



Use Pro2

OpenEdge®

Table of Contents

Part I: Get started.....	9
What's new in Pro2.....	9
Get started with Pro2.....	11
Install and configure Pro2 for LAN	15
Install and configure Pro2 for WAN.....	31
Install and configure Pro2 on Linux.....	47
Pro2 Enterprise View.....	48
Set Up Pro2 Enterprise View.....	48
 Part II: Manage.....	 53
Customize Pro2.....	54
Upgrade Pro2 5.5.x to 6.4	55
Uninstall Pro2.....	61
Establish secure database connections.....	61
Use replication triggers.....	62
Use the job runner.....	65
Remove replication triggers.....	66
Customize Pro2 replication.....	67
Split replication threads.....	68
Configure Pro2 to target SQL database connectivity.....	70
Configure Pro2 e-mail notifications.....	74
Use second-pass replication.....	75
Bulk load with Pro2.....	77
Dump and load with Pro2.....	87
Migrate your OpenEdge database with Pro2.....	88
Check replication logs.....	91
How to schedule jobs in Pro2.....	92
Use CDC with Pro2.....	94
Manage Pro2 Properties.....	102
GET bulk load report API.....	104
GET replication queue records API.....	109
GET thread data API.....	111
GET Pro2 connection information API.....	113
GET version information API.....	113
GET instance information API.....	114
 Part III: Additional information.....	 117
Pro2 FAQs.....	117

Command-line references.....	119
Processor procedure generator.....	122
Pro2 repl databases and table schemas.....	123
Pro2 directory hierarchy.....	148
Pro2 program files.....	149
Replication procedure library.....	153
Replication processor.....	154
Plan for disaster recovery with Pro2.....	155

Copyright

© 2022 Progress Software Corporation and/or its subsidiaries or affiliates. All rights reserved.

These materials and all Progress® software products are copyrighted and all rights are reserved by Progress Software Corporation. The information in these materials is subject to change without notice, and Progress Software Corporation assumes no responsibility for any errors that may appear therein. The references in these materials to specific platforms supported are subject to change.

#1 Load Balancer in Price/Performance, 360 Central, 360 Vision, Chef, Chef (and design), Chef Habitat, Chef Infra, Code Can (and design), Compliance at Velocity, Corticon, Corticon.js, DataDirect (and design), DataDirect Cloud, DataDirect Connect, DataDirect Connect64, DataDirect XML Converters, DataDirect XQuery, DataRPM, Defrag This, Deliver More Than Expected, DevReach (and design), Driving Network Visibility, Flowmon, Inspec, Ipswitch, iMacros, K (stylized), Kemp, Kemp (and design), Kendo UI, Kinvey, LoadMaster, MessageWay, MOVEit, NativeChat, OpenEdge, Powered by Chef, Powered by Progress, Progress, Progress Software Developers Network, SequeLink, Sitefinity (and Design), Sitefinity, Sitefinity (and design), Sitefinity Insight, SpeedScript, Stylized Design (Arrow/3D Box logo), Stylized Design (C Chef logo), Stylized Design of Samurai, TeamPulse, Telerik, Telerik (and design), Test Studio, WebSpeed, WhatsConfigured, WhatsConnected, WhatsUp, and WS_FTP are registered trademarks of Progress Software Corporation or one of its affiliates or subsidiaries in the U.S. and/or other countries.

Analytics360, AppServer, BusinessEdge, Chef Automate, Chef Compliance, Chef Desktop, Chef Workstation, Corticon Rules, Data Access, DataDirect Autonomous REST Connector, DataDirect Spy, DevCraft, Fiddler, Fiddler Classic, Fiddler Everywhere, Fiddler Jam, FiddlerCap, FiddlerCore, FiddlerScript, Hybrid Data Pipeline, iMail, InstaRelinker, JustAssembly, JustDecompile, JustMock, KendoReact, OpenAccess, PASOE, Pro2, ProDataSet, Progress Results, Progress Software, ProVision, PSE Pro, Push Jobs, SafeSpaceVR, Sitefinity Cloud, Sitefinity CMS, Sitefinity Digital Experience Cloud, Sitefinity Feather, Sitefinity Thunder, SmartBrowser, SmartComponent, SmartDataBrowser, SmartDataObjects, SmartDataView, SmartDialog, SmartFolder, SmartFrame, SmartObjects, SmartPanel, SmartQuery, SmartViewer, SmartWindow, Supermarket, SupportLink, Unite UX, and WebClient are trademarks or service marks of Progress Software Corporation and/or its subsidiaries or affiliates in the U.S. and other countries. Java is a registered trademark of Oracle and/or its affiliates. Apache and Kafka are either registered trademarks or trademarks of the Apache Software Foundation in the United States and/or other countries. Any other marks contained herein may be trademarks of their respective owners.

Please refer to the NOTICE.txt or Release Notes – Third-Party Acknowledgements file applicable to a particular Progress product/hosted service offering release for any related required third-party acknowledgements.

September 2022

Product version: Progress OpenEdge Pro2 6.4

Preface

Purpose

This manual explains how to use OpenEdge Pro2. It provides startup instructions about the Pro2 utilities. Additionally, it also discusses the installation and configuration of Pro2, replication process, replication triggers, splitting replication threads. It also describes how to work with CDC, set up second pass replication and Pro2 email alarms.

For the latest documentation updates see the OpenEdge Product Documentation at <https://docs.progress.com>.

Audience

This document is intended for database administrators (DBA's) and consultants to help them configure Pro2 and use it to replicate data. It assumes a fundamental knowledge of both OpenEdge and DataServer for Microsoft SQL and Oracle.

Organization

[Get started with Pro2](#)

Describes the installation process of Pro2.

[Pro2 Enterprise View](#) on page 48

Describes Pro2 Enterprise View and how to install and configure it.

[Customize Pro2](#) on page 54

Elaborates on how to customize Pro2 to suit your business needs.

[Upgrade Pro2 5.5.x to 6.4](#) on page 55

Describes how to upgrade Pro2.

[Uninstall Pro2](#) on page 61

Walks through the steps of uninstalling Pro2.

[Use replication triggers](#) on page 62

Describes what replication triggers are, and how to use them.

[Remove replication triggers](#) on page 66

Illustrates how to remove replication triggers.

[Customize Pro2 replication](#) on page 67

Describes how you can customize Pro2.

[Split replication threads](#) on page 68

Describes how to split replication threads.

[Configure OpenEdge to SQL connectivity for Pro2](#)

Discusses SQL databases and you can configure them for Pro2

[Configure Pro2 e-mail notifications](#) on page 74

Describes how to set up, reset, and remove Pro2 replication failure email notifications.

[Use second-pass replication](#) on page 75

Illustrates how to use second pass replication with Pro2

[Bulk load with Pro2](#) on page 77

Overviews bulk-loading with Pro2

[Check replication logs](#) on page 91

Explains how use the check replication log function.

[How to schedule jobs in Pro2](#) on page 92

Describes how to use the Job Scheduler in the Pro2 UI.

[Use CDC with Pro2](#) on page 94

Discusses Change Data Capture and how to use it with Pro2.

Documentation conventions

See [Documentation Conventions](#) for an explanation of the terminology, format, and typographical conventions used throughout the OpenEdge content library, including information about the following:

- Using ABL documentation
- Examples of syntax descriptions
- OpenEdge messages

Get started

For details, see the following topics:

- [What's new in Pro2](#)
- [Get started with Pro2](#)
- [Install and configure Pro2 for LAN](#)
- [Install and configure Pro2 for WAN](#)
- [Install and configure Pro2 on Linux](#)
- [Pro2 Enterprise View](#)

What's new in Pro2

Pro2 6.2 release

The Pro2 6.2 release offers new features and enhancements that increase usability and management.

Pro2 6.2 database migration

To stay competitive in the modern business world, your applications need to run as close to 24/7 as possible. In some cases, you can only have downtime limited to 4 hours. This can make upgrading or migrating your OpenEdge database difficult, even with proper planning. With Pro2 version 6.2, you can migrate your OpenEdge database with minimal downtime. In this video, we will show you how you can migrate with Pro2.

Pro2 6.2 CDC enhancements

In previous versions of Pro2, the CDC replication process converted CDC records to Pro2 `replqueue` records. This procedure increased the total time of the replication.

In Pro2 6.2, CDC replication records are consumed directly by Pro2, bypassing the need for the records to be converted to `replqueue` records.

The direct replication of CDC works on all Pro2 target database types: Microsoft SQL Server, Oracle, and OpenEdge. This enhancement also functions on both network topologies LAN and WAN.

For more information, see [Use CDC with Pro2](#) on page 94.

Pro2 6.2 Bulk-load enhancements

In previous releases of Pro2 bulk load process used row by row transactional commits on target replication database.

In Pro2 6.2, the bulk-load process is optimized to directly generate native SQL Insert statements and wrap multiple inserts into a single target transaction. This enhancement has improved the efficiency of the load process. For table loads that run for days or weeks, this overall improvement can be dramatic.

Because the new bulk-load method is a Pro2 produced methodology, this new feature operates identically in both Oracle and Microsoft SQL Server environments, allowing Pro2 to provide wide-transaction support in Microsoft SQL Server environments.

For more information, see [Bulk load with Pro2](#) on page 77

Pro2 6.1 release

The Pro2 6.1 release offers new features and enhancements that increase usability and management.

Database schema changes in Pro2 6.1

The `repl.db` schema remains unchanged from 6.0. However, the 5.5 and 6.0 dashboard database, `ReplPerf.db`, has been deprecated in favor of a new database labeled `pro2`. This database resides only within the Pro2 installation folder and now holds configuration information as well as newer performance metrics.

Installation updates in Pro2 6.1

The Pro2 web application is now deployed using `.paar` files in place of `.war` files. The newer method eliminates installation issues encountered with different OpenEdge versions.

The Enterprise View in Pro2 6.1

The Pro2 Enterprise View is a centralized dashboard that aggregates mission-critical data, reports, and metrics across all your Pro2 instances. From the Enterprise View dashboard, you can quickly access each of your Pro2 instances to manage and act on any reports or replications from the instance. The Enterprise dashboard utilizes a new database labeled `Pro2Ent` and does not require connectivity to any source or target databases. For more information, see [Pro2 Enterprise View](#) on page 48.

The Job scheduler in Pro2 6.1

The Pro2 Job Scheduler allows users to optionally discontinue the use of operating system specific scheduler utilities like the Windows Task Scheduler. The Pro2 scheduler works across all OpenEdge supported operating system infrastructures and provides a common interface for dealing with complex scheduling requirements. For more information, see [How to schedule jobs in Pro2](#) on page 92.

Status Check improvements in Pro2 6.1

Status check functionality was enhanced to monitor split threads and Enterprise Push program details.

Web user interface enhancements in Pro2 6.1

- The configuration for **LAN/WAN** was moved to the Settings Menu (**Menu > Settings > LAN/Wan**). This eliminates the perpetual prompting for this information in the New/Edit replication wizard screens.
- **CDC/Trigger update** is now integrated with the **Select Source** page in the **Manage Replication** wizard.
- All watch-box detail grids were modified to include **Clear All** functionality.
- Instance Dashboard improvements:
The dashboard and menu structure were modified/reorganized to provide consistency with the Enterprise View dashboard. Additional performance graphs and CDC statistics are now available on the dashboard.
- Safari and Internet Explorer are now included in the list of supported browsers.

Get started with Pro2

OpenEdge Pro2 is a lightweight, configurable tool that provides near real-time replication of an OpenEdge database to Microsoft SQL, Oracle, or another OpenEdge database.

Learn about Pro2

Pro2 supports enterprises in delivering the critical business data needed to support analytical and other business intelligence initiatives by replicating specific tables and fields, databases, or multiple databases. All replications facilitated by Pro2 can take place while your transactional database is up and running, removing connectivity limitations, disruptions, and risk to your normal business operations.

With Pro2's web UI you can intuitively configure and monitor your database replications, create new replication processes, and manage bulk loading. To deliver near real-time replication, Pro2 uses either OpenEdge Change Data Capture (CDC) or trigger-based replication for optimal performance with your OpenEdge database.

How it works

Replication triggers, or CDC, automatically capture all data changes that occur on your source database and send those changes to your target database. This means that data, like tables and rows, are not actually transferred from your source database to target database, what has transferred is a log of the changes on your source database. Information is written to the replication queue (ReplQueue) in the internal repl and Pro2 databases to identify the created, updated, or deleted record. The multi-threaded replication process retrieves the updated record and the queued data in the replication is moved to the target database. Done in near real-time, the I/O operation is optimized with the updated record residing in cache. Any analysis can be run against current data in a replicated database, leaving the transactional database resources to their normal activities, keeping your data accurate and secure. This is how Pro2 remains lightweight while providing an up-to-date copy of your source database.

The replication tables in the repl and Pro2 databases consist of minimal data, indexing, and a single sequence for process control. The repl database contains the first nine replication tables, while the Pro2 database contains the remaining twenty-six. If your business needs require, the nine tables that are associated with the repl database can be embedded directly into the source database. A common use case for type of configuration is if you need to migrate your data in one OpenEdge database to another in preparation of an upgrade or a dump and load.

To replicate Pro2 uses a replication processor that cycles through replication records periodically, based on user configuration, and replicates the table data directly to the target database via the OpenEdge DataServer. All replication data is captured and maintained in Pro2 replication database tables to facilitate table mapping between source and target database, as well as to maintain the queue record, the record lock, the database connection and configuration details, and the thread level information.

Pro2 allows you to configure the time interval between the replication operations. You can customize the interval in real time according to your needs. For example, you can set the interval to every n seconds, hourly, twice a day, or daily depending on your specific business needs.

Additionally, you can pause all replications or a specific table replication temporarily should the need arise. You can restart the paused replication at any time. Keep in mind that, while the replication process is suspended, users of the target database do not have access to the records that have been updated in your source OpenEdge database until the replication process is restarted and the replication queue is completely cleared.

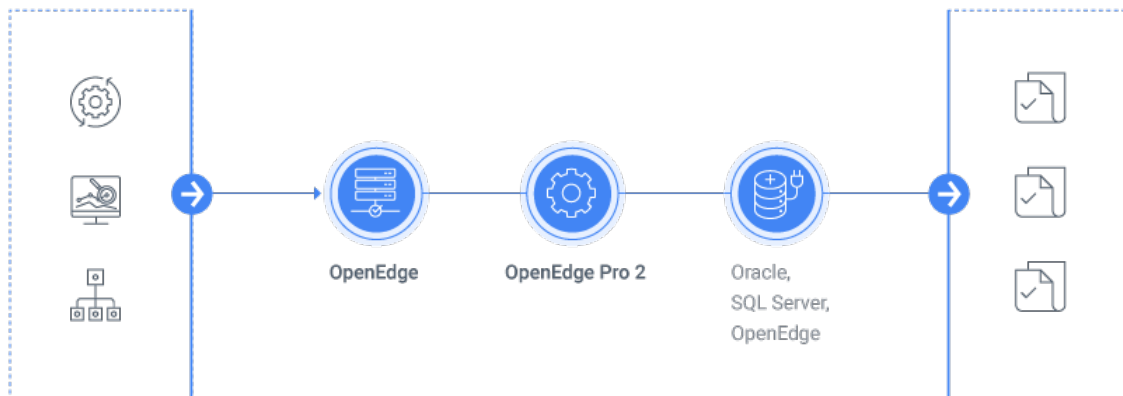
Note: If the replication process is paused, the backlog of data change events could take a long time to process if paused for long period of time.

While the repl and Pro2 databases are lightweight, their initial setup and configuration should be subject to every consideration and precaution as if you were creating a database for an enterprise application in a production environment. Without these databases, data is not replicated from your source database to your target database. This can cause loss of synchronization.

Confer with your database administrator and other key stakeholders to when creating the repl and Pro2 database for your production environment. For more information about database administration, see [OpenEdge database essentials](#).

Architecture

The basis of the replication functionality consists of five primary programs that generate the replication triggers, generate the replication processor functionality, and process the replication records, and a web based user interface application for monitoring and administering the replication processor and configuration.



LAN or WAN

Pro2 architecture varies over local area network (LAN) or wide area network (WAN). Each configuration, whether WAN or LAN, includes:

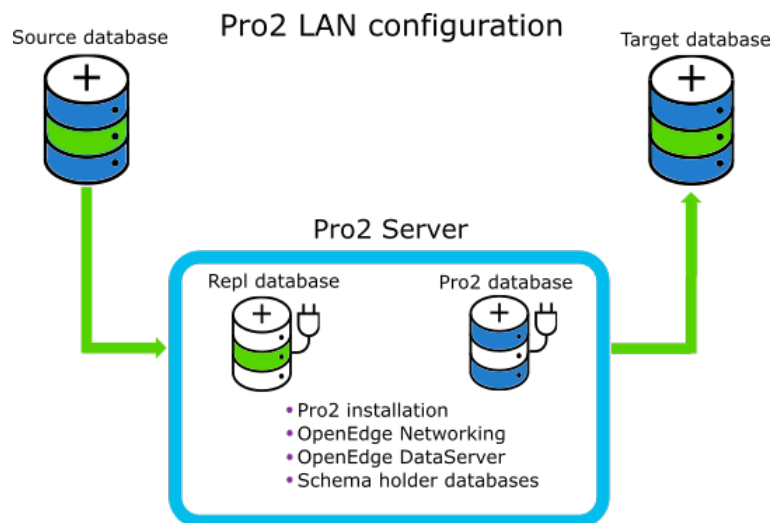
- An OpenEdge source database. There is usually a user application tied to the source database.
- The Pro2 and repl databases.
- A target database that is either a Microsoft SQL Server, Oracle, or an OpenEdge database.

LAN

Pro2 architecture over LAN consists of the following components:

- A source, OpenEdge, database with a user application tied to it.
- The Pro2 and replication databases.
- A target database which can be either Microsoft SQL Server, Oracle or an OpenEdge database.

Note: If your target database is not an OpenEdge database, you need an additional schema holder database which contains information about the data definitions of the target databases.

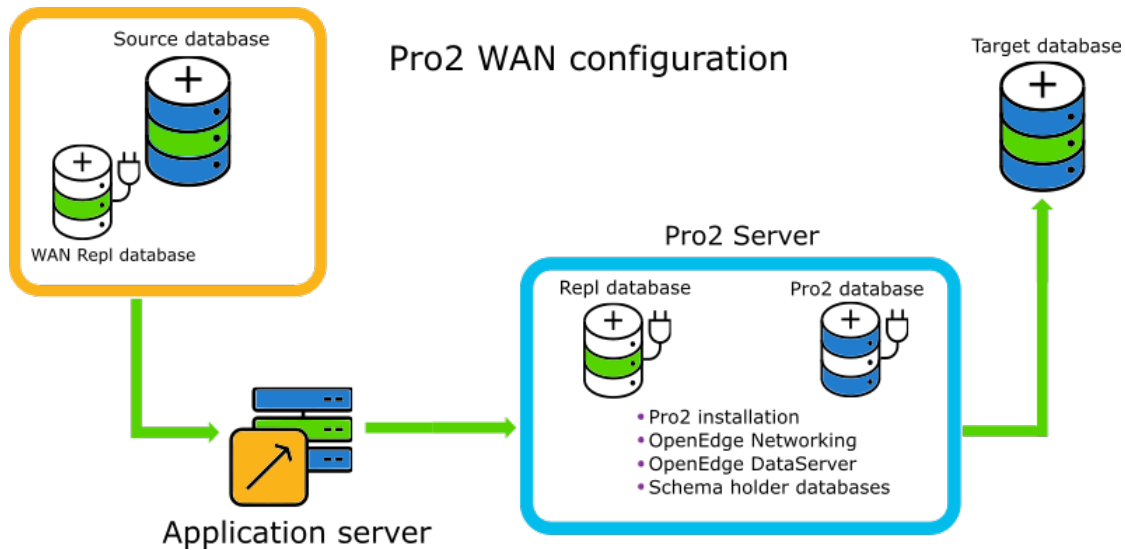


WAN

When the target database is in a different geographic location than the source OpenEdge database, configure Pro2 to include a Progress Application Server on the source database server in addition to the standard configuration on the Pro2 server. In this context, the Pro2 server is where the Pro2 replication instance is configured and operating.

Instead of running the replication procedures using typical client/server mode connections to the source and repl databases, Pro2 sends requests to PAS for OpenEdge (or a classic application server) on the database server which returns data to the calling procedure on the Pro2 server.

Note: The Pro2 server must be on the same local area network as the target database server.



Installation planning and considerations

Before you proceed with the initial installation and configuration of Pro2, take time to create an installation plan for your implementation. Confer with your database administrator, system administrator, and other key stakeholders. Gather information about your implementation needs and consider the following questions.

- What is the size of your OpenEdge database?
- Do you have an environment to test the installation in?
- Where will Pro2 be installed? Keep in mind that it can be installed on its own physical or virtual machine, or on the same machine as your target database.
- Do you require a LAN or WAN configuration?
- Which tables and fields need to be replicated? You can replicate your entire database a portion of it.
- Do you need to embed the replication tables in your source database?

Pro2 setup process

- [Install and configure Pro2 for LAN](#) on page 15
- [Install and configure Pro2 for WAN](#) on page 31

Install and configure Pro2 for LAN

A LAN configuration for Pro2 and your OpenEdge application is best suited for on-premises business solutions. For example, assume that you have an OpenEdge application, OpenEdge database, and a Microsoft SQL Server database set up and configured for your on-premises environment.

In this scenario, your OpenEdge database supports your OpenEdge application and you use the Microsoft SQL Server database for reporting and analytics. Rather than periodically updating your Microsoft SQL Server database with information and changes from your OpenEdge database, you can use Pro2 to replicate changes on your OpenEdge database to your Microsoft SQL Server database in near real time. To achieve this, Pro2 uses a series of replication databases, configuration tables, and a queuing table to communicate database changes from the source database to the target database, in this case from your OpenEdge database to your Microsoft SQL Server database. In short, the Pro2 application connects to the source, replication, and target databases, determines what changed on the source database, fetches the records that were changed, and pushes those records to the target database.

You can install Pro2 at the same time you install and configure OpenEdge, or you can install Pro2 as an add-on to complement your OpenEdge environment later on. Installing Pro2 as an add-on can be especially useful when you are upgrading OpenEdge versions, or need to migrate databases. For more information about database migration, see [Migrate your OpenEdge database with Pro2](#) on page 88.

Before you can install Pro2, you must first install and configure OpenEdge. This installation must be on a separate machine from your source OpenEdge database installation. It can be on its own machine, virtual or physical, or on the same system as your target database. Likewise, when you install Pro2, you can install and configure it on its own machine or on the same system as your source database. The installation of OpenEdge and Pro2 on its own machine, is sometimes referred to as the Pro2 server. The Pro2 server contains PAS for OpenEdge instance, the Repl and Pro2 databases, and the configuration information for the web based user interface.

System requirements

The specifications for a Pro2 server are generally the same whether server is a physical or virtual machine. Because are determined by the OS being loaded on the box. However the following is a general idea of new specifications.

- Minimum 2 processors.
- Memory: If using a 64-bit operating system, use 8 gigabytes of RAM.

Note: If your machine also hosts a SQL server, then use a 64-bit platform with a minimum 8 gig of memory.

- Network speed: minimum 1 gigabit per second.
- Disk: 50 gigabytes of allocated space. This allocation is for both the installation and for any content generated by Pro2, such as log files.

Note: If your machine also hosts a SQL Server database, then the size of the SQL Server database will be approximately twice the size of the Progress data space requirements.

Note: In either a physical or virtual environment it is recommended to spread the I/O. On a physical machine this means separating the operating system/Pro2 and/or SQL database onto separate physical drives. This is the same for a virtual machine the where “disks” become multi-VMDK file (Virtual Machine Disk). For example separate the operating system and Pro2 installation onto separate VMDK files.

These are minimum recommendations. All parameters can be increased to accommodate more robust hardware.

Note: Additionally, during your planning phase, it is important to understand that the Pro2 database uses large object data types. By default, CLOB fields are set to Latin-1 and basic collation by default. Adjust these settings to support your requirements before loading the Pro2 .df file.

For more information about OpenEdge system requirements, see the [Progress Product Availability Guide](#).

Before you begin

Ensure that you have OpenEdge installed and configured on the same machine that you are going to install Pro2 on. For more information about installing OpenEdge, see [Install OpenEdge on Windows](#).

Main steps to install and configure Pro2

1. Install Pro2.
2. Create a Repl and Pro2 database.
3. Start the PAS for OpenEdge instance for the Pro2 web user interface.
4. Load the configuration file.
5. Add the source database details.
6. Add the target database details.
7. Generate the target schema file.
8. Load the target database table file.
9. Map the tables in the source database to the target database.
10. Generate the replication code based on your configuration.
11. Deploy replication triggers.

Install Pro2

1. Close all applications before beginning the installation.
2. Run the `Pro2.exe` file.

There can be a numeric value in the file name that indicates the version of Pro2, for example, `Pro2-6.2.exe`.

3. In the Pro2 installation wizard, click **Next** to Choose the install folder.
4. Specify the path, or click **Choose** to browse and select where you want to install Pro2.

The default installation directory is `C:\Progress\Pro2`.

5. In the **Choose OpenEdge** window, specify the path, or select **Choose** to browse and set the OpenEdge home directory.

The OpenEdge home directory is where OpenEdge is installed on your machine.

The default directory is `C:\Progress\OpenEdge`.

6. On the **PAS Ports** screen, enter the relevant PAS for OpenEdge information in the **Port** and **Instance Name** fields.

The default instance name is `Pro2Web`. You can change this name to according to your needs. It is recommended to change the instance name for each Pro2 installation.

Note: For each installation of Pro2, you must specify different port information. No two installations can use the same ports on the same machine.

7. Click **Next** and review the options you chose for this installation in the **Pre-Installation Summary** page.
8. Click **Install**.

Note: The Pro2 installation wizard can take several minutes to complete and may appear to lag at times. Allow the installation wizard to complete. Do not prematurely cancel the process.

9. Click **Done**.
10. Check the installation logs at `C:\Progress\Pro2\install\logs` folder.

After the installation is complete, go to the Pro2 root folder to continue the configuration process. If you used the default settings during the installation, then this folder is `C:\Progress\Pro2`.

All files, scripts, and procedures for Pro2 are relative to the root folder. This allows Pro2 to be installed several times on the same drive without each installation interfering with each other. This functionality was designed to allow you to be able to create development and production environments to test implementations, as needed, without affecting your production environment.

For more information about the Pro2 root folder and file directory, see the Directory reference at the end of this guide.

Create a Repl and Pro2 database

In this part of the configuration process, you build a Repl and Pro2 database by using Proenv commands and the `repl.df` and `pro2.df` files.

Standard OpenEdge database utilities are used to create the Repl database. The structure file (`.st`) and schema definition file (`.df`) used to create the Repl database can be found in the `db` folder of the Pro2 root folder. If you are using replication triggers with a LAN configuration, all configuration files, parameter (`.pf`) files, and scripts need to be modified to include a connection to the Repl database wherever there is a connection made to the source database. Change data capture (CDC) is not affected by this requirement.

It is important to note that this procedure describes the high level steps to create the Repl and Pro2 databases. When creating these databases every consideration and precaution should be taken, as if you were creating a database for an enterprise application in a production environment, to ensure their availability. Without these databases, data is not replicated from your source database to your target database. This can cause loss of synchronization.

Confer with your database administrator and other key stakeholders to when creating the Repl and Pro2 database for your production environment. For more information about database administration, see [OpenEdge database essentials](#).

To create a Repl and Pro2 database:

1. Open a **Proenv** instance.
2. Set your working directory to the `db` folder in the Pro2 root directory.

Note: Check the directory of the `db` folder to view the database instances. Type `dir` after navigating to the database folder.

3. Create an empty repl database instance by typing the following command `prodb repl empty`.
4. Create an empty Pro2 database instance by typing the following command `prodb pro2 empty`.

Note: Ensure that the you set the code page of the Repl and Pro2 databases to match the code page of your source and target databases.

5. Load the table definitions file in the Repl database by typing `prowin repl -1`.
The **Procedure Editor** window appears.
6. Navigate to **Tools > Data Administration**.
7. In the **Data Administration** window, navigate to **Admin > Load Data and Definitions > Data Definitions (.df file)**....
8. In the **Load Data Definitions** window, load the `repl.df` file and click **OK**.

Note: The `repl.df` file is located in the `db` folder of the Pro2 root folder.

9. Load table definitions in the Pro2 database by entering `prowin pro2 -1`.
The **Procedure Editor** window appears.
10. Navigate to **Tools > Data Administration**.
11. In the **Data Administration** window, navigate to **Admin > Load Data and Definitions > Data Definitions (.df file)**.
12. In the **Load Data Definitions** window, load the `pro2.df` file and click **OK**.

Note: The `pro2.df` file is located in `Pro2 folder/db`.

13. Start the repl and pro2 databases by typing:
 - `Proserve repl`
 - `Proserve pro2`
14. Add the Pro2 database connection details to the `replProc.pf` file in the Pro2 root folder under `\bprepl\Scripts\replProc.pf` to connect the replication threads and PAS for OpenEdge instance to the Pro2 database. Navigate to the `bprepl\scripts` folder and open the `replProc.pf` file. Add the complete path of the database in the file and click **Save**.
15. To check both Repl and Pro2 database instances are connected successfully, open the **Procedure Editor** from the `bprepl\Scripts` folder and navigate to **Tools > Data Dictionary**. If the connection is successful, the **Tables** section displays the tables.

Start the PAS for OpenEdge instance and log in to the Pro2 web application

Now that the database instances are set up successfully, start the PAS OpenEdge instance and log in to the Pro2 web application.

1. Start a Proenv instance.
2. Navigate to the **Pro2** folder by entering `cd` followed by name of the folder where you installed Pro2, for example, `cd Pro2v62`.
3. Enter `instance name\bin\tcman.bat env`.

Note: The default instance name is Pro2Web.

4. Enter `instance name\bin\tcman.bat start`.
5. To verify that the instance started successfully, type `instance name\bin\tcman.bat env`. The server running section shows a number if the instance started.
6. Open any browser and log in at `localhost:port number/pro2/static/` using the default credentials.

Note: Depending on your business needs, it may be useful to configure your PAS for OpenEdge instance as a Windows service. For more information about running a PAS for OpenEdge instance as a Windows service, see [Register and manage an instance as a Windows service](#).

Load the configuration file

Before you set up the source and target database connections in the user interface, you must set up a basic configuration by loading the default configuration file. The configuration file consists of all the default properties and records that are necessary to set up the Pro2 environment.

Note: If you use Internet Explorer to load the configuration file, you may encounter errors. To avoid them, use an alternative web browser like Google Chrome.

To load the configuration file:

1. In the Pro2 web interface, navigate to **Actions > Tools > Load Configuration**.
2. Click **Select Files** and load the `.ini` configuration file, for example `replbasev610.ini`, from the Pro2 folder.
3. Click **Submit**. A success or failure notification is displayed after the upload is complete.

You can view the default properties and records on the **Properties** tab after the configuration file is successfully loaded.

Start the job runner

To start the job runner and initiate the scheduled Enterprise Push job:

1. Navigate to the Pro2 Scripts folder, for example `C:\Pro2\bprepl\Scripts`.
2. Select and execute the `jobrunner.bat` file.
3. Navigate back to the web interface and confirm that the `jobrunner.bat` file is running by checking the status in the Pending Jobs watch-box.

Connect to a source and target database

The Pro2 source database is an OpenEdge database where the data modifications are made, and the target database is the database where the modifications are replicated. The source database must be an OpenEdge database, the target database can be an OpenEdge database, Microsoft SQL Server, or an Oracle database.

Add the source database details

You can set up either trigger-based replication or CDC-based replication. In a trigger-based-replication, the replication queue records (also known as ReplQueue records) are generated by deploying Pro2 triggers on a source database. In a CDC-based replication the ReplQueue records are generated from change tracking table. However, for CDC-based replication, the source database must be CDC enabled.

The screenshot shows the Progress OpenEdge Pro2 web interface. The left sidebar contains a navigation menu with the following items: Pro2 - LAN, Dashboard, Manage Replication (selected), Select Source, Set Target, Generate Target Schema, Mapping, CDC Mapping, Advanced Configuration, Generate Code, Properties, Actions, and Settings. The main content area is titled 'Replication > Select Source'. It contains several input fields: Source DB Name (sports), Source Logical Name (sports), Database Source Path (C:\db), Source DB Mode (Trigger and CDC radio buttons, with CDC selected), Host Name (localhost), Host Port/Service (empty), User Name (empty), and Password (empty). Below these fields is a 'Test Connection' button. At the bottom are 'Cancel' and 'Save' buttons.

To add source database details:

1. From the Pro2 web interface, navigate to the **Manage Replication** tab.
2. Click **New**.
The **Create Replication** window appears.
3. Set up the settings for the replication instance, for example, **Source DB Mode** is set to **Triggers**, and the **Source DB Connection** is set to **LAN**.
4. Click **Next**.
The **Select Source** tab appears.
5. Enter the name of the source database.
6. Enter the host name.
7. Enter the port number in the **Host Port/Service** field (for example, 2233).
8. (Optional) Enter your user name and password.

Note: Enter your user name and password only if it is required by your source database.

9. Click **Test Connection**.

If the test is successful, move on to set the target database. Review your source database details to ensure that they are correct.

10. Click **Next**.

The **Set Target** tab appears.

Add the target database details

The target database can be either a Microsoft SQL Server, Oracle database, or OpenEdge database. If your target database is an OpenEdge database, the you can forgo some of the configuration processes like generating the schema holder. However, there for a Microsoft SQL Server or Oracle database there are several configuration considerations to take into account. For more information about configuring Microsoft SQL Server or Oracle as a target database, see [Configure Pro2 to target SQL database connectivity](#) on page 70.

To add target database details:

1. Select **Target Database Type**. Choose Microsoft SQL Server, Oracle database, or OpenEdge database.
2. Following fields are automatically filled, but they can be changed if necessary
 - **Target Database Name**
 - **Target Schema Image**
 - **Schema Holder DB**
 - **Target ODBC Connection**
3. Enter the source database path. By entering the full path or relative path then there is no need to enter the host and port details.
4. (Optional) Enter your user name and password.

Note: Enter user name and password only if it is required by your target database.

5. Click **Next**.

The **Generate Target Schema** tab appears.

Note: At this point in the process the `replproc.pf` contains the details for your database's .pf file in addition to automatically creating the .pf file.

Here is an example of a .pf file that was created using the sports database and Microsoft SQL Server:

```
# Schema Holder Databases go here.
# If not built yet then just comment out all lines. (Required for MSS/ORA/PROGRESS as target type)
-db C:\web_pro2\pro2\db\sportssh -ld sportssh -RO

# Schema Images go here.
# If not imported yet, then just comment out all lines.
-db sportsodbc          # Required MSS/ORA
-ld sportssql           # Required MSS/ORA

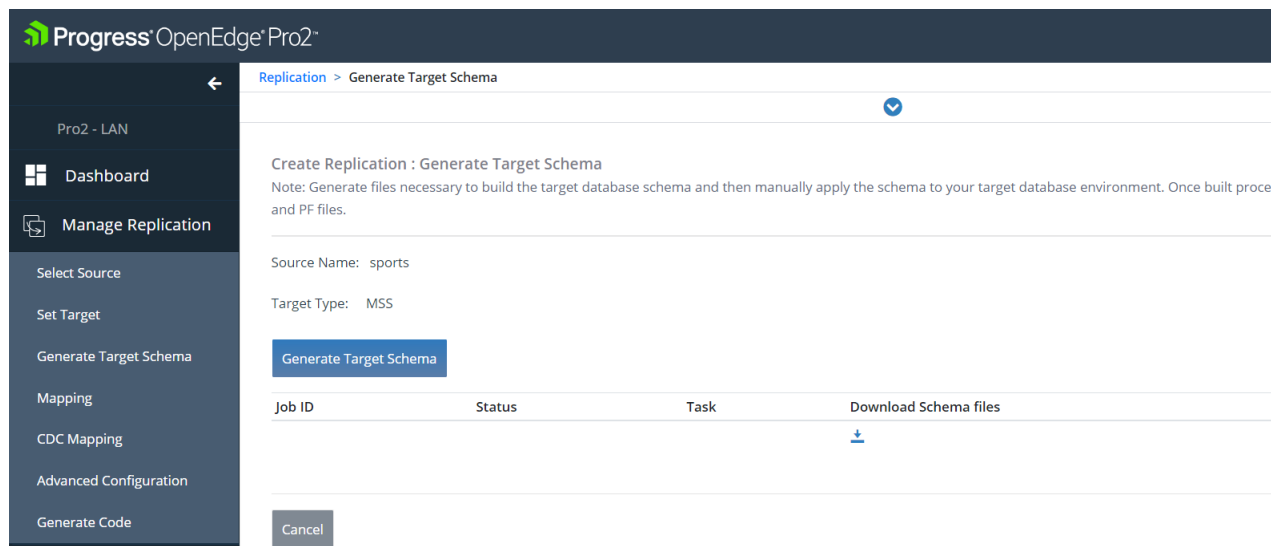
# Required MSS/ORA value should be (MSS/ORACLE)
# For Oracle Target type need to enter username and password

-dt MSS -U sa -P sa
-Dsiv QT_CACHE_SIZE,30000          #Required for MSS and ORA target type in other type just comment it
-Dsiv TXN_ISOLATION,1              #Required for MSS target type in other type just comment it
# -Dsiv BINDING,0                  #Removed for v11
-Dsiv AUTOCOMMIT,1                 #Required for MSS target type only
-Dsiv PRGRS_PREPCACHE,100          #Required for MSS target type only
-Dsiv MSS_PRESERVE_CURS,1          #Required for MSS target type only
-Dsiv PRGRS_LOCK_ERRORS,08501      #Required for MSS target type only
-Dsiv logginglevel,0,svub,1        #This will reduce the DataServer Log output Required for ORA/MSS

#Added below to release locks earlier
-Dsiv PRGRS_NATIVE_LOCKWAIT,0      #Required for MSS target type only
-Dsiv PRGRS_NOWAIT_OVERRIDE,1      #Required for MSS target type only
```

Generate the target schema file

By generating the target schema file, you load the target database with files necessary to build out the target database. Pro2 reads the source database schema, and generates scripts that are then executed on the target database server to create the target schema. By default, all tables and fields are created in the target. The rest of the files (drop.sql, index.sql, trunc.sql, errors.log, and warnings.log) are created separately. You can execute these files as necessary. Typically, tables that are not replicated remain unmapped.



To generate target schema file:

1. Select one or more of the following checkboxes:

Note: These options are available only when the target database is an OpenEdge database. If the target database is Microsoft SQL Server or Oracle database, these options are not available.

- **Preserve Area:** Preserves the source database data definition, and copies them to the target database.
- **Generate Pro2 Target Fields:** Generates Pro2-specific target fields in your target database. Doing so avoids unnecessary replications of the source schemas.
- **Generate Index as Inactive:** Deactivates the existing active index.

2. Click **Generate Target Schema**. A table that contains a replication job appears.

Note: Do not execute this job until you run the job runner file. A job runner batch file continuously processes replication jobs from the job queue. This file is in the `Scripts` folder.

3. Click **Download** under the **Download Schema files** column, to download the target schema files.

Create a target database

If you have not done so already, create a target database for you replicated data. The Target database can be either a Microsoft SQL server, Oracle, or OpenEdge database. Creating a target database will depend largely on they type of database you want to use and your development tooling. The following procedure lists the general steps to creating your target database.

1. In your database admin tool, like Microsoft SQL server Management Studio, create a new database and name it according to your needs.
2. Create a new database query, and load the schema file into the query.

Create a schema holder for your target database

In this step, you create an empty database as a schema holder for your target database. Your target database can be either Microsoft SQL Server or Oracle. The schema holder is a layer that allows ABL to interact with the Microsoft SQL Server or Oracle database.

To create a schema holder:

1. Open a **Proenv** window, and type `prodb database name empty` to create an empty schema holder database.
2. Start a single user session by typing `prowin database name -1`.

The **Procedure Editor** window appears.

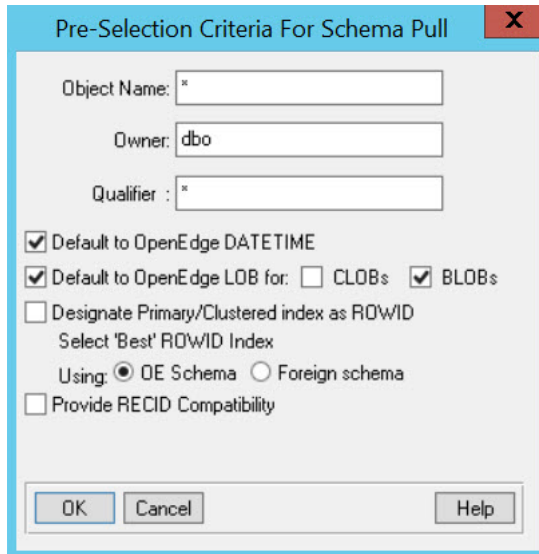
3. From the **Procedure Editor**, select **Tools > Data Administration**.
4. Select **DataServer > database type Utilities > Create DataServer Schema**.

The **Create/Modify Record for Schema** window appears.

5. Specify **Logical Database Name**.
6. If the source database is a SQL server, specify the **ODBC Data Source Name**. Click **OK**.
7. Enter the login ID and password if required in the next dialog box and click **OK**.
8. Enter criteria for **Object Name**, **Object Owner** (typically, `dbo`), and **Qualifier**.
9. Select the **Default to OpenEdge DATETIME** option.

10. If you are using LOB fields in replication, ensure that the **Default to OpenEdge LOB** for **BLOBs** option is selected along with the CLOBs option. This forces the data server to automatically consider certain target side data types to be treated as LOBs.

By selecting CLOBs, `varchar(max)`/`nvarchar(max)` data types are automatically converted to CLOBs. By selecting BLOBs the data server is forced to consider all `varbinary(max)` as BLOBs. On source fields that are character types, Pro2 may convert some types to `varchar(max)` when the source width is wider than the `MAX_CHAR_WIDTH` property setting. This conversion has the added benefit of avoiding row size limits for SQL Servers. However, `varchar(max)`/`nvarchar(max)` are not necessarily treated as CLOBs.



11. Click **OK** to finish.

Load the target database table definitions

After the target schema file is downloaded, load the target database with the appropriate tables required for replication.

For OpenEdge target databases:

1. Cut and paste the target schema file into the `db` folder of Pro2.
2. Open a **Proenv** window, type `prowin -db target` and press **Enter**.
3. In the Procedure Editor, select **Tools > Data Administration**.
4. Select **Admin > Load Data and Definitions > Data Definitions (.df file)**
5. Add the target schema file as the **Input File** and click **OK**.
6. Navigate to the Pro2 web interface and click **Next**.

The **Mapping Source to Target Tables** tab appears.

For Microsoft SQL Server or Oracle target databases:

1. Open a **Proenv** window, type `prowin database name -1` and press **Enter**.
The **Procedure Editor** window appears.
2. Select **Tools > Data Administration**.
3. Select **Database > Select Working Database**.
4. Click **OK**. The **Data Administration** window appears.
5. Select **DataServer > database type Utilities > Update/Add Table Definitions...**
The **Pre-Selection Criteria for Schema Pull** window appears.
6. Enter `dbo` for the **Owner**, select the **Default to OpenEdge DATETIME** and **Default to OpenEdge LOB for: CLOBs and BLOBs** checkboxes. Click **OK**.
The **Select database type Objects** window appears.
7. Click **Select Some....**
The **Select Objects by Pattern Match** window appears.
8. Enter `dbo` for the **Owner**, `table` as **Object Type**, and click **OK**.
9. Truncate the `database name` database to restrict operations in this database. This database should be a read-only database. Enter the following command in the **Proenv** window.
`proutil database name -C truncate bi`
10. Navigate to the Pro2 web interface and click **Next**.
The **Mapping Source to Target Tables** tab appears.

Map tables and fields

You must map data fields between your source and target database so that data in the source can be replicated to the target. You can do this from the **Mapping** dashboard in the web interface. The Repl database contains all the mapping information for the replication of the databases, tables, and fields between the source and target. This information is stored in the `ReplDBXref`, `ReplTableXref`, and `ReplFieldXref` tables. Mapping information can be saved to and loaded from a text file.

Depending on the number of schemas, primary keys, and foreign keys of the databases, the data sources and the database mapping information has varying degrees of complexity.

Map source tables to target tables and generate code

To map source tables to target tables and generate code:

1. On the **Mapping Source to Target Tables** tab, select the tables from the source database that you want to map with the target database. You can map the tables in the following ways:
 - Map—Choose the **Map** option if you want to map a single source table with a single target table.
 - Automap—Choose the **Automap** option if you want to map one or more source tables to the corresponding target tables.

Note: You can also unmap the tables based on your needs using the **Unmap** option.

2. Select the tables to map, and click **Automap** click **Next**.
3. In the **Advanced Configuration** tab, change thread assignments and other optional control flags if required.

Note: The **Advanced Configuration** tab is an optional settings tab.

4. Click **Next**.

The **Generate Code** tab appears.

5. Click **Generate Code**. You are directed to the Pro2 web interface dashboard. Click the **Pending Jobs** watch-box to see which replication jobs are running.

6. Run the replication file to execute the replication jobs. In **Windows Explorer**, navigate to `\bprepl\Scripts`.

7. Double-click the **Replbatch1.bat** file.

The corresponding replication thread starts running on the dashboard.

Note: In a CDC-based replication, double-click the **CDCbatch.bat** file.

8. Refresh the Pro2 user interface to complete the replication configuration process.

Manually test a replication

Testing is an important part of any enterprise applications configuration process. Consider an testing example where a city is assigned to a customer. This change is made in the source database, and needs to be replicated to the target database. To perform the test scenario:

1. In a **Proenv** window, navigate to your Pro2 root folder. For example, `C:\Pro2v62\db`.

2. Enter the command `prowin -db database name -db repl`.

The **Procedure Editor** window appears.

3. Assign city to the first customer in source database.

```
FIND FIRST customer.
ASSIGN city = "NY"
```

4. Open the Pro2 web interface and click the **Total Threads** watch-box. Notice the event type in the **Replication thread** window. This event will show the recent change made to the source database.

Thread Type	Id	Replication Control	Logging Level	Disposition	Status
CDC	0	Enabled	Moderate	Delete Record	STOPPED
JOB	0	Enabled	Moderate	Mark as Applied	RUNNING
REPLICATION	1	Enabled	Moderate	Delete Record	STOPPED

Event Type	Source Database	Source Table	Source Record	Event Date	Event Time	User
W	sports	Customer	00000000000000000000000000000000	2019-07-18	16:15:08	jblum

5. Run the replication file by navigating to `\bprepl\Scripts`.

6. Double-click the **Replbatch1.bat** file to run the replication thread. This action removes the event type in the thread which simulates that the replication record was processed by the thread and sent to the target database.

Total Threads

Thread Type	Id	Application Control	Logging Level	Disposition	Status
CDC	0	Enabled	Moderate	Delete Record	STOPPED
JOB	0	Enabled	Moderate	Mark as Applied	RUNNING
REPLICATION	1	Enabled	Moderate	Delete Record	RUNNING
REPLICATION	2	Enabled	Moderate	Delete Record	STOPPED
REPLICATION	3	Enabled	Moderate	Delete Record	STOPPED
REPLICATION	4	Enabled	Moderate	Delete Record	STOPPED
REPLICATION	5	Enabled	Moderate	Delete Record	STOPPED

Directory reference

The following is a description of the folders under the **Pro2** root folder.

Folder	Description
bprepl	Root directory for application programs.
bprepl\AppSrv	Used in WAN implementations.
bprepl\common	This folder contains common files used across Pro2.
bprepl\datasets	Used to support the acquisition of data sets from the database.
bprepl\images	Image files that can be used for shortcut icons.
bprepl\misc	Miscellaneous replication files and procedures.
bprepl\PRO2_REST	Contains files to support the user interface.
bprepl\repl_as_tgt	Used in WAN implementations.
bprepl\repl_d	Directory for the Pro2 generated database replication delete trigger procedures.
bprepl\repl_export	Used in WAN bulk loads.
bprepl\repl_inc	Directory for Pro2 generated assign include files.
bprepl\repl_jtrig	Directory for any java triggers.
bprepl\repl_log	Default location of log files.
bprepl\repl_mgtrig	Directory listing tables that require merged triggers.
bprepl\repl_mlog	Location for bulk load logs.
bprepl\repl_mproc	Directory for the Pro2 generated bulk copy procedures.
bprepl\repl_mproclog	Location for bulk load program logs.
bprepl\repl_pf	Directory for application server and repl .pf files.
bprepl\repl_pro2dbtrigs	Directory for Pro2 database trigger files.

Folder	Description
bprepl\repl_proc	Directory for the Pro2 generated replication library
bprepl\repl_sql	Directory for SQL replication procedures.
bprepl\repl_tmpl	Directory containing the templates used for various code generation. Contains the ReplLogCheck ErrorTriggers.lst files.
bprepl\repl_w	Directory for Pro2 generated database replication write trigger procedures.
bprepl\replcdc_proc	Directory for Pro2 CDC replication procedures.
bprepl\Scripts	Directory containing the .pf files, scripts, and shortcuts to start various Pro2 functions.
bprepl\SQL_inc	Directory for the direct SQL assign include files.
bprepl\SQL_mproc	Directory for the direct SQL bulk copy procedures.
bprepl\SQL_proc	Directory for the direct SQL replication procedures.
bprepl\custom	Directory to deploy your customized code so that it overrides the existing code in the bprepl folder.
	Note: This folder must maintain the bprepl folder structure and is applicable for both LAN and WAN configurations.
db	Location of schema holder database(s). Also, the initial temporary location for repl database during implementation.
Docs	Contains various read me files for Pro2.
Downloads	Initially empty. Used to save site-specific downloads.
misc	Miscellaneous Pro2 utilities.
PASOE	Directory for the PAS for OpenEdge instance associated with your Pro2 deployment.
tmp	Miscellaneous Pro2 temporary files used during implementation.
utils	Directory for various replication procedures.

ReplProperties and ReplQueue

The OpenEdge replication source database and target database tables are stored in property files. There are configuration settings whose values you set in these tables that control different aspects of your replication environment. The following are the tables for the Pro2 replication environment:

- `ReplProperties`—Configuration settings such as log file location, logical delete tables, and specification of procedure templates are stored in the `ReplProperties` table. Configuration settings can be saved to and loaded from a text file from the **New** button in the **Manage Replication** window on the Pro2 web interface.
- `ReplQueue`—Information about change events is stored in the `ReplQueue` table. This information includes the `ROWID` of the record changed, event date, time, and queue thread. Typically, repl queue records represent updates made to the source database that are waiting to be written to the target SQL database.

Deploy replication triggers in the source database

You can deploy replication triggers in the source database by using the `Pro2/Utils/ReplTrigInsert.p` procedure. This procedure is executed from the **Procedure Editor** window connected to both, the source database and the `repl` database.

To deploy the replication triggers in the source database, complete the following steps:

1. Open a **Proenv** window and navigate to the **db** folder of **Pro2**. Shut down the **repl** and the source database instances by typing the following commands:
 - `proshut repl` to shut down the **repl** database.
 - `proshut <Source database>` to shut down the source database.

Note: Shutting down the source database disconnects all connected clients.

2. In another **Proenv** window, navigate to the **db** folder of **Pro2** and shut down the PAS for OpenEdge instance by typing the following command:

```
instance name\bin\tcman.bat stop
```

3. Navigate to the **db** folder of **Pro2** from the **Windows Explorer**, for example `C:\Progress\Pro2\db`.
4. Create a new folder named **bprepl** in the **db** folder that is the source database location.
5. Navigate to the **bprepl** folder in the **Pro2** root folder (`C:\Progress\Pro2\bprepl`), and copy the following folder:

- **repl_d**
- **repl_w**

These folders contain the replication write and delete triggers that are required to process the replication queue records (also known as **replqueue** records).

6. Paste the folders in the **db\bprepl** folder of **Pro2** (`C:\Progress\Pro2\db\bprepl`).
7. Type `prowin -db <source database> -db repl -1` and press **Enter**.

The **Procedure Editor** window appears.

8. Click **File > Open** and browse to the **Pro2** **utils** folder. For example, `C:\Progress\Pro2\utils`.
9. Select the **ReplTrigInsert.p** file and click **OK**.

The **ReplTrigInsert.p** file opens in the **Procedure Editor** window.

10. Enter the name of the source database for the variable **vDB** by replacing the **"XX"** value, for example **sports** in the **ReplTrigInsert.p** file that is open in the **Procedure Editor** window. Click **Compile > Run** and then close the **Procedure Editor** window.
11. Run the trigger report to check if the **Pro2** replication triggers are inserted using the **Procedure Editor > Tools > Data Dictionary > Database > Reports > Trigger**.
12. In the **Proenv** window, navigate to the **db** folder of **Pro2**, and restart all the database instances by typing the following commands:
 - `proserve repl` to start the **repl** database.
 - `proserve pro2` to start the **Pro2** database.
 - `proserve <source database>` to start the source database.
13. In a separate **Proenv** window, navigate to the **db** folder of **Pro2**, and start the PAS for OpenEdge instance by typing the following command:

```
instance name\bin\tcman.bat start
```

Note: If the source database already has replication triggers, then you need to generate the Pro2 merge triggers and update the existing replication triggers manually.

Install and configure Pro2 for WAN

A WAN configuration for Pro2 and your OpenEdge application is best suited for cloud-based business solutions across multiple geographies. For example, assume that you have OpenEdge applications and databases spread across the US, Europe, and Asia, with a consolidated Microsoft SQL Server database in the US that is used for reporting and analytics. In this configuration, the source databases spread across the globe communicate with an application server that in turn, sends data to the target Microsoft SQL Server database.

You can install Pro2 along side of OpenEdge during your initial setup and configuration, or you can install Pro2 as an add-on to complement your OpenEdge environment later on. Installing Pro2 as an add-on can be especially useful when you are upgrading OpenEdge versions, or need to migrate databases. For more information about database migration, see [Migrate your OpenEdge database with Pro2](#) on page 88.

If you are installing Pro2 along with OpenEdge, then you will need to first install and configure OpenEdge, after the installation and configuration is complete, you then install and configure Pro2.

The Pro2 WAN configuration setup differs from the LAN configuration process in that, after the initial installation of Pro2, you must configure the application server before you can set replication configurations for your Pro2 instances. Moreover, unlike the LAN configuration, the source database does not directly communicate changes to the replication and target databases. The source database is connected to a Progress Application Server instance, which is then connected to an empty synchronized-copy of the replication database that connects to the Pro2 facing replication database.

System requirements

The specifications for a Pro2 server are generally the same whether server is a physical or virtual machine. Because are determined by the OS being loaded on the box. However the following is a general idea of new specifications.

- Minimum 2 processors.
- Memory: If using a 64-bit operating system, use 8 gigabytes of RAM.

Note: If your machine also hosts a SQL server, then use a 64-bit platform with a minimum 8 gig of memory.

- Network speed: minimum 1 gigabit per second.
- Disk: 50 gigabytes of allocated space. This allocation is for both the installation and for any content generated by Pro2, such as log files.

Note: If your machine also hosts a SQL Server database, then the size of the SQL Server database will be approximately twice the size of the Progress data space requirements.

Note: In either a physical or virtual environment it is recommended to spread the I/O. On a physical machine this means separating the operating system/Pro2 and/or SQL database onto separate physical drives. This is the same for a virtual machine the where “disks” become multi-VMDK file (Virtual Machine Disk). For example separate the operating system and Pro2 installation onto separate VMDK files.

These are minimum recommendations. All parameters can be increased to accommodate more robust hardware.

Note: Additionally, during your planning phase, it is important to understand that the Pro2 database uses large object data types. By default, CLOB fields are set to Latin-1 and basic collation by default. Adjust these settings to support your requirements before loading the Pro2 .df file.

For more information about OpenEdge system requirements, see the [Progress Product Availability Guide](#).

Before you begin

Ensure that you have OpenEdge installed and configured on the same machine as Pro2. For more information about installing OpenEdge, see [Install OpenEdge on Windows](#).

Main steps to install and configure Pro2

1. Install Pro2 by using the installation wizard.
2. Create and configure a WAN side repl database.
3. Create and configure the WAN application server.
4. Create a Pro2 side repl and Pro2 database.
5. Create an empty local copy of the source database.
6. Start the PAS for OpenEdge instance for the Pro2 web user interface.
7. Load the configuration file.
8. Connect to your WAN application server instance.
9. Start the job runner.
10. Add the source database details.
11. Generate and load the source schema file.
12. Add the target database details.
13. Create the target database.
14. Create a schema holder for your target database.
15. Generate the target schema file.
16. Load the target database table file.
17. Map the tables in the source database to the target database.
18. Generate the replication code based on your configuration.

Install Pro2

1. Close all applications before beginning the installation.
2. Run the `Pro2.exe` file.

There can be a numeric value in the file name that indicates the version of Pro2, for example, `Pro2-6.2.exe`.

3. In the Pro2 installation wizard, click **Next**. The **Choose the Install Folders** screen appears.
4. Specify the path or click **Choose** to browse and select where you want to install Pro2.

The default installation directory is `C:\Progress\Pro2`.

5. In the **Choose OpenEdge** window, specify the path, or select **Choose** to browse and set the OpenEdge home directory.

The OpenEdge home directory is where OpenEdge is installed on your machine.

The default directory is `C:\Progress\OpenEdge`.

6. On the **PAS Ports** screen, enter the relevant PAS for OpenEdge information in the **Port** and **Instance Name** fields.

The default instance name is Pro2Web. You can change this name to according to your needs. It is recommended to change the instance name for each Pro2 installation.

Note: For each installation of Pro2, you must specify different port information. No two installations can use the same ports on the same machine.

7. Click **Next** and review the options you chose for this installation on the **Pre-Installation Summary** page.
8. Click **Install** to continue with the installation process.

Note: The Pro2 installation wizard can take several minutes to complete and may appear to lag at times. Allow the installation wizard to complete before prematurely canceling the process.

9. Click **Done** to finish the installation process.
10. Check the installation logs at `C:\Progress\Pro2\install\logs` folder.

After the installation is complete, go to the Pro2 AS_Src root folder to continue the configuration process. If you used the default settings during the installation, then this folder would be `C:\Progress\Pro2\bprelp\AppSrv\AS_Src`. Copy this folder to the machine where you have your source database, and rename the folder.

All files, scripts, and procedures for Pro2 are relative to the root folder. This allows for Pro2 to be installed several times on the same drive without each installation interfering with each other. This functionality was designed to allow you the be able to create development and production environments to test implementations as needed without the risk affecting your production environment.

Create and configure a Repl database for WAN

On this step of the configuration process you create a WAN side Repl database. This Repl database is hosted on the same machine as your source database and communicates directly with the source database and the WAN application server.

It is important to note that this procedure describes the high level steps to create the WAN side Repl database. Later in the configuration process, you will need to create another Repl database on the same machine as your Pro2 database and Pro2 installation. When creating these databases every consideration and precaution should be taken, as if you were creating a database for an enterprise application in a production environment, to ensure their availability. Without these databases, data is not replicated from your source database to your target database. This can cause loss of synchronization.

1. On your source database machine, where you have just copied the `AS_Src` root folder to, open a **Proenv** instance.
2. Set your working directory to the `db` folder in the WAN Pro2 root directory.

Note: Check the directory of the `db` folder to view the database instances. Type `dir` after navigating to the database folder.

3. Create an empty Repl database instance by entering the following command `prodb repl empty`.

Note: Ensure that you set the code page of the Repl database to match the code page of your source and target databases.

4. Start the Repl database with the `proserv repl` command.
5. In the WAN Pro2 root directory, go to the `scripts` folder `bprepl\scripts` and add the application server connection details to the `AppSrv.pf` file to connect the replication threads and PAS for OpenEdge or classic application server instance to the Repl database and your source database. Add the complete path of the databases in the file and click **Save**.
6. Load the table definitions file in the Repl database by first entering `prowin repl -1`.
The **Procedure Editor** window appears.
7. Navigate to **Tools > Data Administration**.
8. In the **Data Administration** window, navigate to **Admin > Load Data and Definitions > Data Definitions (.df file)**....
9. In the **Load Data Definitions** window, load the `repl.df` file and click **OK**.

Note: The `repl.df` file is located in `Pro2 folder/db`.

10. Start the Repl database by entering: `Proserve repl`
11. To confirm that the Repl database is connected, open the **Procedure Editor** from the `bprepl\Scripts` folder and navigate to **Tools > Data Dictionary**. If the connection is successful, the **Tables** section displays the tables.

Create and configure a WAN application server

Creating your WAN application server can vary widely depending on your specific business needs and application environment. In general, creating a PAS for OpenEdge instance involves defining a name and location for the instance as well as defining various configuration properties. When you create an instance, the properties of the instance are automatically set to the directory where the new instance is created and the related files and logs are stored. The following properties are set when the new instance is created and can be controlled by the system administrator:

- The environment variables and paths for running commands
- The HTTP and HTTPS transports, and ports
- The username and password for the instance
- The type of instance (development or production)

For more information about PAS for OpenEdge, see [Learn about PAS for OpenEdge administration](#).

To create and configure a WAN application server:

1. On your source database machine, open a **Proenv** instance.
2. Use the `pasman create` command to create an application server instance. For example


```
pasman create -p 11000 -P 11001 -s 11002 P2WAN
```

 - On Windows, a shutdown port, set by the `-s` option, is required.
 - The `-p` (lower case) option specifies the HTTP port. The default is 8810.
 - The `-P` (upper case) option specifies the HTTPS port. The default is 8811.
 - In this example, the instance-path or instance-name is P2WAN
3. Go to the instance-path for your application server using the `cd` command, for example:


```
cd P2WAN
```
4. (Optional) Add OpenEdge Management to your instance if your business needs require, for example:


```
bin\tcman.bat deploy C:\Progress\OpenEdge\servers\pasoe\extras\oemanager.war
```
5. (Optional) Add the PAS for OpenEdge Health scanner to your instance if you want to use its health monitoring capabilities, for example:


```
bin\tcman.bat deploy C:\Progress\OpenEdge\servers\pasoe\extras\oehealth.war
```
6. Use the `oeprop` command to set the application server project directory to the WAN root folder, for example:


```
bin\oeprop AppServer.Agent.PROPATH="C:\Pro2Wan_Scr,
C:\Pro2Wan_Scr\bprepl,{CATALINA_BASE}/OPENEDGE,{DLC}/tty,{DLC}/tty/netlib/OpenEdge.Net.pl"
```
7. Use the `bin` command to set the work directory to the WAN root folder, for example:


```
bin\oeprop AppServer.Agent.workDir="C:\Pro2Wan_Src"
```
8. Set the instance-path project directory by using the `oeprop` command, for example:


```
bin\oeprop
AppServer.Agent.P2WAN.PROPATH="C:\Pro2Wan_Scr,C:\Pro2Wan_Scr\bprepl,{CATALINA_BASE}/webapps/pro2/WEB-INF/openedge,{CATALINA_BASE}"
```
9. Set the start up parameters by using the `oeprop` command to point to the `AppSrv.pf` file:


```
bin\oeprop AppServer.SessMgr.P2WAN.agentStartupParam="-T C:\Pro2Wan-Src\tmp -pf
bprepl\scripts\AppSrv.pf"
```
10. Designate which application server adapters are to be enabled, for example:


```
bin\oeprop P2WAN.ROOT.APSV.adapterEnabled=1
bin\oeprop P2WAN.ROOT.REST.adapterEnabled=0
bin\oeprop P2WAN.ROOT.SOAP.adapterEnabled=0
bin\oeprop P2WAN.ROOT.WEB.adapterEnabled=0
```
11. Test your PAS for OpenEdge instance with the `pasman test -I instance name` command, for example:


```
pasman test -I P2WAN
```
12. After the test is successfully completed, use the `pasman pasoestart -restart -I instance name` command to restart your instance for example:


```
pasman pasoestart -restart -I P2WAN
```

For more information about the OpenEdge properties command (`oeprop`), see [OEPROP](#).

Note: Depending on your business needs, it may be useful to configure your PAS for OpenEdge instance as a Windows service. For more information about running PAS for OpenEdge instance as a Windows service, see [Register and manage an instance as a Windows service](#).

Create a Repl and Pro2 database:

While similar to the Repl database that you created earlier, this Repl database is hosted on the same machine as your Pro2 installation. You build a Repl database by using Proenv commands and the `repl.df` file.

Before you create your replication database, navigate back to the machine where you have Pro2 installed. This machine should be different than your source database machine where your PAS for OpenEdge instance is configured.

Standard OpenEdge database utilities are used to create the Repl database. The structure file (`.st`) and schema definition file (`.df`) used to create the Repl database can be found in the `db` folder of the Pro2 root folder. If you are using replication triggers with a LAN configuration, all configuration files, parameter (`.pf`) files, and scripts need to be modified to include a connection to the Repl database wherever there is a connection made to the source database. Change data capture (CDC) is not affected by this requirement.

It is important to note that this procedure describes the high level steps to create the Repl and Pro2 databases. When creating these databases every consideration and precaution should be taken, as if you were creating a database for an enterprise application in a production environment, to ensure their availability. Without these databases, data is not replicated from your source database to your target database. This can cause loss of synchronization.

Confer with your database administrator and other key stakeholders to when creating the Repl and Pro2 database for your production environment. For more information about database administration, see [OpenEdge database essentials](#).

To create a Repl and Pro2 database:

1. Open a **Proenv** instance.
2. Set your working directory to the `db` folder in the Pro2 root directory.

Note: Check the directory of the `db` folder to view the database instances. Type `dir` after navigating to the database folder.

3. Create an empty repl database instance by typing the following command `prodb repl empty`.
4. Create an empty Pro2 database instance by typing the following command `prodb pro2 empty`.

Note: Ensure that the you set the code page of the Repl and Pro2 databases to match the code page of your source and target databases.

5. Load the table definitions file in the Repl database by typing `prowin repl -1`.
The **Procedure Editor** window appears.
6. Navigate to **Tools > Data Administration**.
7. In the **Data Administration** window, navigate to **Admin > Load Data and Definitions > Data Definitions (.df file)**....
8. In the **Load Data Definitions** window, load the `repl.df` file and click **OK**.

Note: The `repl.df` file is located in the `db` folder of the Pro2 root folder.

9. Load table definitions in the Pro2 database by entering `prowin pro2 -l`.

The **Procedure Editor** window appears.

10. Navigate to **Tools > Data Administration**.

11. In the **Data Administration** window, navigate to **Admin > Load Data and Definitions > Data Definitions (.df file)**.

12. In the **Load Data Definitions** window, load the `pro2.df` file and click **OK**.

Note: The `pro2.df` file is located in `Pro2 folder/db`.

13. Start the repl and pro2 databases by typing:

- `Proserve repl`
- `Proserve pro2`

14. Add the Pro2 database connection details to the `replProc.pf` file in the Pro2 root folder under `\bprepl\Scripts\replProc.pf` to connect the replication threads and PAS for OpenEdge instance to the Pro2 database. Navigate to the `bprepl\scripts` folder and open the `replProc.pf` file. Add the complete path of the database in the file and click **Save**.

15. To check that both the Repl and Pro2 database instances are connected, open the **Procedure Editor** from the `bprepl\Scripts` folder and navigate to **Tools > Data Dictionary**. If the connection is successful, then the **Tables** section displays the tables.

Create an empty local copy of the source database

1. On your Pro2 machine, open a **Proenv** instance.
2. Use the `prodb` command to create an empty copy of your source database, for example:
`prodb source database name empty`
3. Start the database copy by entering `proserve source database name`.
4. Add the source database connection details to the `replProc.pf` file in the Pro2 root folder under `\bprepl\Scripts\replProc.pf` to connect the replication threads and PAS for OpenEdge instance to the Pro2 database. Navigate to the `bprepl\scripts` folder and open the `replProc.pf` file. Add the complete path of the database in the file and click **Save**.
5. To check Repl and Pro2 database instances are connected successfully, open the **Procedure Editor** from the `bprepl\Scripts` folder and navigate to **Tools > Data Dictionary**. If the connection is successful, the **Tables** section displays the tables.

Embed the repl tables (optional)

You can choose to embed the repl tables into your source and source copy database. Embedding the repl tables into the source database and source copy database can simplify implementation. If the repl tables are embedded, no additional database connection is required. One major reason to choose to keep repl as a stand-alone database is to simplify schema updates made by the application provider to the source database. Pro2 works the same whether the repl tables are embedded or in a separate stand-alone database.

If you choose to embed the repl tables in the source database, you must also embed them in the source database copy to be in sync. You need to preform the following procedure for both the source database and the source database copy. To embed the repl tables in a database:

1. Shut down the database.
2. Add the Repl structure to the database:

```
prostrct add db name repladd.st
```

3. Load the repl.df to the database.

Both repladd.st and repl.df are available in the folder where Pro2 is installed.

4. Open Pro2\predefs.i and configure the Embedded_ReplTables and ReplDB settings.

The unmodified settings are as follows:

```
&GLOBAL-DEFINE Embedded_ReplTables /*CREATE ALIAS Repl FOR DATABASE {Source-dbname}.*/  
&GLOBAL-DEFINE ReplDB Repl. /*This line and Embedded_ReplTables line need to be  
changed for embedded repl */
```

- a. Embedded_ReplTables:

Uncomment the **CREATE ALIAS** section for Embedded_ReplTables.

Replace **{Source-dbname}** with the name of the database.

For example:

```
&GLOBAL-DEFINE Embedded_ReplTables CREATE ALIAS Repl FOR DATABASE sports.
```

- b. ReplDB:

Replace Repl with the name of the database.

For example:

```
&GLOBAL-DEFINE ReplDB sports. /*This line and Embedded_ReplTables line need  
to be changed for embedded repl */
```

Start the PAS for OpenEdge instance and log in to the Pro2 web application

Now that the database instances are set up successfully, start the PAS OpenEdge instance and log in to the Pro2 web application.

1. Start a **Proenv** instance.
2. Navigate to the **Pro2** folder by entering `cd` followed by name of the folder where you installed Pro2, for example, `cd Pro2v62`.
3. Enter `instance name\bin\tcman.bat env`.

Note: The default instance name is Pro2Web.

4. Type `instance name\bin\tcman.bat start`.
5. To verify that the instance started successfully, type `instance name\bin\tcman.bat env`. The server running section shows a number if the instance started.
6. Open any browser and log in at `localhost:port number/pro2/static/` using the default credentials.

Load the configuration file

Before you set up the source and target database connections in the user interface, you must set up a basic configuration by loading the default configuration file. The configuration file consists of all the default properties and records that are necessary to set up the Pro2 environment.

Note: If you use Internet Explorer to load the configuration file, you may encounter errors. To avoid them, use an alternative web browser like Google Chrome.

To load the configuration file:

1. In the Pro2 web interface, navigate to **Actions > Tools > Load Configuration**.
2. Click **Select Files** and load the `.ini` configuration file, for example `replbasev610.ini`, from the Pro2 folder.
3. Click **Submit**. A success or failure notification is displayed after the upload is complete.

You can view the default properties and records on the **Properties** tab after the configuration file is successfully loaded.

Connect to your WAN application server instance

After the properties are loaded, you must connect to your WAN PAS for OpenEdge instance from the Pro2 user interface.

To connect to your WAN instance:

1. In the Pro2 user interface, click **Settings** from the side menu.
2. Select **LAN/WAN** from the options.
3. Choose **WAN**.
4. Enter your application server details and click **Submit** when complete. The `Pro2\predefs.i` file is updated.

Start the job runner

To start the job runner and initiate the scheduled Enterprise Push job, use the following procedure:

1. Navigate to the Pro2 Scripts folder, for example: `C:\Pro2\bprepl\Scripts`.
2. Select and execute the `jobrunner.bat` file.
3. Navigate back to the web interface and confirm that the `jobrunner.bat` is running by checking the status in the Pending Jobs watch-box.

Add the source database details

You can set up either trigger-based replication or CDC-based replication. In a trigger-based-replication, the replication queue records (also known as ReplQueue records) are generated by deploying Pro2 triggers on a source database. In a CDC-based replication the ReplQueue records are generated from change tracking table. However, for CDC-based replication, the source database must be CDC enabled.

To add source database details:

1. From the Pro2 web interface, navigate to the **Manage Replication** tab.
2. Click **New**.

The **Create Replication** window appears.

3. (Optional) Enter your **User Name** and **Password**.

Note: Enter your user name and password only if it is required by your source database.

4. Select **Test Connection**.

If the test is successful, move on to set the target database. Review your source database details to ensure they are correct.

5. Click **Next**.

Generate and load the source schema file

By generating the source schema file, you build the files necessary to enable your local empty copy of your source database to communicate with the application server-side source database.

To generate and load the source schema file:

1. On the **Generate Source Schema** tab, click **Generate Source Schema**.
2. After the source schema is generated, click the **Download Schema files** and download all available files.
3. Copy and paste the source schema file `database_name_REM_AREAS.df` in the `db` folder of Pro2.
4. Open a **Proenv** instance and enter the command `prowin database_name` for the local empty copy of source database.
5. In the Procedure Editor, select **Tools > Data Administration**.
6. Select **Admin > Load Data and Definitions > Data Definitions (.df file)**
7. Add the source schema file as the **Input File** and click **OK**.
8. Navigate to the Pro2 web interface and click **Next**.

Add the target database details

The target database can be either a Microsoft SQL Server, Oracle database, or OpenEdge database. If your target database is an OpenEdge database, the you can forgo some of the configuration processes like generating the schema holder. However, there for a Microsoft SQL Server or Oracle database there are several configuration considerations to take into account. For more information about configuring Microsoft SQL Server or Oracle as a target database, see [Configure Pro2 to target SQL database connectivity](#) on page 70.

To add target database details:

1. Select **Target Database Type**. Choose Microsoft SQL Server, Oracle database, or OpenEdge databases.
2. Following fields are automatically filled, but can be changed if necessary
 - Target Database Name
 - Target Schema Image
 - Schema Holder DB
 - Target ODBC Connection
3. (Optional) Enter your user name and password.

Note: Entering your user name and password only if it is required by your target database.

4. Click **Next**.

The **Generate Target Schema** tab appears.

Generate the target schema file

By generating the target schema file, you load the target database with files necessary to build out the target database. Pro2 reads the source database schema, and generates scripts that are then executed on the target database server to create the target schema. By default, all tables and fields are created in the target. The rest of the files (`drop.sql`, `index.sql`, `trunc.sql`, `errors.log`, and `warnings.log`) are created separately. You can execute these files as necessary. Typically, tables that are not replicated remain unmapped.

Pro2 reads the source Progress schema and generates scripts that are then executed on the target database server to create the target schema. By default, all tables and fields are created in the target. Typically, tables not replicated remain in the target but are simply not mapped for replication, however, if it is desired that the tables do not exist at all on the target side, the generated scripts can be edited to remove the pertinent statements.

To generate target schema file:

1. Click **Generate Target Schema**. A table that contains a replication job appears.

Note: Do not execute this job until you run the job runner file. A job runner batch file continuously processes replication jobs from the job queue. This file is in the `Scripts` folder.

2. Click **Download** under the **Download Schema files** column, to download the target schema files.

Create a target database

If you have not done so already, create a target database for you replicated data. The target database can be either a Microsoft SQL Server, Oracle, or OpenEdge database. Creating a target database will depend largely on the type of database you want to use and your development tooling. The following lists the general steps to create your target database:

1. In your database admin tool, like Microsoft SQL server Management Studio, create a new database and give it a name.
2. Create a new database query, and load the schema file into the query.

For more information about target databases, see

Create a schema holder for your target database

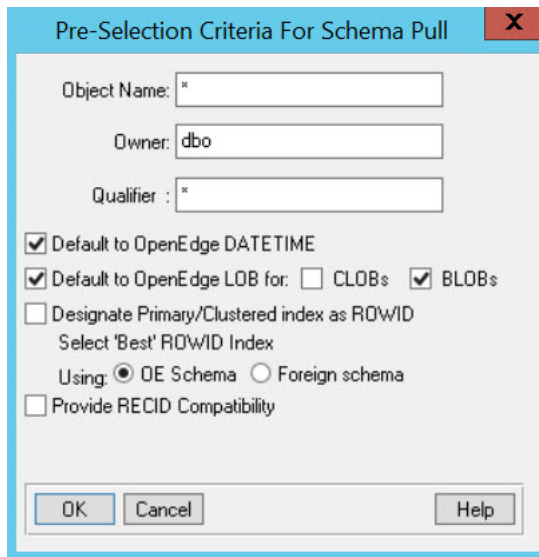
An empty OpenEdge database is created to act as the schema holder for the Microsoft SQL Server or an Oracle database. The schema holder is the layer that allows ABL to interact with the Microsoft SQL Server or Oracle database as though it were a native OpenEdge database.

To create a schema holder:

1. Open a **Proenv** window, and type `prodb database name empty` to create an empty schema holder database.
2. Start a single user session by typing `prowin database name -1`.
The **Procedure Editor** window appears.
3. From the **Procedure Editor**, select **Tools > Data Administration**.
4. Select **DataServer > database type Utilities > Create DataServer Schema**.
The **Create/Modify Record for Schema** window appears.
5. Specify the **Logical Database Name**.
6. If the source database is a SQL Server, specify the **ODBC Data Source Name**. Click **OK**.
7. Enter the login ID and password if required in the next dialog box and click **OK**.

8. Enter criteria for **Object Name**, **Object Owner** (typically, `dbo`), and **Qualifier**.
9. Select the **Default to OpenEdge DATETIME** option.
10. If you are using LOB fields in replication, ensure that the **Default to OpenEdge LOB** for **BLOBs** option is selected along with the CLOBs option. This forces the data server to automatically consider certain target side data types to be treated as LOBs.

By selecting **CLOBs**, `varchar(max)`/`nvarchar(max)` data types are automatically converted to CLOBs. By selecting **BLOBs** the data server is forced to consider all `varbinary(max)` as BLOBs. On source fields that are character types, Pro2 may convert some types to `varchar(max)` when the source width is wider than the `MAX_CHAR_WIDTH` property setting. This conversion has the added benefit of avoiding row size limits for SQL Servers. However, `varchar(max)`/`nvarchar(max)` are not necessarily treated as CLOBs.



11. Click **OK** to finish.

Load the target database table definitions

After the target schema file is downloaded, load the target database with the appropriate tables required for replication.

For OpenEdge target databases:

1. Copy and paste the target schema file in the `db` folder of Pro2.
2. Open a Proenv window, enter `prowin target database name`.
3. In the Procedure Editor, select **Tools > Data Administration**.
4. Select **Admin > Load Data and Definitions > Data Definitions (.df file)**
5. Add the target schema files as the **Input File** and click **OK**.
6. Navigate to the Pro2 web interface and click **Next**.

The **Mapping Source to Target Tables** tab appears.

For Microsoft SQL Server or Oracle target databases:

1. Open a **Proenv** window, type `prowin database name -1` and press **Enter**.
The **Procedure Editor** window appears.
2. Select **Tools > Data Administration**.
3. Select **Database > Select Working Database**.
4. Click **OK**. The **Data Administration** window appears.
5. Select **DataServer > database type Utilities > Update/Add Table Definitions...**
The **Pre-Selection Criteria for Schema Pull** window appears.
6. Enter `dbo` for the **Owner**, select the **Default to OpenEdge DATETIME** and **Default to OpenEdge LOB for: CLOBs and BLOBs** checkboxes. Click **OK**.
The **Select database type Objects** window appears.
7. Click **Select Some....**
The **Select Objects by Pattern Match** window appears.
8. Enter `dbo` for the **Owner**, `table` as the **Object Type**, and click **OK**.
9. Truncate the `database name` database to restrict operations in this database. This database should be a read-only database. Enter the following command in the **Proenv** window.
`proutil database name -C truncate bi`
10. Navigate to the Pro2 web interface and click **Next**.
The **Mapping Source to Target Tables** tab appears.

Map tables and fields

You must map data fields between your source and target database so that data in the source can be replicated to the target. You can do this from the **Mapping** dashboard in the web interface. The repl database contains all the mapping information for the replication of the databases, tables, and fields between the source and target. This information is stored in the `ReplDBXref`, `ReplTableXref`, and `ReplFieldXref` tables. Mapping information can be saved to and loaded from a text file.

Depending on the number of schemas, primary keys, and foreign keys of the databases, the data sources and the database mapping information has varying degrees of complexity.

Map source tables to target tables and generate code

To map source tables to target tables and generate code:

1. On the **Mapping Source to Target Tables** tab, select the tables from the source database that you want to map with the target database. You can map the tables in the following ways:
 - **Map**—Choose the **Map** option if you want to map a single source table with a single target table.
 - **Automap**—Choose the **Automap** option if you want to map one or more source tables to the corresponding target tables.

Note: You can also unmap the tables based on your needs using the **Unmap** option.

2. Select the tables to map, click **Automap**, and click **Next**.
3. In the **Advanced Configuration** tab, change thread assignments and other optional control flags if required.

Note: The **Advanced Configuration** tab is an optional settings tab.

4. Click **Next**.

The **Generate Code** tab appears.

5. Click **Generate Code**. You are directed to the Pro2 web interface dashboard. Click the **Pending Jobs** watch-box to see which replication jobs are running.

6. Run the replication file to execute the replication jobs. In **Windows Explorer**, navigate to `\bprepl\Scripts`.

7. Double-click the **Replbatch1.bat** file.

The corresponding replication thread starts running on the **Dashboard**.

Note: In a CDC-based replication, double-click the **CDCbatch.bat** file.

8. Refresh the Pro2 user interface to complete the replication configuration process.

Manually test a replication

Testing is an important part of any enterprise applications configuration process. Consider an testing example where a city is assigned to a customer. This change is made in the source database, and needs to be replicated to the target database. To perform the test scenario:

1. In a **Proenv** window, navigate to your Pro2 root folder. For example, `C:\Pro2v62\db`.

2. Enter the command `prowin -db database name -db repl`.

The **Procedure Editor** window appears.

3. Assign city to the first customer in source database.

```
FIND FIRST customer
ASSIGN city = "NY"
```

4. Open the Pro2 web interface and click the **Total Threads** watch-box. Notice the event type in the **Replication thread** window. This event will show the recent change made to the source database.

Thread Type	Id	Replication Control	Logging Level	Disposition	Status
CDC	0	Enabled	Moderate	Delete Record	STOPPED
JOB	0	Enabled	Moderate	Mark as Applied	RUNNING
REPLICATION	1	Enabled	Moderate	Delete Record	STOPPED

Event Type	Source Database	Source Table	Source Record	Event Date	Event Time	User
W	sports	Customer	00000000000000000000000000000000	2019-07-18	16:15:08	jblum

5. Run the replication file by navigating to `\bprepl\Scripts`.

6. Double click the **Replbatch1.bat** file to run the replication thread. This action removes the event type in the replication thread which implies that the replication record is processed by the replication thread and sent to the target database.

Thread Type	Id	Application Control	Logging Level	Disposition	Status
CDC	0	Enabled	Moderate	Delete Record	STOPPED
JOB	0	Enabled	Moderate	Mark as Applied	RUNNING
REPLICATION	1	Enabled	Moderate	Delete Record	RUNNING
REPLICATION	2	Enabled	Moderate	Delete Record	STOPPED
REPLICATION	3	Enabled	Moderate	Delete Record	STOPPED
REPLICATION	4	Enabled	Moderate	Delete Record	STOPPED
REPLICATION	5	Enabled	Moderate	Delete Record	STOPPED

Directory reference

The following is a description of the folders under the **Pro2** root folder.

Folder	Description
bprepl	Root directory for application programs.
bprepl\AppSrv	Used in WAN implementations.
bprepl\common	This folder contains common files used across Pro2.
bprepl\datasets	Used to support the acquisition of data sets from the database.
bprepl\images	Image files that can be used for shortcut icons.
bprepl\misc	Miscellaneous replication files and procedures.
bprepl\PRO2_REST	Contains files to support the user interface.
bprepl\repl_as_tgt	Used in WAN implementations.
bprepl\repl_d	Directory for the Pro2 generated database replication delete trigger procedures.
bprepl\repl_export	Used in WAN bulk loads.
bprepl\repl_inc	Directory for Pro2 generated assign include files.
bprepl\repl_jtrig	Directory for any java triggers.
bprepl\repl_log	Default location of log files.
bprepl\repl_mgtrig	Directory listing tables that require merged triggers.
bprepl\repl_mlog	Location for bulk load logs.
bprepl\repl_mproc	Directory for the Pro2 generated bulk copy procedures.
bprepl\repl_mproclog	Location for bulk load program logs.
bprepl\repl_pf	Directory for application server and repl .pf files.
bprepl\repl_pro2dbtrigs	Directory for Pro2 database trigger files.

Folder	Description
bprepl\repl_proc	Directory for the Pro2 generated replication library
bprepl\repl_sql	Directory for SQL replication procedures.
bprepl\repl_tmpl	Directory containing the templates used for various code generation. Contains the ReplLogCheck ErrorTriggers.lst files.
bprepl\repl_w	Directory for Pro2 generated database replication write trigger procedures.
bprepl\replcdc_proc	Directory for Pro2 CDC replication procedures.
bprepl\Scripts	Directory containing the .pf files, scripts, and shortcuts to start various Pro2 functions.
bprepl\SQL_inc	Directory for the direct SQL assign include files.
bprepl\SQL_mproc	Directory for the direct SQL bulk copy procedures.
bprepl\SQL_proc	Directory for the direct SQL replication procedures.
bprepl\custom	Directory to deploy your customized code so that it overrides the existing code in the bprepl folder.
	Note: This folder must maintain the bprepl folder structure and is applicable for both LAN and WAN configurations.
db	Location of schema holder database(s). Also, the initial temporary location for repl database during implementation.
Docs	Contains various read me files for Pro2.
Downloads	Initially empty. Used to save site-specific downloads.
misc	Miscellaneous Pro2 utilities.
PASOE	Directory for the PAS for OpenEdge instance associated with your Pro2 deployment.
tmp	Miscellaneous Pro2 temporary files used during implementation.
utils	Directory for various replication procedures.

ReplProperties and ReplQueue

The OpenEdge replication source database and target database tables are stored in property files. There are configuration settings whose values you set in these tables that control different aspects of your replication environment. The following are the tables for the Pro2 replication environment:

- **ReplProperties**—Configuration settings such as log file location, logical delete tables, and specification of procedure templates are stored in the **ReplProperties** table. Configuration settings can be saved to and loaded from a text file from the **New** button in the **Manage Replication** window on the Pro2 web interface.
- **ReplQueue**—Information about change events is stored in the **ReplQueue** table. This information includes the ROWID of the record changed, event date, time, and queue thread. Typically, repl queue records represent updates made to the source database that are waiting to be written to the target SQL database.

Install and configure Pro2 on Linux

Use the `Pro2-6.2.bin` file to install Pro2 on your Linux machine.

Install Pro2

To install Pro2 for Linux:

1. Locate and execute the **Pro2-6.2.bin** file.
2. In the **Pro2** installer, click **Next** to start the installation process.
3. Specify the install folder path, for example, `USER_INSTALL_DIR=/pro2inst`.
4. In the **Choose OpenEdge** window, specify the path or select **Choose** to browse and set the OpenEdge home directory.

The directory is based on the version of OpenEdge that is installed on your machine, for example, `OE_INSTALL_DIR=/_linuxx86_64/build/dlc`.

5. On the PAS for OpenEdge Ports screen, enter the port information for your PAS for OpenEdge instance and designate the instance name. For example:

HTTP Port	9991
HTTPS Port	9992
Shut Down Port	9993
Instance Name	Pro2Web

6. Click **Next** and review the options you chose for this installation in the **Pre-Installation Summary** page.
7. Click **Install**.
8. Click **Done**.

Silent Pro2 installation

To silently install Pro2 on a Linux machine:

1. Copy the `response.properties.example` file from `C:\Progress\Pro2\Docs\response.properties.example` to your Linux machine.
2. Choose the Pro2 root folder by updating `USER_INSTALL_DIR` path in `response.properties.example`.
3. Choose the OpenEdge install location by updating the `OE_INSTALL_DIR` path in `response.properties.example`.
4. Update PAS for OpenEdge instance name and ports in `response.properties.example`.
5. Run the command `sh ./Pro2-6.2.1.bin -i Silent -f response.properties.example`.

Note: The same procedure can be followed for installing Pro2 Enterprise View (Pro2-6.2-ent.bin) on a Linux platform.

For more information about installing Pro2 Enterprise view, see [Pro2 Enterprise View](#) on page 48.

Pro2 Enterprise View

The Pro2 Enterprise View is a centralized dashboard that aggregates mission-critical data, reports, and metrics across all of your Pro2 instances. From the Enterprise View dashboard, you can quickly access each of your Pro2 instances to manage and act on any reports or replications from the instance.

For example, an e-commerce enterprise has three instances of OpenEdge Pro2 running on three separate data centers: one in the USA, one in India, and one in the UK. Managing data and replications across these three instances can be a hassle. With the Enterprise View, you can observe and navigate to each Pro2 instance with ease and efficiency.

The Pro2 Enterprise View dashboard is included with the latest release of Pro2, but it can also be installed as an add-on to your existing instances. If you are interested in the Pro2 Enterprise View Dashboard, contact your Progress OpenEdge representative, and ask about upgrading to the latest version, or about adding the Pro2 Enterprise View Dashboard to your existing instances.

For more information on Pro2 Enterprise View, see [Pro2 FAQs](#).

Set Up Pro2 Enterprise View

The Pro2 Enterprise View is designed for easy installation, set up, and integration with your existing Pro2 instances.

To set up Pro2 Enterprise View:

1. Install Enterprise View.
2. Create a Pro2 Enterprise View database.
3. Update the `replProc.pf` file.
4. Start a PAS for OpenEdge instance.
5. Set up your Pro2 Enterprise environment.
6. Join your Pro2 instances to Enterprise View
7. Schedule an Enterprise View push job.
8. Start the job runner.

Install Enterprise View

1. Locate and execute the `Pro2-6.2-ent.exe` file. All installation files are provided to you by your Progress representative.
2. In the **Pro2 Enterprise** installation wizard, click **Next**.
3. Specify the installation folder path as `C:\Progress\Pro2ent`.
4. In the **Choose OpenEdge** window, specify the path, or select **Choose** to browse and set the OpenEdge home directory.

The directory is based on the version of OpenEdge that is installed on your machine, for example, `C:\122\dlc`.
5. On the **PAS Ports** window, enter the port information for your PAS for OpenEdge instance, and designate the instance name.
6. Click **Next** and review the options you chose for this installation in the **Pre-Installation Summary** page.
7. Click **Install** to continue with the installation process.
8. Click **Done**.

Create a Pro2 Enterprise View database

Similar to a standard Pro2 replication (repl) database, the Pro2 Enterprise View, or `pro2ent`, database is an internal database that exists on the machine where Enterprise View is installed. All reports and metrics from the Pro2 instances that you joined to Enterprise View are aggregated to this database, where it is then pushed to the Pro2 web user interface.

To Create a `pro2ent` database:

1. Start a Proenv session.
2. Navigate to the `Pro2` folder from the Proenv window. Type `cd` followed by name of the folder where you installed Pro2 Enterprise View, for example, `cd Pro2ent`.
3. Type `cd db` to navigate to the database folder of Pro2.

Note: Check the directory of the `db` folder to view the database instances. Type `dir` after navigating to the database folder.

4. Create an empty `pro2ent` database instance by typing `prodb pro2ent empty`.
5. Load the required table definitions in the `pro2ent` database by typing `prowin pro2ent -1`.
The **Procedure Editor** window appears.
6. Navigate to **Tools > Data Administration**.

7. In the **Data Administration** window, navigate to **Admin > Load Data and Definitions > Data Definitions (.df file)**.
8. In the **Load Data Definitions** window, load the `pro2ent.df` file and click **OK**.

Note: The `pro2ent.df` file is located in `Pro2ent folder/db`.

9. Start the `pro2ent` database by typing: `Proserve pro2ent`

Update replProc.pf

In the `pro2ent` database, you must add the connection details to the `replProc.pf` file. This connects the database to your PAS for OpenEdge instance, and by extension, makes it available to be connected to your other Pro2 instances.

1. Navigate to the `Pro2ent` folder.
2. Add the `pro2ent` database connection details to the `Pro2_HOME\bprepl_ent\Scripts\replProc.pf` file to connect the replication threads and PAS for OpenEdge instance to the `Pro2ent` database.
3. Navigate to the `bprepl_ent\Scripts` folder, and open the `replProc.pf` file. Add the complete path of the database in the file and click **Save**.
4. To test the `Pro2ent` database connections, open the **Procedure Editor** from the `bprepl_ent\Scripts` folder and navigate to **Tools > Data Dictionary**. If the connection is successful, the **Tables** section displays tables.

Start a PAS for OpenEdge instance

Now that the `pro2ent` database is set up, start the PAS for OpenEdge instance and log in to the Pro2 web application:

1. Start a Proenv session.
2. Navigate to the Pro2 folder by entering `cd` followed by name of the folder where you installed Pro2, for example, `cd Pro2ent`.
3. Type `Pro2ent\bin\tcman.bat env`.
4. Type `Pro2ent\bin\tcman.bat start`.
5. To verify that the instance started successfully, type `Pro2ent\bin\tcman.bat env`. The **Server Running** section shows a number if the instance started.
6. Open any browser and log in at `localhost:9991/pro2/static/` with the default credentials.

Set up the Pro2 Enterprise environment

Before you connect your Pro2 instances with your Enterprise View instance, you must set up a basic environment by loading the configuration file. The configuration file consists of all the properties and records that are necessary to set up the Pro2 Enterprise environment.

To load the configuration file:

1. In the Pro2 web interface, navigate to **Settings > Tools > Load Configuration**.
2. Click **Select Files** and load the `replentbasev610.ini` file from the Pro2 folder. The `replentbasev610.ini` file is the Pro2 configuration file.
3. Click **Submit**.

Join your Pro2 instances to Pro2 Enterprise View

After the configuration file is successfully uploaded, your instance of the Pro2 Enterprise View is ready to be joined with your other instances of Pro2. In this phase of the set-up process, you transform Enterprise View from an empty dashboard to one that is full of meaningful data from across all of your Pro2 instances.

Note: A Pro2 instance cannot be joined to more than one Enterprise View instance.

To join your Pro2 instances:

1. From an instance of Pro2 that is not joined with Enterprise View, navigate to the side menu and select **Settings > Enterprise > Join**.
2. On the **Join Enterprise** window, enter:
 - a. **Instance name**
The instance name is designated at the time of installation and setup of that instance.
 - b. **Instance Abbreviation**
The instance abbreviation is determined at the time of installation and setup of that instance. The abbreviation is limited to two characters.
 - c. **Enterprise Application Server Name**
This is the same application server that is associated with your Enterprise View instance, for example, `ent`.
 - d. **Enterprise Host Name**
This is the same host name that is associated with your Enterprise View instance, for example, `localhost`.
 - e. **Enterprise Application Server Port Number**
The port number associated with your enterprise application server.
3. (Optional) To test your connection to the application server, click the **Application Server Test Connection** button. If the test is unsuccessful, ensure that the instance information is correct and try again.
4. Select **Join** to connect the Pro2 and Enterprise View instances. You can save your work and come back to it later by clicking the **Save** button.

Note: It takes a few minutes for the instances to connect.

Schedule an Enterprise Push job

After the connection between your Enterprise View instance and your other Pro2 instances are established, data is not automatically transferred between them. You must schedule an Enterprise push job. Your Pro2 instance to push data, metrics, and reports from an instance to the Enterprise View instance. This is how the Enterprise View instance stays up to date with all of your mission-critical replications.

To Schedule an Enterprise Push job:

1. From an instance of Pro2 that is joined with Enterprise View, navigate to the side menu, and select **Actions > Jobs > Scheduled Jobs**.
2. On the **Scheduled jobs** window, select **New**.
3. On the **Create Scheduled Jobs** window, click on the **Type** drop-down list and select **Enterprise Push**.
4. (Optional) Enter a description for the job. Entering a description can help you differentiate various jobs of the same type from one another.
5. Under the **Settings** section, set how frequently the data is to be pushed to your Enterprise View instance. It is a best practice to schedule the pushes to occur frequently. To support this:
 - a. Select **Daily**.
 - b. Enter the **Start Date** and **Start Time** for when you want the job to begin, such as the current date and time.
 - c. You can set the **End Date** and **End Time** for the job. This, however, stops the flow of data from your Pro2 instance to your Enterprise View instance and is not recommended. To run the job indefinitely, **do not enter an End Date or an End Time**.
 - d. Set the **Repeat task every** to **1 minute**.
6. Click **Save**.

Start the job runner

For the last step of the Enterprise View setup process, you must start the job runner.

To start the job runner and initiate the scheduled Enterprise Push job, use the following procedure:

1. On the machine where you have the Pro2 instance for which you have scheduled the job, navigate to the Pro2 Scripts folder, for example `C:\Pro2\bprepl\Scripts`.
2. Select and execute the **jobrunner.bat** file.
3. Navigate back to the Pro2 instances web interface and confirm that the job completed successfully.

Your Enterprise View instance is now set up, and data will begin to populate the dashboard. Repeat phases 6, 7, and 8 for each of your Pro2 instances that you want to join to your Enterprise View dashboard.



Manage

For details, see the following topics:

- [Customize Pro2](#)
- [Upgrade Pro2 5.5.x to 6.4](#)
- [Uninstall Pro2](#)
- [Establish secure database connections](#)
- [Use replication triggers](#)
- [Use the job runner](#)
- [Remove replication triggers](#)
- [Customize Pro2 replication](#)
- [Split replication threads](#)
- [Configure Pro2 to target SQL database connectivity](#)
- [Configure Pro2 e-mail notifications](#)
- [Use second-pass replication](#)
- [Bulk load with Pro2](#)
- [Dump and load with Pro2](#)
- [Migrate your OpenEdge database with Pro2](#)
- [Check replication logs](#)

- [How to schedule jobs in Pro2](#)
- [Use CDC with Pro2](#)
- [Manage Pro2 Properties](#)
- [GET bulk load report API](#)
- [GET replication queue records API](#)
- [GET thread data API](#)
- [GET Pro2 connection information API](#)
- [GET version information API](#)
- [GET instance information API](#)

Customize Pro2

Pro2 can be customized to meet your needs. You can generate Pro2 specific fields, add and delete index information on the target database, and change table and field names.

Customizable by table, by field/column, or record/row

All tables or a subset of tables can be replicated. In addition, not all fields within the tables selected for replication need to be replicated. In addition, logic can be added to filter records in selected tables so that only those records that meet the specified criteria are replicated.

Custom transformations using ABL-supported logic

Replication data can be manipulated with ABL logic before being written to the target database. For example, field values can be modified based on business logic or target-side-only columns can be populated with data consolidated from multiple source fields.

Generating Pro2-specific fields

Pro2 provides an option Delta DF Pro2Pro to generate only Pro2-specific fields for your target database. In cases where the source schema is already replicated to your target database, you can use Delta DF Pro2Pro to generate only Pro2-specific fields, and thereby avoid unnecessary replication of source schema.

Oracle specialization: Use the following properties to generate Oracle-specific output:

- **ORACLE_USE_LOGICAL**—This property is responsible for converting the logical field to number.
- **ORACLE_USE_SCALE**—This property is responsible for adding precision and scale for decimal fields.

By default, the value of these properties is set to **NO**. To use these properties, set the value to **YES**.

Target-side index information

Customers can add and delete index information on the target database without interfering with Pro2 Replication as long as no unique keys are added and as long as the `PRROWID` key is not modified. Pro2 compiles the `CREATE INDEX` statements into a separate file named `dbname -targettype -index.sql` file. These index statements are applied to the target only if you designate them.

Standard modifications to table and field names

You can modify table and field names in Pro2.

- **Extent fields**—Array fields from the OpenEdge source database are created as individual fields in the target database schema.
- **Reserved words**—Any table or column names that are reserved words in the target database server or in OpenEdge must be renamed. Often this is done by appending an underscore (_) to the end of the column name. However, the column can be renamed to anything that is not a reserved word.

Upgrade Pro2 5.5.x to 6.4

Upgrading Pro2 from 5.5 to 6.4 or above is a manual process that involves:

- Installing and configuring Pro2 6.4 or later versions.
- Importing your 5.5 properties file and table mapping.
- Disconnecting and shutting down your Pro2 5.5 instance.

Pro2 6.4 or above includes all of the enhancements and benefits of the previous 6.x releases and offers many advantages over the 5.x series. Namely, a new intuitively designed user interface, enhancements for change data capture based replication, efficient bulk loading, and so much more. Because of these drastic differences between the two version series, upgrading Pro2 can best be achieved by:

- Installing a fresh version of Pro2 6.4 or above.
- Preparing your 5.5 instance of Pro2 for shutdown.
- Initiating a cut over event to switch from using 5.5 to 6.4 or above.

An aspect of the upgrade process that requires special consideration, is determining whether or not you want to bring your 5.5 properties file into your new Pro2 instance. Generally, older Pro2 installations were performed by Progress Professional Services as a paid engagement. Pro2 configurations can vary greatly between one another depending on how thoroughly the default properties file and code are customized. During your upgrade planning phase, examine your properties and compare them to the new 6.4 properties.

Progress recommends that you first attempt the upgrade on a test environment, and backup your entire Pro2 directory, before upgrading the production environment.

Main steps to upgrade Pro2

1. Plan for the upgrade.
2. Save the 5.5 configuration files.
3. Install Pro2 6.4 or above.
4. Configure Pro2 for LAN or WAN.
5. Load the 5.5 configuration files.
6. Initiate the upgrade cut-over event.
7. Test the upgraded deployment.

Upgrade planning

Due to the highly customizable nature of Pro2 instances, there is no definitive upgrade planning method. Your upgrade planning needs might be vastly different from another Pro2 user. You should confer with your database administrator and other stakeholders to determine the best way to plan for your upgrade.

However, you should consider the following guidelines while planning for your upgrade:

- Determine when your application receives the least amount of user traffic.
- Plan to initiate your upgrade cut-over during a low traffic window.
- Learn about Pro2 6.4 or above features, functionalities, and enhancements.
- Compare your custom 5.5 properties with the 6.4 or above properties. If your custom properties are still viable, create a copy of the file for later use.

For more information about the Pro2 6.4 properties, see "Properties" in the *Pro2® Web User Interface* guide.

- Determine whether a LAN or a WAN configuration is right for your deployment. Accordingly, your application may need a new configuration or may retain the same configuration. For example, changing from LAN to WAN.
- Identify where you want to install Pro2 6.4 or above.
- Devise a test plan.
- Create a backup strategy.

Save your configuration files

If you want to import your Pro2 5.5 configuration details into your 6.4 or above installation, save your properties and mapping file. Before importing them:

1. On the machine where you have Pro2 installed, open the **Pro2 Administration** tool and click **File > Save Configuration**.
2. Save your configuration file to an easily accessible location.
3. Return to the **Administration** tool and click **File > Save mapping file**.
4. Save your mapping file to an easily accessible location.

You need both the mapping and the configuration files during the Pro2 6.4 or above configuration process.

Install Pro2 6.4 or above

If you choose to use the same configuration (LAN or WAN) as your previous Pro2 deployment, Progress recommends that you install Pro2 6.4 or later versions on the same machine as your 5.5 deployment. Though on the same machine, this installation must be in a separate directory to ensure zero interference with your 5.5 deployment. By installing both the 5.5 and 6.4 or above versions on the same machine, you need fewer configurations to support the cut-over event.

1. Depending on your choice of configuration, choose to install and configure 6.4 for LAN or WAN.
 - [Install and configure Pro2 for LAN](#) on page 15
 - [Install and configure Pro2 for WAN](#) on page 31
2. Follow the installation and configuration procedure upto to the step for loading your configuration file. Then perform the following steps:
 - a. In the Pro2 web interface, navigate to **Actions > Tools > Load Configuration**.
 - b. Click **Select Files** to load the .ini configuration file, such as replbasev610.ini from the Pro2 folder, and click **Submit**.
A success or failure notification is displayed after the upload is complete.
 - c. Ensure that all the properties are successfully loaded into the Pro2 database.
 - d. On the Pro2 dashboard menu, click **Actions > Tools > Load Configuration**.
 - e. Select the **Load v5 Properties File** option and click **Select Files** to load the Pro2 5.5 properties.ini file.
 - f. Select the **Overwrite Pro2 Properties** checkbox and click **Submit**.
 - g. Ensure that all existing property values are overwritten with the Pro2 5.5 property values.
3. Start the job runner.
 - a. Navigate to the **Pro2 Scripts** folder, for example C:\Pro2\bprepl\Scripts.
 - b. Select and run the jobrunner.bat file.
 - c. Return to the web interface and confirm that the jobrunner.bat is running by checking the status in the **Pending Jobs** watch-box.
4. Add the source database details.
 - a. From the Pro2 web interface, navigate to the **Manage Replication** tab, and click **New**.
The **Create Replication** window appears.
 - b. In the **Source DB Name** field, type the name of the source database.
 - c. Select **Trigger** or **CDC** as the **Source Database Mode**.
 - d. In the **Host Name** field, type the name of the host.
 - e. In the **Host Port/Service** field, type the port number (for example, 2233).
 - f. If required by your source database, enter your **User Name** and **Password**.

Note: Enter your user name and password only if it is required by your source database.

 - g. Select **Test Connection** and if the test is successful, move on to set the target database.
 - h. Review your source database details to ensure their correctness, and Click **Next**.
The **Set Target** tab appears.
5. Add the target database details.
 - a. In the **Target Database Typelist**, select **Microsoft SQL Server**, **Oracle**, or **OpenEdge**.
 - b. If necessary, change the default values in the following fields:

- **Target Database Name**
- **Target Schema Image**
- **Schema Holder DB**
- **Target ODBC Connection**

c. If required by your target database, enter your **User Name** and **Password**.

d. Click **Next**.

The **Generate Target Schema** tab appears.

Note: If your target SQL database already exists and is not different than the one in your Pro2 5.5 instance, do not generate the target schema or load the file into target.

6. Click **Generate Target Schema**.

7. Create a schema holder for your target database.

Note: Unless you are upgrading the OpenEdge version on the Pro2 instance machine, do not recreate the schema holder.

- a. To create an empty schema holder database, open a **Proenv** window, and enter `prodb database name empty`.
- b. Start a single user session by entering `prowin database name -1`.
The **Procedure Editor** window appears.
- c. In the **Procedure Editor** window, select **Tools > Data Administration**.
- d. Select **DataServer > <database-type> Utilities > Create DataServer Schema**.
The **Create/Modify Record for Schema** window appears.
- e. In the **Logical Database Name** field, type the name of your logical database.
- f. If the source database is **MS SQL Server**, specify the **ODBC Data Source Name**, and click **Ok**.
- g. In the **User ID and Password** dialog box, enter the **Login ID** and **Password** if required, and click **OK**.
- h. In the **Pre-Selection Criteria For Schema Pull** window, do the following:

Pre-Selection Criteria For Schema Pull

Object Name: *

Owner: dbo

Qualifier : *

☒ Default to OpenEdge DATETIME

☒ Default to OpenEdge LOB for: ☐ CLOBs ☒ BLOBs

☐ Designate Primary/Clustered index as ROWID
Select 'Best' ROWID Index
Using: ☒ DE Schema ☐ Foreign schema

☐ Provide RECID Compatibility

OK Cancel Help

- a. Type the values for **Object Name**, **Object Owner** (typically, `dbo`), and **Qualifier**, and select the **Default to OpenEdge DATETIME** checkbox.
- b. If you selected the **Default to OpenEdge LOB for** checkbox, ensure to select the **BLOBs** checkbox along with the **CLOBs** checkbox, so that the data server is forced to automatically treat certain target-side data types as LOBs.

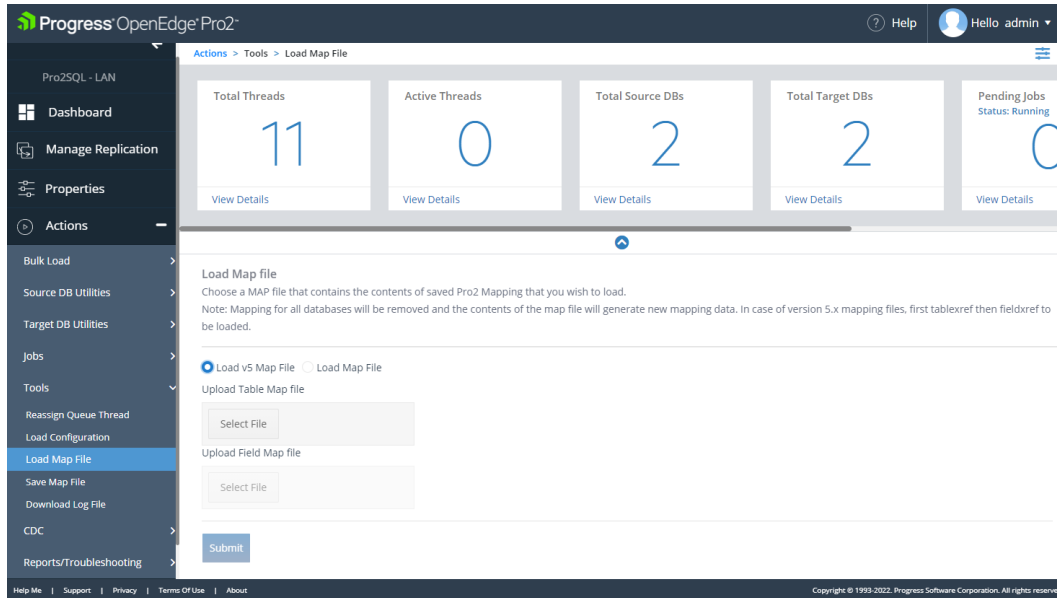
Notes:

- Selecting the **CLOBs** checkbox automatically converts the `varchar(max)` and `nvarchar(max)` data types to CLOB.
- Selecting the **BLOBs** checkbox forces the data server to consider all `varbinary(max)` data types as BLOB.

- On the source fields that are character types, Pro2 may convert some types to `varchar(max)` when the source width is wider than the `MAX_CHAR_WIDTH` property setting. This conversion has the added benefit of avoiding row size limits for SQL Servers. However, `varchar(max)` and `nvarchar(max)` are not necessarily treated as CLOBs.

- On the **Generate Target Schema** page, open a new tab, and navigate to **Actions > Tools > Load Map File**.

Note: The load map functionality deletes all the existing `repl_tablexref` and `repl_fieldxref` records and recreates them.



- Select the **Load v5 Map File** option and click:
 - Select File** in the **Upload Table Map file** box and load the Pro2 5.5 `mapping_TBLxRef.map` file.
 - Click **Select File** in the **Upload Field Map file** box and load the Pro2 5.5 `mapping_FLDxRef.map` file.

Note: Both the table map and field map files are required to complete the load process.

- Click **Submit** and return to the previous tab **Generate Target Schema** page.
 - Click **Next** to navigate to **Mapping Page**.
- Review all the tables and fields mapping information, verify it against your Pro2 5.5 instance and, click **Next**.
 - On the **Advanced Configuration** page, review all the table properties and thread mappings, and ensure that they match your Pro2 5.5 instance.
 - Click **Next** to generate the code.

Note: To ensure proper database connectivity, it is highly recommended to restart both jobrunner and PAS for OpenEdge web instance.

Initiate the upgrade cut-over event

Leaving the target database details unconfigured in the Pro2 UI, go to the Pro2 5.5 root folder and start a **Proenv** instance to shut down the 5.5 replication databases. To do it, perform the following steps:

1. Open a **Proenv** window and enter the `cd` command to navigate to the Pro2 5.5 root folder.
2. To shut down the replication (repl) database, enter `proshut repl -by`.
3. To shut down the replperf database, enter `proshut replperf -by`.
4. Return to the Pro2 6.4 or above user interface and continue the target-side configuration process.

Test the upgraded deployment

1. After confirming that the bulk load was successful, test and troubleshoot the upgraded deployment using your test plan created during the planning phase.
2. Review the test results, and note any abnormalities.
3. Investigate ways to correct any abnormalities you find, and make the appropriate the corrections.
4. If you find no abnormalities in your testing environment, choose a time to upgrade your production environment.

Uninstall Pro2

To uninstall Pro2 on Windows:

1. Delete the PAS for OpenEdge instance.
 - a. Open a **Proenv** window and type `pasman instances`.
 - b. Enter `pasman delete instance name` to delete the PAS for OpenEdge instance. Type **YES** to confirm.
 - c. Close the **Proenv** window.
2. Go to `C:\Progress\Pro2\uninstall` and run `uninstall.exe`.
3. Delete the repl and Pro2 database instances.
 - a. Open a **Proenv** window and navigate to the database folder where you have created the repl and Pro2 databases.
 - b. Enter `proshut repl -by` to shut down the repl database.
 - c. Enter `proshut Pro2 -by` to shut down the pro2 database.
4. Enter `prodel repl` and then type **Y** to delete the database instances.
5. Enter `prodel Pro2` and then type **Y** to delete the database instances.
6. Go to the Pro2 folder and delete the remaining folder skeleton.

Establish secure database connections

For security purposes, Pro2 validates and controls access to your multi-tenant database.

Set-up secure connection to a multi-tenant database

With Pro2, you can configure a secure connection to your multi-tenant database. Each tenant in a multi-tenant database must have its own installation of Pro2, a schema holder, and an ODBC connection. However, for all the tenants, the logical name of the ODBC connection can be the same, and the schema holder name can be same as the Pro2 installation folders are different for each tenant.

To establish a secure connection to a multi-tenant database:

1. Embed Repl database into your source database by performing the following tasks:

- a. Shutdown the source database.
- b. In the `repladd.st` file, add the Repl database structure to the source database by updating the command:

```
prostrct add <sourcedb_name> repladd.st
```

- c. Load `repl.df` to the new database.
- d. Start the source database by running the following command:

```
proserve <sourcedb_name>
```

2. Create a separate folder for each tenant, such as `Pro2_tenant1`, `Pro2_tenant2`, etc., and install Pro2 for each tenant.
3. Edit the `Pro2_env` file and update the paths to point to the corresponding tenant.
4. Create `<database>.pf` files for each tenant, such as `Tenant1DB.pf`, `Tenant2DB.pf`, etc., and edit them to point to their corresponding Pro2 instances.
5. Specify the username and password in the `<database>.pf` files if you are connecting to the database for the first time.

The Pro2 web user interface is now set to connect to your multi-tenant database securely using your credentials.

Use replication triggers

Pro2 replication schema triggers are used with the source OpenEdge Database. A schema trigger is a `.p` procedure that you add, through the data dictionary, to the schema of a database. Schema trigger code defined in the OpenEdge database is executed by database clients.

Pro2 replication triggers are used with the source OpenEdge database. You can use these triggers to:

- Create the replication record based on the database, table, and row ID.
- Record the type of event, (create, write, or delete) that takes place on a record.
- Set the `Applied` flag to false (default).
- Define what happens when an event occurs on a record.

When you use an OpenEdge database architecture, the Pro2 replication triggers are executed by the client executable, as opposed to the trigger being executed by the database server executable, as in most other database systems.

The Pro2 trigger procedures are specified by the schema trigger definition. The Pro2 trigger procedures are lightweight and do not alter the your application flow in any way. They are transparent to both the application and the end-users.

In cases where replication triggers already exist in the source database for particular events and tables, the Pro2 replication logic needs to be integrated with or merged into the pre-existing triggers.

All replication triggers are compression triggers by default.

Note: You cannot use the compression trigger template when Auditing is implemented. You must override the default triggers.

Schema trigger event definitions

Schema triggers are fired when schema-level objects (tables) are modified and when the user log-on or log-off events occur. Some of these triggers are:

- **CREATE:** Creates and enables a database trigger.
- **DELETE:** Removes a database trigger.
- **WRITE:** Writes and edits a database trigger.
- **RE-DEL (REPLICATION-DELETE):** Removes a replication trigger.
- **RP-WRI (REPLICATION-WRITE):** Creates or updates a replication trigger. The specified procedure is run when this type of event occurs.

To get a trigger definition report from the Procedure Editor (The Procedure Editor is an OpenEdge ABL code editor):

1. Run **Tools > Data Administration**.
2. From the **Data Administration** window, select **Database > Reports > Triggers**.

The following table is an example of the output from the Progress trigger report. This example is of a `Customer` table in the `sports` database after Pro2 triggers were inserted:

Table 1: Progress trigger report

Table	Event	CRC	Flags	Procedure
CUSTOMER	CREATE	No		C:\dlc101c\sports\crcust.p
	DELETE	No		C:\dlc101c\sports\delcust.p
	RP-DEL	No		.\bprepl_dlsports_Customer.t
	RP-WRI	No		.\bprepl_wlsports_Customer.t
	WRITE	No		C:\dlc101c\sports\wrcust.p

Alternatively, these triggers can be displayed by the `replTrigDisp.p` procedure (to display) and the `replTrigDisp2.p` procedure (to file).

Trigger procedures

The Pro2 trigger procedures are found by the client executable in a location specified in the `PROPATH`. The replication trigger location can be in the same directory as the other triggers (if there are other triggers defined for the database). However, these triggers must be already included in the `PROPATH`. You must place the trigger procedures on the database server and on any application servers that end users run your application.

Note that the pathname specified for the Pro2 replication triggers in the schema trigger definition is a relative path starting with `bprepl`. Typically, a `bprepl` directory is created with the following sub-directories in a location already in the `PROPATH`:

- `repl_d` (delete triggers)
- `repl_w` (write triggers)

`PROPATH` can be modified to include the location of the `bprepl` directory.

When a replication trigger is defined for a table schema, the client attempts to run the specified trigger procedure. This happens when a client executable attempts to update a record in the source database.

The trigger procedures should be located on the database server if the user is connected as a local direct connect client (whether an end user or by PAS for OpenEdge servicing a remote client). Whereas, the trigger procedures should be on the client system if they are remote and are connected to the database via client/server.

For optimal performance, the replication triggers should be compiled with `.r code`. To compile the triggers, the standard OpenEdge application compiler is used in a Procedure Editor session connected to both the source database and the repl database.

Merged triggers

The Pro2 replication triggers must be merged with the original triggers if the pre-existing replication triggers (`REPLICATION-DELETE` or `REPLICATION-WRITE`) exist in the source database. You can merge the triggers by adding a `RUN` statement in the original replication trigger procedure that calls the Pro2 trigger or by adding the Pro2 replication trigger logic to the original trigger.

Note:

The types of triggers in Progress are as follows:

- **Primary triggers**—`CREATE`, `WRITE`, and `DELETE` are primary triggers, and they should not be integrated with Pro2 triggers. They are not affected by Pro2 replication.
- **Replication triggers**—`REPLICATION-DELETE` or `REPLICATION-WRITE` are executed after the primary triggers and must be merged with the Pro2 triggers.

Insert replication triggers

The `replTrigInsert.p` procedure is used to insert the triggers. This procedure is run from the OpenEdge procedure editor connected to both the source database and the repl database (or to the source database with the embedded repl tables).

To insert replication triggers:

1. Shut down all the database instances and PAS for OpenEdge instance before inserting the replication triggers.
2. Navigate to the `\db` folder of Pro2 from the **Windows Explorer**, for example, `C:\Pro2v61\db`.
3. Create a new folder named `bprepl` in the `db` folder.
4. Navigate to the `\bprepl` folder in the Pro2 folder (`C:\Pro2v61\bprepl`), and copy the following folders:
 - `repl_d`
 - `repl_w`

These folders contain the replication triggers and are required to process the replication queue records (also known as replq records).

5. Paste the folders in the `\db\bprepl` folder of Pro2 (`C:\Pro2v61\db\bprepl`).

6. Type `prowin -db sports -db repl` and press **Enter**.

The **Procedure Editor** window appears.

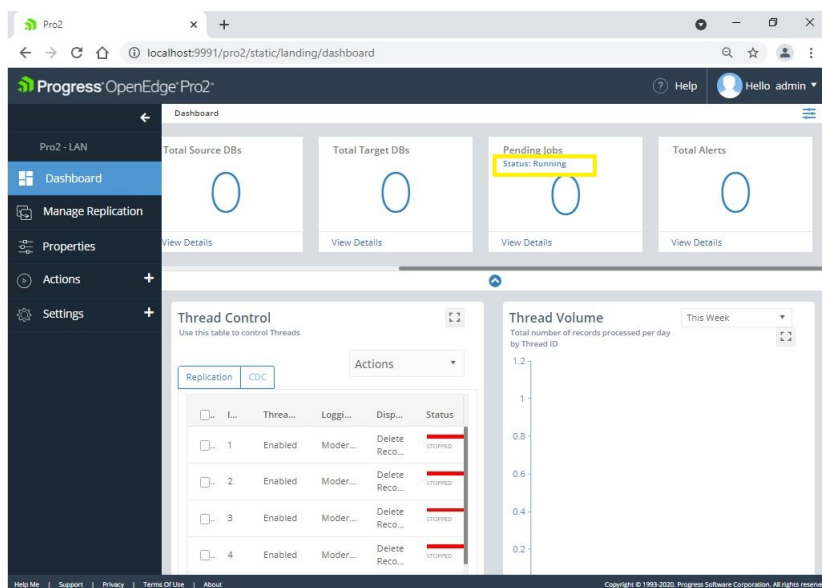
7. Open the `ReplTrigInsert.p` file from `C:\Pro2v61\utils` in the **Procedure Editor** window. This inserts replication triggers into the source database.
8. Enter the name of the source database and close the **Procedure Editor**.
9. Restart all the database instances and the PAS for OpenEdge instance.

Use the job runner

The job runner is a program that is used by Pro2 to run and manage various Pro2 "jobs" within the application. For example, the job runner is used to start a replication job.

To start the job runner:

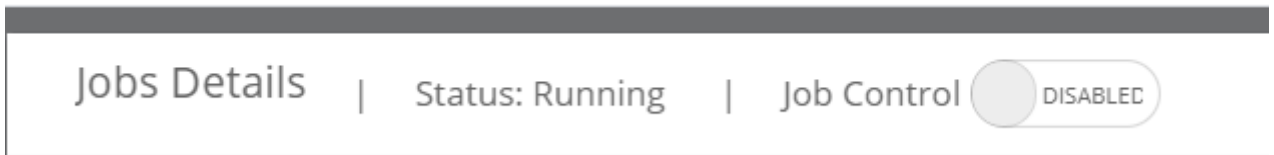
1. Navigate to the Pro2 Scripts folder, for example, `C:\Pro2\bprepl\Scripts`.
2. Select and execute the `jobrunner.bat` file.
3. Navigate back to the web interface and confirm that the `jobrunner.bat` file is running by checking the status in the Pending Jobs watch-box.



Note: Do not close the job runner file window.

To stop the job runner:

1. On the Pro2 web interface go to the **Pending Jobs** watch-box.
2. Toggle the **Job Control** to **Disabled**.



Remove replication triggers

The `replTrigDel.p` procedure is used to delete the replication triggers. This procedure is run from the OpenEdge procedure editor connected to both the source database and the replication database (or to the source database with the embedded replication tables).

To delete replication triggers:

1. Shut down all the database instances and PAS for OpenEdge instances prior to deleting the replication triggers.
2. Navigate to the `\db` folder of Pro2 from the **Windows Explorer**, for example, `C:\Pro2v61\db`.
3. Create a new folder named `bprepl` in the `db` folder.
4. Navigate to the `\bprepl` folder in the Pro2 folder (`C:\Pro2v61\bprepl`) and copy the following folders:
 - `repl_d`
 - `repl_w`

These folders contain the replication triggers and are required to process the replication queue records (also known as `replq` records).

5. Paste the folders in the `\db\bprepl` folder of Pro2 (`C:\Pro2v61\db\bprepl`).

Note: Ignore steps 4 and 5 if the triggers are already added in the `\db\bprepl` folder.

6. Type `prowin -db sports -db repl` and press **Enter**.

The **Procedure Editor** window appears.

7. Open the `ReplTrigDel.p` file from `C:\Pro2v61\utils` in the **Procedure Editor** window.
8. Enter the name of the source database (for example, `sports`), and close the **Procedure Editor** window.
9. Restart all the database instances and the PAS for OpenEdge instance.

Note: Running the `replTrigDel.p` does not delete the trigger procedures. After the trigger definitions are removed, the trigger procedures do not execute even if they remain in the system.

Customize Pro2 replication

Pro2 is written in ABL and is designed for scalability and customization. You can customize auditing, source changes capturing, record maintenance, datatype, and name transformation.

Capture source changes by SQL clients

The standard Pro2 replication triggers capture changes made by ABL clients. Pro2 can also capture changes made to the source OpenEdge database by SQL clients. To do this, Java triggers can be implemented in the OpenEdge source database.

Audit database

Pro2 can be extended to write to a second target database to maintain audit records. Whereas each row is unique in the primary replication database (using `PRROWID` column), the audit database has multiple rows corresponding to each source database record, with a new row created for each change made to the source record. Auditing is implemented by having a second pass through the replication queue by a separate replication processor designated for the audit database. Typically, when auditing is implemented, a subset of the replicated tables is audited, however; it is possible to audit all tables.

Logical deletes

There are times when auditing is not required, but you want to maintain records in the target database after they are deleted from the source database. In this case, instead of being deleted, rows are designated as logical deletes (using `PRROWID` modification) and the data is kept in the target database.

Data-type and name transformation

Data-types on the target side can be the same as on the source database, or they can be different. For example, precision of decimal types can be decreased, logical fields can be changed to character, and integers can be changed to logical.

If you do not need the default conversion of data-types, enable the `TGT_DATATYPE_OVERRIDE` property. This property retains the value of a data-type as is and does not convert it to meet the target schema requirements. However, you must recheck the validations because they may fail.

Table and column names on the target database can be the same or different from those on the source database. If they are the same, the Pro2 Auto-map function is used. Otherwise, the tables are manually mapped, but, mapping must be done once and saved for use in subsequent implementations.

If you want to use literal table and column names for your target database (SQL only), then you can enable the `TGT_USE_LITERAL_NAMES` property. This property allows you to use the same naming convention as the source database for tables and columns without modifying them to meet the requirements of the target database. Another property `GEN_SQL_DEC_FORMAT`, is used to set the format for decimal fields in both schema and differential files. If the property is set to `YES`, the format is same as in the source database. If it is set to `NO` then the default format [decimal(17,2) null] is used. The default value for this property is `NO`.

Split replication threads

You can split each replication thread into multiple split threads regardless of whether it serves replication of a single table or group of tables. You can split a single thread into a maximum of ten split threads. When you split a thread into n number of parts, it provides $n-1$ split threads. For example, if you split the thread 5 (`replBatch5.bat`) into four parts, it provides three split threads 51, 52, and 53 along with the original thread 5. This means, the four parts are threads 5, 51, 52, and 53.

Pro2 determines the number of a split thread dynamically based on the `RECID` of the source record, and groups together all the split threads that belong to the same record or `RECID`. This allows you to run multiple processes without adding queue compression and prevents out-of-sequence processing of more changes to the same `ROWID` or `RECID`.

The following topics are covered in split replication threads:

- Generate new trigger code for splitting threads
- Run split threads
- Assign a table to the split thread

Generate new trigger code for splitting threads

You can generate and install a new replication trigger code to implement thread splitting, or replace the old triggers for tables or threads that you want to split. It is recommended to replace all the existing trigger code with the newly generated trigger code using a split trigger template.

Note: New trigger code only needed if using replication threads, not need if using CDC.

The following split trigger templates are available in the replication template folder `Pro2\bprepl\repl_tmpl`:

- **tplt_repltrig_split_without_compression.p**—Splits threads but does not apply queue compression.
- **tplt_repltrig_split_with_compression.p**—Splits threads and supports queue compression.

To generate new trigger code:

1. In the Pro2 web interface, navigate to the **Properties** tab.
2. Search for `DEL_TRIG_TEMPLATE` and click **Edit**.

The **Edit Property** window appears.

3. Specify the Value as `tplt_repltrig_split_with_compression.p` or `tplt_repltrig_split_without_compression.p`. and click **Save**.
4. Search for `WRI_TRIG_TEMPLATE` and click **Edit**.

The **Edit Property** window appears.

5. Specify the Value as `tplt_repltrig_split_with_compression.p` or `tplt_repltrig_split_without_compression.p`. and click **Save**.
6. In the Pro2 web interface, click the **Properties** tab and modify the property values of the templates `DEL_TRIG_TEMPLATE` and `WRI_TRIG_TEMPLATE` to point to one of the split trigger templates.
7. Click **Manage Replication**, and select the database instance.

The **Edit Replication** window appears.

8. Click **Next**.

9. Navigate to the **Generate Code** tab, and select the **Replication Triggers** checkbox to regenerate the trigger code.

Note: Check if the `jobrunner.bat` file is running. If not, navigate to `\bprepl\Scripts` from **Windows Explorer**, and double click the `jobrunner.bat` file. The **Proenv** window appears.

10. Check if new code is generated by navigating to the `\bprepl\repl_d` folder. The date and time of the files in that folder are recent if they were updated successfully.
11. Copy the `repl_d` and `repl_w` folders from `\bprepl`, and paste them in `\db\bprepl` folder.

Run the split replication threads function

To run the split replication threads function, consider the example of splitting Thread 5 into four parts and perform the following steps:

Note: You can only run split threads after generating new trigger code.

1. Create three new `.bat` files:
 - a. Create three copies of the `replBatch5.bat` file located in the `Pro2\bprepl\Scripts` folder and rename them as `replBatch51.bat`, `replBatch52.bat`, and `replBatch53.bat` respectively.
 - b. Edit the `replBatch51.bat` file, locate and modify `Thread=5` to `Thread=51`, and save your changes. Repeat this step for `replBatch52.bat` and `replBatch53.bat` files.
2. Create new thread positions:
 - a. Go to the Pro2 web interface and click **Manage Replication**, and select the database instance. The Edit Replication window appears.
 - b. Click the **Advanced Configuration** tab.
 - c. For thread 51, type 51 in the field next to the **Create New Thread** button, and then click **Create New Thread**. Repeat this step for threads 52 and 53.
3. Create a new property:
 - a. In the Pro2 interface, click the **Properties** tab, and then click **Add**.
 - b. In the **Property Name** field, specify the name of the property as `SPLIT_THREAD5`.
 - c. In the **Value** field, specify the number of threads as 4.

You can add up to $n-1$ value where n is the number of thread. The maximum value allowed per thread is 10. However, if you specify a value (characters or negative numbers) other than the numbers 1 to 10, then the trigger uses the thread number.

After generating the trigger code and creating new property for split threads, if you do not create the `.bat` files and do not schedule the task entries, then the data remains in the queue until the new thread jobs are started.

Progress recommends that you do not change the split number if there are existing records in the queue. Changing the split number might push the changes of the same record and row to a differently calculated queue.

Assign a table to the split thread

After the replication thread is split, you assign a table to the thread.

To assign a table to the thread:

1. In the Pro2 web interface, click **Manage Replication**, and select the database instance.

The **Edit Replication** window appears.

2. Select **Advanced Configuration** and assign a table (for example, `Customer` table) to Thread 5 from the **Thread#** column.
3. Update the tables on the threads with some test information. This causes the threads to split because the updated tables for a replication.
4. Check that the threads have split in the Pro2 web interface by clicking the **Total Threads** watch-box. The threads are distributed among the split threads.
5. To execute the replication records, run the `replbatch5.bat`, `replbatch51.bat`, `replbatch52.bat` and `replbatch53.bat` files.

After the replication is complete, the status of replication threads appear as running in the **Replication** section of the Pro2 web Dashboard.

Configure Pro2 to target SQL database connectivity

To configure the OpenEdge DataServer for Microsoft SQL Server or Oracle, you must configure the Open Database Connectivity driver, create a schema holder, and create a target database.

Pro2 is designed to replicate data as one-way connection from the OpenEdge source database to the target database. To facilitate this one way connection, Pro2 assumes the target database is read-only. If you plan to make changes to your target database, be aware that these changes can be overwritten by Pro2 when a tables or row are updated one the source database.

Standard data-type conversions

Pro2 performs some data type conversions automatically to circumvent issues that would typically break other types of Open Database Connectivity (ODBC) data transfers from OpenEdge to a Microsoft SQL Server or Oracle database.

- **Date conversions**—Some versions of Microsoft SQL Server and Oracle databases cannot handle dates with a value before January 1, 1753. To work around this issue, Pro2 preserves the month and the date and sets the year to 1753.
- **Column width**—In OpenEdge databases, data is stored in variable length fields, regardless of the field width definition. However, in Microsoft SQL Server and Oracle databases, column width is fixed. This would cause the Microsoft SQL Server or Oracle database to have a larger data footprint than the source OpenEdge database. To work around this, Pro2 truncates data to the column width that is defined in the target schema.
- **Logical fields**—The OpenEdge database recognizes three possible values for logical fields: True (1), False (0), and Unknown (?). The value Unknown is not recognized in other databases. To work around this, if a logical value is True, then Pro2 sets the target field to True, otherwise it is set it to False.

Data types on the target side can be the same or different from the source database. For example, precision of decimal types can be decreased, logical fields can be changed to character, or integers can be changed to logical.

If you do not need the standard data-types conversions, you can enable the `TGT_DATATYPE_OVERRIDE` property. This property retains the value of a data-type and does not convert it to adhere to the target schema requirements. However, you must recheck the validations as they may fail.

Table and column names on the target database can be the same or different from those on the source database. If they are the same, the Pro2 auto-map function on the mapping page of the user interface can be used. Otherwise, the tables need to be manually mapped. However, table mapping is required only once and can be reused in subsequent implementations.

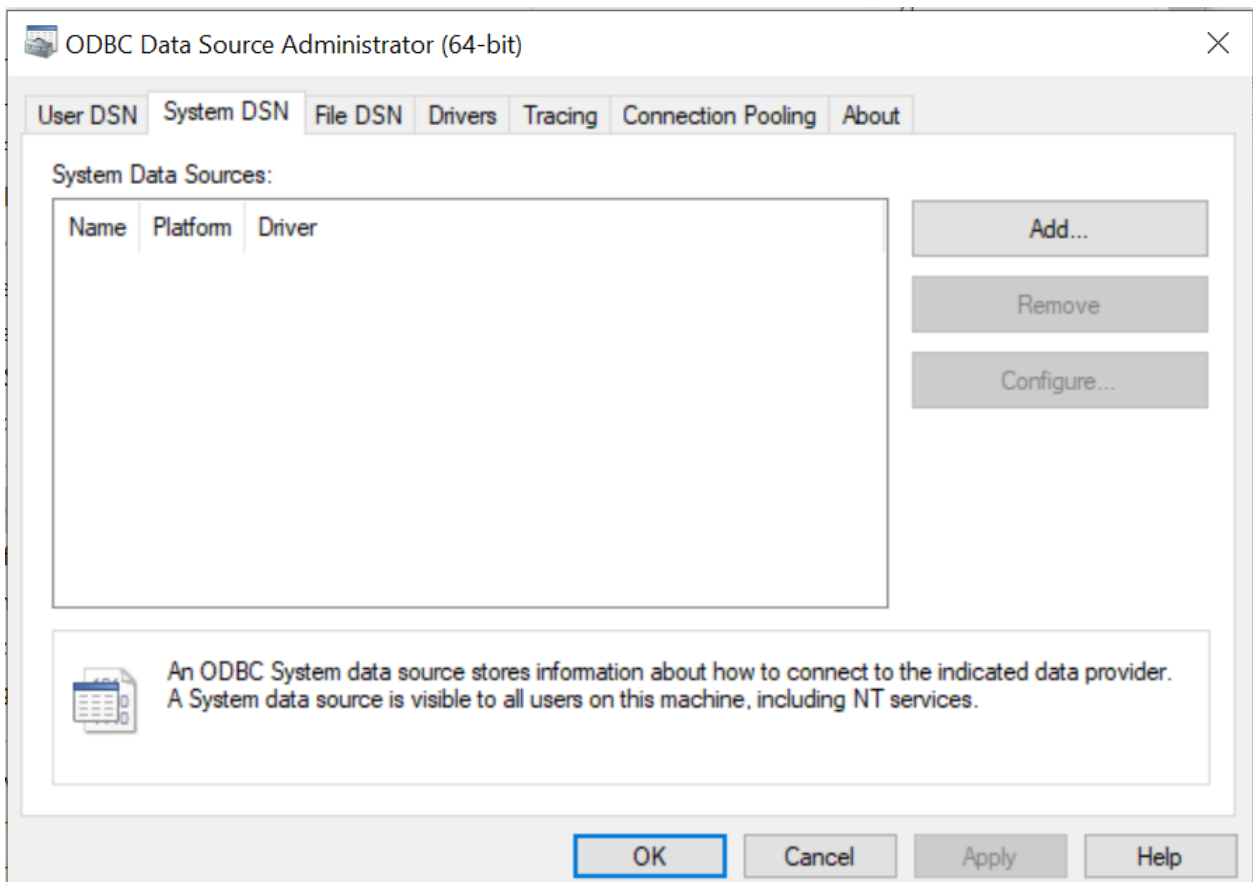
If you want to use literal table and column names for your target SQL database, enable the `TGT_USE_LITERAL_NAMES` property. This property allows you to use the same naming convention as the source database for tables and columns without modifying them to meet the requirements of the target database.

Configure the ODBC DataServer

The ODBC connectivity must be set up before you configure the OpenEdge DataServer. This allows communication between the OpenEdge database and another database.

To configure the ODBC DataServer:

1. Add a new system DSN using the **Windows Data Sources** tool by selecting the System DNS Tab in the **Data Sources (ODBC) Administrative Tools** section in the **Control Panel**.
2. Click **Add** to add a new system DSN.



3. For Microsoft SQL Server, choose the **SQL Server** driver. For Oracle, select the **Microsoft ODBC for Oracle** driver and click **Finish**.
4. Specify the name (for example `logical-db-nameODBC`) for your data source and the server where it is located, then click **Next**.
5. Provide your login information. If you are using Select SQL authentication, provide the login ID and password for the Microsoft SQL Server database, and click **Next**.
6. From the **Change the default database** to drop-down, select the appropriate database, and click **Next**.

7. Accept the defaults on the next dialog box, and click **Next**.
8. Click the **Test connection** button to confirm that you are connected.
9. Exit the **Data Source Administration** tool.

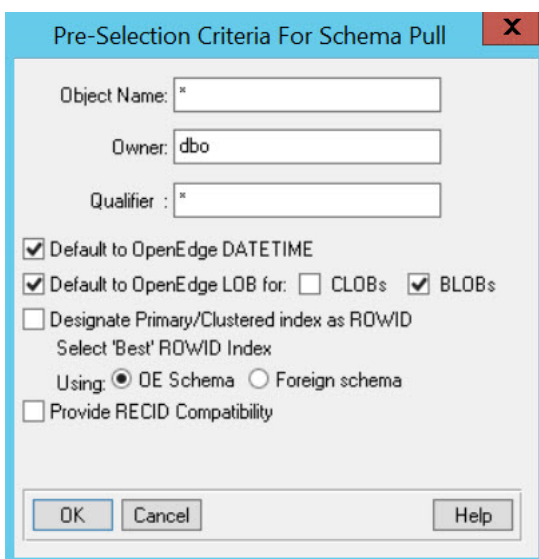
Create an OpenEdge schema holder

An empty OpenEdge database is created to act as the schema holder for the Microsoft SQL Server or Oracle database. The schema holder is the layer that allows ABL to interact with the Microsoft SQL Server or Oracle database as though it were a native OpenEdge database.

To create a schema holder:

1. Open a **Proenv** window, and type `prodb database name empty` to create an empty schema holder database.
2. Start a single user session by typing `prowin database name -1`.
The **Procedure Editor** window appears.
3. From the **Procedure Editor**, select **Tools > Data Administration**.
4. Select **DataServer > database type Utilities > Create DataServer Schema**.
The **Create/Modify Record for Schema** window appears.
5. Specify **Logical Database Name**.
6. If the source database is a SQL server, specify the **ODBC Data Source Name**. Click **Ok**.
7. Enter the **Login ID** and **Password** if required in the next dialog box and click **OK**.
8. Enter criteria for **Object Name**, **Object Owner** (typically, `dbo`), and **Qualifier**.
9. Select the **Default to OpenEdge DATETIME** option.
10. If you are using LOB fields in replication, ensure that the **Default to OpenEdge LOB** for **BLOBs** option is selected along with the **CLOBs** option. This forces the data server to automatically consider certain target side data types to be treated as LOBs.

By selecting CLOB, `varchar(max)/nvarchar(max)` data types are automatically converted to CLOB. By selecting BLOB the data server is forced to consider all `varbinary(max)` as BLOB. On source fields that are character types, Pro2 may convert some types to `varchar(max)` when the source width is wider than the `MAX_CHAR_WIDTH` property setting. This conversion has the added benefit of avoiding row size limits for SQL Servers. However, `varchar(max)/nvarchar(max)` are not necessarily treated as CLOBs.



11. Click **OK** to finish.

Target Side Only Tables and Fields

The following tables are added to the target database for Pro2 use:

Pro2SQL – used by Pro2 to verify connection to target database.

PRROWID – Unique key that corresponds to the source Progress ROWID.

Pro2created – Date/timestamp of the record was first created.

Pro2modified – Date/timestamp of the record was last modified.

Pro2SrcPDB – Name of the source database.

Progress_RECID – Used by Pro2ORA. Required for Pro2SQL with source databases before OpenEdge release 10.2.

Progress_RECID_Ident – Required for Pro2ORA and Pro2SQL with source databases before OpenEdge release 10.2.

Indexes in the SQL Target

Pro2 generates a script to copy all source side indexes to the target database with the exception that any unique keys are translated as non-unique. The source side indexes are not used by Pro2 and are not required. Not creating or dropping unused or unnecessary indexes on the target side can optimize Pro2 performance as there will be no overhead for index maintenance.

One of the benefits of the Pro2aql table is the that it enables you to add indexes on the SQL target database. Most OpenEdge applications have an index structure for Online Transaction Processing (OLTP), however many reporting tools operate more efficiently with an index structure for Online Analytical Processing (OLAP). Adding indexes for OLAP to the SQL target database is useful and recommended, but there is one caveat. The only unique index allowed on the SQL target database is the index on the PRROWID field. If there are UNIQUE indexes other than the PRROWID index, then replication may fail due to a UNIQUE key constraint. There is little value of a UNIQUE index in an OLAP environment, so all additional indexes should not be UNIQUE. If unique index is required, it is strongly recommended that the PRROWID column be part of that index.

Create target Microsoft SQL Server or Oracle database

If you have not done so already, create a target database for you replicated data. The Target database can be either a Microsoft SQL server, Oracle, or OpenEdge database. Creating a target database will depend largely on the type of database you want to use and your development tooling. The following procedure lists the general steps to creating your target database.

1. In your database admin tool, like Microsoft SQL server Management Studio, create a new database and name it according to your needs.
2. Create a new database query, and load the schema file into the query.

For more information about creating a Microsoft SQL Server database, see [Microsoft SQL documentation](#).

For more information about creating an Oracle database, see [Oracle Database Documentation](#)

You can now configure the replication process and proceed with the replication.

Configure Pro2 e-mail notifications

You can configure Pro2 to send e-mail notifications when a replication thread stalls or stops.

To do this, Pro2 compares the timestamp of the thread's most recent replication activity (a heartbeat) against a configurable time period, regardless of the `HEARTBEAT_CHECK _MINUTES` property. The default time period is 10 seconds. If the last recorded activity of the thread is more than 10 seconds from the time of comparison, then an e-mail notification is triggered.

Note: The heartbeat functionality (with e-mail alarm) is applicable for both replication and CDC administrator threads.

To set up Pro2 e-mail alarms:

1. Edit the `predefs.i` file located in the Pro2 root directory and define the following e-mail properties:
 - `FROM-EMAIL-ADDR`—The e-mail address of the sender of the e-mail alert
 - `TO-EMAIL-ADDR`—The e-mail address of the recipient of the e-mail alert
 - `COMPANY-MAIL-SERVER`—The SMTP mail server of the sender of the e-mail alert
2. On the Pro2 web interface **Properties** tab, designate a user name and password by using the **SMTP AUTH** field. The user name and password should be separated by a comma.
3. Create a new task in **Windows Task Scheduler** to periodically run a batch file called `statusCheck.bat`.

Remove the e-mail notification

`StatusCheck` sends only one e-mail notification per day by default.

To remove the restriction of one notification per day:

1. In the Pro2 web interface, go to the **Properties** tab.
2. Set the value of the `ALERT_1_PER_DAY` property to **NO**.

Set up third-party e-mail program

To use a third-party command-line e-mail program like Blat:

1. In the Pro2 web interface, go to the **Properties** tab.
2. Set the property `USE_3RD_PARTY_EMAIL` to **YES**.
3. Edit the `mail.bat` file located in `bprepl/scripts`, and modify the batch script to send the e-mail. For example, for Blat, use the following statement:

```
blat -to %1 -subject %2 -body %3 -from %4 -server %5 -q
```

Note: The argument values (%1, %2) are variables that are populated by the `smtpmail.p` procedure, so you need to pass the appropriate variable to the arguments of your command-line e-mail program. For example, %1 denotes the e-mail recipient address, %2 denotes the subject of the e-mail, and so on. The `mail.bat` file contains remarks that explain the purpose of each the variables.

Use second-pass replication

Second pass replication can be used in two ways: to perform data warehouse auditing tasks or to replicate to a first pass and second pass target database.

Set up second-pass replication as audit

Second-pass replication creates a copy of the source table in the second-pass database and, inserts a record into this table each time there is a change in the source table (for `UPDATE`, `DELETE`, `INSERT`).

A new record is created in the target (or staging) table every time there is a change in the table, regardless of whether the change happens to the same field. The replicated table holds a new record for every change in the source table. A new property, `SECOND_PASS`, is added to the `predefs.i` file. This property supports second-pass replication and the default value of this parameter is set to `NO`. To start Second Pass Replication for a setup, this property should be set to `YES` for that specific setup.

To set up second-pass replication:

1. Create a copy of the Pro2 setup directory and rename it, appending it with `SecondPass`. For example, if your setup is in the folder `Pro2`, copy paste that folder and rename it to `Pro2_SecondPass`.

Note: Copy all folders from the Pro2 setup directory to the `SecondPass` folder except for the `db` and `Pro2Web(PAS Instance)` folders.

2. Create a new folder named `db` in the newly created `SecondPass` folder. This `db` folder is created for the `SecondPass` target database.
3. Open a **Proenv** window and enter `cd C:\Pro2_SecondPass\db` to navigate to the `db` folder, for example, `cd C:\Pro2_SecondPass\db`
4. Create an empty target database from the **Proenv** window. Enter `prodb target database name empty`, for example, `prodb secondtgt empty`.
5. Start the target database from the **Proenv** window. Enter `proserve target database name -S port number` for example, `proserve secondtgt -S 6677`.
6. Load the schema generated from first pass into the target database. In the **Proenv** window enter `prowin target database name`, for example, `prowin secondtgt`.

The **Procedure Editor** window appears.

7. Navigate to **Tools > Data Administration**.

The **Data Administration** window appears.

8. Navigate to **Admin > Load Data and Definitions > Data Definitions (.df file)**.

The **Load Data Definitions** window appears.

9. Select the schema file as the input file, for example, `Sports-tgt.df`. Click **OK**.

A success message appears after the load is complete.

10. Navigate to `C:\Pro2 second pass folder\bprepl\Scripts` folder, for example, `C:\Pro2_SecondPass\bprepl\Scripts`.

11. Right-click the **Pro2 - Editor** tool and select **Properties**.

The **Pro2 - Editor Properties** window appears.

12. On the **Shortcut** tab, edit the **Start in** field to reflect the `Pro2 second pass` folder, for example, `C:\Pro2_SecondPass`.

Note: You can use the same steps for the `runbulkloader` utility if the you need to do second pass bulk load.

13. Edit the `Pro2_env.bat` file to set the value of the `Pro2` setup location to the `C:\Pro2_SecondPass` directory.
14. Open the `replProc.pf` file from `C:/Pro2_SecondPass/bprepl/scripts` folder and ensure that the `rep` and `Pro2` database section to point to the first pass setup.
15. Save the contents of the `replProc.pf` file.
16. Edit your database's `.pf` file, and modify the target databases section to point to the database in the `SecondPass` directory. Save the contents of the `.pf` file. For example:

```
1 # PF File auto generated on 07/26/2019
2 # Example PF File for Database Connections for Pro2 Tool
3 # Actual .pf file should be named after the logical name
4 # for the Source database connection.
5
6 # Source Databases go here (Required for MSS/ORACLE/PROGRESS as target type).
7 -db sports -ld sports -H localhost -S 2233
8
9
10 # Target Databases go here (Required for MSS/ORACLE/PROGRESS as target type).
11 -db secondtgt -ld secondtgt -H localhost -S 6677
```

Note: If you use a Microsoft SQL Server or Oracle database, the name of the second pass schema holder is the same as the first pass and should reference a schema holder database that points to the new `SecondPass` target database.

17. From `C:/Pro2_SecondPass`, open the `predefs.i` file and change the value for `SECOND_PASS` to `YES`.
18. Set the first pass replication thread's disposition to `mark as applied`.

Note: This preserves the queue records so that the can be replicated on the second pass. As a consequence, you **must** run manual purges on the `replqueue` table.

19. From `C:/Pro2_SecondPass/bprepl/repl_tmpl`, rename the process library template name in second-pass setup directory.

- For a WAN setup, rename the file `tmpl_replproc_4audit.pto` to `tmpl_asTgtDb.p`.
 - For a LAN setup, rename the file `tmpl_replproc_4SECOND_PASS.p` to `tmpl_replproc.p` or current replication template.
20. Navigate to the Pro2 web interface and select **Properties**. Edit the `WRI_TRIG_TEMPLATE` to reflect `tplt_repltrig-raw.p` as **Value**. Click **Save**.
 21. Navigate back to the **Properties** tab. Edit the `DEL_TRIG_TEMPLATE` to reflect `tplt_repltrig-raw.p` as the **Value**. Click **Save**.
 22. From the `\Pro2_secondpass\bprepl\scripts` folder, double click the `batchgen_GEN_PROCS.bat` file to generate code.
 23. Create and start the second pass replication threads from the `c:\Pro2_SecondPass\bprepl\scripts` folder.

Note: Alternatively, you can create second pass replication threads and control information by loading the `replbasev610-2ndPass.ini` file present in the Pro2 folder.

Set up second-pass replication non-audit

To setup second pass replication as non-audit, you follow similar steps as first pass replication. The second pass functions exactly the same as first pass in that when the records on the source database are modified, the changes are replicated to the first pass target, and then replicated to the second pass target. This method of replication always overwrites the existing record instead of creating new records.

To set up second pass replication in the non-audit configuration refer to and follow the same steps for second pass replication audit configuration up to step 19. Skip steps 19 to 22 and then resume at step 23.

Note: If you want to change a template for the second pass setup, you can change the property value from **Properties** tab in the user interface, and regenerate the processor libraries, triggers, or bulk copy in the second pass folder. To this, use the `batchgen_GEN_PROCS.bat` file in Scripts folder.

Additionally, you can reuse the same template from the first pass replication for the second pass as well for the replication write/delete trigger, and bulk copy/processor library templates. To bulk load the records to the second pass target, use the `C:\Pro2_secondpass\bprepl\scripts\RunBulkLoader` shortcut.

Bulk load with Pro2

Bulk loading is a process that can load large amounts of data into a target database in a relatively short period of time.

With bulk loading operations in Pro2, depending on the template used, data is replicated either one row at a time or multiple rows are loaded for a single transaction, resulting in a more efficient method to seed a database. Generally, bulk loading is done during the initial seeding of a database after Pro2 has been configured and after your target database is built.

The Bulk load utility can be run from the **Actions** tab on the Pro2 web interface. It can also be run from command line utility `bprepl\Scripts\runbulkloads.bat` by providing input parameter details. Both methods achieve the same result. The method that you choose depends on your preference and business needs.

Example of the command line syntax:

```
bprepl\RunBulkLoads.p
-param "DB=sports;TableInc=customer,
item;
TableExc=xxxxxxxxxx;
RunFlag=A;
ForThread=0;
MaxRecordCount=0;
ResetBulkload=no;
ResetInProcess=no;
MProcThreads=9"
```

Note: The Bulk Load Utility always runs the standard bulk copy procedures in `bprepl\repl_mproc` folder in the Pro2 root directory.

Pro2 bulk load processor

The bulk load processor is a collection of programs that perform a bulk load for an entire table for an initial sync of the source table to the target table. A bulk load procedure executes a query such as `FOR EACH table-name: BUFFER-COPY table-name TO Target-Name`. This process can be run while replication is turned on. If deleted source database rows exist in the target, then they must be removed manually. To ensure that this does not happen, truncate the data from the target table before performing a bulk load.

Generate bulk load procedures

Before you generate bulk load procedures, ensure that you have configured your source and target databases, and mapped all tables that are to be loaded.

The bulk-load procedures can be generated from the **Manage Replication** window in the Pro2 web interface.

To generate bulk load procedures:

1. Select the **Manage Replication** tab, choose your database, and then click **Generate code**.
2. Select **Bulk-Copy Processor**. The bulk load procedures are generated in the directory specified by the `MASS_LOAD_DIRECTORY` property. The properties are set to `bprepl/repl_mproc` by default.

The template file specified by the `MASS_LOAD_TEMPLATE` property is used in the bulk load procedure generation. There are several templates for creating bulk load procedures. They are located in the `bprepl/repl_tmpl` directory and start with `tmpl_mreplproc`. Each of the templates have different functionality for different target types based on your needs. For example `tmpl_mreplproc_mssSendSQL.p` is for Microsoft SQL Server, while `tmpl_mreplproc_restart-auto-push.p` is used for any target type. If bulk load procedures that are generated using this template are stopped and then restarted, they continue from where they left off. In addition, if a source record is locked and cannot be copied, the procedures add the record to the `replqueue` to be written by the replication processor and the bulk load procedure moves on to the next record.

The `Bulk_Max_Cache` property tells the template how many processed row IDs to store in the cache. In general, if the loading fails or stops during the bulk load process and then restarted, the loading starts from the beginning. In such cases, the `Bulk_Max_Cache` property allows you to start the bulk load process from the last processed row IDs stored in the cache, instead of loading from the beginning. This property defaults to 25, and you can modify its value using the **Properties** tab in the Pro2 web interface.

For Oracle WAN implementations, ensure that the `APPSRV_MASS_LOAD_TEMPLATE` property uses the `tmpl_ASmproc_oracle.p` procedure, and the `APPSRV_FETCH_COUNT_MASS_BULK` property has the same value as the `Oracle_Bulk_Transaction_Count` property.

You can use the `INCLUDE_LOB` property to choose whether to include or exclude LOB data from replication and bulk loading. The property is set to `NO` by default, which excludes LOB data from replication and bulk loading. If the property is set to `YES`, then the LOB data is sent to the target database. This is applicable to both LAN and WAN environments.

The elapsed time information is provided in the log files generated by the bulk load procedures. You can find this information on each log entry per 100K rows and at the end of the loading process. Time elapsed is counted in seconds and milliseconds.

The bulk load procedures write to individual log files in the folder specified by the `MASS_LOAD_LOG_DIRECTORY` property (`bprepl\repl_mproclg` folder). The bulk load procedures can be initiated from the **Procedure Editor** or in a group by using the `mr source-database.p` procedure which runs each one in turn. Multiple bulk loads can also be launched at one time from the Bulk Load utility or the web user interface.

Table 2: Bulk load properties

Name	Default value	Description
APPSRV_MASS_LOAD_DIRECTORY	bprepl/AppSrv/as_mproc	This property designates the folder that Pro2 WAN implementations of Bulk Load procedures are generated.
APPSRV_MASS_LOAD_TEMPLATE	tmpl_ASmproc.p	<p>Sets the name of the template procedure that is used during the bulk-load procedure for a WAN implementation. This property value can be set to:</p> <p>Default: <code>tmpl_ASmproc.p</code></p> <p>Microsoft SQL Server: <code>tmpl_ASmproc_mssSendSQL.p</code></p> <p>Oracle: <code>tmpl_ASmproc_oracle.p</code></p> <p>Pro2 to Pro2 replication: <code>tmpl_ASmproc_pro2pro.p</code></p>
MASS_LOAD_TEMPLATE	tmpl_mreplproc_restart-auto-push.p	Sets the name of the template procedure that is used during the bulk-load generation.
MASS_LOAD_TEMPLATE_PRO2ORA	tmpl_mreplproc_oracle.p	This template is used in a LAN implementation for Oracle Target database. It uses the <code>send-sql</code> statement option to widen the Oracle transaction. The <code>send-sql</code> statement option does not support LOB fields.
MASS_LOAD_TEMPLATE_PRO2PRO	tmpl_mreplproc_pro2pro.p	This template is used in a LAN implementation with an OpenEdge Target database. It is faster than the default template, which includes the restart logic.
MASS_LOAD_TEMPLATE_PRO2SQL	tmpl_mreplproc_mssSendSQL.p	This template is used in LAN implementation for Microsoft SQL server. It uses the <code>send-sql</code> to perform faster but it does not support LOB fields.
MASS_LOAD_LOG_DIRECTORY	bprepl/repl_mproclog	Designates the Bulk Load log files storage folder location.
MASS_LOAD_DIRECTORY	bprepl/repl_mproc	This property designates the folder that Pro2 Bulk Load procedures are generated.

Run bulk load from the UI

After you have configured your source and target databases, mapped your tables, generated your bulk load procedure, and set your properties, you are ready to run a bulk load.

Progress OpenEdge Pro2

Actions > Bulk Load > Run Bulk Load

Run Bulk Loads

Enter the appropriate information to begin a mass-record copy of source side table data to the appropriate target side table structure. Please see the online help for additional options used during a bulk load.

Source Database
Select Database

Reset / Clear Bulk-Copy Results Include DB Analysis

Enter file tag for multiple bulk-load runners
A

For tables mapped to Repl Thread
0

Multi-thread bulk loads
9

Max record count
0

Reload table if already bulk-loaded once
☐ Yes ☒ No

Reset the "In Process" loads to start over
☐ Yes ☒ No

Table include list(include only these tables, use Patterns*)
*

Table exception list (skip these)
xxxxxxxx

Run

Help Me | Support | Privacy | Terms Of Use | About

Copyright © 1993-2022, Progress Software Corporation. All rights reserved.

To run a bulk load:

1. Click the **Actions** tab and select **Bulk Load > Run Bulk Loads**.

2. Choose your **Source Database**.

3. (Optional) If you are rerunning bulk loads, reset your bulk load results.

4. Increase the **Run Flag** if more than one instance of a bulk load is run concurrently.

Each instance must be given a separate flag (typically letters A through Z) to distinguish temporary files that are created and used by each instance. Each instance of the Bulk-Load Utility can have up to 5 bulk load threads. The number of bulk load utility instances and associated threads is limited by the Progress Pro2 license.

5. Set the **For mapped replication threads**

Tables that are mapped to the replication thread entered are selected. Zero (0) specifies all threads.

6. Set the **Multi-thread bulk loads**

The number bulk load processes or threads to run at one time. The default value is 9.

7. Indicate the **Max record count**. This property is used per table. Enter **0** to set a limitless maximum record count.

8. Set the **Re-load table if already bulk loaded once**

Pro2 tracks the tables that have been bulk loaded and stores information in the `Repl_Control` tables. It uses this data to restart a load if it is stopped. It also skips loading a table that is already loaded. If you set this flag to **YES** it deletes any `COMPLETED` control records, so the table re-loads from the beginning.

9. Set the **Reset the “In Process”** if already bulk loaded once.

Pro2 tracks the bulk load status and stores that information in `Repl_Control` tables. It uses this data to restart **In Process** tables if a load was stopped.

10. Set the **Table include list**

A comma separated list of tables to include in the bulk load. Load patterns can be specified by using `*` as a wild card. For example: `ca*,da*,e*,z*`. This performs a bulk-copy of all tables starting with `ca`, `da`, `e`, and `z`.

11. Set the **Table exception list**

A comma separated list of tables to exclude or skip. Load patterns can be specified using `*` as a wild card. For example, `ca*,da*,e*,z*`. This example performs a bulk-copy of all tables except those starting with `ca`, `da`, `e`, and `z`.

Include DB Analysis

You can also choose to bulk load only a few selected tables based on the number of records they contain. For example, you can bulk load only those tables that have over 100,000 records, or alternatively, bulk load only the tables that have fewer than 100,000 records. It can be accomplished as follows:

1. To analyze a database or table, run the `DBANALYS` or `TABANALYS` commands in `PROUTIL`.
2. To create the filters in the **Run Bulk Loads** utility window, use the `<dbname>.tab` output file. For example, for `sports` as the source database, run the following `DBANALYS` or `TABANALYS` commands for generating the analysis output file:

```
proutil sports -C dbanalys -csoutput sports.tab
```

```
proutil sports -C tabanalys -csoutput sports.txt
```

Note: The valid extensions for the output file are `.tab` and `.txt`.

3. In the **Run Bulk Loads** window, click **Include DB Analysis**.

The **Include DB Analysis** dialog box opens.

4. In the **Include DB Analysis** dialog box:
 - a. In the **File Name** field, specify the `<dbname>.tab` or `<dbname>.txt` output file that contains the database and the table analysis.
 - b. In the **Insert Into List** field, select either of the following:
 - a. **Include** - To include the tables that pass the filter. These tables are displayed in the **Table include list** field of the **Run Bulk Loads** utility.
 - b. **Exception** - To exclude the tables during the bulk load execution. These tables are displayed in the **Table exception list**.

- c. In the **Table Record** **>=** and **AND** **<=** fields, enter the range of number of records for which you need to filter the tables.
- d. Click **OK**.

Reset/Clear Bulk-Copy Results

The **Reset/Clear Bulk-Copy Results** clears the details captured in the **Repl Control** table from the previous bulk load.

Run bulk loads from the command line

To run bulk loads from the bprepl\Scripts folder, run the runblkld.bat file from the Scripts folder and use the following syntax to run bulk loads:

Table 3: Syntax

```
"%PROEXE%" -ininame Pro2.ini -basekey "INI" -b -pf %REPLPF% -p %CODEDIR%\RunBulkLoads.p
-param "ResetBulkload=no;ResetInProcess=no" >> %CODEDIR%\repl_mproclog\runbulkloads.log
```

Table 4: Parameters

Parameter	Description
TableInc	Comma-separated list of table names to be loaded. If not included on the parameter line, the program defaults to * (all tables).
TableExc	Comma-separated list of table names to be excluded from the load. If not included on the parameter line, the program defaults to xxxxxx (no tables to be excluded).
ResetBulkload	Used to determine if any tables previously marked as complete should be reloaded. Valid entries are YES or NO.
ResetInProcess	Used to determine if the load should restart any tables with a status of In process. YES means restart from the beginning, and NO means to attempt to restart where the load previously stopped.
DB	This parameter should point to a mapped source database. It can be left blank, or you can remove it by using the -params line to load all mapped databases. Invalid entries cause the load to abort.
RunFlag	Determines which run flag to be used. This parameter defaults to RunFlag=A.

Parameter	Description
ForThread	If entered, the process loads only tables mapped to the ForThread value. This parameter defaults to ForThread=0. You can load tables for any thread number.
MProcThreads	This parameter is used to determine how many threads runFlag process will use for a load. The default for this parameter defaults MProcThreads=9. The maximum value is 9. Values greater than 9 will be reset to 9.
MaxRecordCount	This parameter is primarily used for testing. If a value is entered, the load for each table is stopped after the MaxRecordCount is reached. Default is MaxRecordCount=0.

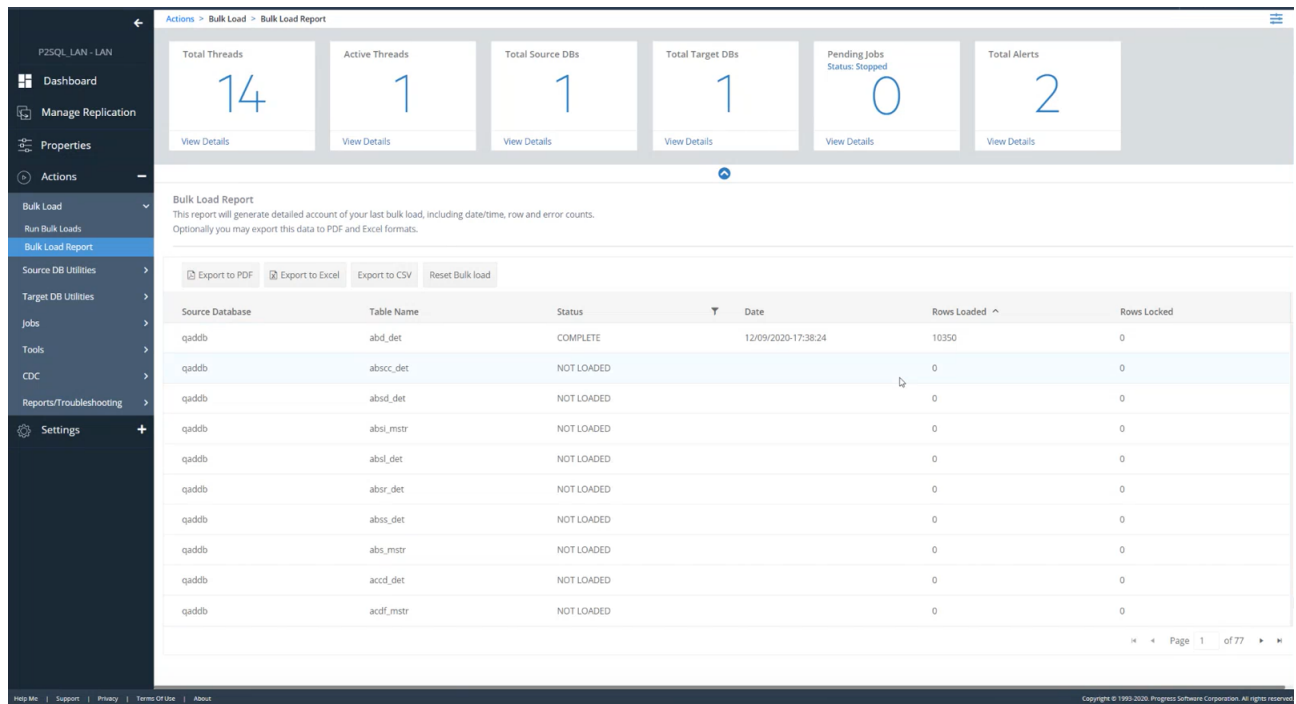
ASCII Bulk load and export

For WAN implementations, the ASCII bulk export/import is designed to sync replication tables from source to target. For large tables (typically over 50 million rows), the ASCII Bulk-export/load utility can be used to decrease the time to perform the bulk load. The process uses an ASCII dump export process on the source server. This process creates the dump and SQL load procedures, and then dumps the data to ASCII flat files. After this is finished, the dumped ASCII data files and the generated SQL load procedures are transferred to the target database server. The SQL load procedures are then run from the SQL query editor.

Bulk load reports

Generating a bulk load report can be useful in a variety of situations and can be essential for troubleshooting. A bulk load report can be generated in two ways: from the Pro2 user interface under **Action > Bulk Load > Bulk Load Report**, or by using the GET bulk load report API. For more information about how to use the API, see [GET bulk load report API](#) on page 104.

The bulk load report generates report of all mapped tables associated with your bulk load history. The bulk load report can be exported in PDF, Excel, and CSV formats. When the export job is complete, you can download the exported report in CSV format from the **Pending Jobs** watchbox.



Troubleshoot bulk load

On occasion, after the bulk load operation is complete, the `replqueue` is full of records with the value `Bulk-Copy-Err` under the `User` column. Records with the `Bulk-Copy-Err` user indicate that the record was not able to be copied to the target for some reason. When this happens, Pro2 assigns the record to what the `Bulk-Copy-Err` queue for processing after the error that blocked it is resolved. Check the `Pro2 directory\bporepl\replmproclog` for log files ending with `_Err.log`. Sort by size because the records with the errors are the only ones above 1KB. Resolve the errors indicated by the logs, and the queue should empty out normally as long as the replication remains running.

Dump and load with Pro2

Pro2 can help your OpenEdge implementation stay highly available by limiting down time during a dump and load procedure.

Index reorganization is the primary benefit of a dump and load. Usually, about 80 to 90 percent of the benefit of a dump and load can be achieved with index maintenance using the index rebuild and compact utilities. However, dumping and loading is still necessary to maintain performance standards. It can also be useful when you need to reorganize your database into different areas or extents due to changes in application requirements.

But back to Pro2. The message here is that downtime for dump and load processing can be limited to a few hours regardless of the database size. That is the entire point. It is not about the speed of the dump and load process as clearly a binary dump and load will be hundreds of times faster than a pro2 bulkload, but that is not the point. The point is this. If it takes 20 hours to perform a dump and load of a 500 GB database, using the fastest available method. If the business cannot tolerate a 20 hour outage, then you can use pro2 to replicate to another OpenEdge database. The bulkload may take a week, but that is not important. When you are ready to cut-over to the freshly bulkloaded database, the downtime will be a few hours only. The downtime is the same if the database is 10 GB, 100 GB, 1 TB, 10 TB. That is the value that Pro2 brings to the dump and load processing.

In general, there are two recommended dump and load methods for Pro2, the Data Dictionary dump and load tool and bulk loading.

For more information about the Data Dictionary dump and load tool, see [Overview of dumping and loading a database](#).

For larger databases, use the Pro2 bulk load functionality, as it is the fastest method of migrating data from one database to another through Pro2. The bulk loader files are loaded sequentially with the indexes turned off, necessitating an index rebuild after the load completes.

For more information about migrating your database with Pro2, see [Migrate your OpenEdge database with Pro2](#) on page 88

The point of using Pro2 to perform the dump and load process is to limit downtime for large databases in a high availability environment. Large databases will never use the dictionary dump and load. I am attaching a presentation I did a few years back on dump and load so you can see what performs best. This shows the dictionary dump and load being 8 times slower than the fastest method being binary dump and load.

Migrate your OpenEdge database with Pro2

You can use Pro2 to migrate your OpenEdge database with planned minimal downtime.

To stay competitive in the modern business world, your applications need to run as close to 24/7 as possible. In some cases, you can only have downtime limited to 4 hours. This can make upgrading or migrating your OpenEdge database difficult, even with proper planning. With Pro2 version 6.2, you can migrate your OpenEdge database with minimal downtime.

With proper planning, two short downtime events are needed to complete the migration process. The first event is used to setup the source database and to configure how changes to the database are recorded, whether they are trigger based or CDC.

The second downtime is used as the “cut over” event. The application continues to use the original database up to the point of the cut over.

A benefit of this method is if the project becomes nonviable for any reason, the original database is intact and functional. Downtime events, though small, can be planned to accommodate business specific priorities such as end of the month, end of quarter, etc.

To Migrate your OpenEdge database with Pro2, watch the following video, or use the procedure below.

The first step in the migration process is to prepare your source and target databases.

To prepare your source database for migration, you must embed Pro2 repl tables directly into your OpenEdge database.

1. Open a **Proenv** instance.
2. Navigate to the `Pro2` folder from the **Proenv** window. Type `cd` followed by the name of the folder where you installed Pro2, for example, `cd Pro2v61`.
3. Type `cd db` to navigate to the database folder of Pro2.

Note: Check the directory of the `db` folder to view the database instances. Type `dir` after navigating to the database folder.

4. Copy the `repl.df` and `repl.st` files from the Pro2 installation folder.
5. Create an empty Repl database instance by typing `prodb repl empty`.
6. Load the required table definitions in the Repl database by typing `prowin repl -l`.
The **Procedure Editor** window appears.
7. Navigate to **Tools > Data Administration**.
8. In the **Data Administration** window, navigate to **Admin > Load Data and Definitions > Data Definitions (.df file)**...
9. In the **Load Data Definitions** window, load the `repl.df` file and click **OK**.

Note: The `repl.df` file is located in *Pro2 folder name/db*.

10. Start the source `repl` database instance by entering `proserve database name -S port number` in **Proenv**.

Now prepare you target database for migration:

1. Copy the `.st` and the `.df` files from your source database.
2. Modify the `.df` to be a type 2 target database.
3. Set up the new target database with a logical name so that replication program can identify it.

For the next procedure, go to the Pro2 UI and add a new replication:

1. From the Pro2 web interface, navigate to the **Manage Replication** tab.
2. Click **New**.

The **Create Replication** window appears.

3. Set up the settings for the replication instance, for example, **Source DB Mode** is set to **Triggers**, and the **Source DB Connection** is set to **LAN**.
4. Click **Next**.
The **Select Source** tab appears.
5. Enter **Source DB Name**
6. Enter **Host Name**
7. Enter the port number in the **Host Port/Service** field (for example, 2233).
8. (Optional) Enter your **User Name** and **Password**.

Note: Enter your user name and password only if it is required by your source database.

9. Select **Test Connection**.

If the test is successful, move on to set the target database. Review your source database details to ensure they are correct.

10. Click **Next**.

The **Set Target** tab appears.

Add the target database details. The target database is where your replicated data flows to when a replication is initiated.

1. Set **OpenEdge** as the **Target Database Type**.
2. Enter the **Target Database Name** and **Logical Name**.
3. Set the **DB Host Name** IP address.
4. Enter the port number in the **DB Port/Service** field.
5. Next, **Generate the Target Schema .def** files.

This .def files contain the changes needed to facilitate the database migration.

6. Copy and paste them on to your target database.

After copying the file into your target database, you can begin the target database configuration process.

1. Open the **Data Administrator** and use **Load Data and definitions** to load the target database .def file.
2. After the process is completed, verify that the Pro2 fields have populated.
3. Now load the inactive index .def file. This deactivates all of the running indexes.
4. When complete, verify that the indexes are inactive.

Return to Pro2 and finish the replication configuration process.

After replication is configured, go to the pro2 dashboard to start the bulk load process.

1. Go to **Actions**.
2. Click **Run bulk load**.
3. Select your OpenEdge source database.
4. Clear the bulk load results and click **Run**.

After the Bulk load process is completed, go to you target database and run the Procedure editor to confirm that the records were replicated.

It is essential that both bulk load and replication processes are running.

After enough time has passed and you are ready to complete the database migration, return to Pro2 and generate the sync-up .df file.

1. Go to **Actions**.
2. Select **Target Database Utilities**.
3. Click **Target Differential**.
4. Enter the **Source Database** name.
5. Select **OpenEdge Database Migration**, and click **Submit**.
6. After the job completes, copy and paste the sync .df file into your target database.

Note: All Pro2 related fields and indexes are be generated in one of three different .df files if there is a default index present in any source table. The .df files generated are:

- *database name*-tgt.df
 - *database name*-inactIndex.df
 - *database name*-defaultindex.df
-

7. In the last step, you validate that there are no differences between your two databases by generating a CRC report.

You are now ready to start using your new database.

Check replication logs

The ReplLog Check feature allows you to scan all the log files for any errors and reports them through an email. To execute this feature, run the RunReplLogChk.bat file from the \Pro2\bprepl\Scripts folder.

If you are running this functionality for the first time, a ErrorTrigger.lst file is created (available in the bprepl/repl_tmpl folder). Add the error list that needs to be scanned/excluded in this file separated by commas. This feature scans all the log files, excluding the unwanted errors, and then send an error report in an email.

You can log the errors in the `ErrorTrigger.lst` file as shown below:

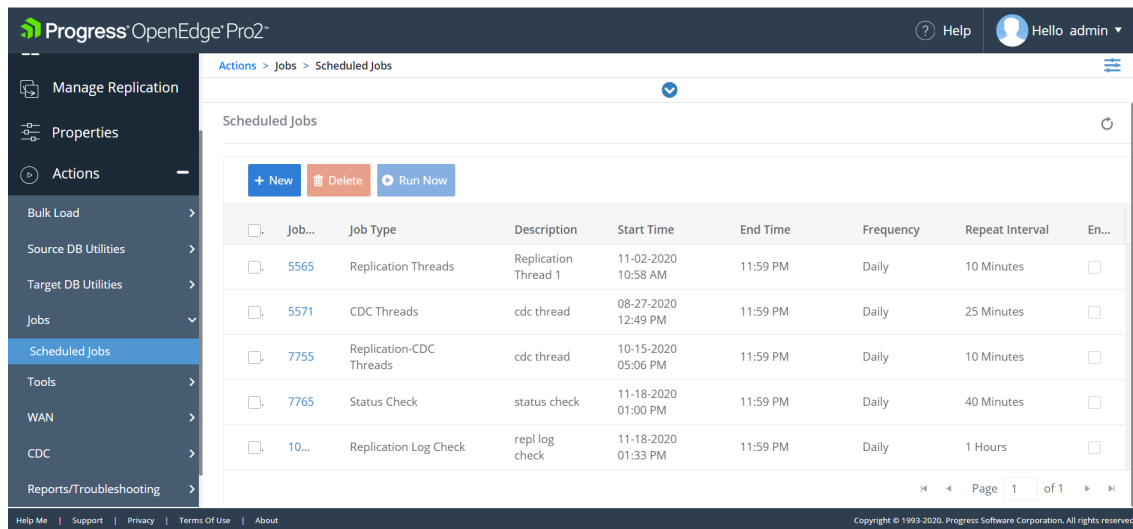
```
[ADMIN_LOG]
error,[SQL Server]**
[ADMIN_LOG_EXCLUDES]
Warning
[REPL_LOG]
error,[SQL Server],Maximum number of client connections,Application server connect
failure,Appserver did not connect,Transport resources unavailable,**
[REPL_LOG_EXCLUDES]
Warning,Closing Replication Log,Closing Replication CDC Proc Log,Closing Replication
Proc Log,Re-Opened Replication Proc Log,Re-Opened Replication CDC Proc Log,Opening
Replication,Closing Replication CDC Log
[REPLCDC_LOG]
error,[SQL Server],Maximum number of client connections,Application server connect
failure,Appserver did not connect,Transport resources unavailable,**
[REPLCDC_LOG_EXCLUDES]
Warning,Closing Replication Log,Closing Replication CDC Proc Log,Closing Replication
Proc Log,Re-Opened Replication Proc Log,Re-Opened Replication CDC Proc Log,Opening
Replication,Closing Replication CDC Log
[APPSRV_LOG]
error,[SQL Server]**
[APPSRV_LOG_EXCLUDES]
Warning,Closing Replication Log
[BULK_LOAD_LOG]
error,[SQL Server]**
[BULK_LOAD_LOG_EXCLUDES]
Warning
[CDC_LOG]
error,[SQL Server],Maximum number of client connections,Application server connect
failure,Appserver did not connect,Transport resources unavailable,**
[CDC_LOG_EXCLUDES]
Warning,Closing CDC Admin Log,Re-Opened CDC Admin Log,Log file closed
[JOBRUNNER_LOG]
error,has stopped the job runner,invalid task name,**
[JOBRUNNER_LOG_EXCLUDES]
Warning,Opening Job Log for date change,Closing Job Log for date change
[ENTERPRISE_PUSH_LOG]
error,Appserver did not connect,**
[ENTERPRISE_PUSH_LOG_EXCLUDES]
Warning
```

Note: If the `ErrorTrigger.lst` file is not found in the expected directory, it is created in `bprepl/repl_tmpl` directory with an empty skeleton.

How to schedule jobs in Pro2

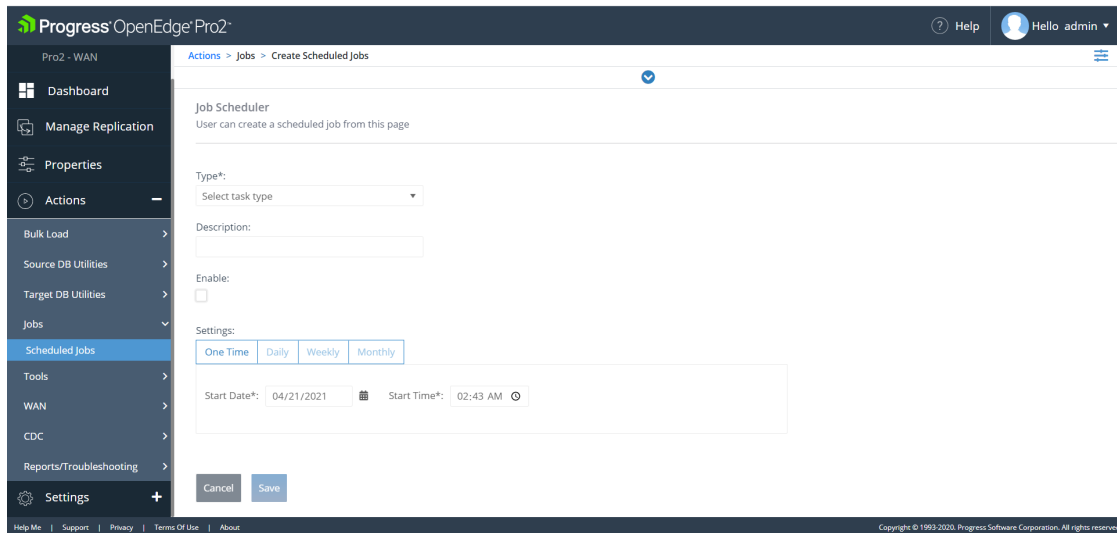
Pro2 is primarily used for replicating and synchronizing selected data and database objects from a source database to a target database. You can choose to manually perform your replications or schedule them to replicate automatically.

You can also schedule a variety of jobs by using the job scheduler. The job scheduler enables you to schedule recurring replications, CDC tasks, file purges, log checks, and more so that you no longer need to perform these tasks manually.



To schedule a job:

1. From the **Actions** tab of the side menu, click **Jobs > Scheduled jobs > New**.



2. Under the **Type** drop-down list, select the one of the following job types:

- Applied Queue Record Purge
- CDC Purge
- CDC Threads
- Enterprise Push
- File Purge
- Replication Log Check
- Replication Threads
- Replication-CDC Threads
- Status Check

3. Enter a **Description** for the job. A description helps you differentiate between similarly scheduled jobs.
4. If you are creating a new job, then ensure that the **Enable** check-box is selected. If you want to disable a scheduled job, but not remove a scheduled job, then you can do so by using this check-box.
5. In the **Settings** section, choose the job's start and end date as well as the start and end time.

You can schedule a job to occur once, daily, weekly, or monthly depending upon your business needs.

If the job is scheduled to repeat monthly, you can indicate the start date, end date, start time, end time, the month or months to repeat on, and number of days per month.

Note:

- In order to schedule a job once, select **One Time** from the **Settings** section and provide the start date and start time only. The default values for the **Start Date** and **Start Time** fields are the current date and time, respectively.
 - To schedule a job daily, weekly, or monthly, you need to provide the end date and end time, along with other parameters. By default, the **End Date** field is blank and the **End Time** is 11:59 PM, or 86340 seconds past midnight.
 - For the monthly frequency, if you leave the **Perform the job on day(s) of the selected months** field blank, then the job is scheduled for the day it is presently for each of the selected months.
-

6. Set the **Repeat task every** field.

Use this field to indicate when the job should be repeated. You can set the number of hours or minutes.

This field is dependent on the repeat cadence. For example, if the job is scheduled to repeat daily, set this field to 0 to repeat the job once per day.

7. Click **Save**.

To run a job on demand:

1. Select a previously created job by clicking its check-box.
2. Click **Run Now**.

Use CDC with Pro2

OpenEdge provides support for a feature called Change Data Capture (CDC). CDC is an OpenEdge RDBMS feature that identifies and captures data that changed in tables of a source database, as a result of `CREATE`, `UPDATE`, and `DELETE` (CUD) operations.

CDC is an industry term that describes the process of duplicating subsets of OLTP data in an external data source with a relatively up-to-date version of relational data. The OpenEdge implementation of CDC provides a flexible and scalable capture process to facilitate the data extraction, transformation, and eventually the loading of the data to an external data source.

Pro2 leverages two methods to implement CDC: CDC Thread and Replication-CDC Thread.

The first method, CDC Thread, is the standard implementation of this feature which replaces ABL triggers with CDC. The Pro2 standard CDC implementation supports a feature called `thread#0`. When this feature is used, the CDC Thread converts all `CDC_change_tracking` records to `ReplQueue` records, regardless of thread that the table is mapped to. This provides the convenience of having a single CDC Thread that converts all CDC records to replication queue records. The CDC replication process is faster than using ABL triggers and can be managed online.

The second method, Replication-CDC Thread, is a faster more efficient method of CDC replication. This method is achieved from bypassing the conversion of CDC records to replication queue records by writing changes directly from the source CDC database to the target database. This results in a replication performance speed increase and a decrease in lag.

Each type has advantages over the other. Replication-CDC Thread has the aforementioned speed, while CDC Thread can use compression and thread splitting. For example, CDC Thread can take multiple updates to a single record with the same `rowid` and compress it down into a single record to be processed. In contrast, Replication-CDC Thread processes a record for each transaction that occurs. The method that you choose depends on your business needs.

Pro2 use only Level 0 policies. Pro2 creates policies with the suffix `_pro2` so that it is easily recognized by the application, for example, `tablename_pro2`. If you create custom policies, ensure that `_pro2` is appended to each policy create for use with Pro2. Moreover, Pro2 does not replicate any changes that are generated from non-Pro2 policies. To determine whether a record is processed, Pro2 uses the `_user-misc` field in the `_change_tracking-table`. After the CDC record is processed, it either assigns the `_user-misc` value to `applied`, or it deletes the CDC record based on disposition value.

Limitations

To avoid read/write conflicts between replication thread types, there are restrictions around which threads can run simultaneously.

- A CDC Thread does not start if any of the same Replication-CDC thread(s) are running. For example, CDC Thread `thread#1` and Replication-CDC `thread#1` cannot run simultaneously. Likewise, Replication `thread#1` and Replication-CDC `thread#1` cannot run simultaneously.
- By design Replication-CDC cannot use split threads or queue compression.
- Second pass replication is not supported with Replication-CDC threads.

If you encounter an error derived from one of the above restrictions, you can delete or modify any threads from **Total Threads** watch-box on the Pro2 dashboard. In the **Total Threads** watch-box, select the problem thread and click **Delete**.

Choose between standard CDC or Replication-CDC

Assume a scenario where a you are running standard CDC replication with 5 active threads. Your replication threads 1-4 are configured normally, thread 5 is a 3-way split thread, and 2nd pass replication is not in play. The thread number list would be 1,2,3,4,5,51 and 52. At this point, LAN or WAN is irrelevant to the scenario.

Split threads are not supported for threads of type Replication-CDC. This means the Replication-CDC thread type is not an option for replication of tables mapped to thread 5.

Threads 1-4 are potential candidates for flipping the thread type. For this example, we will pick thread 4 to convert to a Replication-CDC thread type.

On the web user interface, add a new thread 4 with type Replication-CDC. There is no need to modify the mapping, and it does not matter if single or multiple tables replicate under thread 4.

Ensure that CDC is not running for thread 4.

Note: If you are running one CDC thread to convert all `_cdc` rows, then you must rework your thread conversion strategy, and stop CDC conversions of thread 4.

Start a Replication-CDC thread only for thread #4.

If performance is improved over the standard CDC replication method, you should consider converting threads 1-3 to Replication-CDC.

If performance is not improved, then stop Replication-CDC Thread 4, and revert the CDC changes and restart standard replication thread #4.

As a safety precaution, set the disposition of the new thread to `mark as applied`. Doing so allows you to fallback if you the results of the scenario are not satisfactory.

Enable CDC on the source database

For a CDC-based database replication, you must configure the source database as CDC.

Note: The same versions of OpenEdge must be loaded on both the Pro2 machine and source database machine. For example, if the OpenEdge Database release is 12.0, then 12.0 must be loaded on the Pro2 machine.

If you are unsure if your database has already been enabled for CDC, you test it by opening the **Procedure Editor > Tools > Data Dictionary > Show Hidden Tables > _cdc-change-tracking**. If the CDC Tracking Table is there, then your database is enabled for CDC.

To enable CDC on the source database:

Note: This procedure can be run in Single User mode only.

1. Open the **Proenv** window.
2. Shut down your source database and PAS for OpenEdge instance.
3. Direct your **Proenv** session to your database location and enter the following command to add the CDC structure file to the source database:

```
prostrct add database name db/cdcadd.st
```

Note: The structure file will assign particular areas in the source database for the CDC function.

4. Enter the following command to enable CDC on source database:

```
proutil database name -C enablecdc area ReplCDCArea indexarea ReplCDCArea_IDX
```

5. Restart the PAS for OpenEdge instance and the source database.
6. In the Pro2 web interface, select the source database from the **Manage Replication** tab.
The **Edit Replication** window appears.
7. Change the **Source DB Mode** to CDC.

Note: After you have enabled CDC on the source database, configure the replication process for CDC based replication.

Add, remove, and customize CDC threads

You can perform CDC-based replication after your source database is CDC enabled. Pro2 treats the both replication threads and CDC threads the same, allowing you greater flexibility in your replication configurations. You can add, remove and customize threads as needed. Again, there are two types of CDC threads that you can select, Replication-CDC Threads and CDC Threads.

Perform the following steps to add replication threads:

1. On the Pro2 web user interface dashboard, select **Total Threads**.
The **Total Threads** window appears.
2. Click **+Add**.
The **Add New Thread** window appears.
3. Select either **Replication-CDC Threads** or **CDC Threads**.
4. Enter a **Thread ID**. If the thread type is CDC, select the database and other controls according to your needs..

Note: It is best practice to set the Disposition to **Delete** as it improves performance.

5. Choose your database, if you have multiple source databases.
6. Click **Add**.
7. The CDC thread appears in the **Total Threads** list.

To delete threads:

1. On the Pro2 UI dashboard, select **Total Threads** watchbox.
The **Total Threads** window appears.
2. Choose either **Replication-CDC Threads** or **CDC Threads**.
3. Click the check box beside the thread that you want to delete and select **Delete**.
The **Delete Threads** window appears.

Note: You can delete multiple threads by selecting multiple check boxes at the same time.

4. Click **OK**. The thread no longer appears on the **Total Threads** window.

To customize CDC threads:

1. On the Pro2 UI dashboard, select the **Total Threads** watch-box.
The **Total Threads** window appears.
2. Choose either **Replication-CDC Threads** or **CDC Threads**.
3. Indicate the threads you want to update.
4. Customize the **Logging Level**, **Disposition**, and **Thread Control** as needed using the Actions drop down.

Map CDC

To configure CDC replication, you must map your source and target database after your CDC source database is enabled.

After you have enabled CDC on source database, a **CDC Mapping** tab appears in the **Manage Replication** window.

To enable CDC mapping:

1. From the **Manage Replication** window on the Pro2 web interface, select the **Source Database**.
2. Ensure that the **Source DB Mode** is **CDC**. Choose the **Test DB Connection** button. A message will indicate if CDC is enabled on the source database.

3. Click the **Mapping** option and ensure that all tables to be replicated have been mapped from source to target.
4. Select **CDC Mapping**.
5. Select the source tables to be mapped for CDC and click **Add**.
6. Select the **Policy Settings** for each of the **Source Tables** in the **Add / Activate Policy** column.

Note: Pro2 replication is currently designed to capture records that have changed. In CDC, this is known as a Policy. Activating a policy forces the OpenEdge database to immediately start tracking changes to the selected tables. Deactivating a policy forces the OpenEdge database to immediately stop tracking changes to the selected tables.

You can use the **Table List** functionality to specify specific tables to map by entering them as a comma separated list. This can be useful when you have many tables to sift through or a select few tables that you want to map. By entering in your list of tables, you can **Add**, **Activate**, **Inactivate** or **Delete** the CDC Policy.

Schedule CDC jobs

You can also schedule a variety of jobs by using the job scheduler. The job scheduler enables you to schedule recurring replications, CDC tasks, file purges, log checks, and more so that you no longer need to perform these tasks manually.

To schedule a job:

1. From the **Actions** tab of the side menu, click **Jobs > Scheduled jobs > New**.
2. Under the **Type** drop-down list, select the one of the following job types:
 - CDC Purge
 - CDC Threads
 - Replication-CDC Threads
3. Enter a **Description** for the job. A description helps you differentiate between similarly scheduled jobs.
4. If you are creating a new job, then ensure that the **Enable** check-box is selected. If you want to disable a scheduled job, but not remove a scheduled job, then you can do so by using this check-box.
5. In the **Setting** section, choose the job's start and end date as well as the start and end time.

You can schedule a job to occur once, daily, weekly, or monthly depending upon your business needs.
6. Indicate the **Database** you want to run the thread against, as well as **Thread number**.
7. Click **Save**.

Split CDC threads

You can split each CDC thread into multiple threads regardless of whether the CDC thread serves the replication of a single table, or a group of tables. You can split a single thread into a maximum of 10 split threads. When you split a thread into n number of parts, it provides $n-1$ split threads. For example, if you split the thread 5 (CDCBatch5.bat) into four parts, it provides three split threads 51, 52, and 53 along with the original thread 5. This means, the four parts are threads 5, 51, 52, and 53.

To split CDC threads:

1. Create new .bat files. For example:
 - a. Create three copies of the replBatch5.bat file located in the Pro2\bprepl\Scripts folder and rename them as replBatch51.bat, replBatch52.bat, and replBatch53.bat respectively.
 - b. Edit the replBatch51.bat file, locate and modify Thread=5 to Thread=51, and save your changes. Repeat this step for replBatch52.bat and replBatch53.bat files.
2. Create new thread positions:
 - a. Go to the Pro2 web interface and click the **Total Threads** watchbox.
 - b. Click the **Add** button,
 - c. In the **Thread ID** type 51, and fill out the remaining settings.
 - d. Click **Add** to repeat this step for threads 52 and 53.
3. Create a new property:
 - a. In the Pro2 interface, click the **Properties** tab, and then click **Add**.
 - b. In the **Property Name** field, specify the name of the property as CDCSPLIT_THREAD5.
 - c. In the **Value** field, specify the number of threads as 4.

Note: You can add up to $n-1$ value where n is the number of threads. The maximum value allowed per thread is 10. However, if you specify a value (characters or negative numbers) other than the numbers 1 to 10, the CDC uses only the actual thread number.

After generating the CDC code and creating new property for split threads, if you do not create the .bat files and do not schedule the task entries, then the data remains in the queue until the new replication thread is started.

Progress recommends that you do not change the split number if there are existing records in the queue. Changing the split number might push the changes of the same record and row to a differently calculated queue.

Enable or disable queue compression for CDC

Note: This is an optional property and is disabled by default. This property is not applicable for Replication-CDC Threads

You can enable or disable queue compression by means of the CDC_QUEUE_COMPRESSION property. You can edit this property from the web UI.

1. Click **Properties** tab and select the **CDC_QUEUE_COMPRESSION** property.
2. Click **Edit**.
3. Set the **Value** to either **YES** or **NO**.
4. Click **Save**.

Optimize CDC performance

You can optimize performance for both LAN and WAN configurations that use CDC by running CDC replication threads directly on the source database machine of your deployment.

There are two methods to optimize CDC replication. The method that you use depends on the configuration of your deployment.

For LAN configurations:

1. Go to `bprepl/scripts/` in the Pro2 root folder.
2. Locate the `Build_CDC_pkg.bat` file.
3. Run the `Build_CDC_pkg.bat` file directly on your source database machine.

For WAN configurations:

1. Go to `bprepl/scripts/` in the Pro2 root folder.
2. Locate the `CDCBatch.bat` file.
3. Update the `CDCBatch.bat` with your database name and thread number. For example, `database=database name, Thread=1`.
4. Run the `bprepl/scripts/CDCBatch.bat` directly on the on the source database machine of your WAN deployment.

For more information about CDC optimization, see *Docs/README_CDC_Build.txt* in the root folder of your Pro2 installation.

Manage Pro2 Properties

You can manage Pro2 to properties by loading a properties file, also known as configuration file, into the Pro2 interface. After the properties are loaded, you can Add, Edit or Delete them using the interface.

All of the preset properties necessary for Pro2 functionality are stored in the `Repl_Properties` table of the Pro2 database. In the `Repl_Properties` table, you can configure settings for various properties, including the log file location, logical delete table parameters, procedure template specifications, and more.

Pro2 Configuration settings can also be saved to, and loaded, from a text file, and added to Pro2 by using the **New** button in the **Manage Replication** window on the Pro2 web interface.

To load and manage Pro2 properties:

1. On the Pro2 dashboard menu, click **Actions > Tools > Load Configuration**.
2. Click on select files button and choose the `replbasev610.ini` file for the latest configuration of v6.2 under Pro2 root folder. If you want to use Replication-CDC or second pass replication then, also select one of the following to load in addition to the `replbasev610.ini` file.

File name	Description
<code>replbasev610-2ndPass.ini</code>	.ini file for second pass replication.
<code>replbasev610-Replication-CDC.ini</code>	.ini for CDC based replication with the Replication-CDC thread type.

Note: You can only select one or the other. Due to the fundamental differences in indexing, second pass and Replication-CDC are not compatible with each other.

3. After choosing and loading your files, click the **Submit** button.

Note: After the configuration file is loaded, additional configuration repositories are created under multiple Pro2 database tables:

- `Repl_Properties`- Properties information
- `Repl_Control`- Control record information
- `ThreadControl`- Thread level information
- `AlertType`- Alert related information
- `JobTemplate`- Job template related information (used for Job scheduler)
- `ReplP_wbdef`- watch boxes related information.

If the **Overwrite Pro2 Properties** check box is selected, then all previous properties are overwritten based on property name.

To add properties from the web interface:

1. On the Pro2 dashboard menu, click **Properties > +Add**.
2. Enter the new property **Name** and **Value**.
3. Click **Save** to save and add the new property.

To edit a property that is already loaded to the interface:

1. On the Pro2 dashboard menu, click **Properties**.
2. Select the property that you want to edit and click **Edit**.
3. Enter the updated property **Name** and **Value**.
4. Click **Save** to save and update the property.

To delete a property using the web interface:

1. On the Pro2 dashboard menu, click **Properties**.
2. Select the property that you want to delete and click **Delete**.

To download a copy of the properties file from the Pro2 web interface:

1. After you have modified or added properties, the changes are enacted by the job runner. You can view the status of the change in the **Pending Jobs** watch box.
2. Click the **Pending Jobs** watch box.
3. Select the properties job that correlates to your recent property changes and click on the download icon. The `properties.ini` is downloaded.

GET bulk load report API

Call `GET bulkloadrpt` with your Pro2 log-in credentials to get a JSON report for a bulk load process that you specify as query parameters in the API call.

About this API

The GET bulk load report API is a REST API that, when called, queries a Pro2 database for a data report of a bulk load job. You specify the database host name and port in the URL of the call. To ensure security, you include the log-in credentials for your account in the query. You can use this API to check the progress of a bulk load process when initially seeding a database.

Request

Direct the API call to the URL:

```
http://host_name:port/pro2/rest/Pro2/DPR?dMode=System/getbulkloadrpt&pVars=
```

Request format example as a curl command:

```
curl
-X GET
-u username:password
-v http://host_name:port/pro2/rest/Pro2/DPR?dMode=System/getbulkloadrpt&pVars=
```

Response

The response returns a data-set report of the bulk load job in JSON format.

The following is an example response:

```
{
  "ProDataSet": {
    "ttRpt": [
      {
        "ttDB": "sports",
        "ttFileName": "Benefits",
        "ttTbl": "Benefits",
        "ttStatus": "COMPLETE",
        "ttDateTime": "01/28/2020-01:23:00",
        "ttRowsLoaded": 21,
        "ttRowsLocked": 0
      },
      {
        "ttDB": "sports",
        "ttFileName": "BillTo",
        "ttTbl": "BillTo",
        "ttStatus": "COMPLETE",
        "ttDateTime": "01/28/2020-01:23:01",
        "ttRowsLoaded": 2,
        "ttRowsLocked": 0
      },
      {
        "ttDB": "sports",
        "ttFileName": "Bin",
        "ttTbl": "Bin",
        "ttStatus": "COMPLETE",
        "ttDateTime": "01/28/2020-01:23:04",
        "ttRowsLoaded": 770,
        "ttRowsLocked": 0
      },
      {
        "ttDB": "sports",
        "ttFileName": "Customer",
        "ttTbl": "Customer",
        "ttStatus": "COMPLETE",
        "ttDateTime": "01/28/2020-01:23:04",
        "ttRowsLoaded": 1118,
        "ttRowsLocked": 0
      },
      {
        "ttDB": "sports",
        "ttFileName": "Department",
        "ttTbl": "Department",
        "ttStatus": "COMPLETE",
        "ttDateTime": "01/28/2020-01:23:03",
        "ttRowsLoaded": 7,
        "ttRowsLocked": 0
      },
      {
        "ttDB": "sports",
        "ttFileName": "Employee",
        "ttTbl": "Employee",
        "ttStatus": "COMPLETE",
        "ttDateTime": "01/28/2020-01:23:04",
        "ttRowsLoaded": 55,
        "ttRowsLocked": 0
      },
      {
        "ttDB": "sports",
        "ttFileName": "Family",
        "ttTbl": "Family",
        "ttStatus": "COMPLETE",
        "ttDateTime": "01/28/2020-01:23:04",
        "ttRowsLoaded": 72,
        "ttRowsLocked": 0
      },
      {
        "ttDB": "sports",
        "ttFileName": "Feedback",
```

```

      "ttTbl": "Feedback",
      "ttStatus": "COMPLETE",
      "ttDateTime": "01/28/2020-01:23:05",
      "ttRowsLoaded": 8,
      "ttRowsLocked": 0
    },
    {
      "ttDB": "sports",
      "ttFileName": "InventoryTrans",
      "ttTbl": "InventoryTrans",
      "ttStatus": "COMPLETE",
      "ttDateTime": "01/28/2020-01:23:06",
      "ttRowsLoaded": 75,
      "ttRowsLocked": 0
    },
    {
      "ttDB": "sports",
      "ttFileName": "Invoice",
      "ttTbl": "Invoice",
      "ttStatus": "COMPLETE",
      "ttDateTime": "01/28/2020-01:23:06",
      "ttRowsLoaded": 147,
      "ttRowsLocked": 0
    },
    {
      "ttDB": "sports",
      "ttFileName": "Item",
      "ttTbl": "Item",
      "ttStatus": "COMPLETE",
      "ttDateTime": "01/28/2020-01:23:07",
      "ttRowsLoaded": 55,
      "ttRowsLocked": 0
    },
    {
      "ttDB": "sports",
      "ttFileName": "LocalDefault",
      "ttTbl": "LocalDefault",
      "ttStatus": "COMPLETE",
      "ttDateTime": "01/28/2020-01:23:08",
      "ttRowsLoaded": 10,
      "ttRowsLocked": 0
    },
    {
      "ttDB": "sports",
      "ttFileName": "Order",
      "ttTbl": "Order",
      "ttStatus": "COMPLETE",
      "ttDateTime": "01/28/2020-01:23:14",
      "ttRowsLoaded": 3953,
      "ttRowsLocked": 0
    },
    {
      "ttDB": "sports",
      "ttFileName": "OrderLine",
      "ttTbl": "OrderLine",
      "ttStatus": "COMPLETE",
      "ttDateTime": "01/28/2020-01:23:26",
      "ttRowsLoaded": 13970,
      "ttRowsLocked": 0
    },
    {
      "ttDB": "sports",
      "ttFileName": "POLine",
      "ttTbl": "POLine",
      "ttStatus": "COMPLETE",
      "ttDateTime": "01/28/2020-01:23:18",
      "ttRowsLoaded": 5337,
      "ttRowsLocked": 0
    }
  ],

```

```
{
  "ttDB": "sports",
  "ttFileName": "PurchaseOrder",
  "ttTbl": "PurchaseOrder",
  "ttStatus": "COMPLETE",
  "ttDateTime": "01/28/2020-01:23:13",
  "ttRowsLoaded": 2129,
  "ttRowsLocked": 0
},
{
  "ttDB": "sports",
  "ttFileName": "RefCall",
  "ttTbl": "RefCall",
  "ttStatus": "COMPLETE",
  "ttDateTime": "01/28/2020-01:23:11",
  "ttRowsLoaded": 13,
  "ttRowsLocked": 0
},
{
  "ttDB": "sports",
  "ttFileName": "Salesrep",
  "ttTbl": "Salesrep",
  "ttStatus": "COMPLETE",
  "ttDateTime": "01/28/2020-01:23:12",
  "ttRowsLoaded": 9,
  "ttRowsLocked": 0
},
{
  "ttDB": "sports",
  "ttFileName": "ShipTo",
  "ttTbl": "ShipTo",
  "ttStatus": "COMPLETE",
  "ttDateTime": "01/28/2020-01:23:12",
  "ttRowsLoaded": 3,
  "ttRowsLocked": 0
},
{
  "ttDB": "sports",
  "ttFileName": "State",
  "ttTbl": "State",
  "ttStatus": "COMPLETE",
  "ttDateTime": "01/28/2020-01:23:13",
  "ttRowsLoaded": 51,
  "ttRowsLocked": 0
},
{
  "ttDB": "sports",
  "ttFileName": "Supplier",
  "ttTbl": "Supplier",
  "ttStatus": "COMPLETE",
  "ttDateTime": "01/28/2020-01:23:14",
  "ttRowsLoaded": 10,
  "ttRowsLocked": 0
},
{
  "ttDB": "sports",
  "ttFileName": "SupplierItemXref",
  "ttTbl": "SupplierItemXref",
  "ttStatus": "COMPLETE",
  "ttDateTime": "01/28/2020-01:23:14",
  "ttRowsLoaded": 56,
  "ttRowsLocked": 0
},
{
  "ttDB": "sports",
  "ttFileName": "TimeSheet",
  "ttTbl": "TimeSheet",
  "ttStatus": "COMPLETE",
  "ttDateTime": "01/28/2020-01:23:15",
```

```

        "ttRowsLoaded": 25,
        "ttRowsLocked": 0
    },
    {
        "ttDB": "sports",
        "ttFileName": "Vacation",
        "ttTbl": "Vacation",
        "ttStatus": "COMPLETE",
        "ttDateTime": "01/28/2020-01:23:16",
        "ttRowsLoaded": 12,
        "ttRowsLocked": 0
    },
    {
        "ttDB": "sports",
        "ttFileName": "Warehouse",
        "ttTbl": "Warehouse",
        "ttStatus": "COMPLETE",
        "ttDateTime": "01/28/2020-01:23:16",
        "ttRowsLoaded": 14,
        "ttRowsLocked": 0
    }
]
}
}

```

GET replication queue records API

Call `GET threaddata` with your Pro2 log-in credentials to get a JSON report for replication queue records associated with specific threads.

About this API

The GET replication queue records API is a REST API that, when called, queries a Pro2 replication database for a list of replication queue records that are associated with specific threads in a replication database. You specify the database host name and port in the URL of the call. To ensure security, you include the log-in credentials for your account in the query. You can use this API to get a detailed report of the threads in a replication database, and up to 10 records associated with those threads.

Request

Direct the API call to the URL:

```
http://host_name:port/pro2/rest/Pro2/DPR?dMode=System/threaddata
```

Request format example as a curl command:

```

curl
-X GET
-u username:password
-v http://host_name:port/pro2/rest/Pro2/DPR?dMode=System/threaddata

```

Response

The response returns a data-set report of the replication queue records in JSON format under the `ttReplQueue` array.

The following is an example response:

```
{
  "ProDataSet": {
    "THREADCTL": [
      {
        "ThreadID": 0,
        "Uptime": "2020-04-02T03:33:30.444",
        "ThreadStatus": "STOPPED",
        "LogLevel": "Moderate",
        "Disposition": "Delete Record",
        "RepControl": "Enabled",
        "ThreadType": "CDC",
        "ControlType": "",
        "isAdd": false,
        "isRunning": false,
        "ttReplQueue": [
          {
            "Sequence": 1,
            "EventType": "C",
            "SrcDB": "sports",
            "SrcTable": "Customer",
            "SrcRecord": "0x00000000000000a10",
            "EventDate": "2020-04-02",
            "EventTime": "03:33:47",
            "SrcTransID": 0,
            "Username": "Administrator",
            "Applied": false,
            "ApplDate": null,
            "ApplTime": "",
            "Audited": false,
            "AudDate": null,
            "AudTime": "",
            "UserCust": "Administrator",
            "RawData": "",
            "QThread": 0,
            "THREADTYPE": "CDC"
          },
          {
            "Sequence": 2,
            "EventType": "W",
            "SrcDB": "sports",
            "SrcTable": "Customer",
            "SrcRecord": "0x00000000000000a10",
            "EventDate": "2020-04-02",
            "EventTime": "03:33:47",
            "SrcTransID": 0,
            "Username": "Administrator",
            "Applied": false,
            "ApplDate": null,
            "ApplTime": "",
            "Audited": false,
            "AudDate": null,
            "AudTime": "",
            "UserCust": "Administrator",
            "RawData": "",
            "QThread": 0,
            "THREADTYPE": "CDC"
          },
          {
            "Sequence": 3,
            "EventType": "C",
            "SrcDB": "sports",
            "SrcTable": "Customer",
            "SrcRecord": "0x00000000000000a11",
            "EventDate": "2020-04-02",
            "EventTime": "03:33:47",
            "SrcTransID": 0,
            "Username": "Administrator",
            "Applied": false,
```

```

        "ApplDate": null,
        "ApplTime": "",
        "Audited": false,
        "AudDate": null,
        "AudTime": "",
        "UserCust": "Administrator",
        "RawData": "",
        "QThread": 0,
        "THREADTYPE": "CDC"
    }
}
]
}

```

GET thread data API

Call `GET threaddata` with your Pro2 log-in credentials to get a JSON report for all data on specific threads.

About this API

The GET thread data API is a REST API that, when called, queries a Pro2 replication database for all data for specific threads in a replication database. You specify the database host name and port in the URL of the call. To ensure security, you include the log-in credentials for your account in the query. The request returns a variety of data, such as thread status, logging level, disposition, and more.

Request

Direct the API call to the URL:

```
http://host_name:port/pro2/rest/Pro2/DPR?dMode=System/threaddata
```

Request format example as a curl command:

```
curl
-X GET
-u username:password
-v http://host_name:port/pro2/rest/Pro2/DPR?dMode=System/threaddata
```

Response

The response returns a data-set report of all thread data in JSON format.

The following is an example response:

```
{
  "ProDataSet": {
    "THREADCTL": [
      {
        "ThreadID": 0,
        "Uptime": "2020-01-22T02:36:22.322",
        "ThreadStatus": "STOPPED",
        "LogLevel": "Moderate",
        "Disposition": "Delete Record",
        "RepControl": "Enabled",
        "ThreadType": "CDC",
        "ControlType": "",
        "isAdd": false,
        "isRunning": false
      },
      {
        "ThreadID": 0,
        "Uptime": "2020-01-29T05:02:54.958",
        "ThreadStatus": "STOPPED",
        "LogLevel": "Moderate",
        "Disposition": "Mark as Applied",
        "RepControl": "Enabled",
        "ThreadType": "JOB",
        "ControlType": "",
        "isAdd": false,
        "isRunning": false
      },
      {
        "ThreadID": 1,
        "Uptime": "2020-02-07T04:20:04.654",
        "ThreadStatus": "STOPPED",
        "LogLevel": "Minimum",
        "Disposition": "Mark as Applied",
        "RepControl": "Enabled",
        "ThreadType": "REPLICATION",
        "ControlType": "",
        "isAdd": false,
        "isRunning": false
      },
      {
        "ThreadID": 1,
        "Uptime": "2020-03-20T07:17:21.075",
        "ThreadStatus": "STOPPED",
        "LogLevel": "Moderate",
        "Disposition": "Delete Record",
        "RepControl": "Enabled",
        "ThreadType": "REPLICATION-AUDIT",
        "ControlType": "",
        "isAdd": false,
        "isRunning": false
      }
    ]
  }
}
```


GET Pro2 connection information API

Call GET `getconnection` with your Pro2 log-in credentials to get a JSON report for the type of connection that a Pro2 instance is using.

About this API

The GET connection information API is a REST API that, when called, queries a Pro2 instance the connection type that the instance is using. You specify the instance host name and port in the URL of the call. To ensure security, you include the log-in credentials for your account in the query. The request returns the connection type for the instance. The connection type can be LAN or WAN.

Request

Direct the API call to the URL:

```
http://host_name:port/pro2/rest/Pro2/DPR?dMode=System/getconnection
```

Request format example as a curl command:

```
curl
-X GET
-u username:password
-v http://host_name:port/pro2/rest/Pro2/DPR?dMode=System/getconnection
```

Response

The response returns a data-set report of connection information in JSON format.

The following is an example response:

```
{
  "ProDataSet": {
    "ack": [
      {
        "ConnType": "LAN",
        "AppSrvName": "",
        "AppSrvConnString": ""
      }
    ]
  }
}
```

GET version information API

Call GET `getaboutdata` with your Pro2 log-in credentials to get a JSON report of the version of a Pro2 instance.

About this API

The GET version information API is a REST API that, when called, queries a Pro2 instance for the version release that it is using. You specify the instance host name and port in the URL of the call. To ensure security, you include the log-in credentials for your account in the query. The request returns version information, for example, OpenEdge Pro2 Version 6.1.

Request

Direct the API call to the URL:

```
http://host_name:port/pro2/rest/Pro2/DPR?dMode=System/getaboutdata
```

Request format example as a curl command:

```
curl
-X GET
-u username:password
-v http://host_name:port/pro2/rest/Pro2/DPR?dMode=System/getaboutdata
```

Response

The response returns a data-set report of version information in JSON format.

The following is an example response:

```
{
  "ProDataSet": {
    "ttAbout": [
      {
        "ttTitle": "OpenEdge PRO2 Version 6.1",
        "ttDate": "Build: Tue, 11 Feb 2020 05:13:30",
        "ttVersion": "Version: 6.1"
      }
    ]
  }
}
```

GET instance information API

Call GET `repldbxref` with your Pro2 log-in credentials to get a JSON report of triggers, CDC information, and source and target database information for a Pro2 database.

About this API

The GET thread data API is a REST API that, when called, queries a Pro2 instance for all data on that instance and that instance's database. You specify the instance host name and port in the URL of the call. To ensure security, you include the log-in credentials for your account in the query. The request returns a variety of data, such as trigger data, CDC information, source and target database information, and more.

Request

Direct the API call to the URL:

```
http://host_name:port/pro2/rest/Pro2/DPR?dMode=System/repldbxref&pVars=
```

Request format example as a curl command:

```
curl
-X GET
-u username:password
-v http://host_name:port/pro2/rest/Pro2/DPR?dMode=System/repldbxref&pVars=
```

Response

The response returns a data-set report of all thread data in JSON format.

The following is an example response:

```
{
  "ProDataSet": {
    "ttReplDBXref": [
      {
        "SrcDB": "sports",
        "SchHldr": "",
        "SchImg": "",
        "TgtType": "OpenEdge",
        "TgtConnName": "",
        "TgtPhysName": "target",
        "GenQRec": true,
        "ProcQRec": true,
        "SrcPhysName": "",
        "SchPhysName": "",
        "SrcConnectType": "LAN",
        "SrcDBMode": "CDC",
        "SrcHostName": "localhost",
        "SrcHostPort": "1122",
        "SrcUserName": "",
        "SrcUserPWD": "",
        "SrcLastJobID": 0,
        "AppsrvName": "",
        "TgtUserName": "",
        "AppsrvConnectStr": "",
        "TgtUserPWD": "",
        "TgtDBHost": "localhost",
        "TgtDBPort": "2233",
        "TgtLastJobID": 3562,
        "SrcDBPath": "",
        "TgtDBPath": "",
        "SchDBPath": ""
      }
    ]
  }
}
```




Additional information

For details, see the following topics:

- [Pro2 FAQs](#)
- [Command-line references](#)
- [Processor procedure generator](#)
- [Pro2 repl databases and table schemas](#)
- [Pro2 directory hierarchy](#)
- [Pro2 program files](#)
- [Replication procedure library](#)
- [Replication processor](#)
- [Plan for disaster recovery with Pro2](#)

Pro2 FAQs

When do I need to regenerate code?

You need to regenerate the replication code whenever there are mapping changes. However, triggers and bulk load processor code need to be generated only when a new table is added to replication. Replication processor library code needs to be regenerated whenever a table or field is added or removed.

When do I need to update table or field mapping?

The mapping of tables and fields does not update automatically when schema changes are made to either the source or target database. Once the changes are made to the target SQL schema and after the schema holder is updated, you need to update the mapping to map new tables/fields and to delete mapping of removed tables/fields.

When do I need to update the schema holder?

Anytime a change is made to the target SQL database schema the schema holder database needs to be rebuilt or updated.

How do I contact Pro2 Technical Support?

To report a new issue or update an existing issue, please login to the Progress SupportLink application at <http://progresslink.progress.com/supportlink>.

If you do not have a SupportLink login, please register at <http://progresslink.progress.com/>, or if you need immediate assistance please call us directly.

See the support contact page at <http://web.progress.com/en/support/contact-support.html>

A SupportLink login provides you with the ability to receive exclusive access to the SupportLink Web portal—a single location to access the latest support information, search our knowledge base and manage your support issues 24x7. SupportLink includes:

- Automated knowledge base searches during support case submission to find potential solutions to your issue.
- The ability to set case severity level and provide additional details on your business impact to help us quickly resolve your issue.
- The ability to define and store multiple personalized environments to associate with your support case at the click of a button.
- The ability to manage all your support cases by easily opening, closing and escalating issues.

What is thread lag?

Thread lag is the replication record's, also known as `replqueue`, lag time between creation and processing, at a point and time per day, by thread number. When replication record is processed Pro2 reads the interval in minutes between the time the `replqueue` record was created and when it was processed. Pro2 creates a temp table record with the `srcrecord` and interval.

After each batch of `replqueue` records are processed in `ReplProc.p` and the shutdown check is complete, Pro2 consolidates the data into 1 record per thread, per hour, per day, and writes it to the `replp_threadlag` table. When the consolidation is complete, Pro2 looks to see if a record already exists for the thread, thread type, and, `lagdate = today`. Additionally, it checks if the record is within the lag hour or current hour. If no record is found and the record is not locked, Pro2 accumulate the `AVERAGE COUNT MAXIMUM MINIMUM` for the lag-minutes written during `replqueue` processing. That information is stored in the `replp_threadlag` table by date, thread, and thread type. When the data is read by the **Thread Lag** graph on the Pro2 UI dashboard, the data is summarized by date using all threads, and by extension displays as 1 record per date.

What is the difference between the Pro2 Enterprise View and the Pro2 web user interface?

The pro2 instance is referred to as the traditional replication setup. The newly released enterprise version displays the consolidated details of one or more Pro2 instances. With the help of the enterprise version, the DBA can monitor the activities of all the instances from a single enterprise view.

What is the version compatibility of the Pro2 Enterprise Eiew?

There are no restrictions on the Pro2 instances or Pro2 enterprise view compatibility. You can connect any version of the Pro2 instance with any version of the **Pro2 Enterprise View**.

Does the installation of the Pro2 Enterprise View interfere with the Pro2 6.2.x version?

Pro2 6.2.x Instances and Pro2 Enterprise View are installed separately and do not conflict.

Command-line references

Pro2 supports command-line operations for some of the web interface tool operations. This is an alternative to performing the tasks using the command prompt instead of the web interface. This topic explains the different modes and their respective syntax to execute the administrative tool operations. These operations can be executed using the BatchGen.bat file located in the Scripts folder of your Pro2 installation.

LOAD_CONFIG: Loads the configuration file from the location given using the PATH variable.

Syntax

```
"%PROEXE%" -b -pf %REPLPF% -p %CODEDIR%\BatchGenerators.p -param
"PATH=C:\Pro2\replbasev4.ini;DB=All;Mode=LOAD_CONFIG " >> %CODEDIR%\repl_log\batch.log
```

SAVE_CONFIG: Saves the current configuration to the path given in the PATH variable.

Syntax

```
"%PROEXE%" -b -pf %REPLPF% -p %CODEDIR%\BatchGenerators.p -param
"PATH=C:\Pro2\;DB=All;Mode= SAVE_CONFIG" >> %CODEDIR%\repl_log\batch.log
```

AUTO_DBXREF: Adds the database map record to the Database Mapping table.

Syntax

```
"%PROEXE%" -b -pf %REPLPF% -p %CODEDIR%\BatchGenerators.p -param
"Mode=AUTO_DBXREF;DB=sports,Options=MSS >> %CODEDIR%\repl_log\batch.log
```

GEN_TGT: Adds the Microsoft SQL Server database map record to the Database Mapping table.

Syntax

```
"%PROEXE%" -b -pf %REPLPF% -p %CODEDIR%\BatchGenerators.p -param
"PATH=C:\Pro2\;DB=All;Mode= GEN_TGT Options=NO|YES|NO " >> %CODEDIR%\repl_log\batch.log
```

AUTO_MAP: Maps the tables that were automatically mapped, listed in the Mapping table.

Syntax

```
"%PROEXE%" -b -pf %REPLPF% -p %CODEDIR%\BatchGenerators.p -param
"PATH=C:\Pro2\;DB=All;Mode= AUTO_MAPP " >> %CODEDIR%\repl_log\batch.log
```

GEN_PROCS: Generates the Process libraries, Replication triggers, Bulk-copy processors to the default location specified in properties file.

Syntax

```
"%PROEXE%" -b -pf %REPLPF% -p %CODEDIR%\BatchGenerators.p -param  
"PATH=C:\Pro2\;DB=All;Mode= GEN_PROCS " >> %CODEDIR%\repl_log\batch.log
```

GEN_TGT_DIFF: Generates the target differential files and saves them to the location given in PATH variable.

Syntax

```
"%PROEXE%" -b -pf %REPLPF% -p %CODEDIR%\BatchGenerators.p -param  
"PATH=C:\Pro2\;DB=All;Mode= GEN_TGT_DIFF;Options=NO|YES|NO " >>  
%CODEDIR%\repl_log\batch.log
```

TGT_DELTA_DF: Generates the trigger Delta DF file to the location given in the PATH variable.

Syntax

```
"%PROEXE%" -b -pf %REPLPF% -p %CODEDIR%\BatchGenerators.p -param  
"PATH=C:\Pro2\;DB=All;Mode= TGT_DELTA_DF " >> %CODEDIR%\repl_log\batch.log
```

GEN_DELTA_DF: Generates a Delta DF file on the WAN side and saves the files to the location given in the PATH variable.

Syntax

```
"%PROEXE%" -b -pf %REPLPF% -p %CODEDIR%\BatchGenerators.p -param  
"PATH=C:\Pro2\;DB=All;Mode= GEN_DELTA_DF " >> %CODEDIR%\repl_log\batch.log
```

CHECK_GEN_Q REC: Enables the functionality of generating replication queue records for single and multiple tables (which are separated by comma (,)).

Syntax

```
"%PROEXE%" -ininame Pro2.ini -basekey "INI" -b -pf %REPLPF% -p  
%CODEDIR%\BatchGenerators.p -param  
"PATH=C:\Pro2\;DB=All;Mode=CHECK_GEN_QREC;TABLE=Customer" >> %CODEDIR%\repl_log\batch.log
```

Parameters

TABLE

Name of the mapped table. You can specify a single table name, multiple table names or ALL.

UNCHECK_GEN_QREC: Disables the functionality of generating replication queue records for single and multiple tables (which are separated by comma (,)).

Syntax

```
%PROEXE% -ininame Pro2.ini -basekey "INI" -b -pf %REPLPF% -p
%CODEDIR%\BatchGenerators.p -param
"PATH=C:\Pro2\;DB=All;Mode=UNCHECK_GEN_QREC;TABLE=Customer" >>
%CODEDIR%\repl_log\batch.log
```

Parameters

TABLE

Name of the mapped table. You can specify a single table name, multiple table names or ALL.

ADD_THREAD: Adds a new replication thread.

Syntax

```
%PROEXE% -ininame Pro2.ini -basekey "INI" -b -pf %REPLPF% -p
%CODEDIR%\BatchGenerators.p -param "PATH=C:\Pro2\;DB=All;Mode=ADD_THREAD;THREAD_NUM=10"
>> %CODEDIR%\repl_log\batch.log
```

Parameters

THREAD_NUM

A number for the thread you are adding. The value must be an INTEGER ranging between 1 and 99.

DEL_MAP_TABLE: Deletes a mapped table along with its mapped fields for single and multiple tables (which are separated by comma (,)).

Syntax

```
%PROEXE% -ininame Pro2.ini -basekey "INI" -b -pf %REPLPF% -p
%CODEDIR%\BatchGenerators.p -param
"PATH=C:\Pro2\;DB=All;Mode=DEL_MAP_TABLE;TABLE=Customer" >> %CODEDIR%\repl_log\batch.log
```

Parameters

TABLE

Name of the mapped table. You can specify a single table name, multiple table names or ALL.

DEL_DBMAP: Deletes the mapped records of a database.

Syntax

```
%PROEXE% -ininame Pro2.ini -basekey "INI" -b -pf %REPLPF% -p
%CODEDIR%\BatchGenerators.p -param "PATH=C:\Pro2\;DB=sports;Mode=DEL_DBMAP" >>
%CODEDIR%\repl_log\batch.log
```

Parameters

DB

Name of the database. You can specify a single database name or ALL.

CHECK_CRC: Checks whether the CRC matches for mapped tables in the source databases and the local databases in a WAN environment.

Syntax

```
"%PROEXE%" -ininame Pro2.ini -basekey "INI" -b -pf %REPLPF% -p
%CODEDIR%\BatchGenerators.p -param "PATH=C:\Pro2\;DB=All;Mode=CHECK_CRC" >>
%CODEDIR%\repl_log\batch.log
```

Parameters

DB

Name of the database. You can specify a single database name or ALL.

SYNC_REPL: Synchronizes the replication database table values in a WAN environment.

Syntax

```
"%PROEXE%" -ininame Pro2.ini -basekey "INI" -b -pf %REPLPF% -p
%CODEDIR%\BatchGenerators.p -param "PATH=C:\Pro2\;DB=All;Mode=SYNC_REPL" >>
%CODEDIR%\repl_log\batch.log
```

CDC Purge: The CDC Purge menu item can be used to delete the data of change records other than the old data based on user input about the number of days of data that should be deleted and the maximum number of records that should be deleted per batch.

Syntax

```
"%PROEXE%" -b -pf %REPLPF% -p %CODEDIR%\CDCPurge.p -param
"DB=sports,CDC_PURGE_DAYS=0,MAXPROCESSED=100" > %CODEDIR%\repl_log\CDCPurge.log
```

Processor procedure generator

The processor procedure generator creates a single procedure library that contains an internal procedure for each of the replication tables. These internal procedures encapsulate the replication logic specific to a specific table. The resulting procedure library is run persistently while the replication processor is running. If this procedure is run from the Progress editor, then all databases (source database, schema holder and target database) must be connected.

Additionally, create the following database aliases:

- `SourceDB` for the source database
- `SchemaDB` for the OpenEdge schema holder database.
- `TargetDB` for the target database (which can be an Microsoft SQL Server, Oracle database, or an OpenEdge database).

Pro2 repl databases and table schemas

To facilitate data replication from the source OpenEdge database to the target database, Pro2 uses two light weight databases that contain a series of replication tables. The replication tables manage

Pro2 Repl tables consist of minimal data and indexing, and a single sequence for process control. Replication triggers fire and capture the updated record information to any database replication table as the events take place. A replication table can be in a standalone Repl database or embedded into one of the source OpenEdge databases. To replicate Pro2 uses a replication processor that cycles through replication records periodically, based on user configuration, and replicates the table data directly to the target database.

As an alternate setup, the Repl tables can be embedded directly in the source database.

A `ReplQueue` is a table that is stored in the replication database. The `ReplQueue` table stores information on change events that occur on your source database. This information includes the Progress ROWID of the record changed, event date/time, and queue thread. Typically, `ReplQueue` records represent updates made to the source database that are waiting to be written to the target SQL database.

The Pro2 database and replication database are similar to one another in that they monitor data change events from the `ReplQueue`, and send those change events to the target database so the that the information can be replicated there.

Repl database tables

Table 5: Sequences

Sequence Name	Notes
<code>NextReplNbr</code>	Increments the Sequence Number for each New <code>ReplQueue</code> Record

Table 6: Repl Tables

The following are a list of Replication database Tables:

Name	Label
<code>ReplControl</code>	Replication Control
<code>ReplCustAsgn</code>	Custom Assignments
<code>ReplCustDefs</code>	Custom Definitions
<code>ReplCustFlds</code>	Custom Fields
<code>ReplDBXRef</code>	Database Cross Reference

Name	Label
ReplFieldXref	Column Cross-Reference
ReplProperties	Properties
ReplQueue	Replication Queue
ReplTableXRef	Table Cross-Reference

Table 7: ReplControl – Replication control

Field name	Data type	Notes
GroupID	Character	Control Group
CodeID	Character	Group Sub Code
CodeVal1	Character	First Sub Code Filter
CodeVal2	Character	Second Sub Code Filter
CodeVal3	Character	Record Value

Index name	Components	Unique	Primary
idxControl	GroupID	Yes	Yes
	CodeID		
	CodeVal1		
	CodeVal2		

ReplCustAsgn - Custom assignments

No fields or indexes are defined at this time.

Table 8: ReplCustDefs - Custom definitions

Field name	Data type	Notes
SrcDB	Character	Source Database Name
SrcTable	Character	Source Table Name
CustName	Character	Name

Field name	Data type	Notes
CustDefType	Character	Definition Type (Variable, Temp-Table, or Buffer)
CustMisc	Character	If set to CustDefType the Data Type is a Variable. Otherwise, is the name of the table that this temp-table or buffer corresponds to.

Table 9: ReplCustFlds - Custom fields

Field name	Data type	Notes
SrcDB	Character	Source Database Name
SrcTable	Character	Source Table Name
FldName	Character	Name of this field
FldDataType	Character	Data type
FldWidth	Integer	Maximum width of a field. It applies to Decimal and Varchar Fields only
FldDec	Integer	Maximum number of Decimals
FldMand	Logical	Indicates if a field is mandatory field. It is set to No by default.

Table 10: ReplDBXRef - Database cross-reference

Field name	Data type	Notes
SrcDB	Character	Source Database
SchHldr	Character	Schema Holder DB
SchImg	Character	Target Schema Image
TgtType	Character	Target DB Type
TgtConnName	Character	Target DB Connection
TgtPhysName	Character	Target DB Physical Name
GenQRec	Logical	Generate Queue Record
ProcQRec	Logical	Process Queue Record
SrcPhysName	Character	Source DB Physical Name
SchPhysName	Character	Schema Holder DB Physical

Index name	Components	Unique	Primary
idxDBXRef	SrcDB	Yes	Yes
idxDBType	TgtType		

Table 11: ReplFieldXRef - Field cross-reference

Field name	Data type	Notes
SrcDB	Character	Source Database
SrcTable	Character	Source table
SrcField	Character	Source field
SrcDataType	Character	Source data type
SrcOrder	Integer	Field Order
SchField	Character	Schema Field
SchDataType	Character	Schema Data Type
TgtField	Character	Target Field
TgtDataType	Character	Target Data Type
TgtPrec	Integer	Target Precision
TgtScale	Integer	Scale
SrcExtent	Integer	Source Extent
TgtExtent	Integer	Target Extent
OverrideDefs	Logical	Override Precision/Scale Defaults

Index name	Components	Unique	Primary
idxFldXRef	SrcDB	Yes	Yes
	SrcTable		
	SrcField		
idxSrcOrder	SrcDB		
	SrcTable		
	SrcOrder		

Table 12: ReplProperties – Replication properties

Field name	Data type	Notes
PropertyName	Character	Property Name
PropertyValue	Character	Property Value

Index name	Components	Unique	Primary
idxProperties	PropertyName	Yes	Yes

Table 13: ReplQueue - Replication Queue

Field name	Data type	Notes
Sequence	Integer	Sequence Number
EventType	Character	Event Type Single Letter – Create, Write, Delete
SrcDB	Character	Replication Record's Source Database
SrcTable	Character	Replication Record's Source Table
SrcRecord	Character	Source Record ROWID
EventDate	Date	Date Replication Record was Generated
EventTime	Character	Time Replication Record was Generated
SrcTransID	Integer	Source Database Transaction Number
Username	Character	User Id of Transaction
Applied	Logical	Replication Record Processed over to SQL
ApplDate	Date	Date Replication Record was Processed
ApplTime	Character	Time Replication Record was Applied
Audited	Logical	Audited? (Verification)
AudDate	Date	Audited Date of Verification
AudTime	Character	Audit Time of Verification
UserCust	Character	User Custom Data
RawData	Raw	Field to Store RAW information about the Record

Field name	Data type	Notes
QThread	Integer	Replication Queue Processing Thread #
Sequence	Integer	Sequence Number

Index name	Components	Unique	Primary
idxApplied	Applied	No	No
	QThread		
	Sequence		
idxAudited	Audited	No	No
idxSeq	Sequence	Yes	Yes
idxSrcRecord	SrcRecord	No	No
idxSrcTable	SrcTable	No	No

Table 14: ReplTableXRef - Table cross-reference

Field name	Data type	Notes
SrcDB	Character	Source Database
SrcTable	Character	Source table
SchTable	Character	Schema Table
TgtTable	Character	Target Table
GenQRec	Logical	Generate Queue Record
ProcQRec	Logical	Process Queue Record
QThread	Integer	Queue Thread #
UseInDiff	Logical	Include in Differential
TrigInst	Logical	Trigger Installed
MrgdTrig	Logical	Merged Triggers
OrigDTrigProc	Character	Original Delete Trigger
OrigWTrigProc	Character	Original Write Trigger

Index name	Components	Unique	Primary
idxDiff	UseInDiff	No	No
idxTblXRef	SrcDB	Yes	Yes
	SrcTable		
idxThread	QThread	No	No

Pro2 database tables

Table 15: Sequences

Sequence name	Notes
CustDefIDSeq	Increments the Sequence Number for each New Repl_CustDefs Record
SchemaSeq	Increments the Sequence Number for each New ReplP_SchemaHist Record
ThreadSeq	Currently not assigned
JobTaskIDSeq	Increments the Sequence Number for each New ReplP_JobTask Record
JobIDSeq	Increments the Sequence Number for each New ReplP_Job Record
CompanyIDSeq	Currently not assigned
AlertSequenceID	Increments the Sequence Number for each New ReplP_Alerts Record
NextSyncNbr	Increments the Sequence Number for each New Repl_Sync Record
ThreadErrorSeq	Increments the Sequence Number for each New ReplP_ThreadErrors Record

Table 16: Pro2 tables

Name	Label
ReplP_Alerts	Location to store reportable alerts
ReplP_AlertType	Alert types
ReplP_Company	Instance info
ReplP_EntInfo	Enterprise info

Name	Label
ReplP_Job	Job details
ReplP_JobLobs	Job attachments
ReplP_JobMessage	Job Messages
ReplP_JobTask	Job Task info
ReplP_JobTemplate	Job Templates
ReplP_SchemaHist	History of replicated database tables
ReplP_ThreadActDet	Thread activity data detail
ReplP_ThreadActivity	Thread Activity
ReplP_ThreadErrors	Thread Errors
ReplP_ThreadHist	List of threads used for replication
ReplP_User	User info
ReplP_WBDef	Watch box details
Repl_Control	Replication Control
Repl_CustDefs	Custom Definitions
Repl_CustFlds	Global or table specific custom fields for the SQL schema
Repl_DBXRef	Database Map info
Repl_FieldXref	Field Mapping
Repl_Properties	Properties
Repl_Sync	Sync messages
Repl_TableXRef	Table Mapping
Repl_ThreadControl	Thread Control

Table 17: ReplP_Alerts - Location to store reportable alerts

Field name	Data type	Notes
AlertID	Integer	Alert ID
AlertTypeID	Integer	Alert type ID

Field name	Data type	Notes
AlertTxt	Character	Alert text
AlertTime	Datetime	Time of alert
AlertReporter	Character	Alert reporter

Index name	Components	Unique	Primary
idxAlert	AlertID	No	Yes
	AlertTypeID		

Table 18: RepIP_AlertType - Alert types

Field name	Data type	Notes
AlertTypeID	Integer	Alert type ID
AlertType	Character	Alert ID
AlertCategory	Character	Alert category

Index name	Components	Unique	Primary
idxAlertType	AlertTypeID	No	Yes

Table 19: RepIP_Company - Instance info

Field name	Data type	Notes
COMPANYID	Integer	Company ID
INSTALLTYPE	Character	Installation type
COMPANYNAME	Character	Company name
ADDRESS	Character	Address1
ADDRESS2	Character	Address2
CITY	Character	City
STATE	Character	State
ZIPCODE	Character	Zip code
WEBADDRESS	Character	Company web address

Field name	Data type	Notes
EMAIL	Character	Email
PHONE	Character	Phone

Index name	Components	Unique	Primary
idxCompany	COMPANYID	No	Yes

Table 20: RepIP_EntInfo - Enterprise information

Field name	Data type	Notes
InstNum	Integer	Instance number
InstName	Character	Instance name
InstAbbr	Character	Instance abbreviation
InstURL	Character	Instance URL
EntInstanceNum	Integer	Enterprise number
EntASHost	Character	Enterprise host
EntASName	Character	Enterprise AppServer name
EntASService	Character	Enterprise AppServer service name or port number
EntSuspendTransfers	Logical	Suspend data transfer (yes or no). Default is "no"
EntDeleted	Logical	Delete (yes or no). Default is "no"
CREATEDATE	Datetime-tz	Creation date
InstOS	Character	Instance OS
InstOEVer	Character	Instance OpenEdge version
InstPro2Ver	Character	Instance Pro2 version
InstOEArch	Character	Instance OpenEdge architecture
InstMachine	Character	Instance machine
InstIP	Character	Instance IP
InstTgtType	Character	Target instance type

Field name	Data type	Notes
InstConfig	Character	Instance configuration
InstASName	Character	Instance AppServer name
UPDATEDATE	Datetime-tz	Update date

Index name	Components	Unique	Primary
InstKey	InstNum	Yes	Yes

Table 21: RepIP_Job - Job details

Field name	Data type	Notes
JOBID	Integer	Job ID
DESCRIPTION	Character	Job description
REPEATABLE	Logical	Repeatable (yes or no)
TASKNAME	Character	Task name
SCHEDULETIME	Integer	Schedule time
SCHEDULEDATE	Date	Schedule date
SCHEDULEDAY	Character	Schedule day
CREATEDATE	Datetime-tz	Creation date
UPDATEDATE	Datetime-tz	Update date
RUNEND	Datetime	Task run end date
RUNSTART	Datetime	Task run start date
JOBRESULTSLOB	Blob	Job result
SCHEDULEFREQUENCY	Character	Schedule frequency
PARENTID	Integer	Parent ID
EXPIREDATE	Date	Expiry date
TASKFREQUENCY	Character	Task frequency
TASKINTERVAL	Integer	Task interval
JOBENABLED	Logical	Job enabled (yes or no)

Field name	Data type	Notes
JOBTEMPLATEID	Integer	Job template ID
JOBPARAMETERS	Character	Job parameters
JOBSTATUS	Character	Job status (Pending, Canceled, Running, Done)
JOBRESULTSCLOB	Clob	Job result
SCHEDULEINTERVAL	Character	Schedule interval
EXPIRETIME	Integer	Expiry time

Index name	Components	Unique	Primary
JobID	JobID	Yes	Yes
CreateDate	CreateDate	No	No
JobStatus	JobStatus	No	No
	JOBID		
JOBTEMPLATEID	JOBTEMPLATEID	No	No
ParentID	ParentID	No	No

Table 22: RepIP_JobLobs - Job attachments

Field name	Data type	Notes
JOBID	Integer	Job ID
JOBTASKID	Integer	Job task ID
DESCRIPTION	Character	Job description
JOBRESULTSLOB	Blob	Job result
JOBRESULTSCLOB	Clob	Job result
CREATEDATE	Datetime-tz	Creation date

Index name	Components	Unique	Primary
JobLob	JOBID	Yes	Yes
	JOBTASKID		
	CREATEDATE		

Table 23: ReplP_JobMessage - Job Messages

Field name	Data type	Notes
JOBID	Integer	Job ID
JOBMESSAGE	Character	Job message
CREATEDATE	Datetime-tz	Creation date
JOBTASKID	Integer	Job task ID
DISPLAYED	Logical	Display (yes or no)
MESSAGETYPE	Character	Job message type

Index name	Components	Unique	Primary
JobTaskID	JOBID	No	Yes
	JOBTASKID		
	CREATEDATE		
CreateDate	CREATEDATE	No	No
Displayed	DISPLAYED	No	No
	JOBID		
	JOBTASKID		

Table 24: ReplP_JobTask - Job Task info

Field name	Data type	Notes
JOBID	Integer	Job ID
JOBSTATUS	Character	Job status
JOBPARAMETERS	Character	Job parameters
RUNSTART	Datetime	Job run start date

Field name	Data type	Notes
RUNEND	Datetime	Job run end date
JOBTASKID	Integer	Job task ID
TASKNAME	Character	Task name
CREATEDATE	Datetime-tz	Creation date
UPDATEDATE	Datetime-tz	Update date
JOBRESULTSLOB	Blob	Job result
JOBRESULTSCLOB	Clob	Job result

Index name	Index name Components	Unique	Primary
JobTaskID	JOBID	No	Yes
	JOBTASKID		
	CREATEDATE		
CreateDate	CREATEDATE	No	No
JobStatus	JOBSTATUS	No	No
	JOBID		
	JOBTASKID		

Table 25: RepIP_JobTemplate - Job Templates

Field name	Data type	Notes
JOBTEMPLATEID	Integer	Job template ID
DESCRIPTION	Character	Job description
TASKNAME	Character	Task name
USER_FIELDNAME	Character	User field name
USER_FIELDTYPES	Character	User field type
USER_FIELDVALUES	Character	User field value
USER_FIELDLABELS	Character	User field label
USER_FIELDMINVAL	Integer	User field minimum value

Field name	Data type	Notes
USER_FIELDMAXVAL	Integer	User field maximum value
PROGNAME	Character	Program name
CMDSTRING	Character	Command string to hold the task name, thread number and script extension
JOBPARAMETERS	Character	Job parameters
CREATEDATE	Datetime-tz	Creation date
UPDATEDATE	Datetime-tz	Update date
USER_FIELDTOOLTIP	Character	User field tool tip

Index name	Components	Unique	Primary
JobTemplateID	JOBTEMPLATEID	Yes	Yes

Table 26: RepIP_SchemaHist - History of replicated database tables

Field name	Data type	Notes
S_RELID	Integer	Source record ID
SRCDB	Character	Source database
SRCTABLE	Character	Source table

Index name	Components	Unique	Primary
idxSchema	S_RELID	Yes	Yes
idxSchemaDbTbl	SRCDB	No	No
	SRCTABLE		

Table 27: RepIP_ThreadActDet - Thread activity data detail

Field name	Data type	Notes
ACTIVITYDATE	Date	Thread activity date
S_RELID	Integer	Source record ID
THREADID	Integer	Thread ID
ACTIVITYCOUNT	Integer	Thread activity count

Field name	Data type	Notes
ERRORCOUNT	Integer	Error count
LOCKEDCOUNT	Integer	Locked count
SKIPPEDCOUNT	Integer	Skipped count
THREADTYPE	Character	CDC, Replication or Audit
ACTIVITYTIME	Integer	Activity time
DETHOUR	Integer	Hour unit of time for thread activity
DETUNIT	Integer	Minute unit of time for thread activity. In HH:MM, DETUNIT is calculated as quotient of MM divided by 30

Index name	Components	Unique	Primary
ThreadActDetIdx	THREADTYPE	No	Yes
	ACTIVITYDATE		
	DETHOUR		
	DETUNIT		
	SRCTABLE		

Table 28: RepIP_ThreadActivity - Thread Activity

Field name	Data type	Notes
S_RELID	Integer	Source record ID
THREADID	Integer	Thread ID
THREADTYPE	Character	Thread type
ACTIVITYCOUNT	Integer	Activity count
ERRORCOUNT	Integer	Error count
LOCKEDCOUNT	Integer	Locked count
SKIPPEDCOUNT	Integer	Skipped count
ACTIVITYDATE	Date	Activity date
SRCDB	Character	Source database

Index name	Components	Unique	Primary
ThreadActIdx	SRCDB	No	Yes
	THREADID		
	THREADTYPE		
	ACTIVITYDATE		
ActivityDateIdx	ACTIVITYDATE	No	No
ThreadIdx	THREADID	No	No
	THREADTYPE		

Table 29: ReplIP_ThreadErrors - Thread Errors

Field name	Data type	Notes
S_RELID	Integer	Source record ID
THREADID	Integer	Thread ID
ERRORDescription	Character	Error description
CREATEDATE	datetime-tz	Thread creation date
THREADTYPE	Character	Thread type
THREADERRORID	Integer	Thread error ID
ERRORCOUNT	Integer	Error count

Index name	Components	Unique	Primary
ThreadErrorIdx	THREADERRORID	Yes	Yes
CreateTypeIDIdx	CREATEDATE	No	No
	THREADTYPE		
	THREADID		
TypeIDDateIdx	S_RELID	No	No
	THREADTYPE		
	THREADID		
	CREATEDATE		

Table 30: ReplP_ThreadHist - List of threads used for replication

Field name	Data type	Notes
THREADID	Integer	Thread ID
QTHREAD	Integer	Queue thread number

Index name	Component	Unique	Primary
idxThread	THREADID	No	Yes

Table 31: ReplP_ThreadLag -

Field name	Data type	Notes
THREADID	Integer	Thread ID
THREADTYPE	Character	CDC, Replication or Audit
AVGLAG	Integer	Average lag
MAXLAG	Integer	Maximum lag
MINLAG	Integer	Minimum lag
LAGDATE	Date	Lag date
LAGHOUR	Integer	Lag hour
RECCOUNT	Integer	Record count

Index name	Components	Unique	Primary
ThreadLagIdx	THREADID	No	Yes
	THREADTYPE		
	LAGDATE		
	LAGHOUR		
LagDateIdx	LAGDATE	No	No
	THREADTYPE		

Table 32: ReplP_User - User information

Field name	Data type	Notes
Pro2UserID	Integer	Pro2 user ID

Field name	Data type	Notes
USERNAME	Character	Username
ADDRESS	Character	Address1
ADDRESS2	Character	Address2
CITY	Character	City
STATE	Character	State
ZIPCODE	Character	Zip code
PHONE	Character	Phone
EMAIL	Character	Email
COMPANYID	Integer	Company ID
PASSWORD	Character	Password

Index name	Components	Unique	Primary
ReplP_P2UserIDX	USERNAME	No	Yes

Table 33: ReplP_WBDef - Watch box details

Field name	Data type	Notes
wbID	Character	Watch box ID
wbMode	Integer	Watch box mode
wbTitle	Character	Watch box title
wbValue	Character	Watch box value
wbvalTxt	Character	Tool tip text for each watch box
wblistTxt	Character	Unique value of each watch box
wbType	Character	Watch box type
wbFnxid	Character	Watch box function ID

Index name	Components	Unique	Primary
idxWbdef	wbID	No	Yes

Table 34: Repl_Control - Replication Control

Field name	Data type	Notes
GroupID	Character	Control Group
CodeID	Character	Group Sub Code
CodeVal1	Character	First Sub Code Filter
CodeVal2	Character	Second Sub Code Filter
CodeVal3	Character	Record Value

Index name	Components	Unique	Primary
idxControl	GroupID	Yes	Yes
	CodeID		
	CodeVal1		
	CodeVal2		

Table 35: Repl_CustDefs - Custom Definitions

Field name	Data type	Notes
SrcDB	Character	Source database name
SrcTable	Character	Source table name
CustName	Character	Definition name
CustDefType	Character	Definition type (variable, temp-table, or buffer)
CustMisc	Character	Data type
CustDefID	Integer	Definition ID

Index name	Components	Unique	Primary
idxCustDefs	CustDefID	Yes	Yes

Table 36: Repl_CustFlds – Global or table specific custom fields for the SQL schema

Field name	Data type	Notes
SrcDB	Character	Source database name

Field name	Data type	Notes
SrcTable	Character	Source table name
FldName	Character	Field name
FldDataType	Character	Data type
FldWidth	Integer	Maximum width of a field. It applies to decimal and varchar Fields only
FldDec	Integer	Maximum number of decimals
FldMand	Logical	Indicates if a field is mandatory field. It is set to No by default.

Index name	Components	Unique	Primary
idxCustFlds	SrcDB	Yes	Yes
	SrcTable		
	FldName		

Table 37: Repl_DBXRef – Database cross-reference

Field name	Data type	Notes
SrcDB	Character	Source database
SchHldr	Character	Schema holder database
SchImg	Character	Target schema image
TgtType	Character	Target database type
TgtConnName	Character	Target database connection
TgtPhysName	Character	Target database physical name
GenQRec	Logical	Generate Queue Record (yes or no)
ProcQRec	Logical	Process Queue Record (yes or no)
SrcPhysName	Character	Source database physical name
SchPhysName	Character	Schema holder database physical name
SrcConnectType	Character	Source connection type
SrcDBMode	Character	Source database mode

Field name	Data type	Notes
SrcHostName	Character	Source host name
SrcHostPort	Character	Source host port
SrcUserName	Character	Source database username
SrcUserPWD	Character	Source database password
AppsrvName	Character	AppServer name
TgtUserName	Character	Target database username
TgtUserPWD	Character	Target database password
TgtDBHost	Character	Target database host
TgtDBPort	Character	Target database port
AppsrvConnectStr	Character	AppServer connection string
SrcLastJobID	Integer	Source DB last job ID
TgtLastJobID	Integer	Target DB last job ID
SrcDBPath	Character	Source database path
TgtDBPath	Character	Target database path
SchDBPath	Character	Schema database path
SrcLogical	Character	Source logical
TgtLogical	Character	Target logical

Index name	Components	Unique	Primary
idxDBXRefc	SrcDB	Yes	Yes
idxDBType	TgtType	No	No

Table 38: Repl_FieldXref - Replication Cross-Reference

Field name	Data type	Notes
SrcField	Character	Source field
SrcDataType	Character	Source data type
TgtField	Character	Target field

Field name	Data type	Notes
TgtDataType	Character	Target data type
SrcOrder	Integer	Field order
TgtPrec	Integer	Target precision
TgtScale	Integer	Decimal places in the target field
SrcDB	Character	Source database
SrcTable	Character	Source table
SchField	Character	Schema field
SchDataType	Character	Schema data type
SrcExtent	Integer	Source extent
TgtExtent	Integer	Target extent
OverrideDefs	Logical	Override precision/scale defaults

Index name	Components	Unique	Primary
idxFldXRef	SrcDB	Yes	Yes
	SrcTable		
	SrcField		
idxSrcOrder	Field	No	No
	SrcDB		
	SrcTable		
	SrcOrder		
idxTgtfld	SrcDB	No	No
	SrcTable		
	TgtField		

Table 39: Repl_Properties- Properties

Field name	Data type	Notes
PropertyName	Character	Property name

Field name	Data type	Notes
PropertyValue	Character	Property value
PropertyCategory	Character	Property category

Index name	Components	Unique	Primary
idxProperties	PropertyName	Yes	Yes

Table 40: Repl_Sync – Sync messages

Field name	Data type	Notes
Sequence	Integer	Sequence ID
SyncTable	Character	Table name you want to sync
EventDate	Date	Event date
EventTime	Character	Event time
Username	Character	Username
Applied	Logical	Applied record (yes or no)
ApplDate	Date	Applied date
ApplTime	Character	Applied time

Table 41: Repl_TableXRef – Table mapping

Field name	Data type	Notes
SrcTable	Integer	Source table
TgtTable	Character	Target table
GenQRec	Logical	Generate queue record (yes or no)
ProcQRec	Logical	Process queue record (yes or no)
QThread	Integer	Queue thread number
UseInDiff	Logical	Include in differential (yes or no)
SrcDB	Character	Source database
SchTable	Character	Schema table
TrigInst	Logical	Trigger installed (yes or no)

Field name	Data type	Notes
MrgdTrig	Logical	Merged triggers (yes or no)
OrigDTrigProc	Character	Original delete trigger procedure
OrigWTrigProc	Character	Original write trigger procedure

Index name	Components	Unique	Primary
idxTblXRef	SrcDB	Yes	Yes
	SrcTable		
idxDiff	UseInDiff	No	No
idxThread	QThread	No	No

Table 42: Repl_ThreadControl - Thread Control

Field name	Data type	Notes
ThreadID	Integer	Thread ID
Uptime	datetime	Update time of the thread status
ThreadStatus	Character	Thread status
LogLevel	Character	Log level
Disposition	Character	Delete record/mark as applied
RepControl	Character	CDC, replication, or audit
ThreadType	Character	Thread type
ControlType	Character	Control type
SrcDB	Character	Source database

Index name	Components	Unique	Primary
ThreadCtrlIdx	SrcDB	Yes	Yes
	ThreadID		
	ThreadType		
	ControlType		

Pro2 directory hierarchy

The following is a description of the folders under the Pro2 root installation folder.

Folder	Description
bprepl	Root directory for application programs.
bprepl\AppSrv	Used in WAN implementations.
bprepl\common	This folder contains common files used across Pro2.
bprepl\datasets	Used to support the acquisition of data sets from the database.
bprepl\images	Image files that can be used for shortcut icons.
bprepl\misc	Miscellaneous replication files and procedures.
bprepl\PRO2_REST	Contains files to support the user interface.
bprepl\repl_as_tgt	Used in WAN implementations.
bprepl\repl_d	Directory for the Pro2 generated database replication delete trigger procedures.
bprepl\repl_export	Used in WAN bulk loads.
bprepl\repl_inc	Directory for Pro2 generated assign include files.
bprepl\repl_jtrig	Directory for any java triggers.
bprepl\repl_log	Default location of log files.
bprepl\repl_mgtrig	Directory listing tables that require merged triggers.
bprepl\repl_mlog	Location for bulk load logs.
bprepl\repl_mproc	Directory for the Pro2 generated bulk copy procedures.
bprepl\repl_mproclog	Location for bulk load program logs.
bprepl\repl_pf	Directory for application server and repl .pf files.
bprepl\repl_pro2dbtrigs	Directory for Pro2 database trigger files.
bprepl\repl_proc	Directory for the Pro2 generated replication library
bprepl\repl_sql	Directory for SQL replication procedures.
bprepl\repl_tmpl	Directory containing the templates used for various code generation. Contains the ReplLogCheck ErrorTriggers.lst files.

Folder	Description
bprepl\repl_w	Directory for Pro2 generated database replication write trigger procedures.
bprepl\replcdc_proc	Directory for Pro2 CDC replication procedures.
bprepl\Scripts	Directory containing the .pf files, scripts, and shortcuts to start various Pro2 functions.
bprepl\SQL_inc	Directory for the direct SQL assign include files.
bprepl\SQL_mproc	Directory for the direct SQL bulk copy procedures.
bprepl\SQL_proc	Directory for the direct SQL replication procedures.
bprepl\custom	<p>Directory to deploy your customized code so that it overrides the existing code in the bprepl folder.</p> <hr/> <p>Note: This folder must maintain the bprepl folder structure and is applicable for both LAN and WAN configurations.</p> <hr/>
db	Location of schema holder database(s). Also, the initial temporary location for repl database during implementation.
Docs	Contains various read me files for Pro2.
Downloads	Initially empty. Used to save site-specific downloads.
misc	Miscellaneous Pro2 utilities.
PASOE	Directory for the PAS for OpenEdge instance associated with your Pro2 deployment.
tmp	Miscellaneous Pro2 temporary files used during implementation.
utils	Directory for various replication procedures.

Pro2 program files

Most of the Pro2 source files contain a preprocessor definition for `INSTALL_DIR` that needs to be set to the directory path, fully qualified in Universal Naming Convention format that contains the `bprepl` installation directory. This needs to occur before any compile process.

Table 43: Primary programs

File name	Description
GenReplTrigs.p	Generates the replication triggers. Trigger procedures are created for REPLICATION-WRITE and REPLICATION-DELETE for all mapped tables according to the current database map.
GenReplProc.p	Generates a set of procedures consisting of an individual procedure for each of the tables mapped according to the current database map. Each procedure contains the logic necessary to properly replicate a single record from a single table in a single Source database to a single table in the corresponding target database.
ReplProc.p	Replication Processor – Loads all Replication Processor Libraries into persistent memory and handles the physical replication of data from source to target. The processor program periodically cycles through pending replication records and calls the appropriate procedure from the procedure library. The cycle period is controlled by the current value of the ReplControl sequence in the Replication database. The value is an integer representing the number of seconds to pause between processing cycles.
RunReplProc.p	Initializes the routines for ReplProc.p
bpAdmin.w	The administration and monitoring program for the replication functionality. Replication processing can be monitored from this program. Cycle period setting can be modified, all configuration parameters can be set, certain options can be set, and the GenReplTrigs.p, GenReplProc.p, GenSQLSchema.p and UpdSrcSchema.p programs can be run.
bpadmin.wrx	COM Object support file for bpAdmin.w
ReplAbout.w	Displays version information.
About.txt	Includes the versioning text.
GenBulkCopy.p	Generates a procedure library consisting of an individual procedure for each of the tables mapped in the current database map. Each procedure contains the logic to mass-copy all records in the appropriate table from the source database over to the target database via the DataServer.
CompReplTrig.p	Compiles the procedure files generated with the GenReplTrigs.p and GenReplProc.p programs.
CompReplProc.p	
UpdSrcSchema.p	Updates the Source database listed in the current database map by creating REPLICATION-WRITE and REPLICATION-DELETE triggers within the meta-schema and then pointing to the appropriate trigger procedure files.

File name	Description
GenSQLSchema.p	Using the current database map, builds a SQL Create Table file in Microsoft SQL format which is used to construct a schema in Microsoft SQL Server that matches the schema of the Progress source database. Generates a .sql file consisting of CREATE TABLE and CREATE [UNIQUE] INDEX statements to properly develop an exact copy of the Source schema on a Microsoft SQL Server database. This procedure also adds a "prrowid" field in varchar format that holds the ROWID of the source record.
GenSQLDiff.p	Using the current database map, builds a SQL file in Microsoft SQL format that is used to upgrade the target schema to match the source schema. Generates a .sql file consisting of the necessary SQL commands needed to bring the schema of target database in sync with the schema of source db. Typically used after a schema upgrade to the source db.
LoadFields.p	Used to populate the Mapping screen with Fields, corresponding to the selected Table Map, that are not already mapped for replication.
LoadTables.p	Used to populate the Mapping screen with Tables, corresponding to the selected Database Map, that are not already mapped for replication.
MapAllFields.p	Used to map all fields associated with a Table that has just been auto-mapped.
MapFields.p	Used to cross-reference a single field in the Source table to a single field in the target table.
SetAlias.p	Creates Database Alias Names (SourceDB, SchemaDB, and TargetDB) and/or points them to appropriate Source, Schema and Target Databases according to the current map in use.
repl_tmpl\tmpl_replproc.p	Template File used by GenReplProc.p to create the processor library.
repl_tmpl\tmpl_mreplproc.p	Template File used by GenMassRepl.p to create the bulk copy library.
repl_tmpl\tplt_replTrig.p	Template File used by GenReplTrigs.p to create the Replication Triggers.
SetAlias.p	Creates Database Alias Names (SourceDB, SchemaDB, and TargetDB) and/or points them to appropriate Source, Schema and Target Databases according to the current map in use.
SQLGenMassRepl.p	Used to generate bulk load procedures for Send-SQL.
SQLGenMSSAssign.p	Used to generate include files for field assignments for Send-SQL procedures.
SQLGenReplProc.p	Used to generate replication procedures for Send-SQL.
SQLReplProc.p	Used to run Send-SQL replication procedures.

File name	Description
SQLRunReplProc.p	Initializes the routines for SQLReplProc.p
purgepro2ent.p	<p>As part of regular maintenance, this program is used to purge the following tables:</p> <ul style="list-style-type: none"> Ent_Alerts Ent_ThreadActDet Ent_ThreadActivity Ent_ThreadLag Ent_ThreadErrors <p>To schedule a data purge, use the DATA_RETENTION_DAYS_ENT property.</p>

Table 44: Secondary programs and files

Program Name	Program Description
ReplLib.i	Contains forward prototype declarations for member functions contained in the replication utility procedure library.
ReplLib.p	A procedure library containing internal procedures and functions used to interface with the tables of the Replication Database and with appropriate configuration and map files.

Table 45: Generated programs

File Name	Function
<code><ddir>/d<dbName>_<tableName>.p</code> where <i>ddir</i> = Delete trigger directory Ex: bprepl\repl_d\dsports_customer.p	One procedure for each replicating table containing the logic to create a replication record for deletion. Each procedure is created in the delete trigger directory specified in the properties table.
<code>wdir/w dbName_tableName.p</code> where <i>wdir</i> = Write trigger directory Ex: bprepl\repl_w\wsports_customer.p	One procedure for each replicating table containing the logic to create a replication record for creation or write. Each procedure is created in the write trigger directory specified in the properties table.
<code>pdir/dbName_replproc.p</code> <code>pdir/dbName_tableName_replProc.p</code> <code>pdir/rp_dbName_tableName.i</code> where <i>pdir</i> = Procedure Library directory Ex: bprepl\repl_proc\rpsports_customer.p	A control procedure containing an individual procedure for each replicating table to handle all basic replication functionality between the source and target databases. These procedures are placed in the processor directory specified in the properties table. There is a <code>replproc.p</code> control program for each database.

Table 46: Scripts

Name	Description
<code>purgequeue.bat</code>	<p>The <code>purgequeue.bat</code> file can be run in either interactive or non-interactive modes. To set the script to non-interactive mode, pass an input parameter of 1 when you run the file. For example:</p> <pre>bprepl\Scripts>purgequeue.bat 1</pre> <p>To run the script in interactive mode, do not pass an input parameter. Interactive mode is on by default. If set to interactive, the script purges all queue records. In non-interactive mode, you can run the script in batch regularly and delete replqueue records that are both applied and audited.</p>

Replication procedure library

The replication procedure library (`ReplLib.p`) contains internal procedures and functions that handle general utility functions, such as reading from and writing to configuration files, map files, and the replication properties and controls tables. It is run persistently and is added to either the session or procedure super stack.

Replication procedure library (`ReplLib.p`) reference:

- The replication procedure library returns the name of the kill event using `RETURN-VALUE`.
- It subscribes to the `ReplLibPing` event which requires an `OUTPUT` parameter of `HANDLE` type. It then returns the handle of the persistent instance of the library. And it is used to determine if the procedure is currently running.
- The replication procedure library publishes no events.

Member Functions

FUNCTION	Description	Parameters	Return
<code>formatDate</code>	Returns the input date value as a string in the form <code>YYYY-MM-DD</code> and appends Midnight in the format <code>HH:MM:SS</code> to it.	<code>INPUT DATE</code> – The date to be formatted	<code>CHARACTER</code> – The formatted date
<code>formatLogical</code>	Returns the input Logical variable as either a 1 (True) or a 0 (False) in Integer format.	<code>INPUT LOGICAL</code> – The logical variable to be converted	<code>INTEGER</code> – a Zero for False values or a One (1) for True values

FUNCTION	Description	Parameters	Return
getModDate	Takes the input date and performs various manipulations to convert it into a string such as Weekday , Month dd, yyyy.	INPUT DATE – The date to be converted	CHARACTER – a string interpretation of the date as per Description
getModTime	Takes the input time as an integer and outputs it as a character string in the format HH:MM:SS (24 Hour Time format).	INPUT INTEGER – An integer value representing the elapsed time of the current day, in seconds	CHARACTER – a string interpretation of the time in “HH:MM:SS” format

PROCEDURE	Description	Parameters
LoadConfiguration	Reads a pre-formatted configuration file and places the appropriate sections of that file into the control and properties tables of the Replication Database. This procedure overwrites current settings.	INPUT CHARACTER – a string representing the name of the file from which to load.
LoadMapFile	Reads a pre-formatted map file and places the appropriate sections of that file into the database, table, and field cross-reference tables of the Replication Database. This procedure overwrites current maps with the same cross-reference codes.	INPUT CHARACTER – a string representing the name of the file from which to load.

Replication processor

The replication processor, also known as the thread, is a batch program that periodically cycles through and processes any replication queue records that were not applied to the SQL database. The name of the thread is the timestamp and the number of the thread.

The cycle period is controlled by the sleep interval set by the **Settings** button on the **Dashboard** window of the Pro2 web interface. This value represents the number of seconds that the processor sleeps between cycles. If the value is set to 0, then the batch session exits and must be restarted to resume processing of replication records.

Replication threads

There can be up to five separate threads of replication processors running. For each thread, a separate replBatch.bat from bprepl\Scripts is run (For example: replBatch.bat, replBatch2.bat, replBatch3.bat corresponding to each thread.) Tables are assigned to specific threads in the Properties window of the Pro2 web interface.

Note: To increase the number of replication threads, contact your administrator to modify your license and get additional threads.

For most implementations, one thread is typically enough to maintain pace with the changes to be replicated. For implementations with very high transaction numbers, tables can be spread across up to five queues to manage performance. Individual tables that have exceedingly high transaction volume or are of very high priority for users of the target database can be assigned their own thread.

Other reasons to have tables in separate threads include running static reports on the target database for a subset of tables. These tables are put in their own thread. When it is required to run the static report on the target database, replication for that thread is stopped. Changes for these tables continue to accumulate. When the report is completed, the replication processor for this thread restarts, catches up with the changes in the queue, and then resumes processing the new changes.

Replication log files

Each replication processor writes to two log files `replproc(YEARMDD-thread#).log` and `repllog(YEARMDD-thread#).log`, that are located in the operating system directory specified by the `LOG_DIRECTORY` value in the properties table (by default `bprepl\repl_log` folder). Any errors encountered and general information such as cycle start and stop time and number of records processed are captured here.

These files should be reviewed periodically and require periodic truncation, deletion, or archiving. When the logging level option is set to a setting other than None, the replication processor generates basic log entries, such as when procedure libraries are executed and when the processor queue is started and stopped. Each level builds on the previous level. For example, the Moderate setting logs errors as well as the basic entries generated by the Minimum setting.

Plan for disaster recovery with Pro2

The role of a Replicated SQL database in your business is a major point to consider in planning for Disaster Recovery (D/R) in a Pro2 replication environment. Another point to consider is the size of your source and target databases and the length of time required to restore and to reload the data to the SQL target.

When is it necessary to reset the SQL target database?

Generally, the target SQL database must be loaded whenever the source database or repl database need to be restored from a backup. Bulk loading the data from the source OpenEdge database to the target SQL database can take a long time. This time may range up to days depending upon the size of the database. Your disaster recovery plan should be clear on what situations require a full bulk load of the data and the steps required to do so.

To answer the question of when to reset, it is important to understand the role of `ROWID` in the replication process. The `ROWID` is the unique record identifier in the OpenEdge database. Pro2 uses the `ROWID` to store and identify the corresponding record in the SQL database. Two important facts about how `ROWID`'s are assigned in the OpenEdge database are:

- The order in which records are created and deleted determines their `ROWID`.
- When a record is deleted from the OpenEdge database, its `ROWID` can be used again for a subsequently created record.

Therefore, even if you know which records were created and deleted during the time the source database or repl database were lost and you reapply those changes to a restored version of the database, the `ROWID`'s could be different than the original values stored in the target SQL database and any subsequent changes result in invalid data in the target SQL database.

Why back up the repl database?

The replication database contains valuable information. Understanding the roles of the various tables in the replication database is helpful in determining a backup strategy for the replication database.

Reasons to back up the database are:

- The repl database contains all the mapping information for the replication of the databases, tables and fields between the source and target databases.
- The repl properties file contain configuration settings such as log file location, logical delete tables and specification of procedure templates which are stored in the `ReplProperties` table.
- The `replqueue` table stores information about change events. This information includes the ROWID of the record changed, event date and time, and queue thread.

Restrictions with online backups

You must be cautious when you use online backups as part of your disaster recovery solution. Some of the important points to take note of are:

- The backups of the source database and the repl database could be out of sync depending on the timing of the online backups for the repl database and the source database.
- The replication queue may have transactions that were not included in the backup of the source database if the source database backup occurred first.
- The replication queue in the backup of the repl database might be missing committed transactions if the repl database backup occurred first.

Progress recommends that online backups are used only in conjunction with after-imaging.

Pro2 and after-imaging

After-imaging can be enabled and an on the source database concurrently with Pro2 replication. If after-imaging is enabled and running on the source database, then after-imaging does not need to be enabled on the replication database. However, if after-imaging is not enabled on the replication database, the disaster recovery plan must include re-seeding the target SQL database.

Pro2 and OpenEdge Replication

OpenEdge Replication is a Progress product that maintains a replicated copy of the source database as part of a disaster recovery scheme. Pro2 replication can run concurrently with OpenEdge Replication. If the target SQL database and the replication database are part of the disaster recovery solution, then the OpenEdge Replication configuration must be modified to include them.