Progress® OpenEdge® BPM
BusinessManager:
Clustering Guide
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Preface

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- User types
- Information on documentation
- Conventions used in this manual
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About this documentation

This guide is part of the documentation set for Progress OpenEdge Business Process Server.

User types

Progress OpenEdge Business Process Server is a business process management system that can be used by the following types of users:

<table>
<thead>
<tr>
<th>User type</th>
<th>Responsibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>User type</td>
<td>Responsibilities</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Manager</td>
<td>Responsible for automating business processes in a particular business domain. Business Process Portal’s Management module serves as the primary interface to Business Process Server for the Manager, enabling the manager to monitor, analyze, and control business processes. Also uses the Business Process Modeler for modeling and simulation.</td>
</tr>
<tr>
<td>Application Developer</td>
<td>Responsible for creating customized applications for implementing business processes and developing interfaces associated with tasks. Application developers may work closely with Managers to define the requirements of an application, and determine the business processes.</td>
</tr>
</tbody>
</table>

**Information on documentation**

This documentation includes information for the entire range of Progress OpenEdge Business Process Server users. In the following table, we recommend the guides that are most relevant to each type of user.

<table>
<thead>
<tr>
<th>If you are the …</th>
<th>Read the …</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application User</td>
<td><em>Business Process Portal User’s Guide</em></td>
</tr>
<tr>
<td></td>
<td><em>First Steps Guide</em></td>
</tr>
<tr>
<td></td>
<td><em>Terminology Guide</em></td>
</tr>
<tr>
<td>Manager</td>
<td><em>Business Process Portal Manager’s Guide</em></td>
</tr>
<tr>
<td></td>
<td><em>Business Process Portal User’s Guide</em></td>
</tr>
<tr>
<td></td>
<td><em>Terminology Guide</em></td>
</tr>
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<td>If you are the …</td>
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<tr>
<td>-----------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Application Developer       | Application Developer’s Guide  
|                             | BP Server Developer’s Guide  
|                             | BPM Events User’s Guide  
|                             | Business Process Portal Manager’s Guide  
|                             | Business Process Portal User’s Guide  
|                             | OpenEdge Getting Started: Developing BPM Applications with Developer Studio  
|                             | Customization Guide  
|                             | Managed Adapters Guide  
|                             | First Steps Guide  
|                             | Terminology Guide  
|                             | Server Administrator’s Guide  
|                             | Web services Developer’s Guide  |
| Business Process Server Administrator | BPM Events User’s Guide  
|                             | Business Process Portal Administrator’s Guide  
|                             | Business Process Portal Manager’s Guide  
|                             | Business Process Portal User’s Guide  
|                             | OpenEdge Getting Started: Installation and Configuration Guide  
|                             | Managed Adapters Guide  
|                             | Terminology Guide  
|                             | Server Administrator’s Guide  
|                             | Troubleshooting Guide for Administrators  |

For the latest Business Process Server documentation updates, see OpenEdge Product Documentation on PSDN (http://communities.progress.com/pcom/docs/DOC-16074).

**Conventions used in this manual**

This document uses the following conventions and terminology notations.

<table>
<thead>
<tr>
<th>Convention (styles and terms)</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>bold</strong></td>
<td>Indicates titles of command buttons, check boxes, options, lists, dialog boxes, and portal page names.</td>
</tr>
<tr>
<td><strong>file path</strong></td>
<td>Indicates folder paths and file names.</td>
</tr>
<tr>
<td>Convention (styles and terms)</td>
<td>Purpose</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>---------</td>
</tr>
<tr>
<td><em>italic</em></td>
<td>Indicates book titles.</td>
</tr>
<tr>
<td>monospace</td>
<td>Represents code segments or examples.</td>
</tr>
<tr>
<td><code>backward slash &quot;\&quot;</code></td>
<td>Indicates the path in Windows environment. For UNIX environment, replace with forward slash &quot;/&quot;</td>
</tr>
<tr>
<td>OEBPS_HOME or %OEBPS_HOME%</td>
<td>Represents the installation folder of Business Process Server, C:\Progress\OpenEdge\oebpm\server.</td>
</tr>
<tr>
<td>STUDIO_HOME or %STUDIO_HOME%</td>
<td>Represents the installation folder of OpenEdge BPM components, C:\Progress\OpenEdge\oebpm\studio.</td>
</tr>
<tr>
<td>JBOSS_HOME or %JBOSS_HOME%</td>
<td>Represents the installation folder of JBOSS server, C:\Progress\OpenEdge\oebpm\jboss.</td>
</tr>
</tbody>
</table>

### Product support contact information

If the product documentation does not provide a solution to your specific issue, or if you need clarification on the issue, then contact our Product Support team. You can contact the team through the Internet, telephone, or postal mail, as per the details provided in the following table.

**Table 1: Product Support Contact Information**

<table>
<thead>
<tr>
<th>To contact by</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Web site</td>
<td><a href="http://progresslink.progress.com/supportlink">http://progresslink.progress.com/supportlink</a></td>
</tr>
<tr>
<td></td>
<td>If you are an existing customer, then you can log in to the above site for product support. If you are a first time user, then you need to create an account first.</td>
</tr>
</tbody>
</table>
| Telephone¹    | 1-781-280-4999 for US, Latin America and Canada  
|               | 1-781-280-4543 for the Product Support Fax Line |
| Postal Address¹ | Progress Software Corporation  
|               | 14 Oak Park Drive  
|               | Bedford, MA 01730, USA. |

To enable us to quickly answer your questions, please provide the following information:

- Your name, installation site address and the license key for Business Process Server software.
- Your Business Process Server version and build number.

¹ For support telephone numbers and offices in your region, visit the support web site above. This contact information is for customer support only.
• Your operating system, application server and browser, with version and service pack details, if any.
• Your database management system and version, and information on JVM and JDBC used.
Introduction to Clustering

Clustering allows shared processing by grouping independent nodes together to work as a single system. A cluster is a loosely coupled group of nodes collaborating to provide shared access to the services that each node hosts. To the other systems, or to the other components of the same system, the cluster appears as a single system.

The objectives of clustering are:

• Providing high availability by balancing resource requests.
• Ensuring reliability through reduced system failure, by managing failover.
• Offering scalability by allowing dynamic addition of resources to improve performance.

Together, a clustered system provides higher availability, increased reliability, and greater scalability than each node can provide independently.

For details, see the following topics:

• Clustering terminology
• Designing server clusters

Clustering terminology

Some important clustering terminology is explained below.
Terminology

- **Node.** Refers to the individual system that is part of a cluster. Each node in the cluster has its own local resources. However, the cluster also has common resources, such as a common data storage. These common resources are accessible to each node in the cluster.

- **Load Balancing.** Is the ability to switch between the locations where similar requests are handled. For example, a request for a database connection might be handled on any one of four different servers in a cluster. Deciding which server handles the request depends on the load-balancing logic.

- **Availability.** Refers to the quality of the system's response to process a request, denoting the amount of time that an application or system is available to perform work. Availability is typically measured in percentage uptime.

- **High Availability.** Is defined as support to backup services in the case of a system or node failure. A system with high availability uses load balancing so that all requests are routed to one or more preferred servers until one of the servers becomes unavailable, and then routed to another server that is still operational.

- **Failover.** Is the ability for a request that is being serviced, to have a high availability switchover to another node without disruption of the service. A successful failover means to transfer the service without any intervention by client or manual process.

- **Scalability.** Denotes capability of a system to scale up to provide sustained system availability and throughput, without unacceptable degradation under increase in load. The increase in load could be due to increase in the number of users accessing the application, or in the volume or size of user transactions or actions.

- **Reliability.** Is the ability of a system to perform its required functions and sustain a requested service under stated conditions for a specified period of time.

- **Throughput.** It is the rate of information arriving at, and possibly passing through, a particular point in a network system. The rate at which a processor can work expressed in instructions per second or jobs per hour or some other unit of performance.

- **Horizontal Cluster.** This refers to multiple installations of Progress OpenEdge BusinessManager (herewith referred to as OpenEdge BusinessManager or BusinessManager), each hosting a cluster node, running in the same physical computer or multiple computers, but each BusinessManager installation is part of the same cluster and runs homogeneously.

- **Vertical Cluster.** This refers to a single installation of BusinessManager hosting multiple cluster nodes, running in the same physical machine. A vertical cluster could be part of a horizontal cluster that is, a cluster having three nodes could have two nodes running in the same computer (vertical cluster) and the third node in a different computer (horizontal cluster).

For definitions of more commonly used terms, see the Glossary of this guide. For a fuller listing of BusinessManager terminology, see the *Terminology Guide* in the `OEBPS_HOME\docs` folder.

Designing server clusters

The cluster design depends on several factors such as:

- Extent of high availability needs
- Users, and the volume of the user transactions
- Network design and capacity
- Database design and dependencies
- Systems management
If the load requirements are unpredictable, then more servers are needed in the configuration to ensure high availability and good performance at all times. On the other hand, if the risk of failure is high, along with the possibility of multiple failures, then more servers are required to be available for failover.
Configuring cluster on JBoss

This chapter guides you to configure BusinessManager cluster on JBoss application server.

Note: Clustering of BusinessManager, and high availability are supported only on JBoss Enterprise Application Platform 5.2 application server. Clustering, and high availability are not supported on JBoss Community Edition 5.2 application server (embedded in BusinessManager).

For details, see the following topics:

• Before configuring cluster on JBoss
• Configuring cluster details on JBoss
• Setting up a cluster on JBoss
• Starting servers in a cluster on JBoss
• Stopping servers in a cluster on JBoss

Before configuring cluster on JBoss

Before configuring cluster:

• Ensure that the time on all nodes of the cluster is synchronized at all times.
• Install and verify the Proxy Server.
• Ensure that the JMS persistence tables do not exist in the database user’s account. For the list of these tables, refer to the appendix “Re-initializing BusinessManager database” of the *Installation Guide*.

## Installing Proxy server on JBoss

JBoss application server does not have an integrated proxy server. Thus, if web cluster needs to be configured, then an external proxy server (Apache HTTP server) should be installed.

**Important:** On some Unix based Operating Systems, Apache HTTP Server is installed by default. In that case, this default HTTP server can be used as proxy for BusinessManager.

If Apache HTTP server is not installed by default, then install proxy server on one of the nodes.

**Perform the following steps to install proxy server:**

1. Install Apache HTTP Server 2.x on one of the nodes where BusinessManager is installed. For more information about Apache HTTP Server, refer [http://www.apache.org](http://www.apache.org).

2. Download the corresponding Tomcat connector `mod_jk 1.2.x`. Rename the `mod_jk-1.2.x-xxx.so` file as `mod_jk.so`, and copy it in the `<APACHE_HOME>/modules` folder, where `<APACHE_HOME>` is the Apache server installation folder. For more information about Tomcat connector, refer [http://tomcat.apache.org/download-connectors.cgi](http://tomcat.apache.org/download-connectors.cgi).

3. In `httpd.conf` file under `<APACHE_HOME>/conf` location, specify the port number on which Apache HTTP server listens or use the default port number. Ensure that the port is unused (for example, Listen 14001).

## Verifying Proxy server installation on JBoss

**Verify Proxy Server installation as follows:**

1. Start Apache HTTP server from `<APACHE_HOME>/run` or `<APACHE_HOME>/bin` location using the following command:

   `httpd -k start`

2. Using a web browser, attempt to access the Apache HTTP server to ensure that proxy server has been installed properly. Proxy server URL is as follows:

   `http://<Proxy server host name>:<Proxy server port>`

   **For example**, `http://Proxy.progress.com:14001`

   If Welcome page of Apache HTTP server is displayed, then it indicates that the proxy server is running.

3. Stop the Apache HTTP server with the following command from `<APACHE_HOME>/bin` or `<APACHE_HOME>/run` location.

   `httpd -k stop`
Configuring cluster details on JBoss

To configure cluster details:

1. Launch the Cluster Configuration Tool by executing \( \text{clusterconfigtool.cmd/sh from} \)<OEBPS_HOME>/cluster/bin location of any one of the nodes.

   **Note:** For Windows operating system, the Cluster Configuration Tool can be launched using the Windows shortcut.

2. Review the Application Server Details and Persistence Details about the BusinessManager instance displayed.

Configuring EJB/JMS cluster on JBoss

For JBoss application server, JMS server runs within EJB server. Thus when EJB clustering takes place, JMS is also clustered.

**To configure EJB cluster:**

1. In the left pane, under the node BusinessManager, click Cluster.
2. Under the Cluster node, click EJB to specify the EJB cluster configuration. You can change the default EJB cluster name, if needed.
3. Enter Cluster Name for the EJB cluster.
4. Enter MultiCast Address or use the default values.
   - IP multicast is a simple broadcast technology that enables multiple applications to "subscribe" to a given IP address and port number and listen for messages. A multicast address is an IP address in the range from 224.0.0.0 to 239.255.255.255.
   - If Multicast IP address is not specified, then it is derived from the specified IP address of the first EJB node.
5. Click Add Node. The Node Details are displayed.
6. Enter Name for the node to identify the EJB server node uniquely in the cluster. This name is used for starting and stopping the EJB server on this node.

   **Note:** EJB server node name should be different for each node in the cluster. Only alphabets, numerals and underscore character ( _ ) are allowed.

7. Specify the IP Address of the node.
8. Use the default port numbers, or enter unique port numbers for HTTP Port, HTTPS Port, JNDI Port, and Advance Port Range on which the node listens.
Note: Ensure that the computer can be identified by the IP Address in the network and it is unique across the network.

Ensure that a range of 40 consecutive port numbers starting from the Advance Port Range port number you specify are available. Also, make sure that all the cluster members have a unique set of ports.

In case of vertical clustering, the port numbers must be different on all nodes as all the nodes are on the same computer.

9. Enter the location of OEBPS Home, which is the BusinessManager installation folder.

10. Click Add to add the node to the EJB cluster. Click Add & Continue to add more nodes. Click Cancel to go back to the previous page.

Note: The BusinessManager instance on which cluster configuration is performed also needs to be added as a cluster node explicitly.

Configuring Web cluster on JBoss

To configure Web cluster:

1. In the left pane, under the node BusinessManager, click Cluster.

2. Under the Cluster node, click Web to specify the Web cluster configuration. You can change the default Web cluster name, if needed.

3. Enter Cluster Name for the Web cluster.

4. Enter MultiCast Address or use the default values.

   IP multicast is a simple broadcast technology that enables multiple applications to "subscribe" to a given IP address and port number and listen for messages. A multicast address is an IP address in the range from 224.0.0.0 to 239.255.255.255.

   If Multicast IP address is not specified, then it is derived from the specified IP address of the first Web node.

5. Click Add Node. The Node Details are displayed.

6. Enter Name for the node to identify the Web server node uniquely in the cluster. This name is used for starting and stopping the Portal server on this node.

   Note: Web server node name should be different for each node in the cluster. Only alphabets, numerals and underscore character ( _ ) are allowed.

7. Specify the IP Address of the node.

8. Use the default port numbers, or enter unique port numbers for HTTP Port, HTTPS Port, JNDI Port, and Advance Port Range on which the node listens.
Note: Ensure that the computer can be identified by the IP Address in the network and it is unique across the network.

Ensure that a range of 40 consecutive port numbers starting from the Advance Port Range port number you specify are available. Also, make sure that all the cluster members have a unique set of ports.

In case of vertical clustering, the port numbers must be different on all nodes as all the nodes are on the same computer.

9. Enter the location of OEBPS Home, which is the BusinessManager installation folder.

10. Click Add to add the node to the Web cluster. Click Add & Continue to add more nodes. Click Cancel to go back to the previous page.

Configure Proxy server on JBoss

A proxy server is required with a Web cluster. When a Web cluster is set up, the external clients send their request to the proxy server. Then, it is the proxy server that routes the request to one of the servers in the Web cluster. Therefore the proxy server configuration is essential with the Web cluster.

This section describes how to configure the Apache HTTP Server as a proxy server/load balancer.

To configure proxy server:

1. In the left pane, under the node BusinessManager, click Server.
2. Under the Server node, click Proxy.
3. Enter Name for the server to identify it uniquely in the cluster. This name is used for starting and stopping the Proxy server on this node.
4. Specify the IP Address of the node.
5. Use the default port numbers, or enter unique port number for HTTP Port on which the node listens.
6. Enter Proxy Home as the location of Apache HTTP Server installation (HTTP_SERVER_HOME).

Saving the cluster configuration on JBoss

To save the cluster configuration:

1. Specify configuration details for all the cluster nodes.
2. Save the cluster configuration.

This creates oebps-cluster.xml file in <OEBPS_HOME>/cluster/conf location, containing all cluster configuration details.

Viewing the cluster configuration on JBoss

To view the cluster configuration file:

• Click View > XML.

For file contents, see Understanding the cluster configuration file on page 37.
If you encounter errors during cluster configuration, then refer to the `bmcluster.log` file under `<OEBPS_HOME>/cluster/logs` location.

## Setting up a cluster on JBoss

### To set up a cluster:

1. The cluster configuration file should be present on all the cluster nodes. Copy `oebps-cluster.xml` file from the node on which the cluster configuration file is available to the `<OEBPS_HOME>/cluster/conf` folder of all other cluster nodes.

2. Configure the cluster by executing the `setupcluster.cmd/sh` script from the `<OEBPS_HOME>/cluster/bin` folder on each node of the cluster. This creates the cluster server nodes configured for that BusinessManager instance.
   
   Refer to the `bpmcluster.log` file for log messages from the cluster set up utility.

3. Verify that the cluster nodes have been created in the `<JBoss_Home>/jboss-as/server` location.
   
   On each node of the cluster, the configured server nodes must be created as specified in cluster configuration file.
   
   For Example: For a cluster having 2 nodes, the following server nodes (directories) should be created:
   
   On Node1: `ejbnode1, webnode1`
   
   On Node2: `ejbnode2, webnode2`

4. Execute `modifyprop.cmd/sh` from `<OEBPS_HOME>/cluster/bin` folder on each node of the cluster.
   
   On doing so, certain configuration parameter values are changed in the following configuration files available in `<OEBPS_HOME>/conf` location on all cluster nodes. The original files containing these configuration parameters are backed up by appending `<number>` to the file name, where the `<number>` is the time (in long number format) when the files were modified. Thereafter, cluster specific configurations are updated in the following files.
   
   - `webservice.conf`
   - `bpmportal.conf`
   - `oebpsjms.properties`
   - `oebpsjndi.properties`
   - `bpmevents.conf`
   - `bpserver.conf`
   - `designer.conf`
   - `oebps.conf`

5. On the node where the proxy server is installed, execute `configureproxyserver.cmd/sh` from the `<OEBPS_HOME>/cluster/bin` folder.
Starting servers in a cluster on JBoss

This section guides you to start the servers in the cluster.

Refer oebps-cluster.xml available within <OEBPS_HOME>/cluster/conf location to identify the node names for starting and stopping servers.

Starting EJB servers on JBoss

To start EJB servers:

• Start EJB server with the following command from <OEBPS_HOME>/jboss/bin location on all EJB nodes:

  startEjbServer.cmd/sh <EjbNodeName>

Important: If EJB servers are started simultaneously on multiple nodes, then the servers may hang or take more time to start. Therefore, start the EJB servers one after the other on all the nodes.

Starting BP Server and BPM Events Servers on JBoss

You need to perform different steps to start BP Server and BPM Events servers on different versions of JBoss.

Starting BP Server and BPM Events on JBoss Enterprise Application Platform 5.2

If BP Server and BPM Events servers are configured for auto-startup, then they are started along with EJB server.

• BP Server server gets started on all the cluster nodes.
• BPM Events server gets started on one node and BizPulse monitoring is started on the remaining nodes.

If BP Server and BPM Events servers are not configured for auto-startup, then start these servers on all nodes using command line utilities. See BusinessManager server commands for cluster on page 45 to start BP Server and BPM Events servers.

Starting Portal servers on JBoss

To start Portal servers:

• Start portal server with the following command from <OEBPS_HOME>/jboss/bin location on all cluster nodes:

  startPortalServer.cmd/sh <PortalNodeName>
Starting Proxy server on JBoss

To start Proxy server:

- Start Apache HTTP server from `<APACHE_HOME>/run` or `<APACHE_HOME>/bin` location using the following command:

  ```
  httpd -k start
  ```

Stopping servers in a cluster on JBoss

The sequence followed for stopping servers is reverse to that of starting servers.

Stopping Proxy server on JBoss

To stop Proxy server:

- Stop Proxy server with the following command from `<APACHE_HOME>/bin` or `<APACHE_HOME>/run` location of cluster node on which proxy server is configured:

  ```
  httpd -k stop
  ```

Stopping BP Server and BPM Events servers on JBoss

To stop BP Server and BPM Events servers.

**Important:** Ensure that BP servers are stopped before stopping the EJB and Portal servers.

- See BusinessManager server commands for cluster on page 45 to stop BP Server and BPM Events servers.

Stopping Portal servers on JBoss

To stop Portal servers:

- On each node, stop portal server with the following command from `OEBPS_HOME/jboss/bin` location:

  ```
  stopPortalServer.cmd/sh <PortalNodeAddress>:<PortalNodeJNDIPort>
  ```

You can find the `PortalNodeAddress`, and `PortalNodeJNDIPort` values from the `OEBPS_HOME\cluster\conf\oebps-cluster.xml` file. Open this file in a text editor. In this file, locate the server name given in name property of a `node` tag for the server you want to stop. In this `node` tag, the `address` tag contains the value for the `<PortalNodeAddress>` parameter and `jndi-port` tag contains the value for the `<PortalNodeJNDIPort>` parameter.
For example,

```xml
<nav name="server_node">
    <address>172.21.145.180</address>
    <http-port>16051</http-port>
    <https-port>16052</https-port>
    <jndi-port>16053</jndi-port>
    <advance-port>16054</advance-port>
    <oebps-home>C:/OEBPS_HOME</oebps-home>
    <ports>
        ...
    </ports>
</node>
```

In the above example, server name is "server_node", node address is "172.21.145.180", and JNDI port is "16053". With these values, you can specify the following command to stop the portal server.

```
stopPortalServer.cmd/sh 172.21.145.180:16053
```

### Stopping EJB servers on JBoss

**To stop EJB servers:**

- On each node, stop EJB server with the following command from OEBPS_HOME/jboss/bin location:

  ```
  stopEjbServer.cmd/sh <EjbNodeAddress>:<EjbNodeJNDIPort>
  ```

You can find the EjbNodeAddress, and EjbNodeJNDIPort values from the OEBPS_HOME\cluster\conf\oebps-cluster.xml file. Open this file in a text editor. In this file, locate the server name given in name property of a node tag for the server you want to stop. In this node tag, the address tag contains the value for the <EjbNodeAddress> parameter and jndi-port tag contains the value for the <EjbNodeJNDIPort> parameter.

**Note:** Reverting BusinessManager from Cluster to Standalone configuration is not supported.
After setting up BusinessManager cluster

This chapter guides you to test the cluster setup and start working with the cluster.

For details, see the following topics:

• Verifying servers
• Verifying load balancing on servers
• Installing applications on a BusinessManager cluster
• Working with BusinessManager Portal in a cluster
• Working with managed adapters in a cluster

Verifying servers

After the cluster is set up, you can verify various servers by accessing BusinessManager log messages for debugging errors or problems encountered.

Verifying proxy server

To verify Proxy server:

1. Log into portal using proxy server URL.

Proxy server URL: http://<Proxy server host name>:<Proxy server port>/sbm/bpmportal/login.jsp
If the proxy server redirects to one of the Portal server nodes in the cluster, then My Tasks page of BPM Portal is displayed. This ensures that, proxy server is set up properly.

2. View the respective proxy server log file to verify the status of the server.

Verifying portal server

To verify Portal server:

1. Log into portal servers of all individual nodes of the cluster to verify if all portal servers are running and are accessible.

   Portal server URL: \[http://<Portal server host name>:<Portal server port>/oebpm/bpmportal/login.jsp\]
   Example: \[http://oebpsnode2.progress.com:18793/oebpm/bpmportal/login.jsp\]

2. View the \[bpmportal.log\] file available under OEBPM_HOME/logs/Progress/BusinessManager folder of the respective nodes to verify the status of the server.

Verifying BP server

To verify BP server:

- Check the BP server status in \[bpserver.log\] file under the OEBPM_HOME/logs/Progress/BusinessManager location on all the cluster nodes.

   If the BP server status is logged as "BP Server started in cluster mode successfully" on all the nodes, then it confirms that BP server cluster is set up correctly.

Verifying BPM Events server

To verify BPM Events server status on one of the nodes of the cluster:

1. Start the BPM Events Admin utility by executing \[startBPMEventsAdmin.sh/cmd\] from <OEBPS_HOME>/bin location.

2. After starting the BPM Events Admin utility, use it as follows:

   ====== Host : sys128.tdiinc.com ======
   0) Back
   1) Server Monitor
   2) Loader
   3) Rule Manager
   4) Persistent Structure Monitor
   5) Event Manager
   6) Scheduler
   7) File Manager
   8) JMS
   Enter your selection ( 0 - 8 ) : 1
   ====== Server Monitor ======
   0) Back
   1) Print Status
   2) Suspend
   3) Resume
   4) Stop
5) Start
6) Start Monitor
7) Stop Monitor
Enter your selection (0 - 7): 1
No. of Nodes: 2
Node: sys128.tdiinc.com
BPM Events state: Stopped
Monitor state: Running
Node: sys120.tdiinc.com
BPM Events state: Running
Monitor state: Running
EventsToBeProcessed: 0
State: run
FreeHeapMemory: 225234192
EventsProcessed: 127
HeapMemoryAllocated: 266076160

If BPM Events server is running only on one of the nodes and BPM Events monitor is running on all the other nodes, then it confirms that the BPM Events cluster is set up correctly.

**Verifying load balancing on servers**

You can verify load balancing on various servers.

**EJB/ BP Server/ BPM Events**

Load balancing among the EJB nodes in a cluster is done based on the Load balancing algorithm of the application server. Most of the application servers use round-robin algorithm for load balancing. For more information on how load balancing is achieved, refer your Application server administration guide.

**Portal**

Load balancing among the web nodes in a cluster is done based on the Load balancing algorithm of the proxy server.

To verify that load balancing takes place for portal:

1. Set a different theme for one of the nodes in the cluster by modifying the `bpmportal.theme` parameter in the `bpmportal.conf` file present under `<OEBPS_HOME>/conf` folder.
2. Access the portal via proxy server. For every new browser session created, due to the change in theme of one of the nodes, you can easily observe that some requests are directed to one node and some to the other nodes.
3. Reset the theme on the node after verifying the load balancing so that it is consistent on all nodes.

**Installing applications on a BusinessManager cluster**

For installing applications to a BusinessManager cluster, it is recommended to use BPM Studio. BPM Studio allows to publish applications to every node in the cluster at the same time. For more information, see *BPM Studio User’s Guide*.
Working with BusinessManager Portal in a cluster

If web cluster is configured, then it is always recommended to use the proxy server to access BusinessManager portal.

If BusinessManager applications are published as web services using the BusinessManager portal, then the associated WSDL files are generated only on one of the nodes. These files must be copied to all the nodes of the cluster to work with web services in a clustered environment.

Working with managed adapters in a cluster

When using a managed adapter in a BusinessManager cluster, ensure that all the files required for the adapter to function properly are present in all the cluster nodes. OE BPM Managed Adapters act as a translating module that converts the BusinessManager-specific protocol to another application-specific protocol. In BusinessManager, a Managed Adapter is a pluggable component that connects BusinessManager to an external system such as database and ERP system, or performs its own function of data transformation. Part of the functions related to the operation of the managed adapters (such as adapter configuration, input/output mapping) are handled by standardized BusinessManager components, simplifying the development process of such adapters. Currently, OE BPM offers ten Managed Adapters: DB Adapter, File Adapter, Database Adapter, File Adapter, Email Adapter, FTP Adapter, JMS Adapter, SAP Adapter, OE Adapter, Sonic ESB Adapter, Corticon Adapter, Sharepoint Adapter and Web Service Adapter. When using a managed adapter in a clustered environment, you must ensure that all the files required for the work of the adapter are present in all the cluster nodes. For more information, please refer to the Progress OpenEdge Business Process Server: Managed Adapters Guide.
Exploring the Cluster Configuration Tool

The Cluster Configuration Tool is a quick way of configuring the BusinessManager cluster by providing the required system details and running the cluster setup directly from the Tool after it validates the settings. The cluster configuration is specified for the EJB cluster, JMS cluster, Web cluster, or any combination of these. The Cluster Configuration Tool works in environments that support graphics, and procedures for using this tool are covered in this section. This section explains the Cluster Configuration Tool and its components.

For details, see the following topics:

• Starting the Cluster Configuration Tool
• Proxy Server
• Editing and Deleting Nodes
• Viewing the Cluster Configuration File

Starting the Cluster Configuration Tool

To start the Cluster Configuration Tool, go to OE BPM_HOME\cluster\bin and run clusterconfigtool.cmd|sh.

Verifying Cluster Configuration Persistence Details

To verify the cluster configuration persistence details, perform the following steps:
1. In the left panel, click OEBPM Cluster.
2. In the right panel, under the Persistence Details, verify the persistence details like Database, URL, Driver, Username, and Password.
These values are read from the OEBPS\conf\oebpsdb.properties file and are displayed as read-only.

**OEBPS Cluster Panel**

In the left pane, click the Clusters node or the Servers node. The OEBPM Cluster panel is displayed in the right pane. The OEBPM Cluster panel displays links to the clusters or servers available as an alternative way of navigation.

**Clusters Panel**

In your BusinessManager cluster setup, you can have either clusters of EJB/JMS or Portal servers. The following procedure describes the configuration of the cluster nodes.

1. Click any cluster you want to configure to display its information.
2. You can specify the cluster name and in case of a JMS Cluster, also specify the store type.
3. Click any existing node, or click Add Node to display the Clusters panel in the right pane.

   The Clusters Node Panel displays information about the selected cluster. Typically, it displays the Node Name, IP Address, HTTP Port, JNDI Port, Target Node and OEBPS Home directory for a node in the cluster.

   **Note:** For your convenience, the Cluster Configuration Tool displays the default values for all ports. You may change any of these, if required.

4. After specifying/modifying this information, you can:
   - Click **Add** to add the cluster node.
   - Click **Add and Continue** to add the current cluster node and continue to add more nodes.
   - Click **Cancel** to go back to the previous screen.

**Servers Panel**

The following procedure describes the configuration of the standalone servers.

1. In the left pane, under the node OEBPM Cluster, click Servers.
2. In the left panel or in the Standalone Server Configuration panel, click the server you want to configure, to display its information.
Proxy Server

A proxy server is required with a Web cluster. When a Web cluster is set up, the external clients send their request to the proxy server. Then, it is the proxy server that routes the request to one of the servers in the Web cluster. Therefore the proxy server configuration is essential with the Web cluster. The proxy server is provided as a plugin by the application server vendor and is different for different Web servers. For installation of plugin in Web servers, refer to the vendor specific documentation. The following procedure describes the configuration of the Proxy server.

1. In the left pane, under the node OEBPM Cluster, click Servers.
2. In the Server panel, click Proxy Server to display its information, as shown in the following figure.
3. Specify Name for the server, which should be unique.

Note: Ensure that the machine can be identified by the IP Address in the network and it is unique across the network. For your convenience, the Cluster Configuration Tool displays the default values for all ports. You may change any of these, if required.

The Cluster Configuration Tool retains these values for the current session. When you specify other servers, you can click Save to save the configuration.

Editing and Deleting Nodes

You can modify node configuration to accommodate system changes after the cluster configuration.

1. Click any node to display its configuration as shown in the following figure.
2. Click Edit or select Edit Node from the pop-up menu to modify the contents as shown in the following figure.
3. Make changes as necessary.
4. Do one of the following:
   - Click Update to save the changes.
   - Click Cancel to go back to the previous screen.
5. Click Delete or select Remove Node from the pop-up menu to remove the node from the cluster.
   When the last node in a cluster is deleted, the cluster no longer exists.

Viewing the Cluster Configuration File

From the View menu, click XML to view the saved XML file in a new window. The title of this window will display the name of the XML file.
Understanding the cluster configuration file

This appendix explains the different tags used in the cluster configuration file.

For details, see the following topics:

• Understanding tags
• Defining EJB, WEB and JMS cluster tags
• Defining single node tags

Understanding tags

The configuration file uses the following general tags.

Tags in cluster configuration file

• <cluster-configuration>
  This is the main tag in the configuration file. The attributes of this tag are as follows:
  appserver: This is the name of the application server. For example, JBoss.
  appversion: This is the version of the application server.

• <domain-name>
  This is a mandatory tag for WebLogic as this will hold the WebLogic domain name with which BusinessManager is installed.
Along with the domain-name, you must specify the absolute path of the WebLogic domain used by BusinessManager.

For example,

```xml
<domain-name location="C:\bea\user_projects\domains\oebps75sp2">oebps75sp2</domain-name>
```

- **<protocol>**

  A `<cluster-configuration>` has a `<protocol>` tag that is required to communicate to the application server and create the URLs for lookup.

  For example, `t3://` for WebLogic.

  The protocol can be overridden for an individual `<cluster>` by defining it within the cluster. For example, in the case of a Web cluster which uses HTTPS connection, can be defined as follows:

  ```xml
  <cluster name="WebCluster" type="web">
  <protocol>https://</protocol>
  </cluster>
  ```

  This tag is optional.

- **<synchronize-time>**

  A `<cluster-configuration>` has a `<synchronize-time>` tag that is required for synchronizing the time of all the nodes in the cluster. In this tag, the `node` attribute should have the name of the node, which is taken as the reference and all the other nodes’ time is synchronized with the reference node.

  The cluster nodes are synchronized with the target node time only during the cluster setup. Any exception during the synchronization of node time is ignored and the cluster setup continues. You can also use third-party tools for synchronizing time.

- **<authentication>**

  A `<cluster-configuration>` has an `<authentication>` tag that providesthe user name and password to connect to the application server for the cluster setup. The user name and password should have administration rights.

  The `<authentication>` tag has the `<user>` and `<password>` tags.

- **<multicast>**

  IP multicast is a simple broadcast technology that enables multiple applications to "subscribe" to a given IP address and port number and listen for messages. A multicast address is an IP address in the range from 224.0.0.0 to 239.255.255.255.

  The cluster requires a `<multicast>` tag for WebLogic and JBoss application servers that corresponds to the multicast address. It has a `port` attribute that has the multicast port number.

  **Note:** The multicast address or port should be different for each application cluster. An Application cluster may include EJB cluster, JMS cluster and Web cluster types. This tag is important if more than one application clusters run in the same intranet.

- **<cluster>**

  A `<cluster-configuration>` can have multiple `<cluster>` tags corresponding to each cluster to be set up, for example, one for EJB cluster, one for JMS cluster and one for Web cluster. There could be only one cluster defined for a type. Each cluster will have more than one nodes defined under the `<nodes>` tag. The `<nodes>` tag has as many `<node>` tags as the number of nodes in the cluster.
Attributes:

name: This is the unique name of the cluster.

type: This defines the type of cluster. Valid types are ejb, jms and web.

Note: Cluster name must not contain spaces or special characters that are not allowed by the underlying operating system.

• <node>

This represents a node in the cluster. It has a single attribute:

name: The unique name of the node.

A node is characterized by the following:

• <address>: This is the IP address of the node or its host name.

• <jndi-port>: This is the JNDI port on which the node listens. Normally the naming service runs on this port. This tag is valid for EJB, JMS and WEB nodes.

• <http-port>: This is the HTTP port on which the node listens. This tag is valid for EJB, WEB and PROXY server.

• <oebps-home>: This is the location where BusinessManager is installed in the cluster nodes.

The cluster utility creates a server instance for each node with the server name as the node name.

Defining EJB, WEB and JMS cluster tags

For an EJB/WEB cluster, the following information is required:

• The name attribute of <cluster> element should contain a unique name for the EJB cluster.

• The type attribute of the <cluster> element should be "ejb" or "web" as applicable.

• For each EJB/Web node in the cluster, specify a <node> element under the <nodes> in <cluster>.

• The name attribute of the <node> contains the unique name of the EJB/Web node.

• Under the <node> tag, the IP address of the EJB/Web node and the port on which it listens are specified with the <address>, <jndi-port>, <http-port> and <https-port> elements.

• Under the <node> tag, <oebps-home> element containing the BusinessManager folder location also needs to be specified.

For a JMS cluster, the following information is required:

• The name attribute of <cluster> element should contain a unique name for the JMS cluster.

• The type attribute of the <cluster> element should be "jms".

• The store attribute of the <cluster> element should be "db" for database persistence.

• For each JMS server in the cluster, specify a <node> element under the <nodes> in <cluster>.

• The name attribute of the <node> contains the unique name of the JMS server.

• Under the <node> tag, the IP address of the JMS server and the port on which it listens must be specified with the <address>, <jndi-port> elements.
• Under the `<node>` tag, `<oebps-home>` element containing the BusinessManager folder location also needs to be specified.

## Defining single node tags

Single server tags as the name suggests are used for defining single server instances which are not clustered. Single server tags can be used to define AdminServer, ProxyServer, PortalServer.

### Single server tags

Single server tag can be specified as follows:

- Single server tag has a `name` attribute that is the unique name for the server.
  - For Admin server: `adminServer`
  - For Proxy server: `proxyServer`
  - For Portal server: `portalServer`

- It also has the elements `<address>`, `<jndi-port>`, and `<http-port>` for the IP address/host name and the port on which the server listens.

**Important:** `adminServer`, `ejbServer`, and `portalServer` should be valid active server instances that should already exist before starting the cluster setup.

While defining the cluster configuration file, ensure that the order of tags in the file `oebps-cluster.xml` is the same as defined in the file `oebps-cluster.dtd`. The order of the elements as defined in the DTD file is as follows:

```xml
```

**Note:**

If the sequence is not the same as defined in the DTD file, then while starting the cluster setup, the following exception is displayed:

```
```
Recovering failed nodes

This appendix describes the procedures for recovering failed nodes and configuring BizPulse for failover.

For details, see the following topics:

- Recovering EJB node
- Recovering Web node
- Recovering BP Server node
- Recovering BPM Events node
- Configuring BPM Events for Failover

Recovering EJB node

To recover the failed EJB server:

- Restart the server on the failed node.

See appropriate chapter for your application server for starting EJB servers.

Recovering Web node

To recover the failed Portal server:
• Restart the server on the failed node.
  See appropriate chapter for your application server for starting Portal servers.

Recovering BP Server node
If BP Server fails due to EJB server failure, then two distinct scenarios are possible.

Recovering when BP Server auto-startup is enabled
To recover BP Server node:
• Start EJB server.

Recovering when BP Server auto-startup is disabled
To recover BP Server node:
1. Start EJB server.
2. Execute `addBizLogicNodes.cmd/sh` from `<OEBPS_HOME>/bin` location.
   For example, `addBizLogicNodes.cmd/sh -nc <number of ejb nodes in cluster>`

Recovering BPM Events node
If BPM Events fails due to EJB server failure, then two distinct scenarios are possible.

Recovering when BPM Events auto-startup is enabled
To recover BPM Events node:
• Start EJB server.

Recovering when BPM Events auto-startup is disabled
To recover BPM Events node
1. Start EJB server.
2. Execute `startbizpulsemonitor.cmd/sh` from `<OEBPS_HOME>/bin` location to start up BPM Events monitoring on that node.
   For example, `startbizpulsemonitor.cmd/sh -nc <number of ejb nodes in cluster>`
Configuring BPM Events for Failover

Some of the important parameters in bpmevents.conf which affect BPM Events failover functionality are discussed below:

**BPM Events parameters for failover**

- **bpmevents.server.cluster.monitor.interval**

  When BPM Events monitoring is "on", whenever BPM Events is started, a monitoring process starts on each of the nodes. BPM Events server starts up on any one of the nodes. On the node, where the BPM Events server is active, monitoring process checks the state of the BPM Events at the interval specified by bizpulse.server.cluster.monitor.interval parameter in seconds. By default, the monitoring takes place every 30 seconds, and the process writes the last BPM Events alive time to the database.

  On all the other nodes, monitoring process checks and compares the last BPM Events alive time with the current time.

- **bpmevents.server.cluster.failover.interval**

  When the difference between the last BPM Events alive time and the current time exceeds the specified bpmevents.server.cluster.failover.interval parameter in seconds, the monitoring process tries to start the BPM Events server on a node other than the one on which BPM Events was last active. By default, the BPM Events failover interval is set to 120 seconds.
BusinessManager server commands for cluster

This appendix describes the BusinessManager Server commands you need to use for all the supported application servers.

For details, see the following topics:

- BP Server
- BPM Events

BP Server

You can use appropriate commands to start and stop the BP Server. These commands are explained in the following sections.

Starting BP Server instances

To start BP Server

- Start BP Server from one of the nodes in a cluster as follows:

  startBPServer.cmd/sh -nc <number of ejb nodes in cluster>
The above command starts the BP Server on all instances in the cluster. It also starts the BizStore,
Emailer, MConsole, CheckDue, ResumeWS, and Session services. Use this command only if you want
to start all the servers in a cluster.

Use the following commands to start one or several of all the servers.

Assume a cluster with three nodes. One node in the cluster is shut down or crashes. After the node is
restarted, use the following command to start only the BP Server on that node:

```
addBPServerNodes -u ebms -p admin -nc 1,
```

where 1 indicates the number of nodes to restart.

If you must restart two nodes, then use:

```
addBPServerNodes -u admin -p ebms -nc 2.
```

If a node has crashed or a new node is added, then invoke the following command for EventPublisher:

```
startEventPublisher.cmd/sh
```

If you see a warning message indicating that the EventPublisher is already started, then you can ignore it.

### Stopping BP Server instances

To stop BP Server

- Stop BP Server from one of the nodes in a cluster as follows:

```
stopBizLogicServer.cmd/sh -nc <number of ejb nodes in cluster>
```

**Note:** The `startBizLogicServer` and `stopBizLogicServer` scripts occasionally throw a
`weblogic.jms.common.JMSException`. You can ignore the message and run the script again.

### BPM Events

You can use appropriate commands to start and stop the BPM Events server. These commands are explained
in the following sections.

### Starting BPM Events server

To start BPM Events server

- Start BPM Events server from one of the nodes in a cluster as follows:

```
startBizPulseServer.cmd/sh -nc <number of ejb nodes in cluster>
```

This command starts the BPM Events server on one node, and monitoring on all the nodes in the cluster,
if the parameter `bizpulse.server.cluster.monitor` is set to "on" in the `bizpulse.conf` file.
If the parameter `bizpulse.server.cluster.monitor` is set to "off" in the `bizpulse.conf` file, then the monitoring does not start. However, if you want to start monitoring after you have started the BPM Events server, then you must stop the server, set the parameter `bizpulse.server.cluster.monitor` to "on", and start the server again.

Ensuring BPM Events server starts after JMS server is started

You must ensure that you start BPM Events server only after JMS server is started. BPM Events provides the following two parameters in the `%OEBPS_HOME%\conf\bpmevents.conf` file to help you achieve this.

- `bpmevents.server.jms.init.max.retry.count`
  Before starting BPM Events server, it checks whether JMS server is started and is accessible or not. The value of this parameter specifies how many times BPM Events server can check this.

- `bpmevents.server.jms.init.retry.interval`
  Before starting BPM Events server, it checks whether JMS server is started and is accessible or not. The value of this parameter specifies the duration (in milliseconds) between two successive checks.

Stopping BPM Events server

To stop BPM Events server

- Stop BPM Events server from one of the nodes in a cluster as follows:

  `stopBizPulseServer.cmd/sh -nc <number of ejb nodes in cluster>`

This command stops the BPM Events server, and stops monitoring on all the nodes in the cluster.

Starting and stopping BPM Events monitoring

If you start the BPM Events server with the parameter `bizpulse.server.cluster.monitor` set to "on" in the `bizpulse.conf` file, then monitoring starts on all the nodes in the server.

- In the cluster setup, if you add a new node to the cluster or restart a crashed node, then you can start the BPM Events monitor on that node by running:

  `startBizPulseMonitor.cmd/sh -nc <number of ejb nodes in cluster>`

  **Note:** To use the `startBizPulseMonitor.cmd|sh` command on a new or restarted node, you must have started the server with the parameter `bizpulse.server.cluster.monitor` set to "on" in the `bizpulse.conf` file.

- If you want to stop BPM Events monitoring without stopping the BPM Events server, then you can stop BPM Events monitor by running:

  `stopBizPulseMonitor.cmd/sh -nc <number of ejb nodes in cluster>`
Adding a node to an existing cluster

You can add a node to an existing cluster for the JBoss 5.2 Enterprise Application Platform.

For details, see the following topics:

• Adding a node to an existing JBoss cluster

Adding a node to an existing JBoss cluster

The Cluster Configuration Tool is used to add new node to an existing JBoss 5.2 EAP cluster.

Note: This will not affect the existing cluster configuration.

Prerequisites

Before adding a node to an existing cluster:

1. Ensure that existing cluster node configurations are not changed. For example, if your existing node names are ejbnode1, ejbnode2, webnode1, and webnode2 you must not change this name or any details of these nodes. You can name the new nodes similar to the existing nodes, such as ejbnode3, webnode3, etc.

2. Ensure that the new node name must not conflict with the existing node names.

3. Stop BPM servers in the existing cluster.
Chapter 8: Adding a node to an existing cluster

4. Stop all JBoss cluster servers, that is, EJB cluster and Web cluster before adding new node to the cluster.

5. Create a backup of oebps-cluster.xml file in the <OEBPS_HOME>/cluster/conf folder. It contains existing cluster configuration details.

Configuring a new node for an existing JBoss cluster

To add a new node to an existing cluster:

1. Execute the Cluster Configuration Tool on any OE BPM installation, which is already configured on the cluster.

   Note: Refer to Configuring cluster details on JBoss on page 21 for more information.

2. After you update EJB and Web cluster and save cluster configuration, the existing oebps-cluster.xml file is updated with the details for the new node.

3. The tool validates the new node name with the existing cluster node names. In case there is a validation error, a message is displayed.

Setting up cluster with additional node

Do the following:

1. The updated cluster configuration file must be present on all the cluster nodes. Copy the updated oebps-cluster.xml file to the new node as well as existing nodes of the cluster in the respective OEBPS_HOME\cluster\conf folders.

2. Configure cluster by executing setupcluster.cmd/sh file from <OEBPS_HOME>/cluster/bin folder on each node of the cluster.

3. Update OEBPS configuration by executing modifyprop.cmd/sh from OEBPS_HOME\cluster\bin folder on each node of the cluster.

4. Configure a proxy server of the cluster by executing configureproxy.cmd/sh on the node on which the proxy Server of the cluster is configured from OEBPS_HOME\cluster\bin.
Glossary

Glossary for Progress® OpenEdge® BPM BusinessManager: Clustering Guide.

For details, see the following topics:

• ACL manager
• Activity workstep
• Adapter
• Administration
• Application
• Balanced scorecard
• BAM
• BPM Events
• BPM Webflow
• BPEL
• BPMN
• BP Server
• Business calendar
• Business flow
• Business logic
Chapter 9: Glossary

- Business object
- Business process
- Business Process Server application
- Business Process Server Web services
- Business Process Portal
- Business process management
- Business Process Modeler
- Business rule
- Control flow
- Dashboard
- Dataslot
- Expression editor
- Group
- Heatmap
- Home
- Infopad
- Instance
- KPI
- Managed Adapter
- Management
- Migration
- Performer
- Presentation flow
- Process engine
- Process refresh
- Process template
- Progress Developer Studio for OpenEdge
- Role
- Rollback
- Rule wizard
- Swim lanes
- Task
- User
• Workflow

ACL manager

In Business Process Server, Access Control List Manager provides a finer, more precise control over user access rights for resources and actions.

Activity workstep

In Business Process, the basic unit of work; must be performed by one or more human performers (valid individual user, multiple users or user group).

Adapter

A Java class that integrates remote, third party classes and actions with Business Process. An adapter can automate certain functions and tasks performed by a remote server or other external systems.

Administration

A module in Business Process Portal enabling the administrator to perform tasks such as installing/uninstalling applications, modifying configuration parameters controlling Business Process operations, and manage users, groups and access control. The Administration module is visible only to application users who have permissions to access it.

Application

In Business Process, an application is an installed, executable business process that automates a business flow.

Balanced scorecard

A management application in the Management module that measures performance by analyzing how an organization’s business activities help it achieve its strategic goals. The Balanced Scorecard provides an analysis from a range of perspectives.

BAM

Business Activity Management combines Business process management with strategic and analytical information on specific business performance indicators, providing real-time status information and identifying critical events to assist senior management in making informed business decisions.

BPM Events

A Business Process Server component that provides an open event-driven rule engine to formulate and enforce policies in business applications.

BPM Webflow

A Business Process Server component that enables users to develop customizable, sophisticated presentation flows for business processes, install them as Web applications, and execute them on their Web browsers.

BPEL

BPEL (Business Process Execution Language) for Web services is an XML-based language designed to enable task-sharing for a distributed computing or grid computing environment - including across multiple organizations - using a combination of Web services.

BPMN

BPMN (Business Process Modelling Notation) provides businesses with the capability of defining and understanding their internal and external business procedures through a Business Process Diagram giving organizations the ability to communicate these procedures in a standard manner.
BP Server
A Business Process Server component that provides a flexible, lightweight, scalable workflow process engine for intranets, extranets, and the Internet.

Business calendar
A Business Process Server feature that accurately calculates the Due Date of tasks, and provides support for multiple business calendars across different time zones.

Business flow
The logical sequence of process activities, related to one another by a triggering activity, to achieve an outcome. It represents a business process that begins with a commitment and ends with the termination of that commitment. In Business Process Server, business flow includes Workflow (the flow of all human-performed activities), integration flow (the flow of activities performed by systems) and presentation flow (from a user's viewpoint, the flow of data from one Web page to the next).

Business logic
The control flow and information flow among worksteps that define a business process.

Business object
A representation of an activity in the business domain, including its name, definition, attributes, behavior, relationships and constraints.

Business process
A process involving multiple worksteps in the form of operations, interactions and notifications performed by a user, group of users, an external adapter, or a script.

Business Process Server application
An application is an implementation of a business process. It can contain one or more process templates, performers, adapters, customized forms or rules. An application can be published, installed and run on BP Servers. In Business Process Server, an application is an installed, executable business process that automates a Workflow.

Business Process Server Web services
A Business Process Server component that allows application developers to; a) publish their applications as Web services, and b) find and convert other available Web services on the Internet into Business Process Server applications.

Business Process Portal
A Business Process Server component that offers users, managers, administrators and developers a unified, customizable portal for single sign-on access to all Business Process Server functionalities to which they are granted permission.

Business process management
The concept of guiding work activities through a multi-step business process in order to improve performance and reduce costs within and across functional business units.

Business Process Modeler
A stand-alone component that enables users to design templates for basic business processes.

Business rule
A combination of elements, including validation edits, logon verifications, database lookups, policies and transformations, that represent an enterprise’s way of doing business.
Control flow
The sequences of worksteps and workstep conditions, as defined in a process template in Progress Developer Studio for OpenEdge or Business Process Modeler.

Dashboard
A Business Process Server feature that provides a graphic overview of the status of several business processes on a single Web page, enabling users to monitor the progress of each process. Users can view business processes across all applications or for a selected application.

Dataslot
A data placeholder that persists through the entire process and defines the information flow of the business process. Dataslots are associated with processes, where they can add information into (Input type) or out of (Output type) worksteps, and appear as editable or read-only fields on a user’s interface.

Expression editor
A Business Process Server tool that enables users to define complex conditional expressions within a Decision gateway to support their business requirements.

Group
In Business Process Server, an entity that has as members valid users or other groups who perform related work and have authorized access to specific components.

Heatmap
A Business Process Server feature that provides a convenient, graphical tool for managers to visually locate the bottlenecks in the process execution. It helps managers to get an overview of the status of the currently active instances, identify suspended instances, and analyze the history of the completed instances.

Home
A module in Business Process Portal through which users interact with Business Process Server. Using the Home module, users complete entries to various tasks and applications, update profile, set preferences, and link to the support infrastructure required to achieve these tasks. The Home module is the primary interface for application users.

Infopad
In Business Process Server, a data structure used to capture business metrics, typically displayed as a table with one or two dimensions.

Instance
An individual object within a specific class. In Business Process Server, a self-contained unit that is created each time you use a process template to run a Business Process Server application.

KPI
Key Performance Indicator, used in the Balanced Scorecard system, that provides the data translating enterprise goals into a set of measurable objectives.

Managed Adapter
In Business Process Server, a Managed Adapter is an implementation of an adapter interface that facilitates data exchange between Business Process Server processes and external applications.

Management
A module in Business Process Portal enabling the managers to query, report, and control processes and resources for application users. The Management module is visible only to application users who have permissions to access it.
Migration
The process of moving from the use of one operating environment to another operating environment that is typically seen as improvement. Migration can involve moving to new hardware, new software, or both. It may involve a new application, another type of database, or a redesigned network. Migration is also used to refer simply to the process of moving data from one storage device to another. Business Process Server supports data migration as well as application migration.

Performer
An entity that executes a workstep. Depending on the workstep type, the performer can be a human user, a group of users, an adapter or other external performer, or a script.

Presentation flow
The flow of information and user input from one interface to the next. Typically related to a single Activity workstep in the process and generated in a BPM Webflow environment.

Process engine
Orchestrates the execution of business processes and also coordinates conversations among process engines based on public processes, which forms the backbone of global business collaboration.

Process refresh
A Business Process Server feature for replacing the installed process without versioning, facilitating the running process instances to refresh and seamlessly adapt to the new Workflow.

Process template
In Business Process Server, a model of business flow that includes worksteps, connectors and dataslots. After users publish and install it as an application in Business Process Server folder structure, they can use the application to create process instances.

Progress Developer Studio for OpenEdge
An Integrated Development Environment for Business Process Server that enables application users to develop and publish a Business Process Server application without leaving the development environment.

Role
The actions and activities assigned to a valid application user who is a member of a group. In Business Process Server, only members of a group can be assigned a role. A role indicates the relationships of the user in a group context.

Rollback
In Business Process Server, a feature that restarts the Workflow from a workstep previously selected as the rollback point in the process, performed automatically in the event of a failure.

Rule wizard
An interactive utility that enables application users to quickly develop rules that can be applied to a business process.

Swim lanes
Used in Workflow diagrams to organize complex processes across functional boundaries. For example, seen as horizontal lines on a process map, swim lanes can be used to place individual task steps into different categories that depend on task ownership.
Task
In Business Process Server, a performer is assigned one or more work items that the performer sees as tasks. There are two types of tasks: Assigned, which are assigned specifically to you; and Available, which are available to be performed by you or other members of your user group.

User
In Business Process Server, a valid human performer with authorized access to specific modules.

Workflow
The logical sequence of activities performed by human performers. Workflow includes the tasks, procedural steps, organizations or people involved, required input and output information, and tools needed for each activity in a business process.