driver** dialog:
   a) Ensure the string in the **Name** field is unique and indicates the correct driver.
   b) Ensure the **Driver Class Name** field is correct. The DataDirect Microsoft SQL Server JDBC Driver class name is as follows: `com.prgs.jdbc.sqlserver.SQLServerDriver`
   c) Click the Extra Class Path tab. Verify that the following pathnames appear:

```
install_dir\oeide\architect\eclipse\plugins\com.progress.dbnavigator_2.1.0\drivers\pgsqlserver.jarinstall_dir\
oeide\architect\eclipse\plugins\com.progress.dbnavigator_2.1.0\
drivers\pgbase.jarinstall_dir\oeide\architect\eclipse\plugins\com.progress.dbnavigator_2.1.0\drivers\pgutil.jar
```

Note: The `install_dir` path refers to the complete path of your product installation. You must provide this complete pathname to configure the driver properly.

d) If a required driver is not listed in the **Extra Class Path** list, click **Add**.

e) Choose the required driver; repeat for each additional driver required.

f) Use **Delete** to remove any incorrect pathnames.

See also

JDBC drivers on page 777
Connect to a database on page 781

View MS SQL Server database schema

You can view MS SQL server database schema details in a variety of ways.

Related Reference

MS SQL Server DB Structure View on page 833

MS SQL Server DB Details view on page 832

Display MS SQL Server database function details

In the MS SQL Server DB Structure View on page 833, click any of the FUNCTION child nodes to display details about a particular function in the MS SQL Server DB Details view on page 832. Function information includes details about the parameters; the source code; properties and their values; and a list of any dependent objects.

See also

MS SQL Server DB Structure View on page 833
MS SQL Server DB Details view on page 832

Display MS SQL Server database procedure details

In the MS SQL Server DB Structure View on page 833, click any of the PROCEDURE child nodes to display details in the MS SQL Server DB Details view on page 832 about each procedure that is stored in the database and available for reuse. Procedure details include the source code as well as properties and their current values.

See also

MS SQL Server DB Structure View on page 833
MS SQL Server DB Details view on page 832

Display MS SQL Server database session details

In the MS SQL Server DB Structure View on page 833, click the **SESSIONS** node to display session information from the sysprocesses table in the MS SQL Server DB Details view on page 832. The sysprocesses table holds information about processes (client or system) running on MS SQL Server.

See also

MS SQL Server DB Structure View on page 833
MS SQL Server DB Details view on page 832

Display MS SQL Server database table details

In the MS SQL Server DB Structure View on page 833, click any of the system table or table names to view details, such as columns, indexes, primary key, foreign key, preview, row count, and table and column privileges, in the MS SQL Server DB Details view on page 832.

See also

MS SQL Server DB Structure View on page 833
MS SQL Server DB Details view on page 832

Display MS SQL Server database triggers

In the MS SQL Server DB Structure View on page 833, click any of the `TRIGGER` child nodes to display trigger information in the **DB Details view**. The **DB Details view** provides details about the properties and their values as well as the trigger body source code.

See also

MS SQL Server DB Structure View on page 833
MS SQL Server DB Details view on page 832

Display MS SQL Server database view details

In the MS SQL Server DB Structure View on page 833, the VIEW node lists all created views for the database. Click any of the VIEW child nodes to display information about a particular database view, such as columns, indexes, primary key, foreign key, preview, row count, and table or column privileges.

See also

MS SQL Server DB Structure View on page 833
MS SQL Server DB Details view on page 832

Work with OpenEdge databases

Working with an OpenEdge database using DB Navigator allows you to set preferences, add a SQL connection, troubleshoot the Progress OpenEdge JDBC driver, create a new database, work with user accounts, and view and maintain the database schema.

Set preferences

You set the preferences for Progress DB Navigator by selecting **Window** > **Preferences**. Expand the **Progress DB Navigator** tree view node to see the following preference options:

- SQL Connection profile preferences on page 852 - Configure SQL connections to databases.
- Databases>OpenEdge Schema Editing - Set preferences associated with the schema wizards for OpenEdge databases.

- JDBC Drivers preferences on page 853 - Configure aspects of the JDBC driver.
- SQL Editor preferences on page 854 - Configure SQL Editor preferences.

See also

Connect a database on page 781
Add SQL connection profiles on page 782
Configure a JDBC driver on page 780
SQL Editor on page 830

Add an SQL connection profile for an OpenEdge database

To add a SQL connection profile:

1. Click **Add Connection Profile**  in the Connections view on page 827.
2. Type a unique name in the **Name** field.
3. Select the **Progress OpenEdge JDBC Driver(DataDirect)** from the driver selection list.You can click **New Driver** if you need to Configure a JDBC driver on page 780. In most cases, however, the driver is installed and configured automatically during installation of Progress DB Navigator. SQL can have multiple JDBC connections.Notice that the format for the selected driver's URL appears in the **URL** field. If necessary, you can edit the text in the **URL** field to include the appropriate information for your system.
4. To edit a URL:
   a) Deselect the **Specify URL Details** checkbox (by default, this checkbox is selected, preventing you from editing the URL field).
   b) Supply a hostname (use localhost if the host is local to the system). If you are using an IPv6 address, insert a bracket before and after the address; for example, [thehostmachine].
   c) Type the port number.
   d) Type the database name.

   Note: Since the format of the URL and the required information can vary from driver to driver, see the documentation for your driver if you need more information.

5. Type the user name and password. If there are authenticated users in the database, enter a valid user ID and password. These are used as the default when opening the connection. If no authenticated users exist, enter a user ID that corresponds to the Windows login name of the user who created the database.

   Note: You must specify the user ID when creating a SQL connection.

6. Select **Open on Eclipse startup** if you want the connection to open when Eclipse starts (provided the database server is already started).

   Note: You still must enter a valid user ID and password. Also, be aware that opening database connections slows the startup of Eclipse.

7. Select **Auto-Login** on connect to automatically log into the database when connecting.
8. Type the name of the Host.

Note: If you are connecting to an OpenEdge Personal database (which is the default RDBMS packaged with Progress Developer Studio for OpenEdge), the host name must be `localhost`. You cannot connect to an OpenEdge Personal RDBMS database running remotely. If you are connecting to an OpenEdge Workgroup or OpenEdge Enterprise database, you can specify the host name of the system where the database server process is running. If the database is running on the local system, you can use `localhost` in place of the host name.

9. Select either **Service** or **Port**, and type the correct value. If you are unsure of the value, check the configuration settings for the database in OpenEdge Management or OpenEdge Explorer.
10. Type the logical name of the database in the **Database** field. Check for the correct name in the Databases folder in Progress Explorer.
11. Add any additional JDBC connection properties in the **Additional parameters** field, delimited by semicolons in the format `key1=value; key2=value`.
12. Click **Test Connection** to verify connectivity. If the connection succeeds, a Connection succeeded message appears. If the connection does not succeed, an error message appears.
13. Click **OK**.

Note: See OpenEdge Data Management: SQL Development and OpenEdge Data Management: SQL Reference for more information. You can find these OpenEdge manuals in the Product Documentation section of the Progress Software Developer's Network Web site.

See also

SQL connection profiles on page 776
Work with SQL connection profiles on page 781

Troubleshoot the Progress OpenEdge JDBC driver

DB Navigator requires a JDBC driver in order to connect to a database and supplies JDBC drivers for various database types. In most cases, the driver is installed and configured automatically during installation of DB Navigator.

If the driver is configured properly, the driver is tagged with a blue ✓ icon in the JDBC Drivers preferences on page 853 page. If the driver is tagged with a red icon, however, the driver is not configured and cannot be loaded to connect to a database. If the JDBC driver is not properly configured, you see an error message when you try the database connection.

To troubleshoot the JDBC driver configuration, begin by verifying that the URL specified in the database's connection profile is correct, and then verify several other driver configuration options. These steps are as follows:

1. From the Connections view on page 827, select the database connection in the **Connection Profiles** list.
2. Right-click, and choose **Edit Connection Profile**.
3. Check the **URL** in the **Connection Profile** dialog box.

Note: For the Progress OpenEdge JDBC Driver (DataDirect), the URL should look similar to the following:jdbc:datadirect:openedge://hostname:port;databaseName=name in which port is the port number of the database server and name is the logical database name. If the URL contains an IPv6 address, be sure to include an opening bracket before and a closing bracket after the address; for example, [thehostmachine].

4. Close the **Edit Connection Profile** dialog once you confirm that the URL is correct.
5. Choose **Windows** > **Preferences** > **Progress Databases** > **DB Navigator** > **JDBC Drivers** to open the **JDBC Drivers preferences** page.
6. Select the driver you want to configure from the list, and then choose **Edit**. The **Edit Driver** dialog appears.
7. In the **Edit Driver** dialog:
   a) Ensure the string in the **Name** field is unique and indicates the correct driver.
   b) Ensure the **Driver Class Name** field (at the bottom) is correct. The Progress OpenEdge JDBC Driver (DataDirect) class name is `com.ddtek.jdbc.openedge.OpenEdgeDriver`
   c) Click the **Extra Class Path** tab. Verify that the following pathnames appear:

      ```
      install_dir\oeide\architect\eclipse\plugins\com.progress.dbnavigator_2.1.0\
      drivers\openedge.jarinstall_dir\oeide\architect\eclipse\plugins\com.progress.dbnavigator_2.1.0\
      drivers\base.jarinstall_dir\oeide\architect\eclipse\plugins\com.progress.dbnavigator_2.1.0\drivers\util.jar
      ```

      The install_dir path refers to the complete path of your product installation. You must provide this complete pathname to configure the driver properly.
   d) If a required driver is not listed in the **Extra Class Path** list, click **Add**.
   e) Choose the required driver; repeat for each additional driver required.
   f) Use **Delete** to remove any incorrect pathnames.

See also

JDBC drivers on page 777
Connect a database on page 781

Create an OpenEdge database

To create an OpenEdge database:

1. In the Connections view on page 827, click **Menu** and choose **Create OpenEdge database**.
2. In the **Create Database** dialog, enter the physical name of the database and its full path. Click **Files** to browse to the appropriate directory.
3. Using the radio buttons, select the type of database you want to start with.
4. Click **OK**. A confirmation message appears.

Note: To connect to the database after creating it, you must Add an SQL connection profile for an OpenEdge database on page 793 and start a server for the database.

See also

SQL connection profiles on page 776
Add SQL connection profiles on page 782
Add an SQL connection profile for an OpenEdge database on page 793
Connections view on page 827

Work with OpenEdge database user accounts

In SQL, you must be connected to a database before issuing commands. When you use a SQL connection in DB Navigator to connect to a database, you must supply a user ID and, optionally, a password. If the user ID and password are not in the connection profile, you are prompted to provide them.

Frequently, databases do not have user accounts defined. For example, you might decide not to set up users for a local, working copy of a database that you are using for testing or development. Or, you may implement security on the application level so that database user accounts are not necessary.

If you are connecting to a database with no defined users, keep the following in mind:

- You can log in with any string of characters as a user ID and, optionally, a password. However, you need a login account with database administrator (DBA) privileges if you want to create, modify, or delete database objects, or if you want to view application data.
- DBA privileges are associated with the Windows login of the creator of the database. If you created the database, enter your Windows user name. No password is required.

If you are connecting to a database with defined users, contact the database administrator to set up a user account that has DBA privileges. If you are unsure which users have DBA privileges, you can check the _SYSDBAUTH system table for a list of user privileges.

Note: If you create a user account for an OpenEdge database that has no user accounts defined, make sure that the first account you create has DBA privileges. If the first account does not have DBA privileges, you cannot add a DBA account or any additional user accounts.

See *OpenEdge Data Management: SQL Development* and *OpenEdge Data Management: SQL Reference* for more information. You can find these OpenEdge manuals in the Product Documentation section of the Progress Software Developer's Network Web site.

Create OpenEdge database user accounts

To create a user account:

1. Connect to a database as a user who has DBA privileges.
2. Choose the **Security** node in the Oracle DB Structure View on page 849. The **Security** tab becomes active in the OpenEdge DB Details view on page 834.
3. Click **Add user to database**  in the **Security** tab. The **Create user** dialog appears.
4. Type a user ID. The user ID can contain a maximum of 32 characters and cannot contain any blanks

   ---

   Note: Once a user is created, you can log in to DB Navigator only with a defined user ID.

   ---

5. Type a password and confirm it. Passwords are optional. If you create a password, it can contain a maximum of 32 characters and cannot contain any blanks.

Note: The password is case-sensitive; user IDs are not case-sensitive.

6. Choose to grant either DBA or RESOURCE privileges for the user.

Note: If you create a user account for an OpenEdge database that has no user accounts defined, make sure that the first account you create has DBA privileges. If the first account does not have DBA privileges, you cannot add a DBA account or any additional user accounts. In SQL, DBA and RESOURCE are database-wide privileges that can be assigned to individual users.Users with DBA privileges have the ability to access, modify, or delete a database object and grant privileges to other users. RESOURCE privileges are limited compared to DBA privileges. Users with RESOURCE privileges can create database objects, but cannot modify or delete database objects. They cannot grant privileges to other users.

7. Click **Create**. This generates a SQL script that is executed and committed.

   The new user appears in the list in the **Security** tab and is added to the _User table.

See also

View OpenEdge database user account information on page 797
Change OpenEdge database user account passwords on page 798
Delete OpenEdge database user accounts on page 799
Grant privileges to OpenEdge database user accounts on page 799
Change privileges for OpenEdge database user accounts on page 800
Connect a database on page 781

View OpenEdge database user account information

To view user account information, choose the **Security** node in the OpenEdge DB Structure view on page 836 of a connected database. The **Security** tab appears in the **DB Details view**. Each row in the OpenEdge DB Details view on page 834 represents either an authenticated user or a SQL privilege. Authenticated users are identified by the Account Type internal.

The **DB Details view** displays the following information for ABL-specific connections:

Field	Description
User ID	Either the user ID defined in the _User table or the user SQL authorization.
Name	A user name defined in an ABL tool, such as Database Administration. Since there is no way of defining a user name in SQL, the field is blank for users created in DB Navigator.
Account Type	The value is internal if the account is for an authenticated user found in the _User table. Otherwise, the field is blank.

Field	Description
DBA Rights	The value is Yes if the user has DBA privileges.Users with DBA privileges have the ability to access, modify, or delete a database object and to grant privileges to other users. Only users with DBA privileges can use the OpenEdge edit schema wizards on page 837 wizards for maintaining the database.
Resource Rights	The value is Yes if the user has RESOURCE privileges. In SQL, RESOURCE privileges are limited compared to DBA privileges. Users with RESOURCE privileges can create database objects, but cannot modify or delete database objects. They cannot grant privileges to other users.

Note: See OpenEdge Data Management: SQL Development on the PSDN Product Documentation Web site for more information on managing SQL user accounts.

See also

Create OpenEdge database user accounts on page 796
Change OpenEdge database user account passwords on page 798
Delete OpenEdge database user accounts on page 799
Change privileges for OpenEdge database user accounts on page 800
Grant privileges to OpenEdge database user accounts on page 799

Change OpenEdge database user account passwords

To change a password:

1. Connect to a database as a user who has DBA privileges.
2. Choose the **Security** node in the OpenEdge DB Structure view on page 836. The **Security** tab appears in the OpenEdge DB Details view on page 834.
3. Select a user account from the list in the **Security** tab. You can change passwords for any user accounts whose type is internal.
4. Click **Change user password**  in the **Security** tab.
5. Type a new password, and confirm it.

   Note: The password is case-sensitive.

6. Click **OK**.

See also

View OpenEdge database user account information on page 797
Create OpenEdge database user accounts on page 796
Delete OpenEdge database user accounts on page 799
Change privileges for OpenEdge database user accounts on page 800
Grant privileges to OpenEdge database user accounts on page 799

Delete OpenEdge database user accounts

You can delete any account whose user type is internal. You cannot, however, delete the account you use to connect to the database.

To delete a user account:

1. Connect to a database as a user who has DBA privileges.
2. Choose the **Security** node in the OpenEdge DB Structure view on page 836. The **Security** tab appears in the OpenEdge DB Details view on page 834.
3. Select one or more user accounts from the list in the **Security** tab. To select more than one row, use the SHIFT key to select a range of users, or use the CTRL key while selecting individual rows.
4. Click **Drop user**  in the **Security** tab. A dialog appears in which you must confirm the deletion before it is committed.
5. Click **OK**. The user account no longer appears in the **Security** tab.

Note: You can view a list of users whose accounts have been deleted (and who, therefore, do not have any active privileges) by selecting the **Show Inactive Privileges** check box.

See also

View OpenEdge database user account information on page 797
Create OpenEdge database user accounts on page 796
Change OpenEdge database user account passwords on page 798
Grant privileges to OpenEdge database user accounts on page 799
Change privileges for OpenEdge database user accounts on page 800

Grant privileges to OpenEdge database user accounts

Privileges are granted to a specific user ID. Once the user ID is established, an individual can log into the system using that user ID containing the granted privilege.

To grant privileges to a new user (one not already listed in the Security tab):

1. Connect to a database as a user who has DBA privileges.
2. Choose the **Security** node in the OpenEdge DB Structure view on page 836. The **Security** tab appears in the OpenEdge DB Details view on page 834.
3. Click **Add SQL Privilege**  in the **Security** tab. The **Add SQL Privilege** dialog appears.
4. Type a user ID. The user ID can contain a maximum of 32 characters and cannot contain any blanks.
5. Choose either DBA or RESOURCE privileges for the user. In SQL, DBA and RESOURCE are database-wide privileges that can be assigned to individual users. Users with DBA privileges have the ability to access, modify, or delete a database object and to grant privileges to other users. RESOURCE privileges are limited compared to DBA privileges. Users with RESOURCE privileges can create database objects, but cannot modify or delete database objects. They cannot grant privileges to other users.
6. Click **Create**. This generates, executes, and commits a SQL script. The new user appears in the list in the **Security** tab and is an authenticated user listed in the _User table.

See also

View OpenEdge database user account information on page 797
Create OpenEdge database user accounts on page 796
Change OpenEdge database user account passwords on page 798
Delete OpenEdge database user accounts on page 799
Change privileges for OpenEdge database user accounts on page 800

Change privileges for OpenEdge database user accounts

Changing privileges for OpenEdge database user accounts

To change privileges for a user account:

1. Connect to a database as a user who has DBA privileges.

   Note: You cannot change privileges on the account that you use to log in to the database.

2. Choose the **Security** node in the OpenEdge DB Structure view on page 836. The **Security** tab appears in the DB Details view on page 829.
3. Select a user account from the list in the **Security** tab.
4. Click the **DBA Rights or the Resource Rights cell**. A combo box appears that allows you to choose between Yes (grant privilege) and No (deny privilege).

See also

View OpenEdge database user account information on page 797
Create OpenEdge database user accounts on page 796
Change OpenEdge database user account passwords on page 798
Delete OpenEdge database user accounts on page 799
Grant privileges to OpenEdge database user accounts on page 799

View and maintain OpenEdge database schema

After you connect to an OpenEdge database, DB Navigator allows you to display the OpenEdge database schema and all the schema attributes. The schema elements that you can display in the OpenEdge DB Structure view on page 836 are tables, columns, indexes, sequences, and triggers. The schema element attributes are displayed in the OpenEdge DB Details view on page 834. Both views appear in the DB Navigator perspective on page 776.

DB Navigator also allows you to create, edit, delete, and identify multi-tenant tables. These multi-tenant tables are displayed in the OpenEdge DB Structure view on page 836 view along with the other tables associated with the OpenEdge database. A multi-tenant decorator () added to the table icon indicates that it is a multi-tenant table. It also allows you to create, edit, and delete, multi-tenant sequences.

Work with OpenEdge database tables

In the DB Navigator perspective on page 776, table names for connected databases are listed in the DB Structure view. When you select a table name (or one of its child nodes), schema details are listed in the OpenEdge DB Details view on page 834 view.

Display OpenEdge database table details

To display table details, click a table name (or one of the table's child nodes) in the OpenEdge DB Structure view on page 836. Table information appears in the OpenEdge DB Details view on page 834.

In the **DB Details view**, the **OpenEdge Table** tab is displayed when you are connected to an OpenEdge database. All of the table attributes are listed alphabetically.

Note: Can-* attributes (for example Can-Read, Can-Write) are displayed only if you have DBA privileges.

See also

Edit OpenEdge database table properties on page 802
Add OpenEdge database tables on page 801
Drop OpenEdge database tables on page 802

Add OpenEdge database tables

To add a table to a connected database using the schema wizard:

1. Start the OpenEdge Table wizard on page 837 by clicking **Add table** .The **Add table** icon is on the context menu when either the **TABLE** node or an individual table node is selected in the OpenEdge DB Structure view on page 836. It is also available as a toolbar icon on the **OpenEdge Table** tab of the Oracle DB Details view on page 847.
2. Type a unique name in the **Table Name** field.
3. (Optional) Select the **Multi-tenant** check box to create a multi-tenant table.

   Note: See Add multi-tenant tables on page 803 for more information.

4. In the **Area** field, select a storage area from the list.

   Note: To define a storage area for a multi-tenant table, you must select **Support default tenant**.

5. Type a unique name in the **Dump File** field. This name can be up to 32 characters in length.
6. Optionally, enter information in the **Label**, **Description**, **Validation**, and **Message** fields.

   Note: See OpenEdge Table wizard on page 837 for more information about these fields.

7. (Optional) Select a category of tables to be displayed in the OpenEdge DB Structure view on page 836 view by using the **Category** drop-down list.

   Note: See OpenEdge Table wizard on page 837 for more information

8. (Optional) Select the **Multi-tenant** check box to create a multi-tenant table.

   Note: See Add multi-tenant tables on page 803 for more information.

9. Select **Next** to open the OpenEdge Columns wizard on page 838. You must add at least one column to the table. The **Add Columns** dialog allows you to either copy columns from other tables or create a new column.

   Note: When you copy a column, you copy only the column schema. You do not copy data.

10. Select **Next** to Add OpenEdge database indexes on page 811 or **Finish** to complete the table and add it to the database. Since tables are displayed in ASCII order and sorting is case-sensitive, all lowercase table names sort after the uppercase table names.

    Note: You can also use Generate a create table script on page 786.

See also

Display OpenEdge database table details on page 801
Edit OpenEdge database table properties on page 802
Drop OpenEdge database tables on page 802
OpenEdge Table wizard on page 837

Edit OpenEdge database table properties

Use the OpenEdge Table wizard on page 837 to modify the properties of a table.

Display the **Edit Table wizard** by clicking **Edit table** . This icon is available in the context menu (right-click) when a table name is selected in the OpenEdge DB Structure view on page 836. It is also available as a toolbar icon on the **OpenEdge Table** tab of the OpenEdge DB Details view on page 834.

See also

Display OpenEdge database table details on page 801
Add OpenEdge database tables on page 801
Drop OpenEdge database tables on page 802
OpenEdge edit schema wizards on page 837

Drop OpenEdge database tables

To delete a table:

1. Select one or more table names from the OpenEdge DB Structure view on page 836.
2. Right-click, and choose **Drop Table**  from the context menu. A confirmation dialog prompts you to confirm the deletion. If you are connected to an OpenEdge database, Drop Table is also available on the **OpenEdge Table** tab of the OpenEdge DB Details view on page 834.

   Note: To delete multiple tables simultaneously, select multiple tables in the **DB Structure view**, and then right-click and choose **Drop Table** from the context menu.

See also

Display OpenEdge database table details on page 801
Edit OpenEdge database table properties on page 802

Add OpenEdge database tables on page 801

Work with multi-tenant tables

This topic describes how to work with multi-tenant tables.

Note: The multi-tenant features are limited to Progress OpenEdge databases and do not impact other databases like Oracle, SQL, etc.

Display multi-tenant table details

To display the multi-tenant table details, click a multi-tenant table name (or one of the table's child nodes) in the OpenEdge DB Structure view on page 836. You can also view the multi-tenant table information in the **OpenEdge Table** tab of the OpenEdge DB Details view on page 834. For a multi-tenant table, the **OpenEdge Table** tab of the OpenEdge DB Details view on page 834 displays the property as Multi-tenant and the value as Yes.

The **Security** tab of the **DB Details view** displays the multi-tenant table details (like the tenant name, domain name, and the type of user). You can view details of different sets of users only if you have proper login credentials.

See also

Multitenancy (Progress OpenEdge databases only) on page 777
Add multi-tenant tables on page 803
Edit multi-tenant tables on page 804
Identify multi-tenant tables on page 805
Convert tables to multi-tenant tables on page 805
Delete multi-tenant tables on page 806
OpenEdge DB Structure view on page 836
OpenEdge DB Details view on page 834

Add multi-tenant tables

To add a multi-tenant table to a connected OpenEdge database using the schema wizard:

1. Click **Add table** . The **Add table** icon is on the context menu when either the **TABLE** node or an individual table node is selected in the OpenEdge DB Structure view on page 836. It is also available as a toolbar icon on the **OpenEdge Table** tab of the Oracle DB Details view on page 847.
2. Type a unique name in the **Table Name** field.
3. Select the **Multi-tenant** check box.

   Note: The **Multi-tenant** check box is unchecked and disabled when you try to add a table for database that is not enabled for multitenancy; it is unchecked and enabled when you try to add a shared table.

4. To associate the multi-tenant table with a storage area:
   a) Select the **Support default tenant** check box (if it is not already selected) to enable the **Area** field.
   b) Select a storage area from the drop-down list at the **Area** field.

Note: The **Support default tenant** option is automatically selected when you select the **Multi-tenant** check box. When you clear the **Support default tenant** check box, the **Area** field gets disabled.

5. Type a unique name in the **Dump File** field. This name can be up to 32 characters in length.
6. Optionally enter information in the **Label**, **Description**, **Validation**, and **Message** fields. See OpenEdge Table wizard on page 837 for more information about these fields and other options available on the wizard.
7. Select **Next** to open the OpenEdge Columns wizard on page 838.You must add at least one column to the table. The **Add Columns** dialog allows you to either copy columns from other tables or create a new column.

Note: When you copy a column, you copy only the column schema. You do not copy data.

8. Select **Next** to Add OpenEdge database indexes on page 811 or **Finish** to complete the table and add it to the database.

Note: Since tables are displayed in ASCII order and sorting is case-sensitive, all lowercase table names are listed after the uppercase table names.

See also

Multitenancy (Progress OpenEdge databases only) on page 777
Display multi-tenant table details on page 803
Edit multi-tenant tables on page 804
Identify multi-tenant tables on page 805
Convert tables to multi-tenant tables on page 805
Delete multi-tenant tables on page 806
OpenEdge Table wizard on page 837
OpenEdge DB Structure view on page 836

Edit multi-tenant tables

Use the OpenEdge Table wizard on page 837 wizard to modify the properties of a multi-tenant table in the OpenEdge database.

Open the **Edit Table** wizard by selecting **Edit table** . This option is available in the context menu (right-click) when a table name is selected in the OpenEdge DB Structure view on page 836. It is also available as a toolbar icon on the **OpenEdge Table** tab of the OpenEdge DB Details view on page 834.

Note: When you use the **Edit Table** wizard to edit a multi-tenant table, the **Multi-tenant** check box is selected and disabled to ensure that you do not change the table to a shared table; it is unchecked and disabled when you try to edit a table for database that is not enabled for multitenancy; it is unchecked and enabled when you try to edit a shared table.

See also

Multitenancy (Progress OpenEdge databases only) on page 777
Display multi-tenant table details on page 803
Add multi-tenant tables on page 803

Identify multi-tenant tables on page 805
Convert tables to multi-tenant tables on page 805
Delete multi-tenant tables on page 806
OpenEdge Table wizard on page 837
OpenEdge DB Structure view on page 836

Identify multi-tenant tables

The OpenEdge DB Structure view on page 836 view in DB Navigator displays the multi-tenant tables along with the other tables associated with the OpenEdge database. A **multi-tenant decorator** () which is displayed with each multi-tenant table indicates that it is a multi-tenant table.

See also

Multitenancy (Progress OpenEdge databases only) on page 777
Display multi-tenant table details on page 803
Add multi-tenant tables on page 803
Edit multi-tenant tables on page 804
Convert tables to multi-tenant tables on page 805
Delete multi-tenant tables on page 806
OpenEdge DB Structure view on page 836

Convert tables to multi-tenant tables

1. To convert a table in the OpenEdge database to a multi-tenant table:
   a) Open the table in the OpenEdge Table wizard on page 837 wizard or the OpenEdge Table wizard on page 837 wizard.
   b) Enter the appropriate values for the fields and select the **Multi-tenant** check box.

   Note: See Add multi-tenant tables on page 803 and Edit multi-tenant tables on page 804 for more information.

2. To convert multiple tables in the database to multi-tenant tables simultaneously:
   a) Select one or more table names in the OpenEdge DB Structure view on page 836 view.
   b) Right-click and select **Make Table Multi-tenant**  from the context menu.

   Note: The **Make Table Multi-tenant** option is enabled when you select shared tables; it is disabled when you select multi-tenant tables or when the selected database is not enabled for multitenancy. When you select both multi-tenant tables and shared tables, the **Make Table Multi-tenant** option is enabled and selecting the option converts all the selected shared tables to multi-tenant tables.

See also

Multitenancy (Progress OpenEdge databases only) on page 777
Display multi-tenant table details on page 803
Add multi-tenant tables on page 803
Edit multi-tenant tables on page 804

Identify multi-tenant tables on page 805
Delete multi-tenant tables on page 806
OpenEdge Table wizard on page 837
OpenEdge DB Structure view on page 836

Delete multi-tenant tables

To delete multi-tenant tables in the OpenEdge database:

1. Select one or more multi-tenant table names from the OpenEdge DB Structure view on page 836 view.
2. Right-click and select **Drop Table**  from the context menu. A confirmation dialog prompts you to confirm the deletion. The **Drop Table** option is also available on the **OpenEdge Table** tab of the OpenEdge DB Details view on page 834 view.

See also

Multitenancy (Progress OpenEdge databases only) on page 777
Display multi-tenant table details on page 803
Add multi-tenant tables on page 803
Edit multi-tenant tables on page 804
Identify multi-tenant tables on page 805
Convert tables to multi-tenant tables on page 805
OpenEdge DB Structure view on page 836
OpenEdge DB Details view on page 834

Work with partitioned tables

Identify partitioned tables

To identify whether a table is enabled for partitioning:

1. In the **DB Structure** view, select the table name (or one of the table's child nodes).
2. In the **DB Details** view, select the **OpenEdge Table** tab.

   If the table is enabled for partitioning, the **Property** column displays the value of the **Partitioned** property as true, otherwise, as false.

You can use the other tabs of the **DB Details** view to display the details of a partitioned table. However, for partitioned tables that do not have any policies defined on them, the **Preview** and **Row Count** tabs do not display any information. To identify whether a database is enabled for table partitioning, you can use the **Database** tab of the **DB Details** node in the **DB Structure** view.

See also

Table partitioning in Progress OpenEdge databases on page 778
Work with partitioned tables on page 806

Create partitioned tables without partition policies

You can use the **Add Table** wizard to create a partitioned table (that does not have any partition policies defined on it) with local indexes defined on it. The connected database must be enabled for table partitioning.

To add a partitioned table to a connected OpenEdge database that is enabled for table partitioning:

1. Click **Add table** . The **Add table** icon is available on the context menu when either the **TABLE** node or an individual table node is selected in the **DB Structure** view. It is also available as a toolbar icon on the **OpenEdge Table** tab of the **DB Details** view.
2. Enter a unique name in the **Table Name** field.
3. Select the **Partitioned** check box.

   Note: The **Partitioned** check box is enabled only for databases that are enabled for table partitioning. The **Area** filed is disabled when you select the **Partitioned** check box, since partition areas are defined while defining partition rules.

4. Type a unique name in the **Dump File** field. This name can be up to 32 characters in length.
5. Optionally, enter information in the **Label**, **Description**, **Validation**, and **Message** fields. See OpenEdge Table wizard on page 837 for more information about these fields and other options available on the wizard.
6. Select **Next** to display the OpenEdge Columns wizard on page 838 page. You must add at least one column to the table.

   The **Add Columns** page enables you to either copy columns from other tables or create a new column.

   Note: When you copy a column, you copy only the column schema. You do not copy data.

7. Select **Next** to display the Add OpenEdge database indexes on page 811 page.
8. Enter a name for the index in the **Name** field. The name must be unique within the selected table.
9. Select **Global** or **Local** to specify the scope of the index.

   Note: The index for a partitioned table without partition policies can be either global or local. When you select **Local**, the **Area** field is disabled, since partition areas are defined while defining partition rules. A local index cannot be a word index; so, when you select **Local**, the **Word index** option is disabled.

10. Specify the other index properties (see OpenEdge Index wizard on page 843 for detailed information) and then select **Finish** to complete the table and add it to the database.

Note: Since tables are displayed in ASCII order and sorting is case-sensitive, all lowercase table names are listed after the uppercase table names.

See also

Table partitioning in Progress OpenEdge databases on page 778
Work with partitioned tables on page 806

Work with partitioned tables with partition policies

You can use OEM or the OE SQL Editor to define partition policies on a partitioned table (that is originally created using the **Add Table** wizard without any partition policies defined on it). These partitioned tables are displayed along with the other OpenEdge tables in the **DB Structure** view.

You can use the Add OpenEdge database indexes on page 811 wizard to create local and global indexes for a partitioned table that has partition policy details defined on it. The index for a partitioned table can be global or local. However, the default index created for a partitioned table is a local index unless the explicitly marked as global.

By default, all the partitioned fields that are part of the partition policy details are selected for a local index. If the **Global** option is selected for a partitioned table, only type II areas are displayed in the **Area** field of the **Add Index** wizard. The scope of the index (**Global** or **Local**) is only applicable to partitioned tables. For tables that are not partitioned, the default index created is global. Local indexes are created only for partitioned tables and are partition-aligned indexes.

Note: A partition-aligned index is the index that has a partition key column as the leading prefix of its constraint columns.

See also

Table partitioning in Progress OpenEdge databases on page 778
Work with partitioned tables on page 806

Drop partitioned tables

To delete a partitioned table:

1. Deallocate all the partitions defined on the table using the **PROUTIL** tool.
2. Select the table in the **DB Structure** view.
3. Right-click and select **Drop Table** from the context menu.

   A confirmation dialog prompts you to confirm the deletion.

   If you are connected to an OpenEdge database, **Drop Table** is also available on the **OpenEdge Table** tab of the **DB Details** view.

   Note: To delete multiple tables simultaneously, select multiple tables in the **DB Structure** view, and then, right-click and select **Drop Table** from the context menu.

See also

Table partitioning in Progress OpenEdge databases on page 778
Work with partitioned tables on page 806

Work with OpenEdge database table columns

In the DB Navigator perspective on page 776, column names for connected databases are listed in the OpenEdge DB Structure view on page 836. When you select a table name (or one of its child nodes), column details are listed in the OpenEdge DB Details view on page 834.

Note: See *OpenEdge Data Management: Database Administration* in the Product Documentation section of the Progress Software Developer's Network Web site for information about which schema modifications can (and cannot) be made online.

Display OpenEdge database column details

To display column details, select a table name (or one of the table's child nodes) in the OpenEdge DB Structure view on page 836.

Column information appears in the OpenEdge DB Details view on page 834 under the Columns tab and the **OpenEdge Columns** tab. The Columns tab displays all columns that conform to SQL standards. It shows SQL attributes including the SQL width, data type, size, precision, accept nulls, and comments. The **OpenEdge Columns** tab displays all columns and the OpenEdge attributes for each column, such as name, data type, format, label, column label, initial value, description, and others.

You can sort on any of the columns by clicking on the column label. Clicking once sorts the rows in ascending order; clicking again sorts the rows in descending order.

See also

Add OpenEdge database columns on page 809
Edit OpenEdge database column details on page 809
Copy OpenEdge database columns on page 810
Drop OpenEdge database columns on page 810

Add OpenEdge database columns

To add a column to a table:

1. Select a table name (or the **Columns** node under a table name) in the OpenEdge DB Structure view on page 836.
2. Right-click, and choose **Add Column** from the context menu. If you are connected to an OpenEdge database, **Add Column** is also available on the **OpenEdge Columns** tab of the OpenEdge DB Details view on page 834.
3. Enter column properties in the OpenEdge Columns wizard on page 838 wizard.
4. Click **Add** to add another column, or click **Finish**.

Note: Columns appear in the **DB Structure view** by creation date rather than by Order property value.

See also

Display OpenEdge database column details on page 809
Edit OpenEdge database column details on page 809
Copy OpenEdge database columns on page 810
Drop OpenEdge database columns on page 810
OpenEdge Columns wizard on page 838

Edit OpenEdge database column details

To modify the properties of a column:

1. Select a column name from the OpenEdge DB Structure view on page 836.
2. Right-click, and choose **Edit Column** from the context menu. If you are connected to an OpenEdge database, **Edit Column** is also available on the **OpenEdge Columns** tab of the OpenEdge DB Details view on page 834.

3. Enter changes in the **Edit Columns** dialog.

   Note: Generally you cannot change the data type of a column, but you can change an INTEGER data type to INT64. Once you change to INT64, you cannot change back to INTEGER from DB Navigator.

4. Click **Finish**.

See also

Display OpenEdge database column details on page 809
Add OpenEdge database columns on page 809
Copy OpenEdge database columns on page 810
Drop OpenEdge database columns on page 810
OpenEdge Columns wizard on page 838

Copy OpenEdge database columns

To copy a column and paste it into a table:

1. Select a table name (or the **Columns** node under a table name) in the OpenEdge DB Structure view on page 836.
2. Right-click, and choose **Add Column**  from the context menu. If you are connected to an OpenEdge database, **Add Column** is also available on the **OpenEdge Columns** tab of the OpenEdge DB Details view on page 834.
3. Click **Copy** in the **Add Columns** dialog.

   Note: You can select one or more columns and copy them to the table.

4. Select the column you want to copy in the **Copy Column** dialog, and then select **OK**. You can select one or more columns from the dialog.

   Note: If the column name already exists, the system displays a warning and renames the column, appending an integer to form a unique column name.

5. Click **Finish**. The OpenEdge DB Structure view on page 836 is refreshed with the newly added columns.

See also

Display OpenEdge database column details on page 809
Edit OpenEdge database column details on page 809
Add OpenEdge database columns on page 809
Drop OpenEdge database columns on page 810
OpenEdge Columns wizard on page 838

Drop OpenEdge database columns

To delete a column from a table:

1. Select one or more column names from the OpenEdge DB Structure view on page 836.
2. Right-click, and choose **Drop Column**  from the context menu. A confirmation dialog prompts you to confirm the deletion. If you are connected to an OpenEdge database, **Drop Column** is also available on the **OpenEdge Columns** tab of the OpenEdge DB Details view on page 834.

Note: To delete multiple columns simultaneously, select more than one column in the DB Structure view, then right-click and select **Drop Column** from the context menu.

See also

Display OpenEdge database column details on page 809
Edit OpenEdge database column details on page 809
Add OpenEdge database columns on page 809
Copy OpenEdge database columns on page 810

Work with OpenEdge database indexes

Indexes are used to speed up the process of searching and sorting rows. Every table can have one or more indexes.

In the DB Navigator perspective on page 776, index names for connected databases are listed in the DB Structure view on page 828. When you select a table name (or one of a table's child nodes), index details are listed in both the Indexes and the OpenEdge Indexes tabs in the OpenEdge DB Details view on page 834.

Display OpenEdge database index details

To display index details, select a table name (or one of the table's child nodes) in the OpenEdge DB Structure view on page 836.

Index information appears in the OpenEdge DB Details view on page 834 under the **Indexes** tab and the **OpenEdge Indexes** tab.

The **Indexes** tab displays a list of all indexes in the table that conform to SQL standards. Details in the list include the type of index; whether the index is unique; and which fields comprise the index, their ASCII order, and whether they are ascending or descending.

The **OpenEdge Indexes** tab displays OpenEdge-specific attributes such as primary, active, unique, word index, field type, and sort order.

See also

Edit OpenEdge database index properties on page 812
Add OpenEdge database indexes on page 811
Drop OpenEdge database indexes on page 812
Enable OpenEdge database large index keys on page 813
OpenEdge Index wizard on page 843

Add OpenEdge database indexes

To add an index to a table:

1. Select a table name (or the **Index** node under a table name) in the OpenEdge DB Structure view on page 836.
2. Right-click, and choose **Add Index**  from the context menu. If you are connected to an OpenEdge database, **Add Index** is also available on the **OpenEdge Index** tab of the Oracle DB Details view on page 847.
3. Enter index properties in the OpenEdge Index wizard on page 843
4. Click **Finish**.

See also

Display OpenEdge database index details on page 811
Edit OpenEdge database index properties on page 812
Drop OpenEdge database indexes on page 812
Enable OpenEdge database large index keys on page 813
Enable OpenEdge database large index keys on page 813
OpenEdge Index wizard on page 843

Edit OpenEdge database index properties

You can make an index the primary index for the table, rename an index, or deactivate an index.

To change the component fields of an index, such as ascending or descending order or uniqueness, you must delete and then recreate the index.

To modify the properties of an index:

1. Select an index name from the OpenEdge DB Structure view on page 836.
2. Right-click, and choose **Edit Index**  from the context menu. (Edit Index is also available on the **OpenEdge Columns** tab of the OpenEdge DB Details view on page 834.)
3. Enter changes in the **Edit Index** dialog.
4. Click **Finish**.

See also

Display OpenEdge database index details on page 811
Add OpenEdge database indexes on page 811
Drop OpenEdge database indexes on page 812
Enable OpenEdge database large index keys on page 813
Index wizard on page 843

Drop OpenEdge database indexes

While you can drop an OpenEdge database index, you cannot delete the primary index. To drop the index that is currently the primary index, you must first make another index the primary index.

To delete an index from a table:

1. Select one or more index names from the OpenEdge DB Structure view on page 836.
2. Right-click, and choose **Drop Index**  from the context menu. A confirmation dialog prompts you to confirm the deletion. (**Drop Index** is also available on the **OpenEdge Columns** tab of the OpenEdge DB Details view on page 834.)

Note: To delete multiple indexes simultaneously, select multiple indexes in the **DB Structure view**, and then right-click and select **Drop Index** from the context menu.

See also

Display OpenEdge database index details on page 811
Edit OpenEdge database index properties on page 812
Add OpenEdge database indexes on page 811
Enable OpenEdge database large index keys on page 813
OpenEdge Index wizard on page 843

Enable OpenEdge database large index keys

Large key entries increase the amount of user data in an index from approximately 200 bytes to approximately 1970 bytes. However, even with large index keys enabled for a database, databases with 1K and 2K block sizes adhere to an entry size of approximately 200 characters.

To enable large key entries:

1. Select a table name in the OpenEdge DB Structure view on page 836.
2. Select an **Indexes** tab in the OpenEdge DB Details view on page 834.
3. Right-click, and choose **Enable Large Index Keys** from the context menu. The **DB Details view** changes to display the state of large key support. The **Enable Large Index Keys** menu option is available only if the block size is greater than 4K and if you have not previously enabled large index key support. All newly created databases have large keys enabled by default.

Note: Once you enable large index keys for an index, you cannot disable them.

See also

Display OpenEdge database index details on page 811
Edit OpenEdge database index properties on page 812
Add OpenEdge database indexes on page 811
Drop OpenEdge database indexes on page 812
OpenEdge Index wizard on page 843

Work with OpenEdge database sequences

Sequences are a feature of OpenEdge databases that allow you to automatically increment a value in a field.

You use sequences programmatically. Typically, when you create a new record, a procedure uses a sequence to automatically generate a sequential value for a field. For example, a sequence can increment a customer number when a new customer record is added to a table.

Display OpenEdge database sequence properties

To display sequence details, select a sequence name in the OpenEdge DB Structure view on page 836. Sequence information appears in the OpenEdge DB Details view on page 834 under the **Info** tab.

The **Info** tab displays various properties and their values, including the current value.

See also

Add OpenEdge database sequences on page 814
Edit OpenEdge database sequences on page 814
Drop OpenEdge database sequences on page 815

Add OpenEdge database sequences

To add a sequence to an OpenEdge database that is connected to Progress DB Navigator:

1. Select the **SEQUENCES** node from the OpenEdge DB Structure view on page 836.
2. Right-click, and choose **Add Sequence**  from the context menu.
3. Enter a sequence name and properties in the OpenEdge Add/Edit Sequence wizard on page 844.
4. (Optional) Select the **Multi-tenant** check box to add a multi-tenant sequence.

   Note: See Add multi-tenant sequences on page 816 for more information.

5. Click **Add**.
6. Click **Finish**.

   Note: The sequence is automatically added to the **DB Structure view**.

See also

Display OpenEdge database sequence properties on page 813
Edit OpenEdge database sequences on page 814
Drop OpenEdge database sequences on page 815
Work with multi-tenant sequences on page 815
OpenEdge Add/Edit Sequence wizard on page 844

Edit OpenEdge database sequences

You can modify a sequence to change the limit or the sequence name. The range of sequence values includes:

- Large sequences (-9223372036854775808 to 9223372036854775807)
- Small sequences (-2147483648 to 2147483647)

To change a sequence in an OpenEdge database that is connected to Progress DB Navigator:

1. Under the **SEQUENCES** node in the OpenEdge DB Structure view on page 836, select a sequence name.
2. Right-click, and choose **Edit Sequence**  from the context menu.
3. Change properties in the OpenEdge Add/Edit Sequence wizard on page 844.
4. Click **Finish**.

   Note: See OpenEdge Data Management: Database Administration on the PSDN Product Documentation Web site for more information about sequences.

See also

Display OpenEdge database sequence properties on page 813
Add OpenEdge database sequences on page 814
Drop OpenEdge database sequences on page 815

Drop OpenEdge database sequences

To remove a sequence in an OpenEdge database that is connected to Progress DB Navigator:

1. Under the **SEQUENCES** node in the OpenEdge DB Structure view on page 836, select a sequence name.
2. Right-click, and choose **Drop Sequence**  from the context menu. A confirmation dialog prompts you to confirm the deletion. The **DB Structure view** is automatically refreshed.

Note: To delete multiple sequences simultaneously, select more than one sequence in the **DB Structure view**, and then right-click and select **Drop Sequence** from the context menu.

See also

Display OpenEdge database sequence properties on page 813
Add OpenEdge database sequences on page 814
Edit OpenEdge database sequences on page 814

Work with multi-tenant sequences

This topic describes how to work with multi-tenant sequences.

Note: The multi-tenant features are limited to Progress OpenEdge databases and do not impact other databases like Oracle, SQL, etc.

Display multi-tenant sequence properties

To display multi-tenant sequence details, select a multi-tenant sequence name in the OpenEdge DB Structure view on page 836. The multi-tenant sequence information appears in the OpenEdge DB Details view on page 834 under the **Info** tab.

The **Info** tab displays various properties and their values, including the current value.

Note: The current value of the multi-tenant sequence does not display if you are connected to a database as a user with DBA privileges.

See also

Multitenancy (Progress OpenEdge databases only) on page 777
Add multi-tenant sequences on page 816
Edit multi-tenant sequences on page 816
Delete multi-tenant sequences on page 817
DB Structure view on page 828
DB Details view on page 829

Add multi-tenant sequences

To add a multi-tenant sequence to an OpenEdge database that is connected to DB Navigator:

1. Select the **SEQUENCES** node from the OpenEdge DB Structure view on page 836.
2. Right-click and select **Add Sequence**  from the context menu.
3. Enter a multi-tenant sequence name and properties in the OpenEdge Add/Edit Sequence wizard on page 844.
4. Select the **Multi-tenant** check box.

Note: The **Multi-tenant** check box is unchecked and disabled when you add a sequence for database that is not enabled for multitenancy; it is unchecked and enabled when you add a shared sequence. A shared sequence cannot be converted to a multi-tenant sequence unless it is dropped and recreated.

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5. Click **Add**.
6. Click **Finish**.

Note: The multi-tenant sequence is automatically added to the **DB Structure view**.

See also

Multitenancy (Progress OpenEdge databases only) on page 777
Display multi-tenant sequence properties on page 815
Edit multi-tenant sequences on page 816
Delete multi-tenant sequences on page 817
OpenEdge Add/Edit Sequence wizard on page 844
DB Structure view on page 828

Edit multi-tenant sequences

To change the properties of a multi-tenant sequence in an OpenEdge database connected to DB Navigator:

1. Under the **SEQUENCES** node in the OpenEdge DB Structure view on page 836, select a multi-tenant sequence name.
2. Right-click and select **Edit Sequence**  from the context menu.
3. Change properties in the OpenEdge Add/Edit Sequence wizard on page 844.

Note: When you use the **Edit Sequence** wizard to edit a multi-tenant sequence, the **Multi-tenant** check box is selected and disabled to ensure that you do not change the sequence to a shared sequence; it is unchecked and disabled when you edit a sequence for database that is not enabled for multitenancy; it is unchecked and enabled when you edit a shared sequence. Also, you cannot edit the name of a multi-tenant sequence once it is created.

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4. Click Finish.

See also

Multitenancy (Progress OpenEdge databases only) on page 777
Display multi-tenant sequence properties on page 815
Add multi-tenant sequences on page 816
Delete multi-tenant sequences on page 817
OpenEdge Add/Edit Sequence wizard on page 844
DB Structure view on page 828

Delete multi-tenant sequences

To delete multi-tenant sequences:

1. Select one or more multi-tenant sequence names from the OpenEdge DB Structure view on page 836.
2. Right-click and select **Drop Sequence**  from the context menu. A confirmation dialog prompts you to confirm the deletion.

Note: The DB Structure view is automatically refreshed.

See also

Multitenancy (Progress OpenEdge databases only) on page 777
Display multi-tenant sequence properties on page 815
Add multi-tenant sequences on page 816
Edit multi-tenant sequences on page 816
DB Structure view on page 828
DB Details view on page 829

Work with OpenEdge database triggers

Triggers are procedures that automatically execute when certain database events occur. For example, you might create a DELETE trigger that prompts the user for confirmation before a record is deleted. Triggers allow you to define custom default behaviors and business rules for your data, with the database as the central storage place for these rules.

In DB Navigator, the OpenEdge DB Structure view on page 836 displays three types of triggers under the TRIGGERS node in the OpenEdge schema:

4GL TRIGGERS	The 4GLTRIGGERS node lists all the tables that contain a CREATE (C), DELETE (D), WRITE (W), FIND (F), or ASSIGN (A) trigger. In addition, an ASSIGN TRIGGERS node is located under each table node that has one or more ASSIGN triggers associated with it.
REPLICATION TRIGGERS	The Replication Triggers node lists all the tables that contain a REPLICATION-CREATE, REPLICATION-DELETE, or REPLICATION-WRITE trigger. Note that Replication triggers are written in ABL. Therefore, you can manage Replication Triggers in DB Navigator just like other ABL triggers.
Java triggers	The JAVA TRIGGERS node lists all the tables that contain INSERT, DELETE, or UPDATE Java triggers.

Note: DB Navigator allows you to view all three types of triggers for OpenEdge databases. However, you cannot use the DB Navigator wizards to create, modify, or delete Java triggers. For more information about triggers, see the ABL manuals in the OpenEdge Product Documentation section of the Progress Communities Web site.

See also

Display OpenEdge database triggers on page 818
Create OpenEdge database triggers on page 818
Edit OpenEdge database triggers on page 819
Drop OpenEdge database triggers on page 820

Display OpenEdge database triggers

In the OpenEdge DB Structure view on page 836, click the **TRIGGERS** node (or any of its child nodes) to display trigger information in the OpenEdge DB Details view on page 834. The **DB Details view** shows all of the ABL triggers for the entire database.

Note: For more information, see OpenEdge Development: Programming Interfaces. You can find OpenEdge manuals in the Product Documentation section of the Progress Software Developer's Network Web site.

See also

Create OpenEdge database triggers on page 818
Edit OpenEdge database triggers on page 819
Drop OpenEdge database triggers on page 820

Create OpenEdge database triggers

The OpenEdge Create/Modify Trigger wizard on page 845 allows you to create a new trigger.

Note: You cannot create Java triggers using DB Navigator wizards.

You can create a new OpenEdge .p file, or attach an existing .p file to the trigger by performing the following steps:

1. Select the **TRIGGERS**, the **4GL TRIGGERS**, or the **REPLICATION TRIGGERS** node in the **DB Structure view**.
2. Right-click, and choose **Create Trigger** from the context menu.

   Note: At least one OpenEdge project must be open. If no project is open, you see an error message.

3. Enter trigger information in the OpenEdge Create/Modify Trigger wizard on page 845.
4. Click **Finish**. The new or existing file that you specified opens in the Progress Developer Studio for OpenEdge ABL Editor.

   Note: For more information about triggers, see the ABL manuals in the OpenEdge Product Documentation section of the Progress Communities Web site.

See also

Display OpenEdge database triggers on page 818
Edit OpenEdge database triggers on page 819
Drop OpenEdge database triggers on page 820
OpenEdge DB Structure view on page 836
OpenEdge Create/Modify Trigger wizard on page 845

Edit OpenEdge database triggers

You can edit triggers in two different ways:

- Edit the trigger code in the ABL Editor.
- Change the definition of triggers using the Edit Trigger option.

Note: You cannot modify Java triggers with the ABL Editor or the trigger wizard.

1. To edit the trigger code in the ABL Editor, open an existing trigger and edit the code (using the Progress Developer Studio for OpenEdge ABL Editor) by performing the following steps:

   Note: You cannot modify Java triggers with the ABL Editor or the trigger wizard.

   a) Select the trigger name in the OpenEdge DB Structure view on page 836.

      Note: You can select either an ABL or a REPLICATION trigger. You cannot open and modify Java triggers.

   b) Right-click, and choose Open in Editor from the context menu. This option opens the trigger in the ABL Editor perspective.

      Note: At least one OpenEdge project must be open and the PROPATH must be set to reference the trigger location. If no project is open, you see an error message.If there is more than one project containing the trigger, the system displays a dialog and prompts you to select the trigger.

   c) Edit and save the file.

2. To edit trigger properties with the Edit Trigger option, do the following:
   a) Modify trigger properties by selecting a trigger name in the DB Structure view and choosing Edit Trigger from the context menu.
   b) The Edit Trigger dialog opens and select **whether to override triggers at run time**, **whether to validate triggers at run time**, or attach the trigger to some other .p file.

      Note: If you modify a trigger with CRC enabled, you must initiate the Set CRC option. Select the trigger, and then right-click to expose the context menu. Select **Set CRC**.

   Note: For more information about triggers, see the ABL manuals in the OpenEdge Product Documentation section of the Progress Communities Web site.

See also

Display OpenEdge database triggers on page 818
Create OpenEdge database triggers on page 818
Drop OpenEdge database triggers on page 820
OpenEdge Create/Modify Trigger wizard on page 845
DB Structure view on page 828

Drop OpenEdge database triggers

To delete an ABL trigger, select the trigger name in the OpenEdge DB Structure view on page 836 and choose **Drop Trigger** from the context menu. A dialog prompts you to confirm the deletion.

Note: To delete multiple triggers simultaneously, select the triggers in the **DB Structure view**. Right-click, and then choose **Drop Triggers** from the context menu.

For more information, see OpenEdge Development: Programming Interfaces. You can find OpenEdge manuals in the Product Documentation section of the Progress Software Developer's Network Web site.

See also

Display OpenEdge database triggers on page 818
Add SQL connection profiles on page 818
Edit OpenEdge database triggers on page 819

Import and export schema changes

DB Navigator provides options to import and export data definition files (schema changes) among OpenEdge developers. You can use the Import and Export options to perform the following tasks:

- Import a data definition file.
- Export a complete data definition file.
- Import an incremental data definition file.

You can also use the Import DF and Export DF on the Database connections preferences on page 35 to import and export data definition files.

Work with Oracle databases

Working with an Oracle database using DB Navigator allows you to set preferences, add a SQL connection profile, troubleshoot the Oracle JDBC driver, and view the database schema.

Set preferences

You set the preferences for Progress DB Navigator by selecting **Window** > **Preferences**. Expand the **Progress DB Navigator** tree view node to see the following preference options:

- SQL Connection profile preferences on page 852 - Configure SQL connections to databases.
- Databases>OpenEdge Schema Editing - Set preferences associated with the schema wizards for OpenEdge databases.

- JDBC Drivers preferences on page 853 - Configure aspects of the JDBC driver.
- SQL Editor preferences on page 854 - Configure SQL Editor preferences.

See also

Connect a database on page 781
Add SQL connection profiles on page 782
Configure a JDBC driver on page 780
SQL Editor on page 830

Add an SQL connection profile for an Oracle database

To add a SQL connection profile:

1. Select **Add Connection Profile**  in the Connections view on page 827.
2. Type a unique name in the **Name** field.
3. Select the **Oracle JDBC Driver(DataDirect)** from the driver selection list. You can click **New Driver** if you need to Configure a JDBC driver on page 780. In most cases, however, the driver is installed and configured automatically during installation of Progress DB Navigator. SQL can have multiple JDBC connections. Notice that the format for the selected driver's URL appears in the **URL** field. If necessary, you can edit the text in the **URL** field to include the appropriate information for your system.
4. To edit a URL:
   a) Deselect the **Specify URL Details** checkbox (by default, this checkbox is selected, preventing you from editing the **URL** field).
   b) Supply a hostname (use localhost if the host is local to the system).
   c) Type the port number.
   d) Type the database name.

   Note: Since the format of the URL and the required information can vary from driver to driver, see the documentation for your driver if you need more information.

5. Enter the user name and password.

   Note: You must specify the user ID when creating a SQL connection.

6. Choose **Open on Eclipse startup** if you want the connection to open when Eclipse starts (provided the database server is already started).

   Note: You still must enter a valid user ID and password. Also, be aware that this option slows the startup of Eclipse.

7. Choose **Auto-Login** on connect to automatically log into the database when connecting.
8. Type the name of the Host.
9. Select either Service or Port, and type the correct value.
10. Type the name of the database in the **Database** field.

11. Add any additional JDBC connection properties in the **Additional parameters** field, delimited by semicolons in the format key1=value; key2=value. (Refer to the documentation for your JDBC driver for a list of supported parameters.)
12. Click **Test Connection** to verify connectivity. If the connection succeeds, a Connection succeeded message appears. If the connection does not succeed, an error message appears.
13. Click **OK**.

Troubleshoot the Oracle JDBC driver

DB Navigator requires a JDBC driver in order to connect to a database and supplies JDBC drivers for various database types. In most cases, the driver is installed and configured automatically during installation of DB Navigator.

If the driver is configured properly, the driver is tagged with a blue ✓ icon in the JDBC Drivers preferences on page 853 page. If the driver is tagged with a red ⊗ icon, however, the driver is not configured and cannot be loaded to connect to a database. If the JDBC driver is not properly configured, you see an error message when you try the database connection.

To troubleshoot the JDBC driver configuration, begin by verifying that the URL specified in the database's connection profile is correct, and then verify several other driver configuration options. These steps are as follows:

1. From the Connections view on page 827, select the database connection in the **Connection Profiles** list.
2. Right-click, and choose **Edit Connection Profile**.
3. Check the **URL** in the **Connection Profile** dialog box.

   Note: For the Oracle JDBC Driver (DataDirect), the URL should look similar to `jdbc:progress:oracle://hostname:port:databaseName=name`, in which port is the port number of the database server and name is the logical database name.

4. Close the **Edit Connection Profile** dialog once you confirm that the URL is correct.
5. Choose **Windows** > **Preferences** > **Progress Databases** > **DB Navigator** > **JDBC Drivers** to open the **JDBC Drivers preferences** page.
6. Select the driver you want to configure from the list, and then choose **Edit**. The **Edit Driver** dialog appears.
7. In the **Edit Driver** dialog:
   a) Ensure the string in the **Name** field is unique and indicates the correct driver.
   b) Ensure the **Driver Class Name** field is correct. The Oracle JDBC Driver (DataDirect) class name is:`com.prgs.jdbc.oracle.OracleDriver`
   c) Click the **Extra Class Path** tab. Verify that the following pathnames appear:

      ```
      install_dir\oeide\architect\eclipse\plugins\com.progress.dbnavigator_2.1.0\drivers\pgoracle.jarinstall_dir\oeide\
      architect\eclipse\plugins\com.progress.dbnavigator_2.1.0\drivers\pgbase.jarinstall_dir\oeide\architect\eclipse\
      plugins\com.progress.dbnavigator_2.1.0\drivers\pgutil.jar
      ```

      The `install_dir` path refers to the complete path of your product installation. You must provide this complete pathname to configure the driver properly.

8. If a required driver is not listed in the **Extra Class Path** list, click **Add**.
9. Choose the required driver; repeat for each additional driver required.
10. Use **Delete** to remove any incorrect pathnames.

See also

JDBC drivers on page 777
Connect a database on page 781

View Oracle database schema

You can display the Oracle database schema in a variety of ways.

See also

Oracle DB Structure view on page 849
Oracle DB Details view on page 847

Display Oracle database function details

In the Oracle DB Structure View on page 849, click any of the **FUNCTION** child nodes to display details about a particular function in the Oracle DB Details view on page 847. Function information includes details about the parameters; the source code; properties and their values; and a list of any dependent objects.

See also

Oracle DB Structure View on page 849
Oracle DB Details view on page 847

Display Oracle database jobs details

In the Oracle DB Structure View on page 849, click the **Jobs** child node of the **Monitor** parent node to display information about a job, or task, that you run once or on a particular schedule, in the Oracle DB Details view on page 847.

See also

Oracle DB Structure View on page 849
Oracle DB Details view on page 847

Display Oracle database package body details

In the Oracle DB Structure View on page 849, click any of the **PACKAGE BODY** child nodes to display details about a particular package body in the Oracle DB Details view on page 847. Details include the source code as well as properties and their values.

See also

Oracle DB Structure View on page 849
Oracle DB Details view on page 847

Display Oracle database package details

In the Oracle DB Structure View on page 849, click any of the **PACKAGE** child nodes to display details about a particular package in the Oracle DB Details view on page 847. Details include the source code; properties and their values; and a list of any dependent objects.

See also

Oracle DB Structure View on page 849
Oracle DB Details view on page 847

Display Oracle database procedure details

In the Oracle DB Structure View on page 849, click any of the **PROCEDURE** child nodes to display details in the Oracle DB Details view on page 847 about each procedure that is stored in the database and available for reuse. Procedure details include parameters; the source code; properties and their current values; and a list of any dependent objects.

See also

Oracle DB Structure View on page 849
Oracle DB Details view on page 847

Display Oracle database sequence properties

In the Oracle DB Structure View on page 849, click any of the **SEQUENCE** child nodes to display details about a particular sequence in the Oracle DB Details view on page 847. Sequence information appears in the Oracle DB Details view on page 847 under the **Info** and **Details** tabs, which display various properties and their current values.

See also

Oracle DB Structure View on page 849
Oracle DB Details view on page 847

Display Oracle database sessions details

In the Oracle DB Structure View on page 849, you can view two different types of session details.

From the **Database** node, you can click the **SESSIONS** node to display information about the current user-to-database connection in the Oracle DB Details view on page 847. From the **Monitor** node, you can click the **Sessions** node to see information about the current session, such as username, Session ID, machine name, and the user's logon time, in the Oracle DB Details view on page 847.

See also

Oracle DB Structure View on page 849
Oracle DB Details view on page 847

Display Oracle database system parameter details

In the Oracle DB Structure View on page 849, click the **System Parameters** child node of the Instance parent node to display all system parameters (retrieved from the v$system_parameter table) in the Oracle DB Details view on page 847.

See also

Oracle DB Structure View on page 849
Oracle DB Details view on page 847

Display Oracle database table details

In the Oracle DB Structure View on page 849, click any of the table names to view details, such as columns, indexes, primary key, foreign key, preview, row count, table and column privileges, a list of dependent objects, and property status, in the Oracle DB Details view on page 847.

See also

Oracle DB Structure View on page 849
Oracle DB Details view on page 847

Display Oracle database TableSpace details

In the Oracle DB Structure View on page 849, click the **TableSpace** child node of the Instance parent node to display all table spaces, or logical storage units, in the database.

See also

Oracle DB Structure View on page 849
Oracle DB Details view on page 847

Display Oracle database Top SQL details

In the Oracle DB Structure View on page 849, click the **Top SQL** child node of the **Monitor** parent node to display SQL executions in the Oracle DB Details view on page 847, enabling you to see how resources are affected when a SQL statement is executing.

See also

Oracle DB Structure View on page 849
Oracle DB Details view on page 847

Display Oracle database triggers

In the Oracle DB Structure View on page 849, click any of the **TRIGGER** child nodes to display trigger information in the Oracle DB Details view on page 847. The **DB Details view** provides details about the properties and their values as well as the trigger body source code.

See also

Oracle DB Structure View on page 849
Oracle DB Details view on page 847

Display Oracle database Users details

In the Oracle DB Structure View on page 849, click the **Users** child node of the **Security** parent node to display all authenticated users by username, user ID, and the date on which the user was created, in the Oracle DB Details view on page 847.

See also

Oracle DB Structure View on page 849
Oracle DB Details view on page 847

Display Oracle database view details

In the Oracle DB Structure View on page 849, the **VIEW** node lists all created views for the database. Click any of the **VIEW** child nodes to display information about a particular database view, such as columns, indexes, primary key, foreign key, preview, row count, privileges, a list of dependent objects, and status, in the Oracle DB Details view on page 847.

See also

Oracle DB Structure View on page 849
Oracle DB Details view on page 847

Reference

Components of the DB Navigator perspective

The topics describe the views, wizards, and dialogs associated with the default DB Navigator perspective.

Connection dialog

The **Connection dialog** box appears when you:

- Select a connection profile in the Connections view on page 827.
- Choose **Open connection** from the context (right-click) menu, double-click a connection profile, or click **Open connection** .

Clicking **OK** in the Connection dialog creates a connection between DB Navigator and a database.

Note: The **Open Connection** dialog appears only when the Auto-Login on connect option is not selected.

The **Connection dialog** contains a read-only display of the values defined for the profile name, the driver, and the URL. It also contains the user ID and password, if they were specified in the connection profile. However, you can override the user ID and password in the User and Password fields.

In addition, the **Connection dialog** allows you to select one of these settings:

Setting	Description
AutoCommit	Any changes to the database are committed immediately. This mode is selected by default.
Commit On Close	Any changes to the database are committed when you either close the session or select Commit.

Note: If neither **AutoCommit** nor **Commit On Close** is selected, you must click **Commit** in the **Connections** view toolbar to commit any changes that you have executed from the SQL Editor. If you perform schema management operations using the SQL Editor with **AutoCommit** turned off, there will be pending SQL transactions. If the connection is closed or severed, the transaction is automatically rolled back. Therefore, you should always select **Commit On Close** if you deselect **AutoCommit**.The **OpenEdge schema** wizard automatically commits SQL transactions even if **AutoCommit** is not selected.

See also

Connections view on page 827

Connection Info view

The **Connection Info** view displays SQL connection information for the database selected in the Connections view on page 827. Connection information is shown as property/value pairs.

Connections view

The **Connections view** contains a tree view that displays all available SQL connection profiles and all active sessions.

Note: Several of the controls described in the following table are also available from a context menu. To access this menu, select a connection profile in the **Connections** view, and right-click.

The **Connections** view contains the following toolbar buttons:

	**Add Connection Profile** displays the Add SQL connection profiles on page 782 dialog.
	**Open Connection** opens the Connection dialog on page 826 dialog for the connection profile selected in the tree view.
	**New SQL Editor** opens the SQL Editor on page 830.
	**Close All Connections** closes all open connections and disables any views that have related information.
	**Close Connection** closes the connection that is selected in the **Connections** view.
	**Rollback** rolls back a transaction. Any changes made by the transaction are undone and the database is restored to its initial state. Rollback is disabled if the database connection was started with Connection dialog on page 826 turned on.
	**Commit** makes changes made by a transaction permanent. **Commit** is disabled if the database connection was started with Connection dialog on page 826 turned on.
	Collapses the display of all hierarchical elements in the list, leaving only the top-level entities visible.
	**Create OpenEdge database** opens the **Create database** dialog.

See also

Connect a database on page 781
Connection dialog on page 826
Connection Info view on page 827

DB Structure view

When you open a connection in the Connections view on page 827, the schema for the database appears in the **DB Structure view**. The **DB Structure** appears as a tree view and begins with the root node Database. Depending on the particular SQL-compliant database you are working with, the nodes that appear in the tree view might be different.

Note: You can configure DB Navigator to display or hide schemas. By default, catalogs are displayed while schemas are hidden from view. See DB Navigator preferences on page 851 for more information.

When you select certain nodes in the **DB Structure** view, properties and values appear in the DB Details view on page 829.

When you right-click a node in the **DB Structure** view, a context menu appears that allows you to view schema; for OpenEdge databases, you can view, create, and edit schema. The context menu that appears is dependent on the type of database whose structure you are viewing and the node that is currently selected.

(For OpenEdge databases only) To convert tables in the OpenEdge database to multi-tenant tables, use the context menu **Make Table Multi-tenant** option. See Convert tables to multi-tenant tables on page 805.

The **DB Structure** view contains a toolbar button that launches the **DB Structure Filters** dialog. The **DB Structure Filters** dialog allows you to hide schema, catalogs, and table types. You can specify a delimited list of patterns to exclude or include. For example, you can enter `C*, D*` to display only those tables starting with c or d. To display those tables starting with the letters between A and F, enter `[A-F]*`.

You can also hide tables and columns based on a regular expression pattern. A regular expression is a mechanism for describing text patterns when executing the filter. These expressions are made up of ordinary characters.

The DB Structure Filters dialog also allows you to select the category of tables that you want to view in the OpenEdge DB Structure view on page 836 view. You can either choose from a list of existing categories or create a new one.

Note: Your choices in the **DB Structure Filters** dialog are saved with the connection profile.

The root node **Database** is at the top level of the **DB Structure** view. If the database supports catalogs and you have selected **Show catalog** in the DB Navigator preferences, all catalogs appear below the database node. If you have selected **Show schema** in the DB Navigator preferences, all schemas appear below the database node. Beneath the schema and catalog nodes, the following child nodes appear:

SYNONYM	These SQL elements display all synonyms that were created in SQL against tables. A synonym is an alias that SQL statements can use instead of the name specified when the table, view, or synonym was created. The child nodes contain only tables, views, or other synonyms. They do not display columns or indexes of the tables.
SYSTEM TABLE	Displays virtual systems tables and other meta-schema tables. These tables cannot be altered.

TABLE	Displays all application tables. Table nodes expand to show columns and indexes.When you select a table name, data and meta-data appear in the DB Details view on page 829. **Note:** Since tables are displayed in ASCII order and sorting is case-sensitive, all lowercase table names are listed after the uppercase table names.
VIEW	Displays the names of all created views. A SQL view allows you to extract rows and columns from one or more related tables and to treat the resulting data set as a table that can be viewed or updated.

Depending on which SQL-compliant database's structure you are viewing, the remaining nodes shown might vary.

See also

SQL scripting on page 784
DB Navigator preferences on page 851
MS SQL Server DB Structure View on page 833
OpenEdge DB Structure view on page 836
Oracle DB Structure View on page 849
DB Details view on page 829
Connections view on page 827

DB Details view

The **DB Details** view is a read-only display of information specific to the selected node in the DB Structure view on page 828. You can access this detailed view through the context menu for the selected node.

The context menu that appears is dependent on the type of database whose structure you are viewing and the node that is currently selected in the **DB Structure** view. When a table node (or a child node) is selected, the following tab folders appear in the DB Details view:

Columns	Displays a list of all columns with related SQL information.
Indexes	Displays a list of indexes in the selected table.
Primary Key	Displays the primary keys defined for the selected table. This is relevant only to tables created through SQL, although it displays the components of the OpenEdge primary key.
Foreign Key	Displays any foreign key restraints defined for a selected SQL table.
Preview	Displays a subset of the records in the selected table. In the DB Navigator preferences on page 851, you can set the number of rows returned.

Row Count	Displays the total number of rows in the selected table. **Note:** If you have an OpenEdge database table that contains many records (over a million, for example), it is not advisable to select this panel. Since OpenEdge manually counts the records, which can take a long time, the system appears to freeze.
Privileges	Displays both table and column privileges (as a toggle). Includes the columns Table, Column, Privilege, Grantor, Grantee, and Grantable.

Depending on the type of database whose details you are viewing, there may be other tab folders (in addition to the ones described here) in the **DB Details** view.

See also

DB Structure view on page 828
MS SQL Server DB Details view on page 832
OpenEdge DB Details view on page 834
Oracle DB Details view on page 847

SQL Editor

The **SQL Editor** allows you to view, write, and execute SQL scripts.

In the edit area, you can enter one or multiple SQL statements. Multiple statements are delimited with a semicolon. You can modify the delimiter in the **Progress DB Navigator preferences**.

If you enter a dot after a schema name or a catalog name, the auto-completion menu appears showing all tables. A secondary menu shows all columns within that table. A menu of all columns is displayed upon entering a dot after the table.

The toolbar of the editor contains the following controls:

	Execute the SQL statement(s). **Note:** The Execute icon is disabled until you select a database.
	Select and open an existing .sql file.
	Clear all content from the editor.
	Select a database connection. When you are creating a new script, the default is the connection that is selected in the **Connections** view. **Note:** If more than one catalog exists, another drop-down list appears in which you specify which catalog to use.

You can choose to enable auto-completion assistance for columns within the SQL Editor. Enabling auto-completion allows you to type any letter in the SQL Editor, and then type the CTRL+SPACE keyboard combination to see if there are multiple words that match. If the letter you type has only one match, that key word is entered into the editor.

To enable auto-completion for columns, select the **Columns auto-completing assistance** option from the **Progress DB Navigator preferences** page.

Note: Be aware that auto-completion can slow performance during connection.

See also

Start the SQL editor on page 784
Copy and paste on page 786
Generate a SQL query on page 785
Generate a create table script on page 786
Save SQL scripts on page 787
SQL Editor Preferences on page 854
Set database preferences on page 778
SQL History view on page 832
SQL Results view on page 831

SQL Results view

When you run a SQL query from the SQL editor, a result set appears in the **SQL Results** view. Result sets for each subsequent execution appear in the same view, but in a separate folder. **Folder** tabs are numbered consecutively. If any errors occur, the SQL error is displayed in a message dialog that includes the error code.

The toolbar contains the following controls:

	Retrieve the next result set. By default, the result set is batched in groups of 100 records. The next batch of records can be added to the view by clicking this control. **Note:** You can set the SQL Results rows to batch value in the DB Navigator preferences on page 851 page.
	Retrieve all rows. Expands the number of rows in a result set to include the complete output of a query.
	Copy all rows in the view to the clipboard.
	Close the tab folder.

The status bar at the bottom of the folder shows the number of the row that is selected. It also indicates the number of rows in the result set.

See also

Start the SQL editor on page 784
SQL Editor on page 830
SQL History view on page 832

SQL History view

The **SQL History** view displays a list of all executed unique SQL queries for the current session. It does not persist the queries. The context menu contains three options:

Open in editor	Opens the selected query in a new editor.
Remove from history	Deletes the selected query from the list.
Copy to Clipboard	Copies the selected query to the Clipboard.

See also

Start the SQL editor on page 784
SQL Editor on page 830
SQL Results view on page 831

MS SQL Server database

You can view MS SQL Server database schema by using a Details view and a Structure view.

MS SQL Server DB Details view

The **DB Details** view is a read-only display of information specific to the selected node in the DB Structure view on page 828. You can access this detailed view through the context menu for the selected node.

Note: This detailed view is available only for certain nodes. If the detailed view is unavailable for a node you select in the **DB Structure** view, no information appears in the **DB Details** view.

The content of the **DB Details** view changes depending on which node you select in the **DB Structure** view. When you select a child of one of the nodes listed in the left column of the following table, the corresponding information appears in the **DB Details** view:

SYSTEM TABLE or TABLE or VIEW	For a child node, displays details about the following: • Columns -A list of all columns and related SQL information. You can sort the column names in ascending or descending order by clicking the Column label. • Indexes -A list of indexes in the selected table. • Primary key - A list of the primary keys defined for the selected table. • Foreign key - A list of any foreign key restraints defined for a selected SQL table. • Preview - A subset of the records in the selected table. You can set the number of rows returned in the DB Navigator preferences on page 851. • Row count - The total number of rows in the selected table. • Privileges - A list of both table and column privileges (as a toggle).
PROCEDURE or TRIGGER	For a child node, displays the SQL code in the Source tab and property/value details, such as date created, in the Info tab.

FUNCTIONS	Displays the SQL code in the Source tab and property/value details, such as date created, in the Info tab.
SESSIONS	Displays details about the current schema.

MS SQL Server DB Structure View

When you open a connection in the Connections view on page 827, the schema for the database appears in the **DB Structure** view. The **DB Structure** view is a tree view that shows a separate structure for each schema under the root node Database.

Note: You can configure DB Navigator to display or hide schemas. By default, catalogs are displayed while schemas are hidden from view. See DB Navigator preferences on page 851 for more information.

When you select certain nodes in the DB Structure view, properties and values appear in the MS SQL Server DB Details view on page 832.

The top-level nodes in the MS SQL Server DB Structure view are Database and Monitor. You can use DB Structure view on page 828 to show only certain schema items in the view.

Database

The root node **Database** is at the top level of the **DB Structure** view. If the database supports catalogs and you have selected **Show catalog** in the DB Navigator preferences, all catalogs appear below the database node. If you have selected **Show schema** in the DB Navigator preferences, all schemas appear below the database node.

Beneath the schema and catalog nodes, the following child nodes appear:

SYSTEM TABLE	Displays virtual systems tables and other metaschema tables. These tables cannot be altered.
TABLE	Displays all application tables. Table nodes expand to show columns, indexes, and triggers.When you select a table name, data and meta-data appear in the MS SQL Server DB Details view on page 832. **Note:** Since tables are displayed in ASCII order and sorting is case-sensitive, all lowercase table names sort after the uppercase table names.
VIEW	Displays the names of all created views.
PROCEDURE	Displays all procedures that are stored in the database and available for reuse.
TRIGGER	Displays all triggers, which execute in response to a predefined event or activity.
FUNCTIONS	Displays all functions, or pieces of a program that you can use separately from the remainder of the program.
SESSIONS	Displays the session information for the current catalog.

Monitor

Below the database node is a **Monitor** node that contains the following subnode:

SESSIONS	Displays the information for the current database session.

See also

MS SQL Server DB Details view on page 832

SQL terminology for ABL programmers

This topic is for the ABL (Advanced Business Language) programmer who is not familiar with SQL. It describes how some SQL terms and concepts differ from ABL.

Definition

SQL is the language used to communicate with and extract information from a SQL-compliant database. Using SQL you can read, write, and remove information from a database using English-like statements.

Rows and columns

A SQL table is a group of related data composed of rows and columns. The term row is equivalent to the ABL term record. The term column is equivalent to the **ABL term** field.

SQL column widths

An OpenEdge database can contain columns of variable length. However, SQL CREATE TABLE statements specify the maximum width of each column in a table. Although ABL programs have the ability to insert data whose length exceeds the maximum width, SQL applications are not able to read a row if a column contains data greater than the maximum width.

Schema

In OpenEdge databases, a schema is defined as the area in which all system and user information is stored. An OpenEdge database viewed from SQL contains a schema area, referred to as the PUB (Public) schema. It also contains a schema called SYSPROGRESS, which stores system catalog tables. In SQL, a schema is a collection of related database objects, such as tables or views. A SQL database can contain several schemas.

OpenEdge database

You can view OpenEdge database schema using a Details view and a Structure view.

OpenEdge DB Details view

The **DB Details** view is a read-only display of information specific to the selected node in the OpenEdge DB Structure view on page 836.

Note: This detailed view is available only for certain nodes. If the detailed view is not available for a node you select in the DB Structure view, no information appears in the DB Details view.

The content of the **DB Details** view changes depending on which node you select in the **DB Structure** view. There are two top-level nodes: Database and Security.

Database

When you select a child of one of the nodes listed in the left column of the following table, the corresponding information appears in the **DB Details** view:

SYSTEM TABLE or TABLE	For a child node, displays details about the following: • Columns - A list of all columns and related SQL information. • Indexes - A list of indexes in the selected table. • Primary key - A list of the primary keys defined for the selected table. This is relevant only to tables created through SQL, although it will display the components of the OpenEdge primary key. • Foreign key - A list of any foreign key restraints defined for a selected SQL table. • Preview -A subset of the records in the selected table. You can set the number of rows returned in the DB Navigator preferences on page 851. • Row count - The total number of rows in the selected table. **Note:** If you have an OpenEdge database table that contains many records (over a million, for example), it is not advisable to select this panel. Since OpenEdge manually counts the records, which can take a long time, the system appears to freeze. • Privileges - A list of both table and column privileges (as a toggle). • Partition Key - A list of partition key attributes in the selected database table. • OpenEdge Table - A list of table attributes. Attributes are extracted from the _File system table. **Note:** The Area and Can-* fields are available only for users who have DBA privileges. • OpenEdge Columns - A list of column attributes. Attributes are extracted from the _Field system table. The columns can be sorted in ascending or descending order by clicking the Name label. • OpenEdge Indexes - A list of index attributes.
VIEW	For a child node, displays view properties, which are column name, data type, size, decimal, default value, accept null value, and comments.
SEQUENCES	For a child node, displays the properties of the sequence, including its current value.
TRIGGERS	For a child node, displays details for a trigger, including Trigger Type, Table, Column, Event, Procedure, Overridable, and Check CRC.
DB DETAILS	Displays database properties under the Database tab. Under the Tables & Columns tab, it displays all columns from all tables and their properties sorted by table and column names. You can sort the table names in ascending or descending order by clicking the Column label.

Security

When you select the **Security** node, the **DB Details** view displays the **Security** tab. The **Security** tab displays information from the _Users and the _Sysdbauth tables regarding user accounts and privileges. You can Work with OpenEdge database user accounts on page 796 from the icons on the **Security** tab in the **DB Details** view. For multi-tenant tables in the OpenEdge database, the **Security** tab displays information from the _Tenant table. This information includes the tenant name, domain name, and the type of user.

OpenEdge DB Structure view

When you open a connection in the Connections view on page 827, the schema for the database appears in the **DB Structure** view. The **DB Structure** view is a tree view that shows a separate structure for each schema under the root node Database. Depending on the database, the root and other nodes that appear in the tree view might be different.

Note: You can configure DB Navigator to display or hide schemas. By default, catalogs are displayed while schemas are hidden from view. See DB Navigator preferences on page 851 for more information.

When you select certain nodes in the **DB Structure** view, properties and values appear in the OpenEdge DB Details view on page 834.

The top-level nodes in the **OpenEdge DB Structure** view are Database and Security. You can use DB Structure view on page 828 to work with the schema, and you can use filters to show only certain schema items in the view.

Database

The root node **Database** is at the top level of the **DB Structure** view. If the database supports catalogs and you have selected **Show catalog** in the DB Navigator preferences, all catalogs appear below the database node. If you have selected **Show schema** in the DB Navigator preferences, all schemas appear below the database node.

Beneath the schema and catalog nodes, the following child nodes appear:

SYNONYM	These SQL elements display all synonyms that were created in SQL against tables. The child nodes contain only tables, views, or other synonyms. They do not display columns or indexes of the tables.
SYSTEM TABLE	Displays virtual systems tables and other metaschema tables. These tables cannot be altered.
TABLE	Displays all application tables. Table nodes expand to show columns, indexes, and triggers. **Note:** Since tables are displayed in ASCII order and sorting is case-sensitive, all lowercase table names are listed after the uppercase table names. This node also displays the multi-tenant tables associated with the OpenEdge database. A **multi-tenant decorator** () which is displayed with each multi-tenant table indicates that it is multi-tenant table.
VIEW	Displays the names of all created views. A SQL view allows you to extract rows and columns from one or more related tables and to treat the resulting data set as a table that can be viewed or updated.

SEQUENCES	Displays sequences in alphabetical order. A sequence is an incremented number series applied to a particular field (column). Whenever a new record (row) is created, the number is incremented based on the value in the previous record.
TRIGGERS	Displays ABL schema triggers, replication triggers, and Java triggers.
DB DETAILS	Displays database, table, and column properties in the OpenEdge DB Details view on page 834.

Security

When you select the **Security** node in the **DB Structure** view, a list of user accounts appears in the **DB Details** view. You can manage user accounts from the icons on the **Security** tab in the OpenEdge DB Details view on page 834.

OpenEdge edit schema wizards

The **Edit Schema** wizards allow you to modify schema elements (tables, columns, and indexes). They are available from context menus in the OpenEdge DB Structure view on page 836 of connected OpenEdge databases.

The **Edit Schema** wizards generate and execute SQL scripts that commit schema changes. You can view Edit Schema scripts in an editor and control the script's execution by using options available in the OpenEdge Schema Editing preferences on page 853 page. The two options that apply are Open script in Editor upon completion of wizard and Execute and commit schema change upon completion of wizard.

OpenEdge Table wizard

The **Table** wizard allows you to specify table properties for OpenEdge databases. You use the wizard to specify the properties of a new table or to change the properties of an existing table.

Start the **Table** wizard by clicking **Add Table**  or **Edit Table** . Both are available from context menus in the **DB Structure** view and from the OpenEdge Table tab of the OpenEdge DB Details view on page 834.

The **Table** wizard allows you to specify or change the following properties:

Table Name	Specifies a table name that is unique within the database. Table names must follow these conventions: • A table name can be up to 32 characters long. • A table name can consist of alphabetic characters (A-Z or a-z), digits (0-9), and the pound sign (#), dollar sign ($), percent sign (%), ampersand (&), hyphen (-), and underscore (_). In addition, names must begin with a character (A-Z or a-z). • You cannot use reserved ABL keywords as names. • Names are not case-sensitive; they can be uppercase, lowercase, or a combination of both.
Partitioned	Creates a partitioned table without any partition policies defined on it. **Note:** The **Partitioned** option is enabled only if the selected database is enabled for table partitioning. It is disabled if the **Multi-tenant** option is selected, since a table cannot be both multi-tenant and partitioned.

Multi-tenant	Creates a multi-tenant table.
Support default tenant	Allows you to associate a multi-tenant table with a storage area.
Area	Specifies the storage area from a list of storage areas defined for the database. **Note:** The **Area** field is disabled if the **Support default tenant** check box is cleared while creating a multi-tenant table. The **Area** filed is also disabled when you select the **Partitioned** check box, since partition areas are defined while defining partition rules.
Dump File	Specifies a unique filename for dumping table contents or definitions.
Label	Specifies the label that is used in error messages. This field is followed by a Field string attributes on page 846 field for controlling text preferences and space allocation.
Description	Describes the contents or purpose of the table for documentation purposes.
Validation	Defines what criteria to apply before row deletion is allowed. For example, in a customer table, to restrict deleting customers to those who have no outstanding orders, NOT (CAN-FIND(FIRST order OF customer))
Message	Specifies an error message that is displayed when a record deletion is invalid. This field is followed by a Field string attributes on page 846 field for controlling text preferences and space allocation.
Category	Specifies the category of the OpenEdge tables to be displayed in the OpenEdge DB Structure view on page 836 view. You can specify a category from the existing list or create a new one.
Hidden	Creates hidden tables.
Keep wizard open after adding table	Keeps the wizard open to add one or more other tables.

See also

View and maintain OpenEdge database schema on page 800
Work with OpenEdge database tables on page 800
Connect a database on page 781
Work with multi-tenant tables on page 803
OpenEdge Columns wizard on page 838
OpenEdge Index wizard on page 843
OpenEdge DB Structure view on page 836

OpenEdge Columns wizard

The **Columns** wizard allows you to specify column properties for OpenEdge databases. You use it to specify the properties of a new column or to change the properties of an existing column.

Start the **Columns** wizard by clicking **Add Column**  or **Edit Column** . Both are available from context menus in the **DB Structure** view and from the **OpenEdge Table** tab of the OpenEdge DB Details view on page 834.

The **Columns** wizard allows you to specify the following properties:

Name	A column name that is unique within the selected table. A column name must start with a letter and can contain only letters, digits, or the following symbols: #, $, %, -, _, or &. **Note:** The **Name** field is disabled while editing a partition key column since a partition key column cannot be renamed.
Data Type	A valid OpenEdge data type. The data types include CHARACTER, DATE, DECIMAL, INTEGER, INT64, LOGICAL, DATETIME, DATETIME-TZ, RAW, RECID, BLOB, and CLOB. The properties available in the **Columns** wizard change based on the choice of data type. You cannot change the data type of an existing column except to change from integer to INT64. **Note:** Changing the data type from INTEGER to INT64 is irreversible. The **Data Type** field is disabled while editing a column since the data type of a column cannot be changed.
Size	Maximum size (SQLWidth property) for the column. You can change the size of an existing column for these data types only: CHARACTER, DECIMAL, CLOB, BLOB, and RAW.
Scale	(Available only if Data Type is DECIMAL.) Maximum number of digits to the right of the decimal point. You cannot change the scale of an existing column. The scale defaults to the number of integers defined to the right of the decimal point in the format.
Format	Display format for data in the column. You can choose Character display format examples on page 841, Date display format examples on page 842, Logical display format examples on page 842, and numeric format options to determine how data is displayed on screens or in printed reports. This field is followed by a Field string attributes on page 846 field for controlling text preferences and space allocation. Each data type has a default format defined in the DB Navigator preferences on page 851.
Label	The column heading that appears on screens or in printed reports to identify the column. The Unknown value (?) causes the string that appears in Name to be used. This field is followed by a Field string attributes on page 846 field for controlling text preferences and space allocation. **Note:** If you use ? as a label, precede it with a backslash. For example: \?.
Col Label	A heading that appears when a program lists data in columns. ? causes the string that appears in Label to be used. This field is followed by a Field string attributes on page 846 field for controlling text preferences and space allocation.

Init Value	The initial value, based on data type, for the column. This field is followed by a Field string attributes on page 846 field for controlling text preferences and space allocation.
Order	A number that indicates position of this column in relation to other columns in the table. **Note:** This order is used only when you display schema in an ABL client session. The order is not reflected in the **DB Structure** view, which displays columns in order of creation. By default, the order number for the first column is 10. Order numbers for subsequent columns are automatically incremented by 10. You can, however, modify the default order number to reposition the column. For example, if you want to position a new column between the first column (order number 10) and the second column (order number 20), you can set the order number to 15 for the new column.
Extent	When selected, creates an array field and allows you to specify the number of elements.
Description	A description of the contents or purpose of the column for documentation purposes.
Help Text	A help message that appears whenever a user is prompted to input data. This field is followed by a Field string attributes on page 846 field for controlling text preferences and space allocation.
View As	Specifies a UI widget (fill-in field, combo box, etc.) that represents the column on the screen. The widget you can use depends on the data type. See the VIEW-AS phrase in OpenEdge Development: ABL Reference for more information.
Validation	An expression that defines valid data for the column (for example custnum>0).
Val Msg	The error message that is displayed when the user attempts to enter invalid data. This field is followed by a Field string attributes on page 846 field for controlling text preferences and space allocation.
Case sensitive	When selected, defines character columns as case-sensitive.
Mandatory	When selected, makes the column mandatory. That is, it cannot have the Unknown value (?).
ax Size	(For BLOB or CLOB data types only) A value that indicates the maximum size for the column. You must indicate whether the value expresses Bytes, KiloBytes, MegaBytes, or GigaBytes.
Code page	(For CLOB data types only) Specifies a code page. A code page is a table that assigns a numeric value to each element in a collection of letters, numbers, punctuation, control codes, and other characters. The assignment is one-to-one: no two characters are assigned the same numeric value, and no two numeric values are assigned the same character.

Collation	(For CLOB data types only) Specifies collation preference. A collation is a set of rules that determine how character data is ordered. OpenEdge provides a set of collation tables to sort and compare character data.
String Attribute field	Controls text preferences and how much space the ABL compiler allocates for a Field string attributes on page 846 within an r-code text segment.

The **Columns** wizard also has a tree view that shows the existing columns in the currently selected table. The following buttons are below the tree view:

Copy	Allows one or more columns to be created from other columns in any table. Upon selecting a column and then selecting **OK**, the column information is copied into the **Column** tab folder view and the node is added to the tree view. If a column by the same name already exists in the table, a message is displayed and the column is renamed to be unique.
Remove	Removes selected columns from the tree view. **Note:** The **Remove** option is disabled while editing a partition key column, since a partition key cannot be removed.
Add	Adds a new column node to the tree view and resets the fields in the **Columns** wizard to their initial values.

After one column is added, you can select **Finish**. This action constructs a SQL string, executes the code, and commits it. You can edit and save the SQL string by selecting **Open script in editor** upon completion of wizard on the OpenEdge Schema Editing preferences on page 853.

See also

View and maintain OpenEdge database schema on page 800
Work with OpenEdge database table columns on page 808
Connect a database on page 781
OpenEdge Table wizard on page 837
OpenEdge Index wizard on page 843

Character display format examples

Character display format examples

The following table shows examples of the different character display formats.

Format options	Data	Display
xxxxxxxx	These are characters	These ar
x(9)	These are characters	These are
x(20)	These are characters	These are characters

xxx	These are characters	The
AAA-9999	abc1234	abc-1234
(999) 999-9999	6172754500	(617) 275-4500
!!	ma	MA

Trailing spaces are truncated in character fields. If a character field contains only one space, the space is truncated to a null value. You can use the TRIM function to truncate leading and trailing spaces.

Date display format examples

Date display format examples

The following table shows examples of the different date display formats.

Format options	Data	Display
99/99/99	8/10/2007	08/10/07
99/99/9999	08/10/2007	08/10/2007
99-99-99	08/10/2007	08-10-07
99-99-99	08/10/2007	???????? Note: The value 8/10/2007 exceeds the display format.
999999	08/10/2007	081007
999999	08/10/07	081007
99999999	08/10/2007	08102007

Logical display format examples

Logical display format examples

The following table shows examples of the different logical display formats.

Format options	True	False

yes/no	yes	no
Yes/No	Yes	No
true/false	true	false
shipped/waiting	shipped	waiting
male/female	male	female

OpenEdge Index wizard

The **Index** wizard allows you to specify index properties for OpenEdge databases. You use it to specify the properties of a new index or to change the properties of an existing index.

Start the **Index** wizard by clicking **Add Index**  or **Edit Index** . Both are available from context menus in the **DB Structure** view and from the **OpenEdge Index** tab of the OpenEdge DB Details view on page 834.

The **Index** wizard allows you to specify the following properties:

Name	An index name that is unique within the selected table. Index names must follow certain conventions.
Scope	Defines whether the current index is **Local** or **Global**. **Note:** Local indexes are created only for partitioned tables. A local index is a partition-aligned index that has a partition key column as the leading prefix of its constraint columns. By default, a global index is created for tables that are not partitioned; hence, the **Local** and **Global** options are disabled for tables that are not partitioned.
Area	A storage area from a list of storage areas defined for the database. **Note:** When you select **Local**, the **Area** field is disabled, since partition areas are defined while defining partition rules.
Description	A description of the index for documentation purposes.
Primary	When selected, designates the index as the most frequently used index. OpenEdge allows you to set one index as primary and uses it by default when retrieving or ordering records.
Active	When selected, enables the index to be used to retrieve or order records. An active index updates itself every time a new record is created, deleted, or modified.

Unique	When selected, indicates that every index key must be unique (for example, a social security number).
Word Index	When selected, indicates that all words in the field are index entries. An index that contains all the words from a text field (or array of text fields) allows you to search for records containing specific words or phrases. **Note:** A word index cannot be a primary index. Also, a local index cannot be a word index; so, when you select **Local**, the **Word index** option is disabled.
Fields	(Add Index only) A list of table fields and index fields that allows you to add or remove fields from the index. **Note:** While selecting fields to be added to a local index of a partitioned table, the list of fields must include all the fields defined in the partition policy details and in the same order.
Descending	(Add Index only) When selected, rows are sorted in decreasing order.
Ascending	(Add Index only) When selected, rows are sorted in increasing order. (This option is selected by default.)

See also

SQL terminology for ABL programmers on page 834
View and maintain OpenEdge database schema on page 800
Work with OpenEdge database indexes on page 811
Connect a database on page 781
OpenEdge Table wizard on page 837
OpenEdge Columns wizard on page 838

OpenEdge Add/Edit Sequence wizard

The **Add/Edit Sequence** wizard allows you to set the properties for new ABL sequences or to modify the properties of existing ABL sequences in an OpenEdge database.

Display the **Add/Edit Sequence** wizard from a context menu in the OpenEdge DB Structure view on page 836.

The **Add/Edit Sequence** wizard allows you to set the following properties:

Name	Specifies the name of a new or existing sequence. Sequence names must follow certain conventions. **Note:** You cannot edit the name of a multi-tenant sequence once it is created.
Initial Value	Specifies the first integer in the sequence. The default initial value is zero.

Increment by	Specifies a positive or negative integer value that changes the sequence value at each iteration. When you enter a negative value, the Upper Limit label changes to Lower Limit.
Upper/Lower Limit	Specifies an integer value that defines the upper or lower limit of the sequence, or the default value of unknown (?). When you specify a positive value for the Increment by field, you can define only an upper limit. If you specify a negative value, you can specify only a lower limit. You cannot specify an upper limit that is less than the initial value. Likewise, you cannot specify a lower limit that is greater than the initial value. If you accept the default, the maximum integer value on your system is used as the defined upper limit and the minimum integer value is used as the defined lower limit.
Cycle at limit	Specifies a value that defines the limit of the sequence. When the sequence reaches this value, it starts again at the value defined in Initial Value.
Multi-tenant	Creates a multi-tenant sequence.

See also

Work with OpenEdge database sequences on page 813
Work with multi-tenant sequences on page 815

OpenEdge Create/Modify Trigger wizard

The **Create/Modify Trigger** wizard allows you to set the properties for new ABL triggers or modify the properties of existing ABL triggers in an OpenEdge database.

Display the **Create/Modify Trigger** wizard from a context menu in the OpenEdge DB Structure view on page 836.

Note: To use the **Create/Modify Trigger** wizard, there must be at least one OpenEdge project opened. If no project is open, an error message appears.

The **Create/Modify Trigger** wizard allows you to set the following properties:

Table	A valid table name from a list of tables in the PUB schema.
Column Trigger	When the option is selected, displays all columns for the selected table in the **Column** combo box. The **Event** field is set to ASSIGN (since that is the only event for a column trigger).
Column	A list of the columns in the selected table.
Event	A list of available trigger types including: CREATE, DELETE, WRITE, FIND, REPLICATION-CREATE, REPLICATION-DELETE, REPLICATION-WRITE, and ASSIGN (for column triggers).

Create new trigger file	When the option is selected, the system creates a new file by the system in a specified project and folder. You specify the project and folder in the **New File** dialog, which appears when you select the **Browse** button. When you specify the project and folder, they appear in the read-only **Parent Folder** field. The read-only **Propath** field displays the PROPATH setting for the selected OpenEdge project.
Attach existing trigger	When the option is selected, the system attaches a specified trigger to this trigger. You select an existing trigger in the **Trigger Selection** dialog box, which appears when you select the **Browse** button. After you select a trigger, the trigger file name appears in the read-only **File Name** field.
Override	When the option is selected, users can redefine and overwrite triggers at run time.
Check CRC	When the option is selected, the system checks the validity of the trigger at run time. CRC (Cyclical Redundancy Check) is an algorithm that verifies the integrity of executables. It compares a stored number in the executable with a number calculated from the schema. If the numbers do not match (after a schema change, for example), the executable must be recompiled.

After you complete the **Create/Modify Trigger** wizard, the **ABL Editor** opens.

See also

Work with OpenEdge database triggers on page 817

Field string attributes

Field string attributes control text preferences and how much space the ABL compiler allocates for a string within an r-code text segment.

The following table describes the string attribute control characters you can enter in the **Field String Attributes** fields of the OpenEdge edit schema wizards on page 837:

Code	Description
C	Center the string.
L	Left-justify the string.
nnn	The maximum amount of space allocated for the text segment. (Specify a number from 1 to 999.) If you do not specify a value, the default number of characters for the field type is used.
R	Right-justify the string.
T	Remove trailing spaces. (Spaces are not physically removed from the string, but are not displayed.)
U	Specify that the Translation Manager should not translate the string.

You can specify the characters in any order but use each character only once. You can use only one of the text justification codes (L, C, or R). If you do not specify justification, the ABL Compiler left-justifies the string by default. The compiler uses these codes to justify strings within the allocated bytes in the r-code text segment, not on the screen.

See also

Table wizard on page 837
Columns wizard on page 838
Index wizard on page 843

Oracle database

You can view Oracle database schema by using the a Details view and a Structure view.

Oracle DB Details view

The **DB Details** view is a read-only display of information specific to the selected node in the Oracle DB Structure View on page 849.

Note: This detailed view is available only for certain nodes. If the detailed view is unavailable for a node you select in the **DB Structure** view, no information appears in the **DB Details** view.

The content of the **DB Details** view changes depending on which node you select in the DB Structure view. There are four top-level nodes: Database, Monitor, Security, and Instance.

Database

When you select a child of one of the nodes listed in the left column of the following table, the corresponding information appears in the **DB Details** view:

TABLE	For a child node, displays details about the following: • Columns - A list of all columns and related SQL information. • Indexes - A list of indexes in the selected table. • Primary key - A list of the primary keys defined for the selected table. • Foreign key - A list of any foreign key restraints defined for a selected SQL table. • Preview - A subset of the records in the selected table. You can set the number of rows returned in the DB Navigator preferences on page 851. • Row count - The total number of rows in the selected table. • Privileges - A list of both table and column privileges (as a toggle). • Dependent Objects - A list of objects dependent on that table, identified by owner, type, and name. • Status - Status details, including properties and their values.

VIEW	For a child node, displays details about the following: • Columns -A list of all columns and related SQL information. • Indexes - A list of indexes in the selected table. • Primary key - A list of the primary keys defined for the selected table. • Foreign key - A list of any foreign key restraints defined for a selected SQL table. • Preview - A subset of the records in the selected table. You can set the number of rows returned in the DB Navigator preferences on page 851. • Row count - The total number of rows in the selected table. • Privileges - A list of both table and column privileges (as a toggle). • Dependent Objects - A list of objects dependent on that table, identified by owner, type, and name. • Status - Status details, including properties and their values.
SEQUENCE	Displays the properties of the sequence, including its current value.
PACKAGE	Displays details about each package, including the SQL code, properties and their values, and a list of dependent objects.
PACKAGE BODY	Displays details about each package body, including the SQL code, and properties and their values.
FUNCTION	Displays details about each function, including parameters, SQL code, properties and their values, and a list of dependent objects.
PROCEDURE	Displays details about a procedure, including parameters, SQL code, properties and their values, and a list of dependent objects.
TRIGGER	Displays details about a trigger, including properties and their values, details about other properties, and SQL code.
SESSIONS	Displays details about the current schema. Includes the columns Username, OS User, Session ID, Serial No, Process ID, LockWait, Status, PGA (Kb), UGA (Kb), Module, Machine, Program, and Logon Time.
JAVA SOURCE	Displays details about a Java object, including information about properties and a display of the Java object source.
DATABASE LINK	Displays details about a database link, including the user name, host, and when the link was created.

Monitor

When you select a child of one of the nodes listed in the left column of the following table, the corresponding information appears in the **DB Details** view:

SESSIONS	Displays the following session information: Username, OS User, Session ID, Serial No, Process ID, LockWait, Status, PGA (Kb), UGA (Kb), Module, Machine, Program, and Logon Time.

JOBS	Displays the following job information: Log User, Priv User, Schema User, Last Date, This Date, Next Date, Total Time, Broken, Interval, Failures, What, NLS Env, and Misc Env.
TOP SQL	Displays the following SQL executions data: SQL Text, Reads/Execution, Buffer Gets, Disk Reads, Executions, Sorts, Address, and Hash Value.

Security

When you select a child of the **Users** node, a list of all authenticated users, identified by UserName, UserID, and when created, appears in the **DB Details** view.

Instance

When you select a child of one of the nodes listed in the left column of the following table, the corresponding information appears in the **DB Details** view:

System Parameters	Displays all the system parameters, which are retrieved from the v$system_parameter table. Includes the columns NUM, NAME, TYPE, and VALUE.
TableSpace	Displays child nodes for every existing table space. Includes Allocation Type, Contents, Extent Management, Initial Extent, Logging, Max Extent, Min ExtLen, Min Extent, Next Extent, PCT Increase, and Status.

Oracle DB Structure View

When you open a connection in the Connections view on page 827, the schema for the database appears in the **DB Structure** view. The **DB Structure** view is a tree view that shows a separate structure for each schema under the root node Database.

Note: You can configure DB Navigator to display or hide schemas. By default, catalogs are displayed while schemas are hidden from view. See DB Navigator preferences on page 851 for more information.

When you select certain nodes in the **DB Structure** view, properties and values appear in the Oracle DB Details view on page 847.

The top-level nodes in the **Oracle DB Structure** view are Database, Monitor, Security, and Instance. You can use DB Structure view on page 828 to show only certain schema items in the view; you cannot, however, create or edit schema.

Database

The root node **Database** is at the top level of the **DB Structure** view. If the database supports catalogs and you have selected **Show catalog** in the DB Navigator preferences, all catalogs appear below the database node. If you have selected **Show schema** in the DB Navigator preferences, all schemas appear below the database node.

Beneath the schema and catalog nodes, the following child nodes appear:

SYNONYM	All aliases that were created in SQL against tables. SQL statements can use these aliases instead of the name specified when the schema item, such as table, view, or synonym, for example, was created. The child nodes contain only tables, views, or other synonyms. They do not display columns or indexes of the tables.

TABLE	Displays all application tables. Table nodes expand to show columns and indexes. When you select a table name, data and meta-data appear in the DB Details view on page 829. **Note:** Since tables are displayed in ASCII order and sorting is case-sensitive, all lowercase table names sort after the uppercase table names.
VIEW	Displays the names of all created views. A SQL view allows you to extract rows and columns from one or more related tables and to treat the resulting data set as a virtual table that can be viewed or updated.
SEQUENCE	Displays all sequences, which create an incremented, serial list of numbers applied to a column in a database table.
PACKAGE	Displays all packages, which contain specific procedures, functions, and other schema items in one entity.
PACKAGE BODY	Displays details about each package body, including the SQL code, and properties and their values.
FUNCTION	Displays all functions, or pieces of a program that you can use separately from the remainder of the program.
PROCEDURE	Displays all procedures that are stored in the database and available for reuse.
TRIGGER	Displays all triggers, which you define to run when you modify a table or view or when a particular action occurs.
SESSIONS	Displays information about the current user-to-database connection in the Oracle DB Details view on page 847.
JAVA SOURCE	Displays all Java objects.
DATABASE LINK	Displays all database links. Each database link is present as a local database object and contains specifics necessary for connecting to another database.

Monitor

When you select the **Monitor** node, the following subnodes appear:

SESSIONS	Displays information about the current session, such as username, Session ID, machine name, and the user's logon time, in the Oracle DB Details view on page 847.
JOBS	Displays information about a job, or task, that you run once or on a particular schedule, in the Oracle DB Details view on page 847.
TOP SQL	Displays SQL executions in the Oracle DB Details view on page 847, enabling you to see how resources are affected when a SQL statement is executing.

Security

When you select the **Security** node, the following subnode appears:

Users	Displays all authenticated users by username, user ID, and the date on which the user was created.

Instance

When you select the **Instance** node, the following subnodes appear:

System Parameters	Displays all system parameters (retrieved from the v$system_parameter table) in a viewer.
TableSpace	Displays all table spaces, or logical storage units, in the database.

See also

Oracle DB Details view on page 847
DB Navigator preferences on page 851

Preferences

You can access the preference pages for DB Navigator by choosing **Windows** > **Preferences** > **Progress Databases** > **DB Navigator**.

DB Navigator preferences

The following list describes the preferences you can set in the **DB Navigator Preferences** page:

Preview row limit	Specifies the number of rows to return in the Preview tab folder. The recommended range is 1- 100. The default is 80.
SQL Results row limit	Specifies the number of rows to return after execution of SQL Select statements. The recommended range is 100 - 5000. The default is 2000.
SQL Results rows to batch	Specifies the number of rows to batch when retrieving records. The default is 100.
SQL Editor separator	Specifies the separator to use for separating multiple SQL statements. The default is a semicolon.
Auto commit	Determines the default AutoCommit mode for a connection. If you select the **Auto commit** option in the DB Navigator preferences, AutoCommit is selected by default for each SQL connection profile. (You can, however, select or deselect **AutoCommit** for any connection profile individually.) When you select **AutoCommit**, all executed SQL statements that update the database are automatically committed. If you do not select **AutoCommit**, you must manually commit all transactions by either clicking the **Commit** button in the Connections view on page 827 or issuing a COMMIT statement. **Note:** You see the **Auto commit** option only if you do not have the **Auto-Login on connect** option selected for the connection profile.

Commit On Close	Specifies that commit is performed on closing of the connection. You can enable this option only if the **AutoCommit** option is not selected.
Columns auto-completing assistance	Enables auto-completion for columns within the SQL Editor preferences on page 854. If this option is not selected, columns are available in the auto-completion pop-up only if the column's table node has been expanded. Be aware that auto-completion can slow performance during connection.
Save and restore last selected node in Database Structure View	Saves the last selected node in the **DB Structure** view, then expands and selects the saved node when the connection is restarted.
Append table name to column	Causes the table name to be appended when column names are pasted to the clipboard (for example, Customer.Name).
Enclose in quotes	Causes quotes to be added to column names, table names, or schema when copied to the clipboard (for example, "CustNum", "Name") when Generate SQL queries on page 785 or creating a table script. **Note:** Column names that contain leading underscores (for example, _Buffer-ID) must be enclosed by quotes. Otherwise, the SQL Editor does not recognize them.
Delimiter	Specifies the character used as a delimiter when multiple objects are copied to the clipboard.
Show catalog or Show schema	If **Show catalog** is selected and the database supports catalogs, then all catalogs are listed beneath the root node and all objects per catalog (tables, views, etc.) are grouped together. If **Show schema** is selected, all of the schemas are listed beneath the root node. **Note:** When you change from one preference to the other, you must refresh the DB Structure view, or close and reopen the connection.

See also

Set preferences on page 778
OpenEdge Schema Editing preferences on page 853
SQL Editor preferences on page 854
SQL Connection profile preferences on page 852

SQL Connection profile preferences

The **Connection Profiles** preferences page displays SQL connection profiles. This page includes the following controls:

Add	Adds a new SQL connection profile for the workspace.
Edit	Modifies aspects of an existing SQL connection profile.

Copy	Copies an existing SQL connection profile.
Remove	Deletes a SQL connection profile.

See also

Set preferences on page 778
OpenEdge Schema Editing preferences on page 853
SQL Editor preferences on page 854

JDBC Drivers preferences

The **JDBC Drivers preferences** page allows you to configure JDBC drivers. The page provides a list of available JDBC drivers currently defined for the workspace. Using this page, you can:

Add	Add a new JDBC driver. The **Add new driver** dialog allows you to add a new JDBC driver for the workspace. The page displays Java Class Paths and Extra Class Paths already defined for the workspace. Use the List Drivers button to display existing drivers. Use the drop-down menu to select the **Driver Class Name**. When adding a JDBC driver, you must specify the name of the driver. Type a URL for the driver in the **Example URL** field. If you are using an IPv6 address in the URL for OpenEdge or MS SQL server databases, be sure to insert a bracket before and after the address; for example, [thehostmachine]. **Note:** See the documentation for the driver if you require more information about the driver.
Edit	Modify aspects of an existing JDBC driver. Select the driver you want to edit from the list of available drivers, then click **Edit**.
Copy	Copy a driver. Select the driver you want to copy from the list of available drivers, then click **Copy**.
Remove	Delete a JDBC driver. Select the driver you want to delete from the list of available drivers, then click **Remove**.
Set Default	Set the selected JDBC driver as the default.

See also

Set preferences on page 778
Configure a JDBC driver on page 780

OpenEdge Schema Editing preferences

The following list describes the preferences you can set in the **Databases** > **OpenEdge Schema Editing Preferences** page:

Open script in editor upon completion of wizard	When the option is enabled, a script that is generated by one of the OpenEdge edit schema wizards on page 837 opens in the SQL Editor on page 830.
Execute and commit Schema change on completion of wizard	When the option is enabled, a SQL script generated by one of the **Edit Schema** wizards executes, is committed, and opens in the SQL editor. When the option is disabled, the SQL script does not update the schema. However, the script appears in the SQL editor. This is useful when you want to create a script but do not want to change the schema. **Note:** This option can be disabled only if the **Open script in editor** option is selected.
Grant public SQL rights	Allows users who do not have DBA privileges to view data or edit tables created by the **Edit Schema** wizard.
Default Character Size	Establishes the default size for new character fields.
Default Decimal Size	Establishes the default size for new decimal fields.
Update format to reflect entered size value	When this option is enabled, you can enter a value in the **Size to Format ratio** field. This value is used when entering the size value for a character field. The value of the format field is updated to reflect the entered size as you type.
Default Format	Displays default formats for all ABL data types. You can change the defaults by selecting a data type and clicking the **Set** button.

See also

Set preferences on page 778
OpenEdge edit schema wizards on page 837
SQL Editor preferences on page 854
SQL Connection profile preferences on page 852

SQL Editor preferences

The **SQL Editor Preferences** page allows you to define the SQL editor font and color coding for various elements such as tables, columns, and SQL key words. The preferences also allow you to specify various **Export to Clipboard** options.

See also

SQL scripting on page 784
SQL Editor on page 830
SQL Connection profile preferences on page 852