IBM

Business Process Management Deployment Guide
Using IBM Business Process Manager V8.5

Enterprise integration for business process management deployment

Complete information about architecture and components

Comprehensive configuration details

Uday Pillai
Nirmal Patil
Sergiy Tsymbal

Redbooks

IBM

International Technical Support Organization

Business Process Management Deployment Guide Using IBM Business Process Manager V8.5

January 2014

Note: Before using this information and the product it supports, read the information in "Notices" on page vii.

First Edition (January 2014)

This edition applies to IBM Business Process Manager Version 8.5.

Contents

Notices

This information was developed for products and services offered in the U.S.A.

IBM may not offer the products, services, or features discussed in this document in other countries. Consult your local IBM representative for information on the products and services currently available in your area. Any reference to an IBM product, program, or service is not intended to state or imply that only that IBM product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any IBM intellectual property right may be used instead. However, it is the user's responsibility to evaluate and verify the operation of any non-IBM product, program, or service.

IBM may have patents or pending patent applications covering subject matter described in this document. The furnishing of this document does not grant you any license to these patents. You can send license inquiries, in writing, to:
IBM Director of Licensing, IBM Corporation, North Castle Drive, Armonk, NY 10504-1785 U.S.A.

The following paragraph does not apply to the United Kingdom or any other country where such provisions are inconsistent with local law: INTERNATIONAL BUSINESS MACHINES CORPORATION PROVIDES THIS PUBLICATION "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Some states do not allow disclaimer of express or implied warranties in certain transactions, therefore, this statement may not apply to you.

This information could include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in new editions of the publication. IBM may make improvements and/or changes in the product(s) and/or the program(s) described in this publication at any time without notice.

Any references in this information to non-IBM websites are provided for convenience only and do not in any manner serve as an endorsement of those websites. The materials at those websites are not part of the materials for this IBM product and use of those websites is at your own risk.

IBM may use or distribute any of the information you supply in any way it believes appropriate without incurring any obligation to you.

Any performance data contained herein was determined in a controlled environment. Therefore, the results obtained in other operating environments may vary significantly. Some measurements may have been made on development-level systems and there is no guarantee that these measurements will be the same on generally available systems. Furthermore, some measurements may have been estimated through extrapolation. Actual results may vary. Users of this document should verify the applicable data for their specific environment.

Information concerning non-IBM products was obtained from the suppliers of those products, their published announcements or other publicly available sources. IBM has not tested those products and cannot confirm the accuracy of performance, compatibility or any other claims related to non-IBM products. Questions on the capabilities of non-IBM products should be addressed to the suppliers of those products.

This information contains examples of data and reports used in daily business operations. To illustrate them as completely as possible, the examples include the names of individuals, companies, brands, and products. All of these names are fictitious and any similarity to the names and addresses used by an actual business enterprise is entirely coincidental.

COPYRIGHT LICENSE:
This information contains sample application programs in source language, which illustrate programming techniques on various operating platforms. You may copy, modify, and distribute these sample programs in any form without payment to IBM, for the purposes of developing, using, marketing or distributing application programs conforming to the application programming interface for the operating platform for which the sample programs are written. These examples have not been thoroughly tested under all conditions. IBM, therefore, cannot guarantee or imply reliability, serviceability, or function of these programs. You may copy, modify, and distribute these sample programs in any form without payment to IBM for the purposes of developing, using, marketing, or distributing application programs conforming to IBM's application programming interfaces.

vii

Trademarks

IBM, the IBM logo, and ibm.com are trademarks or registered trademarks of International Business Machines Corporation in the United States, other countries, or both. These and other IBM trademarked terms are marked on their first occurrence in this information with the appropriate symbol (® or ™), indicating US registered or common law trademarks owned by IBM at the time this information was published. Such trademarks may also be registered or common law trademarks in other countries. A current list of IBM trademarks is available on the Web at `http://www.ibm.com/legal/copytrade.shtml`

The following terms are trademarks of the International Business Machines Corporation in the United States, other countries, or both:

AIX®	Lotus®	Redbooks (logo) ®
Blueworks Live™	Passport Advantage®	System z®
DB2®	PowerVM®	Teamworks®
Domino®	POWER®	Tivoli®
IBM®	PR/SM™	WebSphere®
iSeries®	pureScale®	z/OS®
Lombardi Teamworks®	Redbooks®	z/VM®

The following terms are trademarks of other companies:

Adobe, the Adobe logo, and the PostScript logo are either registered trademarks or trademarks of Adobe Systems Incorporated in the United States, and/or other countries.

Linux is a trademark of Linus Torvalds in the United States, other countries, or both.

Microsoft, Windows, and the Windows logo are trademarks of Microsoft Corporation in the United States, other countries, or both.

Java, and all Java-based trademarks and logos are trademarks or registered trademarks of Oracle and/or its affiliates.

UNIX is a registered trademark of The Open Group in the United States and other countries.

Other company, product, or service names may be trademarks or service marks of others.

Preface

The business process management discipline enables organizations to be more efficient, effective, and capable of change while managing time and costs. In this discipline, processes are viewed as strategic assets of an organization that must be understood, managed, and improved to deliver added value products and services to process consumers. In a typical organization, there are IT Systems in place to solve specific functional areas. However, at the human level, the work is not well-controlled and there is poor end-to-end visibility into the entire process that spans humans and systems.

IBM® Business Process Manager (BPM) provides a platform that helps process participants gain enterprise-wide visibility of business processes so that improvements can be made by those who know these processes best. IBM BPM encourages collaboration and supports strong governance of process change. It provides a common software platform for process improvement and IBM BPM lifecycle governance, offering the power and robustness that is required for mission-critical enterprise solutions while combining the simplicity that is required for business engagement through collaboration. Built-in analytics and search capabilities help improve and optimize business processes now and in the future. IBM BPM includes tooling and run time for process design, execution, monitoring, and optimization.

This IBM Redbooks® publication provides an introduction to designing and building IBM Business Process Manager V8.5 environments. The target audience for this book includes IT architects, IT specialists, and consultants who are seeking to understand and implement IBM BPM environments.

This book introduces the changes and new features in IBM Business Process Manager V8.5 and provides an overview of the basic topology and components. Detailed and step-by-step instructions to prepare, build, and verify your environment, including proxy server configuration, also are described.

The book also provides an overview of a consolidated migration approach that was introduced in V8.5. It describes tools and utilities that are available for migrating from the previous version of the product to V8.5. Two step-by-step migration scenarios are described to help you better understand the detailed migration activities that are required for IBM BPM Standard and Advanced.

Authors

This book was produced by a team of specialists from around the world working at the International Technical Support Organization, Austin Center.

Uday Pillai is a senior managing consultant with IBM Software Services for WebSphere®. He has spent all of his seven years at IBM working with the WebSphere product family. His areas of expertise include designing IBM BPM system architectures and topologies for cloud and non-cloud environments. He holds a bachelor's degree in science from Mahatma Gandhi University, India.

Nirmal Patil is a senior managing consultant with IBM Software Services for WebSphere. His role includes regularly advising and assisting customers with all aspects of their IBM BPM implementations, including expanding their adoption of IBM BPM, and he has led several successful IBM BPM engagements for large clients. He holds a master's degree in computer science from Texas A&M University, College Station, Texas.

Sergiy Tsymbal is an IBM BPM technical consultant who has worked for Lombardi (now IBM) since 2006. Today, he is primarily focused on migrations (IBM Lombardi Teamworks® 6.x to IBM BPM8), IBM BPM system architecture design and implementation, solution and infrastructure reviews, and performance tuning and troubleshooting. He holds a master's degree in applied mathematics from National Technical University KhPI, Kharkiv, Ukraine.

- Marc Smith, Program Director, IBM BPM, IBM US
- Chidanandan Theyancheri, Program Manager, IBM BPM Development, IBM US
- Srikanth Bhattiprolu, IBM BPM Development, IBM US
- Axel Buecker, IBM Redbooks Project Leader, IBM US
- Shawn Tooley,IBM ITSO Technical Writer, IBM US

Now you can become a published author, too!

Here is an opportunity to spotlight your skills, grow your career, and become a published author—all at the same time! Join an ITSO residency project and help write a book in your area of expertise, while honing your experience using leading-edge technologies. Your efforts will help to increase product acceptance and customer satisfaction, as you expand your network of technical contacts and relationships. Residencies run from two to six weeks in length, and you can participate either in person or as a remote resident working from your home base.

Find out more about the residency program, browse the residency index, and apply online at this website:

http://www.ibm.com/redbooks/residencies.html

Comments welcome

Your comments are important to us!

We want our books to be as helpful as possible. Send us your comments about this book or other IBM Redbooks publications in one of the following ways:

- Use the online **Contact us** review Redbooks form found at:

    http://www.ibm.com/redbooks

- Send your comments in an email to:

    redbooks@us.ibm.com

- Mail your comments to:

    IBM Corporation, International Technical Support Organization
    Dept. HYTD Mail Station P099
    2455 South Road
    Poughkeepsie, NY 12601-5400

Stay connected to IBM Redbooks

- Find us on Facebook:

  http://www.facebook.com/IBMRedbooks

- Follow us on Twitter:

  http://twitter.com/ibmredbooks

- Look for us on LinkedIn:

  http://www.linkedin.com/groups?home=&gid=2130806

- Explore new Redbooks publications, residencies, and workshops with the IBM Redbooks weekly newsletter:

  https://www.redbooks.ibm.com/Redbooks.nsf/subscribe?OpenForm

- Stay current on recent Redbooks publications with RSS Feeds:

  http://www.redbooks.ibm.com/rss.html

1

Overview of IBM Business Process Manager V8.5

This chapter provides a general overview of IBM Business Process Manager (BPM) product and includes the following topics:

► Understanding business process management
► Lifecycle of a business process
► IBM Business Process Manager

1.1 Understanding business process management

The business process management discipline enables organizations to be more efficient, effective, and capable of change while managing time and costs. In this discipline, processes are viewed as strategic assets of an organization that must be understood, managed, and improved to deliver added value products and services to process consumers.

In a typical organization, there are IT Systems in place to solve specific functional areas. However, at the human level, the work is not well-controlled and there is poor end-to-end visibility into the entire process that spans humans and systems, as shown in Figure 1-1.
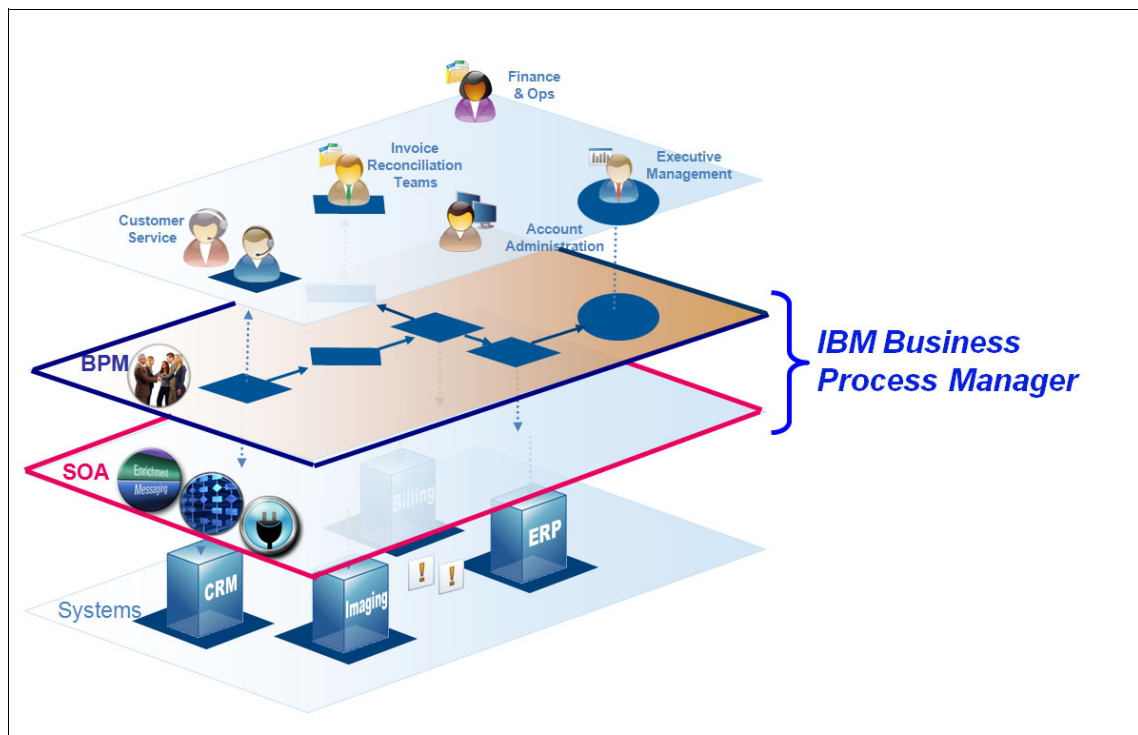
Figure 1-1   How IBM BPM fits into the IT ecosystem

IBM BPM is a platform that helps process participants gain organization-wide visibility of your business processes so that improvements can be made quickly by those who know your processes best. This platform encourages collaboration and supports strong governance of process change.

IBM BPM provides a common software platform for process improvement and business process management lifecycle governance, which offers the power and robustness that is required for mission-critical enterprise solutions while combining the simplicity that is required for business engagement through collaboration. Built-in analytics and search capabilities help you improve and optimize your business processes now and in the future. IBM BPM includes tooling and run time for process design, execution, monitoring, and optimization.

1.2 Lifecycle of a business process

If a process is used, there are always actions that are related to it. Process improvement activity is a continuous, ongoing activity even after a process is deployed and in use.

The lifecycle of a business process consists of the following stages:

► Discover and define

   This is the first stage of the process lifecycle where requirements are identified and analyzed. Key process milestones are identified and process metrics to be captured are defined.

► Design and implement

   In this phase, the actual development of the business process occurs. This includes any external system integrations.

► Execute and monitor

   In this phase, the newly developed business process is distributed to the environment where it is run and used by a business organization and monitored by administrators.

► Measure and optimize

   This phase concentrates on collecting process metrics and process improvement activities that are related to the business process, such as, optimizing and initiating updates to the process.

Figure 1-2 on page 4 shows these phases of a business process lifecycle.
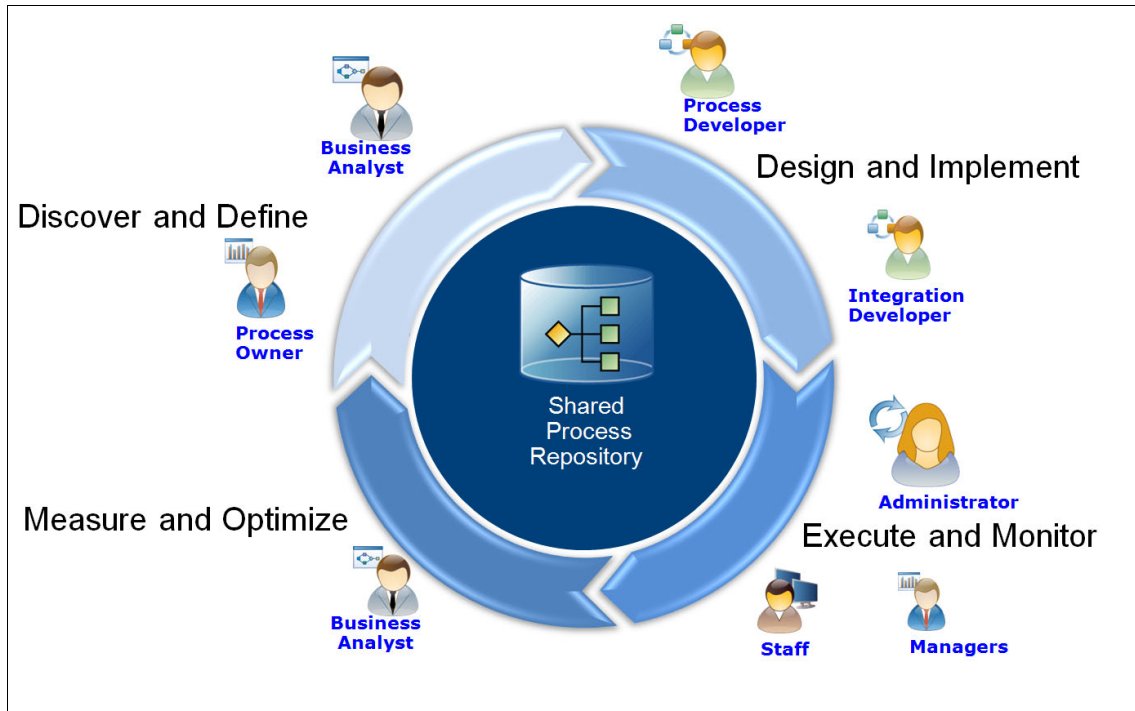
Figure 1-2   Lifecycle of a business process

1.3 IBM Business Process Manager

IBM BPM brings together a number of technologies and capabilities under a single unified platform with which customers can build human-centric and system-centric business processes. It enables organizations to implement businesses process lifecycle and includes tooling and run time for process design, execution, monitoring, and optimization.

A business process management environment mainly consists of a repository environment to store and develop IBM BPM artifacts, authoring tools for process developers to develop and test processes, one or more runtime environments to deploy processes, and a set of administration and monitoring tools to administer and monitor business processes.

Figure 1-3 on page 5 is a high-level overview of a basic IBM BPM environment, the subsections of which are described in the following sections.
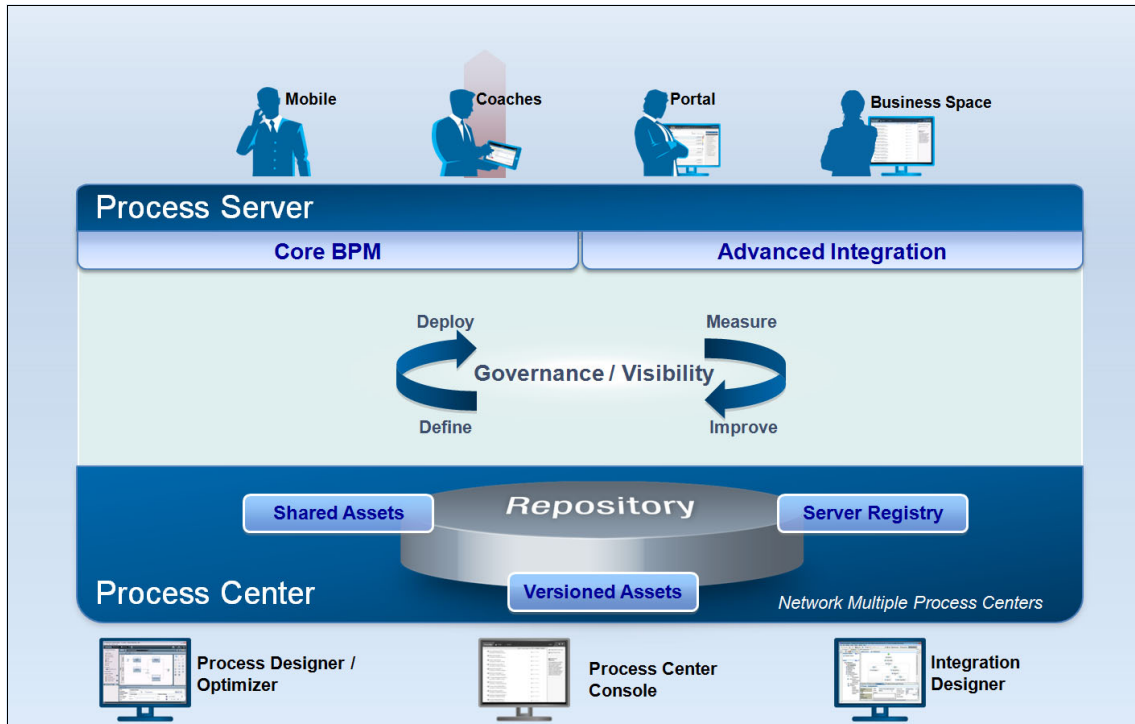
Figure 1-3   Overview of IBM BPM

1.3.1 Product overview

This section provides an overview of the main elements of the IBM BPM product.

Process Center

The Process Center includes a repository for all process artifacts and provides the tooling that is required to develop, deploy, and manage process applications.

The Process Center has a console web application with which uses can maintain the repository, deploy process applications to Process Server environments, and manage running instances of process applications in configured environments. The Process Center also includes a Process Server (the playback server) and Performance Data Warehouse, with which users who are working in the authoring environments can run processes and store performance data for testing and playback purposes.

Authoring environments

IBM Business Process Manager uses the following authoring environments:

► IBM Process Designer

  IBM Process Designer is a design time tool that is used to develop process applications.

  It is an Eclipse-based tool that is used by business process authors. IBM Process Designer is available in all configurations of the product, and offers the capability to model and implement business processes as process applications. IBM Process Designer includes other tooling, that is, the Process Inspector, and the Process Optimizer, for interacting with processes that are running on the Process Center Server (playback server) or a connected Process Server deployment target.

► IBM Integration Designer

  IBM Integration Designer is a development environment for building end-to-end SOA applications. It includes numerous pre-packaged integration adapters to build complex automated processes.

  IBM Integration Designer is available only in the advanced configurations of the product. IBM Integration Designer is used to author complex integrations and fully automated processes that support process applications that are designed in the IBM Process Designer. By using IBM Integration Designer, with a fully integrated testing environment that uses test cases and test suites, IT developers can build reusable SOA services, orchestrate those services, and access back-end systems.

Process Server

Process Server is an IBM BPM runtime environment that supports running a range of business processes and integrations. By using Process Server, you can run processes as you build them. Process Server runs processes and services that authors build by using the Authoring Environments. Process Server handles a process' access to external applications, the Coaches (the user interfaces for process participants), and the business logic. Every process component is loaded and run in Process Server at run time.

An organization often has multiple Process Server environments such as test, user acceptance test, and production. Each Process Server registers with the Process Center and allows the Process Center to facilitate code deployment and management of the runtime process server environments.

The Process Server also provides a number of tools, for example, the ProcessAdmin Console, which enables the management of the Process Server and deployed applications. A second tool is the Process Portal, which can be used to give individual users access to run and manage the tasks of the business processes. In addition, the Process Portal measures performance of business processes, teams, and individuals. The Process Portal delivers an accurate overview that covers all aspects of the governed running business processes. This server environment also contains the Performance Data Warehouse component that collects and aggregates process data from processes that are running on the process servers. This data can be used to improve business processes.

1.3.2 Product editions

IBM Business Process Manager is a unified platform that combines human-centric and integration-centric capabilities into one product. Different configurations of the product are available for different users, and satisfy different needs in the organization. Product configurations can be combined for collaborative authoring and network-deployed runtime environments.

This product is available in three different editions. Table 1-1 provides a high-level overview of each edition.

Table 1-1   List of product editions

Advanced Edition	Complete set of business process management capabilities: ► Extended support for high-volume process automation ► Built in SOA components for extensive organization-wide service integration, orchestration
Standard Edition	Configured for typical business process management projects: ► For multi-project improvement programs, with high business involvement ► Basic system integration support ► Rapid time-to-value and improved user productivity
Express Edition	Configured for first business process management project: ► Rapid time-to-value; improved user productivity ► Low entry price ► Easy installation and configuration

Table 1-2 shows the capabilities and features that are available in each product edition.

Table 1-2   IBM Business Process Manager capabilities by edition

Capability	Advanced	Standard	Express
WebSphere Lombardi Edition compatible execution	X	X	X
Process Designer (BPMN)	X	X	X
Collaborative editing/immediate playback	X	X	X
Interactive process coach user interfaces	X	X	X
ODM-based process rules	X	X	X
Process Portal	X	X	X
Real-time monitoring and reporting	X	X	X
Performance analytics and optimizer	X	X	X
Performance Data Warehouse	X	X	X
Process Center/shared asset repository	X	X	X
Unlimited process authors and users	X	X	200 users/ 3 authors
High availability: Clustering and unlimited cores	X	X	▶ Four cores production ▶ Two cores development ▶ No cluster
WebSphere Process Server compatible execution	X		
Integration Designer (BPEL/SOA)	X		
Transaction support	X		
Integration adapters	X		
Flexible Business Space user interface	X	X	X

1.4 Conclusion

This chapter provided a brief overview of business process management and its components and lifecycle. It also introduced the IBM BPM product.

The next chapter describes the new features that are available in IBM BPM V8.5.

2

What is new in IBM Business Process Manager version 8.5

IBM Business Process Manager V8.5 (BPM) has several new capabilities and improvements over earlier versions. This chapter describes some of the major features and includes the following topics:

► Simplified installation and configuration
► Changes in IBM BPM security
► Changes in web services
► New embedded content management
► New social and actionable dashboards
► New concept of team
► Changes in IBM Blueworks Live integration

2.1 Simplified installation and configuration

The V8.5 release of IBM BPM makes significant strides in simplifying the product installation and configuration as compared to the previous IBM BPM 7.5 and IBM BPM 8 versions of the product. The deployment patterns and clustering topologies were simplified and consolidated and the number of steps that are involved in installation and configuration were reduced.

The installation and configuration changes are described briefly in the following sections and in greater detail in the other chapters of the book.

2.1.1 Installation changes

The typical installation of IBM BPM Standard and IBM BPM Advanced editions of the product no longer uses a stand-alone profile. Instead, it uses only the Network Deployment profile option. One of the key benefits of this change is that it gives the customer a better starting point. An IBM BPM environment can now be easily expanded for growth by adding nodes as needed.

The stand-alone profile is used only in the IBM BPM Express edition of the product and in the IBM Integration Designer's unit test environment (UTE).

Table 2-1 shows the profile types that are used with the installed editions of the product.

Table 2-1   Profile types in use with different product editions

Installed product	Profile type		
	Stand-alone	**Deployment manager**	**Custom managed node**
IBM BPM Express	Yes	No	No
IBM BPM Standard	No	Yes	Yes
IBM BPM Advanced	No	Yes	Yes
Integration Designer UTE (IBM BPM Advanced)	Yes	Optional	Optional

With IBM BPM Standard or Advanced editions, the typical installation option is composed of a deployment manager node and a single managed node that contains one cluster with one member in it. This configuration is also known as *SimpleND*. This install option uses default values for the installation but allows for specifying the installation path and database. This is often the choice for a developer workstation installation.

2.1.2 Changes in profile types

The older versions supported a number of different application server profile types that were based on product edition, function, and installation type. This lead to complexity because of the high number of possible installation combinations. It also required that if a customer decided to move from IBM BPM Standard to IBM BPM Advanced, it requires deleting and re-creating the profiles.

IBM BPM 8.5 now provides the following three profile templates:

► BpmDmgr

  Use for deployment manager profiles for IBM BPM Standard and IBM BPM Advanced editions.

► BpmNode

  Use for managed node profiles for IBM BPM Standard and IBM BPM Advanced editions.

► BpmServer

  Use for stand-alone profiles (for example, for IBM BPM Express Edition only).

Most of the configuration that was previously done during profile creation is now done during the deployment environment (DE) setup. Therefore, the key benefits of this is that installations can be reconfigured as needed without requiring a full reinstallation (as was the case with earlier versions).

2.1.3 New deployment environment pattern types

IBM BPM 8.5 introduces the following three types of IBM BPM-specific deployment environments:

► IBM BPM Standard (Process Center or Process Server)

  This represents all the process applications and toolkits that are authored in Process Designer, Process Portal, Process Administration, and Performance Data Warehouse functions.

► IBM BPM Advanced (Process Center or Process Server)

This represents all the IBM BPM Standard functionality and includes Integration Designer, Service Component Architecture (SCA), Business Process Choreographer, and BusinessSpace functions.

► IBM BPM Advanced Only (Process Server)

This represents all the functionality from WebSphere Process Server 7.0 such as Integration Designer, Service Component Architecture (SCA), Business Process Choreographer, BusinessSpace functions.

During the installation, the deployment environment wizard that guides the user through the DE creation also has fewer steps as compared to IBM BPM 8.0.x version.

While the IBM BPM 7.5 and IBM BPM 8 versions supported numerous cluster patterns per deployment environment, IBM BPM 8.5 supports only the following distinct cluster patterns or topologies:

► Single-cluster pattern (also known as simpleND)

In this case, all deployment environment functions and functional groups of components that run on a single cluster.

► Three-cluster pattern

In this case, there are three clusters and the available functionality is split among the clusters: Application, Remote Messaging, and Remote Support. This is the recommended pattern for production use.

For more information about the deployment environment types and cluster patterns, see Chapter 3, "Components, topologies, and deployment environment patterns types" on page 35.

2.1.4 Scripted installation by using IBM BPMConfig tool

IBM BPM 8.5 introduces a new command-line and properties file-driven tool that is called BPMConfig. It can be used to perform the following tasks in a single command:

► Create profiles
► Create database scripts and tables
► Create a deployment environment

BPMConfig replaces the DB Design Generator and ConfigNode tools from the 7.5.x and 8.0.x versions of the product. The tool is found in the following directory:

`<WAS_HOME>\bin\BPMConfig.bat (.sh)`

It takes as input a properties file and is run on all nodes with the same properties file and syntax. For more information about the BPMConfig tool, see Chapter 5, "Deploying an IBM Business Process Manager environment" on page 89.

2.2 Changes in IBM BPM security

This section describes the changes that were made to the system users and security configuration aspects of V8.5.

2.2.1 Consolidation of users

Prior versions of IBM BPM required and used a number of default system users that were set up by default. The IBM BPM V8.5 release consolidates the users that are referenced within the product. Only the following default users are defined in the system:

► Cell administrator

The primary WebSphere Application Server administrator. A user that belongs to this role administers the cell and topology of the environment and can assign other additional administrator users. This user does not administer the IBM BPM components.

► Deployment environment administrator

The primary IBM BPM administrator. This corresponds to the tw_admin user from previous versions of the product and has administrative access to the IBM BPM environment.

This deployment environment administrator user alias replaces all the multiple users from prior releases, such as, tw_admin, tw_user, tw_portal_admin, tw_runtime_server, tw_webservice, and bpmAuthor.

A default installation of V8.5 also defines only two authentication aliases as compared to approximately 33 aliases in IBM BPM V8. The authentication alias for the cell administrator is CellAdminAlias and DEAdminAlias for the deployment environment administrator. Figure 2-1 on page 16 shows how the DE Admin alias is mapped to all of the roles in a default installation of Business Process Manager V8.5.

Figure 2-1   Deployment environment roles that are mapped to DeAdminAlias

In this release, the IBM BPM Process Administration console now brings back an interface to manage users. It helps administer WebSphere internal file user registry users. It also provides a way to easily set up or modify users for IBM BPM application development and testing. It is also an easy way to change user's passwords and the WebSphere console, as shown in Figure 2-2 on page 17.
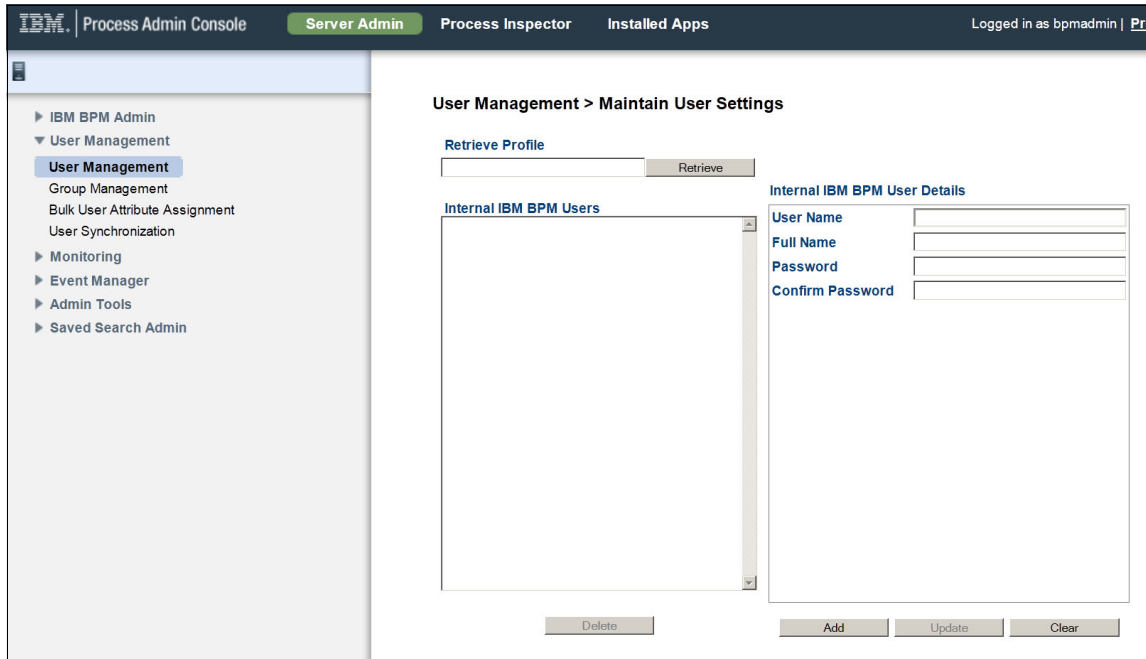
Figure 2-2   User administration from IBM BPM ProcessAdmin console

2.2.2 Security configuration properties

In older releases, IBM BPM server's security configuration aspects were handled mostly by using `.xml` configuration files, namely the `100Custom.xml` file. Many of these properties can now be accessed and modified by using the wsadmin tool.

> **Note:** These properties are no longer configurable by using the `99local.xml` or `100custom.xml` configuration files.

V8.5 introduces new configuration objects in the wsadmin tool, which categorizes the properties that were previously in the `.xml` files. The configuration objects are described in Table 2-2 on page 18.

Table 2-2   New configuration objects in V8.5

Configuration object	Description
BPMAuthAliasRoleType	Defines all of the roles, such as, BPCUser, BPMAuthor, and BPMUser, as shown in Figure 2-1 on page 16.
BPMActionPolicy	Defines all of the portal action policies and the roles that can run those actions. For example, ACTION_ABORT_INSTANCE defines which roles can abort a process instance.
BPMServerSecurity	Defines properties about snapshot deployment by using https and limiting user searches.
BPMServerSecurityUsers	Defines properties whose values are set to a user to notify of Event Manager errors, task received from, and task cancellation.
BPMServerSecurityGroups	Defines a few properties whose values are set to a group to represent privileged actions. For example, bpmAdminGroup defines the group with full administrative access privileges.
BPMVirtualHostInfo	Defines properties for host name, port, and transportProtocol to contain proxy-server information. The BPMVirtualHostInfo object replaces the base-url property that was used in the 99local.xml configuration file to specify the host name and port number of a proxy server in earlier releases
BPMPerformanceDataWarehouse	Defines a property that is called viewUser that is used to create a prefix for the views that Performance Data Warehouse creates for tracking groups. It is used like a schema name.
BPMConsoleSection	Defines properties that correspond to the ProcessAdmin console left menu items. The values are the roles that access those menu items. For example, the'console.user.management property value defines which roles can access the User Management menu item (see Figure 2-2 on page 17). The default value in this case is the tw_admins role.

All of the properties for the configuration objects that are listed in Table 2-2 can be modified by replacing the previous values, except for properties that are contained in the BPMActionPolicy and BPMConsoleSection configuration objects. For BPMActionPolicy, you do not modify existing values; instead, you add and remove roles. For BPMConsoleSection, you do not modify existing values; instead, you add and remove constraints.

> **Note:** For more information, see the IBM Business Process Manager V8.5 information center at this website:
>
> http://pic.dhe.ibm.com/infocenter/dmndhelp/v8r5m0/index.jsp?topic=%2Fcom.ibm.wbpm.admin.doc%2Ftopics%2Fcsec_config_properties.html

2.3 Changes in web services

The following new changes are includes in the web services capabilities in IBM BPM:

► Web service server configuration

A new type of server configuration, which is named Web Service, was added to the Process Designer's process application settings. By using this setting, the author can define web service endpoint connection details per environment, as shown in Figure 2-3.

Figure 2-3   Servers tab allows defining web service servers per environment

An integration service can then reference this configuration when outbound web service integrations are defined. Thus, web service endpoint connection details can be defined once at a process application level and reused for multiple web service operations. Any updates can be done in one place and be referenced in multiple integration services immediately, as shown in Figure 2-4 on page 20.
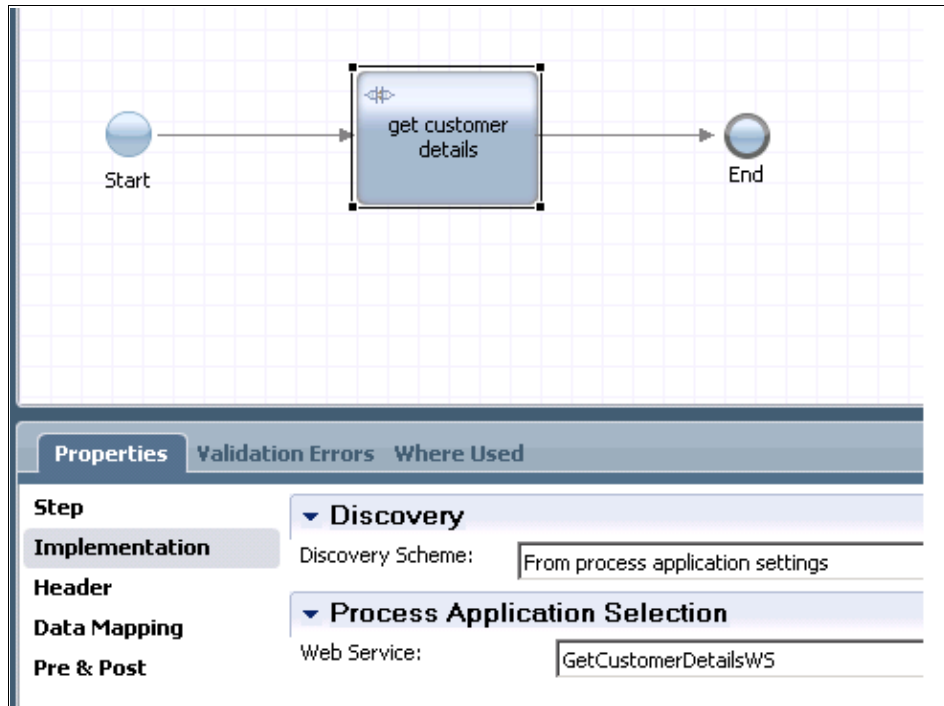
Figure 2-4   Referencing the web service server

► Policy sets and policy bindings

A policy set is a named, reusable collection of configuration parameters (such as, policies). You can configure web service qualities of service, such as, WS-Security and WS-Addressing, and is administered via administrative console. IBM BPM web service integrations (inbound and outbound) can now be associated a policyset and its binding. This allows for reuse among multiple web service integrations and provides more options for securing web services, as shown in Figure 2-5 on page 21 and Figure 2-6 on page 22.
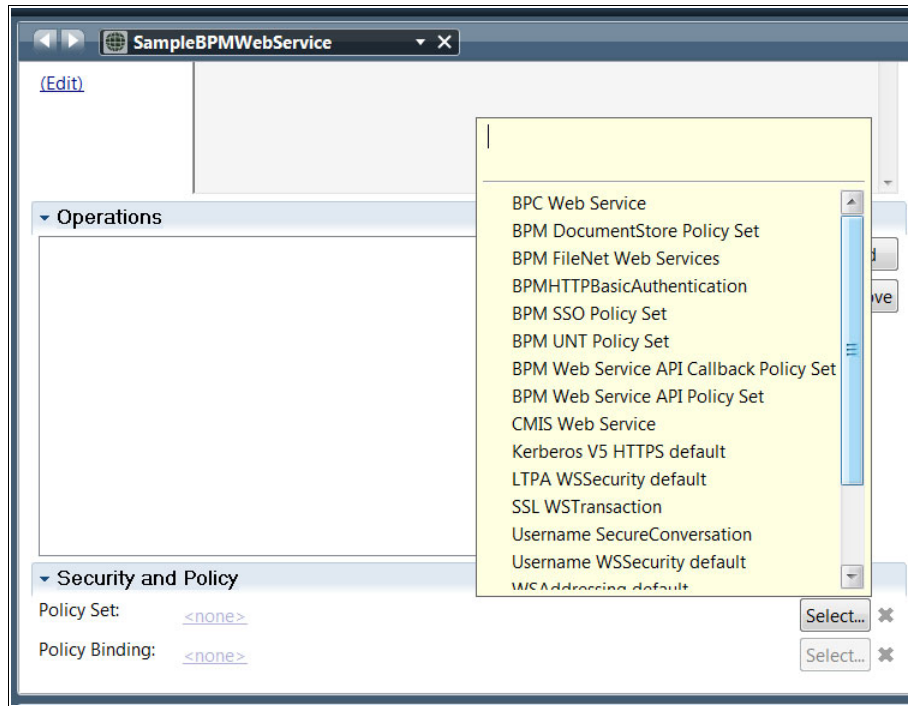
Figure 2-5   Using a policy set
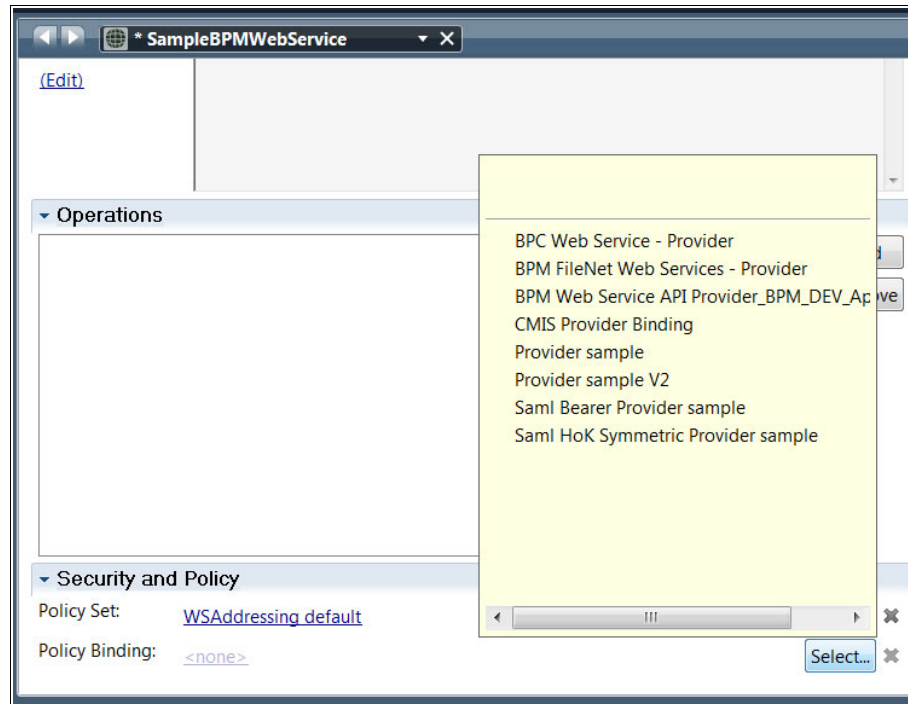
Figure 2-6   Using a policy binding

► Implicit SOAP headers

In IBM BPM 8.5, you can send and receive SOAP headers in SOAP request and response messages for outbound and inbound integrations.

The System Data toolkit provides new business objects (SOAPHeaders and SOAPHeader) as pre-supplied types that can be used in web service integrations.

The Data Mapping step of an outbound web service integration provides a new option to map service variables to SOAP request and response headers.

For web services that are exposed in IBM BPM, new JavaScript variables are provided to specify and access SOAP headers from within JavaScript. SOAP headers are automatically copied into `tw.system.header.soap.request` for incoming web service calls, which can then be accessed with services. To add SOAP headers to the response, you can append headers to the `tw.system.header.soap.response` variable.

These improved integration capabilities of the product can handle more use cases where custom integrations were previously necessary for such scenarios.

2.4 New embedded content management

Heritage Coaches had built-in support for document attachments that are stored within a local IBM BPM database in proprietary form. When IBM BPM 8.0 introduced next generation Coach technology, that local document attachment support was not brought forward. IBM BPM 8.5 addresses this gap and introduces a new standards-compliant embedded store for documents.

IBM BPM 8.5 supports accessing process documents from any Enterprise Content Management (repository that supports the Content Management Interoperability (CMIS) standard, as shown in Figure 2-7.
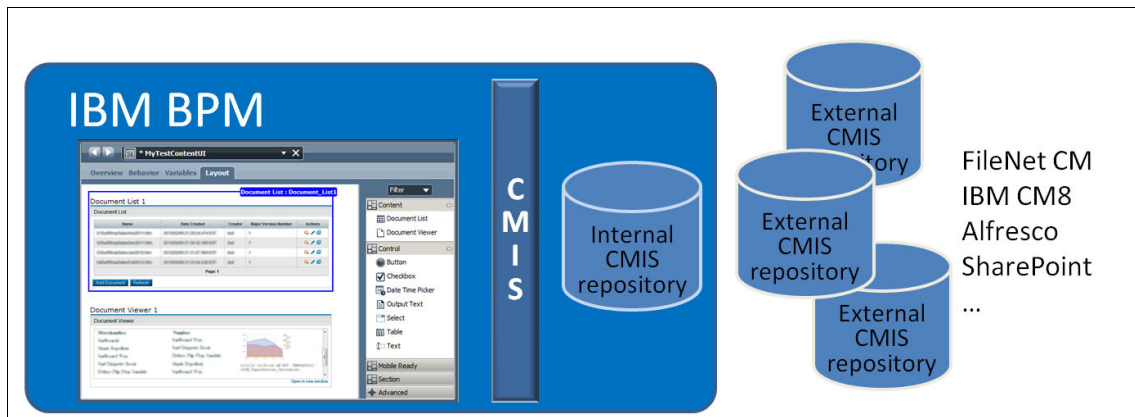
Figure 2-7   Embedded Enterprise Content Management feature

This new document management capability is consistent with the CMIS standard as the internal repository is also accessed by using the same CMIS standard. The heritage Coach and new generation Coach controls present an unchanged, consistent view to the user regardless of whether the source repository is external or internal. They can use the new IBM BPM document store option in the Process Designer when they are using the internal document store.

2.5 New social and actionable dashboards

IBM BPM 8.5 introduces a new dashboard capability with which authors can create customized operational dashboards to offer enhanced visibility for process owners, team leaders, and process participants.

The ready-to-use scoreboards from the previous releases are replaced by using the new, next-generation dashboard functionality that is built that uses a new Dashboard toolkit that is based on Coach Views.

Process designers can easily customize the ready-to-use dashboards and create custom dashboards.

Process Performance dashboard features

The Process Performance dashboard is displayed in the IBM BPM 8.5 Portal tab and provides the following features:

► A single view across multiple processes that are marked as Expose Performance Metrics, with a high-level breakdown of counts for Overdue, At Risk, and On Track instances.

► Gantt-style aggregated measures of duration across time.

► An annotated diagram of the process displaying the activities with a count of Overdue, At Risk, and On Track activities.

► Drill down for performance of a specific process instance.

► Activity of stream comments added to the timeline, which gives you insight into what collaboration occurred for this process instance, as shown in Figure 2-8 on page 25.
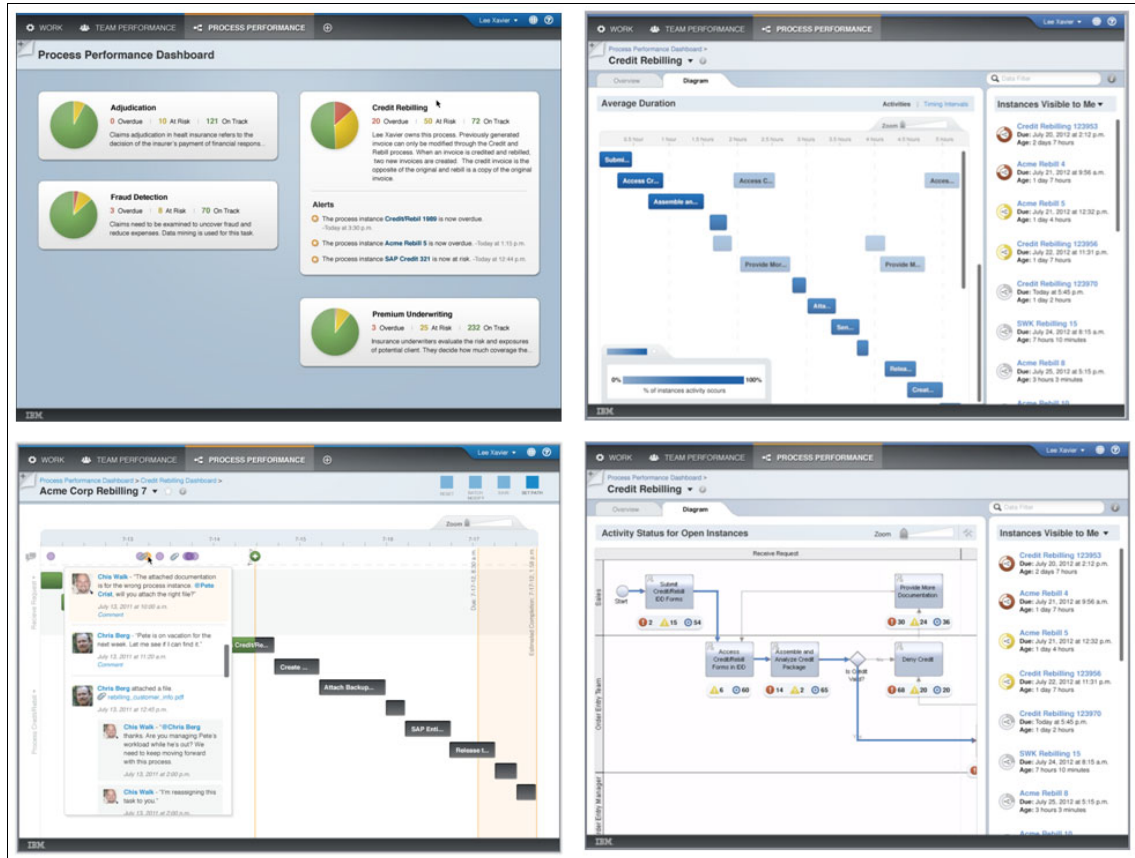
Figure 2-8   New Process Performance dashboard

Team Performance dashboard features

The Team Performance dashboard is displayed in the IBM BPM 8.5 Portal in a tab and provides the following features:

- ► A single at-a-glance view across teams.
- ► An overview for the team and its work
- ► Manage work across a team.
- ► Individual team member view, as shown in Figure 2-9 on page 26.

Figure 2-9   New Team Performances Dashboard

Customized dashboards and the Dashboard toolkit

IBM BPM 8.5 ships with a readily available Dashboard toolkit on which the IBM
BPM 8.5 Portal dashboards, such as, the Process Performance and Team
Performance, are based. Often, there are requirements to customize the
included dashboards. This customization was tedious in earlier versions, but is
made easier in 8.5. The Process Portal application dashboards can be copied
into a new process application and then can be customized therein.

The Dashboard toolkit also contains several predefined Coach views that can be
used to build custom dashboards to provide process visibility to your users, as
shown in Figure 2-10 on page 27.
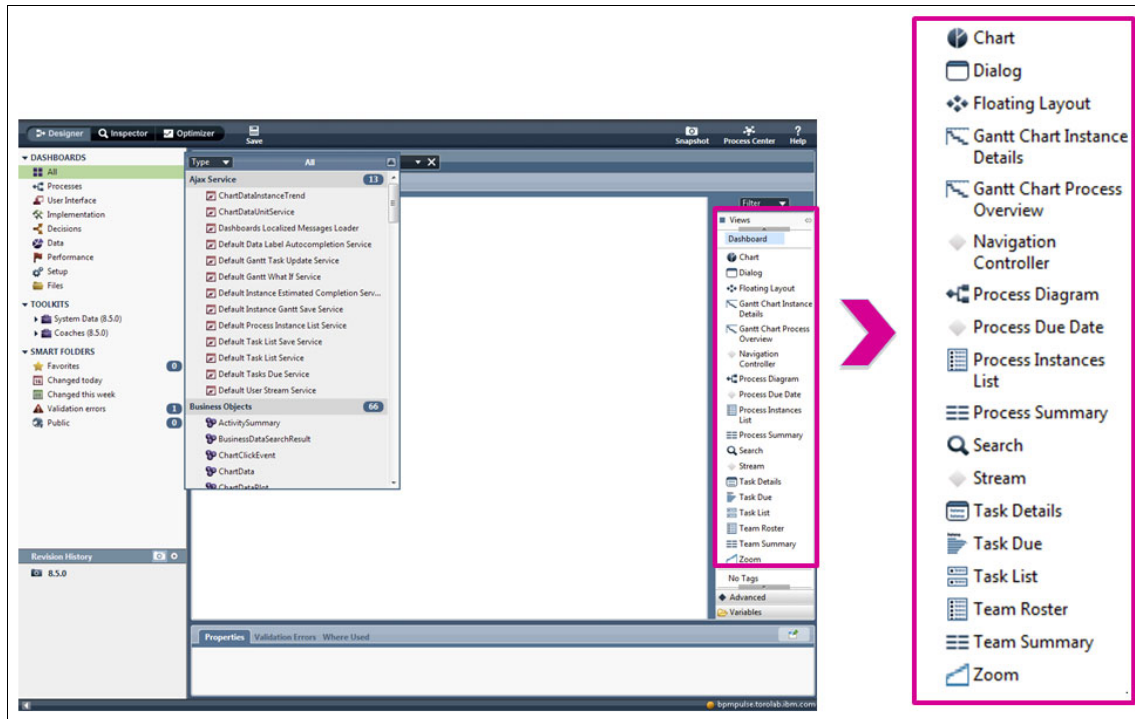
Figure 2-10   Dashboard toolkit that contains reusable, predefined Coach views

2.6 New concept of team

IBM BPM 8.5 introduces a new concept of *team*. A team represents a set of users in your organization and is used to assign tasks to sets of users. A team also can define a Managers Team. This concept of team supersedes the *participant group* concept from older versions. All participant groups become teams during migration to 8.5. No special migration is necessary.

Team members can be set up as in earlier versions by using the Standard Members options and choosing a set of users or groups, as shown in Figure 2-11 on page 28.
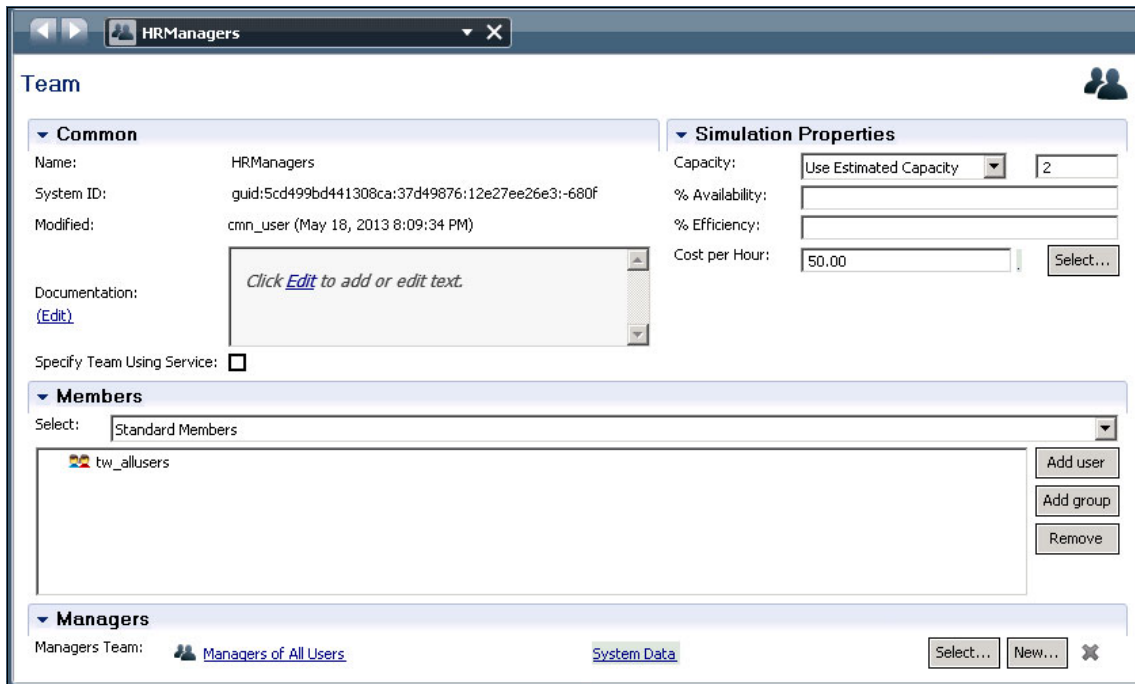
Figure 2-11   View of team artifact

Team retrieval service

Teams can be composed of dynamically determined sets of users or groups. This can be done by selecting the **Specify Team Using Service** option and associating the team with an implementation service. This implementation service is referred to as *team retrieval service*.

This service is based on the team retrieval service template from the system data toolkit and takes as minimum input the team name and returns as output a team object. The implementation service should define the output team object that is composed of dynamically determined members, as shown in Figure 2-12 on page 29.
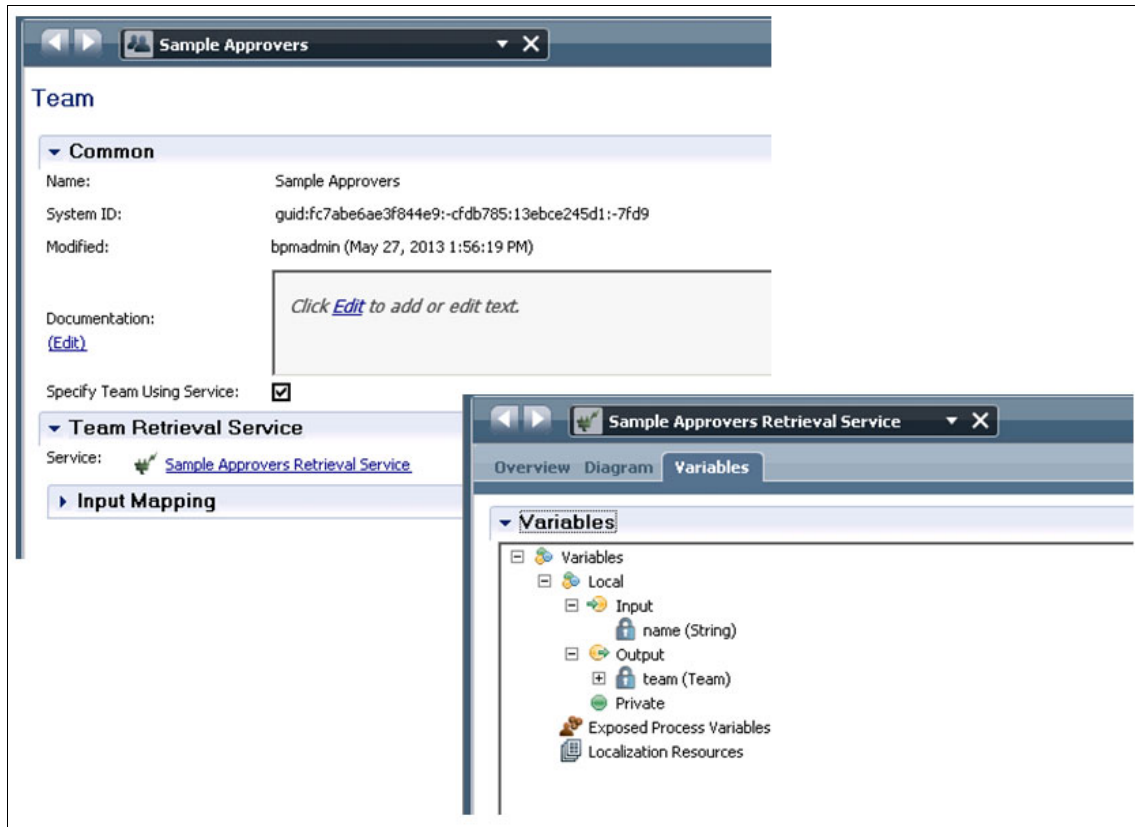
Figure 2-12   Team retrieval service

Team filter service

In many situations, users want to dynamically assign the business process activity to a subset of the full members of the lane-defined team that is based on the runtime business context. This is achieved in IBM BPM 8.5 by using a team filter service. A task can be assigned to a dynamically determine the subset of the team, as shown in Figure 2-13 on page 30.
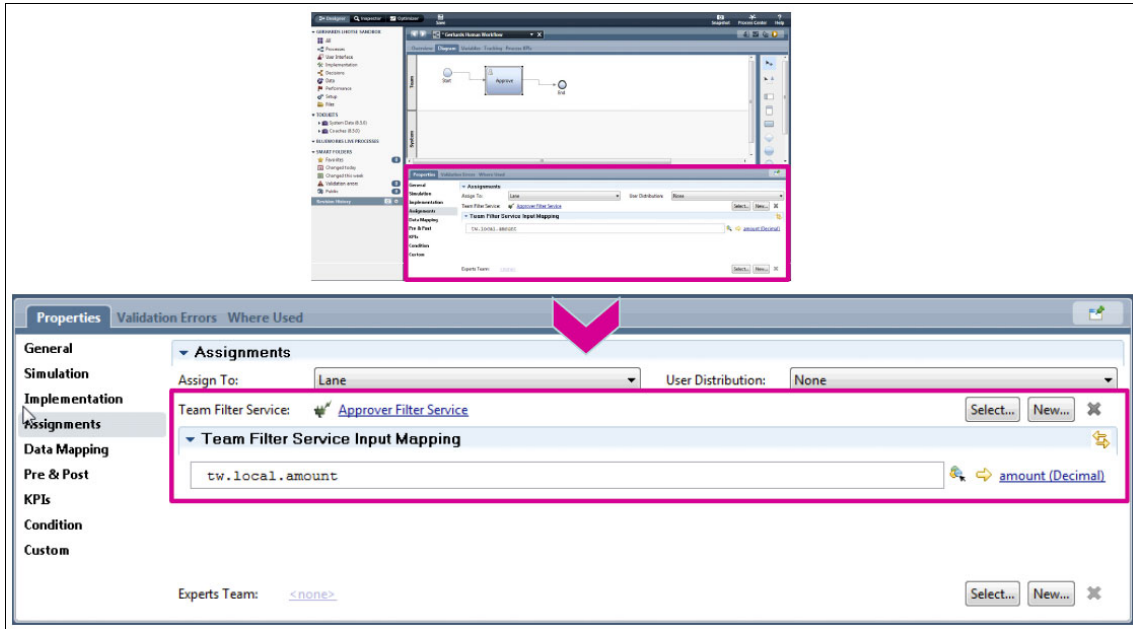
Figure 2-13   Team filter service

A team filter service takes as input the lane-defined or activity-defined team and returns as output a subset of the input team.

Caching options with team services

Team retrieval and team filter services can use the built-in caching feature. By using the Overview tab of the service, the author can enable caching and define a suitable interval for which the results of the service is cached, as shown in Figure 2-14.
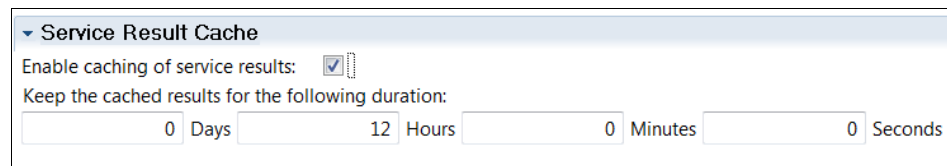
Figure 2-14   Caching options with team service

A least recently used (LRU) algorithm is used for caching and thus any excessive memory usage is avoided. The IBM BPM `.xml` configuration defines a `<service-result-cache-size>` parameter that determines the number of results that are to be cached.

Note: Previous versions of IBM BPM provided an option to define dynamic participant groups by using expression. This is deprecated in IBM BPM 8.5. The lane assignments option to use Last User in Lane, Routing Policy, List of Users, and Custom assign-to options also are deprecated.

2.7 Changes in IBM Blueworks Live integration

IBM Blueworks Live™[1] is a hosted process discovery tool that allows an organization to discover, collaborate, share, and document processes. Older versions of IBM BPM can subscribe and link to processes that are defined in Blueworks Live. This integration was further enhanced in the 8.5 release in the following ways:

► You now can view Blueworks Live processes in Blueworks Live when you are subscribing to the processes from IBM BPM.

► You now can search and find specific spaces and processes when you are subscribing to Blueworks Live processes, as shown in Figure 2-15.
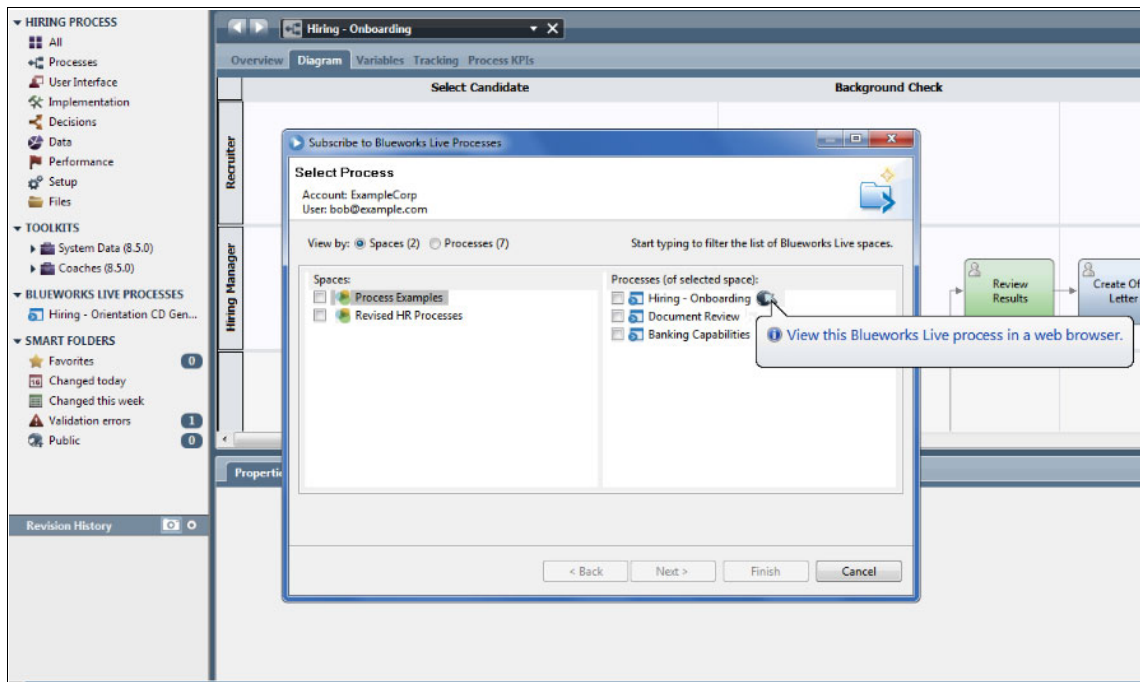
Figure 2-15   Subscribing to a Blueworks Live process

---

[1] For more information about IBM Blueworks Live, see this website: http://www.blueworkslive.com

▶ You now can check for updates or new versions of Blueworks Live processes from IBM BPM, as shown in Figure 2-16.
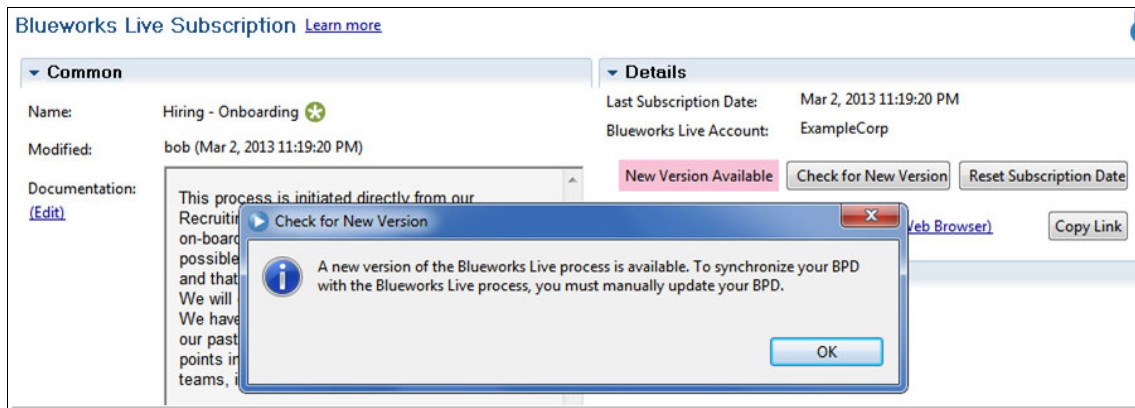
Figure 2-16   Checking for a new version of a subscribed Blueworks Live process

▶ Some Blueworks Live values are now automatically imported into key performance indicators (KPIs). Examples of these values include cost, work time, wait time, and total time.

▶ Blueworks Live activity details that are not imported into another field are now imported into the documentation field of the import object, including business owners, experts, systems, suppliers, inputs, outputs, customers, risk, custom fields, problems, and existing documentation, as shown in Figure 2-17 on page 33.
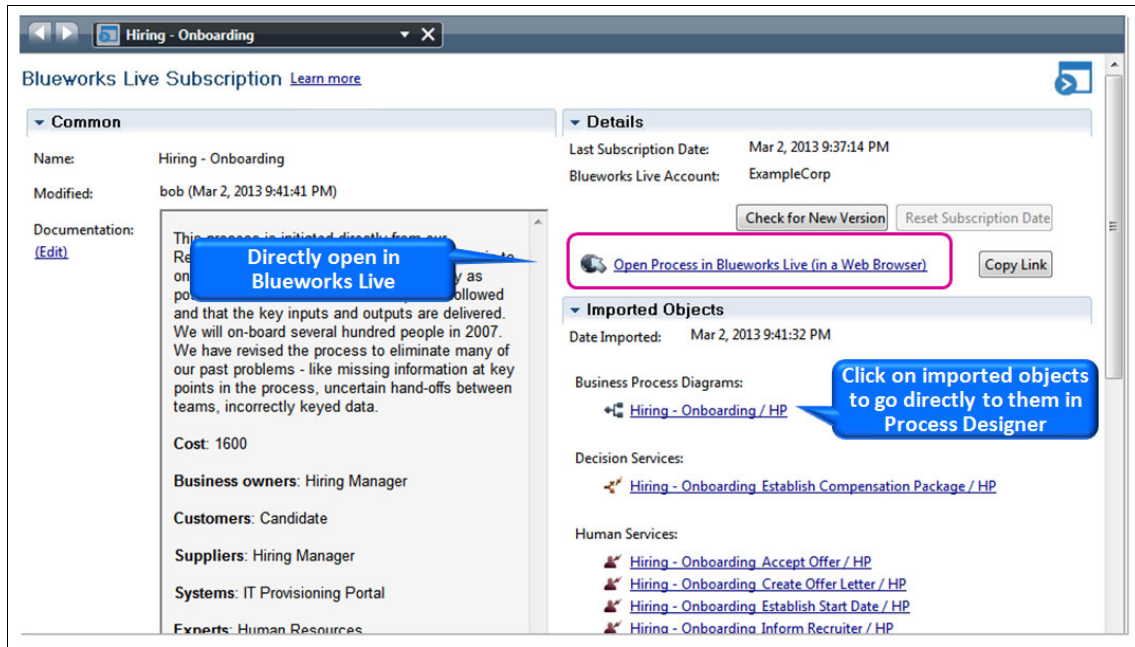
Figure 2-17   Open processes directly in BWL

2.8 Conclusion

This chapter provided an overview of the key new features in IBM Business Process Manager V8.5.

3

Components, topologies, and deployment environment patterns types

Before you plan an IBM Business Process Manager (BPM) installation, it is necessary to understand the concepts and components in an IBM BPM environment.

This chapter introduces the components and concepts of IBM BPM and WebSphere Application Server and describes the topology and deployment pattern types available in IBM BPM 8.5 release.

The chapter includes the following topics:

- ► Components and concepts
- ► Topologies in IBM BPM 8.5
- ► Deployment environment patterns in IBM BPM 8.5

3.1 Components and concepts

An IBM BPM environment is built on top of WebSphere. This section briefly describes the components and concepts of WebSphere Application Server and then describes the components and concepts of an IBM BPM environment.

3.1.1 WebSphere Network Deployment setup

IBM Business Process Manager uses the structures, functions, and services that are provided by WebSphere Application Server. Each Process Center environment and each Process Server environment are built on an IBM WebSphere Application Server cell.

This section introduces the concepts that are provided in a WebSphere Network Deployment setup that are applicable to IBM BPM.

Application servers

The *application server* is the platform on which Java language-based applications run. It provides services that can be used by business applications, such as, database connectivity, threading, and workload management.

In a Network Deployment configuration, you can build a distributed server configuration to enable central administration, workload management, and failover. In this environment, you integrate one or more application servers into a cell that is managed by a central administration instance, which is called a *deployment manager*.

Profiles

WebSphere Application Server runtime environments are built by creating a set of configuration files, called *profiles,* that represent a WebSphere Application Server configuration. The following categories of WebSphere Application Server files are available:

► *Product files* are a set of read-only static files or product binary files that are shared by any instances of WebSphere Application Server.

► *Configuration files (profiles)* are a set of user-customizable data files. This file set includes WebSphere configuration, installed applications, resource adapters, properties, and log files.

Nodes and node agents

A WebSphere node is a logical concept.

A *node* is an administrative grouping of application servers for configuration and operational management within one operating system instance. You can create multiple nodes inside one operating system instance, but a node cannot leave the operating system boundaries.

With Network Deployment, you can configure a distributed server environment that consists of multiple nodes that are managed from one central administration server.

A node consists of a node agent, by which the node is controlled, and the application servers that are created as members of that node.

In distributed server configurations, each node has a *node agent* that works with the deployment manager to manage administration processes. A node agent is created automatically when you add (federate) a stand-alone application server node to a cell.

The WebSphere node agent is a server that enables the deployment manager to remotely manage the node, its application servers, and their applications. A node agent is implemented as a Java virtual machine (JVM).

Cells

A *cell* is a grouping of nodes into a single administrative domain. A cell encompasses the entire management domain. In a Network Deployment environment, a cell can consist of multiple nodes (and node groups). These nodes and groups are all administered from a single point, the deployment manager.

Deployment manager

The *deployment manager* is the central administration point of a cell that consists of multiple nodes and node groups in a distributed server configuration. It is similar to the configuration that is shown in Figure 3-1 on page 38. The deployment manager communicates with the node agents of the cell that it is administering to manage the applications servers within the node. The deployment manager provides management capability for multiple federated nodes and can manage nodes that span multiple systems and platforms. A node can be managed by a single deployment manager, and the node must be federated to the cell of that deployment manager.
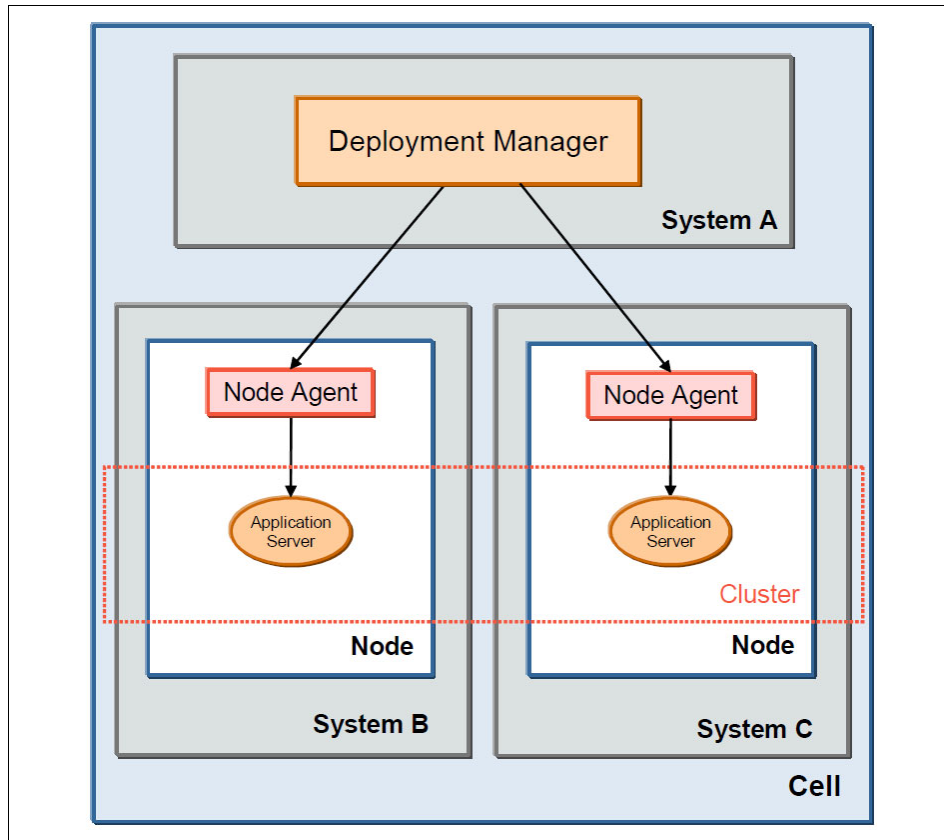
Figure 3-1   WebSphere Cell and its components

The configuration and application files for all nodes in the cell are centralized into the *master repository*. This centralized repository is managed by the deployment manager and regularly synchronized with local copies that are held on each of the nodes. If the deployment manager is not available in the cell, the node agents and the application servers cannot synchronize configuration changes with the master repository. This limitation continues until the connection with deployment manager is reestablished.

3.1.2 IBM BPM environment

IBM BPM brings together a number of technologies and capabilities under a single unified platform with which customers can build human-centric and system-centric business processes.

An IBM BPM environment is mainly consists of a repository environment to store and develop IBM BPM artifacts, authoring tools for process developers to develop and test processes, one or more runtime environments to deploy processes, and a set of administration and monitoring tools to administer and monitor business processes.

Figure 3-2 is a high-level illustration of an IBM BPM environment and its subcomponents. These subcomponents are described next.
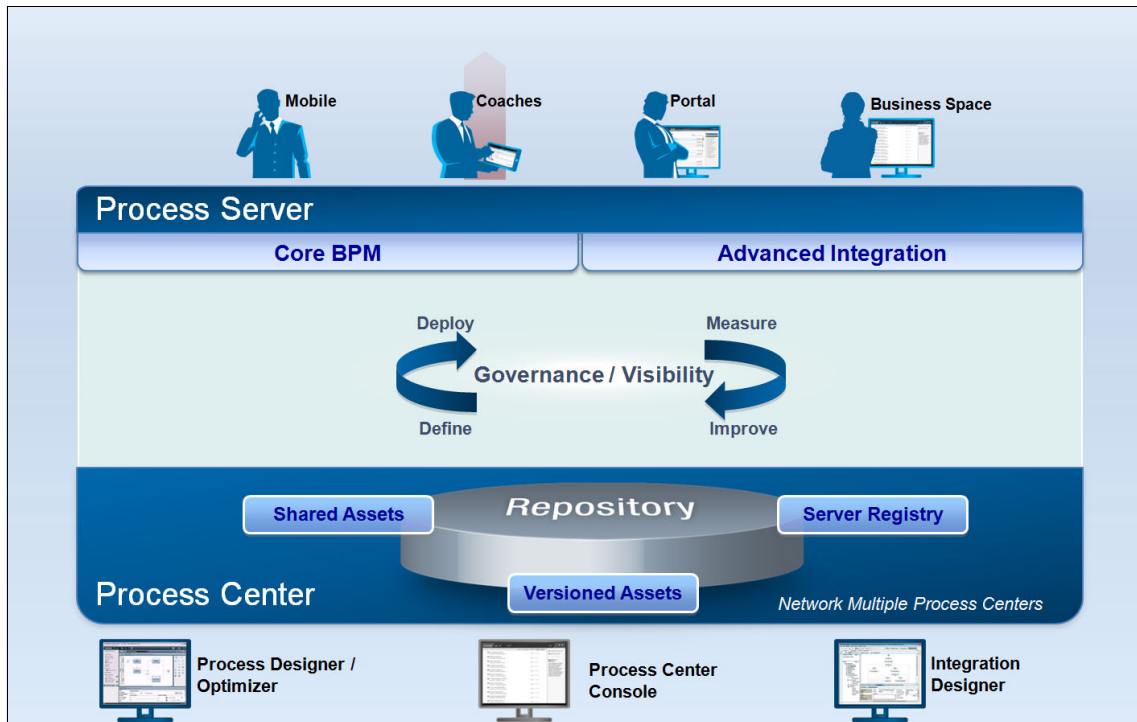
Figure 3-2   IBM BPM deployment overview

Process Center

The Process Center includes a repository for all process artifacts and provides the tooling that is required to develop, deploy, and manage process applications. These artifacts are assembled within process applications and toolkits, as shown in Figure 3-3.
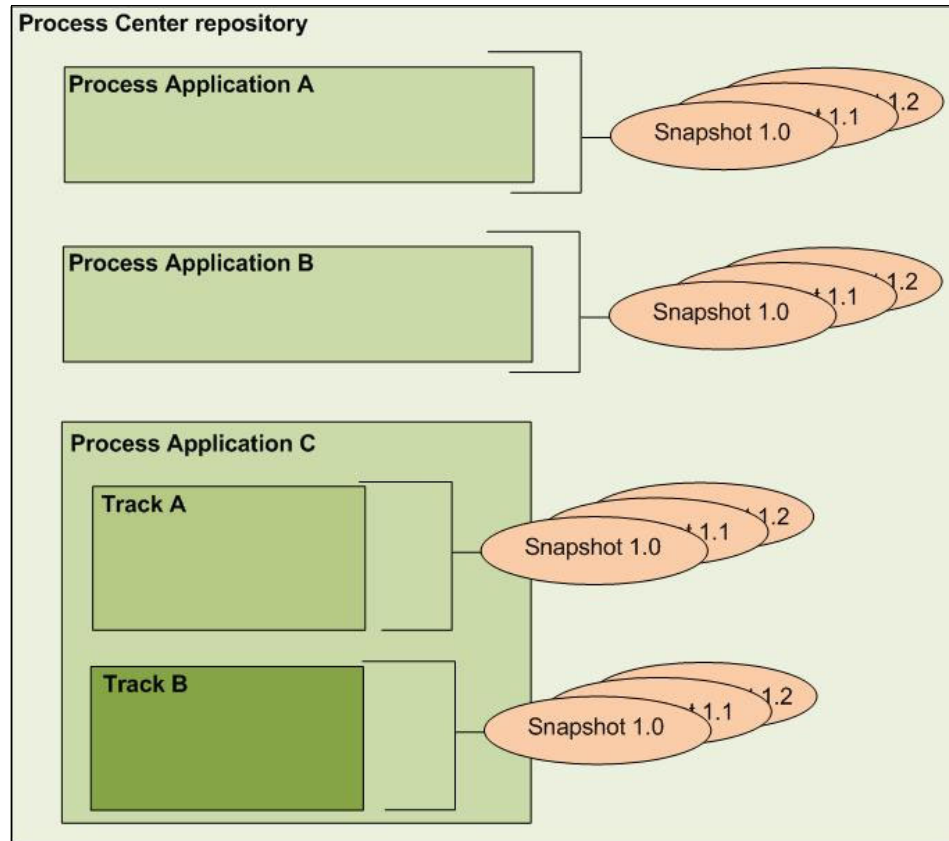
Figure 3-3   Relationship of process applications, snapshots, and tracks

How the artifacts are organized and the terms and concepts that are associated with them is described in Table 3-1.

Table 3-1   Organization of assets in a Process Center repository

Process application	Containers for the process models and supporting implementations that IBM BPM analysts and developers create in IBM Process Designer.
Toolkit	A container for reusable assets. Process applications depend on one or more toolkits. A toolkit can contain other toolkits.
Snapshot	Records of the state of the items within a process application or toolkit (on any track) at a specific point. A process application or toolkit can have multiple snapshots that represent a version. A snapshot can be created from the Process Center and is deployed to a runtime process server.
Track	A process application can have optional parallel flows for development that uses tracks. You can determine whether more tracks are necessary for each process application and, if so, enable them at any time.

The Process Center also provides an administrative web console to maintain the repository, deploy process applications to Process Server environments, and manage running instances of process applications in configured environments. The Process Center includes a Process Server (the playback server) and Performance Data Warehouse, with which the user users who are working in the authoring environments can processes and store performance data for testing and playback purposes.

Process Server

Process Server provides a unified runtime environment that supports running various business processes and integrations. Most organizations have multiple runtime Process Servers for test, staging, and production environments.

The following types of runtime Process Servers are available:

► Online

   An online runtime Process Server that is configured during an IBM BPM installation is automatically discovered and displayed in the web-based Process Center console.

► Offline

An offline server is a runtime Process Server that is not connected to a Process Center. Offline servers can still be used when snapshots of process applications are installed. However, the method for installing process application snapshots to an offline Process Server differs from the method for installing process application snapshots to an online Process Server.

A Process Server also includes other components, such as, the Performance Data Warehouse, business user interfaces, and administrative user interfaces, which are described next.

Business Performance Data Warehouse

The Business Performance Data Warehouse is a server component within a Process Center or Process Server environment. It collects and aggregates process data from running processes. IBM BPM processes can be instrumented for automatic or custom process data collection. This data can be used for reporting and optimization purposes to monitor and improve your business processes.

Business user interfaces

IBM BPM provides the following business user interfaces with which users can use and manage their tasks:

► Process Portal

The Process Portal provides process participants with social capabilities and visibility into process design, inline task completion, online-presence push notifications, and interactive process diagrams to find experts and other process participants. The Process Portal includes Coach-based dashboards to enable process-specific views and a process instance stream that pulls together existing and new alerts into a single, interactive list with user-tagging.

► Business Space

Powered by WebSphere, Business Space is a browser-based graphical user interface with which users can customize content. This interface provides a common presentation layer for application users to manipulate the web interfaces of IBM BPM applications.

► Mobile add-ons

IBM BPM provides add-ons that make it easier to get everyone involved in the business process management lifecycle. Workers can create, run, and manage processes that are built with IBM BPM by using their iPhone and iPad.

The IBM Business Process Manager mobile application for iPhone and iPad enables task management for mobile workers on the go. It provides the following features:

– View and complete tasks from your mobile device.
– Start new processes remotely.
– Review file attachments for more context or approval.
– Attach photos to an existing task.

Note: For more information about the IBM BPM for iPhone and iPad can be found at this website:

https://www.blueworkslive.com/bpmmobile/

Authoring environments

IBM Business Process Manager offers the following authoring environments for developing business process assets:

► IBM Process Designer

   IBM Process Designer is a design time tool to develop process applications.

   It is an Eclipse-based tool that is used by business process authors. IBM Process Designer is available in all configurations of the product and offers the capability to model and implement business processes as process applications. IBM Process Designer includes other tooling, such as, the Process Inspector and the Process Optimizer, for interacting with processes that are running on the Process Center Server (playback server) or a connected Process Server deployment target. It also includes the Process Optimizer perspective to help with simulations of scenarios and historical data analysis.

► IBM Integration Designer

   The IBM Integration Designer is a development environment for building end-to-end SOA applications. It includes numerous pre-packaged integration adapters to build complex automated processes. It is available only in an IBM BPM Advanced installation.

   IBM Integration Designer is available only in the advanced configurations of the product. IBM Integration Designer is used to author complex integrations and fully automated processes that support process applications that are designed in the IBM Process Designer. By using IBM Integration Designer with a fully integrated testing environment that uses test cases and test suites, IT developers can build reusable SOA services, orchestrate those services, and access back-end systems.

Administrative and monitoring tools

IBM Business Process Manager includes some useful administrative and monitoring tools.

Process Center console

The Process Center console provides a convenient location for authors to create and maintain high-level library items, such as, process applications and toolkits. It helps provide a framework for IBM BPM analysts, developers, and application administrators to manage process applications and provides a view of the servers and deployed process applications. In addition, the Process Center console provides tools for maintaining the repository, including setting up the appropriate authorization for users and groups.

The Process Center console is accessed through a web browser at the following URL:

```
http://host:port/ProcessCenter
```

Process Admin console

The Process Admin console is used to administer the Process Servers in your environment, including the users and installed snapshots for each server. It also provides tools to help you manage queues and caches.

The Process Admin Console includes the Process Inspector, a tool that is used to view and manage process instances for process applications that are running on a specific process server.

Access the Process Admin console through a web browser at the following URL:

```
http://host:port/ProcessAdmin)
```

Performance Admin console

The Performance Admin console includes tools for managing the Performance Data Warehouses in your environment. You can use this tool to monitor and reprocess errors and view statistics.

Access the Business Performance Admin console through a web browser at the following URL:

```
http://host:port/PerformanceAdmin
```

Business Process Choreographer

The Business Process Choreographer container is an enterprise workflow engine that supports BPEL business processes and human tasks with transactions. It is available only in an IBM BPM Advanced installation. The core of the Business Process Choreographer container consists of the following components:

► Business Flow Manager (BFM)

 This component runs and manages business processes that are written in Business Process Execution Language (BPEL).

► Human Task Manager (HTM)

 This component manages human tasks. The Business Process Choreographer Explorer can be used to dynamically change the behavior of human tasks, such as, transferring ownership of a task or assigning an expiration date at run time. The HTM also allows for programmatic control of the human task flow. The Business Process Choreographer Explorer can be accessed via a web browser at the following URL:

 `http://host:port/bpc`

Business Rules Manager

The Business Rules Manager is a web-based tool that assists the business analyst in browsing and modifying business rule values. Business rules are designed and developed in IBM Integration Designer that are using if-then rule sets and decision tables to implement their operations. The rule sets and decision tables are set into templates. The templates control which aspects of a business rule you can modify and by exactly how much. They define the structure of if-then rules, condition cases, and actions for decision tables.

The Business Rules Manager does not address rules and decision tables that are created in IBM Process Designer.

Other components of an IBM BPM environment

This section describes other components that are used in an operational IBM BPM environment.

Service Integration Bus

A Service Integration Bus (SIB) supports communication and integration between applications that use messages. A bus is a group of interconnected servers and clusters that were added as members of the bus. Applications connect to a bus at one of the messaging engines that is associated with its bus members. All components in IBM BPM 8.5 use a single SIB per deployment environment as compared to earlier version where there were multiple message buses for individual components.

Databases

IBM BPM requires at least three of the following databases during installation of IBM BPM Standard or IBM BPM Advanced:

► Process Server (or IBM BPM) database (IBM BPM DB)

This database holds tables that pertain to all business process artifact information and is used for Process Server and Process Center environments.

► Performance Data Warehouse database

The Performance Data Warehouse tables support the Performance Data Warehouse server component. It mainly contains data that is tracked in processes automatically by the server and manually by authors. This data is used for reporting and optimization.

► (Optional) Business Process Choreographer database (Business Process Choreographer DB)

During installation, it is possible to optionally store Business Process Choreographer related data in a separate database. Otherwise, this data ends up in the Common database. This applies to the IBM BPM Advanced edition of the product. It contains tables that are used by the Business Flow Manager and the Human Task Manager, and contains all BPEL process template and instance information.

► (Optional) Messaging database (MSG DB)

Each messaging engine requires a unique set of database tables.

There are multiple messaging engines in any IBM BPM environment. There are messaging engines for use by the Process Server bus, the Performance Data Warehouse bus, the Service Component Architecture (SCA) system and application buses, the CEI bus, the Business Monitor bus, and the Business Process Choreographer bus.

► Cell database (CELL DB)

This database contains tables that pertain to the Advanced Edition or earlier WebSphere Process Server (such as AppScheduler, Mediations, and Relationships). These applications and databases are cell scoped in nature as it is applicable across multiple deployment environments.

► Common database (CMN DB)

The Common database contains tables that pertain to the Event Sequencing and Failed Event Manager (FEM) application components of IBM BPM Advanced edition (or WebSphere Process Server). The Common database contents can further vary depending on the installation type and choices that are made during configuration. This database can also contain Business Process Choreographer database tables, the Cell database tables, the Business Space component tables, and Messaging tables.

> **Restriction:** For an advanced-only configuration of IBM BPM Advanced, only one database can be configured to have all component tables.

> **More information:** For more information about databases that are used in IBM BPM, see this website:
>
> http://pic.dhe.ibm.com/infocenter/dmndhelp/v8r5m0/index.jsp?topic=%2Fcom.ibm.wbpm.imuc.doc%2Ftopics%2Fcpln_dbno.html

IBM BPM REST API

IBM Business Process Manager provides a rich set of application programming interfaces (APIs) that are implemented by using Representational State Transfer (REST) services. The APIs provide for access to business process data, human tasks, and business object data. They can be used for various custom applications, such as, user interfaces, portals, or mobile applications. The IBM BPM software provides a ready-to-use testing mechanism for these API calls at the following URL:

http://<host>:<port>/bpmrest-ui

> **More information:** For more information about the IBM BPM REST APIs, see this website:
>
> http://pic.dhe.ibm.com/infocenter/dmndhelp/v8r5m0/topic/com.ibm.wbpm.bpc.doc/topics/cdev_restapis.html

IBM HTTP Server

The IBM HTTP Server (IHS) is a web server that is based on Apache HTTP Server with IBM enhancements. The IHS plug-in provides (among other functions) a load-balancing capability that can be closely integrated with the IBM BPM cell topology.

The HTTP server's responsibility is to distribute load among cluster members. IHS handles HTTP load from thousands of users and should be considered a key component for high-volume scenarios.

Load balancer

A load balancer, also called an *IP sprayer*, enables horizontal scalability by dispatching traffic among several identically configured servers. Depending on the product that is used for load balancing, different protocols are supported.

The load balancer that is included in the WebSphere Edge Components provides the following capabilities:

► Client-to-server affinity
► Easy integration
► Efficient use of equipment
► High availability
► Low processor usage
► Load balancing of a private network
► Scalability

> **Note:** For more information about these features and the functions of Load Balancer, see this website:
>
> http://pic.dhe.ibm.com/infocenter/wasinfo/v8r5/index.jsp?topic=%2Fcom.ibm.websphere.edge.doc%2Flb%2Fcovr_features.html

3.2 Topologies in IBM BPM 8.5

This section describes the meaning of topology in an IBM BPM environment and the available topology options in IBM BPM 8.5.

A topology is the physical layout of the deployment environment that is required to meet the business needs for capacity, availability, and scalability. There are a number of factors to consider in the design and implementation of the chosen topology. For example, business and application requirements, resource requirements and constraints, the intended purpose of the environment, and the operating system on which you install and configure the product all play a role when a topology is chosen and how to design and implement the topology. Each of the supplied Deployment environment patterns addresses a specific set of requirements. Most requirement sets can be met by using one of these patterns.

As compared to the 8.0 version, IBM BPM simplifies the topology selection by providing the following options that address the most typical scenarios, from a proof-of-concept (POC) design to a fully functional production environment:

► Single Cluster

   This clustering choice defines a single cluster that includes all component applications. The single cluster topology is often used for a development, testing, or proof of concept scenario.

► Three Cluster (or Application, Remote Messaging, and Remote Support)

   This clustering choice defines three separate clusters for Remote Messaging, Remote Support, and Application Target. The recommended topology for all production environments is the three-cluster topology.

> **Deprecated cluster configurations:** The two-cluster and four-cluster options from earlier IBM BPM versions (7.5 and 8.0) are no longer available in the deployment wizard in the 8.5 version.

After installation, the following high-level configuration approaches are available:

► The use of the new properties file-based BPMConfig utility.

   In this case, the topology choice is made in the properties file. You can copy a template properties file for the choice of selected product edition and database from the `BPM/samples/config/` directory under the IBM BPM installation directory.

► The use of the ManageProfile and deployment environment wizard.

   In this case, the topology choice is made while the deployment environment wizard is used to create a deployment environment. The wizard presents a selection to choose one of the topology options.

For more information about these approaches, see 5.4, "Configuring the IBM BPM environment" on page 121.

3.2.1 Topology options

This section describes the two topologies or cluster patterns that were introduced in 3.2, "Topologies in IBM BPM 8.5" on page 48.

Single-cluster topology

This topology is a single-cluster WebSphere cell environment where all IBM BPM component applications are deployed in the same cluster. Figure 3-4 on page 50 shows a two-node environment that is running IBM BPM 8.5 Advanced Edition by using the single-cluster topology.
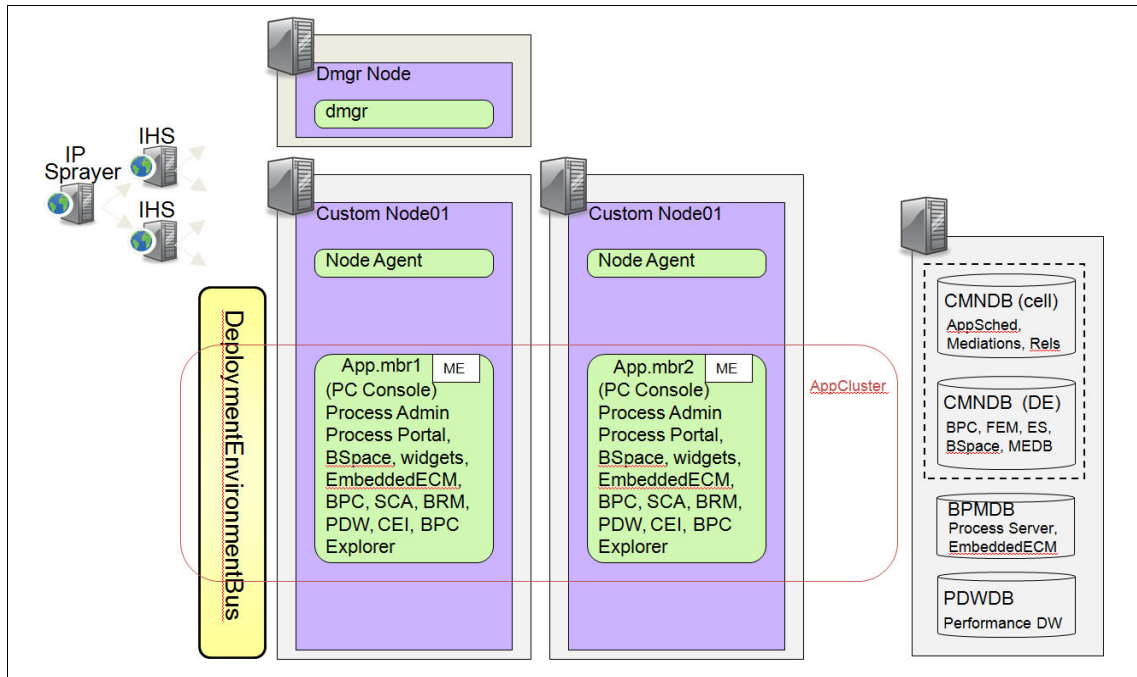
Figure 3-4   Components in a two-node, single-cluster environment

Three-cluster topology

The three-cluster topology defines three separate clusters, one each for Application, Remote Messaging, and Remote Support. Figure 3-5 on page 51 shows a two-node environment that is running IBM BPM 8.5 Advanced Edition by using the three-cluster topology.
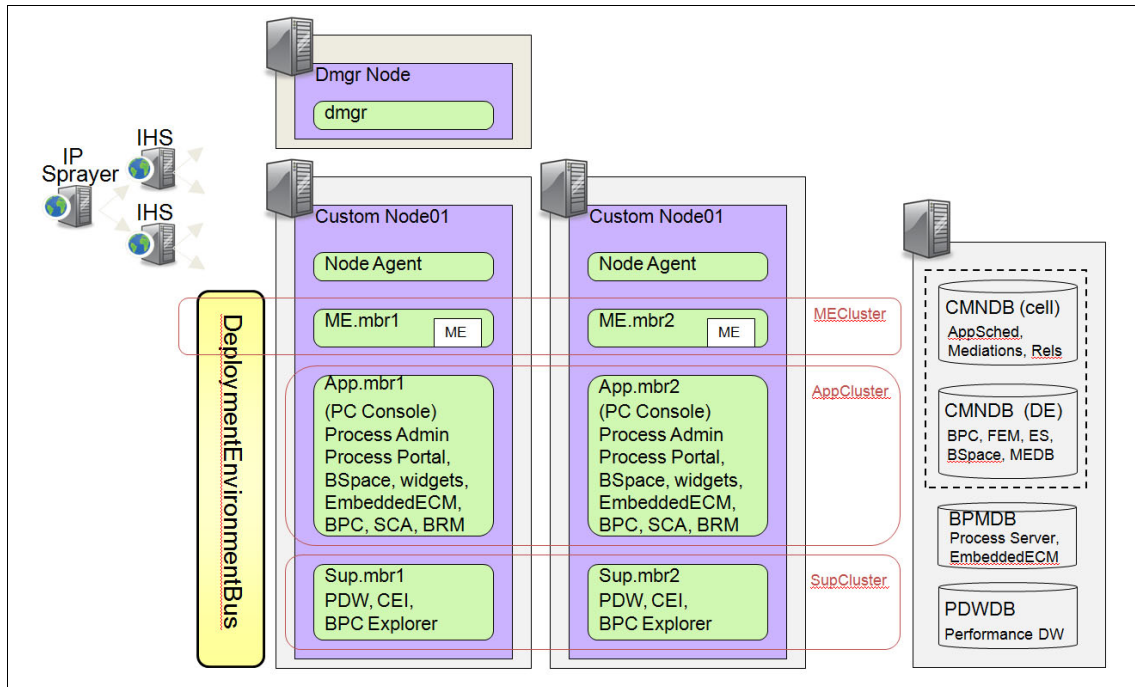
Figure 3-5   Components in a two-node, three-cluster environment

Comparison

Table 3-2 compares the advantages and disadvantages of a single cluster versus a three cluster topology.

Table 3-2   Comparison of single-cluster and three-cluster topologies

Topology	Single-cluster	Three-cluster
Advantages	► Excellent for test environments ► Suitable when hardware constraints exist ► Minimum number of clusters to administer	► Messaging load isolated ► Support load isolated ► Application cluster can do more focused processing
Disadvantages	► Least granular scalability ► Lack of isolation ► Each server jvm process doing all kinds of work, might max out memory	More clusters implies the need for more hardware and memory

Factors to consider in Topology selection

Table 3-3 outlines some of the factors that are applicable in the selection of a single-cluster versus a three-cluster topology.

Table 3-3   Topology selection factors

Factor	Single-Cluster	Three-Cluster
Number of clusters to maintain	One cluster for all components	Three clusters: ► One cluster for applications ► One cluster for the support infrastructure and applications ► One cluster for messaging
Hardware requirements	Can be implemented on limited hardware	More hardware is required for distributed environments
Operational/ Administrative effort	Relatively low	Relatively high
Scalability	All components are scaled at the same rate	Easy to scale. All functions are separated. (more products, such as, WebSphere Enterprise Service Bus, can help scale messaging and asynchronous processing further)

3.3 Deployment environment patterns in IBM BPM 8.5

This section describes a deployment environment pattern and the available pattern types in this 8.5 release of IBM BPM.

A *deployment environment pattern* specifies the constraints and requirements of the components and resources that are involved in a deployment environment. These IBM supplied patterns provide rules and guidelines of component interaction that are characteristic of the most typical use cases. They are based on well-known and tested configuration scenarios and offer a repeatable and automated method of creating a deployment environment that best suit the most typical IBM BPM application needs. The use of patterns helps you create a deployment environment in the most straightforward, well-known, and tested way. Each of the supplied deployment environment patterns addresses a specific set of requirements. Most requirement sets can be met by using one of these patterns.

The following types of deployment environment patterns are available:

► IBM BPM Standard Process Server
► IBM BPM Standard Process Center
► IBM BPM Advanced Process Server
► IBM BPM Advanced Process Center
► IBM BPM Advanced-only Process Server

These patterns are described next.

3.3.1 IBM BPM Standard Process Server and Process Center

This pattern represents all the process applications and toolkits that are authored in Process Designer, Process Portal, Process Administration, and Performance Data Warehouse functions. It does not include the IBM BPM Advanced capabilities. It should be used to construct an IBM BPM Standard Process Server or Process Center environment.

Figure 3-6 shows an IBM BPM Standard environment with multiple Process Designer authoring environments, a single Process Center, and three runtime environments.
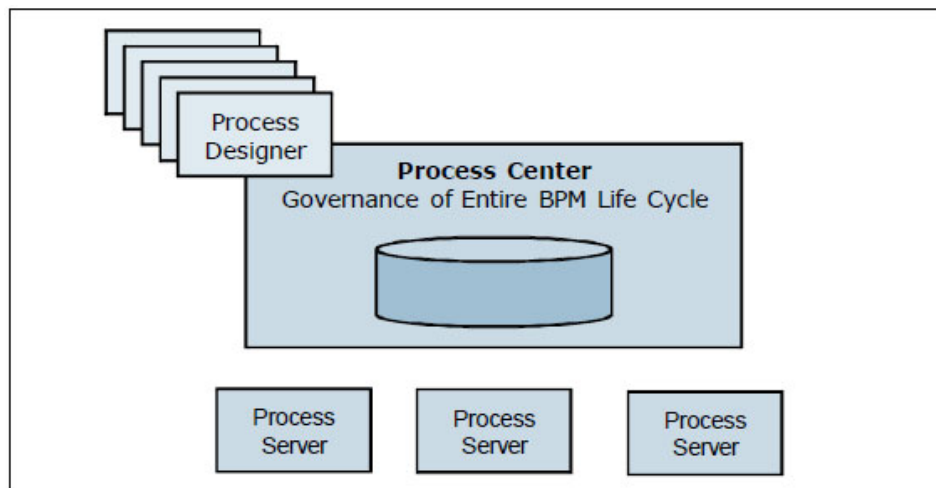
Figure 3-6   Conceptual diagram of an IBM BPM Standard deployment environment

Figure 3-7 on page 54 shows a sample topology of a two-node, three-cluster topology that uses an IBM BPM Standard deployment pattern.
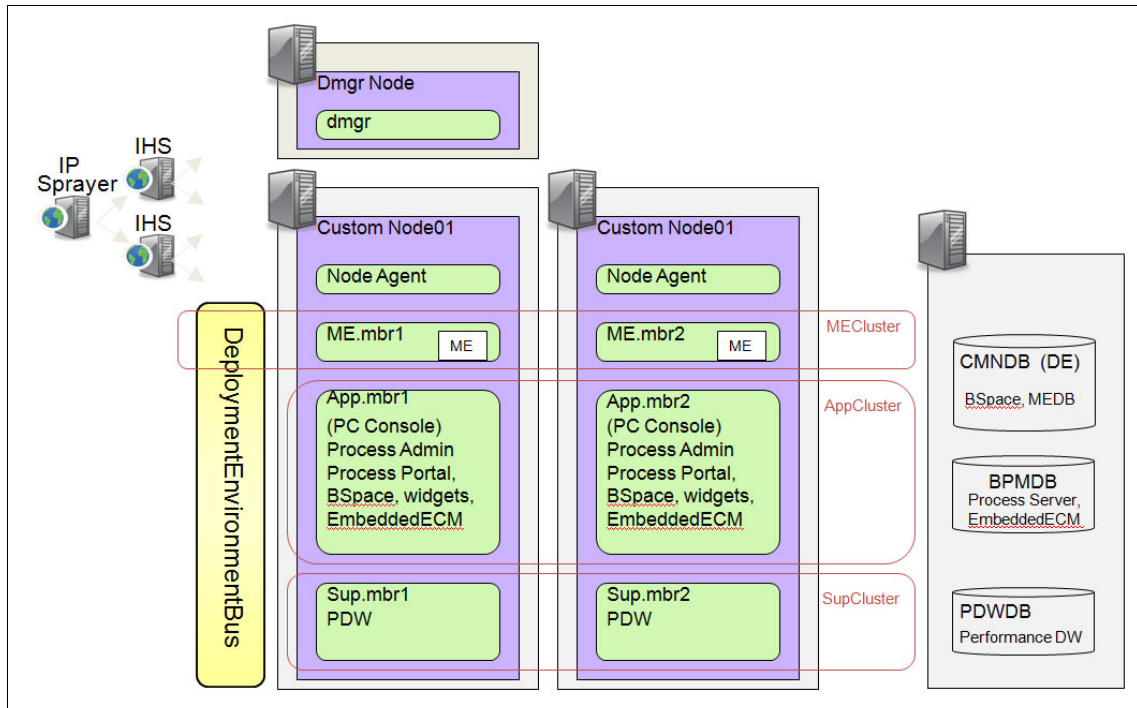
Figure 3-7   Sample three-cluster topology that uses an IBM BPM Standard deployment environment pattern

3.3.2 IBM BPM Advanced Process Server and Process Center

This pattern includes the full feature set of IBM BPM. It also includes the Process Designer, Process Portal, Business Space, Process Administration, and Performance Data Warehouse functions from a Standard edition and Integration Designer, SCA, and Business Process Choreographer, as shown in Figure 3-8 on page 55.
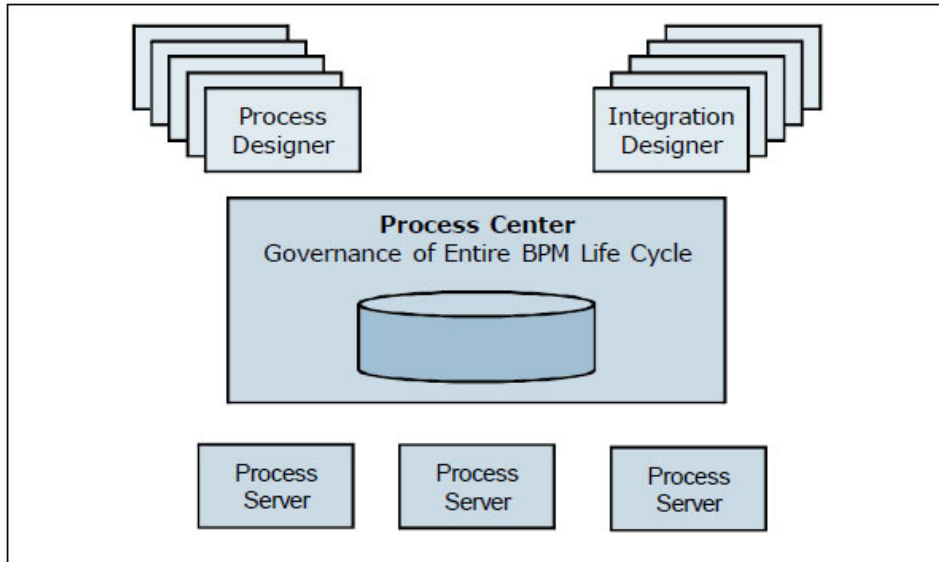
Figure 3-8   Conceptual diagram of an IBM BPM Advanced deployment environment

Figure 3-9 on page 56 shows a sample two-node three-cluster topology that uses an IBM BPM Advanced-Only Process Server deployment environment pattern with the components in it.
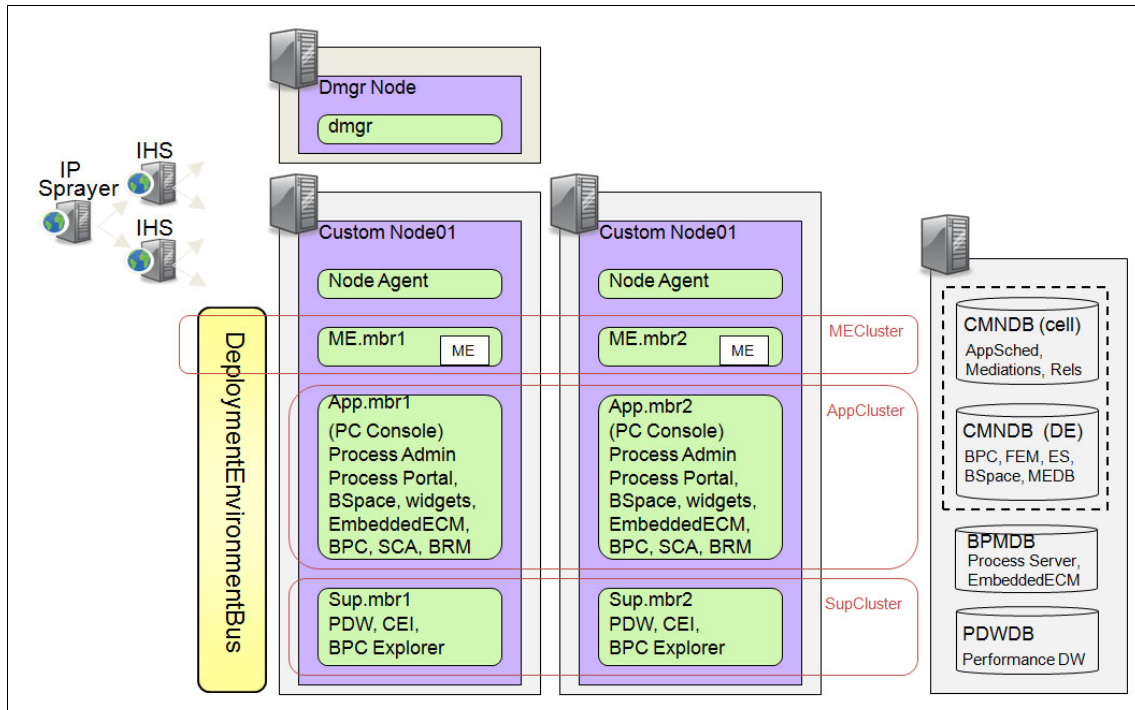
Figure 3-9   Sample three-cluster topology using an IBM BPM Advanced deployment environment pattern

3.3.3 IBM BPM Advanced-only Process Server

This represents all the functions from WebSphere Process Server 7.0, such as, Integration Designer, SCA, Business Process Choreographer, and Business Space functions. It also represents a progression of WebSphere Process Server. This type of deployment environment does not have a Process Center environment (see Figure 3-10 on page 57).
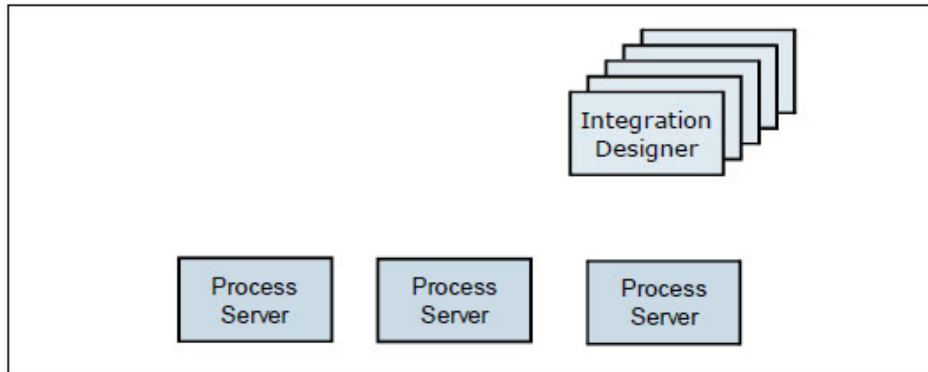
Figure 3-10   An IBM BPM Advanced-only deployment environment

The artifacts that are created in IBM Integration Designer are not associated with process applications and are not stored in a Process Center repository. The artifacts are exported from IBM Integration Designer and installed directly to the Process Server runtime environments. Because this scenario does not include the IBM BPM repository of Process Center, it is expected that developers use their own separate managed code repository system and lifecycle management procedures.

Figure 3-11 on page 58 shows an example of a two-node, three-cluster Advanced-only Process Server and the components within it.
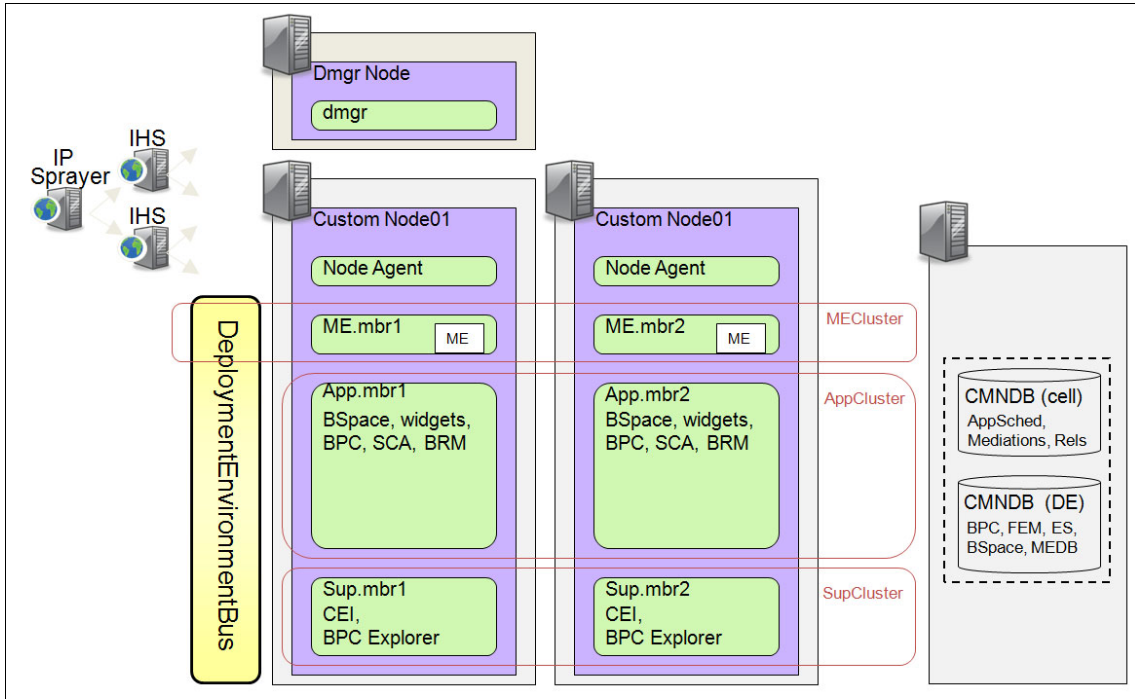
Figure 3-11   Sample three-cluster topology

3.4 Conclusion

After reading this chapter, you should have an understanding of the components and topologies that are available for use in IBM BPM environments.

4

Preparing your infrastructure

This chapter describes the prerequisites and preparation that are needed for building highly scalable IBM Business Process Manager (BPM) environments. It guides you through various installation scenarios and topologies and describes resource considerations regarding IT personnel, hardware, and software. Security requirements and the steps administrators must perform before the installation also are described.

The chapter includes the following topics:

► Installation overview
► Topology selection
► Hardware and operating system configuration
► Network and firewall requirements
► Database preparation
► User registry
► Proxy server and load balancer
► Web browser requirements
► Software repository
► Planning human resources
► Known issues

59

4.1 Installation overview

The installation process installs the IBM Process Center or IBM Process Server components that are based on your selection. Process Center provides a repository for process assets, a runtime environment for testing and studying the performance of processes, and a console for administering access to assets and deploying processes to test, stage, or production environments. Process Server is a runtime environment for process applications and a data warehouse for collecting performance data from the applications. It includes administrator consoles for managing and maintaining the runtime environments and data warehouses. To use these server components, you must configure an environment for them. Configuring environments for Process Server and Process Center are two separate activities: you first configure an environment for one, and then an environment for the other.

4.2 Topology selection

An IBM BPM topology is the physical layout of the deployment environment that is required to meet business needs for capacity, availability, and scalability. In addition, a deployment topology includes other supporting resources, such as, a user registry (for security), one or more HTTP servers, load balancers, and necessary firewalls. Carefully plan the production deployment topology and considering the following factors:

- ► Number of physical machines and hardware resources that are required
- ► Number of clusters and cluster members that are required
- ► Number of databases that are required
- ► Authentication roles and security considerations
- ► Firewall requirements
- ► Web server and load balancer requirements

To make the topology design and implementation process easier, the IBM BPM suite provides a set of deployment environment patterns that represent common deployment topologies. However, a complete scripted installation can be done with IBM BPM V8.5. The scripted installation offers a repeatable method that can be automated for creating the deployment environment that lowers the barrier to introduce them for better compliancy with customer requirements.

The following topology patterns are supported through an IBM BPM installation and configuration process:

► Single cluster topology

The single cluster pattern is the most simple pattern. It defines one application deployment cluster that includes the messaging infrastructure and supporting applications.

► Remote messaging and remote support topology

The remote messaging and remote support pattern defines one cluster for application deployment, one cluster for the messaging infrastructure, and one remote cluster for the supporting applications.

4.3 Hardware and operating system configuration

You might know which supported operating system on which you plan to install the server components. Your options might be limited by the product configuration you are installing and your project preferences and available infrastructure. Furthermore, your operating system selection somewhat constrains the options that are available for other choices you make during the installation process.

This section describes the supported operating systems and fix levels that must in place before IBM PBM is installed and configured.

4.3.1 Supported operating systems

The following operating systems are supported by IBM BPM v8.5:

► IBM AIX® V6.1 TL4 and V7.1 (POWER®)
► SUSE Linux Enterprise Server (SLES) 10 SP3 and SLES 11 SP1 (x86 and IBM System z®)
► Red Hat Enterprise Linux Server (RHEL) 5 update 6 and RHEL 6 (x86 and System z)
► Solaris 10 and 11 (SPARC32 and SPARC64)
► Microsoft Windows Server 2008, Server 2008 R2, and Server 2012
► Microsoft Windows Vista, Windows 7, and Windows 8 (for application design, development, and testing, but not production)

For more information about supported operating systems, see the following websites:

► http://www.ibm.com/support/docview.wss?uid=swg27023005
► http://www.ibm.com/support/docview.wss?uid=swg27023007

4.3.2 IBM Process Designer requirements

The IBM Process Designer includes the following requirements:

► Supported operating systems for Process Designer:

  – Windows Server 2008, Server 2008 R2, and Server 2012
  – Windows Vista, Windows 7, and Windows 8

► Supported browsers for Process Designer:

  – Internet Explorer 9 and 10
  – Mozilla Firefox 10 (minimum)
  – Mozilla Firefox Extended Support Release 10 (minimum)
  – Google Chrome 20 (minimum)

For more information about Process Designer system requirements, see this website:

http://www.ibm.com/support/docview.wss?uid=swg27023009

4.3.3 IBM Integration Designer requirements

The IBM Integration Designer includes the following requirements:

► Supported operating systems for Integration Designer:

  – SLES 10 SP3 and SLES 11 SP1 (x86)
  – RHEL 5 update 6 and RHEL 6 (x86)
  – Windows Server 2008 and Server 2008 R2
  – Windows Vista and Windows 7
  – Database servers: IBM DB2® Express Edition V9.7 FP4 and V10.1

► Supported browsers for Integration Designer:

  – Internet Explorer 9 and 10
  – Mozilla Firefox 10 (minimum)
  – Mozilla Firefox Extended Support Release 10 (minimum)
  – Google Chrome 20 (minimum)

For more information about Integration Designer system requirements, see this website:

http://www.ibm.com/support/docview.wss?uid=swg27022441

4.3.4 Hypervisors that are supported by IBM BPM

Table 4-1 lists the hypervisors that are supported by IBM BPM version 8.5

Table 4-1   Hypervisors that are supported by IBM BPM

Hypervisor	Version supported
IBM PR/SM™	Any version
IBM PowerVM® Hypervisor (LPAR, DPAR, Micro-Partition)	Any version
KVM in SUSE Linux Enterprise Server (SLES)	11
Red Hat KVM as delivered with Red Hat Enterprise Linux (RHEL) and its RHEV equivalent	5.4, 6.0
VMware ESXi	4.1, 5.0, 5.1
WPAR: Product Installed in System Workload Partition	AIX6.1, AIX7.1
IBM z/VM®	6.1,6.2

For more information about supported hypervisors for IBM BPM, see the following websites:

► http://www.ibm.com/support/docview.wss?uid=swg27023005
► http://www.ibm.com/support/docview.wss?uid=swg27023007

4.3.5 64-bit versus 32-bit considerations

You can run IBM BPM applications by using 32-bit or 64-bit JVMs. However, we suggest 64-bit mode for Process Server and Process Center because in 32-bit mode, the maximum heap size is limited by the 4 GB address space size. In most 32-bit operating systems, the practical limit varies between 1.5 GB and 2.5 GB. In contrast, although maximum heap size is limitless in 64-bit mode, standard Java best practices still apply.

The sum of the maximum heap sizes and native memory use of all the Java processes that are running on a system should not exceed the physical memory that is available on the system. This total also includes more memory that is required for the operating system and other applications. Java processes include threads, stacks, and Just-In-Time (JIT) compiled code. IBM BPM V8.5 servers run most efficiently on a 64-bit JVM instance because of the larger amount of memory that is accessible in this mode. The performance and memory footprint of a 64-bit runtime server is about the same as the 32-bit version.

Consider the following factors when you determine the modes to run:

► 64-bit mode is an excellent choice for applications whose liveset approaches or exceeds the 32-bit limits. Such applications either experience OutOfMemoryExceptions or suffer excessive time in garbage collection (GC). We consider anything greater than 10% of the time in GC as excessive. These applications exhibit much better performance when they can run with the larger heaps they need. However, sufficient physical memory on the system must exist to back the Java heap size.

► 64-bit mode is also an excellent choice for applications that, though well-behaved in 32-bit mode, can be algorithmically modified to perform better with larger heaps. An example is an application that frequently persists data to a data store to avoid maintaining a large in-memory cache, even if such a cache greatly improves throughput. Recoding such an application to trade off the more space that is available in 64-bit heaps for less run time yields better performance.

► Moving to 64-bit can cause some degradation in throughput if a 32-bit application fits well with a 1.5 GB to 2.5 GB heap and the application is not expected to grow significantly. For these situations where the memory limitation is not a significant factor, the use of 32-bit JVMs might be a better choice than 64-bit.

Important: IBM recommends 64-bit mode for Process Server and Process Center because in 32-bit mode, the maximum heap size is limited by the 4 GB address space size.

4.3.6 Recommended system resources

Table 4-2 lists the recommended minimum hardware resources for running IBM BPM on various operating system platforms.

Table 4-2   Recommended minimum hardware resources for IBM BPM

Operating system	Memory	Storage	Bit architecture
AIX	8 GB	25 GB	64-bit
Linux	8 GB	25 GB	64-bit
Solaris	8 GB	25 GB	64-bit
Windows	8 GB	25 GB	64-bit

For more information about hardware and software system requirements for IBM BPM, see this website:

http://www.ibm.com/support/docview.wss?uid=swg27023005

4.3.7 Preparing your operating system

This section describes how to prepare your operating system environment for installing IBM BPM.

Preparing AIX systems

Complete the following steps on your AIX systems before IBM BPM is installed:

1. Increase the maximum number of open files. The default setting often is not enough. You can check your current maximum number of open files by using the command `ulimit -n`

   The following example shows the maximum number of open files being increased to 8800, which is large enough for most systems. The `ulimit` requirement is dynamically calculated at installation time and might need to be larger based on the options you select.

   Before you install, run the `ulimit -n 8800` command.

   Alternatively, complete the following steps to edit the resource limits file:

   a. Open `/etc/security/limits.`

   b. Edit or add the default section and include the following line:

   `nofiles = 8800`

   c. Save and close the file.

d. Log off from the operating system and log in again.

2. Set the umask value to 022 by busing the `umask 022` command.

3. Ensure that you have Mozilla Firefox that is installed at version 3.5.x.x or higher.

4. Increase the number of processes that are configured in the AIX operating system to avoid a connection reset error. You can increase the number of processing by using a command or the AIX interface.

   Run the following command:

   ```
   chdev  -l sys0 -a maxuproc='256'
   ```

   > **Using the AIX user interface instead:** In the AIX interface, enter `smitty`, then select **System Environments** → **Change / Show Characteristics of Operating System** → **Number of processes allowed per user (Num.)**. Enter the applicable value.

5. Complete the Tuning AIX systems steps that are described at this website:

   http://pic.dhe.ibm.com/infocenter/wasinfo/v8r5/topic/com.ibm.websphe re.nd.multiplatform.doc/ae/tprf_tuneaix.html

For more information about preparing AIX operating systems, see this website:

http://pic.dhe.ibm.com/infocenter/dmndhelp/v8r5m0/topic/com.ibm.wbpm.im uc.ebpm.doc/topics/prep_bpm_os_aix.html

Preparing Linux systems

Complete the following steps on your Linux systems before IBM BPM is installed:

1. Increase the maximum number of open files. You can check your current maximum number of open files by using the `ulimit-n` command.

   The following example shows the maximum number of open files being increased to 8800, which is large enough for most systems. The `ulimit` requirement is dynamically calculated at installation time and might need to be larger based on the options you select.

   Complete the following steps:

   a. Open `/etc/security/limits.conf`.

   b. Locate the `nofile` parameter and increase the value. If a line that contains the `nofile` parameter does not exist, add the lines that are shown in Example 4-1 on page 67 to the file.

Example 4-1   Editing the limits.conf file

```
# - stack - max stack size (KB)
* soft stack 32768
* hard stack 32768
# - nofile - max number of open files
* soft nofile 65536
* hard nofile 65536
# - nproc - max number of processes
* soft nproc 16384
* hard nproc 16384
```

Save and close the file, then log off and log in again.

2. Set the `umask` value to 022 by using the **umask 022** command.

3. Install the following packages for your operating system:
   – Red Hat Enterprise Linux 5: LibXp-1.0.0-8, rpm-build-4.4.2-37.el5
   – On Red Hat Enterprise Linux 6: ksh-version.rpm Korn shell

4. Ensure that you have Mozilla Firefox that is installed at version 3.5.x.x or higher.

5. On Red Hat Enterprise Linux 5 systems, disable SELinux, or set it to a permissive mode.

6. Restart the computer.

7. Complete the Tuning Linux systems steps that are described at this website:

   `http://pic.dhe.ibm.com/infocenter/wasinfo/v8r5/topic/com.ibm.websphere.nd.multiplatform.doc/ae/tprf_tunelinux.html`

For more information about preparing Linux operating systems, see this website:

`http://pic.dhe.ibm.com/infocenter/dmndhelp/v8r5m0/topic/com.ibm.wbpm.imuc.ebpm.doc/topics/prep_bpm_os_lin.html`

Preparing Solaris systems

Complete the following steps on your Solaris systems before IBM BPM is installed:

1. Increase the maximum number of open files. The default setting often is not enough. You can check your current maximum number of open files by using the **ulimit -n** command.

   The following example shows the maximum number of open files being increased to 8800, which is large enough for most systems. The `ulimit` requirement is dynamically calculated at installation time and might need to be larger based on the options you select.

Before you install, run the `ulimit -Hn 8800` command.

Alternatively, you can complete the following steps to edit the resource limits file:

a. Open `/etc/system`.

b. Add the following line to the end of the file:

   `set rlim_fd_max=8800`

c. Save and close the file.

d. Log off from the operating system and log in again.

2. Set the `umask` value to 022 by using the `umask 022` command.

3. Complete the Tuning Solaris systems steps that are described at this website:

   http://pic.dhe.ibm.com/infocenter/wasinfo/v8r5/topic/com.ibm.websphe
   re.nd.multiplatform.doc/ae/tprf_tunesolaris.html

For more information about preparing Solaris operating systems, see this website:

http://pic.dhe.ibm.com/infocenter/dmndhelp/v8r5m0/topic/com.ibm.wbpm.im
uc.ebpm.doc/topics/prep_bpm_os_sol.html

Preparing Windows systems

Complete the following steps on your Windows systems before IBM BPM is installed:

1. Complete the steps in the Preparing Windows systems for installation topic in the WebSphere Application Server Information Center, which is available at this website:

   http://pic.dhe.ibm.com/infocenter/wasinfo/v8r5/topic/com.ibm.websphe
   re.installation.nd.doc/ae/tins_winsetup.html

2. Complete the Tuning Windows systems steps that are described at this website:

   http://pic.dhe.ibm.com/infocenter/wasinfo/v8r5/topic/com.ibm.websphe
   re.nd.multiplatform.doc/ae/tprf_tunewindows.html

3. Ensure that all servers that are involved are set to the same time. Use the same network time protocol for all servers on all cluster nodes, including application, support, and database clusters. A time mismatch can cause erratic behavior, including duplicate system tasks.

4. If you are installing on Windows 2008 R2 and you plan to install DB2 Express as part of the IBM BPM installation, ensure that you have compatible Microsoft Visual C++ redistributable packages. See Errors when you are running the `db2start` command in the DB2 information center.

5. If you are using a Czech locale, you must change the system settings to prevent seeing corrupted characters in IBM Process Portal and IBM Process Designer. Change the Windows settings by completing the following steps:

   a. Click **Regional and Language Options**, and then open the Administrative tab.

   b. In the Language for non-Unicode programs section, click **Change system locale** to open the locale list.

   c. Select **Czech** from the list and click **OK**.

For more information about preparing Windows operating systems, see this website:

http://pic.dhe.ibm.com/infocenter/dmndhelp/v8r5m0/topic/com.ibm.wbpm.im
uc.ebpm.doc/topics/prep_bpm_os_win.html

4.3.8 Shared file system for transactional high availability

For transaction failover to work successfully, all application servers must access the same high-availability (HA) file system for storing transaction logs. When a server fails, one of its peer servers must take over the transaction logs from the failed server to perform peer recovery. A shared Network File System can be used as the highly available file server for the transaction logs because these file system protocols provide the essential integrating file locking mechanism.

The high availability of the transaction service enables any server in a cluster to recover the transactional work for any other server in the same cluster. Peer recovery is provided within a server cluster. A peer server (another cluster member) can process the recovery logs of a failed server while the peer continues to manage its own transactional workload. You do not have to wait for the failed server to restart, or start a new application server specifically to recover the failed server.

In an HA environment, application servers must also access the compensation logs. Ensure that the compensation log files are stored on a medium that is accessible by all members of the cluster, and that each cluster member has a unique log file location on this medium. All nodes must have read and write access to the recovery logs.

Transactional HA configuration is mandatory for production environments. For more information, see the WebSphere Application Server Information Center, which is available at this website:

http://pic.dhe.ibm.com/infocenter/wasinfo/v8r5/topic/com.ibm.websphere.nd.doc/ae/cjta_trans_ha.html

4.4 Network and firewall requirements

An IBM BPM installation can include various components that are spread across many host servers. These components use the network to communicate changing runtime request information and WebSphere internal administration data. If your network is configured incorrectly, problems might arise during the installation or when operating the environment. Verify that the network components are working and are set up properly, including firewalls, host names and IPs, DNS, latency time, and other components.

In IBM BPM V8.5, there are four major software components: Process Center (PC), Process Server (PS), Process Designer (PD), and Integration Designer (ID). Process Designer and Integration Designer are the tools that interact with Process Server and during development, with the Process Center. You must open a wide range of ports in the firewall for successful communication between these components. You must open the following ports that are listed in Table 4-3 in a firewall for Process Center and Process Server environments.

Table 4-3   Ports that must be open on firewall

Server process	Ports
AppTarget	► BOOTSTRAP_ADDRESS ► CSIV2_SSL_SERVERAUTH_LISTENER_ADDRESS ► WC_DEFAULTHOST ► WC_DEFAULTHOST_SECURE ► SIB_ENDPOINT_ADDRESS ► SIB_ENDPOINT_SECURE_ADDRESS ► ORB_LISTENER_ADDRESS
Messaging	► SIB_ENDPOINT_ADDRESS ► SIB_ENDPOINT_SECURE_ADDRESS ► ORB_LISTENER_ADDRESS
Support	► SIB_ENDPOINT_ADDRESS ► SIB_ENDPOINT_SECURE_ADDRESS ► ORB_LISTENER_ADDRESS ► WC_DEFAULTHOST ► WC_DEFAULTHOST_SECURE

Server process	Ports
Node Agent	ORB_LISTENER_ADDRESS
Deployment manager	▶ SOAP_CONNECTOR_ADDRESS ▶ ORB_LISTENER_ADDRESS ▶ CSIV2_SSL_SERVERAUTH_LISTENER_ADDRESS ▶ WC_ADMINHOST ▶ WC_ADMINHOST_SECURE

You can also open a range of ports for communication between various components. If you are using the default installation ports, the following port ranges are recommended to be open on IBM BPM servers:

▶ 2810 - 2813
▶ 2830 - 2833
▶ 8880 - 8883
▶ 8900 - 8903
▶ 5000 - 5999
▶ 7200 - 7399
▶ 9000 - 9999

4.5 Database preparation

Choosing a database depends on your operating system and on the features that you use with IBM BPM. IBM BPM supports all major database systems and packages JDBC drivers that are necessary for operating IBM BPM environments.

IBM BPM supports the following database systems:

▶ IBM DB2 Enterprise Server Edition V9.7 FP4 and V10.1
▶ DB2 Express Edition V9.7 FP4 and V10.1
▶ DB2 for IBM z/OS®, V9.1 and V10.1
▶ DB2 for IBM pureScale® Feature V9.8 FP4 and V10.1
▶ DB2 HADR Feature V9.7.0.4 and V10.1
▶ Oracle Database 11g R1 and 11g R2 Enterprise and Standard Editions
▶ Oracle Database RAC and Data Guard 11g R1 and 11g R2
▶ Microsoft SQL Server Enterprise Edition 2008, 2008 R2, and 2012

4.5.1 Planning your database configuration

To plan your database configuration, you must know which components of IBM BPM you plan to use. In version 8.5, database requirements are categorized under six different capabilities. Optionally, you can isolate the capabilities into three or six different databases that are based on your requirements, as shown in Table 4-4 on page 72.

Table 4-4   Database capabilities that are based on type of deployment

Database	Sample database name	Standard Process Center or Process Server	Advanced Process Center or Process Server	Advanced -Only Process Server or Process Center	Database capabilities
ProcessServerDb	BPMDB	✓	✓	✓	► Process Server ► EmbeddedECM
PerformanceDb	PDWDB	✓	✓	✓	Performance Data Warehouse
CellOnlyDb	CMNDB	X	✓	✓	► AppScheduler ► CommonDB customization (BR & Selectors) ► DirectDeploy ► EsbLoggerMediation ► Governancerepository ► WBI Mediation ► RelationshipService
SharedDb	CMNDB	✓	✓	✓	► Business Space ► Business Process Choreographer ► Messaging Lock Manager (Event sequencing) ► Recovery (Failed Event Manager)
BpcDB	BPCDB	X	Optional	Optional	Business Process Choreographer only
MessagingDB	MSGDB	Optional	Optional	Optional	Messaging Only

For this IBM Redbooks publication, the authors consolidated all database capabilities into three different databases, as shown in Table 4-5.

Table 4-5   Consolidated database capabilities

Database	Sample database names	Database capabilities
ProcessServerDb	BPMDB	▶ Process Server ▶ EmbeddedECM
PerformanaceDb	PDWDB	Performance Data Warehouse
▶ CellOnlyDb ▶ SharedDb ▶ BpcDB ▶ MessagingDb	CMNDB	▶ AppScheduler ▶ CommonDB customization (BR & Selectors) ▶ DirectDeploy ▶ EsbLoggerMediation ▶ Governancerepository ▶ WBI Mediation ▶ RelationshipService ▶ Lock Manager (Event sequencing) ▶ Recovery (Failed Event Manager) ▶ Business Space ▶ Business Process Choreographer ▶ Messaging

4.5.2 Database considerations

This section describes some general considerations for the different databases.

IBM DB2

IBM DB2 databases must be created by using the UTF-8 character set. You must use a 32 KB default page size for the Common, Process Server, and Performance Data Warehouse databases.

If you use DB2 V10.1, a user temporary table space is required to run stored procedures that are delivered with IBM BPM.

Oracle

Oracle must be installed by using the UTF-8 Universal character set (AL32UTF8) instead of the default database character set (WE8ISO8859P1 - ISO 8859-1 West European). The use of this character set ensures that data that contains native language characters can be saved to the database.

Oracle manages the language and locale settings with the following database parameters:

- ▶ NLS_LANGUAGE
- ▶ NLS_TERRITORY

To change the default language for the databases, change the NLS_LANGUAGE parameter to a supported language for Oracle. Territory settings define the defaults for data formatting, currency, and so on. Set the NLS_TERRITORY parameter to change the Oracle instance.

Install the critical security patch updates as recommended by Oracle. IBM WebSphere Application Server is shipped with an IBM Java SDK that is based on the Oracle SDK. Oracle released critical patch updates (CPU) in October 2012 that contained security vulnerability fixes and the IBM Java SDK that WebSphere Application Server ships is affected.

Microsoft SQL Server

Microsoft SQL Server databases that you create for Process Server and Performance Data Warehouse are case-insensitive. The letters CI in the COLLATE attribute value specifies this. Ensure that this variable looks as it does in the following example:

```
SQL_Latin1_General_CP1_CI_AS (not SQL_Latin1_General_CP1_CS_AS)
```

To use SQL Server with IBM BPM, you must configure SQL Server for XA transactions. SQL Server is not pre-configured for XA transactions. The XA support is delivered as part of the Microsoft JDBC driver distribution and contains a dynamic link library (`sqljdbc_xa.dll`) and an installation script (`xa_install.sql`). Because XA transactions are not enabled by default, you must change the configuration in the Microsoft Windows Distributed Transaction Coordinator (MSDTC). For more information about enabling XA support for SQL Server, see the topic *Understanding XA Transactions* in the Microsoft SQL Server online documentation.

For step-by-step instructions to enable XA transactions on Microsoft SQL server, the IBM Business Process Manager Information Center, which is available at this website:

http://pic.dhe.ibm.com/infocenter/dmndhelp/v8r5m0/topic/com.ibm.wbpm.im uc.ebpm.doc/topics/db_xa_nd_sol_man.html

4.5.3 Database privileges

Set database privileges to determine the authority that you must create or access your data store tables for databases. When you create schemas with the deployment environment or scripts, your user ID must have the authority to create tables. When the tables are created, you must have the authority to select, insert, update, and delete information in the tables.

Table 4-6, Table 4-7 on page 76, and Table 4-8 on page 78 describe the database privileges that are needed to access the data stores for each database type.

Table 4-6   Database privileges that are required for DB2 database user

Database	Installation privileges	Runtime privileges
SharedDb	CREATE TABLE, CREATE INDEX, ALTER TABLE, INSERT, CREATE SEQUENCE, CREATE VIEW, CREATE FUNCTION, CREATE PROCEDUTE	SELECT, UPDATE, DELETE, INSERT, CREATE VIEW, CREATE PROCEDURE, USAGE ON SEQUENCE
BpcDb	CREATE TABLE, CREATE INDEX, ALTER TABLE, INSERT, CREATE SEQUENCE, CREATE VIEW,CREATE FUNCTION,CREATE PROCEDUTE	SELECT, UPDATE, DELETE, INSERT
MessagingDb	CREATE TABLE, CREATE INDEX	SELECT, UPDATE, DELETE, INSERT, DROP ANY TABLE Messaging engines use the TRUNCATE TABLE SQL statement, which might require the DROP ANY TABLE privilege.

Database	Installation privileges	Runtime privileges
Process ServerDb	CREATE TABLE, CREATE INDEX, ALTER TABLE, INSERT, CREATE SEQUENCE, CREATE VIEW,CREATE FUNCTION, CREATE PROCEDURE Other required privileges on the created tables: ALTER, DELETE, INDEX, INSERT, REFERENCES, SELECT, UPDATE	DELETE,INSERT,REFERENCES,SELECT,UPDATE The runtime user must have EXECUTE ON PROCEDURE privileges on the six stored procedures in the `createProcedure_Advanced.sql` script.
PerformanceDb	CREATE TABLE, CREATE INDEX, ALTER TABLE, INSERT, CREATE SEQUENCE, CREATE VIEW,CREATE FUNCTION,CREATE PROCEDUTE	DELETE,INSERT,REFERENCES,SELECT,UPDATE,CREATE VIEW To read the system metadata tables, SELECT permission is required on `syscat.tables`, `syscat.views`, `sys-cat.columns`, `syscat.tabconst`, and `sysibm.sysdummy1`.
CellOnlyDb	CREATE TABLE, CREATE INDEX, ALTER TABLE, INSERT, CREATE SEQUENCE, CREATE VIEW,CREATE FUNCTION,CREATE PROCEDUTE	SELECT, UPDATE, DELETE, INSERT

Table 4-7   Database privileges that are required for Oracle database user

Database	Installation privileges	Runtime privileges
SharedDb	CREATE TABLE, CREATE INDEX, ALTER TABLE, INSERT, CREATE SEQUENCE, CREATE VIEW,CREATE FUNCTION, CREATE PROCEDUTE	SELECT, UPDATE, DELETE, INSERT, CREATE VIEW, CREATE PROCEDURE, USAGE ON SEQUENCE

Database	Installation privileges	Runtime privileges
BpcDb	CREATE TABLE, CREATE INDEX, ALTER TABLE, INSERT, CREATE SEQUENCE, CREATE VIEW,CREATE FUNCTION,CREATE PROCEDUTE	SELECT, UPDATE, DELETE, INSERT
MessagingDb	CREATE TABLE, CREATE INDEX	SELECT, UPDATE, DELETE, INSERT, DROP ANY TABLE Messaging engines use the TRUNCATE TABLE SQL statement, which might require the DROP ANY TABLE privilege.
Process ServerDb	CREATE TABLE, CREATE INDEX, ALTER TABLE, INSERT, CREATE SEQUENCE, CREATE VIEW,CREATE FUNCTION, CREATE PROCEDURE Other required privileges on the created tables: ALTER, DELETE, INDEX, INSERT, REFERENCES, SELECT, UPDATE	DELETE,INSERT,REFERENCES,SELECT,UPDATE The runtime user must have EXECUTE ON PROCEDURE privileges on the six stored procedures in the `createProcedure_Advanced.sql` script.
PerformanceDb	CREATE TABLE, CREATE INDEX, ALTER TABLE, INSERT, CREATE SEQUENCE, CREATE VIEW,CREATE FUNCTION,CREATE PROCEDURE	DELETE,INSERT,REFERENCES,SELECT,UPDATE,CREATE VIEW PerformanceDb users also require GRANT EXECUTE ON DBMS_LOCKS
CellOnlyDb	CREATE TABLE, CREATE INDEX, ALTER TABLE, INSERT, CREATE SEQUENCE, CREATE VIEW,CREATE FUNCTION,CREATE PROCEDUTE	SELECT, UPDATE, DELETE, INSERT

Table 4-8   Database privileges that are required for SQL Server database user

Database	Installation privileges	Runtime privileges
SharedDb	CREATE TABLE, CREATE INDEX, ALTER TABLE, INSERT, CREATE SEQUENCE, CREATE VIEW,CREATE FUNCTION, CREATE PROCEDUTE	SELECT, UPDATE, DELETE, INSERT, CREATE VIEW, CREATE PROCEDURE, USAGE ON SEQUENCE
BpcDb	CREATE TABLE, CREATE INDEX, ALTER TABLE, INSERT, CREATE SEQUENCE, CREATE VIEW,CREATE FUNCTION,CREATE PROCEDUTE	SELECT, UPDATE, DELETE, INSERT
MessagingDb	CREATE TABLE, CREATE INDEX	SELECT, UPDATE, DELETE, INSERT, DROP ANY TABLE Messaging engines use the TRUNCATE TABLE SQL statement, which might require the DROP ANY TABLE privilege.
Process ServerDb	CREATE TABLE, CREATE INDEX, ALTER TABLE, INSERT, CREATE SEQUENCE, CREATE VIEW,CREATE FUNCTION, CREATE PROCEDURE Other required privileges on the created tables: ALTER, DELETE, INDEX, INSERT, REFERENCES, SELECT, UPDATE	DELETE,INSERT,REFERENCES,SELECT,UPDATE The runtime user must have EXECUTE ON PROCEDURE privileges on the six stored procedures in the `createProcedure_Advanced.sql` script.

Database	Installation privileges	Runtime privileges
PerformanceDb	CREATE TABLE, CREATE INDEX, ALTER TABLE, INSERT, CREATE SEQUENCE, CREATE VIEW,CREATE FUNCTION,CREATE PROCEDUTE	DELETE,INSERT,REFERENCES,SELECT,UPDATE,CREATE VIEW PerformanceDb users also require GRANT EXECUTE ON DBMS_LOCKS
CellOnlyDb	CREATE TABLE, CREATE INDEX, ALTER TABLE, INSERT, CREATE SEQUENCE, CREATE VIEW,CREATE FUNCTION,CREATE PROCEDUTE	SELECT, UPDATE, DELETE, INSERT

Important: Performance Data Warehouse users must note the following restrictions:

► The user cannot be assigned to the system administrator (SYSADMIN) role.

► The user must be mapped to the master database with the SqlJDBCXA user role.

For more information about database privileges, see the product information center that is available at this website:

http://pic.dhe.ibm.com/infocenter/dmndhelp/v8r5m0/topic/com.ibm.wbpm.imuc.doc/topics/rpln_db_privileges.htm

4.5.4 Sample database scripts

If you used the `BPMConfig` command to create the deployment environment, the scripts were generated at the same time. If you used the deployment environment wizard and cleared the Create Tables option, you must run the `BPMConfig` command to generate the SQL scripts only. If the property `bpm.de.deferSchemaCreation` is set to `false`, the scripts are run during configuration of the deployment environment. These scripts are run when you use the deployment environment wizard to create your environment.

It is recommended that you create databases before you configure your deployment environment.

Sample scripts for creating databases on DB2

Sample database creation scripts are available at the following location:

`BPM_HOME/BPM/dbscripts/DB2/Create`

You can use the same scripts to create all IBM BPM databases.

Change the database name (@DB_NAME@) and (@DB_USER@) according to your standards and run the script as the instance owner on the database server, as shown in Example 4-2.

Example 4-2   Sample database creation script

```
Db2 –tvf createDatabase.sql
- start script
-- create the database:
create database @DB_NAME@ automatic storage yes  using codeset UTF-8
territory US pagesize 32768;
-- connect to the created database:
connect to @DB_NAME@;
-- The following grant is used for databases without enhanced security.
For more information, review the Info Center for Enhancing Security for
DB2.
grant dbadm on database to user @DB_USER@;
UPDATE DB CFG FOR @DB_NAME@  USING LOGFILSIZ 4096 DEFERRED;
UPDATE DB CFG FOR @DB_NAME@  USING LOGSECOND 64 DEFERRED;
connect reset;
- end script
```

Sample scripts are also available for other major relational databases in the location, as shown in Example 4-3.

Example 4-3   Sample script location

```
BPM_HOME/BPM/dbscripts/DB2/Create
$ pwd
/opt/ibm/WebSphere/AppServer/BPM/dbscripts
$ ls -la
total 0
drwxr-xr-x    6 bpmuser   bpmadm            256 May 30 21:22 .
drwxr-xr-x   10 bpmuser   bpmadm            256 May 30 21:29 ..
drwxr-xr-x    6 bpmuser   bpmadm            256 May 30 21:27 DB2
drwxr-xr-x    6 bpmuser   bpmadm            256 May 30 21:27 DB2zOS
drwxr-xr-x    6 bpmuser   bpmadm            256 May 30 21:27 Oracle
drwxr-xr-x    6 bpmuser   bpmadm            256 May 30 21:27 SQLServer
```

Scripts for creating database objects

The deployment environment wizard or `BPMConfig` utility can generate scripts for configuring database objects under `BPM_HOME/<DMGR_PROFILE>/dbscripts`. It is recommended to use scripts from this location to manually configure the database objects that are shown in Table 4-9.

Table 4-9   Scripts for configuring database objects

Database name	Database script location	Script name
Process Server Database	`/opt/ibm/WebSphere/AppServer/profiles/BPMTestDmgr01/dbscripts/BPM_TST/DB2/BPMDB2`	► `createProcedure_Advanced.sql` ► `createSchema_Advanced.sql`
Performance data warehouse	`/opt/ibm/WebSphere/AppServer/profiles/BPMTestDmgr01/dbscripts/BPM_TST/DB2/PDWDB2`	► `createSchema_Advanced.sql`
► SharedDb ► BpcDb ► MessagingDb	`/opt/ibm/WebSphere/AppServer/profiles/BPMTestDmgr01/dbscripts/BPM_TST/DB2/CMNDB2`	► `createSchema_Advanced.sql` ► `createSchema_Messaging.sql`
CellOnlyDb	`/opt/ibm/WebSphere/AppServer/profiles/BPMTestDmgr01/dbscripts/convios-lpCell01/DB2/CMNDB2`	► `createSchema_sAdvanced.sql`

Note: For this book, the authors used only three databases. SharedDb, BpcDb, MessagingDb, and CellOnlyDb share the same database. You can separate components into separate databases that are based on your requirements.

4.6 User registry

The user registry stores information that is used to authenticate users that are using basic authentication. Your choice of user registry is an essential consideration when you are planning your environment. You must configure WebSphere Application Server to use the user registry in your environment.

The user registry stores information that is used to authenticate users who are requesting access to IBM BPM. You can configure multiple user registry types under federated repositories. Most production deployments use a Lightweight Directory Access Protocol (LDAP) server. For small deployments that are contained on a single server, you can use a file-based user registry.

You can select any of the following registries for your user account repository:

► Federated Repositories
► Local operating system
► Stand-alone LDAP registry
► Stand-alone custom registry

WebSphere Application Server supports any LDAP directory server that supports the LDAP V3 specification. For the LDAP servers that are not listed that support the LDAP V3 specification, you must configure the LDAP server by using a custom LDAP feature with an appropriate filter. You also must obtain the appropriate filter information from your LDAP vendor.

IBM BPM and WebSphere Application Server support the following major LDAP directory servers:

► IBM Lotus® Domino® LDAP Server 7.0
► IBM Tivoli® Directory Server
► IBM Tivoli Directory Server for iSeries®
► IBM z/OS Integrated Security Services
► IBM z/OS.e Integrated Security Services
► Microsoft Active Directory
► Microsoft Active Directory Application Mode (ADAM)
► Novell eDirectory
► Sun Java System Directory Server

4.7 Simple Mail Transfer Protocol configuration

A Simple Mail Transfer Protocol (SMTP) server is required to send email notifications from the Process Server runtime environment. After a new installation, you must manually configure the SMTP server to enable mail notifications.

> **Note:** For fine-grained security, the supported user registries are federated repositories (file-based), federated repositories (LDAP), and stand-alone LDAP registries.

4.8 Proxy server and load balancer

In a network deployment environment, you can configure a routing server (such as IBM HTTP Server, WebSphere Application Server proxy server, or other similar servers) as a proxy server for workload balancing and failover purposes. Instead of incoming HTTP requests going directly to an application server, they go to the proxy server, which then distributes the requests across multiple application servers that perform the work.

You do not have to use IBM HTTP Server for load balancing. Instead, you can use any other type of routing server; for example, WebSphere Application Server proxy server, any other web server, reverse proxy server, or network layer IP sprayer.

IBM BPM and WebSphere Application Server support the following major proxy servers:

► Apache Server 2.2
► IBM Domino 9.09.0
► IBM HTTP Server
► Lotus Domino
► Microsoft Internet Information Services
► Sun Java System Web Server

> **Note:** For more information about supported proxy servers, see this website:
>
> http://www.ibm.com/support/docview.wss?uid=swg27006921#8.5

4.9 Web browser requirements

The Microsoft Internet Explorer Version 8.0 browser is deprecated in this release. You can use this browser with the IBM BPM products. However, the use of the Tab and Table Coach views, the new dashboards, and the associated Dashboard Toolkit are not supported. For these functions, it is advised that you use one of the other supported browser versions, including Microsoft Internet Explorer versions 9 and 10.

Google Chrome is supported on Microsoft Windows, Red Hat Enterprise Linux, SUSE Linux Enterprise Server, and Mac OS X operating systems.

Apple Safari on Apple iPad with iOS is supported for Process Portal and Coaches only. Apple Safari on Mac OS X is supported for Process Portal and Coaches only. As shown in Table 4-10, user interface components that are implemented with Adobe Flash are not available on this platform.

Table 4-10   Supported Web browser versions

Web browser	Versions
Microsoft Internet Explorer	10, 9.0, 8.0
Mozilla Firefox	3.6, ESR 10, 10.0, 11.0, 12.0, 13, 14, 15, 16, 17, ESR 17.0, 20
Google Chrome	20, 21, 22, 23, 24, 25, 26
Apple Safari on iPad (for process portal and Coaches only)	5.0, 5.1, 6.0

4.10 Software repository

Preparing a shared software repository of product binaries is essential when you have multiple products and multiple environments to configure. The repository is a directory that contains all the binary installation products and fixes. We created this repository to organize the installation job. It helps the installation process by making it easier to configure IBM Installation Manager during installations and updates.

For a successful IBM BPM deployment, you need a shared software repository for the following software components:

► Business Process Manager v8.5
► Mandatory fixes
► Proxy server
► Database
► User registry

4.10.1 Software binaries to download

eAssembly part numbers are required to download IBM Business Process Manager Standard Version 8.5 files from the IBM Passport Advantage® website. For more information about each operating system, including part number details for WebSphere supplemental products, such as, IBM HTTP Server, see the following websites:

► AIX:

http://www.ibm.com/support/docview.wss?uid=swg24034319

► Linux:

http://www.ibm.com/support/docview.wss?uid=swg24034318

► Solaris:

http://www.ibm.com/support/docview.wss?uid=swg24034317

► Windows:

http://www.ibm.com/support/docview.wss?uid=swg24034316

4.10.2 Required interim fixes for IBM BPM 8.5

This section describes the interim fixes, or APAR[1], that are required at the time of this writing for the Version 8.5.0.0 products, as shown in Table 4-11 on page 86. You can download the fixes from IBM Fix Central at this website:

http://www.ibm.com/support/docview.wss?uid=swg24035108

---

[1] An Authorized Program Analysis Report (APAR) is a formal report to IBM Development of a problem that is caused by a suspected defect in a current release of an IBM program. If IBM Development can confirm the existence of the defect, the APAR is updated with any known workarounds. They also might indicate which future release, if any, of the IBM programs they intend to target for a formal fix to the defect and whether a Program Temporary Fix (PTF) is planned. The APAR is then published so that it is visible to supported customers.

Table 4-11   Required fixes for IBM BPM v8.5

APAR number	Abstract
JR46829	Process Center console displays incorrect server host name.
JR46828	IBM BPM URLs do not work with WebSEAL.
JR46851	Memory leak during advanced application installation, which leads to OutOfMemory error.

4.11 Planning human resources

Prepare a list of your current IT personnel and subject matter experts who are available during installation and configuration. Determine whether you have the required expertise to install and maintain IBM BPM and manage your databases. Make sure that the appropriate users have user IDs with the authorizations to successfully install all products and files.

Table 4-12 lists the main installation tasks and the subject matter experts that are needed during IBM BPM infrastructure setup.

Table 4-12   Subject matter experts that are needed during IBM BPM installation

Installation tasks (high level)	IBM BPM/ WebSphere Application Server Admin	System Admin	Database Admin	Network Admin	LDAP Admin
Preparation	✓	✓	✓	✓	✓
Install product and fixes	✓	x	x	x	x
Create profiles	✓	x	x	x	x
Generate DB scripts	✓	x	x	x	x
Run DB scripts	x	x	✓	x	x
Create deployment environment	✓	x	✓	x	x
Configuring the user registry and SMTP server	✓	✓	x	✓	✓

Installation tasks (high level)	IBM BPM/ WebSphere Application Server Admin	System Admin	Database Admin	Network Admin	LDAP Admin
Configuring proxy server / load balancer	✓	✓	x	✓	✓
Verification	✓	✓	✓	✓	✓

4.12 Known issues

The following issues are known with version 8.5 of the product:

► IBM BPM V8.5 does not work with Java 7 that can be optionally installed with WebSphere Application Server ND V8.5. For more information, see this website:

http://www.ibm.com/support/docview.wss?uid=swg21639640

► If a user's authentication credentials expire while Process Portal is used, the SystemOut.log file on the server might contain the following message: "A user authenticated as anonymous has attempted to access a session owned by user." This message is only informational; it does not indicate that a problem exists or that the server is under attack. No actions are required by the user or by the administrator. For more information, see this website:

http://www-01.ibm.com/support/docview.wss?uid=swg21638887

► If your source environment uses active and historical LTPA keys, after you migrate to IBM BPM, running a Business Process Choreographer task instance that uses historical keys causes an error. For more information, see this website:

http://www-01.ibm.com/support/docview.wss?uid=swg21638908

► A collaboration session between two users in Process Portal stops when the cluster member that hosts the session is shut down. For more information, see this website:

http://www-01.ibm.com/support/docview.wss?uid=swg21639441

► When you try to manipulate a large set of process instances by using the web Process Inspector in the Process Admin Console, you receive an error. For more information, see this website:

http://www-01.ibm.com/support/docview.wss?uid=swg21637715

- ► After IBM BPM is installed or after the `BPMConfig` command is run, shortcuts (for example, for starting the Quick Start console or the product documentation), do not show up in a non-English locale. For more information, see this website:

  http://www-01.ibm.com/support/docview.wss?uid=swg21639567

- ► You cannot perform a typical installation of IBM BPM or IBM Integration Designer on Linux or UNIX based platforms because the path for IBM Installation Manager contains spaces. For more information, see this website:

  http://www-01.ibm.com/support/docview.wss?uid=swg21639220

- ► After the successful installation of IBM BPM on Microsoft Windows Server 2012 or Windows 8, when you click **Start** → **Programs** → **IBM** → **Business Process Manager 8.5**, the Quick Start shortcut is missing from the displayed menu. Other user-specific shortcuts, such as, the profile shortcuts, might be missing. For more information, see this website:

  http://www-01.ibm.com/support/docview.wss?uid=swg21639358

4.13 Conclusion

In this chapter, you learned about aspects of preparing your environment for an installation of IBM Business Process Manager V8.5.

5

Deploying an IBM Business Process Manager environment

This chapter provides a detailed step-by-step guide for building your IBM Business Process Manager (BPM) environment. It takes you through the required database setup process and describes the IBM BPM installation that uses the user interface and command-line utilities.

Also described is how to create profiles by using the `manageprofile` command-line utility, and how to configure the system by using the deployment environment wizard. Finally, the new BPMConfig utility also is described.

This chapter includes the following topics:

► Preparing for deployment
► Creating and validating databases
► Installing IBM BPM binaries
► Configuring the IBM BPM environment
► Installing IBM Process Designer

5.1 Preparing for deployment

In this release of IBM BPM, the installation procedure is greatly simplified in the following ways:

► Reduced and consolidated databases and schemas.

► Consolidated Service Integration Bus configuration.

► Simplified profile creation without any database dependency.

► Reduced number of configuration steps in the deployment environment wizard.

The IBM BPM product is available in the following configurations:

► Advanced
► Standard
► Express

In this Redbooks publication, we do not describe the installation of the Express configuration of the product because the configuration always is straight-forward and targeted for personal workstation installations for learning and prototype development purposes.

Before IBM BPM is installed, ensure that all the prerequisites are met (for more information, see Chapter 4, "Preparing your infrastructure" on page 59). We saw many cases when a correctly installed product encountered various problems because of officially documented prerequisites were not met.

There are always several official procedures and tools that can be used to install the product, which makes challenging to identify the sequence of the steps you must perform for the particular configuration and procedure that you selected. IBM engineering and documentation teams introduced in IBM BPM 8.0 the new documentation feature the *IBM Business Process Manager Interactive Installation and Configuration Guide*, which guides you through the steps of installing and configuring IBM BPM. The guide is available at this website:

http://pic.dhe.ibm.com/infocenter/dmndhelp/v8r5m0/index.jsp?topic=/com.ibm.wbpm.imuc.doc/topics/bpm_roadmap_form.jsp

However, even with the new interactive guide, there are still many installation options and tools from which to choose.

In this chapter, we describe the following installation options:

▸ Option 1

   Option 1 is the most universal and straight-forward. The procedure should be easy to apply to any type of installation (from notebook to multi-node production cluster) and any operating system or database server.

▸ Option 2

   This option uses the new tool that is called *BPMConfig,* which was introduced in IBM BPM V8.5. It simplifies the installation and configuration of multiple similar multi-node environments.

To stay universal, both installation options follow the Custom installation type and use the command-line interface (CLI). For more information, see *Choosing the type of installation* at this website:

http://pic.dhe.ibm.com/infocenter/dmndhelp/v8r5m0/index.jsp?topic=/com.
ibm.wbpm.imuc.doc/topics/cpln_info_type.html

In those situations where it is possible to use the GUI interface, we outline this as an option.

To stay simple, we configure only parameters that must be configured, with which the product can use default values for the rest of parameters. We describe how to customize other parameters if you have special requirements; for example, strict naming conventions.

We use the Remote Messaging and Remote Support topology because it is the recommended topology. The same procedures can be used with the second officially supported by IBM BPM 8.5 topology, the single cluster. However, this topology is most often used in memory-constrained environments and is not recommended for production use.

We also assume that a 64-bit operating system is used. While still possible, it is not recommended to install the product on a 32-bit operating system.

The installation procedures apply to Process Center and Process Server installations, with some minor differences that we highlight where applicable.

From a database perspective, we prefer to minimize database administrator (DBA) involvement during installation to the creation of the databases and schemas only; the population of the tables is achieved by using the installation tools and do not require manual intervention.

At a high level, IBM BPM installation consists of the following logical steps:

1. Create and validate databases.

2. Install IBM BPM binaries:
   a. Install core offerings.
   b. Install fixes.

3. Configure the IBM BPM environment:
   a. Create WebSphere Application Server profiles.
   b. Create the IBM BPM deployment environment:
      i. Initialize databases.
      ii. Bootstrap databases.

Both of our installation options have the first two high-level steps in common.

In IBM BPM v8.5, not all logical steps require a command to be run. For example, the BPMConfig utility (Option 2) performs all of the IBM BPM environment configuration steps automatically. However, we believe it is important to understand what is going on behind the scenes, especially if something goes wrong and you need to troubleshoot.

We now review these individual logical steps, starting with the creating and validating databases.

5.2 Creating and validating databases

IBM BPM is a database-dependent application. Therefore, it is extremely important to have the databases created correctly and proper permissions granted to the database users before you begin installation.

Because in most enterprise-level installations the databases must be created by DBAs, it is important to communicate the following information to the DBA:

► Database considerations (for example, specific database type, vendor, and such)

► Database privileges

For more information, see 4.5, "Database preparation" on page 71.

Incorrectly created or configured databases often cause issues during or after the installation. Before you start the installation, we recommend that the databases that are created by the DBA be validated. Such validation can be performed with an SQL client tool of your choice. Try to login by using each database user ID to each database that was created and then try to create a table and a view (Common and Performance Data Warehouse databases).

The idea is to verify that you have all of the required databases permissions (which can vary by databases type) so that the installation routines from both options can start and bootstrap the databases.

5.3 Installing IBM BPM binaries

This section describes how to install the IBM BPM product binaries. Complete the following steps to prepare for the binary installation:

> **Valid for both options:** The instructions that are outlined in this chapter are common for both installation options.

1. Download the installation packages and extract them into single folders. In our example scenario, the packages were downloaded to the following locations, depending on the operating system you are using:

   – Windows:

     `D:\IBM\bpminstall\bpmAdv.dvd.8500.windows.x86`

   – UNIX based:

     `/opt/IBM/bpminstall/bpmAll.dvd.8500.Linux.x86`

2. Before you start the installation, make sure that you have write permission on the folder where you are installing the product.

In the next part of the process, we verify whether we require any fixes during installation. Then, we describe two installation options, one that uses the command line and the other that uses the GUI.

> **Implication for a clustered environment:** When a clustered environment is configured on multiple machines, install the IBM BPM binaries on all machines before the IBM BPM environment is configured (for more information, see 5.4, "Configuring the IBM BPM environment" on page 121).

5.3.1 Identifying required fixes

Before the installation is started, it is recommended to consult the official documentation for the list of mandatory and recommended fixes (fix pack or interim fixes).

The zero-day mandatory interim fixes for IBM BPM v8.5 are listed in following technote:

http://www.ibm.com/support/docview.wss?uid=swg24035108

In general, it is a common practice to install the latest fix pack and recommended interim fixes. However, not all interim fixes are listed as recommended. For more information, see the IBM Support Fix Central at this website:

https://www.ibm.com/support/fixcentral/options

Select your version of the product and investigate whether you might be affected by the problems that are addressed by the optional interim fixes that are available. However, be careful you install optional fixes because some of them have special prerequisites. Consider checking with IBM Support whether it is safe and what is required to install a particular optional fix.

Download fixes that are identified and extract them into individual folders that are named as the file name, but without the `.zip` extension. For example, assume you downloaded the IBM BPM 8.5 mandatory fixes and extracted them into the following directories:

► Windows:

```
D:\IBM\bpminstall\fixes\8.5.0.0-WS-BPM-IFJR46851
D:\IBM\bpminstall\fixes\8.5.0.0.WS-BPMPSPCPD-IFJR46828
D:\IBM\bpminstall\fixes\8.5.0.0.WS-BPMPSPCPD-IFJR46829
```

► UNIX based:

```
/opt/IBM/bpminstall/fixes/8.5.0.0-WS-BPM-IFJR46851
/opt/IBM/bpminstall/fixes/8.5.0.0.WS-BPMPSPCPD-IFJR46828
/opt/IBM/bpminstall/fixes/8.5.0.0.WS-BPMPSPCPD-IFJR46829
```

Download fixes manually: The graphical Installation Manager can download the fixes over the Internet from the IBM repository. However, it is recommended to download the fixes manually and reuse them during subsequent installations.

> **Note:** It is recommended to install the fixes before you configure your IBM
> BPM environment (for more information, see 5.4, "Configuring the IBM BPM
> environment" on page 121). Most fixes have special post-installation steps
> that are not required if the fix is installed before the IBM BPM environment is
> configured.

5.3.2 Command-line installation

To simplify and parameterize installation procedures when the command line is
used, we suggest you define and use operating system-level environment
variables. This approach works for all Windows and UNIX based (Linux, AIX, and
Solaris) operating systems. However, for UNIX based operating systems, we
recommend the use of the bash command-line interpreter, which should be
available in most modern UNIX based operating systems.

For the command-line installation, we follow these steps:

1. Set binary-scoped environment variables.
2. Installing IBM Installation Manager.
3. Installing core offerings.
4. Installation fixes.

Set binary-scoped environment variables

During the installation, we used the following environment variables (you should
change the variable values as needed) as placeholders and to simplify
command-line options:

► Windows:

```
set BPM_INST=D:\IBM\bpminstall\bpmAll.dvd.8500.windows.x86
set BPM_FIX=D:\IBM\bpminstall\fixes
set IM_HOME=D:\IBM\IM
set BPM_HOME=D:\IBM\BPM\v8.5
```

► UNIX based:

```
export BPM_INST=/opt/IBM/bpminstall/bpmAll.dvd.8500.Linux.x86
export BPM_FIX=/opt/IBM/bpminstall/fixes
export IM_HOME=/opt/IBM/IM
export BPM_HOME=/opt/IBM/BPM/v8.5
```

Maximum Windows path length: Windows operating systems have a maximum path length limitation of 256 characters, so it is important to set the BPM_HOME path as short as possible. It is also recommended that IBM BPM be installed on Windows on a non-system disk. For more information about the path length limitation, see this website:

http://msdn.microsoft.com/en-us/library/windows/desktop/aa365247(v=vs.85).aspx#maxpath

Important: When you are copying commands from this IBM Redbooks publication, it is recommended that you paste the commands into a text editor (for example, notepad or gedit) first, format accordingly, make sure that there are no special non-latin1 symbols that are copied, and only after that should you paste the command into the command window to run.

We assume that the installation is performed as a non-admin user (recommended). Make sure that the user account, which is used to install the product, has appropriate permissions for the folders that were specified.

For more information about the differences between admin and non-admin installations, see this website:

http://pic.dhe.ibm.com/infocenter/wasinfo/v8r5/topic/com.ibm.websphere.installation.base.doc/ae/cins_nonroot.html

Installing IBM Installation Manager

IBM BPM is installed by using the IBM Installation Manager, which is an Eclipse-based product, so each installation package that is installed by Installation Manager is an Eclipse repository.

To install Installation Manager for your respective platform, use the following commands:

► Windows:

```
cd %BPM_INST%
IM\tools\imcl install com.ibm.cic.agent -accessRights nonAdmin
-acceptLicense -installationDirectory %IM_HOME% -repositories
%BPM_INST%/IM/repository.config -showVerboseProgress -log
IMSilentInstall.log
```

► UNIX based:

```
cd $BPM_INST
./IM/tools/imcl install com.ibm.cic.agent -accessRights nonAdmin
-acceptLicense -installationDirectory $IM_HOME -repositories
$BPM_INST/IM/repository.config -showVerboseProgress -log
IMSilentIns-tall.log
```

On successful completion, you see a message similar to the one that is shown in the following example:

```
Installed com.ibm.cic.agent_1.6.2000.20130301_2248 to the
/opt/ibm/WebSphere/InstallationManager/eclipse directory.
```

Installing core offerings

Install IBM BPM silently by using the Installation Manager command line (`imcl`) installation command. Complete the following steps:

1. Read and accept the license terms before you begin the installation. Adding `-acceptLicense` to the command line means that you accept all licenses.

2. Run the following command:

```
imcl install list_of_product_IDs -acceptLicense
-installationDirectory location -repositories repository
-showVerboseProgress -log logName.log
```

You can use the same command for Windows and UNIX based installations. If you are running Windows 7, Windows Vista, or Windows Server 2008, start your command prompt by right-clicking and selecting **Run as administrator**.

The following command parameters are available:

– `list_of_product_IDs` is a list of the IDs for the products and features that you want to install. The syntax is `product ID,` `feature,` with multiple products separated by spaces (see Table 5-1).

– `location` is the path to the directory where you want to install the products. We defined the location earlier by using the BPM_HOME environment variable. IBM BPM supports the installation of the product into an existing supported instance of WebSphere Application Server Network Deployment; however, we do not describe the scenario here.

– `repository` is the path to the repository where you extracted the files, which is one of the following directories:

```
$BPM_INST/repository/repos_64bit
$BPM_INST/repository/repos_32bit
```

As noted earlier, we suggest installing 64 bit, if possible.

It is possible to specify more than one repository by separating the repository locations with commas. For example, the latest fix pack or mandatory interim fixes can be installed with the product. However, we prefer to install them separately to simplify troubleshooting of installation problems that might occur.

– `logName` is the name of the log file to record messages and results.

Table 5-1 describes the `product ID, feature` that is available for Business Process Manager.

Table 5-1   List of the product IDs and features

Product	Product ID	Feature and Description
IBM BPM Advanced	com.ibm.bpm.ADV.v85	► AdvancedProcessCenter ► AdvancedProcessServer.NonProduction - Test, staging, or development use ► AdvancedProcessServer.Production - Production use
IBM BPM Standard	com.ibm.bpm.STD.v85	► StandardProcessCenter ► StandardProcessServer.NonProduction Test, staging, or development use ► StandardProcessServer.Production - Production use
WebSphere Application Server Network Deployment	com.ibm.websphere.ND.v85	► core.feature: Required. WebSphere Application Server core content ► ejbdeploy: Required. Pre-Enterprise JavaBeans (EJB) 3.0 modules ► thinclient: Required. Stand-alone thin clients and resource adapters ► embeddablecontainer: Embeddable EJB container ► samples: Sample applications feature ► com.ibm.sdk.6_64bit: 64-bit SDK This feature can be selected only on a 64-bit system. You must specify either this feature or com.ibm.sdk.6_32bit ► com.ibm.sdk.6_32bit: 32-bit software development kit (SDK). You must specify either this feature or com.ibm.sdk.6_64bit

On successful completion, you see a message similar to the one that is shown in Example 5-1.

Example 5-1   Sample output message after a successful installation

```
Validating eclipse configuration for IBM WebSphere Application
Server V8.5.
Installed com.ibm.websphere.ND.v85_8.5.2.20130321_2003 to the
/opt/ibm/WebSphere/AppServer directory.
Installed com.ibm.bpm.ADV.v85_8.5.0.20130404_0357 to the
/opt/ibm/WebSphere/AppServer directory.
```

3. Verify that the product and versions were installed by using the `versionInfo` utility, as shown in the following examples:

   – Windows:

   ```
   cd %BPM_HOME%
   bin\versionInfo.bat
   ```

   – UNIX based:

   ```
   cd $BPM_HOME
   ./bin/versionInfo.sh
   ```

Typical example installation commands

Example commands for some of the common configurations are shown in the following examples.

Watch your environment: The command should be run in the same command-line window where the environment variables where initialized.

How to enter the command: The actual command should be a single-line command; therefore, you must edit the command in a text editor accordingly before it is pasted into command-line window.

Example 5-2 on page 100 shows the installation command for a Standard Process Center on Windows.

Example 5-2   Windows: Standard Process Center

```
cd %IM_HOME%
eclipse\tools\imcl install com.ibm.bpm.STD.v85,StandardProcessCenter
com.ibm.websphere.ND.v85,core.feature,ejbdeploy,thinclient,embeddableco
ntainer,samples,com.ibm.sdk.6_64bit -acceptLicense
-installationDirectory %BPM_HOME% -sharedResourcesDirectory
%IM_HOME%/../IMShared -repositories
%BPM_INST%/repository/repos_64bit/repository.config
-showVerboseProgress -log bpm85silentinstall.log
```

Example 5-3 shows the installation command for an Advanced NonProduction Process Server on Windows.

Example 5-3   Windows: Advanced NonProduction Process Server

```
cd %IM_HOME%
eclipse\tools\imcl install
com.ibm.bpm.ADV.v85,AdvancedProcessServer.NonProduction
com.ibm.websphere.ND.v85,core.feature,ejbdeploy,thinclient,embeddableco
ntainer,samples,com.ibm.sdk.6_64bit -acceptLicense
-installationDirectory %BPM_HOME% -sharedResourcesDirectory
%IM_HOME%/../IMShared -repositories
%BPM_INST%/repository/repos_64bit/repository.config
-showVerboseProgress -log bpm85silentinstall.log
```

Example 5-4 shows the installation command for an Advanced Process Center on UNIX.

Example 5-4   UNIX: Advanced Process Center

```
cd $IM_HOME
./eclipse/tools/imcl install com.ibm.bpm.ADV.v85,AdvancedProcessCenter
com.ibm.websphere.ND.v85,core.feature,ejbdeploy,thinclient,embeddableco
ntainer,samples,com.ibm.sdk.6_64bit -acceptLicense
-installationDirectory $BPM_HOME -sharedResourcesDirectory
$IM_HOME/../IMShared -repositories
$BPM_INST/repository/repos_64bit/repository.config -showVerboseProgress
-log bpm85silentinstall.log
```

Example 5-5 shows the installation command for an Advanced Production Process Server on UNIX.

Example 5-5   UNIX: Advanced Production Process Server

```
cd $IM_HOME
./eclipse/tools/imcl install
com.ibm.bpm.ADV.v85,AdvancedProcessServer.Production
com.ibm.websphere.ND.v85,core.feature,ejbdeploy,thinclient,embeddableco
ntainer,samples,com.ibm.sdk.6_64bit -acceptLicense
-installationDirectory $BPM_HOME -sharedResourcesDirectory
$IM_HOME/../IMShared -repositories
$BPM_INST/repository/repository.config -showVerboseProgress -log
bpm85silentinstall.log
```

Example 5-6 on page 101 shows the installation command for a Standard Production Process Server on UNIX.

Example 5-6   UNIX: Standard Production Process Server

```
cd $IM_HOME
./eclipse/tools/imcl install
com.ibm.bpm.STD.v85,StandardProcessServer.Production
com.ibm.websphere.ND.v85,core.feature,ejbdeploy,thinclient,embeddableco
ntainer,samples,com.ibm.sdk.6_64bit -acceptLicense
-installationDirectory $BPM_HOME -sharedResourcesDirectory
$IM_HOME/../IMShared -repositories
$BPM_INST/repository/repos_64bit/repository.config -showVerboseProgress
-log bpm85silentinstall.log
```

Installation fixes

For the following installation of fixes, we assume that you already identified, downloaded, and extracted the required fixes (for more information, see 5.3.1, "Identifying required fixes" on page 94).

> **Installing a fix into an existing deployment:** If you install the fixes into an existing and fully configured IBM BPM 8.5 deployment, make sure that you stop all clusters, node agents, and deployment managers. Back up the entire BPM_HOME folder and all databases as a precaution.

Complete the following steps:

1. Run the following command line (**imcl**) to install the fixes:

```
$IM_HOME/eclipse/tools/imcl install OFFERING_ID1 OFFERING_ID2
FIX_ID1 FIX_ID2 -acceptLicense -installationDirectory $BPM_HOME
-repositories
OFFERING_ID1_REPO_DIR,OFFERING_ID2_REPO_DIR,FIX_ID1_REPO_DIR,FIX_ID2
_REPO_DIR -showVerboseProgress -log fixinstall.log
```

Where `OFFERING_ID`s are the IDs from Table 5-1 on page 98.

`FIX_ID`s can be identified by inspecting the `repository.xml` file inside each `ifix` `.zip` file where the IDs are specified similar to the following example:

```
<repositoryDigest>
   <repository>
     <fix id='FIX_ID1'>
     <fix id='FIX_ID2'>
  <repository>
<repositoryDigest>
```

The `*REPO_DIR`s are folders where `repository.xml` files of the individual fixes are located.

> **More than one fix:** There can be more than one fix in the repository. In this case, the `repository.xml` file is under a combined subfolder that is inside the fix folder.

For example, to install IBM BPM 8.5 mandatory fixes, the following commands must be run. For more information, see "Set binary-scoped environment variables" on page 95.

The Windows example is shown in Example 5-7.

Example 5-7   Sample imcl command to install mandatory fixes on Windows

```
cd %BPM_FIX%
%IM_HOME%\eclipse\tools\imcl install 8.5.0.0-WS-BPM-IFJR46851
8.5.0.0-WS-BPM-IFJR46828 8.5.0.0-WS-BPMPCPD-IFPD46828
8.5.0.0-WS-BPM-IFJR46829 8.5.0.0-WS-BPMPCPD-IFPD46829 -acceptLicense
-installationDirectory %BPM_HOME% -repositories
8.5.0.0-WS-BPM-IFJR46851,8.5.0.0.WS-BPMPSPCPD-IFJR46828\combined,8.5
.0.0.WS-BPMPSPCPD-IFJR46829\combined -showVerboseProgress -log
fixinstall.log
```

The UNIX based example is shown in Example 5-8.

Example 5-8   Sample imcl command to install mandatory fixes on UNIX

```
cd $BPM_FIX
$IM_HOME/eclipse/tools/imcl install 8.5.0.0-WS-BPM-IFJR46851
8.5.0.0-WS-BPM-IFJR46828 8.5.0.0-WS-BPMPCPD-IFPD46828
8.5.0.0-WS-BPM-IFJR46829 8.5.0.0-WS-BPMPCPD-IFPD46829 -acceptLicense
-installationDirectory $BPM_HOME -repositories
8.5.0.0-WS-BPM-IFJR46851,8.5.0.0.WS-BPMPSPCPD-IFJR46828/combined,8.5
.0.0.WS-BPMPSPCPD-IFJR46829/combined -showVerboseProgress -log
fixinstall.log
```

2. Upon successful completion of the `ifix` installation, you should see a message that is similar to the one that is shown in Example 5-9.

Example 5-9   Sample messages that are seen after successful installation of ifixes

```
.
Installed 8.5.0.0-WS-BPM-IFJR46851_8.5.0.20130613_0927 to the
D:\IBM\BPM\v8.5 directory.
Installed 8.5.0.0-WS-BPM-IFJR46828_8.5.0.20130612_1222 to the
D:\IBM\BPM\v8.5 directory.
Installed 8.5.0.0-WS-BPMPCPD-IFPD46828_8.5.0.20130612_1228 to the
D:\IBM\BPM\v8.5 directory.
Installed 8.5.0.0-WS-BPM-IFJR46829_8.5.0.20130612_1231 to the
D:\IBM\BPM\v8.5 directory.
Installed 8.5.0.0-WS-BPMPCPD-IFPD46829_8.5.0.20130612_1235 to the
D:\IBM\BPM\v8.5 directory.
```

3. Validate the installed fixes by running the following commands:

   – Windows:

   ```
   %BPM_HOME%\bin\versionInfo.bat –ifixes
   %BPM_HOME%\bin\versionInfo.bat -fixpacks
   ```

   – UNIX based:

   ```
   $BPM_HOME/bin/versionInfo.sh –ifixes
   $BPM_HOME/bin/versionInfo.sh -fixpacks
   ```

For more information about installing fix packs and interim fixes, see this website:

http://pic.dhe.ibm.com/infocenter/dmndhelp/v8r5m0/index.jsp?topic=/com.
ibm.wbpm.imuc.doc/topics/updating.html

5.3.3 Graphical user interface

The CLI can save time when the same commands must be run on multiple machines. However, it is inconvenient when a single environment is installed, especially on the systems that have a GUI available.

In this section, we use the GUI to describe the following tasks:

► Install core offerings
► Install fixes

Install core offerings

Browse to the folder where the IBM BPM installation binaries were extracted (defined via BPM_INST environment variable) and run `launchpad64.exe`.

> **Security check on Windows:** On Windows, when prompted with a security warning (multiple warnings), clear the Always ask before opening this file option and then click **Run**.

Complete the following steps:

1. Select **Custom installation**, as shown in Figure 5-1.
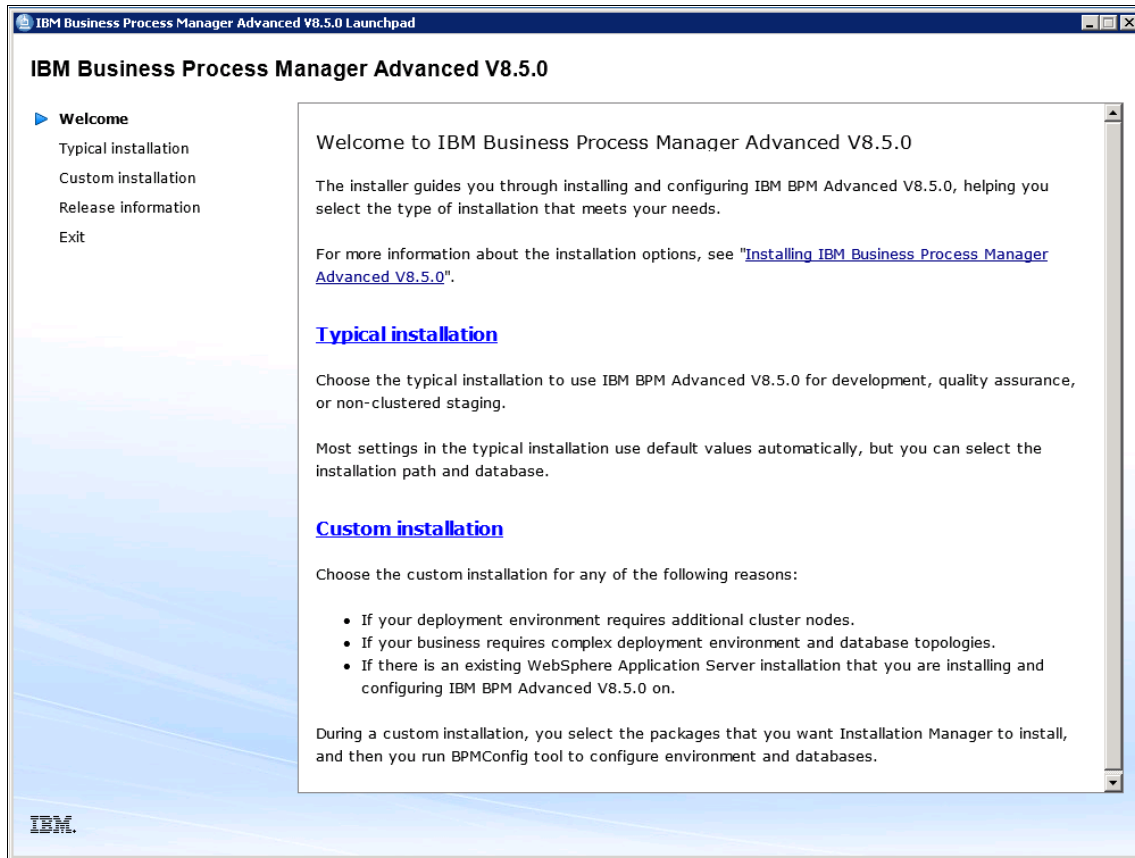
Figure 5-1   Install types available

2. Clear the Install as administrative user option and click **Install** to start IBM Installation Manager, as shown in Figure 5-2.
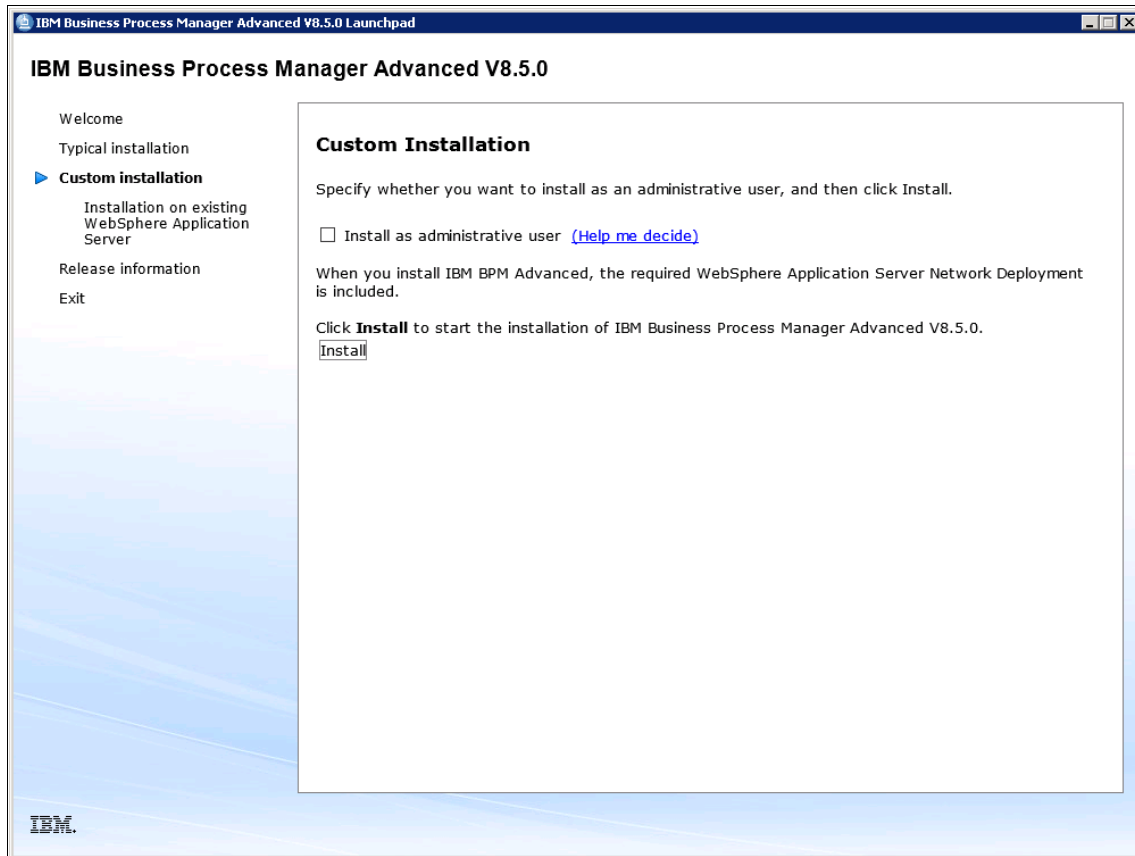
Figure 5-2   Custom installation

3. Ensure that all packages except DB2 Express are selected. Click **Next**, as shown in Figure 5-3.
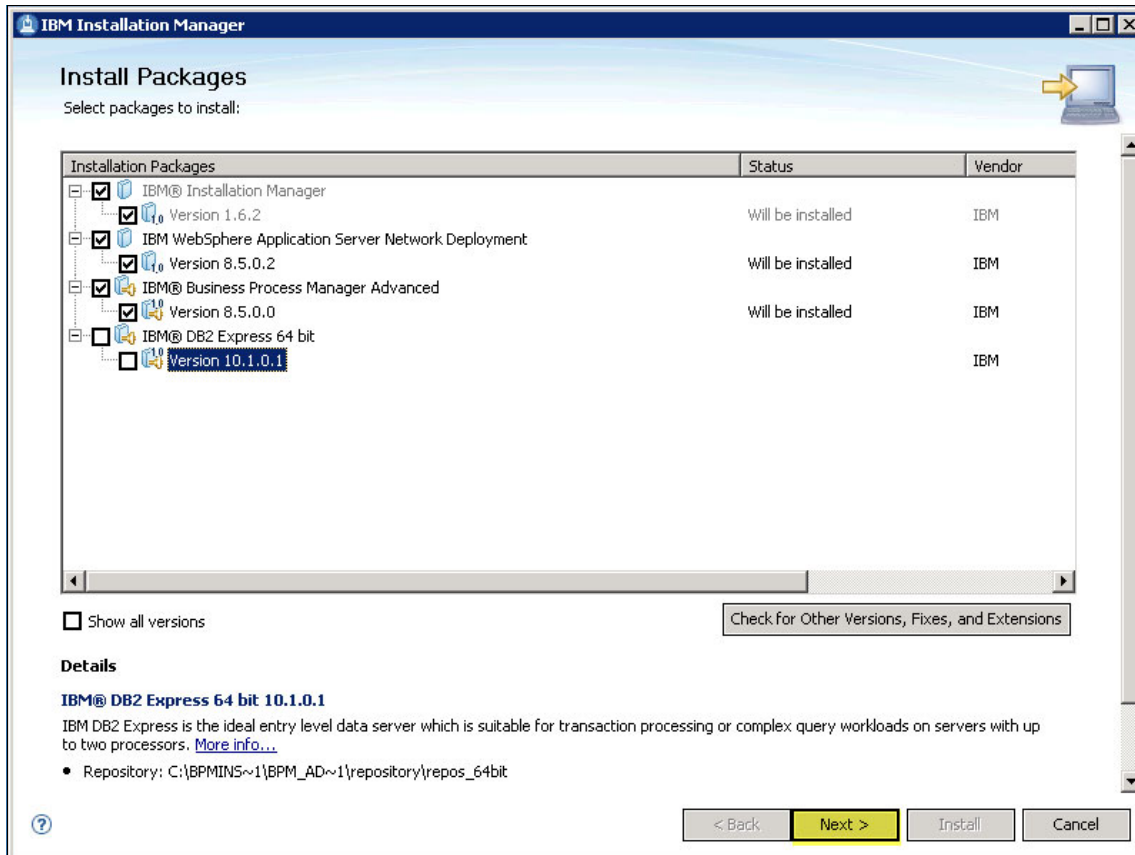
Figure 5-3   List of install packages

4. Keep all recommended fixes selected and click **Next**, as shown in Figure 5-4.
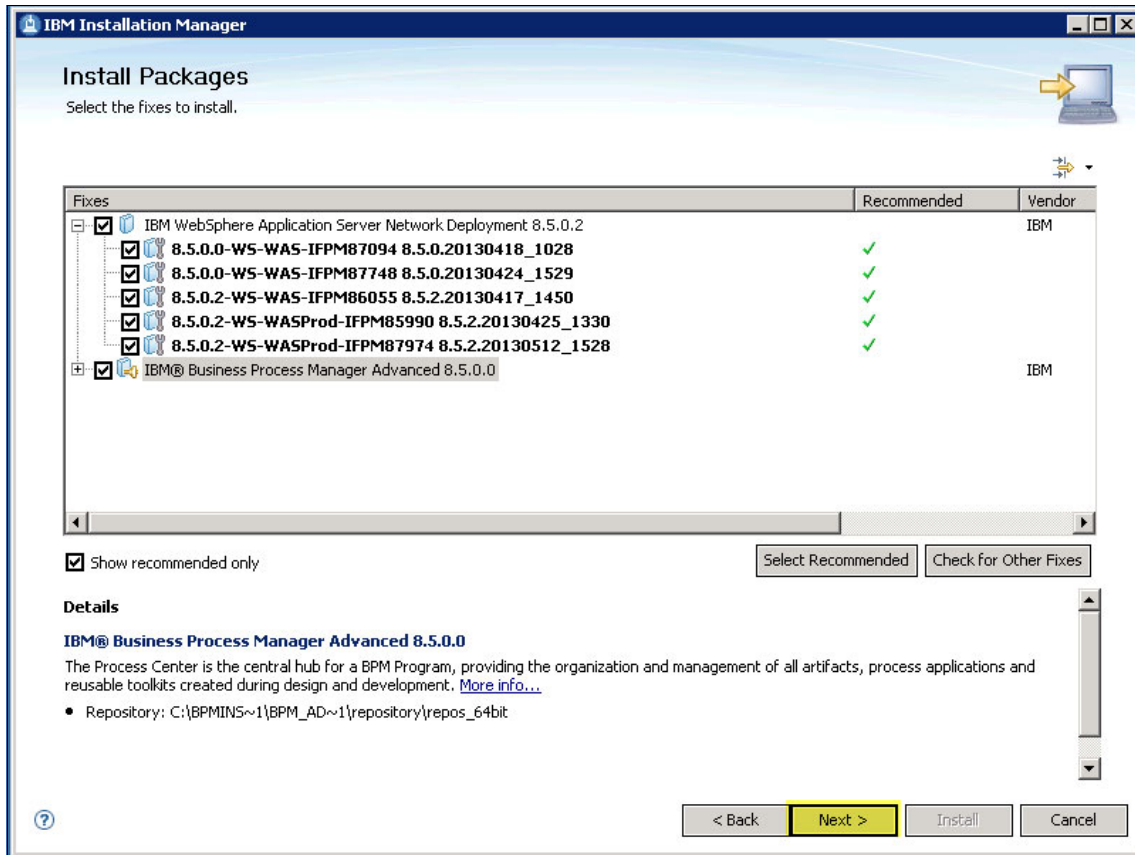
Figure 5-4   List of iFixes

5. Read the license agreements and then select the I accept the terms in the license agreements option. Click **Next**.

6. Set Installation Manager and Shared Resource installation directories accordingly. Make sure that the user who is running the installation has permissions to write to those directories. Select a common directory to install all IBM products (for example, `D:\IBM` or `/opt/IBM`) and grant required permissions before the installation is started. Click **Next**, as shown in Figure 5-5.
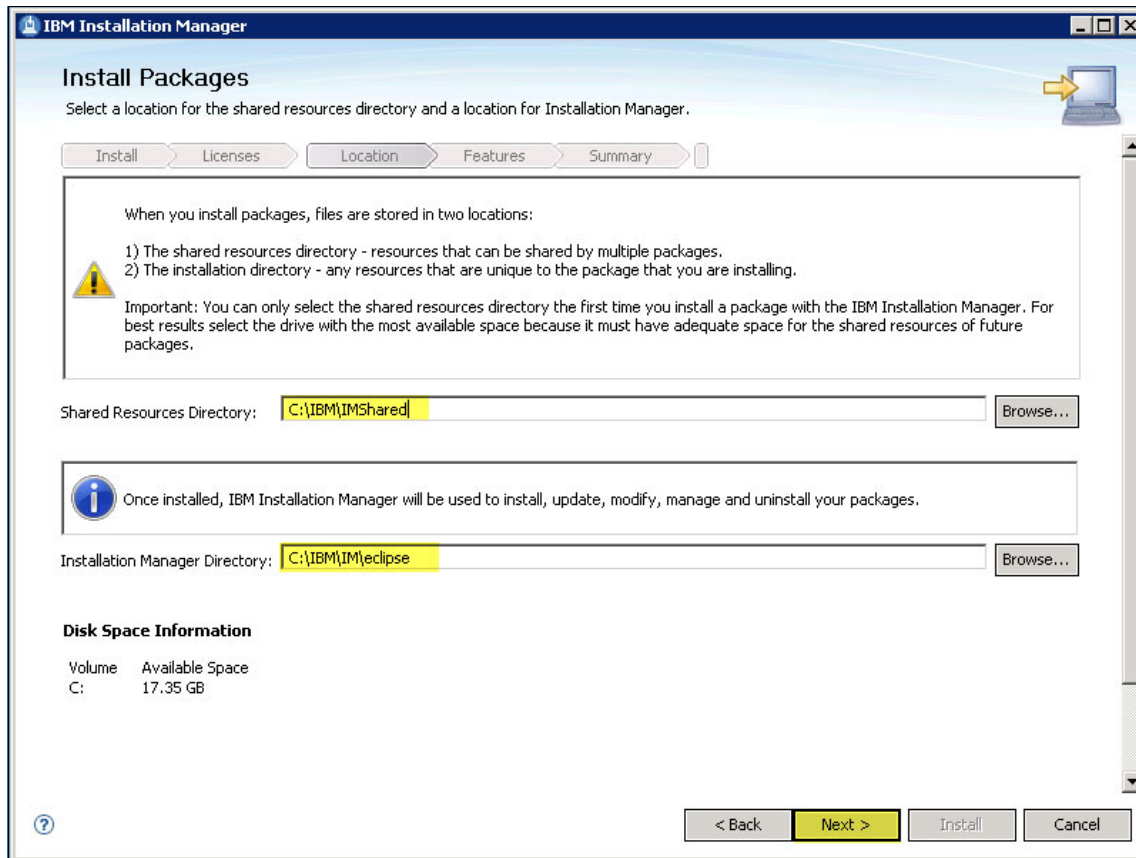
Figure 5-5   Location of install directories

7. Set the IBM BPM installation directory and click **Next**, as shown in Figure 5-6.
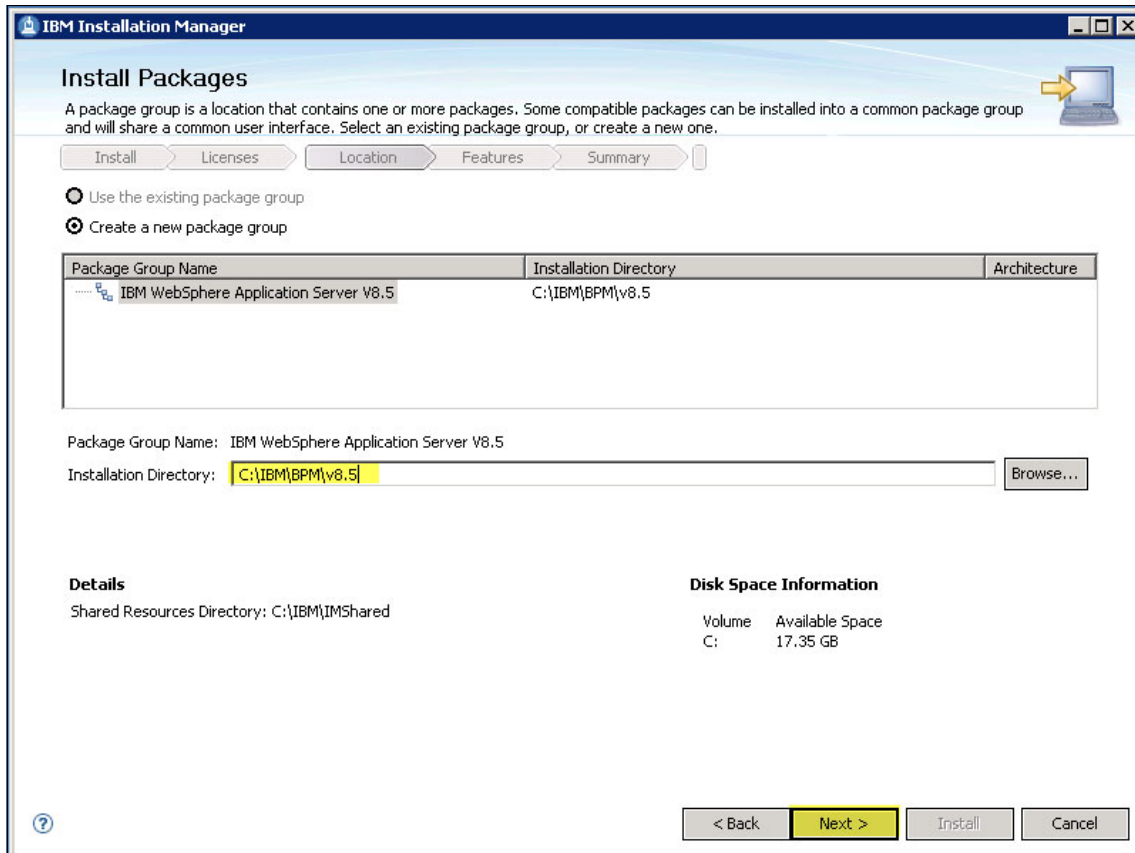
Figure 5-6   Install location for IBM BPM

8. Expand Translations Supported by Only Some Packages and select the needed languages. Click **Next**, as shown in Figure 5-7.
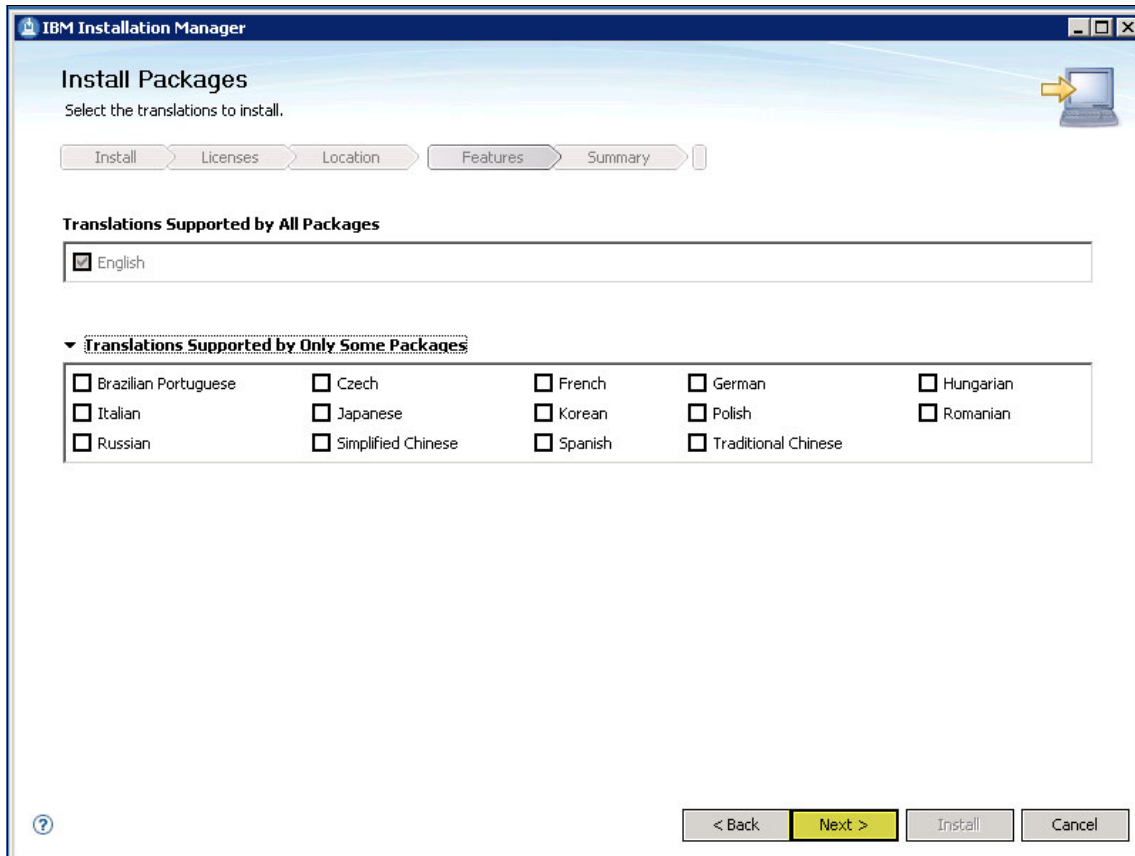
Figure 5-7   Language selection

9. Expand **IBM Business Process Manager** and select the appropriate feature (see Table 5-1 on page 98 for available features). Click **Next**, as shown in Figure 5-8.
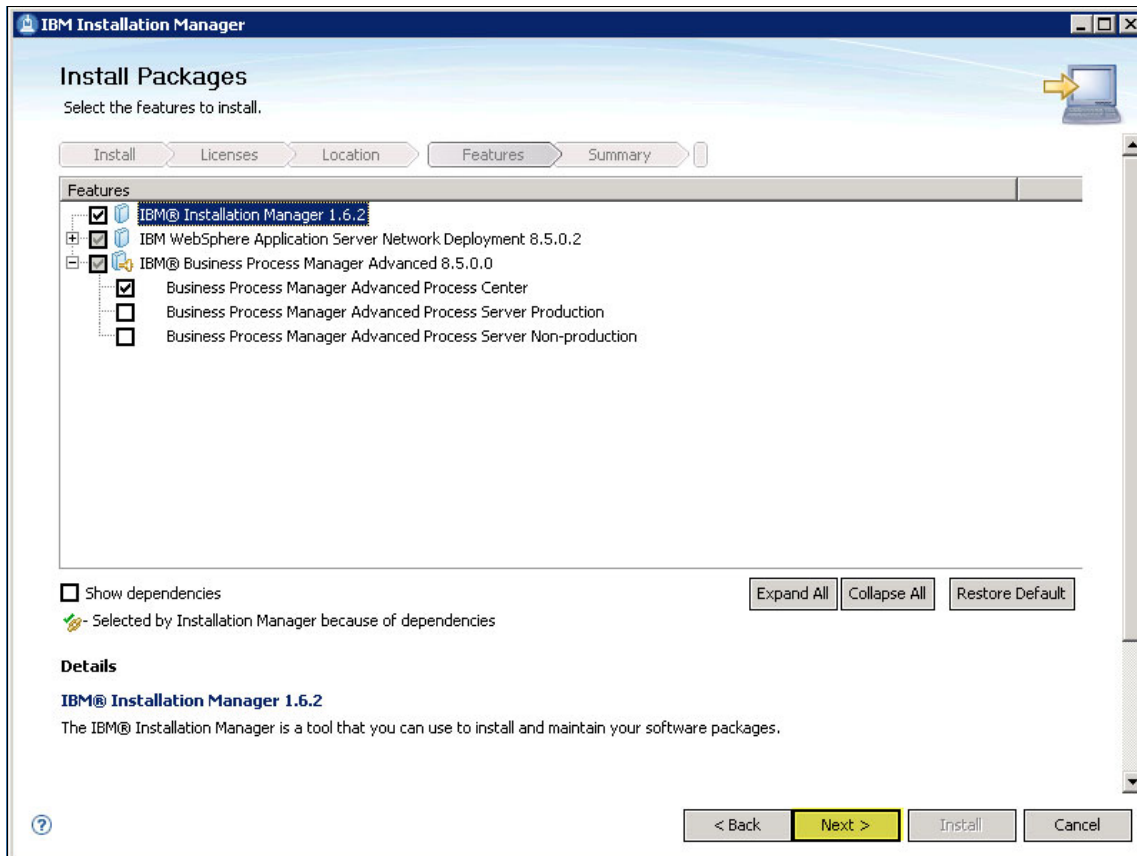
Figure 5-8   Feature selection

10. Verify that all selections are correct and click **Install**, as shown in Figure 5-9.
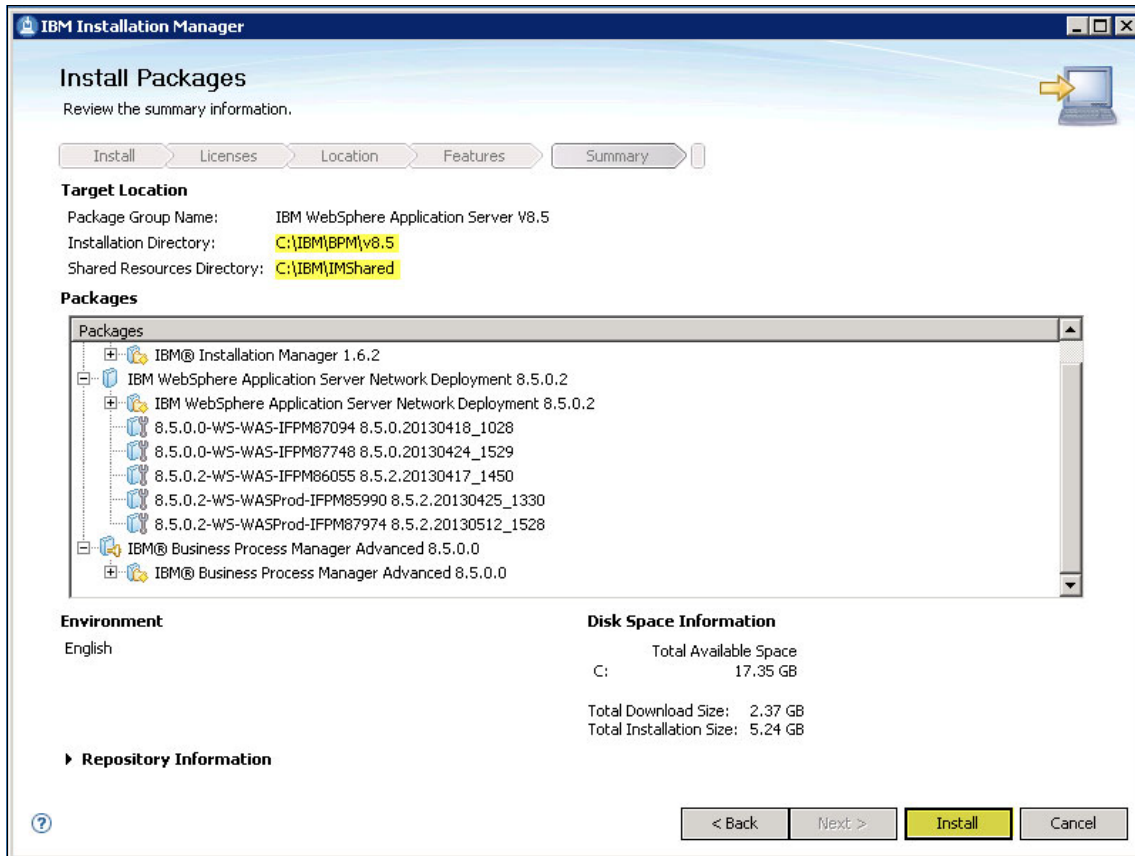
Figure 5-9   Summary information

11. Select **None** in the Which program do you want to start? section because we do not use the Profile Management Tool in our installation procedures. Click **Finish** (as shown in Figure 5-10) to finalize the installation of IBM BMP 8.5.
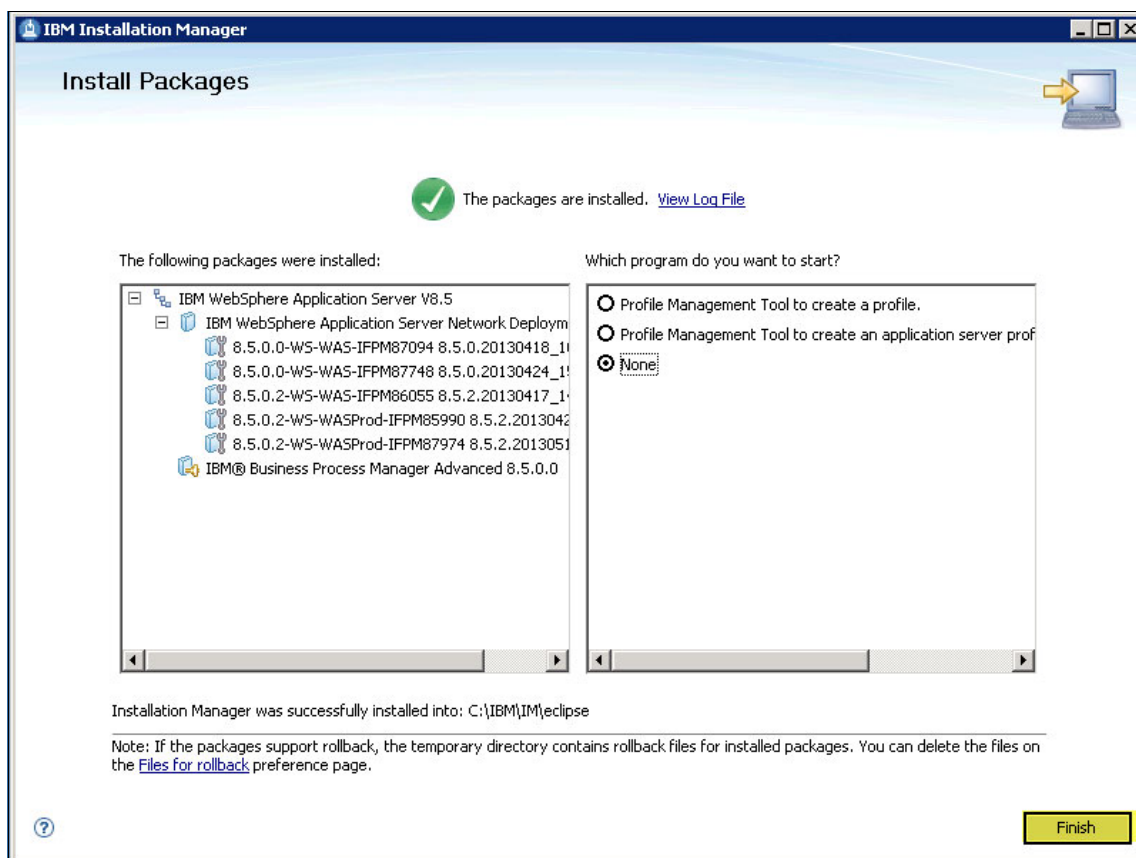
Figure 5-10   Binary install completion

Install fixes

We now assume that you already identified, downloaded, and extracted the required fixes as described in 5.3.1, "Identifying required fixes" on page 94.

> **Fixing a configured system:** If you want to install the fixes into an existing, fully configured IBM BPM 8.5 system, make sure to stop all clusters, node agents, and deployment managers. Back up the entire BPM_HOME folder and all databases.

Complete the following steps to install the fixes:

1. Start the graphical IBM Installation Manager and click **File** → **Preferences** → **Repositories**.

2. Click **Add Repository**, browse to the folder that contains the fixes, and select the `repository.config` file.

3. Repeat step 2 for each fix and click **OK** to close the preferences window, as shown in Figure 5-11.
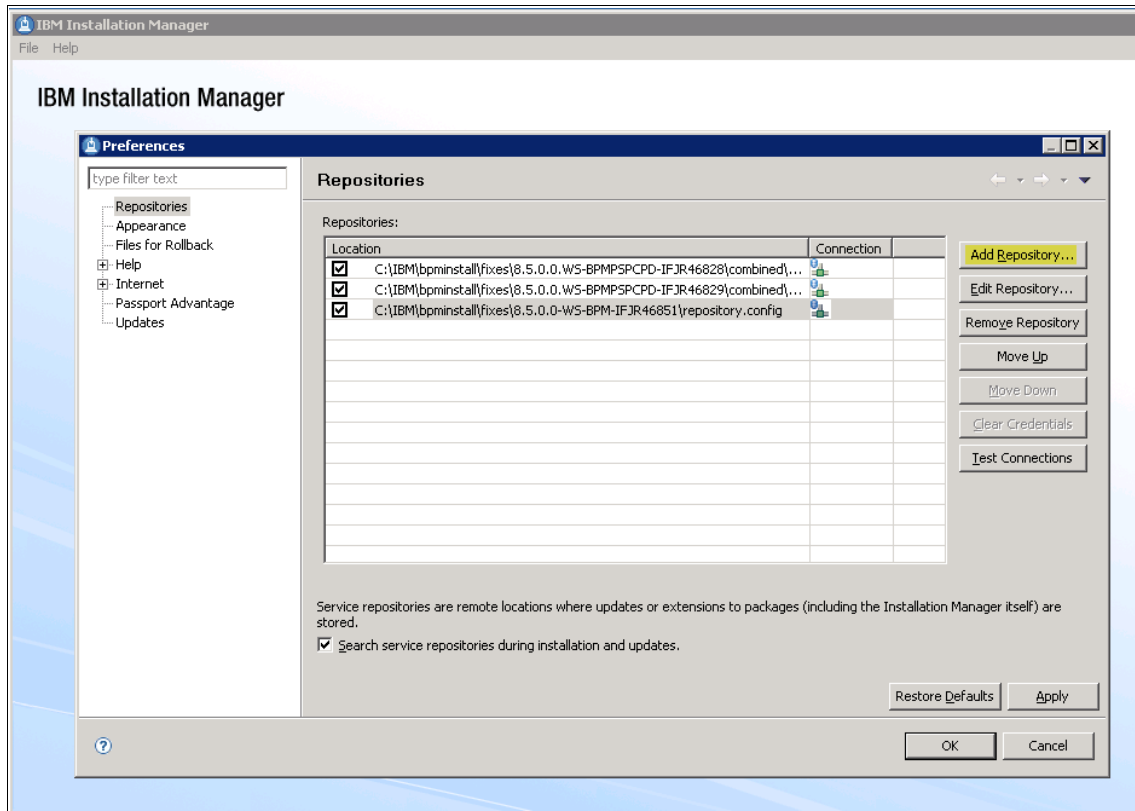

Figure 5-11   Configuring repositories for fixes
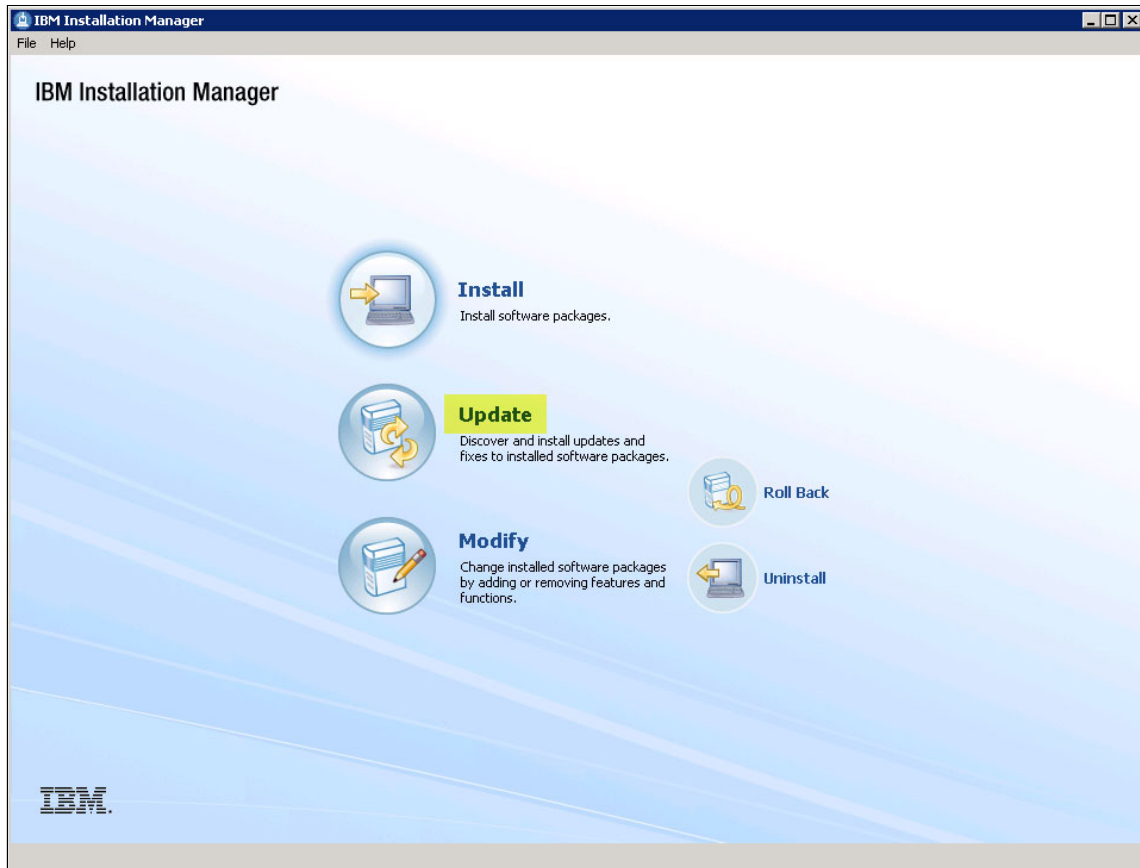
4. Click **Update** in the main window, as shown in Figure 5-12.

Figure 5-12   IBM Installation Manager main window

5. Confirm the installation folder and click **Next**, as shown in Figure 5-13.
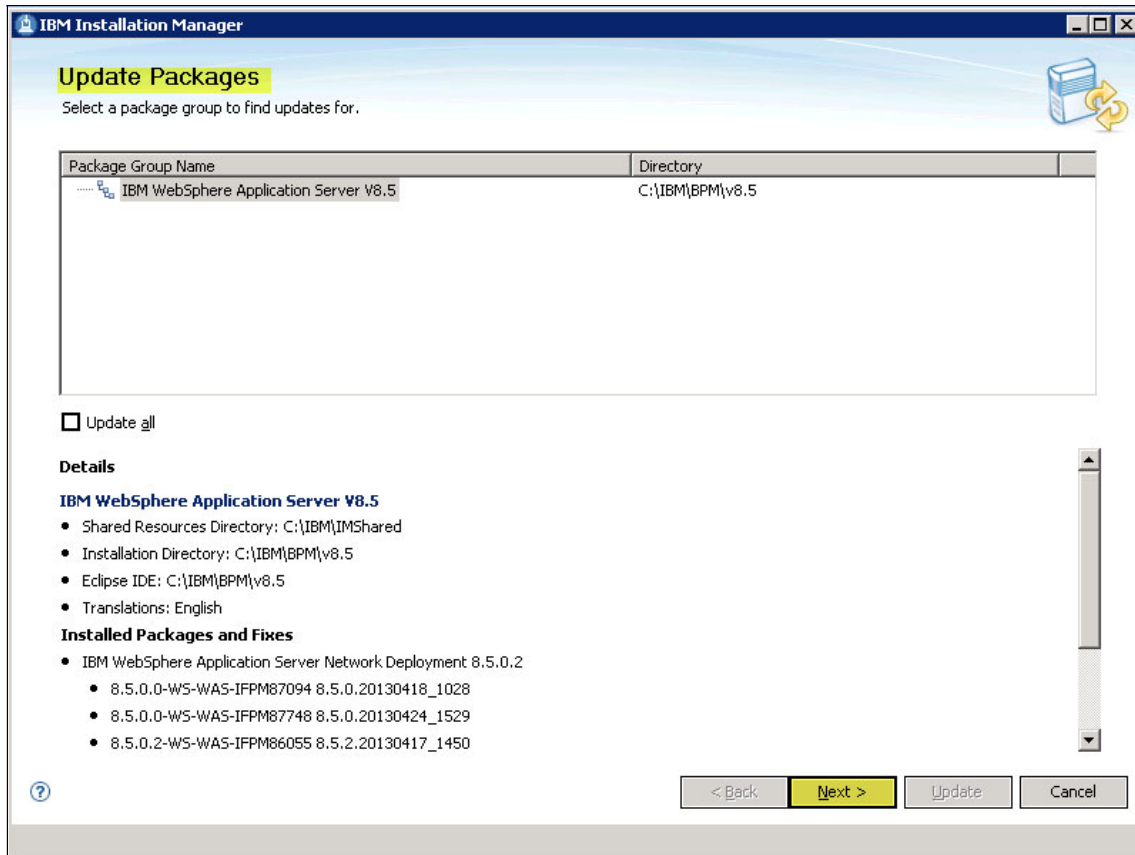
Figure 5-13   Confirm installation folder

6. When prompted for an IBM ID to access the IBM download site, click **Cancel** twice because the fixes already were downloaded and added as repositories to the Installation Manager.

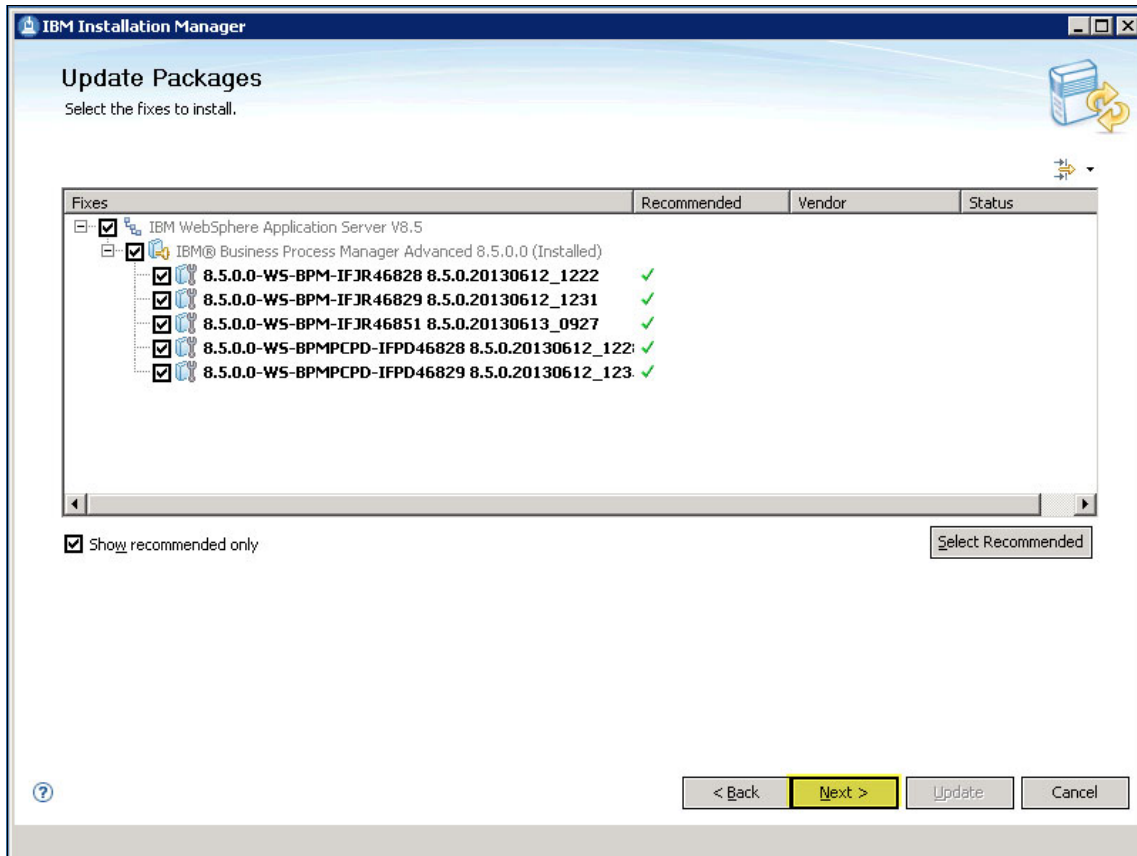7. Make sure that all required fixes are selected and click **Next**, as shown in Figure 5-14.

Figure 5-14   Fixes selected
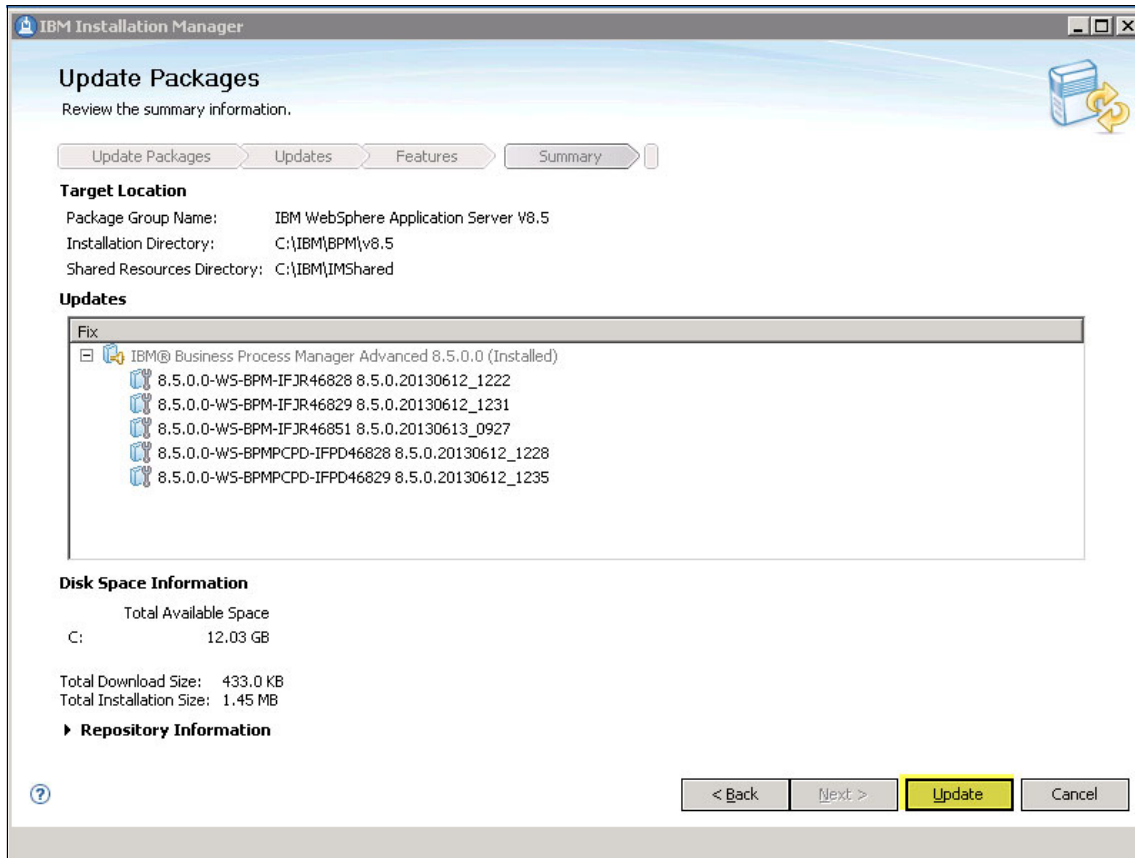
8. Click **Update**, as shown in Figure 5-15.

Figure 5-15   Update packages

9. After the installation is finished, click **Finish**, as shown in Figure 5-16.
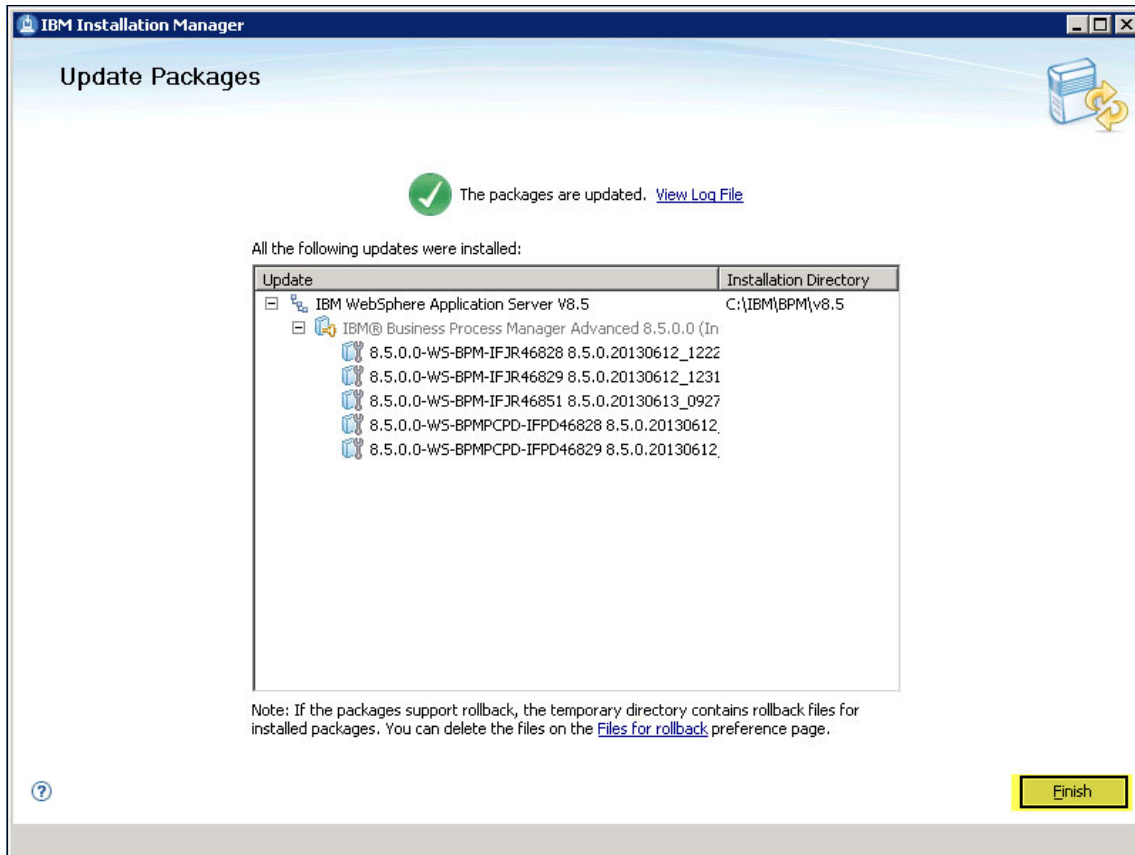

Figure 5-16   Installation completed

10.Validate the installed fixes by running the following commands:

– Windows:

```
%BPM_HOME%\bin\versionInfo.bat –ifixes
%BPM_HOME%\bin\versionInfo.bat -fixpacks
```

– UNIX based:

```
$BPM_HOME/bin/versionInfo.sh –ifixes
$BPM_HOME/bin/versionInfo.sh -fixpacks
```

If you are installing the fixes into an existing, fully configured IBM BPM 8.5, follow
the post-installation instructions that are specified in the `ifix` specific readme file
for each ifix. In case of a fixpack installation, follow the fixpack-specific upgrade
instructions (often available online), such as, for profile and cluster upgrade.

For more information about installing fix packs and interim fixes, see this website:

http://pic.dhe.ibm.com/infocenter/dmndhelp/v8r5m0/index.jsp?topic=/com.ibm.wbpm.imuc.doc/topics/updating.html

5.4 Configuring the IBM BPM environment

The following options that are recommend when you are configuring the IBM BPM 8.5 environment. In this section, we outline the pros and cons of each option and the typical use cases:

► Option 1: Profiles and deployment environment wizard
  – Pros:
    • Easy-to use graphical user interface of the wizard.
    • Small number of mandatory parameters to specify.
    • Convenient environment-specific, auto-generated defaults are provided by the wizard.
    • Can test database connectivity.
    • Can export the configuration as BPMConfig properties file.
  – Cons:
    • Manual steps are used to create and federate WebSphere Application Server profiles.
    • Not scriptable.
    • Limited database configuration options.
  – Typical use cases:
    • Quick installation of one or two IBM BPM 8.5 environments.
    • Generate sample properties file for a specific environment (even without saving configuration), which can later be used to configure multiple similar IBM BPM environment by using the BPMConfig utility.
► Option 2: BPMConfig
  – Pros:
    • Combines WebSpere Application Server profile creation and configuration of the IBM BPM environment.
    • Scriptable.
    • Targeted to become the default installation utility in future releases of IBM BPM.

- – Cons:
  - • Complex structure of the properties file with over 25 options to specify.
  - • Impossible to use environment-specific, auto-generated defaults for optional parameters (for example, names of cells, nodes and servers).
- – Typical use cases:
  - • Scripted installations (provisioning) of multiple similar IBM BPM environment.
  - • Advanced customization of installation parameters needed.
  - • Custom database configuration (for example, individual users to access each DB).
  - • Migrating from earlier versions of IBM BPM.

In the next section, we describe the IBM BPM configuration process by using these two options.

5.4.1 Option 1: Profiles and wizard

This option consists of the manual creation of WebSphere Application Server profiles by using the `manageprofiles` command-line utility followed by the configuration of the IBM BPM environment by using the deployment environment wizard (part of the WebSphere Application Server administrative console).

We suggest that the wizard should start the databases (create database objects and populate tables) so that databases exist and are validated (for more information, see 5.2, "Creating and validating databases " on page 92).

Creating WebSphere profiles

The following types of WebSphere Application Server profiles that must be created.

► Deployment manager
► Managed Node

At least one single deployment manager profile and one Managed Node profile must be created per IBM BPM environment.

The name of each profile must be unique in the scope of a particular WebSphere Application Server installation (machine).

Creating the deployment manager profile

Before we can create the profile, we must set a few environment variables by completing the following steps:

1. Set profile-scoped environment variables.

   Similar to the binary installation procedure (for more information, see 5.3.1, "Identifying required fixes" on page 94), we use the following environment variables to parameterize the commands:

   – Windows:

   ```
   set BPM_HOME=D:\IBM\BPM\v8.5
   set HOST_NAME=conesx-vm60.bocaraton.ibm.com
   set DMGR_PROFILE_NAME=PCDmgr01
   ```

   – UNIX based:

   ```
   export BPM_HOME=/opt/IBM/BPM/v8.5
   export HOST_NAME=conesx-vm60.bocaraton.ibm.com
   export DMGR_PROFILE_NAME=PCDmgr01
   ```

   Adjust the variables accordingly to match your configuration.

   It is recommended to always specify a fully qualified domain name (FQDN) as the host name. This is required for a Process Designer that is in a different network domain to connect to the environment (Process Inspector in case of runtime environment).

   We suggest a simple installation approach in which you configure only parameters that must be configured, and allow the product to use auto generated default values for the rest of parameters.

   If you have strict and well-defined WebSphere Application Server naming conventions, you can also specify parameters, such as, `-cellName` or `-nodeName` or any other `manageprofiles` parameters that are listed in the documentation that is available at the following website:

   http://pic.dhe.ibm.com/infocenter/dmndhelp/v8r5m0/topic/com.ibm.wbpm
   .ref.doc/topics/rins_manageprofiles_parms.html

2. Create Deployment Manager profile.

   The command to create the deployment manager profile uses the environment variables that were defined earlier, but there is a `–adminPassword` parameter that must be specified in the command line. Use a complex password to avoid changing the password in the future.

   Unlike previous versions of the IBM BPM products, in V8.5 there are now only two default users (no more tw_* users).

The *cell administrator* (celladmin) is the primary WebSphere Application Server administrator. A user that is assigned to this role can assign other administrator roles, and is responsible for the administration of the cell and topology. A user that is assigned to this role is not responsible for the administration of the IBM BPM components, which is now the responsibility of *deployment environment administrator* (deadmin or bpmadmin) who is the primary IBM BPM administrator. A user that is assigned to this role has administrative access to the Process Center and Process Admin Console. For more information about IBM BPM security roles, see this website:

http://pic.dhe.ibm.com/infocenter/dmndhelp/v8r5m0/index.jsp?topic=%2Fcom.ibm.wbpm.admin.doc%2Fadminguide%2Ftopic%2Fmanaging_users_E.html

Run the following commands to create a Deployment Manager profile:

– Windows:

```
cd %BPM_HOME%
bin\manageprofiles.bat -create -templatePath
%BPM_HOME%/profileTemplates/BPM/BpmDmgr -profileName
%DMGR_PROFILE_NAME% -hostName %HOST_NAME% -adminUserName
celladmin -adminPassword celladmin
```

– UNIX-based:

```
cd $BPM_HOME
./bin/manageprofiles.sh -create -templatePath
$BPM_HOME/profileTemplates/BPM/BpmDmgr -profileName
$DMGR_PROFILE_NAME -hostName $HOST_NAME -adminUserName celladmin
-adminPassword  celladmin
```

3. After the successful completion, you see a message similar to the one that is shown in the following example:

```
INSTCONFSUCCESS: Success: Profile PCDmgr01 now exists. Please
consult D:\IBM\BPM\v8.5\profiles\PCDmgr01\logs\AboutThisProfile.txt
for more information about this profile.
```

4. Start the newly created deployment manager profile by running the following commands:

– Windows:

```
%BPM_HOME%\profiles\%DMGR_PROFILE_NAME%\bin\startManager.bat
```

– UNIX-based:

```
$BPM_HOME/profiles/$DMGR_PROFILE_NAME/bin/startManager.sh
```

5. After successful startup, you see a message similar to the one that is shown in the following example:

```
ADMU0116I: Tool information is being logged in file
D:\IBM\BPM\v8.5\profiles\PCDmgr01\logs\dmgr\startServer.log
ADMU0128I: Starting tool with the PCDmgr01 profile
ADMU3100I: Reading configuration for server: dmgr
ADMU3200I: Server launched. Waiting for initialization status.
ADMU3000I: Server dmgr open for e-business; process id is 3608
```

Log in to the WebSphere Application Server administrative console as the `celladmin` user by using a URL similar to the one that is shown in the following example. Change the `HOSTNAME` placeholder with the host name of the machine where the deployment manager profile was created and started:

```
https://HOSTNAME:9043/ibm/console/
```

Creating nodes profiles

Before we can create the profile, we must set a few environment variables by completing the following steps:

1. Set profile-scoped environment variables.

   Similar to the binary installation procedure (see "Set binary-scoped environment variables" on page 95), we use the following environment variables to parameterize the commands:

   – Windows:

   ```
   set BPM_HOME=D:\IBM\BPM\v8.5
   set HOST_NAME=conesx-vm60.bocaraton.ibm.com
   set NODE_PROFILE_NAME=PCNode01
   set DMGR_HOST_NAME=conesx-vm74.bocaraton.ibm.com
   ```

   – UNIX-based:

   ```
   export BPM_HOME=/opt/IBM/BPM/v8.5
   export HOST_NAME=conesx-vm60.bocaraton.ibm.com
   export NODE_PROFILE_NAME=PCNode01
   export DMGR_HOST_NAME=conesx-vm74.bocaraton.ibm.com
   ```

   Adjust the variables accordingly to match your configuration.

   It is recommended to always specify a fully qualified domain name (FQDN) as the host name. This is required for a Process Designer that is in a different network domain to connect to the environment (Process Inspector in case of runtime environment).

2. Create a node profile on each machine in the environment by using the following commands. The first node can coexist on the same machine with the deployment manager profile that was created earlier:

– Windows:

```
cd %BPM_HOME%
bin\manageprofiles.bat -create -templatePath
%BPM_HOME%/profileTemplates/BPM/BpmNode -profileName
%NODE_PROFILE_NAME% -hostName %HOST_NAME%
```

– UNIX-based:

```
cd $BPM_HOME
./bin/manageprofiles.sh -create -templatePath
$BPM_HOME/profileTemplates/BPM/BpmNode -profileName
$NODE_PROFILE_NAME -hostName $HOST_NAME
```

3. After successful completion, you see a message that is similar to the one that is shown in the following example:

```
INSTCONFSUCCESS: Success: Profile PCNode01 now exists. Please
consult D:\IBM\BPM\v8.5\profiles\PCNode01\logs\AboutThisProfile.txt
for more information about this profile.
```

Federating managed node to deployment manager

Federate the managed profile that was created with the deployment manager profile. Before you run the following commands, specify the correct password for the `celladmin` user:

▶ Windows:

```
%BPM_HOME%\profiles\%NODE_PROFILE_NAME%\bin\addNode.bat
%DMGR_HOST_NAME% -user celladmin -password celladmin
```

▶ UNIX based:

```
$BPM_HOME/profiles/$NODE_PROFILE_NAME/bin/addNode.sh $DMGR_HOST_NAME
-user celladmin -password celladmin
```

After successful completion, you see a message of which the last line is similar to the following example:

```
ADMU0003I: Node conesx-vm74Node01 has been successfully federated.
```

Backup installation

Now that IBM BPM is installed and profiles are created and federated, it is time to back up the entire installation to restore it in case something goes wrong during the deployment environment creation.

Complete the following steps:

1. Stop all node agents by clicking **WebSphere Admin Console** → **System administration** → **Node** → **select all nodes** → **Stop**.

2. Stop the deployment manager by clicking **WebSphere Admin Console** → **System administration** → **Deployment manager** → **Stop**.

3. Back up the entire BPM_HOME directory on all machines in the environment.

4. If a virtual machine is running, take a snapshot of each virtual machine instead of backing up the folders. On UNIX based systems, you can create a `.tar` file of the BPM_HOME file system.

Creating the IBM BPM deployment environment

The deployment environment wizard can be considered a graphical user interface for the BPMConfig utility (see 5.4.2, "Option 2: BPMConfig" on page 141) because the utility is used by the wizard to generate the deployment environment. The wizard is part of the WebSphere Integrated Solutions Console that is deployed on the deployment manager profile, which, if you followed the installation procedure, should be stopped at the moment.

Complete the following steps

1. Start the deployment manager profile by running the following commands:

   – Windows:

     `%BPM_HOME%\profiles\%DMGR_PROFILE_NAME%\bin\startManager.bat`

   – UNIX-based:

     `$BPM_HOME/profiles/$DMGR_PROFILE_NAME/bin/startManager.sh`

2. After it is started, login to the console via the URL that is similar to the following URL by using your `celladmin` credentials:

   `https://HOSTNAME:9043/ibm/console/`

3. Click **Servers** → **Deployment Environments** and click **New…** to start the wizard, as shown in Figure 5-17 on page 128.
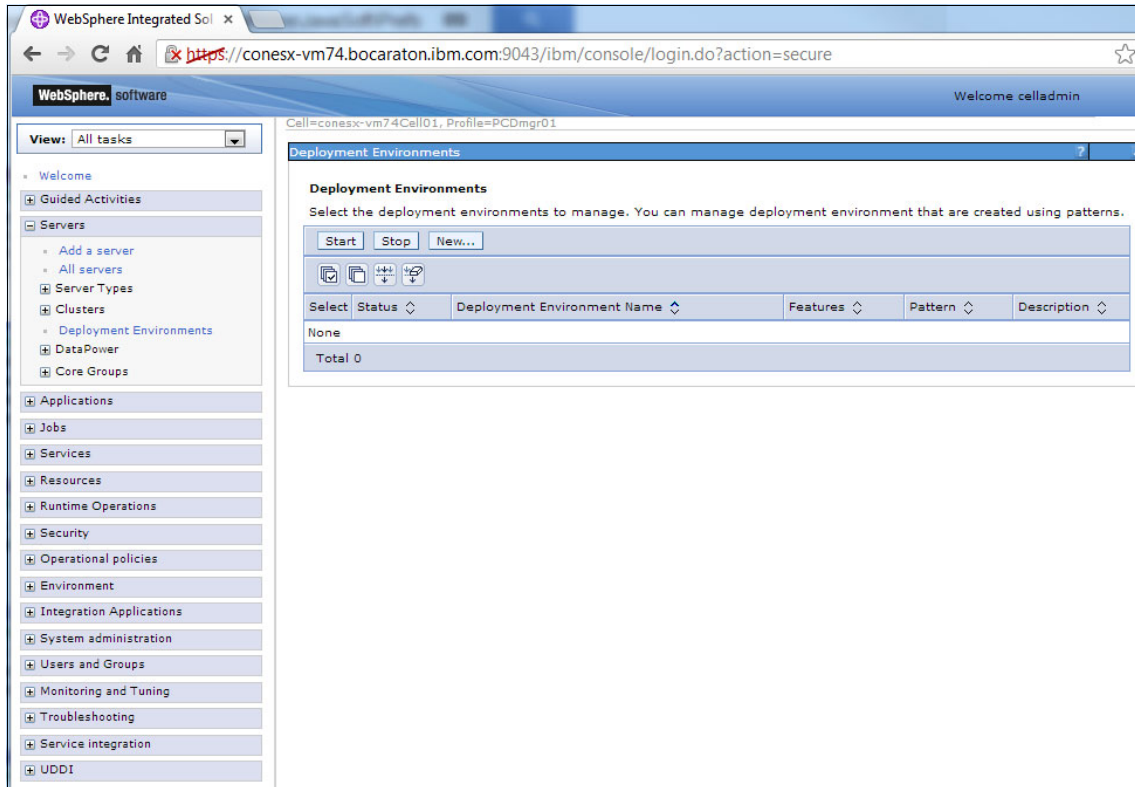
Figure 5-17   Create a deployment environment

4. Figure 5-18 on page 129 shows how to create a deployment environment.

    Provide a deployment environment name `DEVPC`, with your administrator user name `bpmadmin` and the password.

    For the type of deployment environment, select **Advanced Process Center**, and for the cluster pattern select **Application, Remote Messaging, and Remote Support**. Click **Next** to continue.

Figure 5-18   Create New deployment environment

5. Figure 5-19 shows the Step 1: Select Nodes window of the wizard. Select the nodes to use for your deployment environment and click **Next** to continue.
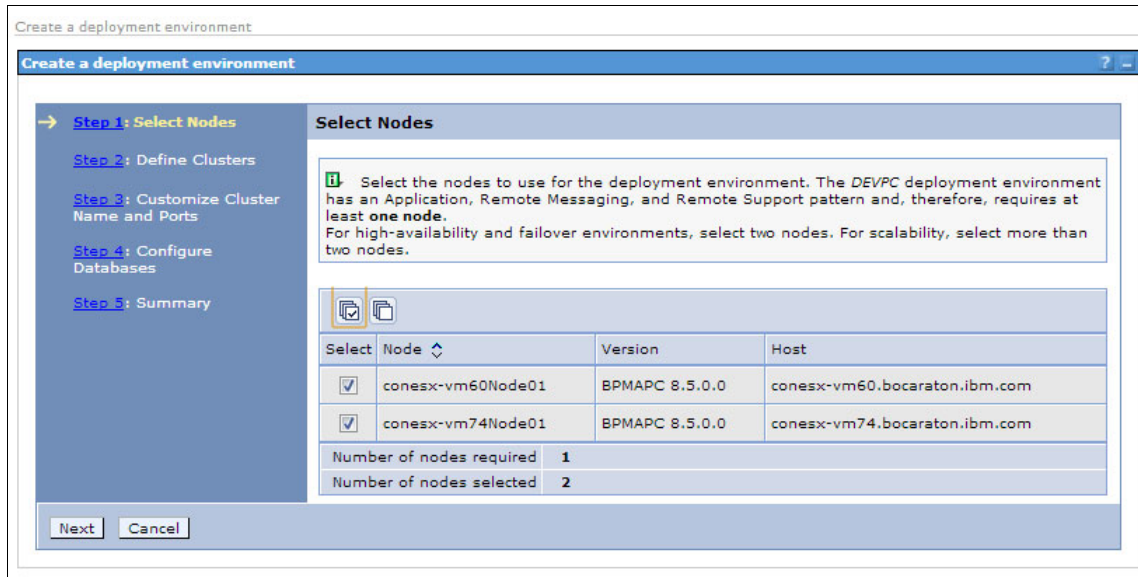

Figure 5-19   Select Nodes window

6. Figure 5-20 shows the Step 2: Define Clusters window of the wizard. Map each cluster to the listed nodes by indicating the number of cluster members per node. Click **Next** to continue.
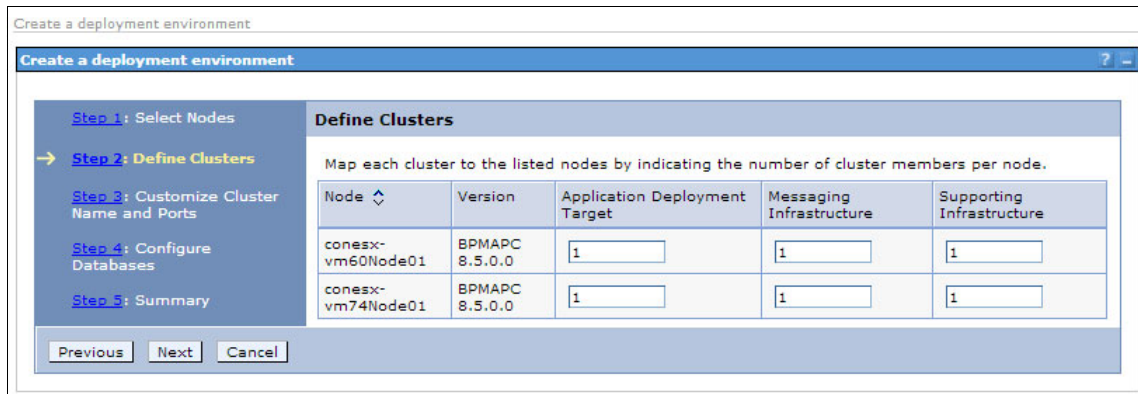

Figure 5-20   Define Clusters window

7. In Figure 5-21, Step 3: Customize Cluster Name and Ports of the wizard, we suggest keeping the auto-generated default names for Clusters and Cluster Members, unless you have strict and well-defined naming conventions.

A Starting Port does not have to be set unless you have a port conflict for one of the default ports that are used by the IBM BPM installation on the particular machine. Another installation of IBM BPM on the same machine causes such port conflict. Click **Next** to continue.

Figure 5-21   Customize Cluster window

8. Step 4: Configure Process Server of the wizard, is specific to a Process Server deployment environment only. The `bpmadmin` user that is specified in Figure 5-22 is the Process Center's user. Configure the Process Server properties and click **Next** to continue.

Figure 5-22   Configure Process Server connection to Process Center

9. The following steps require that the databases are created so that connection to the databases can be tested. Figure 5-23 shows Step 4: Configure Databases of the wizard for an Oracle database environment.

Figure 5-23   Configure Database for Oracle

In Figure 5-24, we use only three databases, with Common and Cell databases shared. This example shows a use case for a Microsoft SQL database.

Figure 5-24   Configure Database for MS SQL

Keep the **Create Tables** selected so that the wizard populates the databases when the deployment environment is generated. The database users must have appropriate permissions that are granted (for more information, see Chapter 4, "Preparing your infrastructure" on page 59).

Figure 5-25 shows a Configure Database window for IBM DB2.
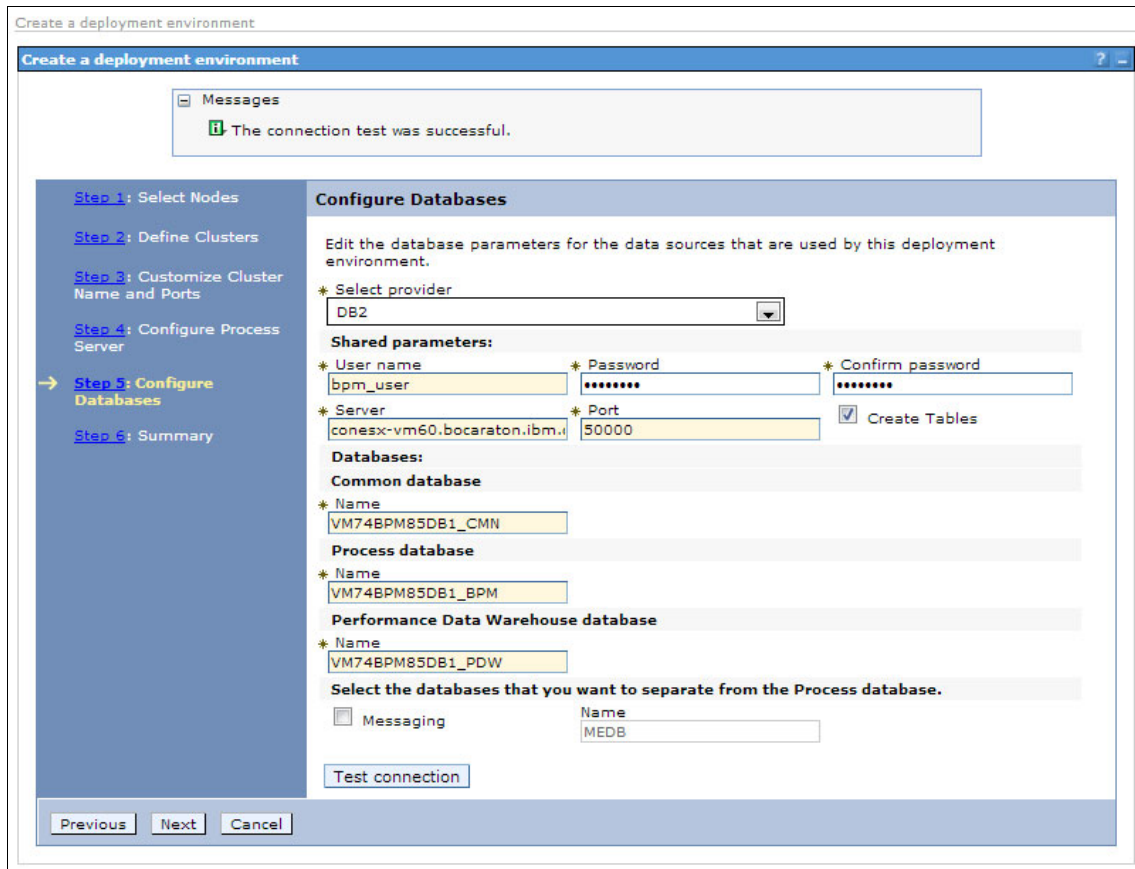
Figure 5-25   Configure Database for IBM DB2 window

10. Before you select **Generate Deployment Environment** (as shown in Figure 5-26), make sure that you select **Export for Scripting** to save your configuration options in a properties file that can be customized later and used to install more nodes or other environments by using the BPMConfig utility.

If you select **Cancel**, no changes are applied to the configuration or your databases.
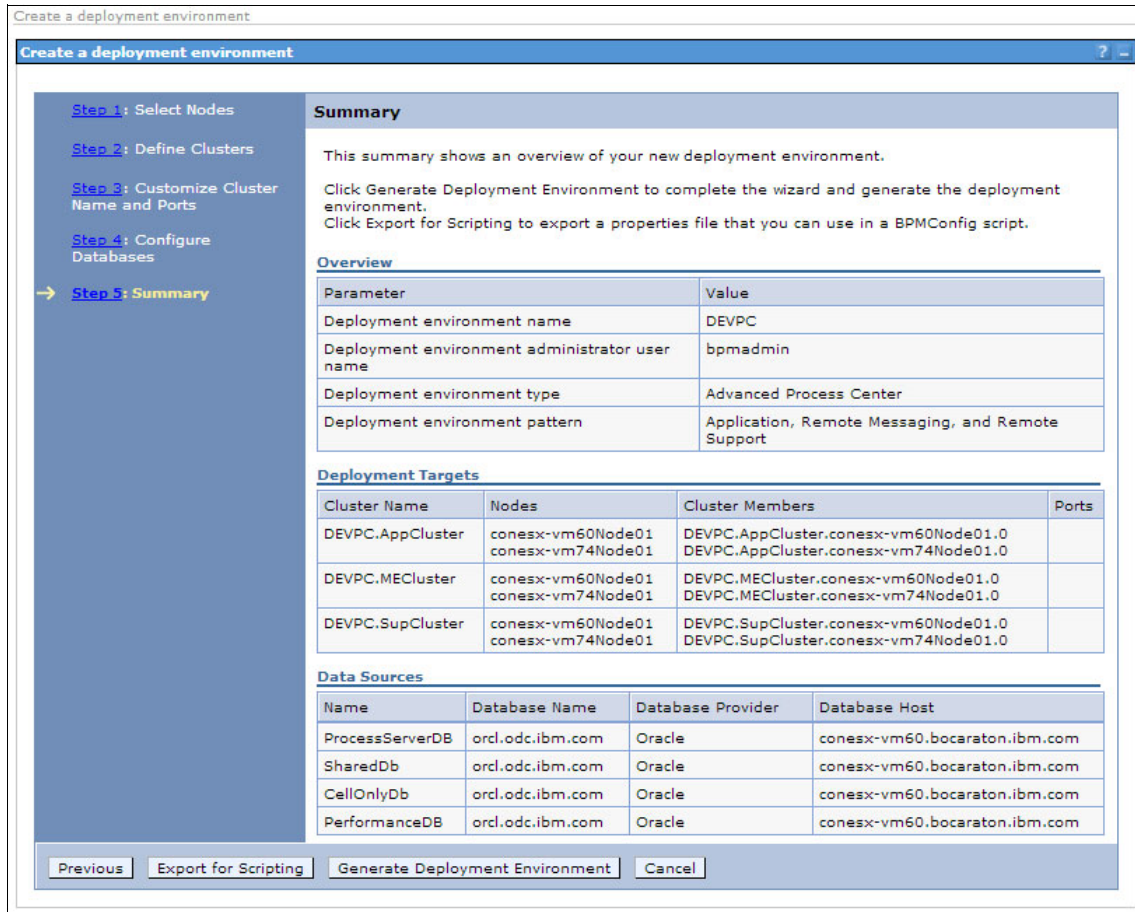
Figure 5-26   Configuration Summary before generation

11. Upon successful generation of your deployment environment, you see the Configuration Status, as shown in Figure 5-27. Click **Save Changes** to save the generated configuration to the cell's master repository. If you select **Discard Changes**, you also must re-create the databases because those are started and bootstrapped during the environment generation process.
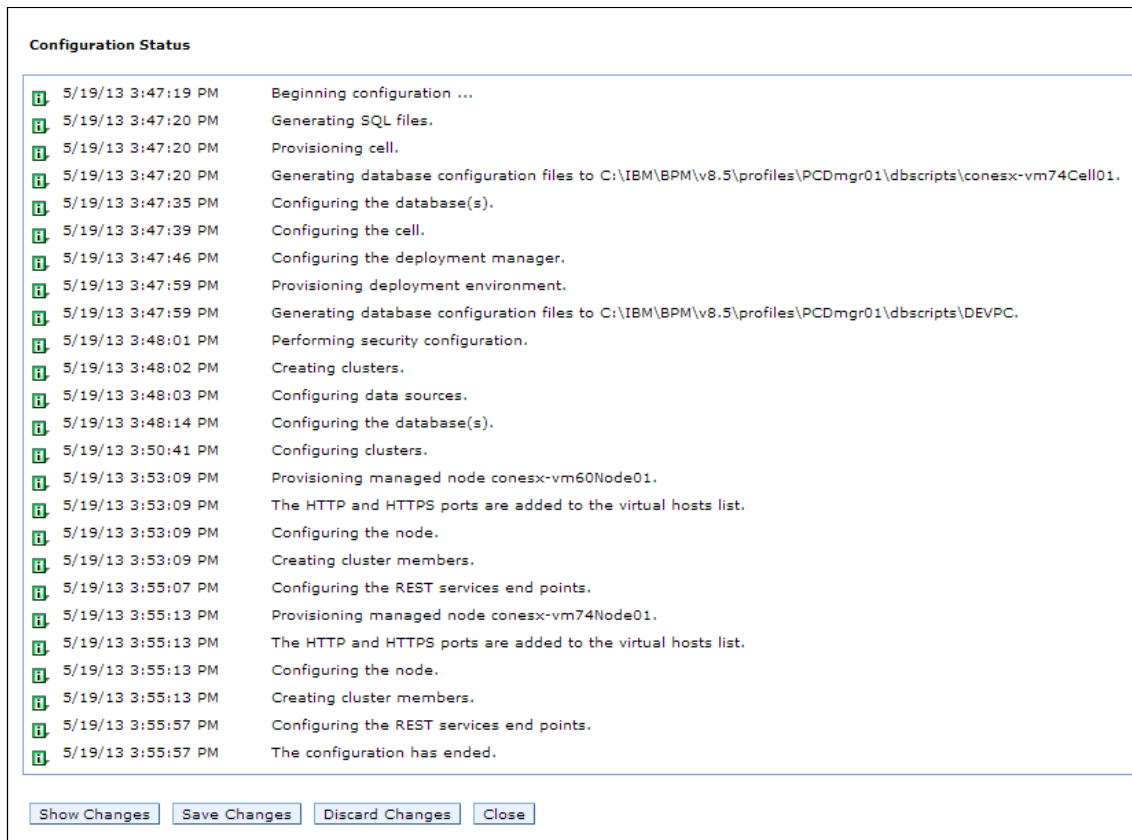
Figure 5-27   Configuration results

Saving the changes can take some time, so the process should be left to run until it is complete.

12. When the deployment manager is back up and running, run the following commands on each node in the environment to synchronize the nodes.

– Windows:

```
%BPM_HOME%\profiles\%NODE_PROFILE_NAME%\bin\syncNode.bat
%DMGR_HOST_NAME% -user celladmin -password celladmin
```

– UNIX based:

```
$BPM_HOME/profiles/$NODE_PROFILE_NAME/bin/syncNode.sh
$DMGR_HOST_NAME -user celladmin -password celladmin
```

13.After successful completion, you see a message that is similar to the one that is shown in Example 5-10.

Example 5-10   Completion message

```
ADMU0116I: Tool information is being logged in file
            D:\IBM\BPM\v8.5\profiles\PCNode01\logs\syncNode.log
ADMU0128I: Starting tool with the PCNode01 profile
ADMU0401I: Begin syncNode operation for node conesx-vm74Node01 with
deployment manager conesx-vm74.bocaraton.ibm.com: 8879
ADMU0016I: Synchronizing configuration between node and cell.
ADMU0402I: The configuration for node conesx-vm74Node01 has been
synchronized with deployment manager conesx-vm74.bocaraton.ibm.com:
8879
```

14.Start your nodes by using the following commands:

– Windows:

```
%BPM_HOME%\profiles\%NODE_PROFILE_NAME%\bin\startNode.bat
```

– UNIX-based:

```
$BPM_HOME/profiles/$NODE_PROFILE_NAME/bin/startNode.sh
```

15.Start the clusters from the menu by clicking **WebSphere Admin Console** → **Servers** → **Clusters** → **WebSphere application server clusters** with the Messaging Cluster being the first clusters.

16.Check the `SystemOut.log` of each cluster member for any errors.

Extending existing environment

Complete the following steps to extend the existing IBM BPM 8.5 environment (such as, adding nodes):

1. Install the IBM BPM binaries on the new machine according to the steps that are described in 5.3, "Installing IBM BPM binaries" on page 93.

2. Create a managed node profile according to the steps that are described in "Creating nodes profiles" on page 125.

3. Federate the newly created node profile to the deployment manager according to the steps that were described in "Federating managed node to deployment manager" on page 126.

4. Extend the deployment environment with the newly added managed node by performing the following steps:

   a. Log in to WebSphere Application Server Integrated Solutions Console.

   b. Click **Servers** → **Deployment Environments** → **<DE_NAME** (as shown in Figure 5-28,) where <DE_NAME> represents the name of your deployment environment, such as, PROD in our example. Click **Deployment Topology** to continue.
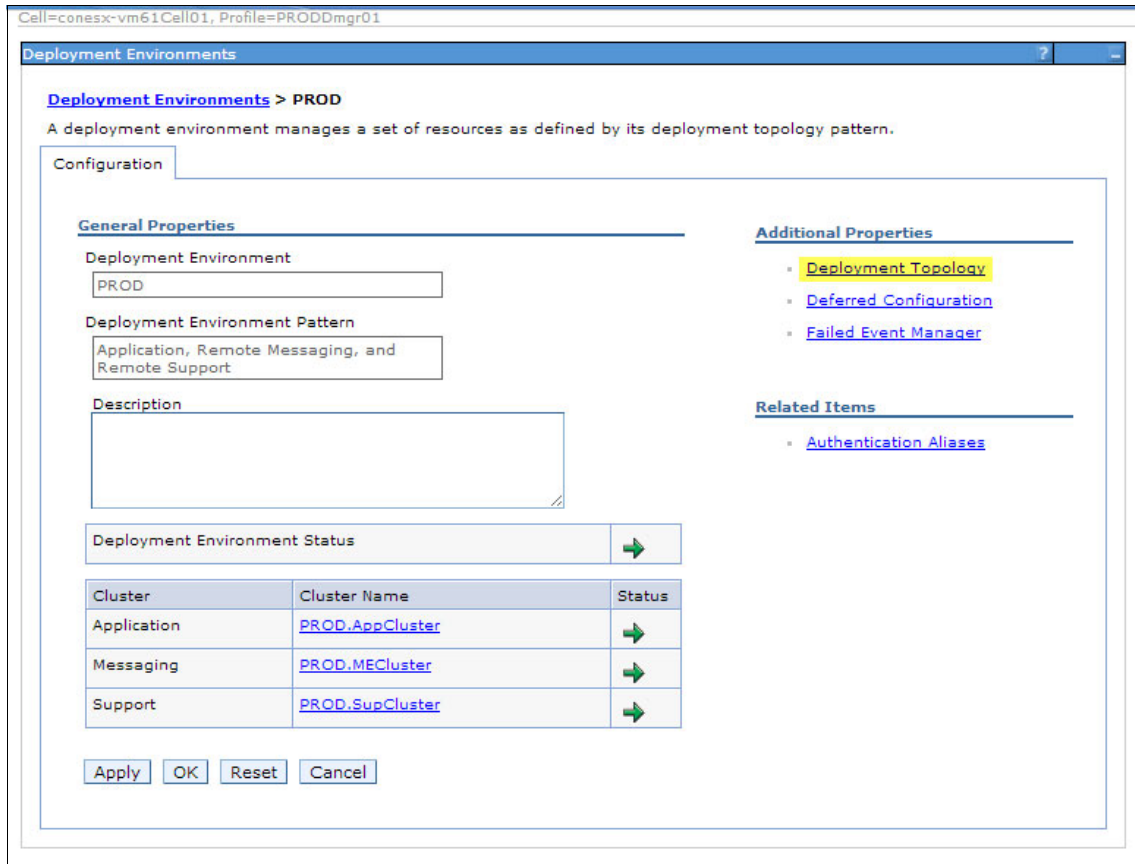
Figure 5-28   Locating the Deployment Topology window

c. Select a new node in the Add Nodes drop-down list and then click **Add** to add a node to the deployment environment. Specify the number of members for each cluster to be added. If you do not want to extend a specific cluster to the node, change 1 to 0 for the cluster, as shown in Figure 5-29.
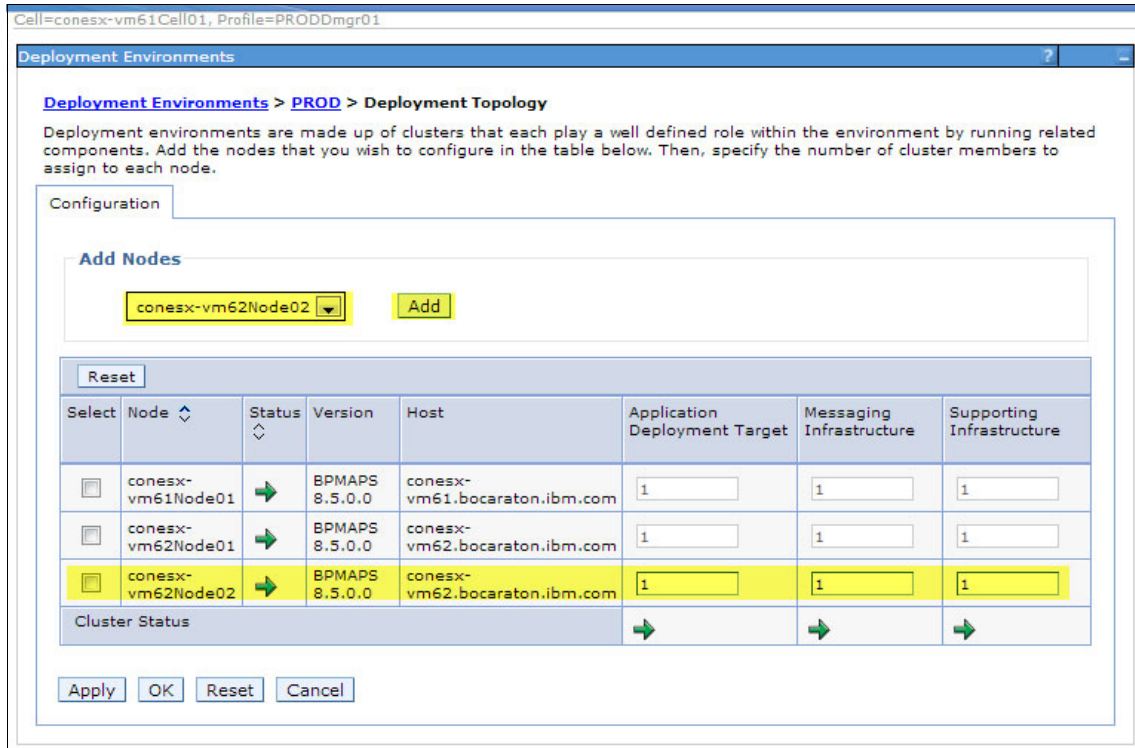
Figure 5-29   Adding a node to the deployment environment

d. Click **OK** and then click **Save**.

e. Replicate your configuration changes from the existing nodes to the new members. This configuration includes overrides that are specified in the `100Custom.xml` file (see Chapter 7, "Post-installation configuration" on page 217) and JVM configuration (heap size).

f. Perform a full synchronization of the new node.

g. Update your HTTP load balancer configuration to include the new node.

h. Start the new node and validate its operation.

5.4.2 Option 2: BPMConfig

This section describes the process that is used for configuring and deploying an IBM BPM deployment environment by using the newly introduced BPMConfig utility.

BPMConfig overview

The `BPMConfig` command-line utility that was introduced in v8.5 can help you create a typical network deployment environment instead of using the deployment environment wizard or `wsadmin` command. The `BPMConfig` command uses a properties file that contains all of the values that are used in the configuration of your deployment environment, including profiles.

Sample properties files are provided for you to copy and customize to configure your own environments. Messages that are related to the running of the `BPMConfig` command are recorded in the `BPM_HOME/logs/config/BPMConfig.log` file.

Run the `BPMConfig` command on all the computers that participate in the deployment environment by using the same properties file.

Use the `BPMConfig` command to perform the following tasks:

► Validate the configuration settings in an existing configuration properties file.

► Create the BPMDmgr and BPMNode profiles instead of using the Profile Management Tool or the `manageprofiles` command-line utility.

► Create the deployment environment and bootstrap the system information.

► Create the required database tables or generate the SQL scripts that you can use to create your database tables later.

► Extend an existing deployment environment that was created by using the `BPMConfig` command.

► Start the deployment environment.

> **Restriction:** Run `BPMConfig` commands sequentially; do not try to run the command on multiple machines at the same time.

BPMConfig parameters

In this section, the most important parameters that are used with the `BPMConfig` command-line utility are described.

Validate properties file

The following command validates that the configured deployment environment is correct by comparing it against the values in the properties file that was used to create that deployment environment:

```
BPMConfig -validate  <properties file>
```

Create profiles, deployment environment, and DB scripts

This is the BPMConfig all-in-one configuration option. The following command creates the profiles, deployment environment configuration, and the database tables or the SQL scripts for creating the required database tables. Depending on the value that you set for the `bpm.de.deferSchemaCreation` parameter in the properties file, the database tables or the scripts to generate the database tables are created:

```
BPMConfig -create -de <properties_file>
```

Create profiles

The following command creates only the profiles that are based on a customized copy of the sample properties file that is installed with the product. Use this option to create only the profiles:

```
BPMConfig -create –profile <properties file>
```

Create SQL scripts

This option generates only SQL scripts in the output directory by using the database values that are defined in properties file, as shown in following example:

```
BPMConfig -create -sqlfiles < properties file > -outputDir <output
directory>
```

Start deployment environment

The following command starts the deployment environment by using the deployment manager and deployment environment name. Also, you can specify the properties file to start the deployment environment:

```
BPMConfig -start -profile <Dmgr ProfileName> -de <Deployment
EnvironmentName> -username <DmgrAdmin> -password <Dmgr password>
```

The following command also can be used:

```
BPMConfig -start < properties file >
```

Stop deployment environment

The following command stops the deployment environment by using the deployment manager and deployment environment name. Also, you can specify the properties file to stop the deployment environment:

```
BPMConfig -stop -profile <Dmgr ProfileName> -de <Deployment
EnvironmentName> -username <DmgrAdmin> -password <Dmgr password>
```

The following command also can be used:

```
BPMConfig -stop < properties file >
```

BPMConfig properties file

The following options are available to create or use a BPMConfig properties file:

► Export by using the deployment environment wizard
► Use sample configuration properties file included with product
► Use configuration properties file from existing environment

Export by using the deployment environment wizard

You can export a sample configuration file by completing the following steps and customizing the file for other environments and complex properties:

1. Complete a product installation as described in 5.3, "Installing IBM BPM binaries" on page 93.

2. Create and federate IBM BPM deployment manager profiles.

3. Create and federate managed profiles.

4. Prepare and run the deployment environment wizard until you get to the Summary window, as shown in Figure 5-30 on page 144.

Figure 5-30   Deployment environment configuration summary

5. Select **Export for scripting** to generate a properties file and save it to a preferred location.

6. After the properties file is saved, click **Cancel** to quit the generation of the deployment environment because the environment is generated by using the BPMConfig utility according to the customized properties file.

You can customize and extend the generated BPMConfig properties file and use it for duplicating IBM BPM environments.

For more information about the required properties you need to edit for each deployment type, see "Creating a three-cluster IBM BPM topology by using the BPMConfig utility" on page 147.

Use sample configuration properties file included with product

Your IBM BPM installation includes several sample configurations files that are provided as a starting point for your configuration. These sample files are composed of common properties and settings for different IBM BPM environments. Before you begin your configuration, select a sample file that most closely resembles the configuration that you want, copy the file, and customize it to suit your own environment.

Sample configuration files are provided in the `BPM_HOME/BPM/samples/config` folder, as shown in Figure 5-31.

```
$ pwd
/opt/ibm/WebSphere/AppServer/BPM/samples/config
$ ls -la
total 48
drwxr-xr-x    8 bpmuser  bpmadm         256 May 30 21:22 .
drwxr-xr-x    3 bpmuser  bpmadm         256 May 30 21:22 ..
drwxr-xr-x    2 bpmuser  bpmadm        4096 May 30 21:22 advanced
drwxr-xr-x    2 bpmuser  bpmadm        4096 May 30 21:22 advancedonly
drwxr-xr-x    2 bpmuser  bpmadm        4096 May 30 21:22 express
drwxr-xr-x    2 bpmuser  bpmadm        8192 May 30 21:22 migration
drwxr-xr-x    2 bpmuser  bpmadm         256 May 30 21:22 multiplede
drwxr-xr-x    2 bpmuser  bpmadm        4096 May 30 21:22 standard
$ cd advanced
$ ls -la
total 592
drwxr-xr-x    2 bpmuser  bpmadm        4096 May 30 21:22 .
drwxr-xr-x    8 bpmuser  bpmadm         256 May 30 21:22 ..
-rw-r--r--    1 bpmuser  bpmadm       11350 May 19 11:54 Advanced-PC-SingleCluster-DB2.properties
-rw-r--r--    1 bpmuser  bpmadm       10695 May 19 11:54 Advanced-PC-SingleCluster-DB2zOS.properties
-rw-r--r--    1 bpmuser  bpmadm       12460 May 19 11:54 Advanced-PC-SingleCluster-Oracle.properties
-rw-r--r--    1 bpmuser  bpmadm        7942 May 19 11:54 Advanced-PC-SingleCluster-SQLServer-WinAuth.properties
-rw-r--r--    1 bpmuser  bpmadm       11370 May 19 11:54 Advanced-PC-SingleCluster-SQLServer.properties
-rw-r--r--    1 bpmuser  bpmadm       14649 May 19 11:54 Advanced-PC-ThreeClusters-DB2.properties
-rw-r--r--    1 bpmuser  bpmadm       14334 May 19 11:54 Advanced-PC-ThreeClusters-DB2zOS.properties
-rw-r--r--    1 bpmuser  bpmadm       15759 May 19 11:54 Advanced-PC-ThreeClusters-Oracle.properties
-rw-r--r--    1 bpmuser  bpmadm       11241 May 19 11:54 Advanced-PC-ThreeClusters-SQLServer-WinAuth.properties
-rw-r--r--    1 bpmuser  bpmadm       14669 May 19 11:54 Advanced-PC-ThreeClusters-SQLServer.properties
-rw-r--r--    1 bpmuser  bpmadm       12941 May 19 11:54 Advanced-PS-SingleCluster-DB2.properties
-rw-r--r--    1 bpmuser  bpmadm       12286 May 19 11:54 Advanced-PS-SingleCluster-DB2zOS.properties
-rw-r--r--    1 bpmuser  bpmadm       14051 May 19 11:54 Advanced-PS-SingleCluster-Oracle.properties
-rw-r--r--    1 bpmuser  bpmadm        9533 May 19 11:54 Advanced-PS-SingleCluster-SQLServer-WinAuth.properties
-rw-r--r--    1 bpmuser  bpmadm       12961 May 19 11:54 Advanced-PS-SingleCluster-SQLServer.properties
-rw-r--r--    1 bpmuser  bpmadm       16240 May 19 11:54 Advanced-PS-ThreeClusters-DB2.properties
-rw-r--r--    1 bpmuser  bpmadm       15925 May 19 11:54 Advanced-PS-ThreeClusters-DB2zOS.properties
-rw-r--r--    1 bpmuser  bpmadm       17350 May 19 11:54 Advanced-PS-ThreeClusters-Oracle.properties
-rw-r--r--    1 bpmuser  bpmadm       12832 May 19 11:54 Advanced-PS-ThreeClusters-SQLServer-WinAuth.properties
-rw-r--r--    1 bpmuser  bpmadm       16260 May 19 11:54 Advanced-PS-ThreeClusters-SQLServer.properties
$
```

Figure 5-31   Sample BPMConfig properties file location

For each of the product configurations, there is a different folder that contains sample configuration files. For example, for IBM BPM Advanced, there is an `advanced` folder that contains a set of sample configuration properties files.

Within each folder, there is a set of files that are specific to the different database types and configuration environments.

The properties within these sample files are organized into sections that relate to the different types of environment characteristics. The file also contains descriptions of the properties and information about values to set.

Table 5-2 provides brief descriptions of each section and their properties.

Table 5-2   IBM BPMConfig properties file section and description

Section	Types of properties
Deployment environment basic properties	This section contains the properties that relate to the overall deployment environment, including the deployment environment name, product configuration (such as, Express, Standard, Advanced) and deployment environment type (Process Center or Process Server). It also contains a setting that determines whether database tables should be created during the creation of the deployment environment.
Deployment environment and database administrator authentication alias and role properties	This section contains the properties for defining the authentication alias and role properties (such as, username, passwords, and role mappings) for the deployment environment administrator and the database administrator.
Cell properties	This section defines the cell administrator authentication alias and role mappings.
Deployment manager properties	This section contains the properties that are related to the deployment manager node, including deployment manager profile name, installation location for the product, deployment manager host name, and SOAP port.
Node properties	This section contains properties that are related to the managed nodes in a deployment environment, including the name, the install location for the product, and the node profile name, host name, and initial port assignment. To add managed nodes to a deployment environment, you create a set of these properties and specify the properties for that node.

Section	Types of properties
Cluster properties	This section defines the cluster capabilities (such as, application, support, or messaging capabilities) and the databases that are used on this cluster. In a properties file that configures a single-cluster environment, there is only one of these sections. In a properties file that configures a multi-cluster environment, there is one of these sets of properties for each of the clusters. When the configuration is modified to add clusters, you must duplicate this set of properties and specify the values for that new cluster.
Cluster member properties	This section describes the cluster members for each cluster and the cluster to which each corresponds. Properties include the cluster capabilities (such as, application, support, or messaging capabilities) and the databases that is used by the cluster.
Database properties	This section defines the databases to be used for this deployment environment, the capabilities for each database, and the authentication alias and role mappings for each database. The sample properties files refer to the set of databases that are required by default.

Use configuration properties file from existing environment

If you already have an IBM BPM 8.5 environment that is installed and configured in your organization, you should have a configuration properties file that you can extend and use to install new environments.

If Option 1 (DE wizard) was used to install that environment, the BPMConfig properties file that was used by the DE wizard can be found at a path similar to the one that is shown in the following example:

```
$BPM_HOME/logs/config/bpmconfig-PROD-20130610-205136.properties
```

Creating a three-cluster IBM BPM topology by using the BPMConfig utility

This section describes the process that uses the `BPMConfig` utility to build a recommended IBM BPM topology. This section also describes all of the required parameters that you must change in the sample BPMConfig properties for Process Center and Process Server environments.

You can also use the sample properties file that is included with this IBM Redbooks publication for building your IBM BPM environments. The following high-level steps are used to build an IBM BPM environment by using a sample configuration file:

1. As with the binary installation procedure (see 5.3, "Installing IBM BPM binaries" on page 93), we use the following environment variables to parameterize the commands:

   – Windows:

   ```
   set BPM_HOME=D:\IBM\BPM\v8.5
   ```

   – UNIX-based:

   ```
   export BPM_HOME=/opt/IBM/BPM/v8.5
   ```

2. Locate the sample configuration file that most closely reflects the environment you are trying to extend. Sample configuration files are provided in the following location:

   ```
   $BPM_HOME/BPM/samples/config
   ```

3. Edit the required parameters. Also, modify the properties file to add the other nodes and profiles to extend the existing environment.

4. Run the **BPMConfig** command on the deployment manager system and on each computer that has a managed node, passing it the names of the properties file you created, as shown in the following example:

   ```
   $BPM_HOME/bin/BPMConfig -create -de my_environment.properties
   ```

Locate and edit the required BPMConfig parameters

Locate a sample properties file that was included with the product and create a copy of it before you use it. Use the properties file that matches your environment requirements as closely as possible. For this example, we are using the `Advanced-PS-ThreeClusters-DB2.properties` file to build the three cluster topology.

For a better understanding, we are dividing the parameters in the properties file into the following sections:

► Cell manager properties

Table 5-3 shows the recommended cell manager properties.

Table 5-3 Recommended cell manager properties

Property	Description	Sample Value
`bpm.dmgr.nodeName`	Name of the deployment manager node. Node name must be unique in a cell.	convios-lp39DmgrNode01
`bpm.dmgr.hostname`	Deployment manager hostname. Do not use `localhost` for environments that are spread across multiple machines.	convios-lp39.bocaraton.ibm.com
`bpm.dmgr.installPath`	The installation location of the IBM BPM product.	/opt/IBM/BPM/v8.5
`bpm.dmgr.profileName`	Deployment manager profile name.	TSTDmgr01
`bpm.cell.name`	IBM BPM Cell Name. Cell Name must be unique across IBM BPM environments.	convios-lp39CellManager01
`bpm.cell.authenticationAlias.1.user`	Cell (WebSphere Application Server) administration authentication user.	celladmin or wasadmin
`bpm.cell.authenticationAlias.1.password`	Cell (WebSphere Application Server) administration authentication user password.	***********

► Managed node properties

For this example, we are using two node horizontal clusters. You can add or remove node properties that are based on your requirement. If you have more than two nodes in your cluster, add the properties for the extra nodes in the same properties file, as shown in Table 5-4 on page 150.

Table 5-4   Recommended managed node properties

Property	Description	Sample Value
`bpm.de.node.1.name`	Managed node name. Node name must be unique in a cell.	convios-lp38Node01
`bpm.de.node.1.hostname`	If the hostname is the same as deployment manager, this node is created on the same computer. Do not use `localhost` for environments that are spread across multiple machines.	convios-lp38.bocaraton.ibm.com
`bpm.de.node.1.installPath`	The installation location of the IBM BPM product.	/opt/IBM/BPM/v8.5
`bpm.de.node.1.profileName`	Managed node profile name.	TSTNode01
`bpm.de.node.2.name`	Managed node name. Node name must be unique in a cell.	convios-lp39Node01
`bpm.de.node.2.hostname`	If the hostname is the same as deployment manager, this node is created on the same computer. Do not use `localhost` for environments that are spread across multiple machines.	convios-lp39.bocaraton.ibm.com
`bpm.de.node.2.installPath`	The installation location of the IBM BPM product.	/opt/IBM/BPM/v8.5
`bpm.de.node.2.profileName`	Managed node profile name.	TSTNode02

► Deployment environment properties

Table 5-5 shows the recommended deployment environment properties.

Table 5-5   Recommended deployment environment properties

Property	Description	Sample Value
bpm.de.name	Deployment environment name	TST_PS
bpm.de.deferSchemaCreation	Options: True or False If this is set to False, database tables are created during deployment environment creation when **BPMConfig** is run with the `create de` action. If set to True, the tables must be created manually.	false
bpm.de.type	Type of product configuration: Express, Standard, Advanced, or AdvancedOnly	Advanced
bpm.de.environment	Type of deployment environment: Process Center or Process Server.	Process Server
bpm.de.psServerName	Only for Runtime Process Server. This name is displayed in the Process Center console. This parameter is not applicable for advanced-only installations.	BPMTest
bpm.de.psPurpose	Only for Process Server. The intended purpose for this deployment environment. Options: Test, Staging,or Production	Test
bpm.de.psOffline	Only for Process Server. Options: True or False. Set to False if the Process Server is online and can be connected to the Process Center.	false

`bpm.de.psProcessCenterHostname`	Only for Process Server. The host name of the Process Center.	convios-lp34.bocaraton.ibm.com
`bpm.de.psProcessCenterPort`	Only for Process Server. The port number for the specified Process Center.	9080
`bpm.de.authenticationAlias.1.user`	IBM BPM deployment environment administrator.	deadmin or bpmadmin
`bpm.de.authenticationAlias.1.password`	IBM BPM deployment environment administrator password.	*********
`bpm.de.authenticationAlias.2.user`	Database user. For DB2 and SQL Server.	pcdbusr
`bpm.de.authenticationAlias.2.password`	Database password. For DB2 and SQL Server.	********
`bpm.de.authenticationAlias.3.user`	Only for Oracle database. User for common database.	cmndbusr
`bpm.de.authenticationAlias.3.password`	Password for common database user.	***********
`bpm.de.authenticationAlias.4.user`	Only for Oracle database. User for process Server database	bpmdbusr
`bpm.de.authenticationAlias.4.password`	Password for process server database user.	**********
`bpm.de.authenticationAlias.5.user`	Only for Oracle database. User for Performance Data Warehouse database.	pdwdbusr
`bpm.de.authenticationAlias.5.password`	Password for Performance database user.	**********
`bpm.de.authenticationAlias.5.user`	Only for Oracle database. User for cell only database.	celldbusr
`bpm.de.authenticationAlias.5.password`	Password for cell only database user.	**********

► Database properties

In this section, we describe the recommended database properties that you must change for the following deployment patterns; advanced, standard, and advanced only:

– Database properties for advanced

The required databases for IBM BPM advanced deployments are CellOnlyDb, SharedDb, ProcessServerDB, and PerformanceDB, as shown in Table 5-6.

Table 5-6   Recommended database properties for advanced

Property	Description	Sample Value
bpm.de.db.1.hostname	Database hostname. Do not use `localhost` for environments that are spread across multiple machines.	convios-lp22.bocaraton.ibm.com
bpm.de.db.1.portNumber	Database port number.	50000
bpm.de.db.1.databaseName	Database name.	CMNDB
bpm.de.db.1.schema	Database schema.	shareddb
bpm.de.db.1.dbCapabilities	List of components that are configured on this database. For Advanced configurations, the options are: Messaging, BusinessSpace, CommonDB, and BPC. For Standard and Express configurations, the options are: Messaging, BusinessSpace, ProcessServer, EmbeddedECM, and Business Performance Data Warehouse.	Messaging, BusinessSpace, CommonDB,BPC
bpm.de.db.2.hostname	Database hostname. Do not use `localhost` for environments that are spread across multiple machines.	convios-lp22.bocaraton.ibm.com
bpm.de.db.2.portNumber	Database port number.	50000
bpm.de.db.2.databaseName	Database name.	BPMDB
bpm.de.db.2.schema	Database schema.	procdb

`bpm.de.db.2.dbCapabilities`	List of components that are configured on this database. For Advanced configurations, the options are: Messaging, BusinessSpace, CommonDB, and BPC. For Standard and Express configurations, the options are: Messaging, BusinessSpace, ProcessServer, EmbeddedECM, and Business Performance Data Warehouse.	ProcessServer,EmbeddedECM
`bpm.de.db.3.hostname`	Database hostname. Do not use `localhost` for environments that are spread across multiple machines.	convios-lp22.bocaraton.ibm.com
`bpm.de.db.3.portNumber`	Database port number.	50000
`bpm.de.db.3.databaseName`	Database name.	PDWDB
`bpm.de.db.3.schema`	Database schema.	perfdb
`bpm.de.db.3.dbCapabilities`	List of components that are configured on this database. For Advanced configurations, the options are: Messaging, BusinessSpace, CommonDB, CellScopedDB, and BPC. For Standard and Express configurations, the options are: Messaging, BusinessSpace, ProcessServer, EmbeddedECM, and Business Performance Data Warehouse.	Business Performance Data Warehouse
`bpm.de.db.4.dbCapabilities`	Database capability.	CellScopedDB
`bpm.de.db.4.databaseName`	Database name.	CMNDB
`bpm.de.db.4.hostname`	Database hostname. Do not use `localhost` for environments that are spread across multiple machines.	Convios-lp22.bocaraton.ibm.com
`bpm.de.db.4.portNumber`	Database port number.	50000
`bpm.de.db.4.schema`	Database schema name.	celldb

– Database properties for standard

The required databases for IBM BPM standard deployments are SharedDb, ProcessServerDB, and PerformanceDB, as shown in Table 5-7.

Table 5-7   Recommended properties for standard

Property	Description	Sample Value
`bpm.de.db.1.hostname`	Database hostname. Do not use `localhost` for environments that are spread across multiple machines.	convios-lp22.bocaraton.ibm.com
`bpm.de.db.1.portNumber`	Database port number.	50000
`bpm.de.db.1.databaseName`	Database name.	CMNDB
`bpm.de.db.1.schema`	Database schema.	shareddb
`bpm.de.db.1.dbCapabilities`	List of components that are configured on this database. For Advanced configurations, the options are: Messaging, BusinessSpace, CommonDB, CellScopedDB, and BPC. For Standard and Express configurations, the options are: Messaging, BusinessSpace, ProcessServer, EmbeddedECM, and Business Performance Data Warehouse.	Messaging, BusinessSpace,
`bpm.de.db.2.hostname`	Database hostname. Do not use `localhost` for environments that are spread across multiple machines.	convios-lp22.bocaraton.ibm.com
`bpm.de.db.2.portNumber`	Database port number.	50000
`bpm.de.db.2.databaseName`	Database name.	BPMDB
`bpm.de.db.2.schema`	Database schema.	procdb

`bpm.de.db.2.dbCapab ilities`	List of components that are configured on this database. For Advanced configurations, the options are: Messaging, BusinessSpace, CommonDB, CellScopedDB, and BPC. For Standard and Express configurations, the options are: Messaging, BusinessSpace, ProcessServer, EmbeddedECM, and Business Performance Data Warehouse.	ProcessServer,E mbeddedECM
`bpm.de.db.3.hostnam e`	Database hostname. Do not use `localhost` for environments that are spread across multiple machines.	convios-lp22.bo caraton.ibm.com
`bpm.de.db.3.portNum ber`	Database port number.	50000
`bpm.de.db.3.databas eName`	Database name.	PDWDB
`bpm.de.db.3.schema`	Database schema.	perfdb
`bpm.de.db.3.dbCapab ilities`	List of components that are configured on this database. For Advanced configurations, the options are: Messaging, BusinessSpace, CommonDB, CellScopedDB, and BPC. For Standard and Express configurations, the options are: Messaging, BusinessSpace, ProcessServer, EmbeddedECM, and Business Performance Data Warehouse.	Business Performance Data Warehouse

– Database properties for advanced only

The required databases for IBM BPM standard deployments are CellOnlyDb and SharedDb, as shown in Table 5-8.

Table 5-8   Recommended properties for advanced only

Property	Description	Sample Value
`bpm.de.db.1.hostna me`	Database hostname. Do not use `localhost` for environments that are spread across multiple machines.	convios-lp22.bocarato n.ibm.com
`bpm.de.db.1.portNu mber`	Database port number.	50000
`bpm.de.db.1.databa seName`	Database name.	CMNDB
`bpm.de.db.1.schema`	Database schema.	shareddb
`bpm.de.db.1.dbCapa bilities`	List of components that are configured on this database. For Advanced configurations, the options are: Messaging, BusinessSpace, CommonDB, CellScopedDB, and BPC. For Standard and Express configurations, the options are: Messaging, BusinessSpace, ProcessServer, EmbeddedECM, and Business Performance Data Warehouse.	Messaging,Business Space,CommonDB,B PC
`bpm.de.db.2.hostna me`	Database hostname. Do not use `localhost` for environments that are spread across multiple machines.	convios-lp22.bocarato n.ibm.com
`bpm.de.db.2.portNu mber`	Database port number.	50000
`bpm.de.db.2.databa seName`	Database name.	CMNDB
`bpm.de.db.2.schema`	Database schema.	celldb

bpm.de.db.2.dbCapabilities	List of components that are configured on this database. For Advanced configurations, the options are: Messaging, BusinessSpace, CommonDB, CellScopedDB, and BPC. For Standard and Express configurations, the options are: Messaging, BusinessSpace, ProcessServer, EmbeddedECM, and Business Performance Data Warehouse.	CellScopedDB

Important: Cell name and node names must be unique across IBM BPM environments.

The database user name and schema name must be the same for Process Server and Performance Server databases.

If you are using an Oracle database, you must include the database user name and password for all databases, including the optional databases.

After you edit the properties file, the next step is to validate the accuracy of the properties file.

Validating the BPMConfig properties file

Validate that the configured deployment environment is correct by comparing it against the values in the properties file that is used to create that deployment environment.

Change the directory to $BPM_HOME/bin or $BPM_HOME\bin and run the following **BPMConfig** command:

► Windows:

    BPM_HOME\bin\BPMConfig -validate my_environment.properties

► UNIX based:

    BPM_HOME/bin/BPMConfig.sh -validate my_environment.properties

Running BPMConfig to create deployment environment

After successfully validating the BPMConfig properties file, you can create the deployment environment by using a single **BPMConfig** command.

> **Watch for the right privileges:** As a best practice, it is recommended to use the **BPMConfig** command utility to generate database objects and load system information. It is important to verify and confirm that the database users that are used in the BPMConfig properties file have sufficient privileges to perform the actions.

> **Use the same profile:** Run the **BPMConfig** command with the same properties file on all computers that participate in the deployment environment. You must first run the command on the computer that has the deployment manager profile, and then run it on each computer that has a managed node.

Change the directory to $BPM_HOME/bin or $BPM_HOME\bin and run the following **BPMConfig** command:

► Windows:

```
BPM_HOME\bin\BPMConfig -create -de my_environment.properties
```

► UNIX based:

```
BPM_HOME/bin/BPMConfig.sh -create -de my_environment.properties
```

The BPMConfig utility performs the following tasks:

► Create deployment manager
► Start deployment manager
► Create managed node profiles
► Federate managed nodes
► Generate SQL files
► Configure database objects
► Perform security configuration
► Configure clusters
► Provision deployment environment
► Configure data sources
► Add http and https ports to virtual host entries
► Bootstrap database
► Synchronize nodes

In our example, we are running the following **BPMConfig** command:

```
./BPMConfig.sh -create -de Advanced-PS-ThreeClusters-DB2.properties
```

The output of this command is shown in Example 5-11.

Example 5-11   Running the BPMConfig command

```
./BPMConfig.sh -create -de Advanced-PS-ThreeClusters-DB2.properties
Logging to file
/opt/ibm/WebSphere/AppServer/logs/config/BPMConfig_20130521-110634.log.
CWMCB0713I: Node BPMTestNode2 is not a local node, skipping.
Validating the profile registry.
[]
Configuring the deployment manager.
Creating the deployment manager profile.
INSTCONFSUCCESS: Success: Profile BPMTestDmgr01 now exists. Please consult
/opt/ibm/WebSphere/AppServer/profiles/BPMTestDmgr01/logs/AboutThisProfile.txt for
more information about this profile.
Starting deployment manager profile BPMTestDmgr01.
ADMU0116I: Tool information is being logged in file
 /opt/ibm/WebSphere/AppServer/profiles/BPMTestDmgr01/logs/dmgr/startServer.log
ADMU0128I: Starting tool with the BPMTestDmgr01 profile
ADMU3100I: Reading configuration for server: dmgr
ADMU3200I: Server launched. Waiting for initialization status.
ADMU3000I: Server dmgr open for e-business; process id is 14286924
Configuring managed node profiles.
Creating the managed node BPMTestNode01 profile.
INSTCONFSUCCESS: Success: Profile BPMTestNode01 now exists. Please consult
/opt/ibm/WebSphere/AppServer/profiles/BPMTestNode01/logs/AboutThisProfile.txt for
more information about this profile.
Retrieving signers.
CWPKI0308I: Adding signer alias "CN=convios-lp39.bocaraton.ibm.c" to local
           keystore "ClientDefaultTrustStore" with the following SHA digest:
           DA:66:0F:C2:C9:25:DF:D9:0C:B2:73:C7:F8:CF:93:9C:3A:D5:C1:9E
Adding the node BPMTestNode01 to the cell PSCell1.
ADMU0116I: Tool information is being logged in file
           /opt/ibm/WebSphere/AppServer/profiles/BPMTestNode01/logs/addNode.log
ADMU0128I: Starting tool with the BPMTestNode01 profile
CWPKI0309I: All signers from remote keystore already exist in local keystore.
ADMU0001I: Begin federation of node BPMTestNode01 with deployment manager at
           convios-lp39.bocaraton.ibm.com:8879.
ADMU0009I: Successfully connected to deployment manager Server:
           convios-lp39.bocaraton.ibm.com:8879
ADMU0507I: No servers found in configuration under:
/opt/ibm/WebSphere/AppServer/profiles/BPMTestNode01/config/cells/PSCell1BPMTestNode01
/nodes/BPMTestNode01/servers
ADMU2010I: Stopping all server processes for node BPMTestNode01
ADMU0024I: Deleting the old backup directory.
```

```
ADMU0015I: Backing up the original cell repository.
ADMU0012I: Creating Node Agent configuration for node: BPMTestNode01
ADMU0014I: Adding node BPMTestNode01 configuration to cell: PSCell1
ADMU0016I: Synchronizing configuration between node and cell.
ADMU0300I: The node BPMTestNode01 was successfully added to the PSCell1 cell.
ADMU0306I: Note:
ADMU0302I: Any cell-level documents from the standalone PSCell1 configuration
           have not been migrated to the new cell.
ADMU0307I: You might want to:
ADMU0303I: Update the configuration on the PSCell1 deployment manager with
           values from the old cell-level documents.
ADMU0306I: Note:
ADMU0304I: Because -includeapps was not specified, applications installed on
           the standalone node were not installed on the new cell.
ADMU0307I: You might want to:
ADMU0305I: Install applications onto the PSCell1 cell using wsadmin $AdminApp
           or the administrative console.
ADMU0003I: Node BPMTestNode01 has been successfully federated.
Generating SQL files.
Provisioning cell.
Generating database configuration files to
/opt/ibm/WebSphere/AppServer/profiles/BPMTestDmgr01/dbscripts/PSCell1.
Configuring the database(s).
Configuring the cell.
XL TXE-J compiling stylesheet: null
XL TXE-J compiling stylesheet: null
XL TXE-J compiling stylesheet: null
XL TXE-J compiling stylesheet: null
Configuring the deployment manager.
Provisioning Deployment Environment.
Generating database configuration files to
/opt/ibm/WebSphere/AppServer/profiles/BPMTestDmgr01/dbscripts/BPM_TST.
Performing security configuration.
Creating clusters.
Configuring data sources.
Configuring the database(s).
Configuring clusters.
Operation completed successfully
OkProvisioning managed node BPMTestNode01.
The HTTP and HTTPS ports are added to the virtual hosts list.
Configuring the node.
Creating cluster members.
3
importFile: /opt/ibm/WebSphere/AppServer/BPM/Lombardi/imports/system-toolkit.twx
deploy: false
```

```
latestSystemToolkit: true
activateSnapshot: false
importFile: /opt/ibm/WebSphere/AppServer/BPM/Lombardi/imports/system-coaches.twx
deploy: false
latestSystemToolkit: false
activateSnapshot: false
importFile: /opt/ibm/WebSphere/AppServer/BPM/Lombardi/imports/system-dashboards.twx
deploy: false
latestSystemToolkit: false
activateSnapshot: false
importFile: /opt/ibm/WebSphere/AppServer/BPM/Lombardi/imports/governance-toolkit.twx
deploy: false
latestSystemToolkit: false
activateSnapshot: false
importFile:
/opt/ibm/WebSphere/AppServer/BPM/Lombardi/imports/content-integration-toolkit.twx
deploy: false
latestSystemToolkit: false
activateSnapshot: false
importFile: /opt/ibm/WebSphere/AppServer/BPM/Lombardi/imports/process-portal.twx
deploy: true
latestSystemToolkit: false
activateSnapshot: true
processApp: TWP
snapShot: 8.5.0
Activating snapshot 8.5.0 in process app TWP
Activating snapshot done: 8.5.0 in process app TWP
importFile: /opt/ibm/WebSphere/AppServer/BPM/Lombardi/imports/saved-search-admin.twx
deploy: true
latestSystemToolkit: false
activateSnapshot: true
processApp: SSA
snapShot: 8.5.0
Activating snapshot 8.5.0 in process app SSA
Activating snapshot done: 8.5.0 in process app SSA
Configuring the REST services end points.
Saving configuration changes, please be patient...
Synchronizing node BPMTestNode01.
ADMU0116I: Tool information is being logged in file
          /opt/ibm/WebSphere/AppServer/profiles/BPMTestNode01/logs/syncNode.log
ADMU0128I: Starting tool with the BPMTestNode01 profile
ADMU0401I: Begin syncNode operation for node BPMTestNode01 with Deployment
          Manager convios-lp39.bocaraton.ibm.com: 8879
ADMU0016I: Synchronizing configuration between node and cell.
ADMU0402I: The configuration for node BPMTestNode01 has been synchronized with
```

```
           deployment manager convios-lp39.bocaraton.ibm.com: 8879
Stopping deployment manager profile BPMTestDmgr01.
ADMU0116I: Tool information is being logged in file
```

/opt/ibm/WebSphere/AppServer/profiles/BPMTestDmgr01/logs/dmgr/stopServer.log
```
ADMU0128I: Starting tool with the BPMTestDmgr01 profile
ADMU3100I: Reading configuration for server: dmgr
ADMU3201I: Server stop request issued. Waiting for stop status.
ADMU4000I: Server dmgr stop completed.
BPMConfig completed successfully.
```

Starting deployment environment by using BPMConfig

You can use the **BPMConfig** command to start all processes, including deployment manager, node agent, and application clusters. You have the following options to start the IBM BPM environment by using the BPMConfig command:

► Start using a profile name and a deployment environment name.
► Start using the BPMConfig properties file.

> **Note:** You must run BPMConfig **start** command individually on all remote nodes

Start using a profile name and a deployment environment name

Run the following **BPMConfig** commands to start your deployment environment (sample output is shown in Example 5-12 on page 164):

► Windows:

   BPM_HOME\bin\BPMConfig -start -profile DmgrProfile -de De1 -username DmgrAdmin -password mypassword

► UNIX based:

   BPM_HOME/bin/BPMConfig.sh -start -profile DmgrProfile -de De1 -username DmgrAdmin -password mypassword

Example 5-12   Start your deployment environment by using profile and DE name

```
./BPMConfig.sh -start -profile BPMTestDmgr01 -de BPM_TST -username wasadmin -password
wasadmin
Logging to file
/opt/ibm/WebSphere/AppServer/logs/config/BPMConfig_20130610-211057.log.
Starting deployment manager profile BPMTestDmgr01.
ADMU0116I: Tool information is being logged in file


/opt/ibm/WebSphere/AppServer/profiles/BPMTestDmgr01/logs/dmgr/startServer.log
ADMU0128I: Starting tool with the BPMTestDmgr01 profile
ADMU3100I: Reading configuration for server: dmgr
ADMU3200I: Server launched. Waiting for initialization status.
ADMU3000I: Server dmgr open for e-business; process id is 8782070
Starting node BPMTestNode01.
ADMU0116I: Tool information is being logged in file


/opt/ibm/WebSphere/AppServer/profiles/BPMTestNode01/logs/nodeagent/startServer.log
ADMU0128I: Starting tool with the BPMTestNode01 profile
ADMU3100I: Reading configuration for server: nodeagent
ADMU3200I: Server launched. Waiting for initialization status.
ADMU3000I: Server nodeagent open for e-business; process id is 7667804
Starting cluster MECluster.
Starting cluster AppCluster.
Starting cluster SupCluster.
BPMConfig completed successfully.
```

Start by using the BPMConfig properties file

Run the following **BPMConfig** commands to start your deployment environment
(sample output is shown in Example 5-13 on page 165):

► Windows:

  BPM_HOME\bin\BPMConfig -start my_environment.properties

► UNIX based:

  BPM_HOME/bin/BPMConfig.sh -start my_environment.properties

```
./BPMConfig.sh -start Advanced-PS-ThreeClusters-DB2.properties
Logging to file
/opt/ibm/WebSphere/AppServer/logs/config/BPMConfig_20130608-202639.log.
Starting deployment manager profile BPMTestDmgr01.
ADMU0116I: Tool information is being logged in file

/opt/ibm/WebSphere/AppServer/profiles/BPMTestDmgr01/logs/dmgr/startServer.log
ADMU0128I: Starting tool with the BPMTestDmgr01 profile
ADMU3100I: Reading configuration for server: dmgr
ADMU3200I: Server launched. Waiting for initialization status.
ADMU3000I: Server dmgr open for e-business; process id is 8323174
Starting node BPMTestNode01.
ADMU0116I: Tool information is being logged in file

/opt/ibm/WebSphere/AppServer/profiles/BPMTestNode01/logs/nodeagent/startServer.log
ADMU0128I: Starting tool with the BPMTestNode01 profile
ADMU3100I: Reading configuration for server: nodeagent
ADMU3200I: Server launched. Waiting for initialization status.
ADMU3000I: Server nodeagent open for e-business; process id is 7733328
Starting cluster MECluster.
Starting cluster AppCluster.
Starting cluster SupCluster.
BPMConfig completed successfully.
```

Stopping deployment environment by using BPMConfig

You can stop the IBM BPM environment by using the `BPMConfig` command by specifying the profile, deployment environment name, user name, and password. You can also stop the IBM BPM environment by using the `BPMConfig` command by passing the name of the configuration properties file that contains the configuration properties for your deployment environment.

Stop by using a profile name and a deployment environment name

Run the following `BPMConfig` commands to stop your deployment environment (sample output is shown in Example 5-14 on page 166):

▶ Windows:

   `BPM_HOME\bin\BPMConfig -stop -profile DmgrProfile -de De1 -username DmgrAdmin -password mypassword`

▶ UNIX based:

   `BPM_HOME/bin/BPMConfig.sh -stop -profile DmgrProfile -de De1 -username DmgrAdmin -password mypassword`

Example 5-14   Stop your deployment environment by using profile and DE name

```
./BPMConfig.sh -stop -profile BPMTestDmgr01 -de BPM_TST -username wasadmin -password
wasadmin
Logging to file
/opt/ibm/WebSphere/AppServer/logs/config/BPMConfig_20130610-215341.log.
Stopping cluster SupCluster.
Stopping cluster AppCluster.
Stopping cluster MECluster.
Stopping node BPMTestNode01.
ADMU0116I: Tool information is being logged in file

/opt/ibm/WebSphere/AppServer/profiles/BPMTestNode01/logs/nodeagent/stopServer.log
ADMU0128I: Starting tool with the BPMTestNode01 profile
ADMU3100I: Reading configuration for server: nodeagent
ADMU3201I: Server stop request issued. Waiting for stop status.
ADMU4000I: Server nodeagent stop completed.

Stopping deployment manager profile BPMTestDmgr01.
ADMU0116I: Tool information is being logged in file

/opt/ibm/WebSphere/AppServer/profiles/BPMTestDmgr01/logs/dmgr/stopServer.log
ADMU0128I: Starting tool with the BPMTestDmgr01 profile
ADMU3100I: Reading configuration for server: dmgr
ADMU3201I: Server stop request issued. Waiting for stop status.
ADMU4000I: Server dmgr stop completed.
BPMConfig completed successfully.
```

Stop by using the BPMConfig properties file

Run the following `BPMConfig` commands to stop your deployment environment (sample output is shown in Example 5-15 on page 167):

► Windows:

  `BPM_HOME\bin\BPMConfig -stop my_environment.properties`

► UNIX based:

  `BPM_HOME/bin/BPMConfig.sh -stop my_environment.properties`

Example 5-15   Stop your deployment environment by using the properties file

```
./BPMConfig.sh -stop Advanced-PS-ThreeClusters-DB2.properties
Logging to file
/opt/ibm/WebSphere/AppServer/logs/config/BPMConfig_20130610-221434.log.
Stopping cluster SupCluster.
Stopping cluster AppCluster.
Stopping cluster MECluster.
Stopping node BPMTestNode01.
ADMU0116I: Tool information is being logged in file

/opt/ibm/WebSphere/AppServer/profiles/BPMTestNode01/logs/nodeagent/stopServer.log
ADMU0128I: Starting tool with the BPMTestNode01 profile
ADMU3100I: Reading configuration for server: nodeagent
ADMU3201I: Server stop request issued. Waiting for stop status.
ADMU4000I: Server nodeagent stop completed.

Stopping deployment manager profile BPMTestDmgr01.
ADMU0116I: Tool information is being logged in file

/opt/ibm/WebSphere/AppServer/profiles/BPMTestDmgr01/logs/dmgr/stopServer.log
ADMU0128I: Starting tool with the BPMTestDmgr01 profile
ADMU3100I: Reading configuration for server: dmgr
ADMU3201I: Server stop request issued. Waiting for stop status.
ADMU4000I: Server dmgr stop completed.
BPMConfig completed successfully.
```

Troubleshooting BPMConfig failures

Table 5-9 shows the location of log files that contain BPMConfig activities.

Table 5-9   Detailed log locations

Activity	Log location	Sample location
Overall BPMConfig utility failures	`$BPM_HOME/logs/config/`	`/opt/ibm/WebSphere/AppServer/logs/config/ BPMConfig_20130521-110634.log`
Deployment manager profile creation errors	`$BPM_HOME/logs/managepro files`	`/opt/ibm/WebSphere/AppServer/logs/managep rofiles/BPMTestDmgr01_create.log`
Managed Node Profile creation errors	`$BPM_HOME/logs/managepro files`	`/opt/ibm/WebSphere/AppServer/logs/managep rofiles/BPMTestNode01_create.log`
Node federation errors	`$BPM_HOME/profiles/$NODE _PROFILE_NAME/logs`	`/opt/ibm/WebSphere/AppServer/profiles/BPM TestNode01/logs/addNode.log`
Deployment manager server startup errors	`$BPM_HOME/ profiles/$DMGR_PROFILE_N AME/logs/dmgr`	`/opt/ibm/WebSphere/AppServer/profiles/BPM TestDmgr01/logs/dmgr/SystemOut.log`
Node agent startup errors	`$BPM_HOME/ profiles/$NODE_PROFILE_N AME/logs/nodeagent`	`/opt/ibm/WebSphere/AppServer/profiles/BPM TestNode01/logs/nodeagent/SystemOut.log`
Deployment environment generation failures	`$BPM_HOME/ profiles/$DMGR_PROFILE_N AME/logs/dmgr`	`/opt/ibm/WebSphere/AppServer/profiles/BPM TestDmgr01/logs/dmgr/SystemOut.log`
Bootstrap failures	`$BPM_HOME/ pro-files/$DMGR_PROFILE_ NAME/logs`	`/opt/ibm/WebSphere/AppServer/profiles/BPM TestDmgr01/logs/ bootstrapProcesServerData.AppCluster.Tue- May-21-11.45.21-2013.log`
AppTarget cluster member startup errors	`$BPM_HOME/ pro-files/<ManagedNode_H ome>/logs`	`/opt/ibm/WebSphere/AppServer/profiles/BPM TestNode01/AppClusterMember1`
Messaging cluster member startup errors	`$BPM_HOME/ profiles/<ManagedNode_Ho me>/logs`	`/opt/ibm/WebSphere/AppServer/profiles/BPM TestNode01/logs/MEClusterMember1`
Support cluster member startup errors	`$BPM_HOME/ profiles/<ManagedNode_Ho me>/logs`	`/opt/ibm/WebSphere/AppServer/profiles/BPM TestNode01/SupClusterMember1`

Creating deployment manager and managed-node profiles by using the BPMConfig command

You can use the **BPMConfig** command utility to create profiles for the deployment manager and managed nodes separately from creating the deployment environment. Complete the following steps to create the profiles:

1. On the system where you want to create the profiles, locate the appropriate sample properties directory: $BPM_HOME/BPM/samples/config

2. Find the sample properties file that most closely represents your target deployment environment and make a copy of this file before you begin editing.

3. Modify your version of the properties file so that the values correspond to your own configuration.

4. Run the **BPMConfig** command on the computer that runs the deployment manager, passing it the name of the properties file that you created, as shown in the following examples:

   – On Windows:

      BPM_HOME\bin\BPMConfig -create -profile my_environment.properties

   – UNIX based:

      BPM_HOME/bin/BPMConfig.sh -create -profile my_environment.properties

   The following high-level activities occur during this command run:

   – Validate the profile registry for existing profiles
   – Create deployment manager profile
   – Start deployment manager profile
   – Create managed node profile
   – Federate profiles
   – Stop deployment manager profile

   Logs are generated in the $BPM_HOME/logs/config directory. Example 5-16 shows sample output of the command.

Example 5-16   Create deployment manager and managed-node profiles

```
./BPMConfig.sh -create -profile Advanced-PS-ThreeClusters-DB2.properties
Logging to file
/opt/ibm/WebSphere/AppServer/logs/config/BPMConfig_20130520-174713.log.
CWMCB0713I: Node BPMTestNode2 is not a local node, skipping.
Validating the profile registry.
[]
Configuring the deployment manager.
Creating the deployment manager profile.
```

INSTCONFSUCCESS: Success: Profile BPMTestDmgr01 now exists. Please consult
/opt/ibm/WebSphere/AppServer/profiles/BPMTestDmgr01/logs/AboutThisProfile.txt for
more information about this profile.
Starting deployment manager profile BPMTestDmgr01.
ADMU0116I: Tool information is being logged in file

/opt/ibm/WebSphere/AppServer/profiles/BPMTestDmgr01/logs/dmgr/startServer.log
ADMU0128I: Starting tool with the BPMTestDmgr01 profile
ADMU3100I: Reading configuration for server: dmgr
ADMU3200I: Server launched. Waiting for initialization status.
ADMU3000I: Server dmgr open for e-business; process id is 17629376
Configuring managed node profiles.
Creating the managed node BPMTestNode01 profile.
INSTCONFSUCCESS: Success: Profile BPMTestNode01 now exists. Please consult
/opt/ibm/WebSphere/AppServer/profiles/BPMTestNode01/logs/AboutThisProfile.txt for
more information about this profile.
Retrieving signers.
CWPKI0308I: Adding signer alias "CN=convios-lp39.bocaraton.ibm.c" to local
            keystore "ClientDefaultTrustStore" with the following SHA digest:
            70:29:F3:A3:99:EF:20:B0:4A:1B:43:BC:DE:92:EE:A7:D3:CB:7C:5E
Adding the node BPMTestNode01 to the cell PSCell1.
ADMU0116I: Tool information is being logged in file
            /opt/ibm/WebSphere/AppServer/profiles/BPMTestNode01/logs/addNode.log
ADMU0128I: Starting tool with the BPMTestNode01 profile
CWPKI0309I: All signers from remote keystore already exist in local keystore.
ADMU0001I: Begin federation of node BPMTestNode01 with deployment manager at
            convios-lp39.bocaraton.ibm.com:8879.
ADMU0009I: Successfully connected to deployment manager Server:
            convios-lp39.bocaraton.ibm.com:8879
ADMU0507I: No servers found in configuration under:

/opt/ibm/WebSphere/AppServer/profiles/BPMTestNode01/config/cells/PSCell1BPMTestNode01
/nodes/BPMTestNode01/servers
ADMU2010I: Stopping all server processes for node BPMTestNode01
ADMU0024I: Deleting the old backup directory.
ADMU0015I: Backing up the original cell repository.
ADMU0012I: Creating Node Agent configuration for node: BPMTestNode01
ADMU0014I: Adding node BPMTestNode01 configuration to cell: PSCell1
ADMU0016I: Synchronizing configuration between node and cell.
ADMU0300I: The node BPMTestNode01 was successfully added to the PSCell1 cell.
ADMU0306I: Note:
ADMU0302I: Any cell-level documents from the standalone PSCell1 configuration
            have not been migrated to the new cell.
ADMU0307I: You might want to:
ADMU0303I: Update the configuration on the PSCell1 deployment manager with

```
             values from the old cell-level documents.
ADMU0306I: Note:
ADMU0304I: Because -includeapps was not specified, applications installed on
           the standalone node were not installed on the new cell.
ADMU0307I: You might want to:
ADMU0305I: Install applications onto the PSCell1 cell using wsadmin $AdminApp
           or the administrative console.
ADMU0003I: Node BPMTestNode01 has been successfully federated.
Stopping deployment manager profile BPMTestDmgr01.
ADMU0116I: Tool information is being logged in file

/opt/ibm/WebSphere/AppServer/profiles/BPMTestDmgr01/logs/dmgr/stopServer.log
ADMU0128I: Starting tool with the BPMTestDmgr01 profile
ADMU3100I: Reading configuration for server: dmgr
ADMU3201I: Server stop request issued. Waiting for stop status.
ADMU4000I: Server dmgr stop completed.
BPMConfig completed successfully.
```

Generating database scripts by using the BPMConfig command

As shown in Example 5-17 on page 172, you can use the `BPMConfig` command
to generate the database scripts that are used to create your database tables. If
you used the `BPMConfig` command or the network deployment environment
wizard in the administrative console to create the deployment environment, the
scripts were generated for you:

► Windows:

   **BPM_HOME\bin\BPMConfig -create -sqlfiles my_environment.properties
   -outputDir d:\ibm\bpm\v8.5\dbscripts**

► UNIX based:

   **BPM_HOME/bin/BPMConfig.sh -create -sqlfiles
   my_environment.properties -outputDir /MyBPMScriptDir**

Sample output is shown in Example 5-17 on page 172.

Example 5-17   Generate databases scripts by using BPMConfig command

```
./BPMConfig.sh  -create -sqlfiles Advanced-PS-ThreeClusters-DB2.properties -outputDir
/opt/ibm/WebSphere/AppServer/psdbscripts
Logging to file
/opt/ibm/WebSphere/AppServer/logs/config/BPMConfig_20130512-100017.log.
Generating SQL files.
Generating database configuration files to
/opt/ibm/WebSphere/AppServer/psdbscripts/convios-lp39Cell01.
Generating database configuration files to
/opt/ibm/WebSphere/AppServer/psdbscripts/TST_PS.
BPMConfig completed successfully.
```

Extending the network deployment environment by using BPMConfig command

After you create a deployment environment by using the `BPMConfig` command, you can run the command later to extend the deployment environment; for example, to create new profiles or to add nodes.

When managed nodes are added to an existing deployment environment, define each new node by duplicating the set of `bpm.de.node properties` that exist in the properties file and specifying the values that apply to the new managed node.

Complete the following steps before the `BPMConfig` command is run to extend the deployment environment:

1. Install the product on the computer where you want to extend the deployment environment.

2. Create the deployment environment by running the `BPMConfig` command.

3. Confirm that the deployment manager is running.

> **Important:** Run the `BPMConfig` command with the same properties file on all computers that participate in the deployment environment. You must first run the command on the computer that runs the deployment manager profile and then run it on each computer that has a managed node. At any time, only one profile creation can be performed on a computer and only one node federation can be performed against a particular deployment manager. For this reason, if you are creating multiple profiles at once on different computers, you must use the `federateLater` option, then run the command with the `create de` option sequentially on each computer to federate the managed nodes.

The **BPMConfig** command performs the following actions for extending nodes:

a. Creates a managed node for each new node that is specified in the configuration properties that are based on the specified values.

b. Federates the node and adds the node to the deployment environment. If the `-create -profile` action was issued with the `-federateLater` option, the node is created but not federated.

c. Creates clusters and cluster members as specified in the configuration properties file that do not already exist.

Running the BPMConfig utility to extend a deployment environment

Complete the following steps to extend an existing deployment environment by using the **BPMConfig** command utility:

1. Locate the sample configuration file that most closely reflects the environment you are trying to extend. Sample configuration files are provided in the `$BPM_HOME/BPM/samples/config` folder. You can also use the same properties file that was used for your existing deployment environment.

2. Modify the properties file to add the nodes and profiles to extend the existing environment.

   You must edit the following deployment environment node properties for extending an existing environment. These are sample properties that are used to add a second node in an existing deployment environment:

   ```
   bpm.de.node.2.name=BPMTestNode2
   bpm.de.node.2.hostname=convios-lp38.bocaraton.ibm.com
   bpm.de.node.2.installPath=/opt/ibm/WebSphere/AppServer
   bpm.de.node.2.profileName=BPMTestNode02
   ```

3. Run the **BPMConfig** command on each computer that has a managed node, passing it the names of the properties file you created, as shown in the following examples:

   – Windows:

     `BPM_HOME\bin\BPMConfig -create -de my_environment.properties`

   – UNIX based:

     `BPM_HOME/bin/BPMConfig.sh -create -de my_environment.properties`

   An output sample is shown in Example 5-18 on page 174.

Example 5-18   Extend a deployment environment

```
./BPMConfig.sh -create -de Advanced-PS-ThreeClusters-DB2.properties
Logging to file
/opt/ibm/WebSphere/AppServer/logs/config/BPMConfig_20130604-120143.log.
CWMCB0713I: Node convios-lp39DmgrNode01 is not a local node, skipping.
CWMCB0713I: Node BPMTestNode01 is not a local node, skipping.
Validating the profile registry.
[]
Configuring managed node profiles.
Creating the managed node BPMTestNode02 profile.
INSTCONFSUCCESS: Success: Profile BPMTestNode02 now exists. Please consult
/opt/ibm/WebSphere/AppServer/profiles/BPMTestNode02/logs/AboutThisProfile.txt for
more information about this profile.
Retrieving signers.
CWPKI0308I: Adding signer alias "CN=convios-lp39.bocaraton.ibm.c" to local
           keystore "ClientDefaultTrustStore" with the following SHA di-gest:
           DC:0D:82:CD:E5:B3:9D:14:F6:A4:5F:59:2C:79:D6:40:22:D7:AD:7E
Adding the node BPMTestNode2 to the cell convios-lpCell01.
ADMU0116I: Tool information is being logged in file
           /opt/ibm/WebSphere/AppServer/profiles/BPMTestNode02/logs/addNode.log
ADMU0128I: Starting tool with the BPMTestNode02 profile
CWPKI0308I: Adding signer alias "root_1" to local keystore
           "ClientDefaultTrustStore" with the following SHA digest:
           74:70:D5:F2:95:58:DA:DB:4B:A9:2A:3E:DB:BF:29:03:94:3B:F3:B4
CWPKI0308I: Adding signer alias "root_2" to local keystore
           "ClientDefaultTrustStore" with the following SHA digest:
           29:71:5B:72:4D:4A:32:BC:43:5B:78:3B:F1:E1:52:47:E4:A6:C8:51
CWPKI0308I: Adding signer alias "webserver1" to local keystore
           "ClientDefaultTrustStore" with the following SHA digest:
           26:CC:9A:E1:3B:33:3B:84:DC:C6:52:EF:E0:80:2E:08:57:4A:DE:F4
ADMU0001I: Begin federation of node BPMTestNode2 with deployment manager at
           convios-lp39.bocaraton.ibm.com:8879.
ADMU0009I: Successfully connected to deployment manager Server:
           convios-lp39.bocaraton.ibm.com:8879
ADMU0507I: No servers found in configuration under:

/opt/ibm/WebSphere/AppServer/profiles/BPMTestNode02/config/cells/convios-lpCell01BPMT
estNode2/nodes/BPMTestNode2/servers
ADMU2010I: Stopping all server processes for node BPMTestNode02
ADMU0024I: Deleting the old backup directory.
ADMU0015I: Backing up the original cell repository.
ADMU0012I: Creating Node Agent configuration for node: BPMTestNode2
ADMU0014I: Adding node BPMTestNode02 configuration to cell: convios-lpCell01
ADMU0016I: Synchronizing configuration between node and cell.
```

```
ADMU0300I: The node BPMTestNode2 was successfully added to the convios-lpCell01
           cell.
ADMU0306I: Note:
ADMU0302I: Any cell-level documents from the standalone convios-lpCell01
           configuration have not been migrated to the new cell.
ADMU0307I: You might want to:
ADMU0303I: Update the configuration on the convios-lpCell01 deployment manager
           with values from the old cell-level documents.
ADMU0306I: Note:
ADMU0304I: Because -includeapps was not specified, applications installed on
           the standalone node were not installed on the new cell.
ADMU0307I: You might want to:
ADMU0305I: Install applications onto the convios-lpCell01 cell using wsadmin
           $AdminApp or the administrative console.
ADMU0003I: Node BPMTestNode2 has been successfully federated.
Provisioning managed node BPMTestNode2.
Synchronizing node BPMTestNode2.
ADMU0116I: Tool information is being logged in file
           /opt/ibm/WebSphere/AppServer/profiles/BPMTestNode02/logs/syncNode.log
ADMU0128I: Starting tool with the BPMTestNode02 profile
ADMU0401I: Begin syncNode operation for node BPMTestNode02 with Deployment
           Manager convios-lp39.bocaraton.ibm.com: 8879
ADMU0016I: Synchronizing configuration between node and cell.
ADMU0402I: The configuration for node BPMTestNode02 has been synchronized with
           deployment manager convios-lp39.bocaraton.ibm.com: 8879
BPMConfig completed successfully.
```

All BPMConfig parameters in a configuration properties file

This section describes all of the parameters that are available in a properties file for configuring an IBM BPM environment, as shown in Table 5-10.

Table 5-10   Available BPMConfig properties

Property	Description	PC Adv	PS Adv	PC Std	PS Std
DE basic properties					
`bpm.de.name`	IBM BPM deployment environment name.	✓	✓	✓	✓
`bpm.de.deferSchemaCreation`	Options: True or False. If this is set false, database tables are created during deployment environment creation when BPMConfig is run with the create de action. If set to True, the tables must be created manually.	✓	✓	✓	✓
`bpm.de.type`	Type of product configuration: Express, Standard, Advanced, or AdvancedOnly	✓	✓	✓	✓
`bpm.de.environment`	Type of deployment environment: Process Center or Process Server	✓	✓	✓	✓
`bpm.de.psServerName`	Server name	x	✓	x	✓
`bpm.de.psPurpose`	The intended purpose for this deployment environment. Options: Test, Staging, or Production.	x	✓	x	✓
`bpm.de.psOffline`	Options: True or False. Set to False if the Process Server is online and can be connected to the Process Center.	x	✓	x	✓
`bpm.de.psProcessCenterTransportProtocol`	The transport protocol to access the specified Process Center. Options: http or https.	x	✓	x	✓
`bpm.de.psProcessCenterHostname`	The host name of the specified Process Center.	x	✓	x	✓
`bpm.de.psProcessCenterPort`	The port number for the specified Process Center.	x	✓	x	✓
DE and DBA authentication alias and role properties					
`bpm.de.authenticationAlias.1.name`	Database user authentication alias	✓	✓	✓	✓

Property	Description	PC Adv	PS Adv	PC Std	PS Std
`bpm.de.authenticationAlias.1.user`	Database user	✓	✓	✓	✓
`bpm.de.authenticationAlias.1.password`	Database user password	✓	✓	✓	✓
`bpm.de.authenticationAlias.2.name`	Deployment environment administrator authentication alias.	✓	✓	✓	✓
`bpm.de.authenticationAlias.2.user`	Deployment environment admin user	✓	✓	✓	✓
`bpm.de.authenticationAlias.2.password`	Deployment environment admin user password	✓	✓	✓	✓
`bpm.de.authenticationAlias.3.name`	Process center authentication alias. This is used by process server to connect to process center	x	✓	x	✓
`bpm.de.authenticationAlias.3.user`	User to connect to Process Center	x	✓	x	✓
`bpm.de.authenticationAlias.3.password`	Password for Process Center user	x	✓	x	✓
Cell properties					
`bpm.cell.name`	BPM Cell Name	✓	✓	✓	✓
`bpm.cell.authenticationAlias.1.name`	Cell authentication alias	✓	✓	✓	✓
`bpm.cell.authenticationAlias.1.user`	Cell admin user	✓	✓	✓	✓
`bpm.cell.authenticationAlias.1.password`	Cell admin user password	✓	✓	✓	✓
Deployment manager properties					
`bpm.dmgr.name`	Name of the deployment manager node. The server's name is always `dmgr` and cannot be changed.	✓	✓	✓	✓
`bpm.dmgr.hostname`	Deployment manager hostname. Do not use localhost for environments that are spread across multiple machines.	✓	✓	✓	✓
`bpm.dmgr.installPath`	The installation location of the IBM BPM product.	✓	✓	✓	✓

Property	Description	PC Adv	PS Adv	PC Std	PS Std
bpm.dmgr.profileName	Deployment manager profile name.	✓	✓	✓	✓
bpm.dmgr.initialPortAssignment	To overwrite the default port assignments, specify the starting port number for generating and assigning all ports for the deployment manager profile.	✓	✓	✓	✓
bpm.dmgr.soapPort	Deployment manager soap port. Update this property after the deployment manager profile is created. It is used to connect to the deployment manager when remote nodes are created.	✓	✓	✓	✓
Node properties: First node					
bpm.de.node.1.name	Node Name	✓	✓	✓	✓
bpm.de.node.1.hostname	If the hostname is the same as deployment manager, this node is created on the same computer. Do not use localhost for environments that are spread across multiple machines.	✓	✓	✓	✓
bpm.de.node.1.installPath	Product install location on Node1	✓	✓	✓	✓
bpm.de.node.1.profileName	Managed Node profile name on node1	✓	✓	✓	✓
bpm.de.node.1.initialPortAssignment	Port assignment. This is an optional property.	✓	✓	✓	✓
Node properties: Second node (Optional)					
bpm.de.node.2.name	Node Name.	✓	✓	✓	✓
bpm.de.node.2.hostname	If the hostname is the same as deployment manager, this node is created on the same computer. Do not use localhost for environments that are spread across multiple machines.	✓	✓	✓	✓
bpm.de.node.2.installPath	Product install location on Node1	✓	✓	✓	✓
bpm.de.node.2.profileName	Managed Node profile name on node1	✓	✓	✓	✓
bpm.de.node.2.initialPortAssignment=	Port assignment. This is an optional property.	✓	✓	✓	✓
Cluster properties					

Property	Description	PC Adv	PS Adv	PC Std	PS Std
`bpm.de.cluster.1.name`	Application Target cluster name	✓	✓	✓	✓
`bpm.de.cluster.2.name`	Messaging cluster name	✓	✓	✓	✓
`bpm.de.cluster.3.name`	Support Cluster name.	✓	✓	✓	✓
Node 1: Cluster member properties					
`bpm.de.node.1.clusterMember .1.name`	Node1 ME cluster member	✓	✓	✓	✓
`bpm.de.node.1.clusterMember .1.weight`	The proportion of requests that are sent to this cluster member.	✓	✓	✓	✓
`bpm.de.node.1.clusterMemb-e r.1.initialPortAssignment`	Starting port	✓	✓	✓	✓
`bpm.de.node.1.clusterMember .1.cluster`	ME cluster name	✓	✓	✓	✓
`bpm.de.node.1.clusterMember .2.name`	Node2 Support cluster member	✓	✓	✓	✓
`bpm.de.node.1.clusterMember .2.weight`	The proportion of requests that are sent to this cluster member.	✓	✓	✓	✓
`bpm.de.node.1.clusterMemb-e r.2.initialPortAssignment`	Starting port	✓	✓	✓	✓
`bpm.de.node.1.clusterMember .2.cluster`	Support cluster name	✓	✓	✓	✓
`bpm.de.node.1.clusterMember .3.name`	Node2 App Target cluster member	✓	✓	✓	✓
`bpm.de.node.1.clusterMember .3.weight`	The proportion of requests that are sent to this cluster member.	✓	✓	✓	✓
`bpm.de.node.1.clusterMemb-e r.3.initialPortAssignment`	Starting port	✓	✓	✓	✓
`bpm.de.node.1.clusterMember .3.cluster`	App Target cluster name	✓	✓	✓	✓
Node 2: Cluster member properties					
bpm.de.node.2.clusterMember .1.name	Node2 ME cluster member name	✓	✓	✓	✓

Property	Description	PC Adv	PS Adv	PC Std	PS Std
bpm.de.node.2.clusterMember .1.weight	The proportion of requests that are sent to this cluster member	✓	✓	✓	✓
bpm.de.node.2.clusterMemb-er.1.initialPortAssignment	Starting port	✓	✓	✓	✓
bpm.de.node.2.clusterMember .1.cluster	ME cluster name	✓	✓	✓	✓
bpm.de.node.2.clusterMember .2.name	Node2 Support cluster member name	✓	✓	✓	✓
bpm.de.node.2.clusterMember .2.weight	The proportion of requests that are sent to this cluster member.	✓	✓	✓	✓
bpm.de.node.2.clusterMemb-er.2.initialPortAssignment	Starting port	✓	✓	✓	✓
bpm.de.node.2.clusterMember .2.cluster	Support cluster name	✓	✓	✓	✓
bpm.de.node.2.clusterMember .3.name	Node2 App Target cluster member name	✓	✓	✓	✓
bpm.de.node.2.clusterMember .3.weight	The proportion of requests that are sent to this cluster member.	✓	✓	✓	✓
bpm.de.node.2.clusterMemb-er.3.initialPortAssignment	Starting port number	✓	✓	✓	✓
bpm.de.node.2.clusterMember .3.cluster	App cluster name	✓	✓	✓	✓
Database properties					
bpm.de.db.1.databaseName	Database name	✓	✓	✓	✓
bpm.de.db.1.type	Database type. Options: DB2, DB2zOS, Oracle, or SQLServer.	✓	✓	✓	✓
bpm.de.db.1.hostname	Database hostname. Do not use local-host for environments that are spread across multiple machines.	✓	✓	✓	✓
bpm.de.db.1.portNumber	Database port number	✓	✓	✓	✓
bpm.de.db.1.schema	Database schema name	✓	✓	✓	✓
bpm.de.db.2.databaseName	Database name.	✓	✓	✓	✓

Property	Description	PC Adv	PS Adv	PC Std	PS Std
bpm.de.db.2.type	Database type. Options: DB2, DB2zOS, Oracle, or SQLServer	✓	✓	✓	✓
bpm.de.db.2.hostname	Database hostname. Do not use local-host for environments that are spread across multiple machines.	✓	✓	✓	✓
bpm.de.db.2.portNumber	Database port number	✓	✓	✓	✓
bpm.de.db.2.schema	Database Schema Name	✓	✓	✓	✓
bpm.de.db.3.databaseName	Database name	✓	✓	✓	✓
bpm.de.db.3.type	Database type. Options: DB2, DB2zOS, Oracle, or SQLServer	✓	✓	✓	✓
bpm.de.db.3.hostname	Database hostname. Do not use local-host for environments that are spread across multiple machines.	✓	✓	✓	✓
bpm.de.db.3.portNumber	Database port number	✓	✓	✓	✓
bpm.de.db.3.schema	Database Schema Name	✓	✓	✓	✓
bpm.de.db.4.databaseName	Database name	✓	✓	✓	✓
bpm.de.db.4.type	Database type. Options: DB2, DB2zOS, Oracle, or SQLServer	✓	✓	✓	✓
bpm.de.db.4.hostname	Database hostname. Do not use local-host for environments that are spread across multiple machines.	✓	✓	✓	✓
bpm.de.db.4.portNumber	Database port number	✓	✓	✓	✓
bpm.de.db.4.schema	Database Schema Name	✓	✓	✓	✓

5.5 Installing IBM Process Designer

Installing the IBM Process Designer is a straightforward task and described in the official IBM documentation, which is available at this website:

http://pic.dhe.ibm.com/infocenter/dmndhelp/v8r5m0/index.jsp?topic=/com.ibm.wbpm.imuc.doc/topics/tins_bpm_pcntr_wle.html

At a high level, you must perform the following steps to install IBM Process Designer:

1. Log in to the IBM BPM Process Center at this URL:

   https://<HOST_NAME>:9443/ProcessCenter

2. Click the IBM Process Designer **Download** option. When you are prompted, save the `IBM Process Designer.zip` file to your file system.

3. Extract the contents of the `IBM Process Designer.zip` file to a temporary directory on your file system.

4. Open a command window and change to the directory where you extracted the contents of the `IBM Process Designer.zip` file.

5. Run one of the following commands to install Process Designer. If you are in the Administrators group on Windows, you can install by using the `admin` command. If you are not an administrative user, or if you want to install to your own user name without administrative privileges, install by using the `nonadmin` command:

   `installProcessDesigner_admin.bat`
   `installProcessDesigner_nonadmin.bat`

5.6 Conclusion

In this chapter, we described the installation of the product binaries and fixes. We also described different configuration options for the deployment environment and the installation of the Process Designer.

6

Installing and configuring IBM HTTP Server

In a network deployment environment, you can configure a routing server, such as, the IBM HTTP Server or WebSphere Application Server proxy server, as a proxy server for workload balancing and failover purposes. Instead of incoming HTTP requests going directly to an application server, they go to the proxy server, which then distributes the requests across multiple application servers that perform the work. In our work, we use the IBM HTTP Server.

This chapter includes the following topics:

► IBM HTTP Server architecture
► Preparing for the installation
► Installing IBM HTTP Server
► Conclusion

183

6.1 IBM HTTP Server architecture

IBM HTTP Server is a full-featured web server that is included with other products, such as, IBM WebSphere Application Server, at no charge. You can use this web server for projects that do not warrant the expense of an external HTTP server product. The IBM HTTP Server is based on the Apache HTTP Server and provides a rich set of Apache features in addition to IBM enhancements.

IBM HTTP Server features the following highlights:

► It can be remotely administered by using the IBM WebSphere administrative console.

► It includes a graphical certificate management tool.

► It provides a consistent Apache HTTP-based web server that supports many platforms, including IBM AIX, HP-UX, Linux, Solaris, Microsoft Windows, and IBM z/OS.

► It is supported by IBM when used with licensed and supported IBM products that include IBM HTTP Server.

► It provides integrated support to help secure HTTPS transactions by using the IBM FIPS and the Common Criteria certified Secure Sockets Layer (SSL) toolkit.

► It can authenticate web requests against a Lightweight Directory Access Protocol (LDAP) server over secure and non-secure connections.

Figure 6-1 on page 185 shows how IBM HTTP Server (IHS) is integrated with WebSphere Application Server. In the web server machine, IHS and WebSphere web server plug-in for IHS are installed. In this machine, the web server is started. The web server administration server also must be started. The administration server is only available from IHS and not from the default Apache distribution. On the WebSphere side, an unmanaged node that is called `ihs_node1` is defined. Then, a web server is defined in that node. These definitions contain enough information so that WebSphere can communicate with the IHS admin server (such as, host name, port number, administrative user ID, and password).
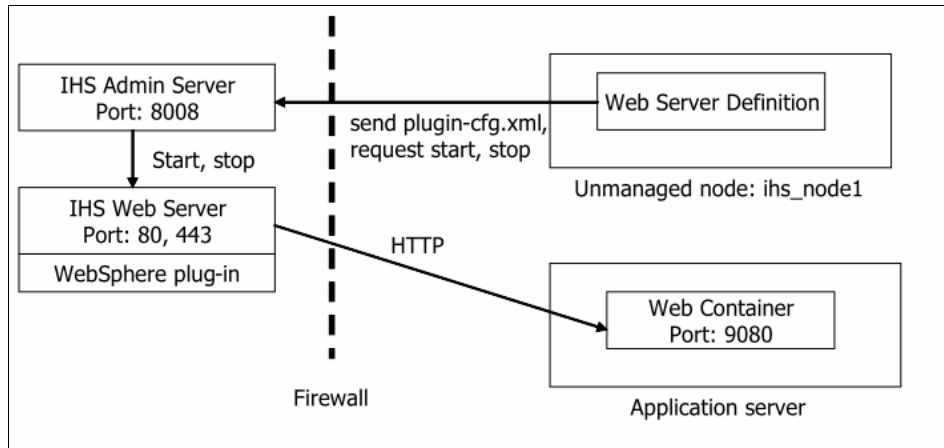
Figure 6-1   IBM HTTP Server architecture

As shown in Figure 6-1, apparently there are two machines that are involved in running the web server. This is not true. The unmanaged node and web server definition on the right side of the figure are logical definitions in the WebSphere configuration to represent the machine that is running the web server. By using the web server definition in WebSphere, you can propagate the `plugin-cfg.xml` file to the web server, and then request the web server to be started and stopped. WebSphere communicates with the IHS admin server by using HTTP over port 8008 to complete the task.

6.2 Preparing for the installation

In this section, we describe where to get the product installation files. Also described are the system requirements.

6.2.1 Downloading IBM HTTP Server binaries

IBM HTTP Server installation binaries are available for download from the IBM Passport Advantage website as supplemental packages of WebSphere Application Server Network Deployment installation images. The files are available at this website:

`http://www.ibm.com/software/lotus/passportadvantage/`

No separate licenses are required for the use of HTTP Server. It is part of the IBM Business Process Manager (BPM) license.

6.2.2 System requirements

WebSphere Application Server system requirements cover all components, including IBM HTTP Server. The minimum operating system and hardware requirements for the application server must be met on the web server system to support the basic installation and use of IBM HTTP Server.

For more information about system requirements, see this website:

http://www.ibm.com/support/docview.wss?rs=180&uid=swg27006921

6.3 Installing IBM HTTP Server

This section describes the ideal HTTP server topology and the installation and configuration procedure.

6.3.1 Server topology

An HTTP server that operates as an individual component can lead to a single point of failure. You must configure the HTTP server to integrate it into the high-availability topology and to minimize the risk of a system failure. A highly available HTTP server is installed on two nodes in a cluster. If the primary node fails, the HTTP server operations failover to the secondary node immediately.

Most organizations that are using IBM BPM do not use an HTTP service IP. Instead, they use an *external load balancer* to process HTTP requests. In such a scenario, you can have multiple active HTTP servers with the external load balancer that directs the requests. If you use an external load balancer, ensure that the load balancer does not represent a single point of failure.

This is the recommended topology for production environments for load balancing, failover, and workload management. The load balancers can be implemented as appliances or software. IHS is used for workload management to spray HTTP requests in a round-robin fashion across the applications on multiple nodes. The WebSphere plug-in that is used by IHS allows requests to spray across applications in a cluster, as shown in Figure 6-2 on page 187.
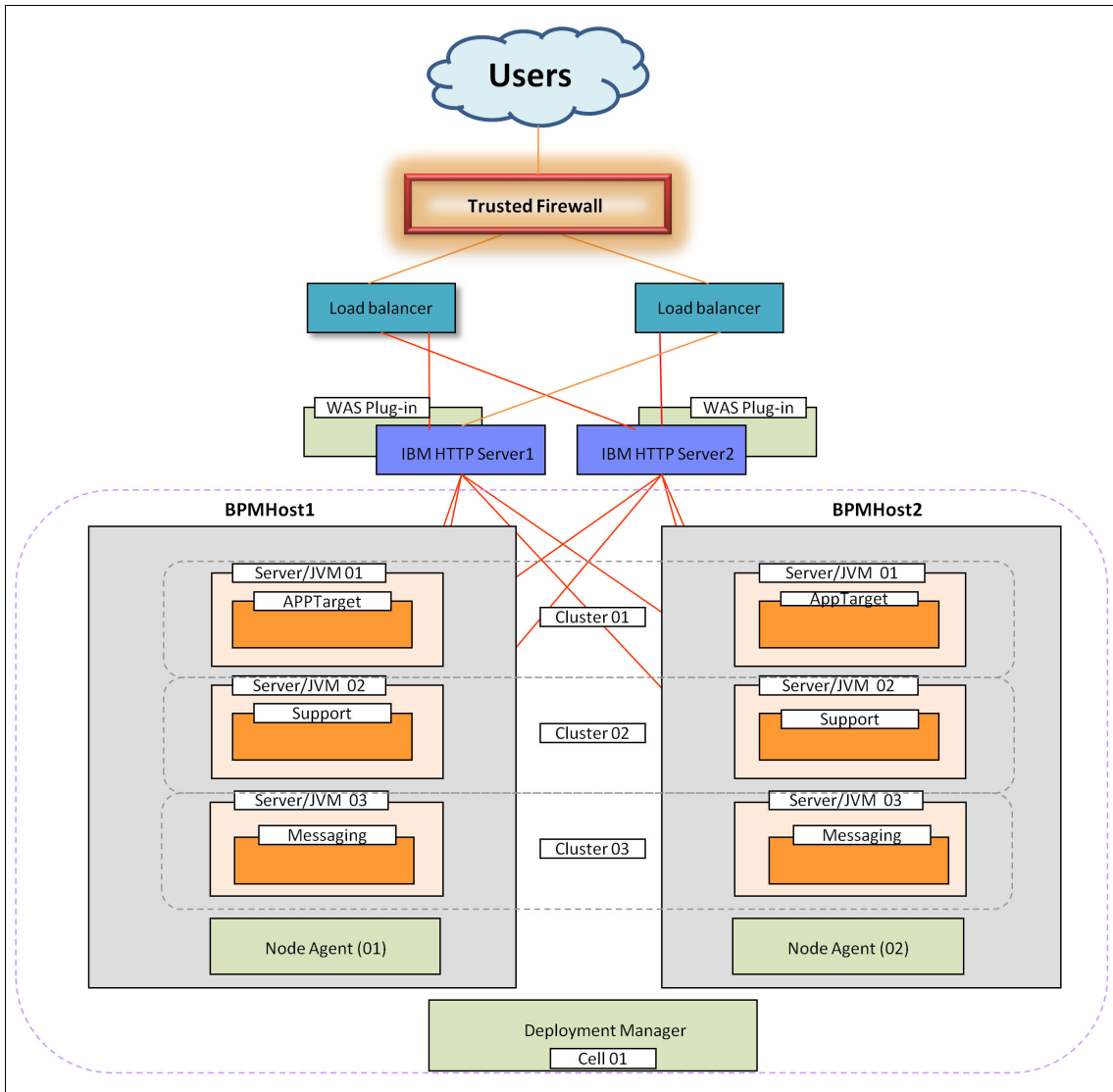
Figure 6-2   High availability topology for IHS

6.3.2 Local installation

You can define a locally installed web server on an unmanaged or managed node. If the web server is defined on an unmanaged node, the administrative functions are handled through the IBM HTTP Server administration server. If the web server is defined on a managed node, the administrative functions of the web server are handled through the WebSphere Application Server node agent, which is beneficial.

> **Web server implications:** Web servers that are not provided with the WebSphere Application Server product do not provide an administration server. Web servers that do not provide an administration server must be on a managed node to facilitate plug-in administration functions and generation and propagation of the `plugin-cfg.xml` file.

If the web server that you are setting up is an IHS, and you plan to manage that web server through a node agent that is running as a non-root user, you must adhere to the following requirements:

► The user ID that you designate as the user ID that owns the IHS directories and files is the same user ID under that the non-root node agent is running.

► You cannot run an IHS as a root user if the node agent that is managing that IHS is running as non-root node agent because a node agent process that is running as a non-root user cannot create an IHS that is running as a root user.

► The value that you specify for the listener port value must be greater than 1024. An IHS that is running under a non-root user ID does not start if the port number for its listener port is 1024 or less.

You can ensure that the non-root node agent and the IHS are using the same user ID if you specify the user ID that you used to install the product as the user ID for the IHS when you install the IHS. However, if you decide to run the node agent as a non-root user after you install the IHS and web server plug-in, complete the following steps to enable the node agent and the IHS to run as non-root users:

1. Change the user ID for WebSphere Application Server to a non-root user ID.

2. Configure the run-as setting for the node agent.

3. Use the administrative console to create a new IHS, unless an already defined IHS has the required properties.

4. Change the ownership of the IHS directory and files to the non-root user ID under which the non-root node agent is running.

6.3.3 Remote installation

You can create a web server definition in the administrative console when the web server and the web server plug-in for application server are on the same machine and the application server is on a different machine. You can run application server on one platform and a web server on another platform.

With a remote web server installation, WebSphere Application Server can facilitate plug-in administration functions and generation and propagation of the `plugin-cfg.xml` file for IHS for WebSphere Application Server, but not for other web servers.

Web servers that are not IHS for WebSphere Application Server must be on the same machine as the WebSphere Application Server (as a managed node) to facilitate plug-in administration functions and generation and propagation of the `plugin-cfg.xml` file.

You can choose a remote web server installation if you want the web server on the outside of a firewall and WebSphere Application Server on the inside of a firewall. You can create a remote web server on an unmanaged node. Unmanaged nodes are nodes without node agents. Because there is no WebSphere Application Server or node agent on the machine that the node represents, there is no way to administer a web server on that unmanaged node unless the web server is IHS for WebSphere Application Server. With IBM IHS, an administration server facilitates administrative requests, such as, start and stop, view logs, and view and edit the `httpd.conf` file.

6.3.4 Installing binaries

For this book, the authors installed IBM HTTP Server remotely. This section describes the process of installing HTTP server and plug-in binaries silently by using response files, as shown in Figure 6-3 on page 190. Sample response files are available in this directory:

`IHS_Install_media/responsefiles/sample location`

It is recommend that you back up the sample response files before you start editing them for your environment.

```
# pwd
/opt/IHSInstall/responsefiles/samples
# ls -la
total 472
drwxr-xr-x    2 root      system        4096 May 02 2012  .
drwxr-xr-x    3 root      system         256 May 02 2012  ..
-rw-r--r--    1 root      system       17547 May 02 2012  WASv85.appclient.install.Win32.xml
-rw-r--r--    1 root      system       17533 May 02 2012  WASv85.appclient.modify.Win32.xml
-rw-r--r--    1 root      system       12559 May 02 2012  WASv85.appclient.uninstall.Win32.xml
-rw-r--r--    1 root      system       19765 May 02 2012  WASv85.ihs.install.Win32.xml
-rw-r--r--    1 root      system       12681 May 02 2012  WASv85.ihs.uninstall.Win32.xml
-rw-r--r--    1 root      system       17514 May 02 2012  WASv85.plg.install.Win32.xml
-rw-r--r--    1 root      system       12258 May 02 2012  WASv85.plg.uninstall.Win32.xml
-rw-r--r--    1 root      system       17547 May 02 2012  WASv85.plugclient.install.Win32.xml
-rw-r--r--    1 root      system       17675 May 02 2012  WASv85.plugclient.modify.Win32.xml
-rw-r--r--    1 root      system       12896 May 02 2012  WASv85.plugclient.uninstall.Win32.xml
-rw-r--r--    1 root      system       17219 May 02 2012  WASv85.wct.install.Win32.xml
-rw-r--r--    1 root      system       16983 May 02 2012  WASv85.wct.modify.Win32.xml
-rw-r--r--    1 root      system       12229 May 02 2012  WASv85.wct.uninstall.Win32.xml
#
```

Figure 6-3   Location of response files

Installing IHS by using sample response file

This section describes the following steps that are required to install IHS by using sample response files:

1. Edit repository location section.
2. Edit installation package information section.
3. Run imcl command to install IHS.
4. Verify IHS installation.

Edit the response files with required properties. Required properties are highlighted in Example 6-1and Example 6-2 on page 191.

Sample response files that are used for this book are available for download, as described in Appendix A, "Additional material" on page 341.

Edit repository location section

Example 6-1 shows the section in which the repository location is specified.

Example 6-1   Response file for editing the repository location section

```
<server>
    <!-- ##### Local Repositories ###################################
     # Uncomment and update the following line when using a local
     # repository located on your own machine to install a
     # IBM HTTP Server offering.
     ######################################################### -->
    <repository location='/opt/IHSInstall'/> -->
</server>
```

Edit installation package information section

Example 6-2 shows the section in which install package information is specified.

Example 6-2   Response file for editing the installation package information section

```
<install modify='false'>
<offering id='com.ibm.websphere.IHS.v85'
 profile='IBM HTTP Server for WebSphere Application Server V8.5'
 features='core.feature,arch.64bit' installFixes='none'/>
<!-- <offering id='PM12345_WAS80' profile='IBM HTTP Server for
WebSphere Application Server V8.5'/> -->

</install>

<profile id='IBM HTTP Server for WebSphere Application Server V8.5'
 installLocation='/opt/ibm/HTTPServer'>
<data key='eclipseLocation' value='/opt/ibm/HTTPServer'/>
<data key='user.import.profile' value='false'/>
<data key='user.ihs.httpPort' value='80'/>
<data key='user.ihs.installHttpService' value='false'/>
<data key='cic.selector.nl' value='en'/>
</profile>
```

Run imcl command to install IHS

Run the **imcl** command from the `<Installation_Manager_Home>/eclipse/tools` directory, as shown in the following example:

```
./imcl -acceptLicense -showProgress input <response_file_path_and_name>
-log <log_file_path_and_name>
```

A sample output is shown in Example 6-3.

Example 6-3   Running the imcl command to install IHS

```
# ./imcl -acceptLicense -showProgress input
/opt/IHSInstall/responsefiles/samples/WASv85.ihs.install.aix.xml
       25%                50%                75%               100%
--------|------------------|------------------|------------------|
.......................................
Installed com.ibm.websphere.IHS.v85_8.5.0.20120501_1108 to the
/opt/ibm/HTTPServer directory.
```

Verify IHS installation

To verify the IHS installation, run the **versioninfo** command from the
IHS_HOME/bin directory, as shown in Example 6-4.

Example 6-4   Installation status report for IHS

```
# ./versionInfo.sh
WVER0010I: Copyright (c) IBM Corporation 2002, 2012; All rights
reserved.
WVER0012I: VersionInfo reporter version 1.15.1.48, dated 2/8/12
------------------------------------------------------------
IBM WebSphere Product Installation Status Report
------------------------------------------------------------
Report at date and time May 29, 2013 10:47:44 PM EDT
Installation
------------------------------------------------------------
Product Directory      /opt/ibm/HTTPServer
Version Directory      /opt/ibm/HTTPServer/properties/version
DTD Directory          /opt/ibm/HTTPServer/properties/version/dtd
Log Directory          /var/ibm/InstallationManager/logs
Product List
------------------------------------------------------------
IHS                    installed
Installed Product
------------------------------------------------------------
Name                   IBM HTTP Server for WebSphere Application Server
Version                8.5.0.0
ID                     IHS
Build Level            gm1218.01
Build Date             5/1/12
Package                com.ibm.websphere.IHS.v85_8.5.0.20120501_1108
Architecture           PPC64
Installed Features     IBM HTTP Server 64-bit with Java, Version 6
                       Core runtime
------------------------------------------------------------
End Installation Status Report
```

Start HTTP Server

Use your operating system shell to start IHS from the /opt/ibm/HTTPServer/bin
directory by using the following command:

 # ./apachectl start

After it is started, you can connect to your IHS, as shown in Figure 6-4 on
page 193.
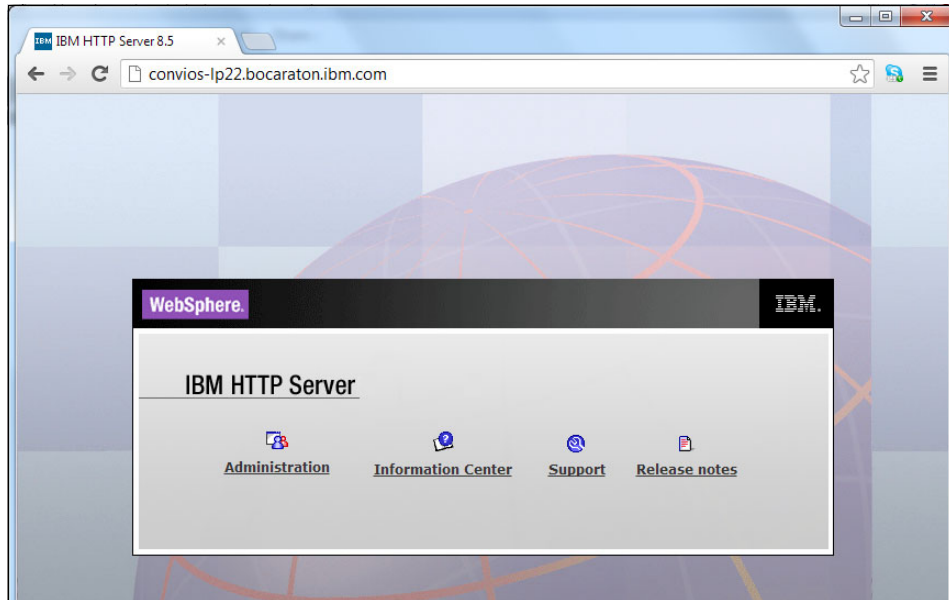
Figure 6-4   Start your IBM HTTP Server

Installing plug-in binaries by using sample response file

This section describes the following steps that are required to install the plug-in binaries by using sample response files:

1. Edit repository location section.
2. Edit installation package information section.
3. Run imcl command to install plug-in binaries.
4. Verify plug-in binary installation.

Edit the response files with required properties. Required properties are highlighted in Example 6-5 and Example 6-6 on page 194.

Sample response files that are used for this book are available for download, as described in Appendix A, "Additional material" on page 341.

Edit repository location section

Example 6-5 on page 194 shows the section in which the repository location is specified.

Example 6-5   Response file for editing the repository location section

```
#####################################################################
<server>
    <!-- ##### Local Repositories
####################################
    # Uncomment and update the following line when using a local
    # repository located on your own machine to install a
    # Web Server Plug-ins offering.
    ########################################################### -->
    <repository location='/opt/IHSInstall'/>
</server>
```

Edit installation package information section

Example 6-6 shows the section in which the installation package information is specified.

Example 6-6   Response file for editing the installation package information section

```
#####################################################################
<install modify='false'>
<offering id='com.ibm.websphere.PLG.v85'
 profile='Web Server Plug-ins for IBM WebSphere Application Server
V8.5'
 features='core.feature,com.ibm.jre.6_64bit' installFixes='none'/>
<!-- <offering id='PM12345_WAS80' profile='Web Server Plug-ins for IBM
WebSphere Application Server V8.5'/> -->
</install>

<profile id='Web Server Plug-ins for IBM WebSphere Application Server
V8.5'
 installLocation='/opt/ibm/WebSphere/Plugins'>
<data key='eclipseLocation' value='/opt/ibm/WebSphere/Plugins'/>
<data key='user.import.profile' value='false'/>
<data key='cic.selector.nl' value='en'/>
</profile>
```

Run imcl command to install plug-in binaries

Run the following command from the
<Installation_Manager_Home>/eclipse/tools directory:

**./imcl -acceptLicense -showProgress input <response_file_path_and_name>
-log <log_file_path_and_name>**

This is shown in Example 6-7.

Example 6-7   imcl command to install plug-in binaries

```
# ./imcl -acceptLicense -showProgress input
/opt/IHSInstall/responsefiles/samples/WASv85.plg.install.aix.xml -log
/opt/IHSInstall/plugin.log
          25%               50%               75%              100%
----------|-----------------|-----------------|---------------|
..................................................................
.....
Installed com.ibm.websphere.PLG.v85_8.5.0.20120501_1108 to the
/opt/ibm/WebSphere/Plugins directory.
```

Verify plug-in binary installation

Run the **versioninfo** command from the Plugin_Home/bin directory, as shown in
Example 6-8.

Example 6-8   IBM WebSphere product installation status report for plug-in

```
# pwd
/opt/ibm/WebSphere/Plugins/bin
# ./versionInfo.sh
WVER0010I: Copyright (c) IBM Corporation 2002, 2012; All rights
reserved.
WVER0012I: VersionInfo reporter version 1.15.1.48, dated 2/8/12
--------------------------------------------------------------
IBM WebSphere Product Installation Status Report
--------------------------------------------------------------
Report at date and time May 29, 2013 11:22:52 PM EDT
Installation
--------------------------------------------------------------
Product Directory       /opt/ibm/WebSphere/Plugins
Version Directory       /opt/ibm/WebSphere/Plugins/properties/version
DTD Directory
/opt/ibm/WebSphere/Plugins/properties/version/dtd
Log Directory           /var/ibm/InstallationManager/logs
Product List
--------------------------------------------------------------
PLG                     installed
Installed Product
--------------------------------------------------------------
Name            Web Server Plug-ins for IBM WebSphere Application
Server
Version         8.5.0.0
```

```
ID              PLG
Build Level     gm1218.01
Build Date      5/1/12
Package         com.ibm.websphere.PLG.v85_8.5.0.20120501_1108
Architecture    PPC64
Installed Features  IBM 64-bit WebSphere Runtime Environment for Java
                    Core runtime
-------------------------------------------------------------
End Installation Status Report
```

Installing WebSphere Customization Toolbox binaries

This section describes the following steps that are required to install the WebSphere Customization Toolbox binaries by using sample response files.

The required properties are shown in Example 6-9 and Example 6-10 on page 197.

Sample response files that were used for this book are available for download, as described in Appendix A, "Additional material" on page 341.

Edit repository location section

Example 6-9 shows the section in which the repository location is specified.

Example 6-9   Response file for editing the repository location section

```
######################################################################
<server>
    <!-- ##### Local Repositories
######################################
    # Uncomment and update the following line when using a local
    # repository located on your own machine to install a
    # Web Server Plug-ins offering.
    ######################################################### -->
    <repository location='/opt/IHSInstall'/>
</server>
```

Edit installation package information section

Example 6-10 on page 197 shows the section in which the installation package information is specified.

Example 6-10   Response file for editing the installation package information section

```
######################################################################
<install modify='false'>
<offering id='com.ibm.websphere.WCT.v85'
 profile='WebSphere Customization Toolbox V8.5'
 features='core.feature,pct' installFixes='none'/>
<!-- <offering id='PM12345_WAS80' profile='WebSphere Customization
Toolbox V8.5'/> -->

</install>

<profile id='WebSphere Customization Toolbox V8.5'
 installLocation='/opt/ibm/WebSphere/Toolbox'>
<data key='eclipseLocation' value='/opt/ibm/WebSphere/Toolbox'/>
<data key='user.import.profile' value='false'/>
<data key='user.select.64bit.image,com.ibm.websphere.WCT.v85'
value='false'/>
<data key='cic.selector.nl' value='en'/>
</profile>
```

Run imcl command to install WebSphere Customization Toolbox binaries

Run the following command from the
`<Installation_Manager_Home>/eclipse/tools` directory:

`./imcl -acceptLicense -showProgress input <response_file_path_and_name>`
`-log <log_file_path_and_name>`

This is shown in Example 6-11.

Example 6-11   imcl command to install WebSphere Customization Toolbox binaries

```
# ./imcl -acceptLicense -showProgress input
/opt/IHSInstall/responsefiles/samples/WASv85.wct.install.aix.xml
        25%               50%               75%              100%
---------|-----------------|-----------------|-----------------|
...............................................
Installed com.ibm.websphere.WCT.v85_8.5.0.20120501_1108 to the
/opt/ibm/WebSphere/Toolbox directory.
```

6.3.5 Configuring the web server plug-in by using the Plug-in Configuration Tool

You can use the **wctcmd** command and specify the Plug-in Configuration Tool (PCT) to configure an IHS to use a WebSphere Application Server as a hosting server. A sample response file is available to configure the web server plug-in in Appendix A, "Additional material" on page 341.

Complete the following steps:

1. Locate the sample response file in the `/WCT_Home/WCT` directory, as shown in Figure 6-5.

```
# pwd
/opt/ibm/WebSphere/Toolbox/WCT
# ls -la
total 256
drwxr-xr-x    5 root      system            256 May 30 11:30 .
drwxr-xr-x   11 root      system           4096 May 30 11:31 ..
drwxr-xr-x    3 root      system            256 May 30 11:30 configuration
-rwxr-xr-x    1 root      system          82943 Apr 16 2012  eclipse
-rwxr-xr-x    1 root      system            180 Apr 16 2012  eclipse.ini
drwxr-xr-x    5 root      system            256 May 30 11:30 features
-rwxr-xr-x    1 root      system          11625 May 30 11:54 pct_responsefile.txt
drwxr-xr-x    4 root      system          16384 May 30 11:30 plugins
-rwxr-xr-x    1 root      system             94 Apr 16 2012  wct.sh
-rwxr-xr-x    1 root      system            282 Apr 16 2012  wctcmd.sh
#
```
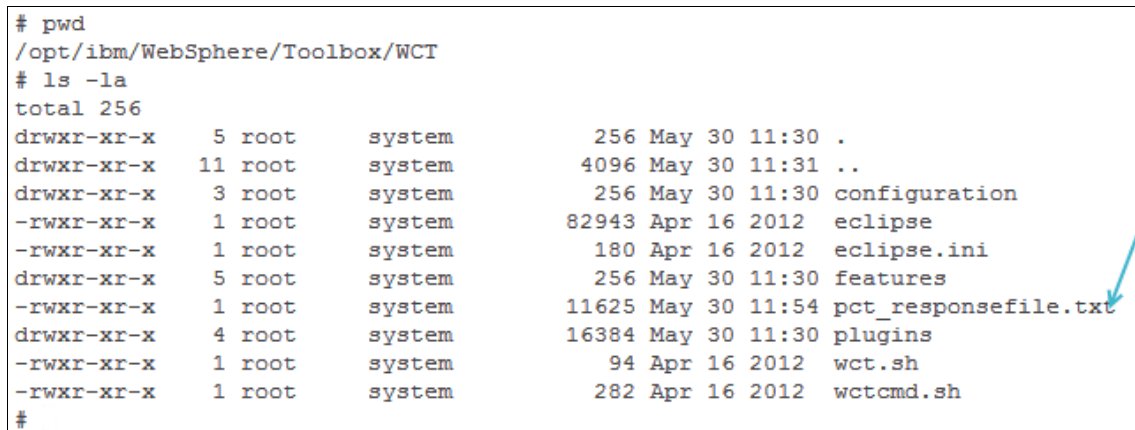
Figure 6-5   Sample response file for plug-in configuration

2. Edit the properties in the response file, as shown in Example 6-12.

Example 6-12   Edit the properties for the pct_responsefile

```
configType=remote
enableAdminServerSupport=true
enableUserAndPass=true
enableWinService=false
ihsAdminCreateUserAndGroup=true
ihsAdminPassword=ihsadmin
ihsAdminPort=8008
ihsAdminUnixUserGroup=ihsadmin
ihsAdminUnixUserID=ihsadmin
mapWebServerToApplications=true
wasMachineHostname=convios-lp39.bocaraton.ibm.com
webServerConfigFile1=/opt/ibm/HTTPServer/conf/httpd.conf
webServerDefinition=webserver1
```

```
webServerHostName=convios-lp22.bocaraton.ibm.com
webServerInstallArch=64
webServerPortNumber=80
webServerSelected=IHS
```

3. Run the `wctcmd` command to generate the IHS plug-in configuration, as shown in Example 6-13. Here, the command is used on UNIX.

Example 6-13   WebSphere Customization Toolbox command to generate IHS plug-in

```
# ./wctcmd.sh -tool pct -createDefinition -defLocName
/opt/ibm/WebSphere/Plugins -defLocPathname
/opt/ibm/WebSphere/Plugins -response
/opt/ibm/WebSphere/Toolbox/WCT/pct_responsefile.txt
Importing definition location...

Definition location successfully imported

Launching tool pct ...

Tool execution completed successfully.
```

> **Java null pointer exception:** If you notice a Java null pointer exception when you run this command, upgrade IHS, the IHS plug-in, and WebSphere Custom Toolbox to the latest fix level. To resolve the problem, we upgraded to fix level 8.0.0.6. For more information, see this website:
>
> http://www.ibm.com/support/docview.wss?uid=swg1PM46369

4. Start and verify the IHS and Administration Server installation, as shown in Example 6-14.

Example 6-14   Verify your installation

```
# pwd
/opt/ibm/HTTPServer/bin
# ./apachectl start
# ./adminctl start
./adminctl start: admin http started
#
```

5. Locate the web server configuration script. On UNIX systems, it is in the following directory:

/opt/ibm/WebSphere/Plugins/bin/configurewebserver1.sh

6. Copy the web server configuration script to the remote WebSphere Application Server bin directory, as shown in the following example:

```
/opt/ibm/WebSphere/AppServer/bin
```

In Example 6-15, we show how to do this by using the **scp** command.

Example 6-15   Copy the web server configuration script

```
# scp configurewebserver1.sh
bpmuser@convios-lp39.bocaraton.ibm.com:/opt/ibm/WebSphere/AppServer/
bin
bpmuser@convios-lp39.bocaraton.ibm.com's password:
configurewebserver1.sh
100% 2484     2.4 KB/s   00:00
```

7. Run the web server configuration script on the WebSphere Application Server.

Change the directory to WAS_HOME/bin. Then, run the following command to add webserver1 to the WebSphere Application Server configuration:

configurewebserver1.bat|sh -profileName profile_name -user admin_user_name –password admin_password -ihsAdminPassword ihs_admin_password

For our UNIX environment, this is shown in Example 6-16.

Example 6-16   Run the web server configuration script

```
./configurewebserver1.sh -profileName BPMTestDmgr01 -user wasadmin
-password wasadmin
```

8. Verify IHS configuration.

Next, you can verify the IHS configuration from the WebSphere Integrated Solution Console. In the left side pane, click **Servers** → **Server Types** → **Web server**. Then, verify your IHS entry for webserver1 and click the link, as shown in Figure 6-6 on page 201.
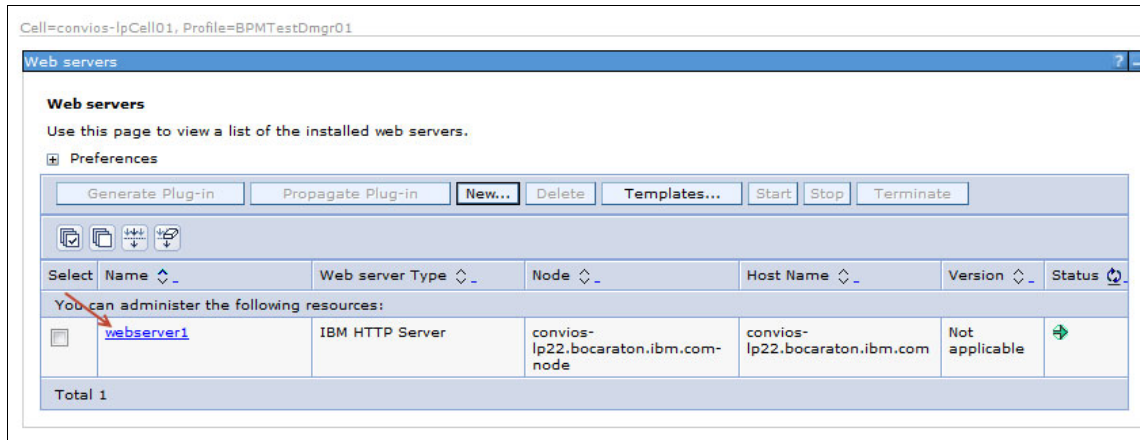
Figure 6-6   Verify IHS configuration

9. Confirm that the Remote Web server management properties are configured correctly, as shown in Figure 6-7. After the properties are configured correctly, click **OK** to return to the Web servers overview page.
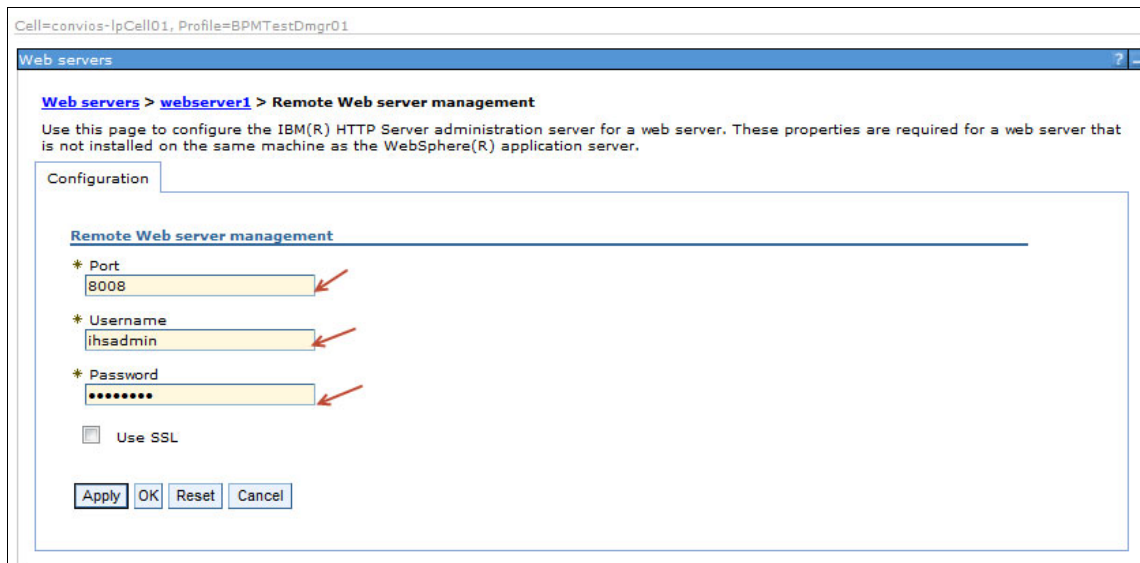
Figure 6-7   Web server remote management properties

10. The plug-in must now be generated. Click the box next to webserver1 resource and then click **Generate Plug-in**. The IBM HTTP Server must have permission to write to the `plugin-cfg.xml` file. After the plug-in is generated successfully, two messages are displayed, as shown in Figure 6-8.
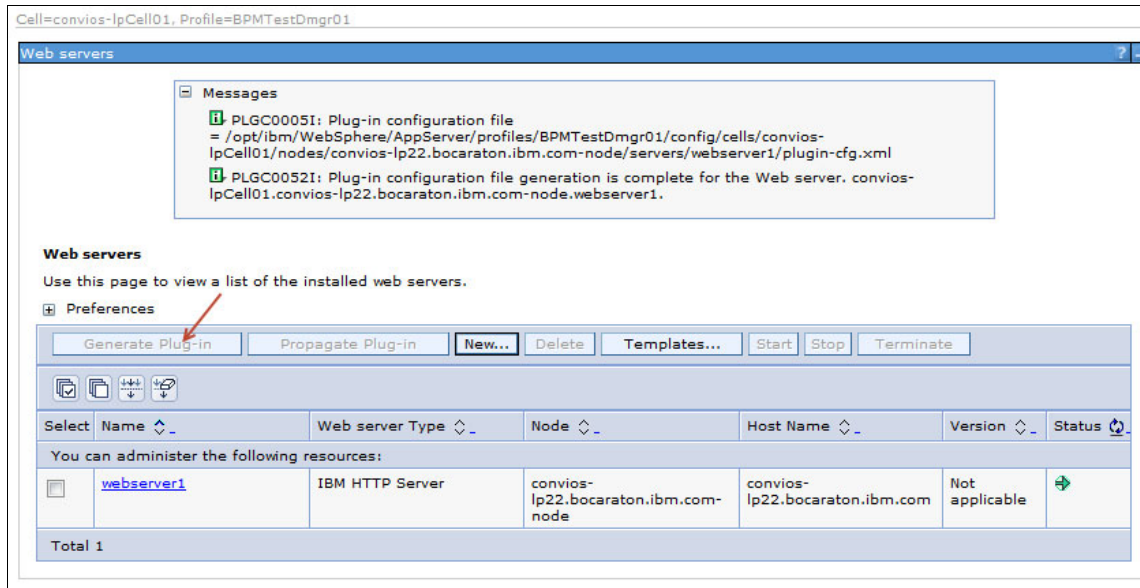
Figure 6-8   Generate plug-in

11.Propagate the plug-in by selecting the webserver1 resource again and by clicking **Propagate Plug-in**. After the plug-in is propagated successfully, two messages are displayed, as shown in Figure 6-9.
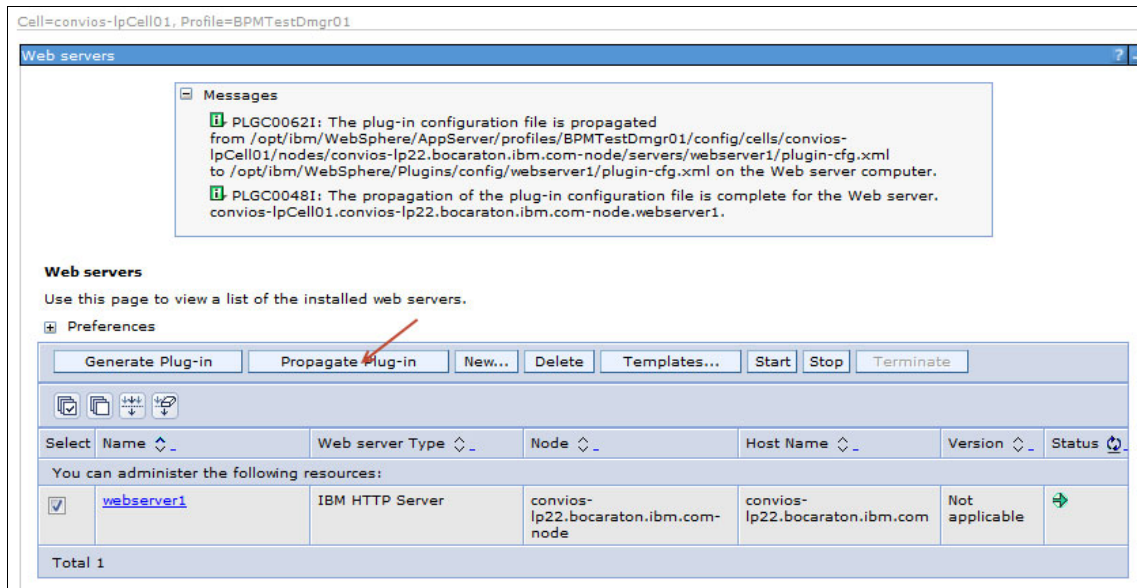
Figure 6-9   Propagate plug-in

12. Stop and start the web server.

13. Verify your web server configuration by browsing to your Process Admin Console. In our example, we are pointing our browser to the following web address that hosts our web server:

`http://convios-lp22.bocaraton.ibm.com/ProcessAdmin`

The resulting Process Admin Console is shown in Figure 6-10.
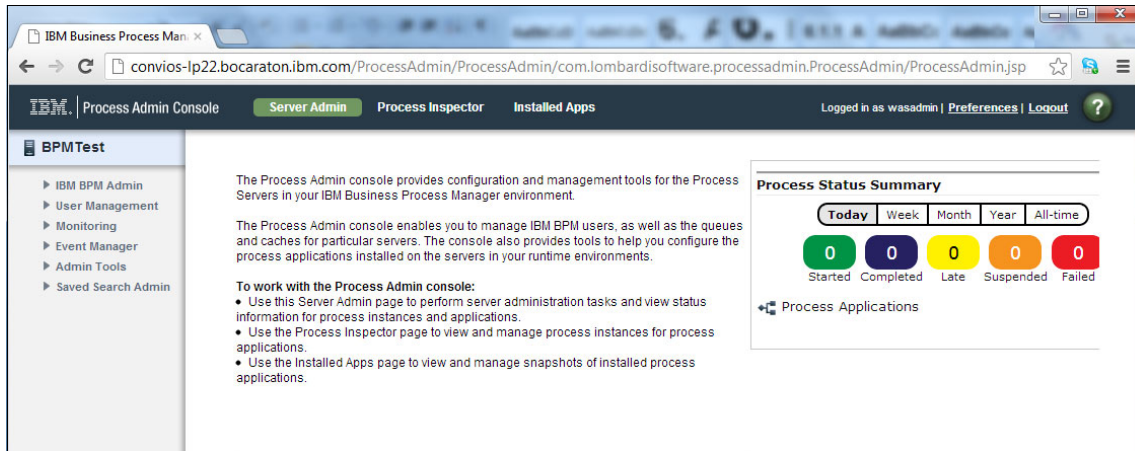
Figure 6-10   Verify admin process

6.3.6 Securing IHS with SSL communications

For secure communication, you can set up the SSL directives in the default `httpd.conf` configuration file. In our example, we use a self-signed certificate to configure SSL communication between IHS and IBM Business Process Manager.

A self-signed certificate provides a certificate to enable SSL sessions between clients and a server, while waiting for the officially signed certificate to be returned from the certificate authority (CA). A private and public key is created during this process. This process generates a self-signed X.509 certificate in the identified key database. A self-signed certificate has the same issuer name as its subject name.

The `gskcmd` command provides a command-line interface (CLI) for certificate management tasks that might otherwise be provided by the `ikeyman` utility.

Complete the following steps to configure SSL by using a self-signed certificate:

1. Create a new key database by using the **gskcmd** command. The following **gskcmd** syntax[1] is used to create a key database:

```
<IHS_Home>/bin/gskcmd -keydb -create -db <filename> -pw <password>
-type <cms | jks | jceks | pks12> -expire <days> -stash
```

Where:

   – `-keydb` specifies that the following command targets a key database.

   – `-create` specifies that the command creates a key database.

   – `-db <filename>` specifies the name of the key database.

   – `-pw <password>` specifies the password for the new key database.

   – `-type <cms | jks | jceks | pkcsk>` specifies the database type.

   – `-expire <days>` specifies the number of days before the password or the certificate expires.

   – `-stash <filename>` specifies that the password for the key database is stashed to a file.

The following example shows how to create a new key database:

```
# ./gskcmd -keydb -create -db /opt/ibm/HTTPServer/bin/key.kdb -pw
ihsadmin -type cms -expire 3650 -stash
/opt/ibm/HTTPServer/bin/key.sth
```

2. Create a self-signed certificate by using the **gskcmd** command, as shown in the following syntax:

```
<IHS_Home>/bin/gskcmd -cert -create -db <filename> -pw <password>
-size <2048 | 1024 | 512> -dn <distinguished_name> -label label>
-default_cert <yes | no> - expire <days> -san dnsname <DNS name
value>[,<DNS name value>] -san emailaddr <email address
value>[,<email address value>]  -san ipaddr <IP address value>[,<IP
address val-ue>][-ca <true | false>]
```

Where:

   – `-cert` specifies that the following command targets a self-signed certificate.

   – `-create` specifies a create action.

   – `-db <filename>` is the name of the key database.

   – `-pw <password>` specifies the password to access the key database.

---

[1] For more information about the gskcmd options, see the IHS Information Center at this website:
http://pic.dhe.ibm.com/infocenter/wasinfo/v8r5/topic/com.ibm.websphere.ihs.doc/ihs/rihs
_ikeycmdsyn.html

- – `-size <2048 | 1024 | 512>` indicates a key size of 2048, 1024, or 512 bit. The default key size is 1024 bit. The 2048-bit key size is available if you are using Global Security Kit (GSKit) Version 7.0.4.14 or later.

- – `-dn <distinguished_name>` indicates an X.500 distinguished name. Enter the `dn` as a quoted string of the following format (only CN, O, and C are required):

  - CN: common_name
  - O: organization
  - OU: organization_unit
  - L: location
  - ST: state, province
  - C: country

  This is seen in the following example:

  ```
  "CN=weblinux.raleigh.ibm.com,O=IBM,OU=IBM HTTP
  Server,L=RTP,ST=NC,C=US"
  ```

- – `-label <label>` is a descriptive comment that is used to identify the key and certificate in the database.

- – `-default_cert <yes | no>` specifies whether this is the default certificate in the key database.

- – `-expire <days>` indicates the validity period for new self-signed digital certificates; the default is 365 days; the minimum is one day. The maximum is 7300 days (20 years).

- – `-san * <subject alternate name attribute value> | <subject alternate name attribute value>` specifies the subject alternative name extensions in the certificate request that inform SSL clients of alternative host names that correspond to the signed certificate.

The following example shows how to create a self-signed certificate:

```
# ./gskcmd -cert -create -db /opt/ibm/HTTPServer/bin/key.kdb -pw
ihsadmin -size 1024 -dn
CN=convios-lp22.bocaraton.ibm.com,O=IBM,OU=BPMODC,L=AUS,ST=TX,C=US
-label webserver1 -default_cert yes -expire 3650
```

3. Enable SSL directives.

   Add SSL directives to the IHS `httpd.conf` configuration file. Create an SSL virtual host stanza by using the directive as shown in Example 6-17.

   Example 6-17   Add SLL directives to the httpd.conf file

   ```
   LoadModule ibm_ssl_module modules/mod_ibm_ssl.so
        Listen 443
            <VirtualHost *:443>
              ServerName convios-lp22.bocaraton.ibm.com
                   SSLEnable
                   SSLProtocolDisable SSLv2
            </VirtualHost>
   SSLDisable
   KeyFile /opt/ibm/HTTPServer/bin/key.kdb
   ```

4. Stop and start the web server.

6.3.7 Configuring trust

Complete the following steps to configure trust between the WebSphere Application Server SSL certificate and the IHS plug-in:

1. By using the WebSphere Integrated Solutions Console, click **Security** → **SSL certificate and key management**, as shown in Figure 6-11 on page 208.
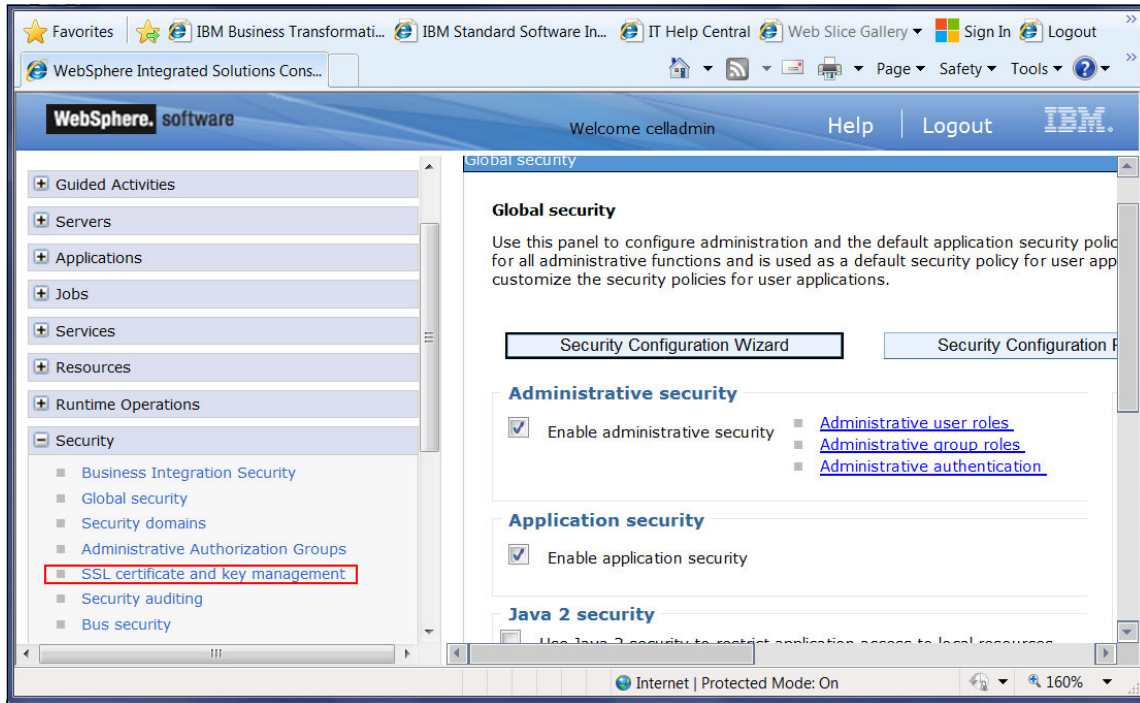
Figure 6-11   WebSphere Integrated Solutions Console

2. From the Related Items list, click **Key stores and certificates**, as shown in Figure 6-12.
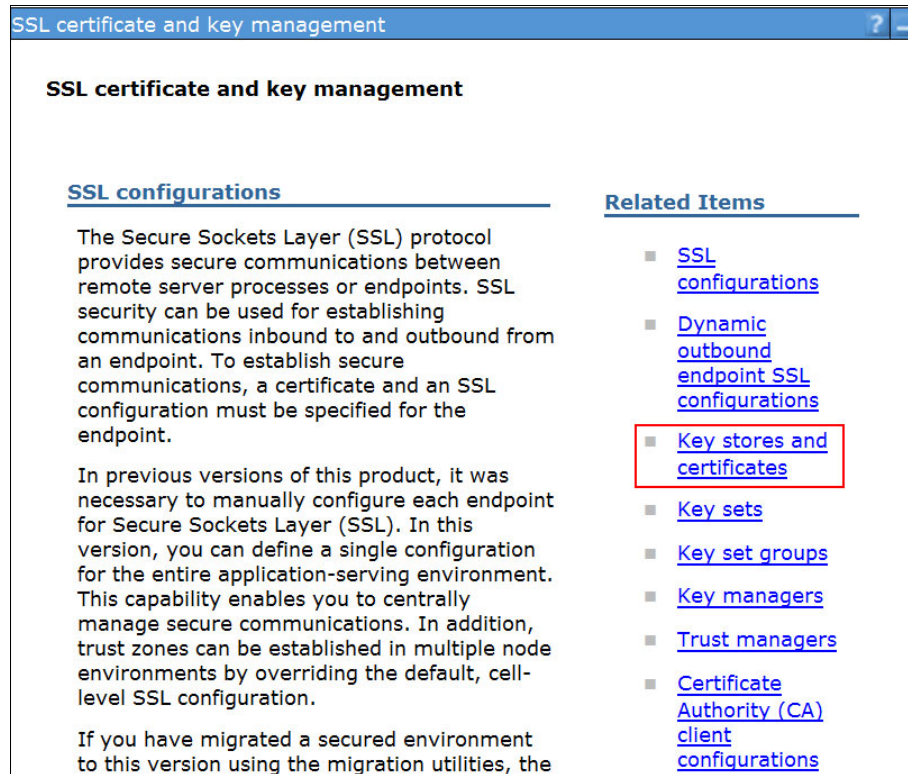
Figure 6-12   SSL certificate and key management

3. Click **NodeDefaultKeyStore**, as shown in Figure 6-13.

Figure 6-13   Key stores and certificates

4. In the Additional Properties list, click **Personal certificates**, as shown in Figure 6-14.
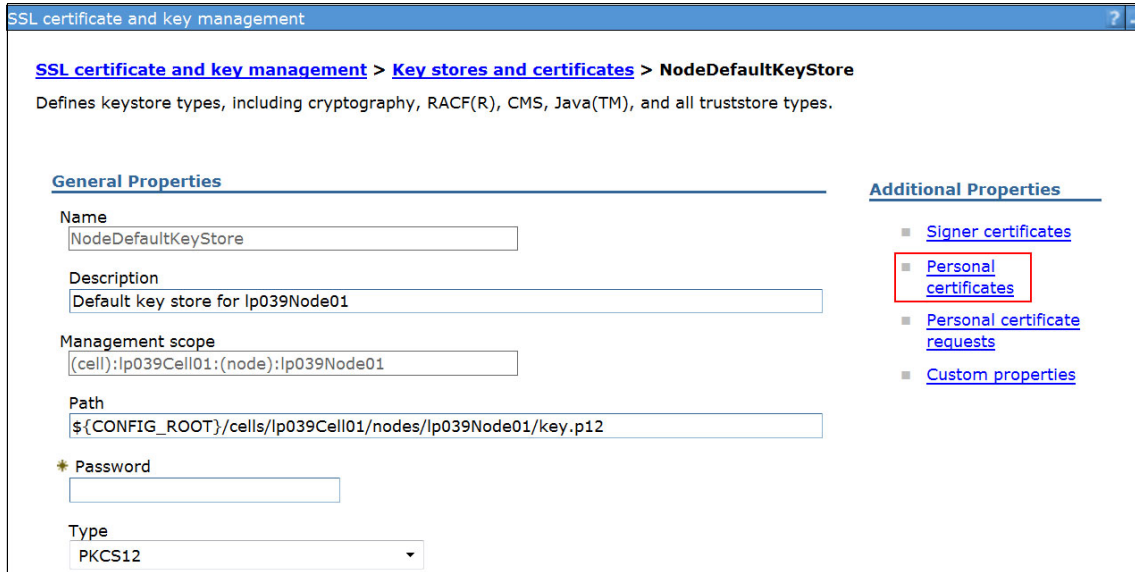
Figure 6-14   NodeDefaultKeyStore

5. Write down the highlighted Serial Number of the default certificate. Select the default certificate and then click **Extract**, as shown in Figure 6-15.
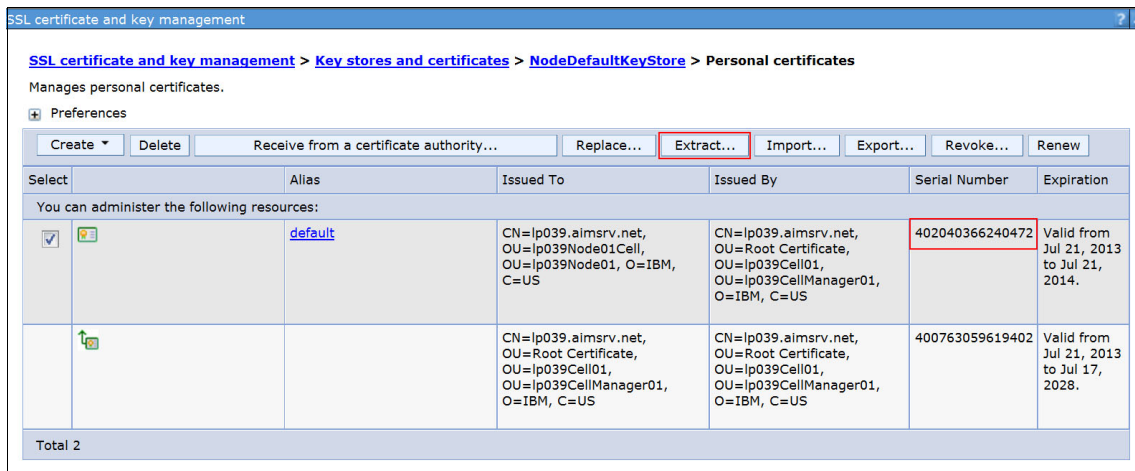
Figure 6-15   Personal certificates

6. Write down the highlighted Certificate file name to be extracted with the full path and leave the data type as it is. Click **OK**, as shown in Figure 6-16.
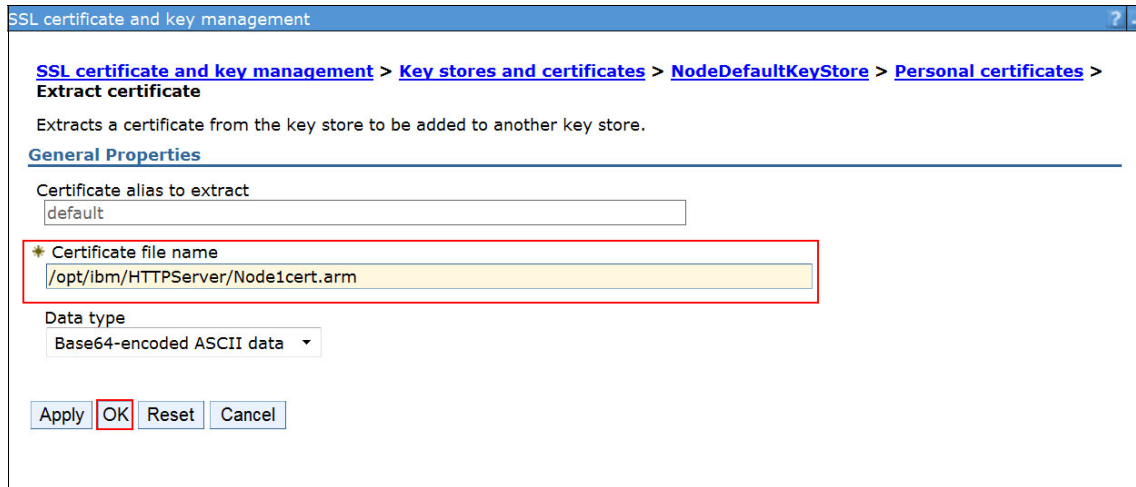
Figure 6-16   Extract certificate

7. Repeat steps 5 and 6 for all nodes, then continue with the following steps.

8. Click **Security** → **SSL certificate and key management** → **Key stores and certificates**.

9. Click **CMSKeyStore** for webserver1, as shown in Figure 6-17.

Figure 6-17   Key stores and certificates

10. In the CMSKeyStore window, select **Signer certificates** from the Additional Properties list. Click **Add**, as shown in Figure 6-18.
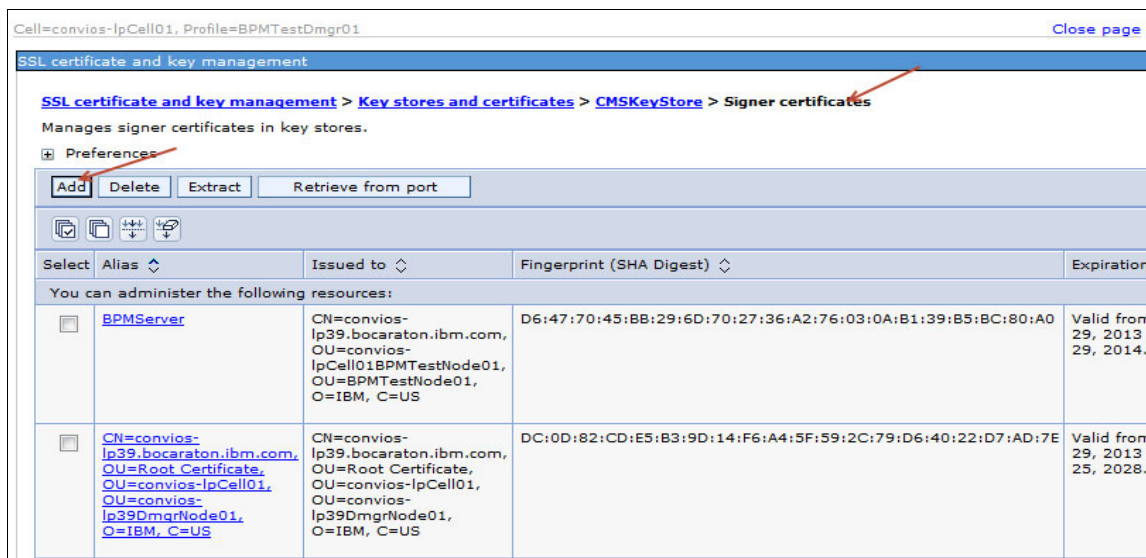
Figure 6-18   Signer certificates

11. Specify the Alias and File name that you extracted in step 6 on page 212 with the full path and enter them as shown in Figure 6-19. Click **OK** to save the changes.
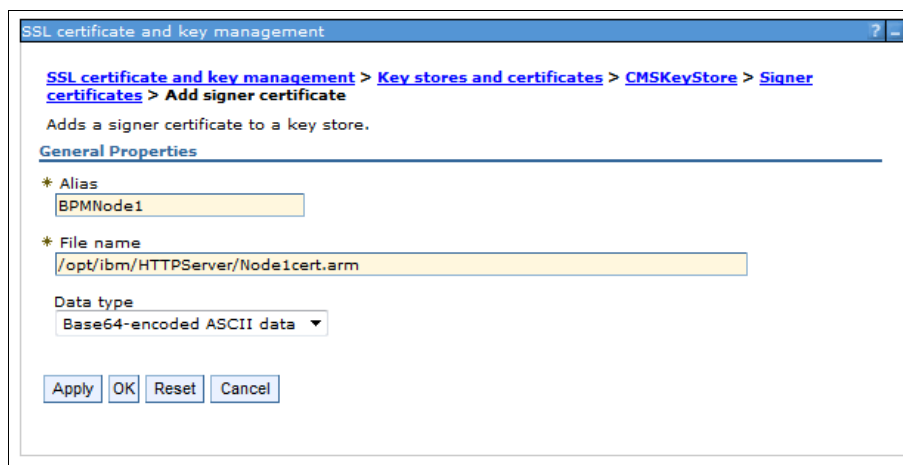
Figure 6-19   Specify signer information

12. Repeat steps 9,10 and 11 for all certificates that were extracted from all nodes.

13. Copy the updated CMSKeystore file from the WebSphere Application Server to the remote IHS.

In our example, the source location is shown in the following example:

```
${CONFIG_ROOT}/cells/convios-lpCell01/nodes/convios-lp22.bocaraton.i
bm.com-node/servers/webserver1/plugin-key.kdb
```

The CMS key database file is under the unmanaged IHS node; here, it is webserver1.

Our target location on the remote IHS is shown in the following example:

```
/opt/ibm/WebSphere/Plugins/config/webserver1
```

Double check location information: Before the keystore file is copied, you can verify the correct location of the CMS keystore on the remote IHS server by checking the value of the `Keyfile` parameter in the `plugin-cfg.xml` file.

14. Apply and synchronize the changes.

15. Restart the IHS.

6.4 Conclusion

This chapter described the topology, installation, and configuration of an IBM HTTP Server.

7

Post-installation configuration

This chapter describes some common post-installation configuration tasks for constructing enterprise-grade IBM Business Process Manager (BPM) environments.

This chapter includes the following topics:

► Configuring the SMTP server
► Configuring the LDAP repository
► Configuring transaction properties for peer recovery
► Changing passwords
► Configuring the HTTP load balancer URL

217

7.1 Configuring the SMTP server

To use the email task notification feature, you must configure IBM BPM to use an appropriate SMTP relay server inside your organization. Contact your mail server administrator team to obtain the host name of the SMTP server that permits SMTP relay from your IBM BPM servers. IBM BPM does not support any type of SMTP authentication or nonstandard SMTP ports.

Create a file that is named `102CustomSMTP.xml` with the content that is shown in Example 7-1. Replace `$SMTP_HOST_NAME` with your SMTP server host name. Use a simple text editor; for example, Notepad on the Windows platform.

Example 7-1   Content of the file 102CustomSMTP.xml

```
<properties>
  <server merge="mergeChildren">
    <email merge="mergeChildren">
      <smtp-server merge="replace">$SMTP_HOST_NAME</smtp-server>
    </email>
  </server>
</properties>
```

Place the `102CustomSMTP.xml` file in the following directory for each `NODE_NAME` and `APP_TARGET_SERVER` in the cluster:

`$BPM_HOME/profiles/$DMGR_PROFILE_NAME/config/cells/<DMGR_CELL>/nodes/<NODE_NAME>/servers/<APP_TARGET_SERVER>/process-server/config/`

This step should be performed in the deployment manager profile only and use a similar path. The files are then pushed to each node by using the WebSphere synchronization mechanism.

Synchronize the nodes by logging in to the WebSphere Integrated Solutions Console, browsing to **System Administration** → **Nodes**, selecting all nodes, and then clicking **Full Synchronize**.

Wait for the synchronization to finish and then restart the AppTarget cluster (AppCluster).

7.2 Configuring the LDAP repository

In this section, we describe how to add an LDAP repository to the federated repository to be used with the default file-based repository. We also describe how to use group and user filters to restrict results that are returned from LDAP.

We use Microsoft Active Directory (Windows 2003 mode) as an example, so some fields, such as, the LDAP Distinguished Name format and some other LDAP attributes, are specific to Active Directory.

The following details for the LDAP configuration are described:

► Prerequisites
► Adding LDAP to the WebSphere federated repository
► Validating LDAP configuration
► Configuring LDAP filters
► Recovering from security configuration problems

7.2.1 Prerequisites

Before you proceed with the LDAP configuration in your IBM BPM environment, you must request the values of the following mandatory parameters from your LDAP administrator:

► Fully Qualified Domain Name (FQDN) of the LDAP server
► LDAP port
► Bind distinguished name
► Bind password
► Base distinguished name

Before the LDAP repository configuration is started, it is recommended that you verify the parameters that are provided by trying to connect to the LDAP repository by using an LDAP browser of your choice.

7.2.2 Adding LDAP to the WebSphere federated repository

Complete the following steps to add LDAP to the WebSphere federated repository:

1. Stop all IBM BPM clusters' members and node agents on all machines. Only the deployment manager should be running.

2. Log in to the WebSphere Integrated Solutions Console by using the following address:

   `https://<DMGR_HOST_NAME>:9043/ibm/console`

In the left pane, click **Security** → **Global Security**. In the User account repository section, click **Configure…**, as shown in Figure 7-1.
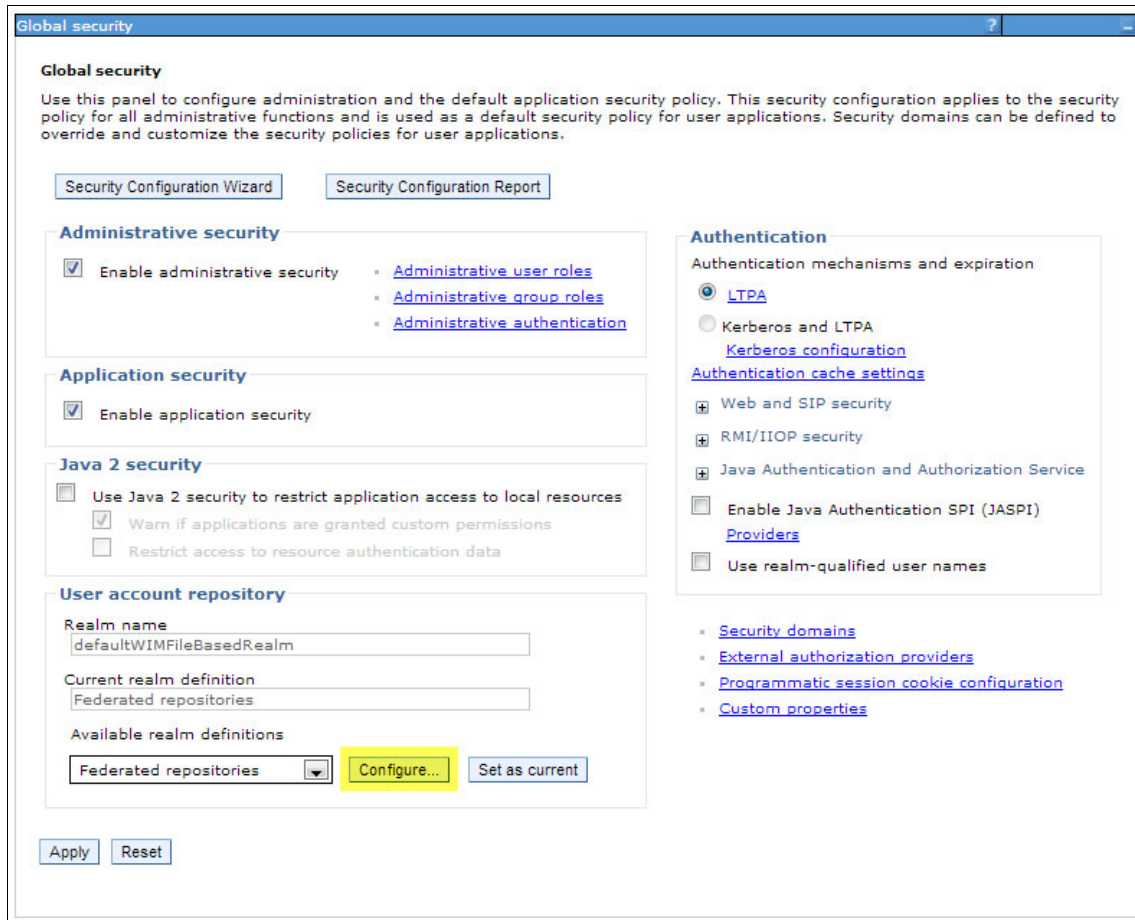
Figure 7-1   Configuring User account repository

3. In the Related Items part of the page, click **Manage repositories**, as shown in Figure 7-2.

Figure 7-2   Federated repositories

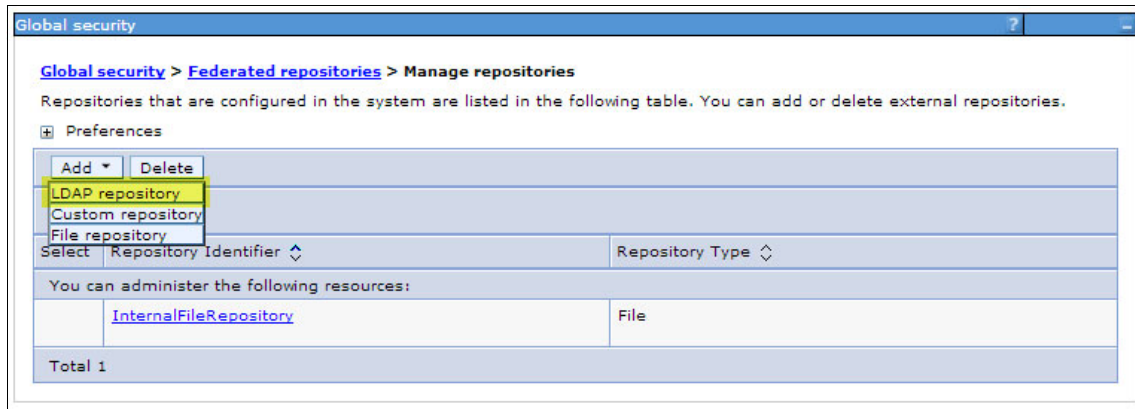4. In the Add drop-down list, select **LDAP repository,** as shown in Figure 7-3.

Figure 7-3   Manage repositories

5. As shown in Figure 7-4 on page 224, you must provide the following information:

   – Repository Identifier: Enter a meaningful name for the new repository. In our example, we are using `ODC AD`.

   – LDAP server section:

     • Directory type: Select an appropriate type of LDAP (we choose **Microsoft Windows Active Directory**).
     • Primary host name: Specify the LDAP server's host name; in our case, we use `conesx-vm74.bocaraton.ibm.com`.
     • Port: Specify an LDAP port. In the case of Microsoft Active Directory, it can be the default LDAP port `389` or the Global Catalog port `3268` if you are configuring against a Global Catalog enabled Domain Controller[1].

   – Security section:

     • Bind distinguished name: Specify an LDAP user.
     • Bind password: Specify an LDAP password.

       This information is used to connect to the LDAP server.

     In the case of Microsoft Active Directory, the distinguished name (DN) for a specific user can be identified by running one of the following commands on any member server that is part of the Active Directory domain:

     ```
     dsquery user -samid binduser
     dsquery user -name binduser
     ```

---

[1] For more information, see this website:
http://technet.microsoft.com/en-us/library/cc978012.aspx

The DN is returned in the following format, which is what we enter for the Bind distinguished name:

```
CN=binduser,CN=Users,DC=odc,DC=ibm,DC=local
```

Another way to specify the bind user for Microsoft Active directory is to use the following domain notation in the Bind distinguished name field:

```
binduser@odc.ibm.local
```

Also, provide the appropriate Bind password for the LDAP connection.

After all of the mandatory options are specified, click **OK** to save the configuration, as shown in Figure 7-4 on page 224.

Figure 7-4   Configure new LDAP repository

6. Browse to the Federated repositories window and click **Add repositories (LDAP, custom, etc)…** as shown in Figure 7-5.
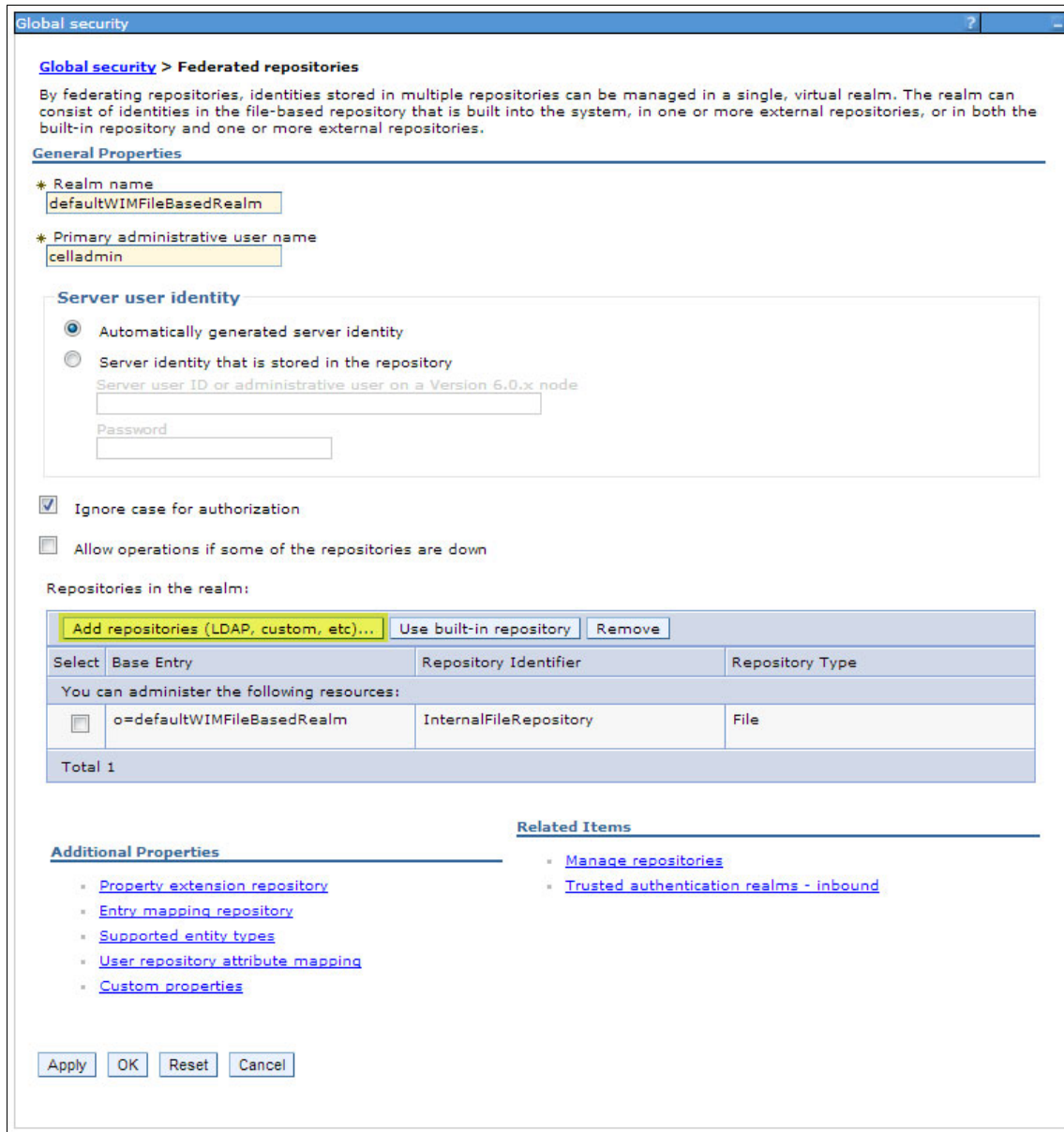

Figure 7-5   Adding new repository to list of repositories

7. Select the corresponding repository (which you created previously) in the Repository drop-down menu and set the base DN in the Unique distinguished name of the base (or parent) entry in federated repositories field. The unique name often is equal to the actual DN; otherwise, select **Distinguished name in the repository is different** and specify the actual DN. Click **OK** to save, as shown in Figure 7-6.
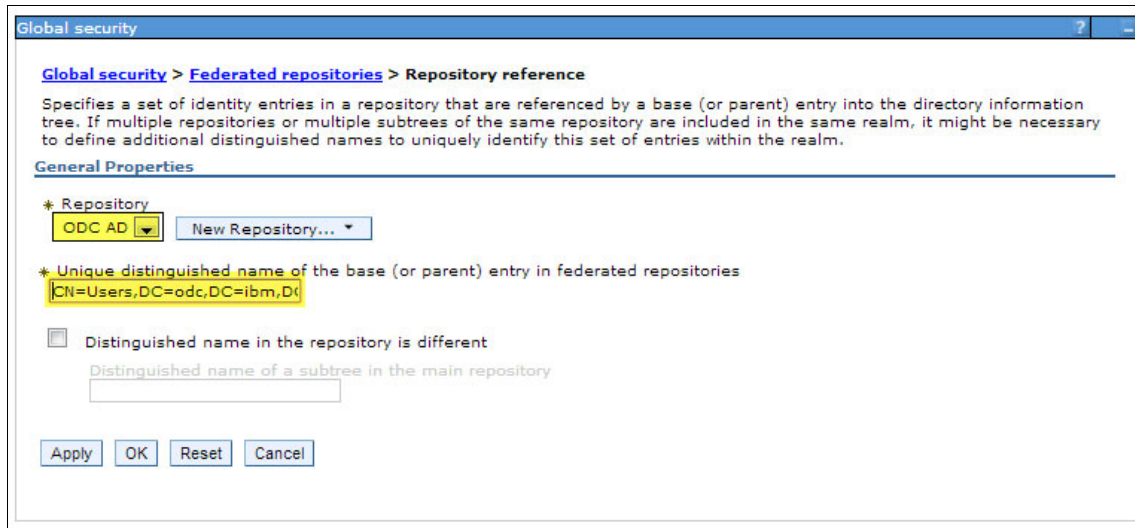

Figure 7-6   Configuring base DN for the repository

In our example, we point to the following DN:

CN=Users,DC=odc,DC=ibm,DC=local

Use the correct DN: Try to avoid pointing to the root of your domain forest (DC=odc,DC=ibm,DC=local) because this action can have a significant negative performance effect on LDAP queries.

8. Configure multiple unique base DNs for the same LDAP server if users and groups from multiple subdomains must be available to IBM BPM. For example, the following country-based base DNs can be configured for a global corporation's LDAP structure:

```
DC=US,DC=odc,DC=ibm,DC=local
DC=UK,DC=odc,DC=ibm,DC=local
DC=HK,DC=odc,DC=ibm,DC=local
```

The Federated repositories window should look similar to the window that is shown in Figure 7-7 on page 228.

If the LDAP server that you configured becomes unavailable (development instance or not a stable LDAP), consider selecting the **Allow operations if some of the repositories are down** option. Otherwise, even InternalFileRepository users cannot log in if the LDAP repository is unavailable.

Figure 7-7   New repository added

9. Verify your configuration and click **OK** and then click **Save**, as shown in Figure 7-8.
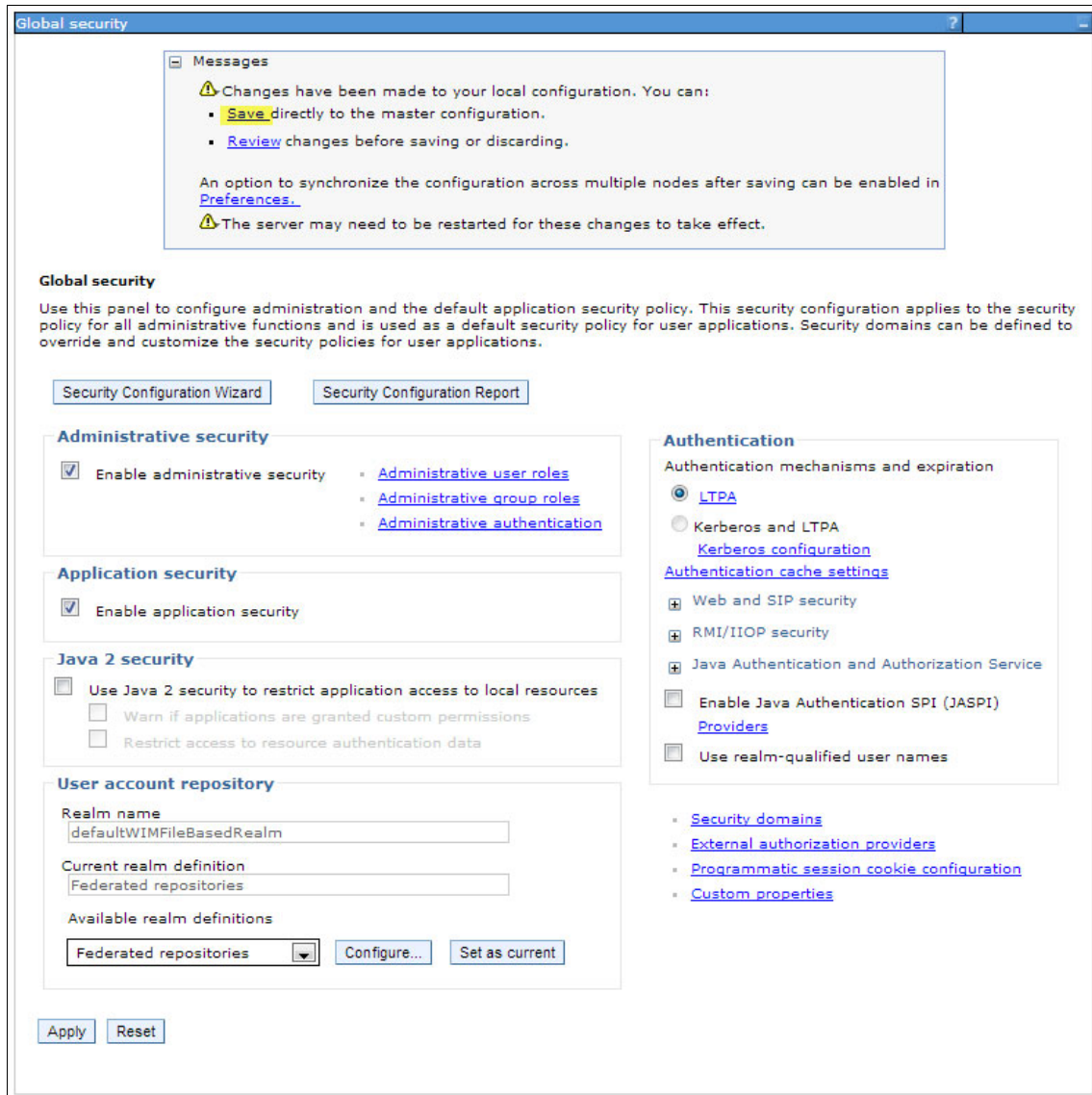

Figure 7-8   Saving changes to the master configuration

10. Restart your deployment manager.

7.2.3 Validating LDAP configuration

It is important to verify the configuration on your WebSphere Application Server level before IBM BPM is started, especially if multiple base DN, user, or group filters (see 7.2.4, "Configuring LDAP filters" on page 232) were specified.

Complete the following steps to validate the LDAP configuration:

1. Log in to the WebSphere Integrated Solutions Console and click **Users and Groups** → **Manage Users**. You should see the users from the InternalFileRepository provider and the LDAP server that were previously configured. However, for the LDAP repository, only the users that match the configured base DNs and user filter are returned.

   To check the availability of a particular LDAP user, specify the name of the LDAP user in the Search for field and click **Search**.

   Pay attention to the time it takes to return the results of the LDAP search. If it takes longer than a couple of seconds, consider introducing an LDAP filter for user or group to narrow the base DNs, as shown in Figure 7-9.
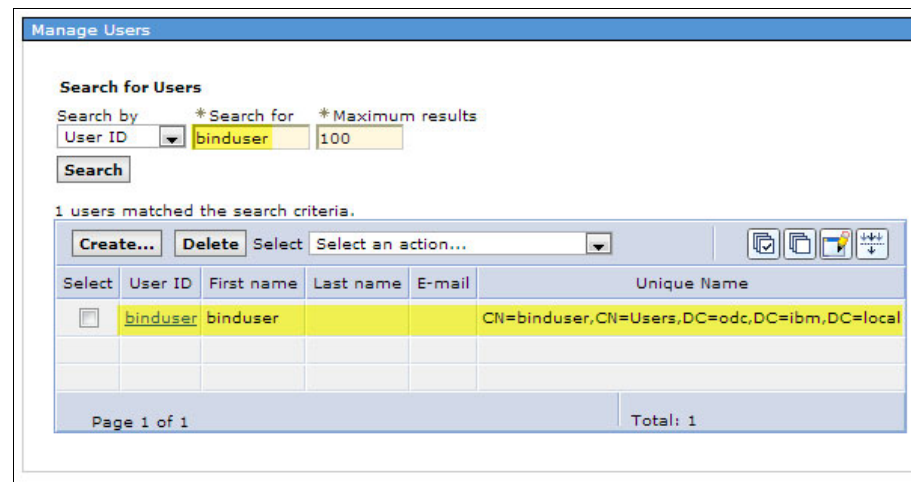

Figure 7-9   Validating LDAP users via Manage Users

2. Similar verification can be performed for groups by clicking **Users and Groups** → **Manage Groups**.

After the LDAP configuration is verified, start all node agents and IBM BPM clusters by completing the following steps:

1. Log in to the IBM BPM Process Admin Console of one of the nodes as IBM BPM administrator (`bpmadmin`) by using the following link (replace the <NODE_HOST_NAME> placeholder with your own address):

   `https://<NODE_HOST_NAME>:9443/ProcessAdmin`

   Click **User Management** → **Group Management**.

2. Enter the name of the LDAP group into the Select Group to Modify field and select one of the groups that is returned. The members of the group should be listed on the right, as shown in Figure 7-10.

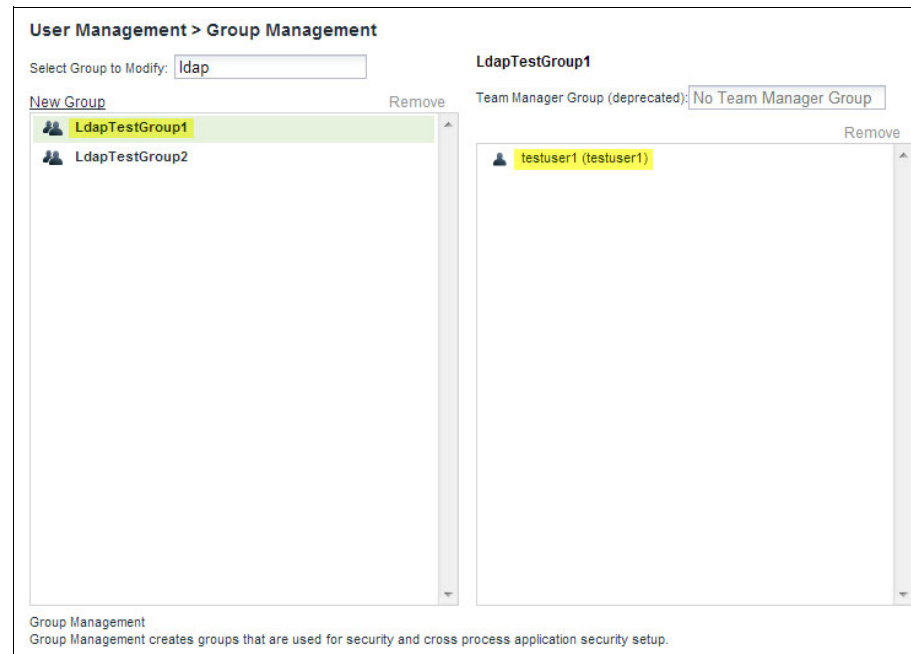

Figure 7-10   Validating LDAP groups

3. Try to log in to the IBM BPM Process Portal as one of the LDAP users that was returned as a member of the LDAP group by using the following link (replace the <NODE_HOST_NAME> placeholder with your own address):

   `https://<NODE_HOST_NAME>:9443/ProcessPortal`

If all of these operations were successful, you configured your LDAP repository correctly.

The next optional step after successful LDAP repository configuration is to add LDAP users and groups to IBM BPM internal Administrator (`tw_admins`) and Authors (`tw_authors`) groups by using the window that is available by clicking **User Management → Group Management**.

7.2.4 Configuring LDAP filters

There are instances in which the LDAP results that are returned must be limited to address performance and security concerns. Such use cases include the following typical examples:

► High number of LDAP groups (over 3500) returned with only a subset of groups that are used by IBM BPM.

► Slow authentication against big Domain Forest.

► Restrict LDAP users can log in to IBM BPM.

We address these concerns by using group filter and user filter.

Group filter

A common use case is when the LDAP repository contains thousands of groups while only a limited number of LDAP groups are used by the process applications that are deployed in IBM BPM. In such cases, it is recommended that you identify a common naming pattern for those groups that are used in IBM BPM (or create the groups according to the pattern) and configure an LDAP group filter to restrict the group that is queried from LDAP to these specific patterns.

For example, to limit the groups that are returned from our ODC Active Directory repository to only those that start with LDAP or TEST, we configure the filter according to the following procedure:

1. Log in to the WebSphere Integrated Solutions Console.

2. Click **Security → Global security → Federated repositories → Manage repositories → ODC AD → Federated repositories entity types to LDAP object classes mapping → Group**.

3. Set the Search filter to the following configuration, as shown in Figure 7-11 on page 233:
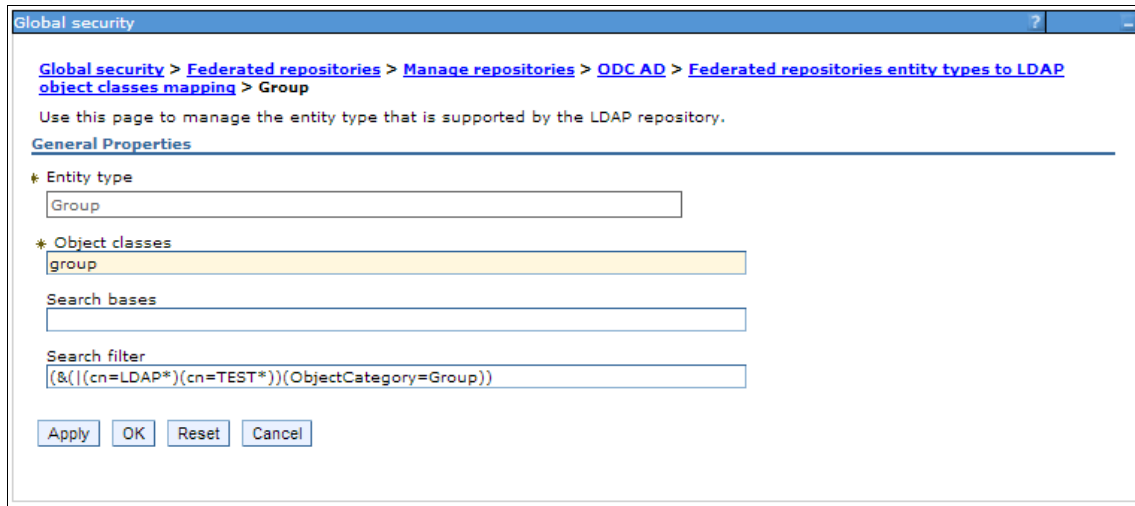
   `&(|(cn=LDAP*)(cn=TEST*))(ObjectCategory=Group)`

Figure 7-11   Configure Search filter for Active Directory Groups

User filter

Another use case is to restrict the LDAP users who can log in to IBM BPM to specific groups only. This is achieved with the LDAP User filter, which should also improve performance of user-related LDAP queries against big LDAP repositories (Active Directory forest).

In the case of Microsoft Active Directory, the DN for a specific group can be identified by running the following commands on any member server that is part of the Active Directory domain:

```
dsquery group -name LDAP*
"CN=LdapTestGroup1,CN=Users,DC=odc,DC=ibm,DC=local"
"CN=LdapTestGroup2,CN=Users,DC=odc,DC=ibm,DC=local"
```

After the DNs of the groups are identified, configure the User filter according to the following procedure:

1. Log in to the WebSphere Integrated Solutions Console.

2. Click **Security** → **Global security** → **Federated repositories** → **Manage repositories** → **ODC AD** → **Federated repositories entity types to LDAP object classes mapping** → **PersonAccount**.

3. Set the Search filter to the following configuration, as shown in Figure 7-12 on page 234:

```
(&(ObjectCategory=User)(|(memberOf=CN=LdapTestGroup1,CN=Users,DC=odc
,DC=ibm,DC=local)(memberOf=CN=LdapTestGroup2,CN=Users,DC=odc,DC=ibm,
DC=local)))
```
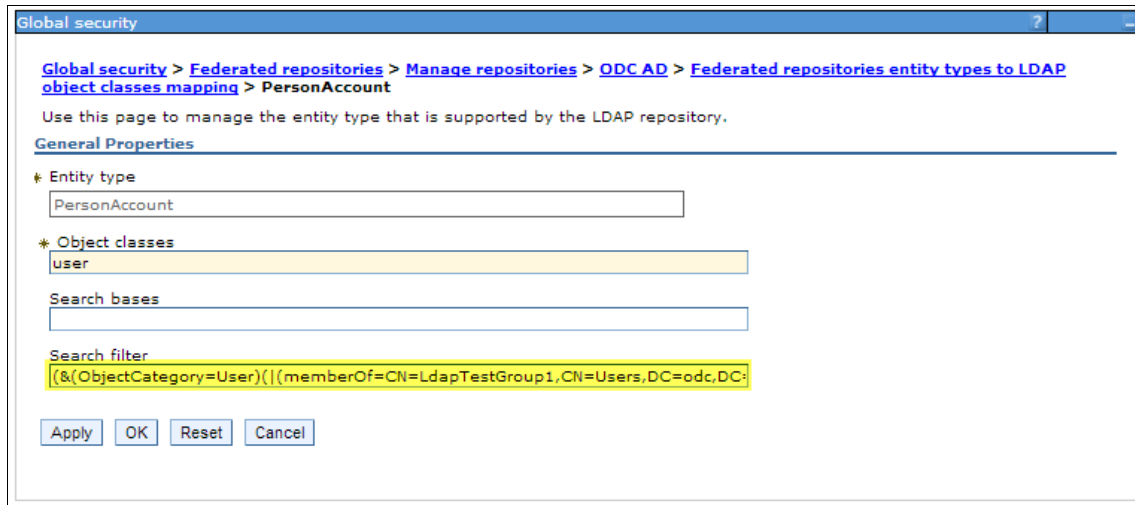
Figure 7-12   Configure Search filter for Active Directory Users

Another method for achieving the same result is to set the filter that prohibits login for the users with specific naming pattern in one of the LDAP attributes. For example, the following filter excludes users that have the samAccountName attribute (Active Directory only) starting with tw_*, which filters out all existing Lombardi users, such as, tw_admin and tw_user:

```
(&(ObjectCategory=User)(!(samAccountName=tw_*)))
```

7.2.5 Recovering from security configuration problems

If you are having problems after you complete a security-related configuration change (for example, you cannot start the deployment manager or log in to the WebSphere Integrated Solutions Console), you can disable Administrative security by running the following command:

► Windows:

```
set BPM_HOME=D:\IBM\BPM\v8.5
%BPM_HOME%\bin\wsadmin.bat -conntype NONE -c securityoff
```

► UNIX based:

```
export BPM_HOME=/opt/IBM/BPM/v8.5
$BPM_HOME/bin/wsadmin.sh -conntype NONE -c securityoff
```

After the command is run, restart deployment manager, log in, and then roll back the change that caused the problem.

7.3 Configuring transaction properties for peer recovery

The following configuration change is required for transaction failover in clustered, multimode IBM BPM environments (especially production).

To enable proper failover handling, the transaction and recovery log of each cluster member must be shared. Sharing means that the log files can be commonly accessed by each node or cluster member. Choose what best fits your needs from the various technologies that are available today to establish a shared filestore among systems.

> **Note:** The high availability of the transaction service enables any server in a cluster to recover the transactional work for any other server in the same cluster. For more information, see the WebSphere Application Server Information Center at this website:
>
> http://pic.dhe.ibm.com/infocenter/wasinfo/v8r5/topic/com.ibm.websphere.nd.multiplatform.doc/ae/cjta_trans_ha.html

The shared filestore technique that is used for this example is Network File System (NFS). Another common shared filestore is storage area network (SAN) infrastructure. The storage system must be highly available; otherwise, the storage can become a single point of failure. For example, in case of NFS, avoid setting the NFS share on one of the actual IBM BPM nodes.

Complete the following steps to configure transaction properties for peer recovery:

1. Enable each cluster by completing the following steps:

   a. Log in to the WebSphere Integrated Solutions Console.

   b. Select **Servers** → **Clusters** → **WebSphere application server clusters**.

   c. In the IBM WebSphere Application Server clusters panel, you see the names of the clusters, as shown in Figure 7-13. Click the **PROD.AppCluster** cluster.
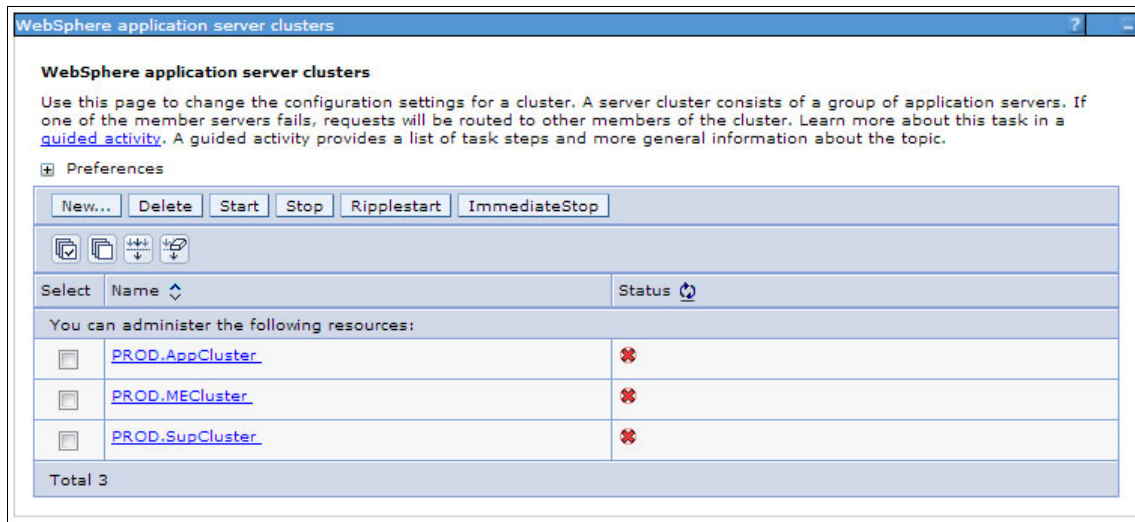
Figure 7-13   Displaying the three PROD runtime environment clusters

d. In the panel for the selected cluster, select the **Enable failover of transaction log recovery** option (see Figure 7-14). Click **OK** to save the change.
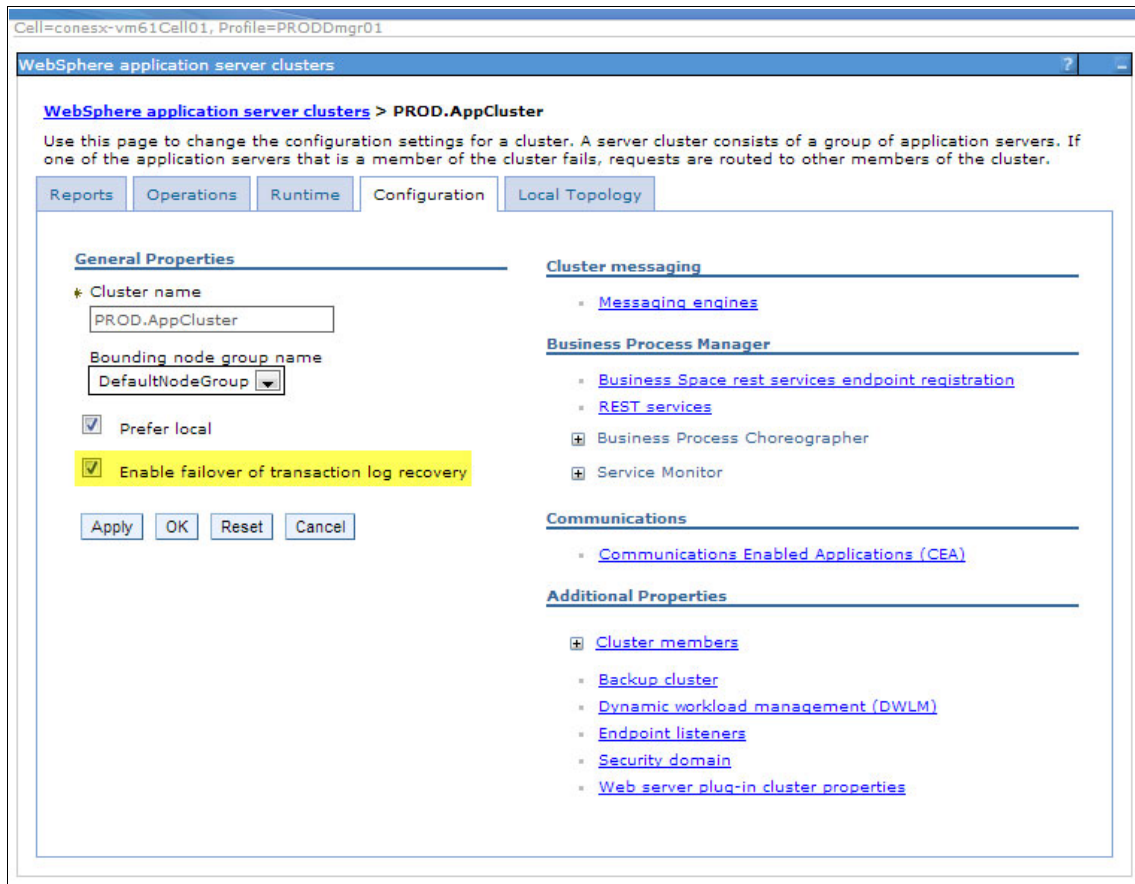
Figure 7-14   Enabling failover of transaction log recovery

Repeat this step for each of the remaining clusters (`PROD.MECluster` and `PROD.SupCluster`).

2. As a user with proper administrative authority, create a directory for `tranlog` and `recoverylog` directories on the shared file system. Our example assumes that the defined mount point on the file system is `/opt/ibm/BPMShared`, and that this mount point is available to every node of the cell. Make sure that the IBM BPM user is granted proper permissions to write into this directory. During the startup process, IBM BPM creates the subdirectories according to the directory paths we use in the next steps.

3. Configure each cluster member to its newly created shared transaction log folder by completing the following steps:

   a. Log in to the WebSphere Integrated Solutions Console.

   b. Click **Servers** → **Server types** → **WebSphere application servers**.

   c. In the Application servers panel, you see the names of each of the servers (cluster members). Click cluster member name **PROD.AppCluster.conesx-vm61Node01.0**.

   d. In the upper right under Container Settings, expand **Container Services** and click **Transaction Service**, as shown in Figure 7-15.
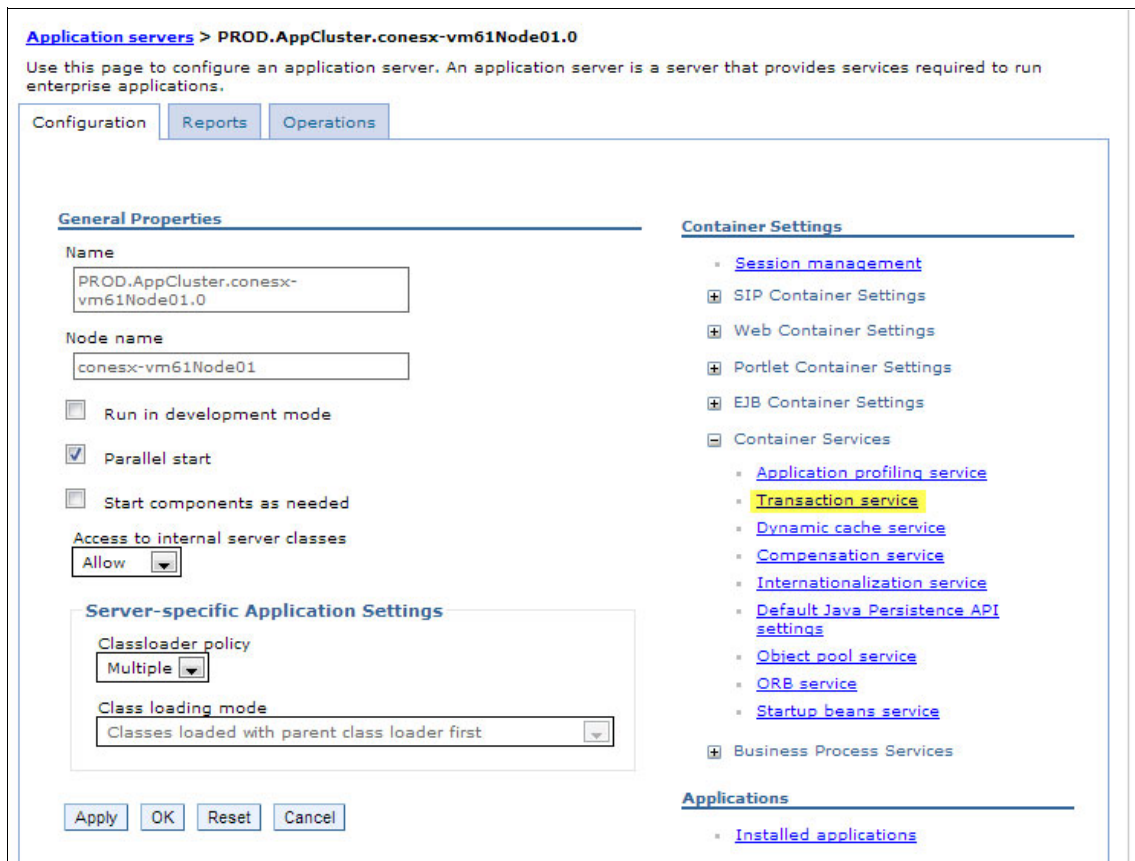

Figure 7-15   Configure Application servers

e. Complete the following steps in the Transaction service panel:

    iii. Specify the tranlog directory that corresponds to this server, for example:

    `/opt/ibm/BPMShared/tranlogs/PROD.AppCluster.conesx-vm61Node01.0`

    iv. Clear the **Enable file locking** option.

    v. Click **OK** to save the change.

> **Important:** If NFS Version 3 is used for storing transaction recovery logs and automated peer recovery is used, file locking must be disabled. For more information, see this website:
>
> `http://pic.dhe.ibm.com/infocenter/wasinfo/v8r5/index.jsp?topic=%2Fcom.ibm.websphere.nd.iseries.doc%2Fae%2Ftjta_disable_lock.html`

f. Repeat step 3 on page 238 for each of the following remaining cluster members to configure their translogs:

- `PROD.MECluster.conesx-vm61Node01.0`
- `PROD.SupCluster.conesx-vm61Node01.0`
- `PROD.AppCluster.conesx-vm62Node01.0`
- `PROD.MECluster.conesx-vm62Node01.0`
- `PROD.SupCluster.conesx-vm62Node01.0`

4. Complete the following steps to configure each member of the AppTarget cluster to its newly created shared recovery folder:

a. In the WebSphere Integrated Solutions Console, click **Servers → Server types → WebSphere application servers**.

b. Select the cluster member `PROD.AppCluster.conesx-vm61Node01.0`.

c. In the upper right under Container Settings, expand **Container Services** and select **Compensation Service**.

d. Complete the following steps in the Compensation service panel:

    i. Enter the following recovery log directory:

    `/opt/ibm/BPMShared/recoverylogs/PROD.AppCluster.conesx-vm61Node01.0`

    ii. Click **OK** to save the change.

e. In the WebSphere Integrated Solutions Console, click **Servers → Server types → WebSphere application servers** and select the remaining application cluster member: `PROD.AppCluster.conesx-vm61Node02.0`

f. In the upper right under Container Settings, expand **Container Services** and select **Compensation Service**.

g. Complete the following steps in the Compensation service panel:

   i. Enter the following recovery log directory:

```
/opt/ibm/BPMShared/recoverylogs/PROD.AppCluster.conesx-vm61Node02.0
```

   ii. Click **OK** to save the change.

7.4 Changing passwords

It is recommended that strong passwords are used for `celladmin` and `bpmadmin` users during the installation of IBM BPM 8.5 so that you do not have to change them later. If you still must change the passwords or you must change them periodically, follow the procedure that is outlined in this chapter.

When the password of the user that is defined in the file registry or external security provider is changed and the user ID is used by IBM BPM authentication aliases or RunAs roles of IBM BPM applications, the password must be synchronized.

Complete the following steps to change the `bpmadmin` password:

1. Go to the external provider and change the password for the user at the provider level. To do this for the WebSphere file registry, log in to WebSphere Integrated Solutions Console and complete the following steps:

   a. Click **Users and Groups** → **Manage Users**.

   b. Select the user.

   c. Enter the new password in the password field.

   d. Click **Apply** → **OK** → **Save changes** and then stop the server.

2. Update passwords in the aliases and runAs roles for the applications by running the following **updateBPMAliasesAndRunAsRolesPasswords** commands with the wsadmin tool:

   – Windows:

```
set BPM_HOME=D:\IBM\BPM\v8.5
%BPM_HOME%\bin\wsadmin.bat -conntype NONE -lang jython -c
"AdminTask.updateBPMAliasesAndRunAsRolesPasswords('[-userName
bpmadmin -password newpassword]')"
```

– UNIX based:

```
export BPM_HOME=/opt/IBM/BPM/v8.5
$BPM_HOME/bin/wsadmin.sh -conntype NONE -lang jython -c
"AdminTask.updateBPMAliasesAndRunAsRolesPasswords('[-userName
bpmadmin -password newpassword]')"
```

When complete, you receive output as shown in Example 7-2.

Example 7-2   Update password output

```
WASX7357I: By request, this scripting client is not connected to any
server process. Certain configuration and application operations will
be available in local mode.
Processing: IBM_BPM_PerformanceDW_PROD.SupCluster
Processing: IBM_BPM_Teamworks_PROD.AppCluster
Processing: BPEContainer_PROD.AppCluster
Processing: TaskContainer_PROD.AppCluster
```

If during the installation of the runtime environment you changed the password for the specified bpmadmin user to connect to the Process Center, the **updateBPMAliasesAndRunAsRolesPasswords** command most likely changed the password for the alias PROCCTR_USER_ALIAS_* that maps to bpmadmin and is used to connect to the Process Center. Therefore, your runtime environment is cannot connect to the Process Center to perform the heartbeat function. To fix this, complete these steps:

1. Log in to WebSphere Integrated Solutions Console and click **Security** → **Business Integration Security**.

2. Locate the alias that is named similar to PROCCTR_USER_ALIAS_* and change the password for the bpmadmin from the Process Center, as shown in Figure 7-16 on page 242.

Figure 7-16   Changing password for Process Center authentication alias

3. Synchronize the nodes and restart all IBM BPM clusters.

7.5 Configuring the HTTP load balancer URL

After you installed and configured your IBM BPM multi-node cluster, you must customize your environment so that it can function properly as a cluster with your HTTP load balancer URL (web server or hardware load balancer). Make sure that the Process Server was installed and configured and that you created and configured the servers and clusters.

Complete the following steps to configure the HTTP load balancer URL (which is now referred to as *web server*) in IBM BPM 8.5:

1. Complete the following steps to configure the Process Server and the Process Center to point to a web server. If no web server is available, all URLs point to the cluster member host name and port. If there is no web server, the cluster server member does not need to be changed. If you have a web server, change all values to point to the web server host name and port. If you are using the default port for http (80) or https (443), the port is an optional part of the URL:

   a. Start the **wsadmin** scripting command tool, from where you can issue all of the following subcommands. To start **wsadmin** by using the Jython language, run the following command from the bin directory of the server profile:

   ```
   $ ./wsadmin.sh -conntype NONE -lang jython
   WASX7357I: By request, this scripting client is not connected to
   any server process. Certain configuration and application
   operations will be available in local mode.
   WASX7031I: For help, enter: "print Help.help()"
   ```

   b. Extract the object properties by using the following command:

   ```
   wsadmin>virtualhosts = AdminConfig.list
   ('BPMVirtualHostInfo')
   wsadmin>print virtualhosts
   (cells/convios-lpCell01/clusters/AppCluster|cluster-bpm.xml#BPMVi
   rtualHostInfo_1369974546271)
   ```

   If the wsadmin **print** command shows multiple results, select the correct server by counting from zero.

   c. Change the host to point to the web server host name (the host name must be the same as the host name in the IHS SSL certificate), as shown in the following example:

   ```
   wsadmin>AdminConfig.modify(vh,
   [['hostname','convios-lp22.bocaraton.ibm.com']])
   ''
   ```

d. Change the port to the value of the web server port, as shown in the following example:

```
wsadmin>AdminConfig.modify(vh, [['port', '443']])
''
```

e. Change the transport protocol, as shown in the following example:

```
wsadmin>AdminConfig.modify(vh, [['transportProtocol', 'https']])
''
```

f. Verify your update, as shown in the following example:

```
wsadmin>print AdminConfig.show(vh)
[hostname convios-lp22.bocaraton.ibm.com]
[port 443]
[transportProtocol https]
```

g. Save the changes and exit, as shown in the following example:

```
wsadmin>AdminConfig.save()
''
wsadmin>exit
```

2. You must customize the environment to enable it to function properly as a cluster with the web server. The default configuration for each cluster member is for its generated URL to point to itself instead of to the load-balancing web server. Therefore, the configuration must be changed so that URLs that are generated by all nodes in the system point to the common web server URL.

There are several configuration values to be replaced with the web server URL, including portal-link, portal-run-task-link, portal-process-info-link, gadget-link, server-link, and activity-stream-image-link. Such configuration settings are recorded in the `99Local.xml` configuration file. However, the custom configuration overrides the `100Custom.xml` file that is used. This enables overriding the default installation configuration without directly editing the `99Local.xml` configuration file that contains the relevant configuration settings.

In our environment, `100Custom.xml` is found in the following location:

```
$BPM_HOME/profiles/$DMGR_PROFILE_NAME/config/cells/<DMGR_CELL>/nodes
/<NODE_NAME>/servers/<APP_TARGET_SERVER>/process-server/config/
```

> **Note:** `100Custom.xml` is also replicated within each node folder, but you do not need to modify those other versions of the file. Only the files within the deployment manager profile require modification because the deployment manager synchronizes the `100Custom.xml` configuration file from the deployment manager profile to the affected nodes.

IBM BPM accepts multiple override files if their name starts with a digit and
has an .xml file name extension. For example, the load balancer configuration
can be stored in a 101CustomLB.xml file. The content of our sample
101CustomLB.xml file that is used for a Process Server environment is shown
in Example 7-3.

Example 7-3   Content of sample 101CustomLB.xml file

```
<properties>
<server merge="mergeChildren">
  <email merge="mergeChildren">
  <mail-template merge="mergeChildren">
  <portal-link
merge="replace">https://convios-lp22.bocaraton.ibm.com/ProcessPortal
</portal-link>
  <portal-run-task-link
merge="replace">https://convios-lp22.bocaraton.ibm.com/ProcessPortal
/dashboards/TWP/BPM_WORK?tw.local.view=taskcompletion&amp;tw.local.t
askid={2}</portal-run-task-link>
  <portal-process-info-link
merge="replace">https://convios-lp22.bocaraton.ibm.com/ProcessPortal
/dashboards/TWP/Process+Performance?tw.local.selectedInstanceId={6}<
/portal-process-info-link>
  <gadget-link
merge="replace">https://convios-lp22.bocaraton.ibm.com/ProcessPortal
/gadgets/OpenSocial/BPMOpenSocialGadget.xml</gadget-link>
  </mail-template>
  </email>
  <connections-task-notification merge="mergeChildren">
 <task-notification-template merge="mergeChildren">
  <server-link
merge="replace">https://convios-lp22.bocaraton.ibm.com</server-link>
  <activity-stream-image-link
merge="replace">https://convios-lp22.bocaraton.ibm.com/ProcessPortal
/com/ibm/bpm/social/img/Bpm_connections_48x48.png</activity-stream-i
mage-link>
  <gadget-link
merge="replace">https://convios-lp22.bocaraton.ibm.com/ProcessPortal
/gadgets/OpenSocial/BPMOpenSocialGadget.xml</gadget-link>
  </task-notification-template>
  </connections-task-notification>
</server>
</properties>
```

After these configuration changes are applied, you must synchronize and restart the servers.

3. If you are using the Advanced Edition of IBM BPM 8.5, you also must change the URL and port of the REST service interface for the AppTarget cluster. Complete the following steps:

    a. Log in to the WebSphere Integrated Solutions Console.

    b. Click **Servers** → **Clusters** → **WebSphere application server clusters** → **AppCluster**.

    c. In the Business Process Manager section, select **REST services**.

    d. Change the values for host name or virtual host in a load-balanced environment and port to reflect the settings for your web server address, as shown in Figure 7-17 on page 247.

Figure 7-17   REST services interface for AppCluster

4. Verify your Process Portal connection by using https. In our example, we use the following address:

   `https://convios-lp22.bocaraton.ibm.com/portal`

   The Process Portal should connect properly and display the window that is shown in Figure 7-18 on page 248.
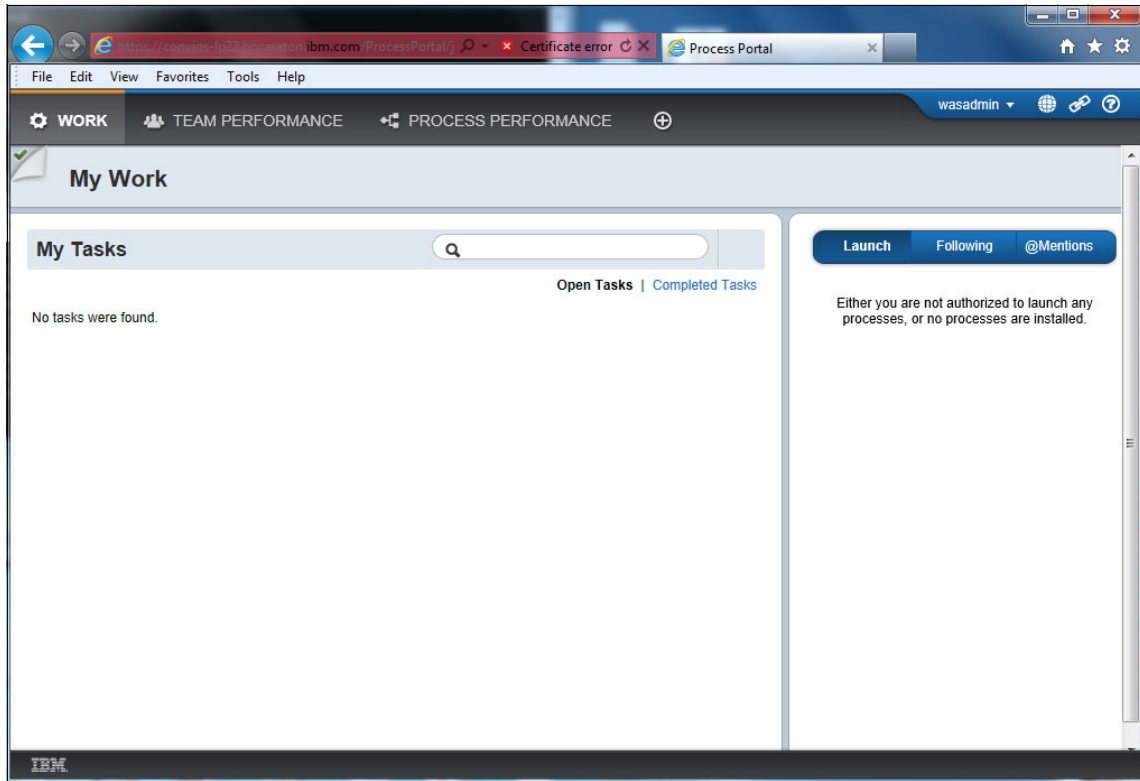
Figure 7-18   Process Portal My Work window

7.6 Conclusion

In this chapter, we described the following common post-installation configuration tasks:

► Configuring SMTP server
► Configuring LDAP server
► Configuring transaction properties for peer recovery
► Changing passwords
► Configuring an HTTP load balancer

Verification

This chapter describes the installation verification, which is an important step in the overall installation process. However, the installation verification is not something that happens only after the actual installation is completed.

The verification should be continuously repeated during the installation to ensure that a small problem, which can be identified and fixed during installation, does not turn into bigger problems that are much more difficult to fix later.

This chapter includes the following topics:

► Verification during installation and configuration
► Post-installation verification
► Conclusion

8.1 Verification during installation and configuration

The verification should start when you download the IBM BPM product and continue throughout the installation procedure. The following verification principles should be followed during the installation and configuration process:

► Make sure that there are no errors that are reported by the archive tool when you extract the binaries.

► Make sure that all prerequisites are met, including available disk space. For more information, see Chapter 4, "Preparing your infrastructure" on page 59.

► Inspect the output of all the commands you run during the installation procedure. Make sure that there are no errors or failures reported in the output.

► In the deployment environment wizard (Option 1), use the Test option where available.

If you catch an error during the running of the particular step, inspect the logs to identify the root cause and fix the problem before you continue with the next step of the installation procedure.

8.2 Post-installation verification

Assume that you have not encountered any problems or can fix them during the installation. In the following sections, we describe steps that help you validate if the installation was successful. In the case of a successful installation, you should not see any error messages or exceptions while you are completing these processes.

8.2.1 Stopping and restarting node agents and deployment manager

Assuming the IBM Business Process Manager (BPM) environment is not yet started, complete the following steps to start and restart the node agents and deployment manager:

1. Log in to the WebSphere Integrated Solutions Console.

2. Click **System administration** → **Nodes**, and select all nodes. Click **Stop**.

3. Click **System administration** → **Deployment manager** and click **Stop**.

4. Make sure that no IBM BPM Java processes are running on the machines.

5. Start the deployment manager (by using the `startManager` command) and node agents (by using the `startNode` command) on each node. Monitor the deployment manager and node agent start logs to ensure that there are no errors or exceptions.

6. Log in again to the WebSphere Integrated Solutions Console.

7. Click **System administration** → **Nodes** and make sure that all nodes are reported as synchronized.

8.2.2 Starting IBM BPM clusters

After the deployment manager and all node agents start successfully, start the individual cluster members individually and monitor the `SystemOut.log` file (which is in the managed profile's log folder). Ensure that there are no errors or exceptions.

Start the clusters in the following order:

1. MECluster (Messaging)
2. SupCluster (Support)
3. AppCluster (Application Target)

Each cluster member is considered started when you see a message similar to the following example:

```
[6/15/13 18:30:09:832 EDT] 00000001 WsServerImpl  A  WSVR0001I: Server
PROD.AppCluster.conesx-vm61Node01.1 open for e-business
```

8.2.3 Validating messaging engine status

Inspect the `SystemOut.log` file of the first started member of the MECluster and make sure you see a message similar to the following example:

```
[6/10/13 21:07:45:205 EDT] 00000069 SibMessage    I
[BPM.PROD.Bus:PROD.MECluster.000-BPM.PROD.Bus] CWSID0016I: Messaging
engine PROD.MECluster.000-BPM.PROD.Bus is in state Started.
```

Unlike the previous version of IBM BPM, there is only one messaging engine in IBM BPM 8.5.

8.2.4 Identifying WebSphere Application Server-specific ports

IBM BPM functionality should be validated on each node in the environment. Before you begin, you must identify WebSphere Application Server (Java virtual machine process) specific ports that are assigned to each server during installation. The ports can differ from the default, especially if there are multiple environments that are configured on the same machine or multiple cluster members that are configured vertically.

Complete the following steps to identify ports that are assigned to each WebSphere Application Server in each cluster:

1. Log in to the WebSphere Integrated Solutions Console.
2. Click **Servers** → **Server Types** → **WebSphere application servers**.
3. Inspect each WebSphere Application Server that belongs to AppCluster and SupCluster.

4. In the Communications section, expand **Ports** and note the port entries for `WC_defaulthost` and `WC_defaulthost_secure`, as shown in Figure 8-1.

Figure 8-1   WebSphere Application Server ports

Verify ports for load balancers: In addition to verification by using WebSphere Application Server ports on each node, after you configured a web server or load balancer in front of the IBM BPM environment, you must perform each step with a web server and load balancer port.

8.2.5 Validating Process Center operation

The Process Center environment often is the first IBM BPM environment that is installed. The process that is described in this section is used to ensure that Process Center is installed and configured correctly. Here, we also verify the Process Designer authorizing capabilities and connectivity to the Process Center.

The Process Center console is deployed to AppCluster. Complete the following steps for each AppCluster member server by using the `WC_defaulthost` port that is described in 8.2.4, "Identifying WebSphere Application Server-specific ports" on page 252:

1. Log in to the Process Center console by using IBM BPM administrator credentials (`bpmadmin`) by using a URL similar to the following example (see Figure 8-2):

   `http://<node_host_name>:<WC_defaulthost>/ProcessCenter/`
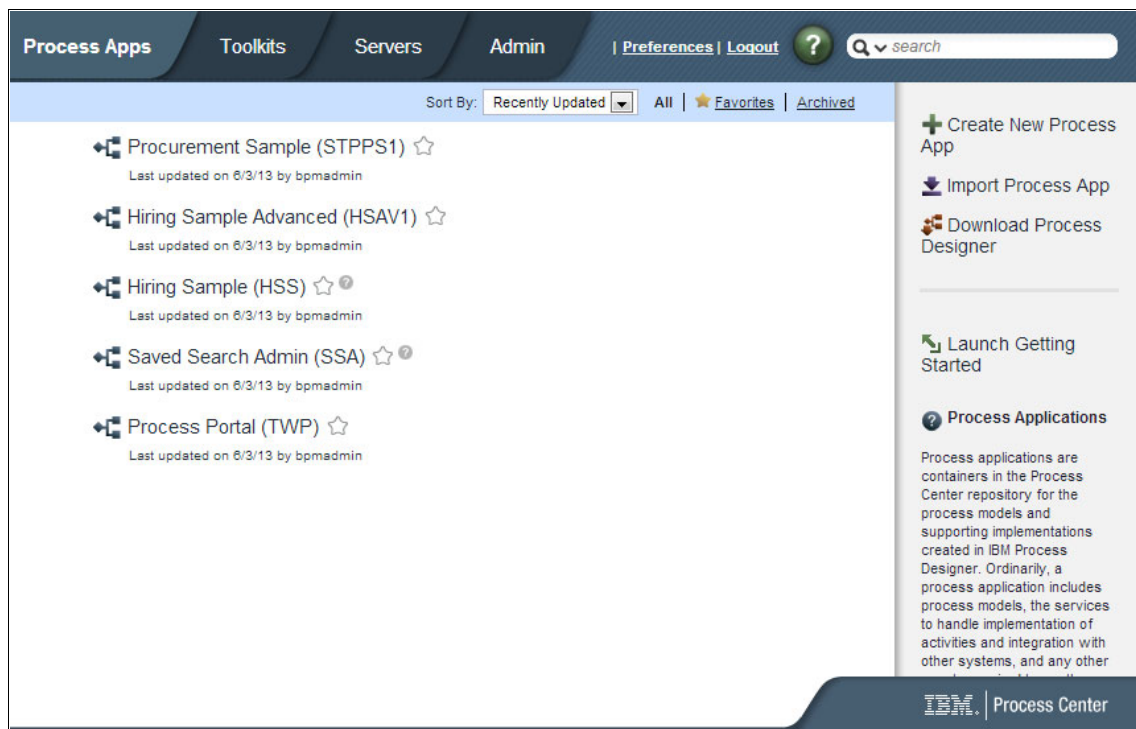
Figure 8-2   Process Center console

2. Download and install Process Designer according to the steps that are described in 5.5, "Installing IBM Process Designer" on page 182.

3. Start Process Designer and log in by using IBM BPM administrator credentials (`bpmadmin`).

4. Select **Open in Designer** next to the Hiring Sample, or Hiring Sample Advanced (available in the Advanced Edition of IBM BPM only), process application.

5. On the left, navigate to Processes and open Standard HR Open New Position or Advanced HR Open New Position Business Process Definitions (BPDs).

6. Scroll down the diagram and locate the Notify hiring manager activity. Right-click the activity and select **Activity Wizard**, as shown in Figure 8-3.
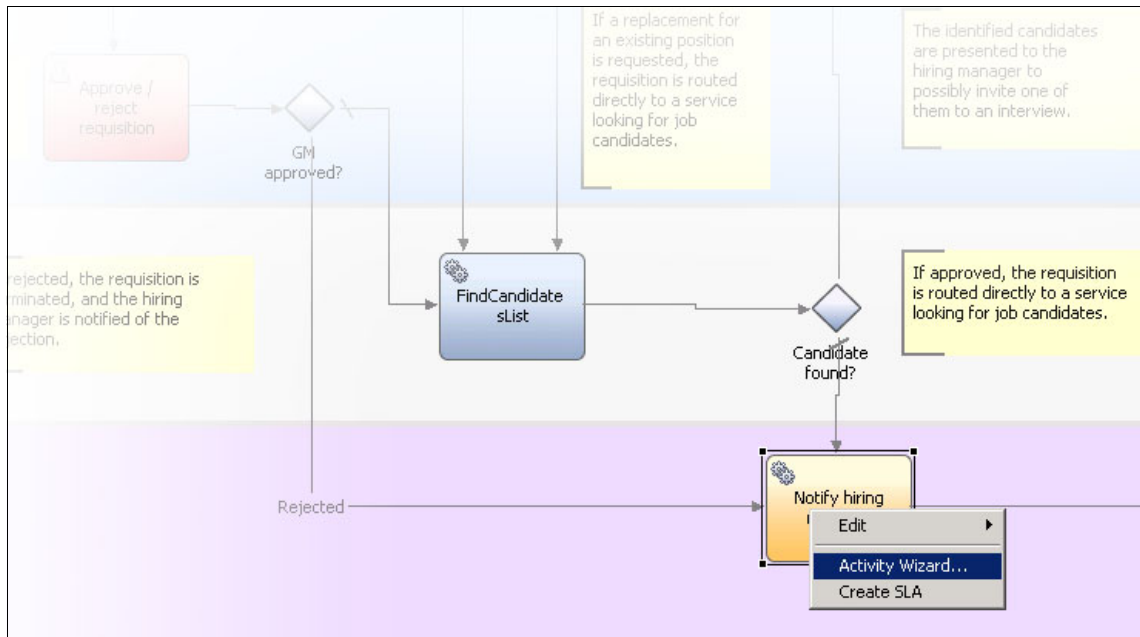
Figure 8-3   Starting the Activity Wizard for the Notify hiring manager activity

7. In the Activity Wizard window, click **Finish**, as shown in Figure 8-4.
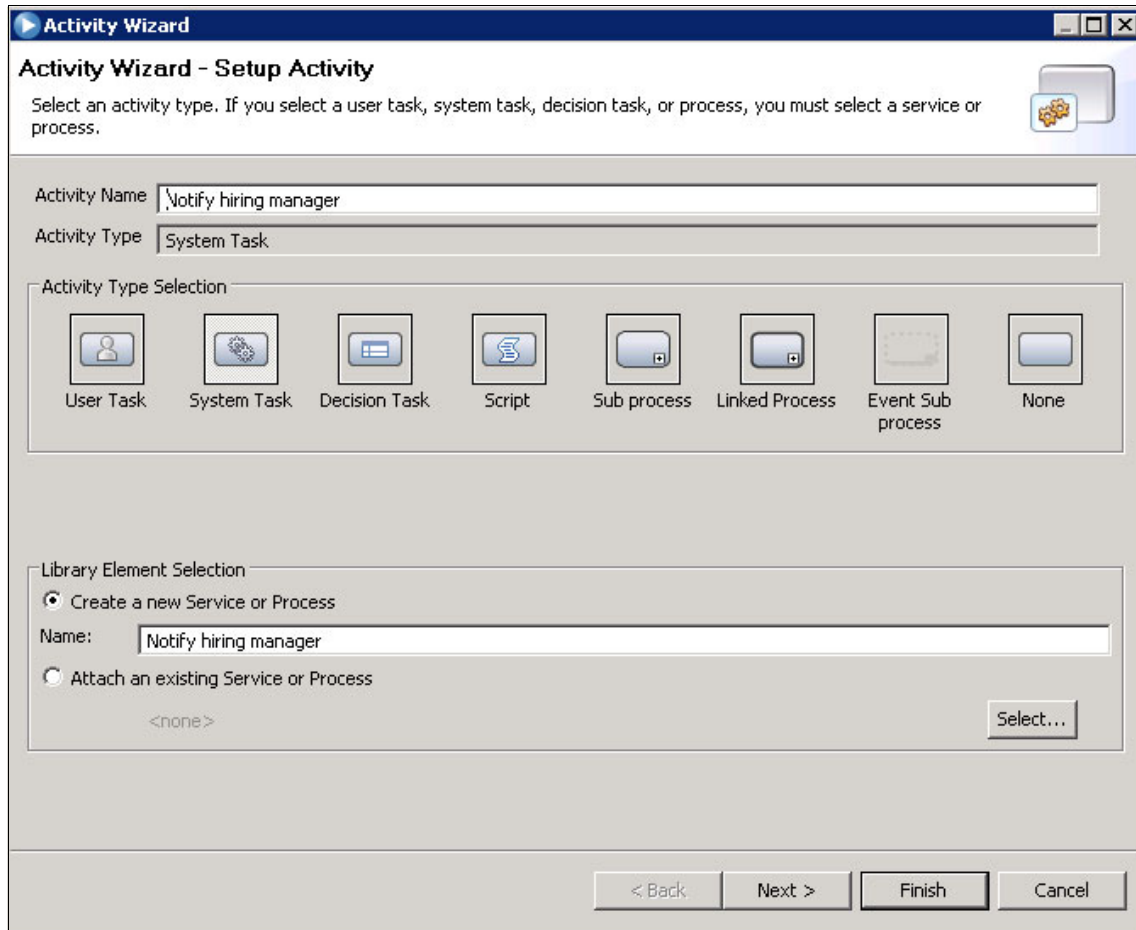
Figure 8-4   Activity Wizard for the Notify hiring manager activity

8. Double-click the **Notify hiring manager activity** to open the new Integration Service that was created by the wizard.

9. Create a snapshot of the process application by clicking **Snapshot** in the upper right. Name the snapshot `Installation Validation` and click **OK**.

10. Update Tracking Definitions for the application by selecting **Process Designer menu** → **File** → **Update Tracking Definitions**. Click **OK** to confirm.

11. (This step is applicable to the Advanced Edition only.) Switch to the Process Center perspective of the Process Designer and examine the Hiring Sample Advanced application. Click the twistie next to the Current snapshot and select **Deploy**, as shown in Figure 8-5.
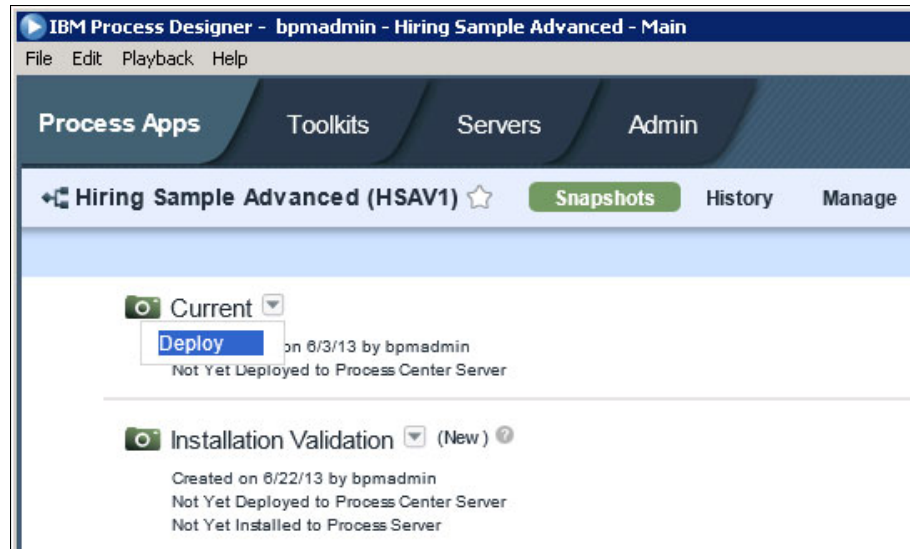
Figure 8-5   Deploy Advanced components for Current snapshot

12. Open the application in the Process Designer and wait until the status of the application in the lower right corner changes to "deployed", as shown in Figure 8-6.

Figure 8-6   Deployed status icon in Process Designer

13. Return to the Standard HR Open New Position or Advanced HR Open New Position BPDs.

14. Create an instance of the BPD by clicking **Run** in the upper right. Switch to the Process Inspector perspective.

15. Select the task on the right and click the debug button, as shown in Figure 8-7.
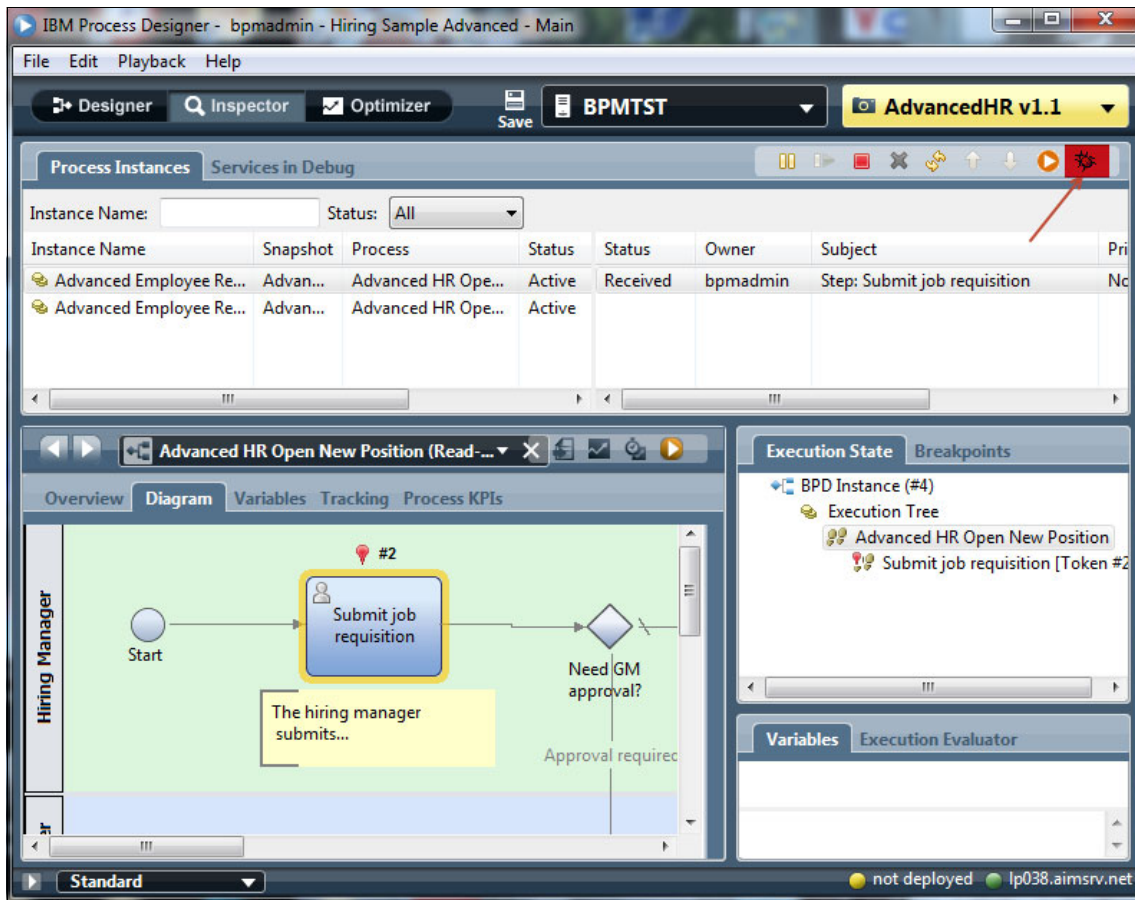
Figure 8-7   Debug task inside the Process Inspector

16. The Debug window opens. Click **Step** twice and watch the Process Inspector perspective moving token progress from one service step to another. Click **Run**.

17. Complete the mandatory fields in the Coaches and submit the task.

18. Return to the Process Inspector and switch from the Services in Debug tab to Process Instances.

19. Click **Refresh** in the panel that is next to the Run and Debug buttons.

20. Validate that the status of the old task changed to Closed and a task was created.

21. Run the new and the following tasks to complete the instance.

22. Create more instances of the process and run some of the tasks.

23. Open the BPD and switch to the Optimizer perspective.

24. In the Mode drop-down menu, select **Single Historical**.

25. Under Selected Scenarios, click **Select…** and then select **All Available**.

26. Click **Calculate** and validate that you have data similar to what is shown in Figure 8-8.
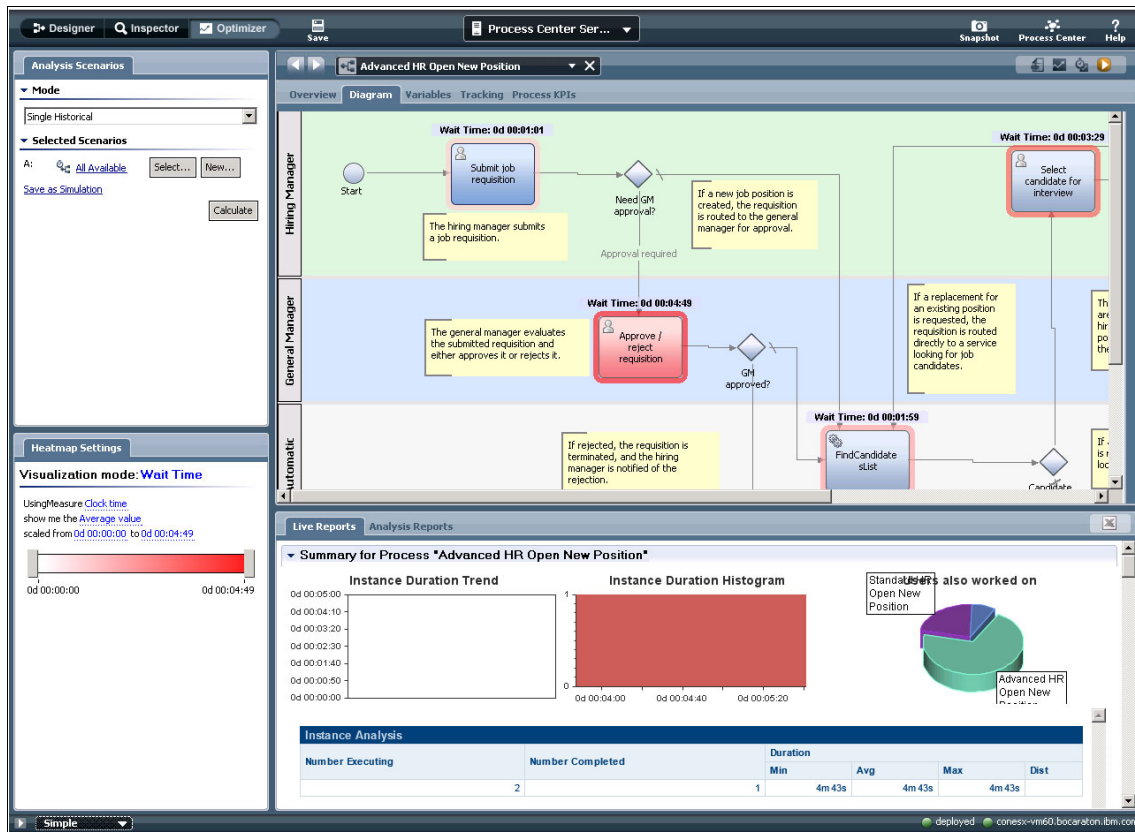
Figure 8-8   Process Optimizer data for the Advanced HR Open New Position BPD

8.2.6 Validate Process Server (Runtime) operation

The following items are required for Process Server (Runtime) environment verification:

► Process Center environment is installed, configured, and validated
► Process Designer is installed and validated

The steps that are presented here assume an online runtime environment. For more information about snapshot installation instructions for an offline environment, see the IBM BPM 8.5 Information Center at this website:

http://pic.dhe.ibm.com/infocenter/dmndhelp/v8r5m0/topic/com.ibm.wbpm.ad
min.doc/topics/releasing_installing_procs_D.html

Complete the following steps to validate Process Server (Runtime) operation:

1. Start Process Designer and log in by using IBM BPM administrator credentials (bpmadmin).

2. Navigate the Hiring Sample or Hiring Sample Advanced (available in the Advanced Edition of IBM BPM only) process application.

3. Click **Install** next to the Installation Verification snapshot.

4. Select the environment that you want to verify and click **OK**.

5. Wait for the Installation in progress message under the snapshot name next to environment name change to "0 instances".

6. Open the Hiring Sample or the Hiring Sample Advanced application inside the Process Designer.

7. On the left side, browse to Processes and open the Standard HR Open New Position or the Advanced HR Open New Position BPD.

8. Switch to the Process Inspector perspective.

9. Select the runtime environment that you want to verify from the drop-down menu, as shown in Figure 8-9 on page 261). Click **Yes** if you are prompted for a certificate.
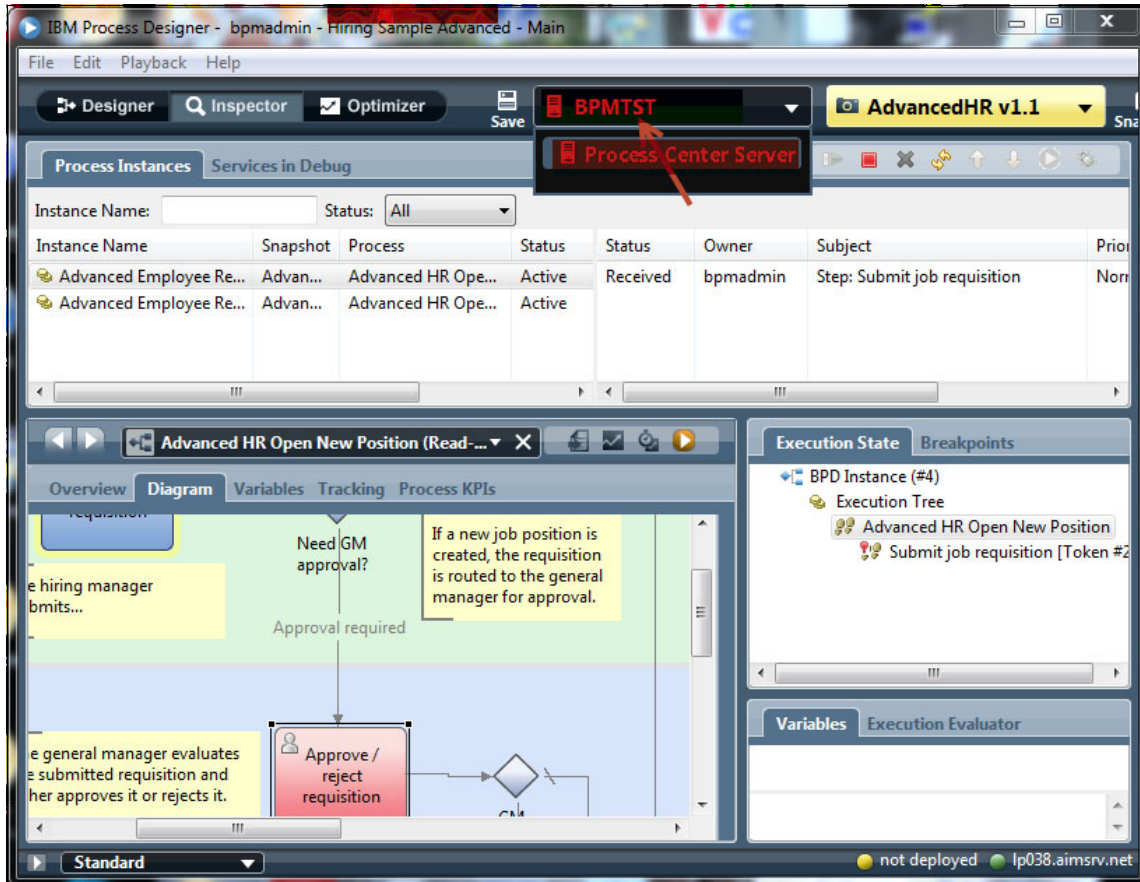
Figure 8-9   Connecting Process Inspector to runtime environment

10. Upon successful connection, create an instance of the BPD from the Process Inspector.

8.2.7 Validating other operational components

The following steps are common for all types of IBM BPM 8.5 installations (Process Center, Process Server, and Standard and Advanced) unless otherwise noted (for example, Advanced only).

It is recommended that you perform the verification steps for Process Center (see 8.2.5, "Validating Process Center operation" on page 254) and Process Server (see 8.2.6, "Validate Process Server (Runtime) operation" on page 260) before you continue with the validations steps that are outlined here.

The following tasks should be performed for each node in the cluster:

► Process Portal
► Process Admin console
► Performance Admin Console
► REST and web services API consoles
► Business Space (advanced only)
► Human Task Manager (advanced only)
► Business Process Choreographer (advanced only)

These tasks are described next.

Process Portal

The Process Portal is deployed to the AppCluster and requires an SSL connection, so you must perform the following steps for each AppCluster member server by using the `WC_defaulthost_secure` that is described in 8.2.4, "Identifying WebSphere Application Server-specific ports" on page 252:

> **No load balancer required:** Unlike IBM BPM v8.0 Process Portal, IBM BPM v8.5 does not require a web server or load balancer that is configured in front of the environment.

1. Log in to Process Portal with IBM BPM administrator credentials (`bpmadmin`) by using a URL similar to the following example:

   `https://<node_host_name>:<WC_defaulthost_secure>/ProcessPortal`

2. In the case of the Process Server (runtime environment) installation, we assume that Process Server specific validation steps were already performed and the Hiring Sample application is already deployed to the environment. If not, complete the steps that are described in 8.2.6, "Validate Process Server (Runtime) operation" on page 260.

3. Select **Standard HR Open New Position** or **Advanced HR Open New Position** (depending on your edition of IBM BPM) on the right side to create an instance of the process. Complete the mandatory fields (marked by asterisks) in each step of the task and select **Submit job requisition**, as shown in Figure 8-10 on page 263.
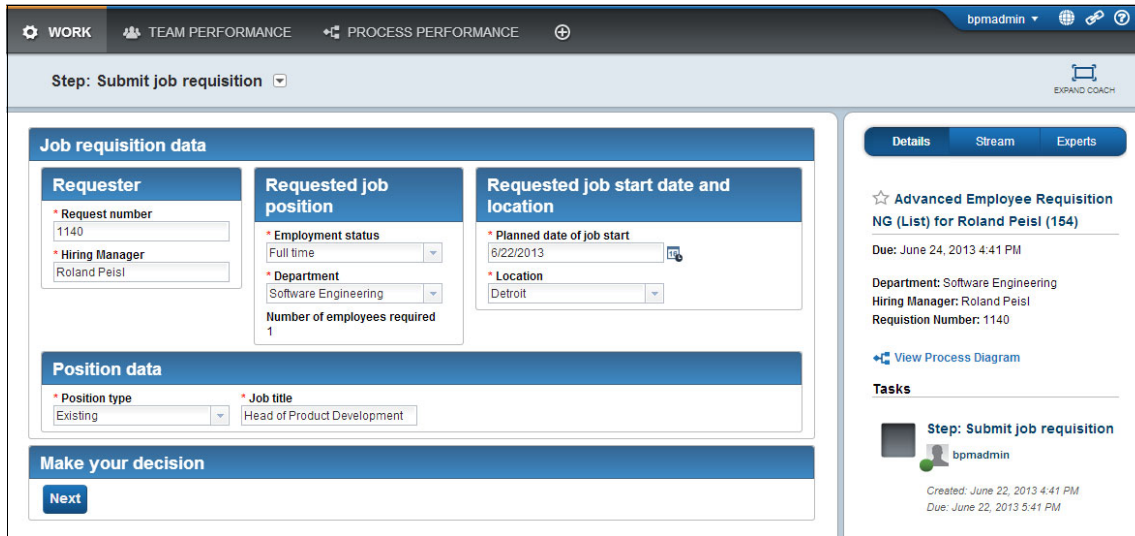
Figure 8-10   Submit job requisition window

4. Wait for a few seconds and watch a new task appear in the portal. You should also see a task notification pop-up window.

5. (Advanced only) Check the `SystemOut.log` file of the AppTarget server and validate that you can see the following messages that were generated by Business Process Execution Language (BPEL) processes that were run by using the Advanced Integration Service:

```
[6/22/13 14:56:23:489 PDT] 0000035d SystemOut     O LIST: Person
successfully added:...Mercury
[6/22/13 14:56:24:005 PDT] 0000035d SystemOut     O LIST: Person
successfully added:...Brumanowitsch
[6/22/13 14:56:24:005 PDT] 0000035d SystemOut     O LIST: Person
successfully added:...Thilo
[6/22/13 14:56:24:552 PDT] 0000035d SystemOut     O LIST: Person
successfully added:...Kawuttke
[6/22/13 14:56:24:552 PDT] 0000035d SystemOut O LIST: Person
successfully added:...Christopherus
```

6. Run the tasks and complete the instances.

7. Click **Team Performance** at the upper portion and validate that you can see the Team Performance Dashboard and corresponding data to the activities that were performed, as shown in Figure 8-11 on page 264.
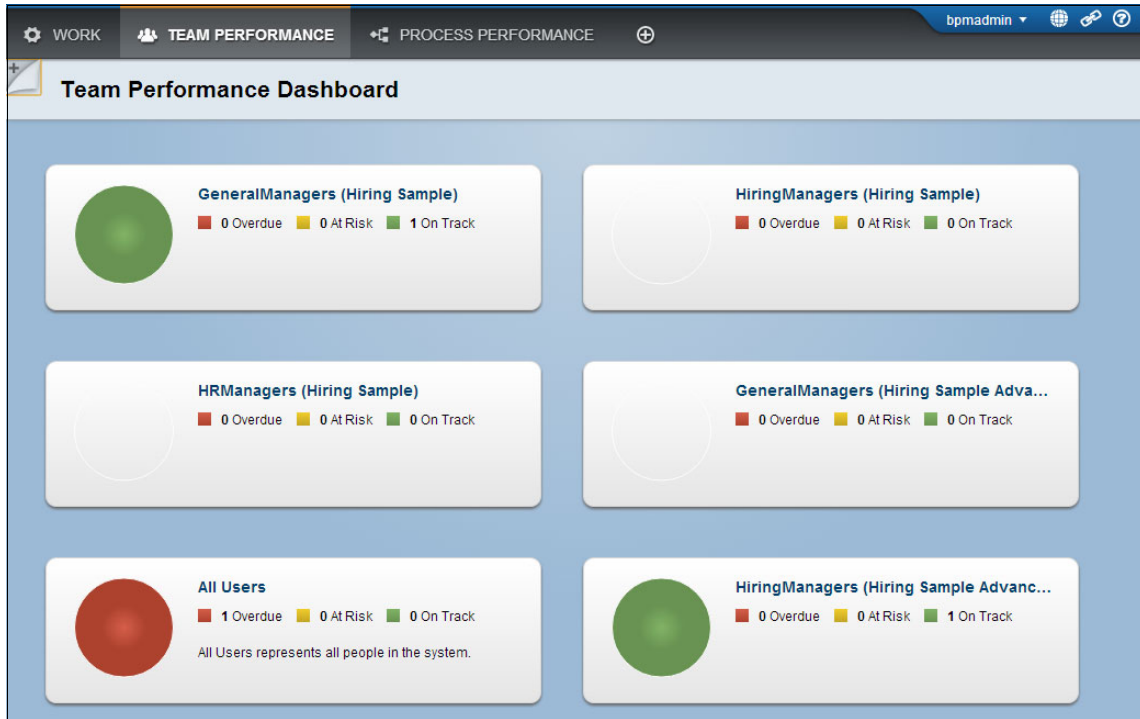
Figure 8-11   Team Performance Dashboard

8. When you click the user name in the upper right (here, it is `bpadmin`), you can change several preferences. For example, you can change the language, log in again as `bpadmin`, and then validate that the language was changed successfully.

Process Admin console

The Process Admin console is deployed to the AppCluster, so complete the following steps for each AppCluster member server by using the `WC_defaulthost` port that is described in 8.2.4, "Identifying WebSphere Application Server-specific ports" on page 252.

1. Log in to Process Admin console with IBM BPM administrative credentials (`bpmadmin`) by using a URL similar to the following example:

```
http://<node_host_name>:<WC_defaulthost>/ProcessAdmin
```

2. Click **Server Admin** → **Event Manager** → **Monitor** and validate that each Scheduler shows a green-colored status, as shown in Figure 8-12.

Figure 8-12   Event Manager Scheduler status

3. In the same window, click **Pause All** and **Refresh**. Validate that the status changed to red.

4. Click **Resume All** and **Refresh** and validate that status returns to green.

5. Click **Monitoring** → **Instrumentation** and validate that you can view instrumentation data, as shown in Figure 8-13.

Figure 8-13   Instrumentation window

6. Browse to the Process Inspector at the top of the page. Validate that you can see the instances that were created earlier during the Process Portal validation (see "Process Portal" on page 262), as shown in Figure 8-14.
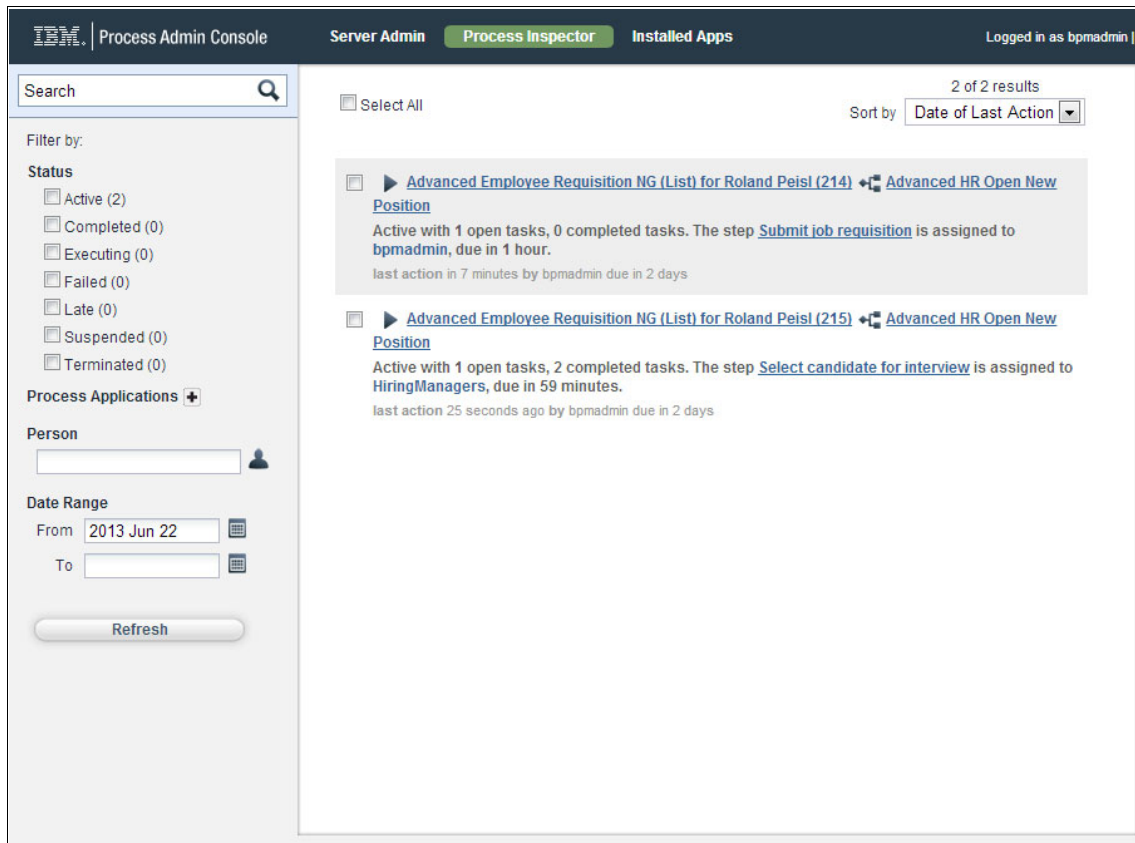
Figure 8-14   Web-based Process Inspector

7. Click one of the instances and then click **Suspend**. Validate that the status changed to Suspended.

8. Click **Resume** and validate that the status changed to Active.

9. Browse to the Installed Apps tab at the top of the page.

10. Click **All** next to the Sort Snapshots By drop-down list. Validate that you can see the default applications (Process Portal and Saved Search Admin) and other sample applications (Hiring Sample or Hiring Sample Advanced), as shown in Figure 8-15.
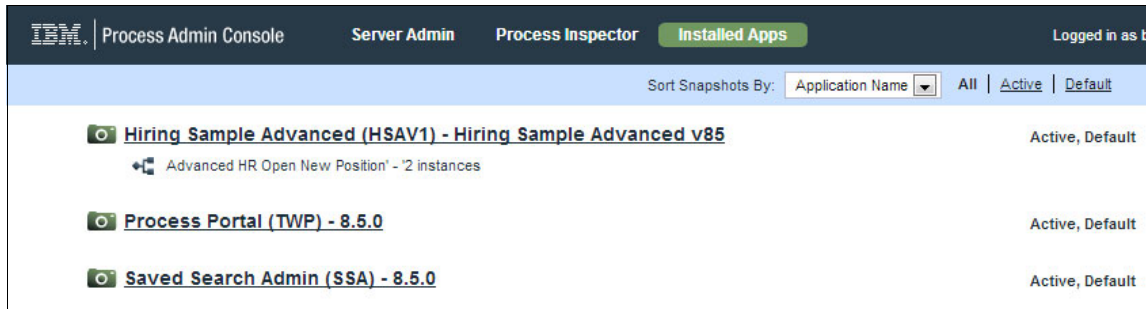
Figure 8-15   Installed Apps window

11. Navigate into the Hiring Sample or Hiring Sample Advanced process application and select the Team Bindings tab. If you do not see the tab, try to expand your browser window to the right, as shown in Figure 8-16.
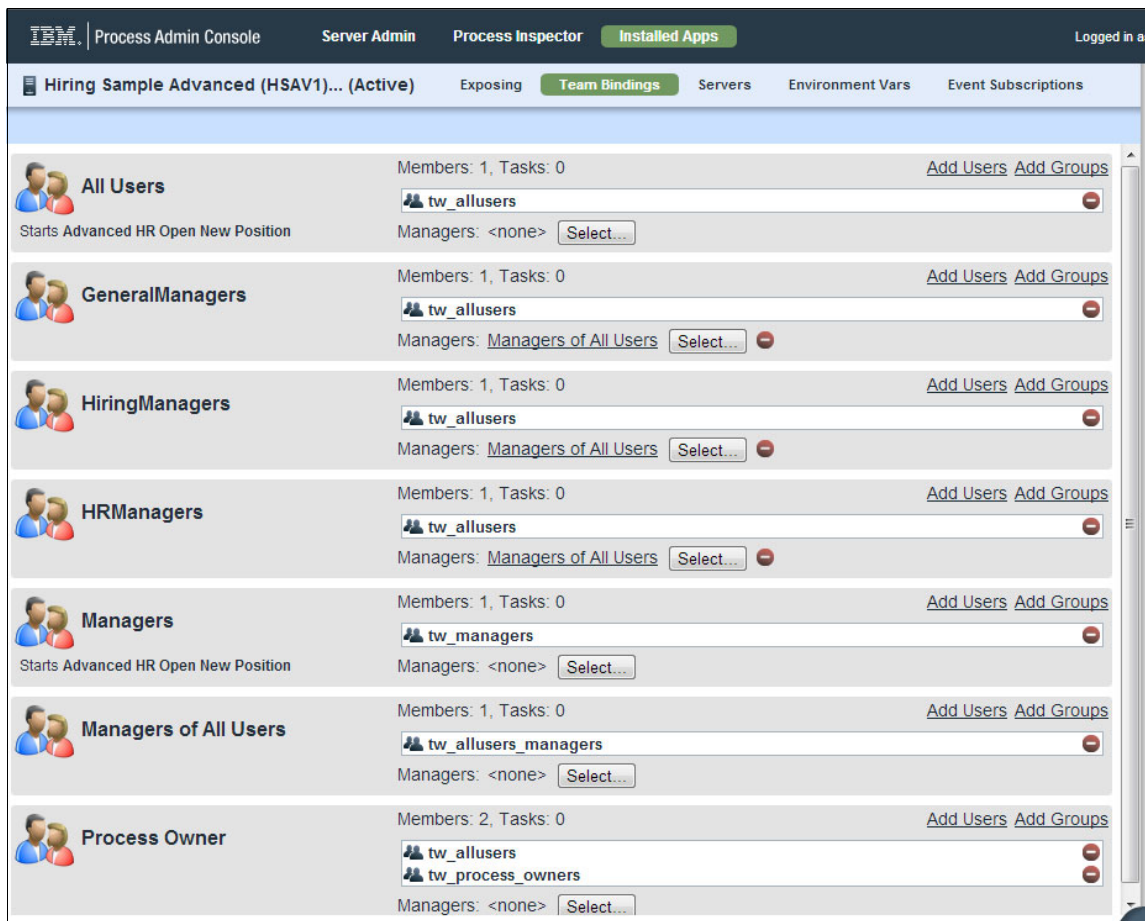
Figure 8-16   Role Bindings window for Hiring Sample Advanced application

Performance Admin Console

The Performance Admin Console is deployed to the SupCluster, so you must perform the following steps for each SupCluster member server by using the `WC_defaulthost` port that is described in 8.2.4, "Identifying WebSphere Application Server-specific ports" on page 252 section:

1. Log in to the Process Admin console with IBM BPM administrator credentials (`bpmadmin`) by using a URL that is similar to the following example:

   `http://<node_host_name>:<WC_defaulthost>/PerformanceAdmin/`

2. Browse to View Statistics section. Validate that you can see the at1348521105828 (Advanced) or aEmpRequisition121297892720600 (Standard) views with row counts greater than zero, as shown in Figure 8-17. For your Process Center installation, make sure you performed the Update Tracking Definition step that is described in 8.2.5, "Validating Process Center operation" on page 254.
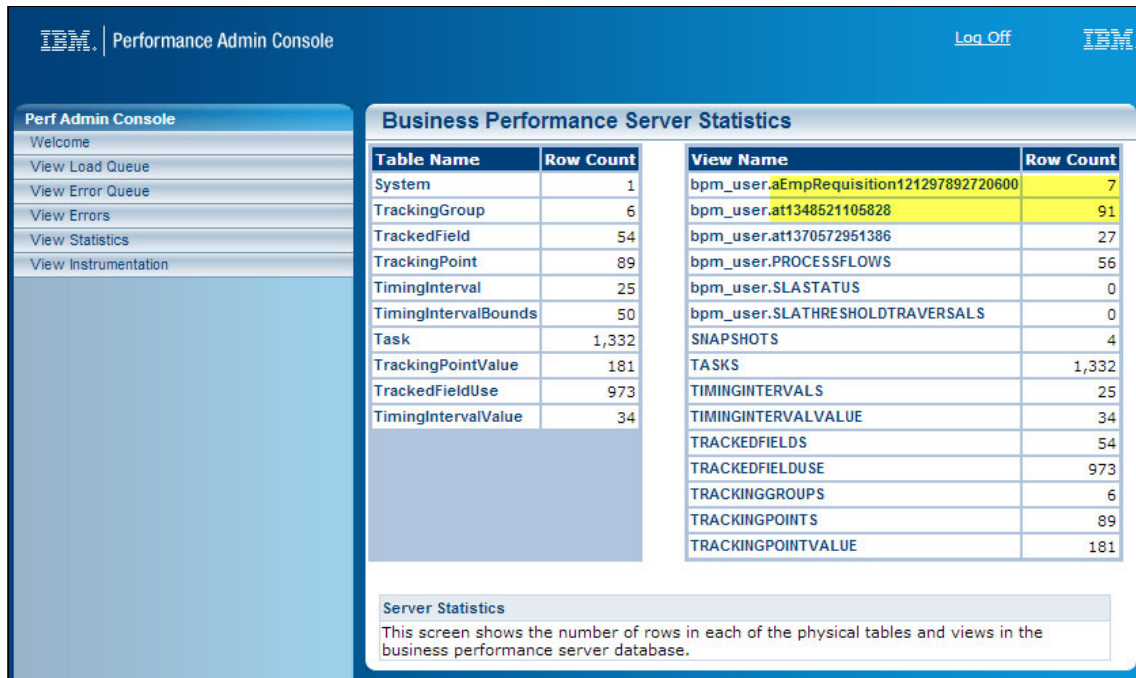
Figure 8-17   Business Performance Server Statistic

REST and web services API consoles

The REST and web services API consoles are deployed to the AppCluster, so you must perform the following steps for each AppCluster member server by using the WC_defaulthost port that is described in 8.2.4, "Identifying WebSphere Application Server-specific ports" on page 252:

1. Log in to REST API Tester console with IBM BPM administrator credentials (bpmadmin) by using a URL similar to the following example:

   http://<node_host_name>:<WC_defaulthost>/bpmrest-ui/

2. Click **Business Process Management REST API** → **Organizational API** → **Users** and then click **Execute Call**. Validate that you can see the list of users that are available on the system that is returned, as shown in Figure 8-18 on page 271.
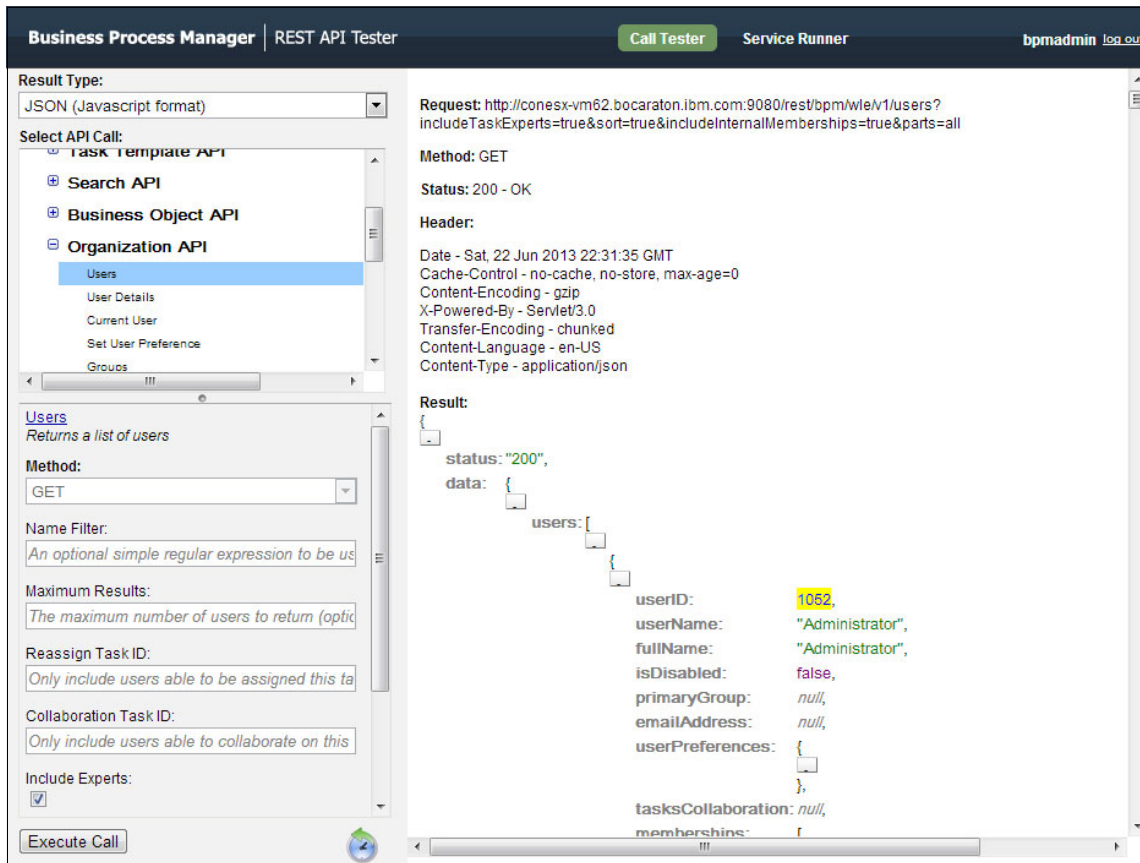
Figure 8-18   REST API Tester Users call run

3. Open the web services API WSDL by using a URL that is similar to the following example:

```
http://<node_host_name>:<WC_defaulthost>/webapi/services/WebAPISoap?
wsdl
```

4. Validate that you can see the WSDL definition that is similar to the one that is shown in Figure 8-19 on page 272.

Figure 8-19   Web services API WSDL

Business Space (advanced only)

In this section, you log in to the Business Space and browse to the System Health widget to ensure that the Business Space infrastructure is operating correctly.

The Business Space is deployed to the AppCluster, so you must perform the following steps for each AppCluster member server by using the `WC_defaulthost_secure` port that is described in 8.2.4, "Identifying WebSphere Application Server-specific ports" on page 252:

1. Log in to the Business Space Console with Cell administrator credentials (`celladmin`) by using a URL that is similar to the following example:

   `https://<node_host_name>:<WC_defaulthost_secure>/BusinessSpace/`

2. Click **Go to Spaces**, then click **Problem Determination**. Browse to the System Health tab.

3. You see a page that is similar to the one that is shown in Figure 8-20 on page 274, which shows the various deployment environments, clusters, and node agents that you configured and that they are running. Here, you can also explore the other tabs and check other components in your environment.

Figure 8-20   System Health tab in Business Space

4. Verify the health of individual modules by switching to the Business Space Module Health tab, as shown in Figure 8-21.
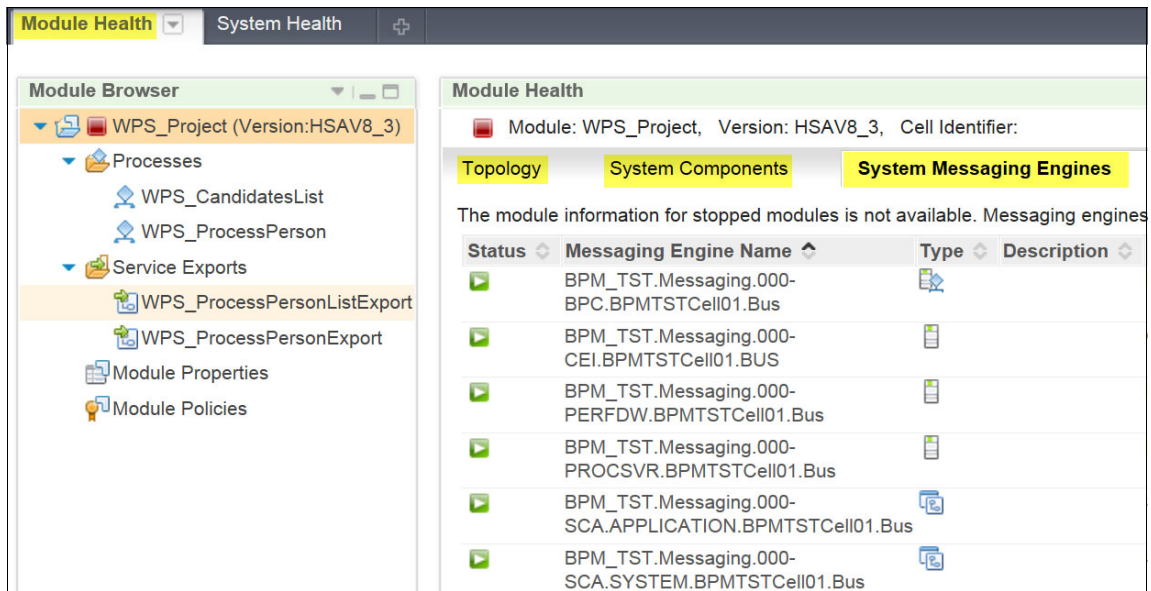
Figure 8-21   Module Health tab in Business Space system verification

Human Task Manager (advanced only)

The Human Task Manager is deployed to the SupCluster, so you must perform the following steps for each SupCluster member server by using the `WC_defaulthost_secure` port that is described in 8.2.4, "Identifying WebSphere Application Server-specific ports" on page 252.

Complete the following steps to verify that the Human Task Manager component is working correctly:

1. Log in to the Business Process Choreographer Explorer with IBM BPM administrator credentials (`bpmadmin`) by using a URL that is similar to the following example:

   `https://<node_host_name>:<WC_defaulthost_secure>/bpc/`

2. Click **Task Templates** → **My Task Templates**. You see preconfigured sample human tasks. Select the box next to Widget Message, then click **Create Instance**, as shown in Figure 8-22.
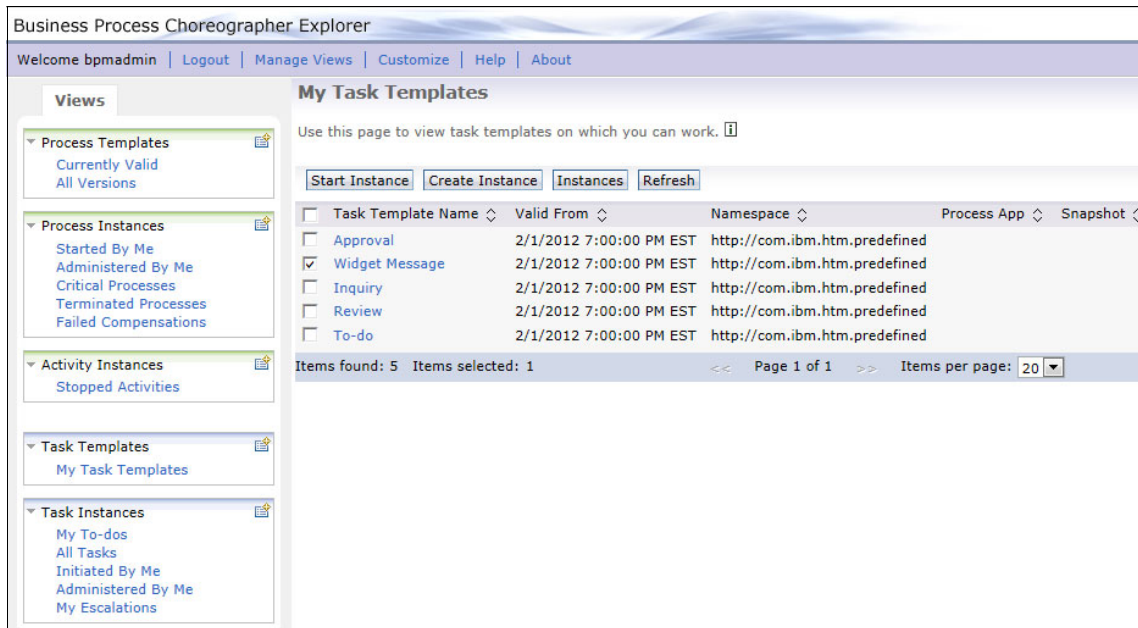
Figure 8-22   Business Process Choreographer Explorer creating a Widget Message instance

3. Enter values for the subject and message fields of the human task, then click **Submit**, as shown in Figure 8-23.
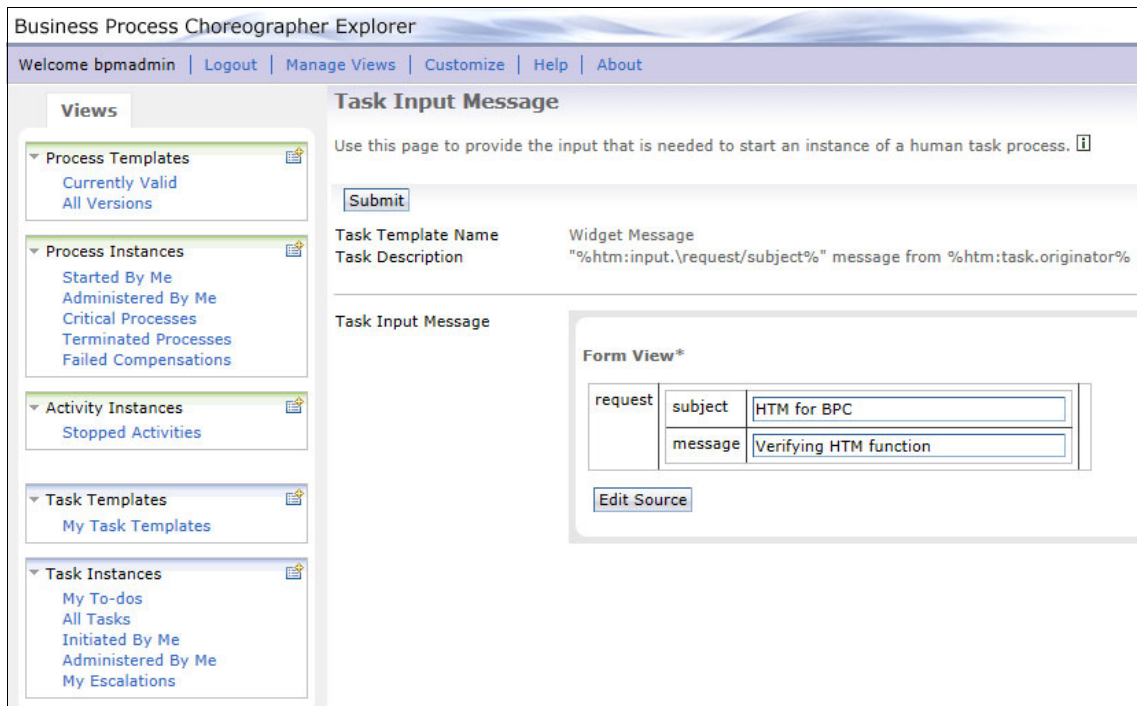
Figure 8-23   Configuring a Widget Message subject and message

4. Click **Task Instances** → **Initiated By Me**. Here, you can see an instance of the task that you created. Click the task name, **Widget Message**.

5. Select the Custom Properties tab and click the empty space next to the `htm_assigned_to` field (this property can be edited, although it does not appear so at first). Enter a valid user who should own the task. Click **Save**, then **Start**, then **Submit**. The task now has an owner, as shown in Figure 8-24.
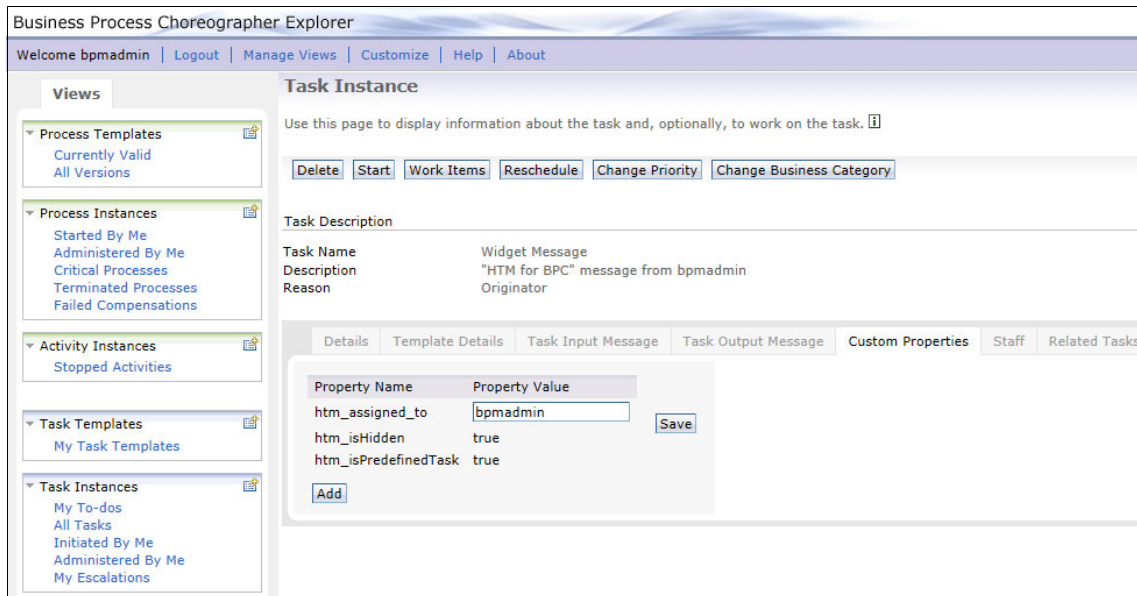
Figure 8-24 Business Process Choreographer Explorer assigning new Widget Message to a user

6. Select the box next to the Widget Message task and click **Work on**, as shown in Figure 8-25.

Figure 8-25   Business Process Choreographer Explorer working on a new Widget Message

7. Enter appropriate text into the response comments field, then click **Complete**, as shown in Figure 8-26.
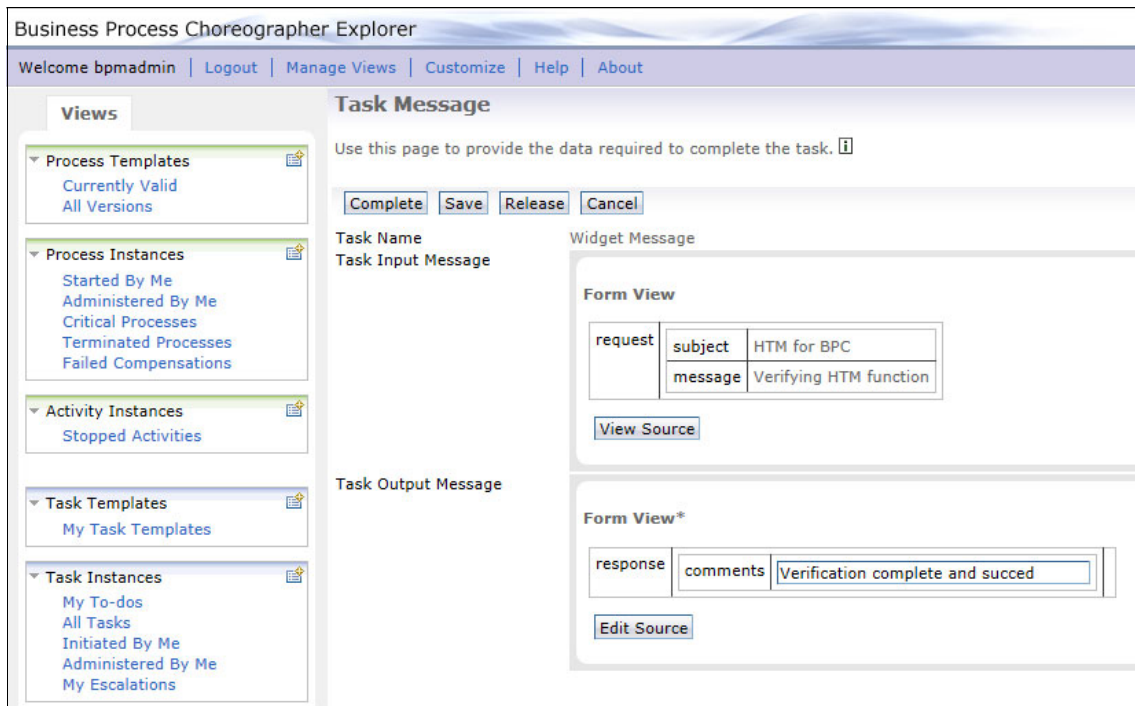
Figure 8-26   Business Process Choreographer Explorer creating output for new Widget Message

The new human task is now finished and you verified that the human task manager is working correctly. If you want to delete this test task, click **Task Instances Administered By Me**, select the task, and then select **Delete**.

Business Process Choreographer (advanced only)

Verify that the Business Process Choreographer is working correctly and that it can be aligned with the Process Designer and Integration Designer interaction verification. You can find interaction samples to demonstrate the interaction capabilities in the latest IBM Business Process Manager V8.5 sample page on the official IBM Business Process Manager Samples and Tutorials site, which is available at this website:

http://publib.boulder.ibm.com/bpcsamp/v7r5/index.html

The Procurement sample shows how to develop the interaction that is part of the workflow and how it is run by the BPEL process engine. This sample can be used to verify the function of the business process engine.

Click **Interaction Samples** → **Procurement sample: Calling a human task from a BPEL process** for instructions. Under the Build it yourself link, you can find instructions about how to build the application and deploy it to IBM BPM Server.

Under the Run the Sample link, you can find instructions about how to run the sample by using the Business Process Choreographer Explorer and Business Space. This verifies that the Business Process Choreographer is working correctly.

8.3 Conclusion

This chapter described several verification steps for an IBM BPM Standard and IBM BPM Advanced installation.

9

Overview of migration

The task of migration can be a tedious undertaking for every IT professional. Different versions must be considered with platform and middleware choices.

IBM Business Process Manager (BPM) 8.5 delivers a consolidated runtime migration instead of different migration paths for IBM BPM Advanced and IBM BPM Standard. A new interactive migration guide, which is available with IBM BPM 8.5, can generate a printable, shareable set of migration instructions that are customized to suit your specific migration scenario.

This chapter includes the following topics:

► Migration paths
► IBM BPM Interactive Migration Guide
► Migration limitations
► Migration utilities and scripts
► High-level migration tasks
► Common migration scenarios

9.1 Migration paths

With version-to-version migration, applications can be migrated to the new version of the product by updating the applications by using the authoring tools and redeploying them, or by using the runtime migration tools, which preserve some configuration information and automatically redeploy the applications. There is not much change on artifact migration in IBM BPM 8.5, and we focus on runtime migration in this chapter.

The IBM BPM 8.5 migration utilities support migrating users from the IBM BPM default database registry to the WebSphere Application Server file registry. Passwords are also migrated so that you no longer must change or reset passwords after migration.

IBM BPM 8.5 supports the migration paths that are listed in Table 9-1. You can migrate between the same environment type, such as, Process Server to Process Server, or Process Center to Process Center.

Table 9-1   Supported migration paths

Source	Target (IBM BPM v8.5)
IBM BPM Standard v7.5.x or IBM BPM Standard v8.0.x	IBM BPM Standard or IBM BPM Advanced
IBM BPM Advanced v7.5.x or IBM BPM Advanced v8.0.x	IBM BPM Advanced
WebSphere Lombardi Edition v7.1.x or WebSphere Lombardi Edition 7.2.x	IBM BPM Standard or IBM BPM Advanced
WebSphere Process Server 7.0.0.x	IBM BPM Advanced Only or IBM BPM Advanced

A consolidated and consistent migration process for Standard and Advanced IBM BPM environments supports the following advantages:

► No dependency on WebSphere Application Server profile and configuration upgrade.

► Supported topology changes during the migration process.

► Consistent migration path for different topologies and product versions.

► New interactive migration guide for generating migration roadmap for a specific environment, as shown in Figure 9-1 on page 285.
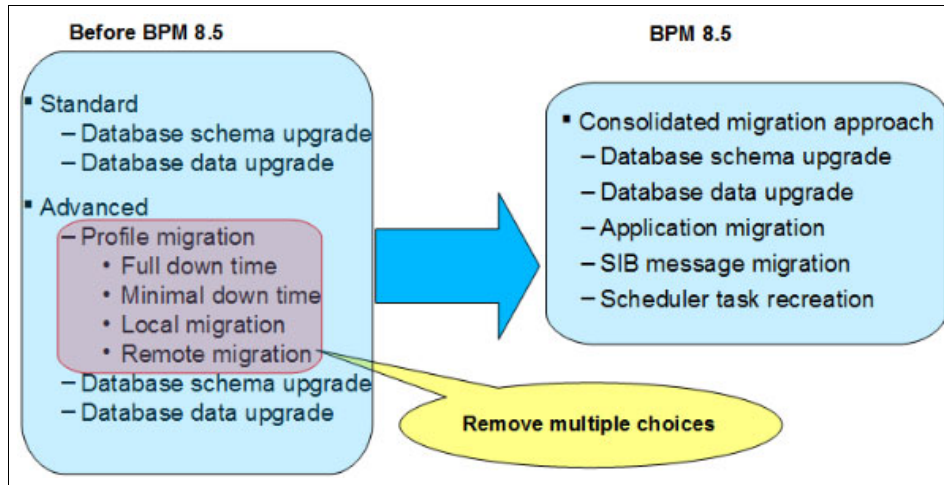
Figure 9-1   Migration guide

9.2 IBM BPM Interactive Migration Guide

In this section, we describe the steps that are used for migrating to IBM BPM 8.5 from a previous version or another product by using the IBM BPM Interactive Migration Guide. The generated output from this guide is restricted to supported migration scenarios. However, it might be possible to generate an unsupported set of instructions. The Interactive Migration Guide uses rules and considerations that are described in other topics in the IBM BPM 8.5 information center.

> **Accessing the Interactive Migration Guide:** The Interactive Migration Guide is available at this website:
>
> `http://pic.dhe.ibm.com/infocenter/dmndhelp/v8r5m0/topic/com.ibm.wbpm`
> `.imuc.doc/topics/bpm_mig_roadmap_form.jsp`

9.3 Migration limitations

Migration includes the following limitations:

► No in-place upgrade for binaries and profiles.

► No support for migrating from WPS 6.2.x and Teamworks 6.2.x.

► Does not support migration of failed events. You must resubmit or delete failed events before migration.

- ► Does not apply the performance tuning parameters from source to target automatically during migration. You must manually complete this as a post-migration task.

- ► You must complete the following configurations manually after migration:
  - – RunAs roles
  - – Role-to-user mappings for applications
  - – Custom data source
  - – JMS
  - – Scheduler
  - – Lightweight Directory Access Protocol (LDAP)
  - – Proxy and virtual host
  - – Business Process Choreographer if you have it configured in the source environment

- ► The Common Event Infrastructure is deprecated in IBM BPM 8.5. There is no migration support available for this feature. If you configured a Common Event Infrastructure (CEI) in your source environment, you must configure it manually after migration.

- ► You must run a migration process separately for each deployment environment that is configured in a cell.

- ► Does not support migration if the source profile has Monitor augmented because IBM BPM 8.5 does not support an argument profile with Business Monitor.

9.4 Migration utilities and scripts

IBM BPM 8.5 provides a set of scripts and utilities for successfully migrating your existing IBM BPM environment to version 8.5. This section describes the following migration scripts and utilities that are available with IBM BPM 8.5:

- ► BPMCreateRemoteMigrationUtilities command
- ► Migration properties file for migration commands
- ► BPMExtractDBConfiguration command
- ► BPMConfig properties file for migration
- ► BPMExtractSourceInformation command
- ► BPMManageApplications command
- ► BPMGenerateUpgradeSchemaScripts command
- ► BPMMergeFileRegistry command

- ▶ DBUpgrade command
- ▶ BPMMigrate command

9.4.1 BPMCreateRemoteMigrationUtilities command

The `BPMCreateRemoteMigrationUtilities` command creates an archive file that contains all the commands and their prerequisites that must run on the source environment so they can be used to extract or manage the configuration for migration purpose.

The IBM BPM binary installation process creates the utility in the `BPM8.5_Home`/`bin` location.

The `BPMCreateRemoteMigrationUtilities` command includes the following syntax:

`BPMCreateRemoteMigrationUtilities archive_file_fullpath`

The location of the archive file is displayed when you run the `BPMCreateRemoteMigrationUtilities` command. By default, the archive file is in the `BPM8.5_Home/util/migration/script` directory.

Limitations of BPMCreateRemoteMigrationUtilities command

To migrate to a computer with a different operating system, you must install IBM BPM 8.5 on the source or a third computer with the same operating system as the source, and then package the migration utilities there. If you are migrating to a different operating system, such as, from Windows to Linux, you cannot package the migration utilities on the target Linux computer because the package is for Linux only and it does not work on the Windows source environment.

If the source environment operating system (such as, Windows 2003) is not supported in IBM BPM 8.5, you must install the new version of IBM BPM on a third computer with a Windows operating system that is supported on IBM BPM 8.5 and that has the same bit type (for example, 32 bit or 64 bit) as the migration source computer.

9.4.2 Migration properties file for migration commands

The migration properties file contains information about the source and target environment. The migration utilities use this properties file as input parameter. The `migration.properties` file is in the `bpm85_home/util/migration/resources` directory.

Table 9-2 shows property names and values of the `migration.properties` file.

Table 9-2   Property names and values of the migration.properties file

Property name	Property value	Notes
admin.username	The user name of the primary administrator (on the target IBM BPM 8.5, it is the user of CellAdmin)	These properties are required and must be changed if you are running the migration command on the target or the source.
admin.password	The password for admin.username	
bpm.home	The installation directory of IBM BPM. For WebSphere Lombardi Edition, it should be `WLE_Home/AppServer`	
profile.name	Deployment manager profile name for network deployment environment or the profile name for stand-alone environment.	
► source.application.cluster.name ► source.support.cluster.name ► source.messaging.cluster.name ► source.web.cluster.name	If the source is based on a Network Deployment environment, you must specify these properties if they exist for different topology. If the source is stand-alone, leave fields empty.	Required if your source environment is Network Deployment environment.
target.config.property.file	The full path of the config properties file that is used by BPMConfig to create your target environment.	Required on the target.
source.product.version	The version of your source product; must be in four-digit style, such as, 7.5.0.0, 8.0.1.0.	
ltpa.password	The password that is used to export and import the LTPA keys; by default, this password is WebAS.	Optional

> **More information about properties:** For more information, see the descriptions in the headers of the `migration.properties` template.

9.4.3 BPMExtractDBConfiguration command

The `BPMExtractDBConfiguration` command extracts the database information from the migration source. You can then use this database information to create a deployment environment for a new version of IBM BPM that uses the databases from the previous version.

This utility also extracts custom data source information from the source environment, which can help you create these data sources again in the new version.

The **BPMExtractDBConfiguration** command uses the `migration.properties` file as input. It is in the `/BPM_home_8.5/bin` directory.

The **BPMExtractDBConfiguration** features the following syntax:

```
BPMExtractDBConfiguration -output /tmp/db_config -propertiesFile
/tmp/remoteUtil/util/migration/resources/migration.properties
```

If you use the remote migration utility to run the command in the source environment, the log file is in the `/remote_migration_utility/logs/migration` directory. Otherwise, the log file is in the `BPM_home_8.5/logs/migration` directory on the target environment.

> **Important:** If you experience SOAP invocation timeout issues, change the value of the `com.ibm.SOAP.requestTimeout` property in the `soap.client.props` file in the `BPM85_Home/util/migration/resources` directory or in the `/remote_migration_utility/util/migration/resources` directory. If you are running this command more than once because you have more than one deployment environment, remember to specify different output file names.

9.4.4 BPMConfig properties file for migration

Configuration of IBM BPM 8.5 is different from any previous version. The deployment environment wizard is intended for a simple scenario only. In most cases, the wizard is not suitable for a migration scenario. Therefore, if you want to perform a proper migration, you must use BPMConfig to configure the target deployment environment.

IBM BPM 8.5 also provides a set of different sample properties files for several migration scenarios. You can check all the sample properties files for migration in the following directory:

```
BPM85_Home/BPM/samples/config/migration
```

Modify your version of a properties file by editing the properties for user credentials, database information, host name, and installation path. You must also update all the properties with the value `@TO_BE_REPLACED@`.

Consider the following points regarding migration:

► Select the configuration properties file that most closely represents your target deployment environment and copy this file. The sample files are named according to the following format:

`de_type-environment_type-topology-database_type[-suffix].properties`

The following choices are valid:

— `de_type` can be set to Standard or Advanced or AdvancedOnly.

— `environment_type` can be set to PS for Process Server or PC for Process Center.

— `topology` can be set to SingleCluster or ThreeClusters.

— `database_type` can be set to DB2, DB2zOS, Oracle, or SQLServer.

— `suffix` (optional) can be set to -WinAuth for an SQL Server database, or to -MultiBus if you use multiple service integration buses in the source environment and want to do the same in the target environment. IBM BPM 8.5 supports a single bus and messaging engine, which is the recommended configuration. Choose the -MultiBus option only if you have a special requirement for multiple buses.

► Take special note of the `bpm.de.deferSchemaCreation` property. Make sure that this property is already set to true because you are migrating and do not want to initialize the databases while you are creating the deployment environment. You configure the databases later if you add any new capability.

► In IBM BPM 8.5, the old common database is split into two pieces. One is cell-scoped and is used for the entire cell. The other, which includes event sequencing and the failed event manager, is deployment environment-scoped and must be configured for each deployment environment. You can reuse the old common database for the deployment environment-scoped database if you are on a single deployment environment.

► If you are migrating on multiple deployment environments, you must have a separate deployment environment-scoped database for each deployment environment. If you have data in the event sequencing table (named PERSISTENTLOCK) in the source environment, export the data from the source and import it into the event sequencing table (PERSISTENTLOCK) in the new deployment environment-scoped common database component.

9.4.5 BPMExtractSourceInformation command

The `BPMExtractSourceInformation` command is used to check for migration readiness and to take a snapshot of the source environment during migration.

When it is used with the `-precheck` option, this command ensures that your source environment is in the correct state for migration.

> **Note:** This pre-check is necessary only if you are migrating from IBM BPM Advanced or WebSphere Process Server.

When it is used with the `-backupFolder` option, this command extracts the configuration information, customizations, performance options, applications, LTPA keys, and service integration bus (SIB) messages from the source deployment manager environment. The extracted information is stored in the `/BPM_home_8.5/bin` directory.

If you installed the new version of the product on a different computer and copied the migration files to the source environment, the file can be found in the `/remote_migration_utility/bin` directory on the source computer.

The following syntax is used for checking the readiness of the source environment:

```
BPMExtractSourceInformation -precheck -propertiesFile
migration_properties_file
```

This command performs the following checks:

► Whether any existing SIB messages are still in a transaction.
► Whether too many SIB messages are stuck in a queue.
► Whether any failed events are not processed.

The following syntax is used for generating a snapshot of the source environment:

```
BPMExtractSourceInformation -backupFolder snapshot_folder
-propertiesFile migration_properties_file
```

The **BPMExtractSourceInformation** command stores a log in the following location:

► If the `-backupFolder` parameter is set, the log file is in `/snapshot_folder/logs`.

► If the `-backupFolder` parameter is not set and you are using the remote migration utility, the log file is in `/remote_migration_utility/logs/migration`.

► If the `-backupFolder` parameter is not set and you are not using the remote migration utility, the log file is in `/BPM85_Home/logs/migration`.

If you are using `−backupFolder` to extract needed information from the source, you might see some of the following subfolders under `snapshot_foder/cell_name`:

► `/Adpaters` holds adapter configuration on the application level.

► `/Applications` holds the WebSphere Application Server application and HTM_PredefinedTask system applications. You do not find Lombardi applications at this location because Lombardi applications are always stored in the database.

► `/BLAs` and `/CompositionUnits` holds assets that are used by business-level applications.

► `/Configurations` holds the configuration files that the user can refer to (such as, `PerformanceTuningParameters.properties`) or the migration toll handles the migration automatically (such as, `100SourceCustomMerged.xml`).

► `/Messages` holds the SIB messages that were not yet used in the source environment.

9.4.6 BPMManageApplications command

The **BPMManageApplications** command is used to make sure that no new events or processes are entering the system during migration when you are migrating from IBM BPM Advanced or WebSphere Process Server.

When it is used with the `-autoStart false` option, this command disables the automatic starting of all applications and schedulers in the deployment environment. When it is used with the `-autoStart true` option, this command enables the automatic starting of all applications and schedulers. The parameter `−source` or `−target` specifies whether the command disables or enables the source environment or the target environment.

The **BPMManageApplications** command is in the `/BPM_Home_8.5/bin` directory. If you installed the new version of the product on a different computer and copied the migration files to the source environment, the file can be found in the `/remote_migration_utility/bin` directory on the source computer.

To disable the automatic starting of applications and schedulers, run the following command:

BPMManageApplications -autoStart false -source|-target -propertiesFile migration_properties_file

To enable the automatic starting of applications and schedulers, run the following command:

```
BPMManageApplications -autoStart true -source|-target -propertiesFile
migration_properties_file
```

> **Server restart:** After the `BPMManageApplications` command is run, a server restart is required.

9.4.7 BPMGenerateUpgradeSchemaScripts command

The `BPMGenerateUpgradeSchemaScripts` command generates SQL scripts and upgradeSchema scripts for a database that must be upgraded during a version-to-version migration or a refresh pack upgrade.

For a version-to-version migration, the command generates SQL scripts and upgrade-Schema scripts in the `/target_deployment_manager_profile/dbscripts/Upgrade` directory, under the following subdirectories:

- ► `/deployment_environment_name/DBType/database_name.schema_name`
- ► `/cell_name/database_type/database_name.schema_name`

   (This subdirectory is used if you must create a cell scope database.)

> **Note:** The `BPMGenerateUpgradeSchemaScripts` command should be started from the `BPM_home/bin` directory.
>
> The Process Server and Performance Data Warehouse database upgrade scripts that are generated under the `/target_install_root/profiles/profile_name/dbscripts` directory do not need to be run manually because they are started by the `DBUpgrade` command.

The `BPMGenerateUpgradeSchemaScripts` command uses the `migration.properties` file as input.

The `BPMGenerateUpgradeSchemaScripts` command features the following syntax:

```
BPMGenerateUpgradeSchemaScripts.sh -propertiesFile
/tmp/remoteUtil/util/migration/resources/migration.properties
```

After the **BPMGenerateUpgradeSchemaScripts** command is run, the log files are in the following directory:

```
Dmgr_Profile/logs/BPMGenerateUpgradeSchemaScripts.upgrade.timestamp.err
or
```

9.4.8 BPMMergeFileRegistry command

If you use a file-based user registry in the source environment, merge the file-based user registry with the target environment. To merge the file-based user registry, you must run the **BPMMergeFileRegistry** command, which is in the /BPM85_Home/bin directory.

The **BPMMergeFileRegistry** features the following syntax:

```
BPMMergeFileRegistry.sh -backupFolder snapshot_folder -propertiesFile
migration_properties_file
```

The snapshot_folder points to the directory in which the extracted information is stored by the **BPMExtractSourceInformation** command, and the migration_properties_file contains the full path to the migration.properties file in which you specified the information for the target environment.

9.4.9 DBUpgrade command

The **DBUpgrade** command upgrades previous versions of database schemas and data to the current version of IBM BPM. The **DBUpgrade** command updates the following items in the database to IBM BPM 8.5:

► System Data toolkit
► Process Portal process application
► Hiring sample tutorial process application

If you are migrating from Teamworks 7.0.0 or 7.0.1, the **DBUpgrade** command converts encrypted passwords to work with the encryption algorithm that is used by IBM BPM V8.0.1. Encrypted passwords can be stored in the database for users that are defined through the WebSphere Application Server file registry or for secure web service integrations.

The **DBUpgrade** command is in the /BPM85_Home/bin/ directory. Before the command is run, make sure that the servers and cluster members are stopped.

The **DBUpgrade** command features the following syntax:

```
DBUpgrade -propertiesFile migration_properties_file -backupFolder
snapshot_folder
```

The logs are saved in the /BPM85_Home/profiles/PROFILE_NAME/logs directory in files that are named DBUpgrade_TimeStamp.log and bootstrapProcesServerData.AppClusterName.TimeStamp.log. PROFILE_NAME is the value that you specified for the profile.name property in the migration.properties file.

> **Updating dependencies:** Although the **DBUpgrade** command updates the System Data toolkit to IBM BPM 8.5, it does not automatically update existing dependencies. The dependencies are updated as part of the post migration procedures.
>
> You must run the **DBUpgrade** command only once, even if you have multiple nodes and cluster members.
>
> You might see warning messages in the log that are similar to the following example:
>
> Couldn't load Resource META-INF*****
>
> These messages can safely be ignored.
>
> If you are migrating from IBM BPM 7.5.x and you receive an out-of-memory error that indicates too many or too large data records are present, you can try to increase the heap size of the JVM for the **DBUpgrade** command or decrease the value of database.batch.size (the size of the records to be updated as a batch) in the BPM_home/util/dbUpgrade/upgrade.properties file.

9.4.10 BPMMigrate command

The **BPMMigrate** command imports the migration snapshot, which includes information about configuration, LTPA keys, applications, and service integration bus messages, from your previous version to your new version. The migration snapshot is taken by using the **BPMExtractSourceInformation** command.

If you are migrating from IBM BPM Advanced or WebSphere Process Server, the **BPMMigrate** command performs the following tasks:

► Stops the automatic generation of LTPA keys and applies the LTPA keys from the source environment to the target environment.

► Installs your applications in the target environment.

► Synchronizes the managed nodes.

► Runs the command to move the SIB messages from the source environment to the target environment.

► Runs the command to re-create the scheduler tasks.

- Applies the customizations from the `100Custom.xml` in the source environment to the configuration objects in the target environment (only for IBM BPM Advanced).
- Updates the WebSphere Adapters.

The command can be found in the `/BPM85_Home/bin` directory.

The **BPMMigrate command** features the following syntax:

```
BPMMigrate -backupFolder snapshot_folder -propertiesFile
migration_properties_fileDescription
```

The logs are in the `/snapshot_folder/logs` directory.

> **Note:** For IBM BPM Standard and WebSphere Lombardi Edition, the **BPMMigrate** command does not migrate LTPA keys, WebSphere Application Server applications, adapters, and SIB messages, as applications should be all in the database. Instead, the **BPMMigrate** command migrates only the `100Custom.xml` file.
>
> Make sure that the messaging engines in the target environment are started successfully, or the **BPMMigrate** command fails with the following exception:
>
> ```
> Cannot find message engine.
> ```

For the scheduler migration, the **BPMMigrate** command starts an AdminTask that is registered during server start and uses the scheduler service to re-create each scheduler task. The log is saved on one of the nodes.

If you experience SOAP invocation timeout issues during scheduler migration, modify the `soap.client.props` file under `deployment_manager_profile/properties`, and change the value of the `com.ibm.SOAP.requestTimeout` property.

9.5 High-level migration tasks

Table 9-3 shows the sequence of high-level steps for migrating IBM BPM from a previous version of the product to IBM BPM 8.5. (In Table 9-3, "WLE" refers to WebSphere Lombardi Edition and "WPS" refers to WebSphere Process Server.)

Table 9-3   High-level migration steps

Step	Migration task	Source /Target	Advanced	Standard	WLE	WPS
1	Verify that the hardware and operating system is supported.	Target	Yes	Yes	Yes	Yes
2	Install IBM BPM 8.5 binaries.	Target	Yes	Yes	Yes	Yes
3	Package remote migration utilities and copy them to source (only in the case of a remote target).	Target	Yes	Yes	Yes	Yes
4	Update the `migration.properties` file with the configuration information for the source environment. The `migration.properties` file is part of the remote migration utility that is found at `Remote_migration_utility_Home/util/migration/resources/migration.properties`	Sources	Yes	Yes	Yes	Yes
5	Extract all database-related information from the source environment. This helps to configure the target environment by reusing the existing databases (optional).	Sources	Yes	Yes	Yes	Yes
6	Select and edit the properties file that matches your target environment under the following folder: `BPM85_Home/BPM/samples/config/migration`	Target	Yes	Yes	Yes	Yes
7	Configure the target IBM BPM 8.5 environment by using the **BPMConfig** command. Use the properties that were updated in step 6.	Target	Yes	Yes	Yes	Yes

Step	Migration task	Source /Target	Advanced	Standard	WLE	WPS
8	Check the readiness of source environment for migration by using the `BPMExtractSourceInformation -precheck` command. This command performs the following checks: ► Whether any existing SIB message is in a transaction ► Whether too many SIB messages are stuck in a queue ► Whether any failed events are not processed	Source	Yes	No	No	Yes
9	Run the `BPMManageApplications` command to disable automatic starting of all your applications and schedulers. This action confirms that no new events or processes in the source system and no scheduler tasks are used during the migration process.	Source	Yes	No	No	Yes
10	Take a snapshot of the source environment by using the `BPMExtractSourceInformation` command to extract information, such as, configuration customizations, applications, LTPA keys, and SIB messages. You need one snapshot for each deployment environment in your source cell. You do not need a separate snapshot per profile from your source cell. You import this snapshot to the target environment in a later stage.	Source	Yes	Yes	Yes	Yes
11	Stop all running processes, including deployment environment, node agent, and deployment manager.	Source	Yes	Yes	Yes	Yes
12	Copy the snapshot and migration properties files to the target computer. This is required only if your target is on a different system.	Source	Yes	Yes	Yes	Yes
13	Back up all your old databases, including customer's system of records.	Source	Yes	Yes	Yes	Yes

Step	Migration task	Source /Target	Advanced	Standard	WLE	WPS
14	Configure extra databases that are required for your target environment. Update the `migration.properties` to point to your target environment. Run the **BPMGenerateUpgradeSchemaScripts** command to generate the SQL scripts to initialize the newly configured database and the upgrade SQL script that is used by the database upgrade in step 15.	Target	Yes	Yes	Yes	Yes
15	Run the database upgrade script to upgrade source databases to IBM BPM 8.5.	Target	Yes	Yes	Yes	Yes
16	If you use a file-based user registry in the source environment, merge the file-based user registry with the target environment by using the **BPMMergeFileRegistry** command.	Target	Yes	Yes	No	Yes
17	Disable the automatic starting of all applications and schedulers in the target environment by running the **BPMManageApplications** command.	Target	Yes	No	No	Yes
18	Start all processes including deployment manager, node agents, and the deployment environment.	Target	Yes	Yes	Yes	Yes

Step	Migration task	Source /Target	Advanced	Standard	WLE	WPS
19	Import the migration snapshot from the source environment into the target environment by using the `BPMMigrate` command. This command performs the following actions: ▸ Stops automatic generation of LTPA keys and applies the LTPA keys from the source environment to the target environment. ▸ Installs your WebSphere Application Server applications in the target environment. ▸ Synchronizes the managed nodes. ▸ Runs the command to move the SIB messages from the source environment to the target environment. ▸ Runs the command to re-create the scheduler tasks. ▸ Applies the customizations from the `100Custom.xml` in the source environment to the configuration objects in the target environment. ▸ Updates the WebSphere Adapters, if any.	Target	Yes	Yes	Yes	Yes
20	Apply custom configurations to target environment. Use the `PerformanceTuningParameters.properties` that is generated by the `BPMExtractSourceInformation` command to understand the custom configurations from the source environment.	Target	Yes	Yes	Yes	Yes
21	Enable the automatic start of all applications and schedulers in the target environment.	Target	Yes	No	No	Yes
22	Run the Business Space data migration if you have Business Space that is configured in your source environment (WebSphere Process Server 7.0.0.x only).	Target	No	No	No	Yes

Step	Migration task	Source /Target	Advanced	Standard	WLE	WPS
23	Restart the environment and verify migration.	Target	Yes	Yes	Yes	Yes

9.6 Common migration scenarios

This section describes some of the common scenarios to show the step-by-step migration process, utilities, and commands.

9.6.1 Migration scenario 1

In this scenario, we migrate an IBM BPM 7.5.1 Advanced three-cluster environment to an IBM BPM 8.5 Advanced three-cluster environment. The source and target environments are on different machines, as shown in Table 9-4.

Table 9-4   Migration scenario 1

	IBM BPM Version	Operating System	Topology	Product Type	Database
Source	IBM BPM 7.5.1 Advanced	Linux	Three Cluster	Process Center	DB2
Target	IBM BPM 8.5.0 Advanced	Linux	Three Cluster	Process Center	DB2

Complete the following steps for this setup:

1. Verify your hardware and that your operating system is supported for the target servers.

> **Detailed system requirements:** For more information about system requirements of the supported releases of IBM BPM Advanced, see this website:
>
> http://www.ibm.com/support/docview.wss?uid=swg27023005

2. Install IBM BPM 8.5 binaries on target servers.

Install IBM BPM 8.5 on your target Linux operating system, use `/opt/BPM85` as the installation root.

> **Note:** For more information, see Chapter 5, "Deploying an IBM Business Process Manager environment" on page 89.

3. Package remote migration utilities on the target server and copy them to the source server.

Create the migration utilities by using the `BPMCreateRemoteMigrationUtilities` command in the `/opt/BPM85/bin` directory (as shown in Example 9-1), so that you can use these utilities to perform actions on the source environment.

Example 9-1   BPMCreateRemoteMigrationUtilities command

```
[root@localhost bin]# ./BPMCreateRemoteMigrationUtilities.sh
/home/itaas/migration/MigrationUtilities.zip
Buildfile: /opt/BPM85/util/migration/scripts/createMigrationUtilDisk.ant

create_zip_image:
      [zip] Building zip: /home/itaas/migration/MigrationUtilities.zip

BUILD SUCCESSFUL
Total time: 1 minute 2 seconds
```

Copy the generated `MigrationUtilities.zip` to the `/home/itaas/migration` directory on the machine that has the source environment running.

4. Update the migration properties file on the source with the configuration information for the source environment.

Extract the `MigrationUtilities.zip` to the `/opt/MigrationUtilities` directory and copy the `migration.properties` from `/opt/MigrationUtilities/util/migration/resources` to `/home/itaas/migration/85Migration`.

Then, edit the `migration.properties` inside the `/home/itaas/migration/85Migration` directory, as shown in Example 9-2.

Example 9-2   Edit the migration.properties file

```
admin.username=bpmadmin
admin.password=bpmadmin
bpm.home=/opt/BPM751
profile.name=Dmgr01
source.application.cluster.name=PCDE.AppTarget
source.support.cluster.name=PCDE.Support
```

```
source.messaging.cluster.name=PCDE.Messaging
source.web.cluster.name=
```

We are using `bpmadmin` and `bpmadmin` as the primary administrator and password combination for the source environment. The source environment was installed to `/opt/BPM751`, the name of deployment manager profile is Dmgr01. We are using a three-cluster topology, which features the following clusters:

 – PCDE.AppTarget
 – PCDE.Support
 – PCDE.Messaging

The `migration.properties` file is used for migration commands later, such as, **BPMExtractDBConfiguration** and **BPMExtractSourceInformation**.

5. Extract all database-related information from the source environment.

Make sure that the deployment manager is started, and run the command that is shown in Example 9-3 to extract the database information from the source environment.

Example 9-3   Extract the database information from the source environment

```
[root@linuxvm66 bin]# ./BPMExtractDBConfiguration.sh -output
/home/itaas/migration/85Migration/dbConfiguration.properties
-propertiesFile /home/itaas/migration/85Migration/migration.properties
CWMCO1036I: BPM migration logs are saved under
/opt/MigrationUtilities/logs/migration.
ssl.defaullt.password.in.use.CWPKIO041W
ssl.disable.url.hostname.verification.CWPKIoo27I
Client code attempting to load security configuration
Client code attempting to load security configuration
CWMCO3022I: Start to export database information from the source
environment.
CWMCO3023I: Export of database information from the source environment
completed successfully.
```

You can see on the console that the log is saved in the `/opt/MigrationUtilities/logs/migration` directory and uses the name `BPMExtractDBConfiguration_<timestamp>.log`. You can check the log if any exception occurred. Example 9-4 shows the content of the `dbConfiguration.properties` file.

Example 9-4   Content of dbConfiguration.properties file

```
#********************************************************************
# DE1.Support
#********************************************************************
##################################################################
```

```
# The data source properties for Performance Data Warehouse data source
##################################################################
datasource.1.name=Performance Data Warehouse data source
datasource.1.jndi=jdbc/PDWDB
datasource.1.Authentication_alias_for_XA_recovery.userName=db2inst1
datasource.1.description=Performance Data Warehouse data source
datasource.1.provider=DB2 Universal JDBC Driver Provider (XA)
datasource.1.Scope=cells/linuxvm66Cell01/clusters/DE1.Support
datasource.1.databaseName=P751L
datasource.1.driverType=4
datasource.1.serverName=9.111.101.64
datasource.1.portNumber=50000


##################################################################
# The data source properties for Process Server data source
##################################################################
datasource.2.name=Process Server data source
datasource.2.jndi=jdbc/ProcessDB
datasource.2.Authentication_alias_for_XA_recovery.userName=db2inst1
datasource.2.description=Process Server data source
datasource.2.provider=DB2 Universal JDBC Driver Provider (XA)
datasource.2.Scope=cells/linuxvm66Cell01/clusters/DE1.Support
datasource.2.databaseName=B751L
datasource.2.driverType=4
datasource.2.serverName=9.111.101.64
datasource.2.portNumber=50000


##################################################################
# The data source properties for Business Space data source
##################################################################
datasource.3.name=Business Space data source
datasource.3.jndi=jdbc/mashupDS
datasource.3.Authentication_alias_for_XA_recovery.userName=db2inst1
datasource.3.description=Business Space data source
datasource.3.provider=DB2 Universal JDBC Driver Provider (XA)
datasource.3.Scope=cells/linuxvm66Cell01/clusters/DE1.Support
datasource.3.databaseName=C751L
datasource.3.driverType=4
datasource.3.serverName=9.111.101.64
datasource.3.portNumber=50000
datasource.3.schemaName=C75BS00
```

6. Select and edit the properties file that matches your target environment.
   Sample properties files are available on your target environment. Complete
   the following steps:

   a. Select `Advanced-PC-ThreeClusters-DB2.properties` in the
      `/opt/BPM85/BPM/samples/config/migration` directory.

b. Make a copy of this file to `/home/itaas/migration` and rename it to `Scenario1-Advanced-PC-ThreeClusters-DB2.properties`. Then, read the "Migration considerations" section at the top of this file to get a basic understanding what this file is about.

Edit the required values as they are highlighted in Example 9-5.

Example 9-5   Edit the Scenario1-Advanced-PC-ThreeClusters-DB2.properties file

```
# Make sure deferSchemaCreation is set to true
bpm.de.deferSchemaCreation=true
# The installation location of the BPM product
bpm.dmgr.installPath=/opt/BPM85
##################################################
# Cell (WAS) administration authentication alias   #
##################################################
bpm.cell.authenticationAlias.1.name=CellAdminAlias
bpm.cell.authenticationAlias.1.user=bpmadmin
bpm.cell.authenticationAlias.1.password=bpmadmin
```

> **Note:** Use `bpmadmin` as the user name and password for celladmin, the same as the primary administer of the source environment.
>
> If you use a file-based user registry in the source environment, use the same primary administrator user ID and password from source environment as the target CellAdmin user and password.

```
################################################################
# Deployment environment administrator authentication alias.    #
################################################################
bpm.de.authenticationAlias.1.name=DeAdminAlias
bpm.de.authenticationAlias.1.user=deAdmin
bpm.de.authenticationAlias.1.password=deAdmin
######################################
# Database user authentication alias    #
######################################
bpm.de.authenticationAlias.2.name=BPM_DB_ALIAS
bpm.de.authenticationAlias.2.user=db2admin
bpm.de.authenticationAlias.2.password=passw0rd
```

> **Note:** If you use a different user to access different databases, such as, User1 to access ProcessServer and User2 to access PDW, you must make a copy of the `Database user authentication alias` section and use different authentication alias, as shown in the following example:
>
> ```
> bpm.de.authenticationAlias.2.name=BPM_DB_PS_ALIAS
> bpm.de.authenticationAlias.2.user=User1
> bpm.de.authenticationAlias.2.password=password
> bpm.de.authenticationAlias.3.name=BPM_DB_PDW_ALIAS
> bpm.de.authenticationAlias.3.user=User2
> bpm.de.authenticationAlias.3.password=password
> ```
>
> Then, you can use the corresponding authentication alias when you configure the database properties later.

```
# If the hostname is the same as deployment manager, this node
will be created on the same computer. Do not use localhost for
environments that are spread across multiple machines.
bpm.de.node.1.hostname= linuxvm66
bpm.de.node.1.installPath=/opt/BPM85
```

> **Note:** We added a local node in this case. You also must configure the second node if you want to add another local or remote node. If it is a remote node, copy the same properties file to the remote machine, change the `bpm.dmgr.hostname` and `bpm.dmgr.soapPort` to match with deployment manager, then run **BPMConfig** again.

```
#########################
# Database properties   #
#########################
bpm.de.db.1.name=BusinessSpaceDb
bpm.de.db.1.dbCapabilities=BusinessSpace
bpm.de.db.1.databaseName=CMNDBWL
bpm.de.db.1.hostname=9.115.199.168
bpm.de.db.1.portNumber=50000
bpm.de.db.1.roleMapping.1.alias=BPM_DB_ALIAS
bpm.de.db.1.schema=IBMBUSSP
```

> **Note:** See `/home/itaas/migration/85Migration/dbConfiguration.properties`, extracted in step 5 on page 303, to find the database with `datasource.<number>.jndi=jdbc/mashupDS`, and reuse the old database. You must modify the alias if you use a different alias for different databases when you configure `bpm.de.authenticationAlias`.

```
bpm.de.db.2.name=MessagingDb
bpm.de.db.2.dbCapabilities=Messaging
bpm.de.db.2.databaseName=CMNDBWL
bpm.de.db.2.hostname=9.115.199.168
bpm.de.db.2.portNumber=50000
bpm.de.db.2.roleMapping.1.alias=BPM_DB_ALIAS
bpm.de.db.2.schema=CMNCM00
```

> **Note:** You can decide whether you want to reuse one of the old Messaging databases or create one. IBM BPM 8.5 supports a single bus and messaging engine, which is the recommended configuration.

```
bpm.de.db.3.name=ProcessServerDb
bpm.de.db.3.dbCapabilities=ProcessServer,EmbeddedECM
bpm.de.db.3.databaseName=BPMDBWL
bpm.de.db.3.hostname=9.115.199.168
bpm.de.db.3.portNumber=50000
bpm.de.db.3.roleMapping.1.alias=BPM_DB_ALIAS
bpm.de.db.3.schema=db2admin
```

> **Note:** See `/home/itaas/migration/85Migration/dbConfiguration.properties`, extracted in step 5 on page 303, to find the database with `datasource.<number>.jndi=jdbc/TeamWorksDB`, and reuse the old database. You must modify the alias if you use a different alias for different databases when you configure `bpm.de.authenticationAlias`. If there is no schema in the `dbConfiguration.properties` file, you should use user name as the schema.

```
bpm.de.db.4.name=PerformanceDb
bpm.de.db.4.dbCapabilities=PDW
bpm.de.db.4.databaseName=PDWDBWL
bpm.de.db.4.hostname=9.115.199.168
bpm.de.db.4.portNumber=50000
bpm.de.db.4.roleMapping.1.alias=BPM_DB_ALIAS
bpm.de.db.4.schema=db2admin
```

```
bpm.de.db.5.name=CellOnlyDb
bpm.de.db.5.dbCapabilities=CellScopedDB
bpm.de.db.5.databaseName=CMNDBWL
bpm.de.db.5.hostname=9.115.199.168
bpm.de.db.5.portNumber=50000
bpm.de.db.5.roleMapping.1.alias=BPM_DB_ALIAS
bpm.de.db.5.schema=db2admin
```

```
bpm.de.db.6.name=DEScopeCMNDb
bpm.de.db.6.dbCapabilities=CommonDB
bpm.de.db.6.databaseName=CMNDBWL
bpm.de.db.6.hostname=9.115.199.168
bpm.de.db.6.portNumber=50000
bpm.de.db.6.roleMapping.1.alias=BPM_DB_ALIAS
bpm.de.db.6.schema=db2admin
```

```
bpm.de.db.7.name=BpcDb
bpm.de.db.7.dbCapabilities=BPC
bpm.de.db.7.databaseName=CMNDBWL
bpm.de.db.7.hostname=9.115.199.168
bpm.de.db.7.portNumber=50000
bpm.de.db.7.roleMapping.1.alias=BPM_DB_ALIAS
bpm.de.db.7.schema=CMNBE00
```

> **Note:** See
> `/home/itaas/migration/85Migration/dbConfiguration.properties`,
> extracted in step 5 on page 303, to find the database with
> `datasource.<number>.jndi=jdbc/BPEDB`, and reuse the old database.
> You must modify the alias if you use a different alias for different
> databases when you configure `bpm.de.authenticationAlias`. If there is
> no schema in the `dbConfiguration.properties` file, you should use
> user name as the schema.

7. Configure the target IBM BPM 8.5 environment by using the **BPMConfig**
   command on the target servers.

   Run the following **BPMConfig** command to create the target deployment
   environment:

   ./BPMConfig.sh -create -de
   /home/itaas/migration/Scenario1-Advanced-PC-ThreeClusters-DB2.proper
   ties

   You can see on the console that the `BPMConfig_<timestamp>.log` file is saved
   in the `/opt/BPM85/logs/config` directory. You can check the log if any
   exception occurred.

8. Check the readiness of the source environment for migration.

   Make sure that the deployment manager, one of the nodes, and the
   deployment environment are all started normally.

   Run the following **BPMExtractSourceInformation** command to make sure that
   your source environment is in the correct state for migration:

   ./BPMExtractSourceInformation.sh -precheck -propertiesFile
   /home/itaas/migration/85Migration/migration.properties

   The output is shown in Figure 9-2 on page 310.

```
[root@linuxvm66 bin]# ./BPMExtractSourceInformation.sh -precheck -propertiesFile
 /home/itaas/migration/85Migration/migration.properties
CWMCO1036I: BPM migration logs are saved under /opt/MigrationUtilities/logs/migr
ation.
ssl.default.password.in.use.CWPKI0041W
ssl.disable.url.hostname.verification.CWPKI0027I
Client code attempting to load security configuration
Client code attempting to load security configuration
CWMCO1020I: Start to do pre-check for the source environment.
CWMCO5045I: Starting application wpsFEMgr ...
CWMCO5046I: wpsFEMgr started successfully.
CWMCO1022I: Pre-check of the source environment passed. See the following summar
y of pre-check results. You can continue other migration steps.
*****************************************************************************
Summary of pre-check results:
1.Count of failed event in source environment: 0
2.Count of SIB destination that contains more than 5,000 messages in source envi
ronment: 0

3.Count of SIB destination that contains messages still involved in active trans
action in source environment: 0

*****************************************************************************
```

Figure 9-2   BPMExtractSourceInformation command running on source server

You can see on the console that the `BPMExtractSourceInformation`
`_<timestamp>.log` file is saved in the
`/opt/MigrationUtilities/logs/migration` directory. You can check the log if
any exception occurs.

> **No other activities:** Make sure that there is no message still involved in
> any active transactions, no failed event, and no SIB destination that
> contains more than 5,000 messages.

9. Run the following **BPMManageApplications** command on the source server to
   disable the automatic starting of your applications and schedulers:

   ./BPMManageApplications.sh -autoStart false -source -propertiesFile
   /home/itaas/migration/85Migration/migration.properties

   The output is shown in Figure 9-3 on page 311.

```
[root@linuxvm66 bin]# ./BPMManageApplications.sh -autoStart false -source -prope
rtiesFile /home/itaas/migration/85Migration/migration.properties
CWMC01036I: BPM migration logs are saved under /opt/MigrationUtilities/logs/migr
ation.
CWMC04020I: Start to set auto-start properties for all applications and the sche
duler daemon.
WASX7357I: By request, this scripting client is not connected to any server proc
ess. Certain configuration and application operations will be available in local
 mode.
WASX7303I: The following options are passed to the scripting environment and are
 available as arguments that are stored in the argv variable: "[false, DE1.Suppo
rt,dmgr,DE1.AppTarget,DE1.Messaging]"
Begin to set auto start for all applications to (false)
Change auto start setting of application: AppScheduler
Change auto start setting of application: BPCExplorer_DE1.Support
Change auto start setting of application: BPMAdministrationWidgets_DE1.Support
Change auto start setting of application: BSpaceEAR_DE1.Support
Change auto start setting of application: BSpaceForms_DE1.Support
Change auto start setting of application: BSpaceHelp_DE1.Support
```

Figure 9-3   Running BPMManageApplications command

You can see on the console, the `BPMManageApplications_<timestamp>.log` is saved in the `/opt/MigrationUtilities/logs/migration` directory. You can check the log if any exception occurs.

> **Check your environment:** Stop the deployment environment, nodes, and the deployment manager. Make sure the deployment manager, one of the nodes, and the deployment environment started normally again. Applications and scheduler daemons do not start during server start.

10. Take a snapshot of the source environment by using the following **BPMExtractSourceInformation** command to extract the information that is needed for migration:

./BPMExtractSourceInformation.sh -propertiesFile /home/itaas/migration/85Migration/migration.properties -backupFolder /home/itaas/migration/85Migration/751Snapshot

The output is shown in `Example 9-6`.

Example 9-6   BPMExtractSourceInformation command running in source server

```
[root@localhost bin]# ./BPMExtractSourceInformation.sh -propertiesFile
/home/itaas/migration/85Migration/migration.properties -backupFolder
/home/itaas/migration/85Migration/751Snapshot
CWMC01036I: BPM migration logs are saved under
/home/itaas/migration/85Migration
/751Snaphot/logs
ssl.default.password.in.use.CWPKI0041W
ssl.disable.url.hostname.verification.CWPKI0027I
```

```
Client code attempting to load security configuration
Client code attempting to load security configuration
CWMC01020I: Start to do pre-check for the source environment.
CWMC05045I: Starting application wpsFEMgr ...
CWMC05046I: wpsFEMgr started successfully.
CWMC01022I: Pre-check of the source environment passed. See the following
summary of pre-check results. You can continue other migration steps.
```

This command also performs a pre-check at the beginning of the source information extraction. Wait for the **BPMExtractSourceInformation** command to complete successfully, as shown in Example 9-7.

Example 9-7   Successful messages from BPMExtractSourceInformation utility

```
CWMC04004I: Start to take snapshot of applications.
CWMC04001I: Source application directory is
/opt/BPM85/profiles/DmgrProfile/config/cells/PCCell/applications
CWMC04002I: Application backup directory is
/home/itaas/migration/85Migration/751Snapshot/PCCell1/Applications.
CWMC04003I: There are 11 applications saved in the snapshot directory.
CWMC04032I: BLAs exported successfully.
CWMC04032I: Composition units exported successfully.
CWMC04005I: Snapshot of applications completed successfully.
CWMC01025I: Start to query deployment configuration for adapters.
CWMC01026I: Query deployment for adapters completed successfully.
CWMC01002I: All steps of the snapshot completed successfully.
```

The BPMExtractSourceInformation_<timestamp>.log is saved in the /home/itaas/migration/85Migration/751Snapshot/logs directory. You can check the log if any exceptions occurred.

Running the command produces the subfolders in the /home/itaas/migration/85Migration/751Snapshot backup folder that you specified, as shown in Figure 9-4.
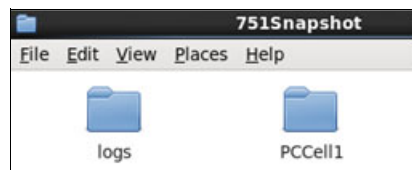
Figure 9-4   BPMExtractSourceInformation output

One folder uses the cell name, the other is the logs folder. The folder that uses the cell name has the subfolders that are shown in Figure 9-5 on page 313.
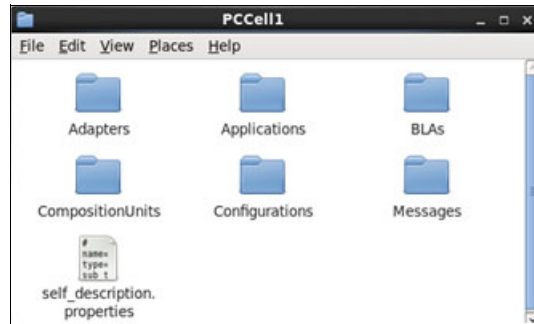
Figure 9-5   BPMExtractDourceInformation output under the cell folder

11. On your source environment, stop all running processes, including the deployment environment, node agent, and deployment manager.

12. Copy the snapshot and migration properties file to the target computer. This is required only if your target is on a different system.

    Compress the snapshot and migration properties file in the `/home/itaas/migration/85Migration` directory and then copy them to the target computer. On the target environment, extract them again to the folder `/home/itaas/migration`, as shown in Figure 9-6.

Figure 9-6   Displaying the files copied over to target environment

13. Back up all of your old databases, including customer's system of records on the source database server by using database utilities.

14. Generate SQL scripts and configure any new databases on the target server that are required for your new target environment. Complete the following steps:

    a. Update the migration properties file with the configuration information to match the target environment.

       Open the `migration.properties` file in the `/home/itaas/migration/85Migration` directory, and change the value of `bpm.home` and `profile.name` to match the target envrionment, then enter the value for `target.config.property.file` and `source.product.version`, as shown in Example 9-8 on page 314.

Example 9-8   Edit the migration.properties file

```
admin.username=bpmadmin
admin.password=bpmadmin
bpm.home=/opt/BPM85
profile.name=DmgrProfile
#Input these properties when you're working on target environment
target.config.property.file=/home/itaas/migration/Scenario1-Advanced-PC-
ThreeClusters-DB2.properties
source.product.version=7.5.1.0
```

b. Run the following **BPMGenerateUpgradeSchemaScripts** command to generate the SQL scripts for migration:

./BPMGenerateUpgradeSchemaScripts.sh -propertiesFile /home/itaas/migration/85Migration/migration.properties

The output is shown in Example 9-9.

Example 9-9   Generating upgrade schema scripts

```
[root@localhost bin]# ./BPMGenerateUpgradeSchemaScripts.sh
-propertiesFile /home/itaas/migration/85Migration/migration.properties
CWMC00008 I : Information is being logged to the
/opt/BPM85/profiles/DmgrProfile/logs/BPMGenerateUpgradeSchemaScripts.upg
rade.Mon-May-27-06.16.25-EDT-2013.log file.

[info] Please pick one of the following [source product types] :

(1)BPMAdvanced
(2)BPMStandard
(3)BPMExpress
(4)WPS
(5)WLE

Please enter the number for the source product type :1
CWMC00002I: Found component BPC is configured for the CMNDBWL database.
CWMC00003I: Do you want to generate scripts? Y/N
```

Enter 1, as you are migrating from IBM BPM Advanced 7.5.1. The command continues, as shown in Example 9-10.

Example 9-10   GenerateUpgradeSchemaScript messages

```
CWMC00005I: Scipts have been generated in the
/opt/BPM85/profiles/DmgrProfile/dbscripts/Upgrade/De1/DB2/CMNDBWL.CMNCMO
O directory.
CWMC00002I: Found component ProcessServer is configured for the BPMDBWL
database.
CWMC00003I: Do you want to generate scripts? Y/N
y
```

```
CWMC00005I: Scripts have been generated in the
/opt/BPM85/profiles/DmgrProfile/dbscripts/Upgrade/De1/DB2/BPMDBWL.db2adm
in directory.
CWMC00002I: Found component PDW is configured for the PDWDBWL database.
CWMC00003I: Do you want to generate scripts? Y/N
y
CWMC00005I: Scripts have been generated in the
/opt/BPM85/profiles/DmgrProfile/dbscripts/Upgrade/De1/DB2/PDWDBWL.db2adm
in directory.
CWMC00007I: The command BPMGenerateUpgradeSchemaScripts completed
successfully.
```

Enter y for the prompted components to generate the upgrade SQL
scripts.

> **Reporting:** You should also enter y if you had the reporting function
> configured in the source environment and want to remove the database
> schema after migration.

The upgrade SQL scripts are stored in the
De1/DB2/database_name.schema_name subdirectory that is inside the
/opt/BPM85/profiles/DmgrProfile/dbscripts/Upgrade directory.

The BPMGenerateUpgradeSchema-Scripts.upgrade.<timestamp>.log is
saved in the /opt/BPM85/profiles/DmgrProfile/logs directory. You can
check the log if any exception occurs.

c. Copy the folder /opt/BPM85/profiles/DmgrProfile/dbscripts/Upgrade to
your database server.

d. Because we are migrating from Advanced to Advanced, we do not have
any new capability to add during migration. So, no new database
components must be configured in this migration path.

e. Drop the following messaging engine tables with the prefix SIB under
database CMNDBWL with schema CMNCM00:

- SIB000
- SIB001
- SIB002
- SIBCLASSMAP
- SIBKEYS
- SIBLISTING
- SIBOWNER
- SIBOWNERO
- SIBXACTS

15. Run the database upgrade script to upgrade the source databases to IBM BPM v8.5 on the target server. Complete the following steps:

a. Copy the folder `/opt/BPM85/profiles/DmgrProfile/dbscripts/Upgrade` to your database server. We are using DB2 on Windows, so copy it to `D:\85Migration`. The folder `D:\85Migration\Upgrade\De1\DB2` shows the following structure:

- BMPDBWL.db2admin
- CMNDBWL.CMNCM00
- CMNDBWL.db2admin
- CMNDBWL.IBMBUSSP
- PDWDBWL.db2admin

The scripts in the `BPMDBWL.db2admin` and `PDWDBWL.db2admin` folders are for Process Server and Performance Data Warehouse database upgrade. We do not need to run them manually, because they will be run by the **DBUpgrade** command automatically.

The folder `CMNDBWL.db2admon` contains the `createSchema_CommonDB.sql` file. Because we are reusing the DEScoped common database in this scenario, you do not need to run this file. If you want to use a new DEScoped common database, you should use this SQL file to initialize the new DEScoped common database.

The folder `CMNDBWL.IBMBUSSP` contains upgrade SQL files to upgrade the BusinessSpace database. You can run the `upgradeSchema.bat` file directly or run each SQL script in the following sequence:

i. `upgradeSchema_SchemaStatus.sql`

ii. `upgradeSchema751_BusinessSpace.sql`

iii. `createSchema_Monitor.sql`

b. Run the `upgradeSchema.bat` file for this scenario, as shown in Example 9-11.

Example 9-11   Run upgrade schema script

```
D:\85Migration\Upgrade\De1\DB2\CMNDBWL.IBMBUSSP>upgradeSchema.bat
Enter DB2 user[dbUserId]:db2admin
Enter DB2 password[dbPassword]:_
```

Enter the user name and password for the Business Space database. Example 9-12 shows the output from running this script.

Example 9-12   Output from upgrade schema script action

```
CREATE TABLE IBMBUSSP.LAYOUT_MARKUP_NODE ( PAGE_OLD   VARCHAR(64)
NOT NULL, CREATED   BIGINT    NOT NULL, MODIFIED   BIGINT    NOT NULL,
CONTENT   BLOB(3M), CONSTRAINT PK1500 PRIMARY KEY (PAGE_OID) )
```

```
DB20000I  The SQL command completed successfully.

The upgradeSchema script completed successfully.

D:\85Migration\Upgrade\De1\DB2\CMNDBWL.IBMBUSSP>
```

Make sure to check the result.log in the same folder as the command for the details. It is safe to ignore the following warning:

```
SQL0100W No row was found for FETCH, UPDATE, or DELETE; or the
result of a query is an empty table. SQLSTATE=02000
```

c. To upgrade the Process Server and Performance Data Warehouse databases to 8.5, and also update some topology data in the BPC database, run the **DBUpgrade** command, as shown in the following example:

**./DBUpgrade.sh -propertiesFile
/home/itaas/migration/85Migration/migration.properties
-backupFolder /home/itaas/migration/85Migration/751Snapshot**

The output is shown in Example 9-13.

Example 9-13   Shows database upgrade success messages

```
[root@localhost bin]# ./DBUpgrade.sh -propertiesFile
/home/itaas/migration/85Migration/migration.properties -backupFolder
/home/itaas/migration/85Migration/751Snapshot

IBM Business Process Manager 8.5.0 Upgrade

Executing Command: ./DBUpgrade.sh -propertiesFile
/home/itaas/migration/85Migration/migration.properties -backupFolder
/home/itaas/migration/85Migration/751Snapshot

Loading environment settings

Using config properties to read DE information:
/home/itaas/migration/Scenario1-Advanced-PC-ThreeClusters-DB2.properties
CWMCB0242E: No action will be performed for the node profile, because the node
profile Node2 installPath and hostName do not match the local machine.
Profile path: /opt/BPM85/profiles/DmgrProfile
Is ND: true

Migration logs are saved under /opt/BPM85/profiles/DmgrProfile/logs.

Begin to set WCCM system properties...
End of setting WCCM system properties.
Loading process server database info using JNDI jdbc/TeamWorksDB...

Loading performance database info using JNDI jdbc/PerformanceDB...
```

Wait for the **DBUpgrade** command to complete successfully, as shown in Example 9-14.

Example 9-14   Shows database upgrade success messages

```
Executing upgrade step: Add bpmadmin and celladmin security user to
LSW_USR_XREF and LSW_USR_GRP_MEM_XREF tables.
Executing upgrade step: Migrate users from DB provider to File
Respository.
Executing upgrade step: Update LSW_UCA_UCA_EVENT_TYPE_REF and
IMPLEMENTATION_TYPE columns.
Executing upgrade step: Add the index to LSW_TASK for 8.0.1.1
Executing upgrade step: Upgrade 8.0.1 schema to 8.5.0 for
ProcessServerDatabase
Executing upgrade step: Upgrade 8.0.1 schema to 8.5.0 for
PerfServerDatabase
Successfully executed 6 upgrade steps.
Process Server database is now version 8.5.0.
Performance Data Warehouse database is now version 8.5.0.
Process Server and Performance Data Warehouse database upgrade completed
successfully.

Executing upgrade step: Replace the recorded cell name at the BPC
database.
Successfully executed 1 upgrade steps.
Advanced database upgrade completed successfully.

IBM Business Process manager V8.5.0 Enterprise database upgrade program
finished.

Loading system data

Creating
/home/itaas/migration/85migration.751Snapshot/logs/DBUpgrade.success
All upgrade steps have been completed successfully.
```

You can see on the console, the DBUpgrade_<timestamp>.log file is saved in the /opt/BPM85/profiles/DmgrProfile/logs directory. The **DBUpgrade** command starts the **bootstrapProcessServerData** command when performing the "Loading system data" step, and the corresponding bootstrapProcessServerData_<timestamp>.log file is placed inside the same /opt/BPM85/profiles/DmgrProfile/logs directory. You can check any of the logs if an exception occurred.

16. On the target server, you must merge the file-based user registry because we are also using a file-based registry in the source environment, as shown on the following example:

```
./BPMMergeFileRegistry.sh -propertiesFile
/home/itaas/migration/85Migration/migration.properties -backupFolder
/home/itaas/migration/85Migration/751Snapshot
```

The output is shown in Example 9-15.

Example 9-15   Shows running the BPMMergeFileRegistry command

```
[root@localhost bin]# ./BPMMergeFileRegistry.sh -propertiesFile
/home/itaas/migration/85Migration/migration.properties -backupFolder
/home/itaas/migration/85Migration/751Snapshot
CWMCO1036I: BPM migration logs are saved under
/home/itaas/migration/85Migration/751Snapshot/logs.
CWMCO3039I: Start to merge source user registry file with target user
registry file.
CWMCBO242E: No action will be performed for the node profile, because the
node profile Node2 installPath and hostName do not match the local machine.
CWMCO3040I: Merge source user registry file with target user registry file
completed successfully.
```

As you can see on the console, the `BPMMergeFileRegistry_ <timestamp>.log` file is saved in the `/home/itaas/migration/85Migration/751Snapshot/logs` directory. You can check the log if any exception occurred.

17. You must disable the automatic starting of all applications and schedulers in the target environment by using the **BPMManageApplications** command.

```
./BPMManageApplications.sh -autoStart false -target -propertiesFile
/home/itaas/migration/85Migration/migration.properties
```

The output is shown in Example 9-16.

Example 9-16   Running BPMManageApplications command after upgrade

```
[root@localhost bin]# ./BPMManageApplications.sh -autoStart false -target
-propertiesFile /home/itaas/migration/85Migration/migration.properties
CWMCO1036I: BPM migration logs are saved under /opt/BPM85/logs/migration.
CWMCO4020I: Start to set auto-start properties for all applications and the
scheduler daemon.
CWMCBO242E: No action will be performed for the node profile, because the
node profile Node2 installPath and hostName do not match the local machine.
WASX7357I: By request, this scripting client is not connected to any server
process. Certain configuration and application operations will be available
in local mode.
WASC7303I: The following options are passed to the scripting environment
and are available and arguments that are stored in the argv variable:
"[false, MECluster,dmgr,AppCluster,SupCluster]"
```

```
Begin to set auto start for all applications to (false)
Change auto start setting of application: REST Services Gateway Dmgr
Change auto start setting of application: AppScheduler
Change auto start setting of application: BPEContainer AppCluster
```

As you can see on the console, the `BPMManageApplications_<timestamp>.log` file is saved in the `/opt/BPM85/logs/migration` directory. You can check the log if any exception occurred. Wait for the **BPMManageApplications** command to complete successfully.

After the **BPMManageApplications** command finishes, you see the following output on your console:

`Custom nodes were not synchronized to the cell repository. Restart the deployment manager and custom node can help to synchronize.`

The synchronization for your nodes occurs automatically at the next startup.

18. On the target server, start all processes, including the deployment manager, node agents, and deployment environment. Complete the following steps:

   a. Check to make sure that all clusters, servers, and messaging engines started, as shown in Figure 9-7.

Select	Name ⇕	Status ↻
	You can administer the following resources:	
☐	BPM_DEV.AppCluster	➡
☐	BPM_DEV.MECluster	➡
☐	BPM_DEV.SupCluster	➡
Total 3		

Figure 9-7   Verify target clusters startup

   b. Check that no applications started on the WebSphere Application Server console, as shown in Figure 9-8 on page 321.

Select	Name ⇕	Application Status ↻
	You can administer the following resources:	
☐	[AppScheduler](#)	❌
☐	[BPCExplorer_BPM_DEV.SupCluster](#)	❌
☐	[BPEContainer_BPM_DEV.AppCluster](#)	❌
☐	[BPMAdministrationWidgets_BPM_DEV.AppCluster](#)	❌
☐	[BSpaceEAR_BPM_DEV.AppCluster](#)	❌
☐	[BSpaceForms_BPM_DEV.AppCluster](#)	❌
☐	[BSpaceHelp_BPM_DEV.AppCluster](#)	❌
☐	[Business.Rules.Manager_BPM_DEV.AppCluster](#)	❌
☐	[BusinessRules_BPM_DEV.AppCluster](#)	❌
☐	[HTM_PredefinedTaskMsg_V8000_BPM_DEV.AppCluster](#)	❌
☐	[HTM_PredefinedTasks_V8000_BPM_DEV.AppCluster](#)	❌
☐	[HumanTaskManagementWidgets_BPM_DEV.AppCluster](#)	❌

Figure 9-8   Verify that no applications started on the target server

19. Import the migration snapshot from the source environment into the target environment by using the **BPMMigrate** command. Perform this activity on the target server, as shown in the following example:

```
./BPMMigrate.sh -propertiesFile
/home/itaas/migration/85Migration/migration.properties -backupFolder
/home/itaas/migration/85Migration/751Snapshot
```

The output is shown in Example 9-17.

Example 9-17   Shows running the BPMMigrate command on the target server

```
[root@localhost bin]# ./BPMMigrate.sh -propertiesFile
/home/itaas/migration/85Migration/migration.properties -backupFolder
/home/itaas/migration/85Migration/751Snapshot
CWMCO1036I: BPM migration logs are saved under
/home/itaas/migration/85Migration/751Snapshot/logs.
ssl.default.password.in.use.CWPKI0041W
ssl.disable.url.hostname.verification.CWPKI0027I
Client code attempting to load security configuration
Client code attempting to load security configuration
CWMCB0242E: No action will be performed for the node profile, because the
node profile Node2 installPath and hostName do not match the local machine.
CWMCO1003I: Start to migrate snapshot to the target environment.
CWMCO3016I: Start to import LTPA key to the target environment.
CWMCO3017I: Import of LTPA key completed successfully.
CWMCO4007I: Start to migrate applications to the target environment.
```

```
CWMCO4030I: Business level applications migration complete successfully.
CWMCO4017I: There are 7 applications to be migrated.
```

As you can see on the console, the `BPMMigrate_<timestamp>.log` file is saved in the `/home/itaas/migration/85Migration/751Snapshot/logs` directory. You can check the log if any exception occurred. The `BPMSchedulers_<timestamp>.log` file is saved on one of the nodes in the `/opt/BPM85/profiles/Node1Profile/logs` directory.

20. Apply custom configurations to target environment.

See the `PerformanceTuningParameters.properties` file that was generated by the **BPMExtractSourceInformation** command to understand the custom configurations from the source environment. Apply all custom configurations to the target environment, as needed.

In our example, we must add the authentication alias SCA_Auth_Alias as it was used in the source environment, as shown in Figure 9-9.

Select	Alias ⬍	User ID ⬍	Description ⬍
	You can administer the following resources:		
☐	BPMAdminAlias_BPM_DEV	bpmadmin	
☐	BPM_DB_ALIAS_BPM_DEV	pcdbusr	
☐	CellAdminAlias	celladmin	BPM Cell Administrator Alias
☐	lp038CellManager01/SCA_Auth_Alias	bpmadmin	
	Total 4		

Figure 9-9   SCA authentication alias customization highlighted

Migration of documents: The migration of document attachments to the IBM BPM document store is considered to be a required IBM BPM post-migration task and it must be performed after the database migration is complete. The original versions of the document attachments continue to be in the IBM BPM database until all documents are migrated. After the migration is complete, you can use Coaches or heritage Coaches to work with IBM BPM documents in the IBM BPM document store.

21. Enable the automatic start of all applications and schedulers in the target environment.

    Run the **BPMManageApplications** command, as shown in the following example:

    ```
    ./BPMManageApplications.sh -autoStart true -target -propertiesFile
    /home/itaas/migration/85Migration/migration.properties
    ```

    Follow the messages on the console. The `BPMManageApplications_<timestamp>.log` file is in the `/opt/BPM85/logs/migration` directory. You can check the log if any exception occurred. Wait for the **BPMManageApplications** command to complete successfully.

22. Restart all the processes on the target environment and verify the migration. Complete the following steps:

    a. Stop the deployment environment, deployment manager, and nodes.

    b. Start the deployment manager, nodes, and deployment environment.

    c. Verify the migration results.

    d. Confirm that you can successfully log on to the following BM BPM portals:

       • Process Admin Console
       • Process Center Console
       • Business Portal Console
       • Business Process Choreographer Console

    e. Verify the following key functionalities that the migration process touched, so that you can ensure it does not break after migration:

       • Lombardi and WPS applications can start and work normally.
       • SIB messages in the queue can be used normally.
       • Scheduler tasks can be used normally.
       • Some customizations reapplied on the target work as before.

> **Restrictions:** In this sample scenario, we do not configure all the possible customizations. For more information, see the IBM BPM 8.5 Information Center, which is available at this website:
>
> http://pic.dhe.ibm.com/infocenter/dmndhelp/v8r5m0/index.jsp?topic=%2Fcom.ibm.wbpm.main.doc%2Fic-homepage-bpm.html

9.6.2 Migration scenario 2

In this scenario, we migrate an IBM BPM 8.0 Standard four-cluster environment to an IBM BPM 8.5 Standard three-cluster environment. This time, the source and target environments are on the same machine, as shown in Table 9-5 on page 324.

Table 9-5   Migration scenario 2

	IBM BPM Version	**Operating System**	**Topology**	**Product Type**	**Database**
Source	IBM BPM 8.0.0 Standard	Windows	Four Cluster	Process Center	DB2
Target	IBM BPM 8.5.0 Standard	Windows	Three Cluster	Process Center	DB2

Complete the following steps to set up this migration:

1. See the following website to verify that the hardware and operating system are supported:

   http://www.ibm.com/support/docview.wss?uid=swg27023007

2. Install IBM BPM 8.5 binaries.

   Install IBM BPM 8.5 by using the installation manager and custom installation on your target Windows operating system; use `C:\BPM85` as the installation root.

3. Update the `migration.properties` file with the configuration information for the source environment.

   Copy the `migration.properties` from `C:\BPM85\util\migration\resources` to `C:\85Migration`, then edit the `migration.properties` file as shown in Example 9-18.

Example 9-18   Edit the migration.properties file

```
admin.username=bpmadmin
admin.password=bpmadmin
bpm.home=C:/BPM80
profile.name=Dmgr01
source.application.cluster.name=DE1.AppTarget
source.support.cluster.name=DE1.Support
source.messaging.cluster.name=DE1.Messaging
source.web.cluster.name=DE1.WebApp
```

We are using `bpmadmin/bpmadmin` as the primary administrator/password combination for the source environment. The source environment was installed to `C:\BPM80`, and the name of the deployment manager profile is Dmgr01. Because the source environment is deployed as a four-cluster topology, the name of each cluster is DE1.AppTarget, DE1.Support, DE1.Messaging, and DE1.WebApp.

This `migration.properties` file is used for the migration commands later, such as, **BPMExtractDBConfiguration** and **BPMExtractSourceInformation**.

4. Extract all database-related information from the source environment.

   Make sure Dmgr01 is started, and run the **BPMExtractDBConfiguration** command that is shown in the following example to extract the database information from the source environment.

   ```
   BPMExtractDBConfiguration.bat -output
   C:\85Migration\dbConfiguration.properties -propertiesFile
   C:\85Migration\migration.properties
   ```

   The output is shown in Example 9-19.

   Example 9-19   BPMExtractDBConfiguration execution messages

   ```
   C:\BPM85\bin\>BPMExtractDBConfiguration.bat -output
   c:\85Migration\dbConfiguration.properties -propertiesFile
   C:\85Migration\migration.properties
   CWMCO1036I: BPM migration logs are saved under c:\BPM85\logs\migration.
   ssl.default.password.in.use.CWPKI0041W
   ssl.disable.url.hostname.verification.CWPKI0027I
   Client code attempting to load security configuration
   Client code attempting to load security configuration
   CWMCO3022I: Start to export database information from the source
   environment.
   CWMCO3023I: Export of database information from the source environment
   completed successfully.
   ```

   You can see on the console, the `BPMExtractDBConfiguration_<timestamp>.log` file is saved in the `C:\BPM85\logs\migration` directory. You can check the log if any exception occurred. Then, open the `dbConfiguration.properties` file to check the data source information in cluster and cell scope.

Sample content of the dbConfiguration.properties file that was generated in step 4 is shown in Example 9-20.

Example 9-20   Sample content of the dbConfiguration.properties file

```
#********************************************************************
# DE1.Support
#********************************************************************
################################################################
# The data source properties for Performance Data Warehouse data source
################################################################
datasource.1.name=Performance Data Warehouse data source
datasource.1.jndi=jdbc/PDWDB
data-source.1.Authentication_alias_for_XA_recovery.userName=db2admin
datasource.1.description=Performance Data Warehouse data source
datasource.1.provider=DB2 Using IBM JCC Driver (XA)
datasource.1.Scope=cells/WIN-UR3JVPB4JKUCell01/clusters/DE1.Support
datasource.1.databaseName=P80L
datasource.1.driverType=4
datasource.1.serverName=9.181.129.233
datasource.1.portNumber=50000
################################################################
# The data source properties for Process Server data source
################################################################
datasource.2.name=Process Server data source
datasource.2.jndi=jdbc/ProcessDB
data-source.2.Authentication_alias_for_XA_recovery.userName=db2admin
datasource.2.description=Process Server data source
datasource.2.provider=DB2 Using IBM JCC Driver (XA)
datasource.2.Scope=cells/WIN-UR3JVPB4JKUCell01/clusters/DE1.Support
datasource.2.databaseName=B80L
datasource.2.driverType=4
datasource.2.serverName=9.181.129.233
datasource.2.portNumber=50000
################################################################
# The data source properties for Business Space data source
################################################################
datasource.3.name=Business Space data source
datasource.3.jndi=jdbc/mashupDS
data-source.3.Authentication_alias_for_XA_recovery.userName=db2admin
datasource.3.description=Business Space data source
datasource.3.provider=DB2 Using IBM JCC Driver (XA)
datasource.3.Scope=cells/WIN-UR3JVPB4JKUCell01/clusters/DE1.Support
datasource.3.databaseName=B80L
datasource.3.driverType=4
datasource.3.serverName=9.181.129.233
datasource.3.portNumber=50000
datasource.3.schemaName=BSPBS00
#********************************************************************
```

```
# DE1.AppTarget
#********************************************************************
################################################################
# The data source properties for Process Server data source
################################################################
datasource.4.name=Process Server data source
datasource.4.jndi=jdbc/TeamWorksDB
data-source.4.Authentication_alias_for_XA_recovery.userName=db2admin
datasource.4.description=Process Server data source
datasource.4.provider=DB2 Using IBM JCC Driver (XA)
datasource.4.Scope=cells/WIN-UR3JVPB4JKUCell01/clusters/DE1.AppTarget
datasource.4.databaseName=B8OL
datasource.4.driverType=4
datasource.4.serverName=9.181.129.233
datasource.4.portNumber=50000
```

5. Complete the following steps to configure the target IBM BPM environment:

   a. Select `Standard-PC-ThreeClusters-DB2.properties` in the
      `C:\BPM85\BPM\samples\config\migration` directory.

   b. Copy this file to `C:\85Migration`, and rename it to
      `Scenario2-Standard-PC-ThreeClusters-DB2.properties.` Read the
      "Migration considerations" at the top of this file to get a basic
      understanding of this file.

      Keep the default values if you do not have to change them, and edit the
      required ones in bold, as shown in Example 9-21.

   Example 9-21   Edit the Scenario2-Standard-PC-ThreeClusters-DB2.properties file

```
# Make sure deferSchemaCreation is set to true
bpm.de.deferSchemaCreation=true
# The installation location of the BPM product.
bpm.dmgr.installPath=C:/BPM85
##################################################
# Cell (WAS) administration authentication alias    #
##################################################
bpm.cell.authenticationAlias.1.name=CellAdminAlias
bpm.cell.authenticationAlias.1.user=bpmadmin
bpm.cell.authenticationAlias.1.password=bpmadmin
```

   Note: Use bpmadmin as the user name and password for CellAdmin,
   which is the same as the primary administer of the source environment.

```
################################################################
# Deployment environment administrator authentication alias.    #
################################################################
```

```
bpm.de.authenticationAlias.1.name=DeAdminAlias
bpm.de.authenticationAlias.1.user=deAdmin
bpm.de.authenticationAlias.1.password=deAdmin
######################################
# Database user authentication alias   #
######################################
bpm.de.authenticationAlias.2.name=BPM_DB_ALIAS
bpm.de.authenticationAlias.2.user=db2admin
bpm.de.authenticationAlias.2.password=Passw0rd
```

Note: If you use different users to access different databases, such as, User1 to access the ProcessServer and User2 to access the PDW, you must make a copy of the #Database user authentication alias# section and use different authentication aliases, as shown in the following example:

```
bpm.de.authenticationAlias.2.name=BPM_DB_PS_ALIAS
bpm.de.authenticationAlias.2.user=User1
bpm.de.authenticationAlias.2.password=password
bpm.de.authenticationAlias.3.name=BPM_DB_PDW_ALIAS
bpm.de.authenticationAlias.3.user=User2
bpm.de.authenticationAlias.3.password=password
```

Then, you can use the corresponding authentication alias when you configure the database properties later.

```
# If the hostname is the same as deployment manager, this node
will be created on the same computer. Do not use localhost for
environments that are spread across multiple machines.
bpm.de.node.1.hostname=WIN-UR3JVPB4JKU
bpm.de.node.1.installPath=C:/BPM85
```

Note: We added a local node in our scenario case. You also must configure the second node if you want to add another local or remote node. If it is a remote node, you must copy the same properties file to the remote machine, change the bpm.dmgr.hostname and bpm.dmgr.soapPort to match with the deployment manager, and then run **BPMConfig** again.

```
#########################
# Database properties   #
#########################
bpm.de.db.1.name=BusinessSpaceDb
bpm.de.db.1.dbCapabilities=BusinessSpace
bpm.de.db.1.databaseName=B80L
```

```
bpm.de.db.1.hostname=9.181.129.233
bpm.de.db.1.portNumber=50000
bpm.de.db.1.roleMapping.1.alias=BPM_DB_ALIAS
bpm.de.db.1.schema=BSPBS00
```

> **Note:** See `C:\85Migration\dbConfiguration.properties` that was
> extracted in step 4 on page 325, find the database with
> `datasource.<number>.jndi=jdbc/mashupDS`, and reuse the old
> database. You must modify the alias if you use a different alias for
> different databases when you configure `bpm.de.authenticationAlias`.

```
bpm.de.db.2.name=MessagingDb
bpm.de.db.2.dbCapabilities=Messaging
bpm.de.db.2.databaseName=B80L
bpm.de.db.2.hostname=9.181.129.233
bpm.de.db.2.portNumber=50000
bpm.de.db.2.roleMapping.1.alias=BPM_DB_ALIAS
bpm.de.db.2.schema=db2dmin
```

> **Note:** You can decide whether you want to reuse one of the old
> messaging databases or create one. IBM BPM 8.5 supports a single
> bus and messaging engine, which is the recommended configuration.

```
bpm.de.db.3.name=ProcessServerDb
bpm.de.db.3.dbCapabilities=ProcessServer,EmbeddedECM
bpm.de.db.3.databaseName=B80L
bpm.de.db.3.hostname=9.181.129.233
bpm.de.db.3.portNumber=50000
bpm.de.db.3.roleMapping.1.alias=BPM_DB_ALIAS
bpm.de.db.3.schema=db2admin
```

> **Note:** See
> `/home/itaas/migration/85Migration/dbConfiguration.properties`
> that was extracted in step 4 on page 325, find the one with
> `datasource.<number>.jndi=jdbc/TeamWorksDB`, and reuse the old
> database. You must modify the alias if you use different alias for
> different databases when you configure `bpm.de.authenticationAlias`.
> If no schema is in the `dbConfiguration.properties`, you should use
> user name as the schema.

```
bpm.de.db.4.name=PerformanceDb
bpm.de.db.4.dbCapabilities=PDW
bpm.de.db.4.databaseName=P80L
bpm.de.db.4.hostname=9.181.129.233
```

```
bpm.de.db.4.portNumber=50000
bpm.de.db.4.roleMapping.1.alias=BPM_DB_ALIAS
bpm.de.db.4.schema=db2admin
```

> **Note:** See
> `/home/itaas/migration/85Migration/dbConfiguration.properties`
> that was extracted in step 4 on page 325, find the one with
> `datasource.<number>.jndi=jdbc/PerformanceDB`, and reuse the old
> database. You must modify the alias if you use a different alias for
> different databases when `configure bpm.de.authenticationAlias`. If
> no schema is in the `dbConfiguration.properties`, you should use user
> name as the schema.

6. Configure the target IBM BPM 8.5 environment by using the **BPMConfig**
   command to create the deployment environment, as shown in the following
   example:

```
BPMConfig.bat -create -de
C:\85Migration\Scenario2-Standard-PC-ThreeClusters-DB2.properties
```

The output is shown in Example 9-22.

Example 9-22   BPMconfig execution messages

```
C:\BPM85\bin\>BPMConfig.bat -create -de
C:\85Migration\Scenario2-Standard-PC-ThreeClusters-DB2.properties
Logging to file c:\BPM85\logs\config\BPMConfig_20130605-225538.log
CWMCB0713I : Node Node2 is not a local node, skipping.
Validating the profile registry.
[]
Configuring the deployment manager.
Creating the deployment manager profile.
```

You can see on the console that the `BPMConfig_<timestamp>.log` file is saved
in the `C:\BPM85\logs\config` directory. You can check the log if any
exceptions occurred.

7. Make sure Dmgr01 is started, then take a snapshot of the source
   environment by using the **BPMExtractSourceInformation** command to extract
   information that must be migrated, as shown in the following example:

```
BPMExtractSourceInformation.bat -propertiesFile
C:\85Migration\migration.properties -backupFolder
C:\85Migration\80Snapshot
```

The output is shown in Example 9-23.

Example 9-23   BPMExtractSourceInformation execution messages

```
C:\BPM85\bin\>BPMExtractSourceInformation.bat -propertiesFile
C:\85Migration\migration.properties -backupFolder C:\85Migration\80Snapshot
CWMC01036I: BPM migration logs are saved under
c:\85Migration\80Snapshot\logs.
ssl.default.password.in.use.CWPKI0041W
ssl.disable.url.hostname.verification.CWPKI0027I
Client code attempting to load security configuration
Client code attempting to load security configuration
CWMC01001I: Start to take snapshot of the source environemnt.
CWMC03005I: Start to copy configuration files.
CWMC03006I: Configuration files were copied successfully.
CWMC03001I: Start to take snapshot of configuration from the source
environment.

XL TXE-J compiling stylesheet:
C:\BPM85\util\migration\scripts\PMIXML2PropertiesTransformer.xsl
CWMC03002I: Snapshot of configuration from the source environment completed
successfully.
CWMC03010I: Start to snapshot configuration file 100Custom.xml
CWMC03011I: Snapshot of configuration file 100Custom.xml completed
successfully.

CWMC01002I: All steps of the snapshot completed successfully.
```

You can see on the console that the
`BPMExtractSourceInformation_<timestamp>.log` file is saved in the
`C:\85Migration\80Snapshot\logs` directory. You can check the log if any
exceptions occurred.

Now we have the following files in the `C:\85Migration` folder:

 – `80Snapshot` (folder)
 – `dbConfiguration.properties`
 – `migration.properties`
 – `Scenario2-Standard-PC-ThreeCluster-DB2.properties`

8. On the source environment, stop all running processes, including deployment
   environment, node agent, and deployment manager.

9. Back up all your old databases, including the customer's system of records.

10. Complete the following steps to generate SQL scripts and configure extra databases that are required for your target environment.

a. Update the `migration.properties` file with the configuration information to match the target environment.

Open the `migration.properties` file in the `C:\85Migration` directory and change the value of `bpm.home` and `profile.name` to match the target envrionment, then enter the value for `target.config.property.file` and `source.product.version`, as shown in Example 9-24.

Example 9-24   Edit the migration.properties file

```
admin.username=bpmadmin
admin.password=bpmadmin
bpm.home=C:/BPM85
profile.name=DmgrProfile
#Input these properties when you're working on target environment
target.config.property.file=C:/85Migration/Scenario2-Standard-PC-ThreeCl
usters-DB2.properties
source.product.version=8.0.0.0
```

b. Run the **BPMGenerateUpgradeSchemaScripts** command to generate the SQL scripts for migration, as shown in the following example:

```
BPMGenerateUpgradeSchemaScripts.bat -propertiesFile
C:\85Migration\migration.properties
```

Enter `2` because you are migrating from IBM BPM Standard 8.0.0.

Enter `y` for the prompted components and generate the upgrade SQL scripts. The `C:\BPM85\profiles\DmgrProfile\dbscripts\Upgrade` directory contains the upgraded SQL scripts with the `De1/DB2/database_name.schema_name` subdirectory.

The `BPMGenerateUpgradeSchema-Scripts.upgrade.<timestamp>.log` file is saved in the `C:\BPM85\profiles\DmgrProfile\log` directory. You can check the log if any exceptions occurred, as shown in Figure 9-10 on page 333.

```
C:\BPM85\bin>BPMGenerateUpgradeSchemaScripts.bat -propertiesFile C:\85Migration\
migration.properties
CWMC00008I: Information is being logged to the C:\BPM85\profiles\DmgrProfile\log
s\BPMGenerateUpgradeSchemaScripts.upgrade.Thu-Jun-06-20.57.44-CST-2013.log file.

[info] Please pick one of the following [source product types] :

<1>BPMAdvanced
<2>BPMStandard
<3>BPMExpress
<4>WPS
<5>WLE

Please enter the number for the source product type :2
CWMC00002I: Found component ProcessServer is configured for the B80L database.
CWMC00003I: Do you want to generate scripts? Y/N
y
CWMC00005I: Scripts have been generated in the C:/BPM85/profiles/DmgrProfile/dbs
cripts/Upgrade/De1/DB2/B80L.db2admin directory.
CWMC00002I: Found component PDW is configured for the P80L database.
CWMC00003I: Do you want to generate scripts? Y/N
y
CWMC00005I: Scripts have been generated in the C:/BPM85/profiles/DmgrProfile/dbs
cripts/Upgrade/De1/DB2/P80L.db2admin directory.
CWMC00007I: The command BPMGenerateUpgradeSchemaScripts completed successfully.
```

Figure 9-10   BPMGenrerateUpgradeSchemaScripts output messages

c. Copy the folder `C:\BPM85\profiles\DmgrProfile\dbscripts\Upgrade` to your database server. Because we are migrating from Standard 8.0.0 to Standard 8.5, we do not have any new capability to add during migration. So, no new database components need to be configured in this migration path.

d. Configure the following tables for V8.5:
   - `createSchema_Monitor.sql`
   - `createTable_BusinessSpace.sql`

   Run **`createSchema_Monitor.sql`** against the Business Space database by using the database utility, as shown in Example 9-25.

Example 9-25   Run createSchema_Monitor.sql

```
db2 connect to B80L USER db2admin USING Passw0rd

db2 -tvf
C:\BPM85\profiles\DmgrProfile\dbscripts\Upgrade\De1\DB2\B80L.BSPBS00\cre
ateSchema_Monitor.sql

db2 connect reset
```

> **When to initialize the Business Space database:** In Standard 8.0.0, we already have a Business Space database configured by default, so there is no need to run **`createTable_BusinessSpace.sql`** here. If you are upgrading from Standard 7.5.x, you also must create a Business Space database and run the **`createTable_BusinessSpace.sql`** command to initialize the Business Space database.

e. Drop the messaging engine tables under the database B80L with the schema db2admin if it exists; the tables have a prefix of SIB.

11. Run the database upgrade script to upgrade source databases to IBM BPM v8.5.

You must upgrade existing databases so that your data can be accessed with the new version. In this scenario, we must run only the **DBUpgrade** command to upgrade the Process Server and Performance Data Wharehouse databases, as shown in the following example:

```
DBUpgrade.bat -propertiesFile C:\85Migration\migration.properties
-backupFolder C:\85Migration\80Snapshot
```

The output is shown in Figure 9-11.

```
C:\BPM85\bin>DBUpgrade.bat -propertiesFile C:\85Migration\migration.properties -
backupFolder C:\85Migration\80Snapshot

IBM Business Process Manager 8.5.0 Upgrade

Executing Command: DBUpgrade.bat -propertiesFile C:\85Migration\migration.proper
ties -backupFolder C:\85Migration\80Snapshot

Loading environment settings

Using config properties to read DE information: C:/85Migration/Scenario2-Standar
d-PC-ThreeClusters-DB2.properties
CWMCB0242E: No action will be performed for the node profile, because the node p
rofile Node2 installPath and hostName do not match the local machine.
Profile path: C:/BPM85/profiles/DmgrProfile
Is ND: true

Migration logs are saved under C:/BPM85/profiles/DmgrProfile/logs.

Begin to set WCCM system properties...
End of setting WCCM system properties.
Loading process server database info using JNDI jdbc/TeamWorksDB...

Loading performance database info using JNDI jdbc/PerformanceDB...
```

Figure 9-11   DBUpgrade execution messages

Wait for **DBUpgrade** to complete successfully, as shown in Figure 9-12 on page 335.

```
*** Executing upgrade step: Upgrade from version 8.0.0 to 8.0.1 ***
Executing upgrade step: Upgrade 8.0.0 schema to 8.0.1 for ProcessServerDatabase
Executing upgrade step: Upgrade 8.0.0 schema to 8.0.1 for PerfServerDatabase
*** Executing upgrade step: Upgrade from version 8.0.1 to 8.5.0 ***
Executing upgrade step: Add bpmadmin and celladmin security user to LSW_USR_XREF
 and LSW_USR_GRP_MEM_XREF tables
Executing upgrade step: Migrate users from DB provider to File Repository.
Executing upgrade step: Update LSW_UCA UCA_EVENT_TYPE_REF and IMPLEMENTATION_TYP
E columns.
Executing upgrade step: Add the index to LSW_TASK for 8.0.1.1
Executing upgrade step: Upgrade 8.0.1 schema to 8.5.0 for ProcessServerDatabase
Executing upgrade step: Upgrade 8.0.1 schema to 8.5.0 for PerfServerDatabase
Successfully executed 5 upgrade steps.
Process Server database is now version 8.5.0.
Performance Data Warehouse database is now version 8.5.0.
Process Server and Performance Data Warehouse database upgrade completed success
fully.

IBM Business Process Manager V8.5.0 Enterprise database upgrade program finished
.

Loading system data

Creating C:\85Migration\80Snapshot\logs\DBUpgrade.success
All upgrade steps have been completed successfully.
```

Figure 9-12   DBUpgrade success messages

You can see on the console that the `DBUpgrade_<timestamp>.log` file is saved
in the `C:\BPM85\profiles\DmgrProfile/logs` directory. **DBUpgrade** starts the
bootstrapProcessServerData command when you are performing the
"Loading system data" step, and the corresponding
`bootstrapProcessServerData_<timestamp>.log` file is in the same folder as
DBUpgrade. You can check any of the log files if exceptions occurred.

12. Merge the file-based user registry because we are also using a file-based
registry in the source environment, as shown in the following example:

`BPMMergeFileRegistry.bat -propertiesFile`
`C:\85Migration\migration.properties -backupFolder`
`C:\85Migration\80Snapshot`

The output is shown in Figure 9-13.

```
C:\BPM85\bin>BPMMergeFileRegistry.bat -propertiesFile C:\85Migration\migration.p
roperties -backupFolder C:\85Migration\80Snapshot
CWMC01036I: BPM migration logs are saved under C:\85Migration\80Snapshot\logs.
CWMC03039I: Start to merge source user registry file with target user registry f
ile.
CWMCB0242E: No action will be performed for the node profile, because the node p
rofile Node2 installPath and hostName do not match the local machine.
CWMC03040I: Merge source user registry file with target user registry file compl
eted successfully.
```

Figure 9-13   BPMMergeFileRegistry execution messages

The `BPMMergeFileRegistry_<timestamp>.log` file is saved in the
`C:\85Migration\80Snapshot\logs` directory. You can check the log if any
exceptions occurred.

13. Start all processes, including deployment manager, node agents, and the
deployment environment.

14. Import the migration snapshot from the source environment into the target environment by using the `BPMMigrate` command, as shown in the following example:

```
BPMMigrate.bat -propertiesFile C:\85Migration\migration.properties
-backupFolder C:\85Migration\80Snapshot
```

The output is shown in Figure 9-14.

```
C:\BPM85\bin>BPMMigrate.bat -propertiesFile C:\85Migration\migration.properties
-backupFolder C:\85Migration\80Snapshot
CWMCO1036I: BPM migration logs are saved under C:\85Migration\80Snapshot\logs.
ssl.default.password.in.use.CWPKI0041W
ssl.disable.url.hostname.verification.CWPKI0027I
Client code attempting to load security configuration
Client code attempting to load security configuration
CWMCB0242E: No action will be performed for the node profile, because the node p
rofile Node2 installPath and hostName do not match the local machine.
CWMCO1003I: Start to migrate snapshot to the target environment.
CWMCO1014I: Start to perform configuration synchronization of all custom nodes w
ith the cell repository.
CWMCO1015I: Configuration synchronization of all custom nodes has completed.
CWMCO1017I: Start to migrate BPM schedulers to the target environment.

CWMCO5001I: Invoking the AdminTask to migrate BPM schedulers ...

CWMCO1031I: Log file for scheduler migration will be saved on the host: localhos
t
WASX7209I: Connected to process "AppClusterMember1" on node Node1 using SOAP con
nector;  The type of process is: ManagedProcess

CWMCO5047I: Path of scheduler migration log: C:\BPM85\profiles\Node1Profile\logs
\BPMSchedulers_Thu-Jun-06-23.07.43-CST-2013.log
CWMCO5019I: 1 / 1 PCSharing Scheduler tasks migrated successfully.
CWMCO5007I: All scheduler migration steps completed successfully.

CWMCO1018I: Migration of BPM schedulers has completed. Check the scheduler migra
tion log for details.
CWMCO3019I: Start to Import 100Custom to the target environment.
CWMCO3020I: Import of 100Custom completed successfully.
CWMCO3036I: Start to generate migration2002to3001.properties that is required by
 Business Space data migration.
CWMCO3037I: Generate migration2002to3001.properties completed successfully.It wa
s generated under folder C:\85Migration\80Snapshot\BusinessSpace\migration\migra
tion2002to3001.properties.
CWMCO1014I: Start to perform configuration synchronization of all custom nodes w
ith the cell repository.
CWMCO1015I: Configuration synchronization of all custom nodes has completed.
CWMCO1004I: All steps of the migration completed successfully.
```

Figure 9-14   BPMMigrate command success messages

The `BPMMigrate_<timestamp>.log` file is saved in the `C:\85Migration\80Snapshot\logs` directory. The scheduler migration log, `BPMSchedulers_<timestamp>.log`, is saved on one of the nodes in the `/opt/BPM85/profiles/Node1Profile/logs` directory. You can check the logs if any exceptions occurred.

15. Apply any custom configurations to your target environment.

See the `PerformanceTuningParameters.properties` file that was generated by the **BPMExtractSourceInformation** command in step 7 on page 330 to understand the custom configurations from the source environment. You also must manually apply other customizations that are applicable to the target environment.

For more information about customizations, see the IBM Information Center at this website:

http://bidoc.torolab.ibm.com/review/8500/topic/com.ibm.wbpm.imuc.doc/topics/tmig_apply_std_lin.html

> **Migrating document attachments:** The migration of document attachments to the IBM BPM document store is considered to be a required IBM BPM post-migration task and it should be done after the database migration is complete. The original versions of the document attachments continue to be in the IBM BPM database until all documents are migrated. After the migration is complete, you can use Coaches or heritage Coaches to work with IBM BPM documents in the IBM BPM document store.

16. Complete the following steps to restart the environment and verify migration:

    a. Stop the deployment environment, deployment manager, and all nodes.

    b. Start the deployment manager, nodes, and the deployment environment.

    c. Verify migration results by logging in to the following IBM BPM portals:

        • Process Admin
        • Process Center
        • Business Portal
        • Performance Admin

17. Verify the following key functionalities that the migration task touched to make sure that they do not break after migration:

    a. Lombardi Applications can start and work normally.

    b. Some customizations on 100Clustom.xml still work as before on the new environment.

    c. Verify Process Server to Process Center connection.

    d. Verify Process application deployment.

9.6.3 Troubleshooting migration

Complete the following steps to enable traces for migration activities:

1. For the following migration command-line utilities, set the log level in the logging.properties file in the BPM85_HOME/util/migration/resources directory:

    – BPMExtractDBConfiguration
    – BPMExtractSourceInformation
    – BPMManageApplications

- BPMMergeFileRegistry
- BPMMigrate

This is shown in Example 9-26.

Example 9-26   Logging.properties location

```
/opt/ibm/WebSphere/AppServer/util/migration/resources
$ ls -la
total 56
drwxr-xr-x    2 bpmuser  bpmadm              256 May 30 21:22 .
drwxr-xr-x    4 bpmuser  bpmadm              256 May 30 21:22 ..
-rw-r--r--    1 bpmuser  bpmadm             1474 May 19 11:32
logging.properties
```

The default log level is FINE for the global logging level and file output log
level. You must change both properties to a wanted level so that it takes
effect, as shown in Example 9-27.

Example 9-27   Changing default log levels

```
# default global logging level. Logging level possible values: FINEST,
FINER, FINE, INFO, WARNING, SEVERE.
.level = FINE
# file output properties
com.ibm.bpm.migration.logging.NonBlockingFileHandler.level = FINE
```

2. For DBUpgrade, you should modify the `logging.properties` file in the
   `BPM85_HOME/util/dbUpgrade` directory, as shown in Example 9-28.

Example 9-28   Modify the logging.properties file

```
/opt/ibm/WebSphere/AppServer/util/dbUpgrade
$ ls -la
total 136
drwxr-xr-x    3 bpmuser  bpmadm              256 May 30 21:29 .
drwxr-xr-x   20 bpmuser  bpmadm             4096 May 30 21:30 ..
-rw-r--r--    1 bpmuser  bpmadm             1490 May 19 15:04
logging.properties
```

The default log level is FINE for the global logging level and file output log
level. You must change both properties to a wanted level so that it takes
effect, as shown in Example 9-29 on page 339.

Example 9-29   Changing default log levels

```
# default global logging level. Logging level possible values: FINEST,
FINER, FINE, INFO, WARNING, SEVERE.
.level = FINE
# file output properties
com.ibm.bpm.migration.logging.NonBlockingFileHandler.level = FINE
```

3. If you experience SOAP invocation timeout issues when you are running some of the migration commands, complete the following steps:

   a. Modify the `soap.client.props` file in the `BPM85_Home/util/migration/resources` or the `remote_migration_utility/util/migration/resources` directory.

   b. Change the value of the `com.ibm.SOAP.requestTimeout` property.

   c. Run the command again.

> **Plan your steps:** If all commands on the source environment ran successfully, you have all the data that is needed in the snapshot. In the case of a failed migration step on the target, such as, a failed database upgrade or BPMMigrate, you can restore the database and rerun the database upgrade and BPMMigrate. There is no need to run the migration steps from the beginning of the process.

9.6.4 Migration best practices

The following best practices can help successfully complete migrations on production environments:

1. Test your migration procedure in a staging environment.

2. Practice your rollback plan on a test system.

3. Clone your production environment and perform the full migration procedure, estimate the server downtime to complete the migration.

4. Record the customizations and performance tuning changes that you performed on the source environment. Then, you can apply them again to the target after migration.

5. Check the server log to see whether any unexpected exceptions occurred.

6. Prepare specific test cases that have a high impact to your business, and test them on the migrated environment.

7. Verify the following areas that are touched during migration process:

   a. Verify whether the SIB messages can be used normally after migration.

   b. Verify whether the scheduler tasks can be used normally after migration.

   c. Verify that the customized `100Custom.xml` is moved to the target environment and works normally.

   d. Verify the document control in the Coach if you migrated document attachments to the IBM BPM document store.

9.7 Conclusion

This chapter provided an overview of migration tasks and details about new migration utilities that are available in IBM Business Process Manager V8.5. It also explained a few common migration scenarios.

Additional material

This book refers to additional material that can be downloaded from the Internet, as described in the following sections.

Locating the web material

The web material that is associated with this book is available in softcopy on the Internet from the IBM Redbooks Web server, which is available at the following URL:

ftp://www.redbooks.ibm.com/redbooks/SG248175

Alternatively, you can go to the IBM Redbooks website at:

http://www.ibm.com/redbooks

Select **Additional materials** and open the directory that corresponds with the IBM Redbooks form number, SG248175.

Using the web material

The additional web material that accompanies this book includes many files that were used and described in this book. They help you get a better understanding of the different installation, configuration, and migration situations that you encounter in your own environment.

Downloading and extracting the web material

Create a subdirectory (folder) on your workstation, and extract the contents of the web material `.zip` file into this folder.

Related publications

The publications that are listed in this section are considered particularly suitable for a more detailed discussion of the topics covered in this book.

IBM Redbooks

The following IBM Redbooks publications provide more information about the topic in this document. Some publications that are referenced in this list might be available in softcopy only:

► *IBM Business Process Manager Version 8.0 Production Topologies*, SG24-8135

► *IBM WebSphere Application Server V8 Concepts, Planning, and Design Guide*, SG24-7957

You can search for, view, download or order these documents and other Redbooks, Redpapers, Web Docs, draft, and other materials at the following website:

http://www.ibm.com/redbooks

Online resources

The following websites are also relevant as further information sources:

► IBM Business Process Manager detailed system requirements:

http://www.ibm.com/support/docview.wss?uid=swg27023007

► IBM Business Process Manager v8.5 Information Center:

http://pic.dhe.ibm.com/infocenter/dmndhelp/v8r5m0/index.jsp?topic=%2Fcom.ibm.wbpm.main.doc%2Fic-homepage-bpm.html

► WebSphere Application Server v8.5 Information Center:

http://pic.dhe.ibm.com/infocenter/wasinfo/v8r5/index.jsp?topic=/com.ibm.websphere.nd.multiplatform.doc/ae/welcome_ndmp.html

Help from IBM

IBM Support and downloads:

http://www.ibm.com/support

IBM Global Services:

http://www.ibm.com/services

Business Process Management Deployment Guide Using IBM Business Process Manager V8.5

Business Process Management Deployment Guide
Using IBM Business Process Manager V8.5

IBM Business Process Manager (BPM) provides a platform that helps process participants gain enterprise-wide visibility of business processes, so that improvements can be made by those who know these processes best. IBM BPM encourages collaboration and supports strong governance of process change. It provides a common software platform for process improvement and BPM lifecycle governance, offering the power and robustness required for mission-critical enterprise solutions while combining the simplicity required for business engagement through collaboration. Built-in analytics and search capabilities are designed to help improve and optimize business processes now and in the future.

This IBM Redbooks publication provides an introduction to designing and building IBM Business Process Manager V8.5 environments. The target audience for this book includes IT architects, IT specialists, and consultants who are seeking to understand and implement IBM BPM environments.

This book introduces the changes and new features in IBM Business Process Manager V8.5 and provides an overview of the basic topology and components. Detailed and step-by-step instructions to prepare, build, and verify your environment, including proxy server configuration, also are described.

The book also provides an overview of a consolidated migration approach that was introduced in V8.5. It describes tools and utilities that are available for migrating from the previous version of the product to V8.5. Two step-by-step migration scenarios are described to help you better understand the detailed migration activities that are required for IBM BPM Standard and Advanced.

Enterprise integration for business process management deployment

Complete information about architecture and components

Comprehensive configuration details