

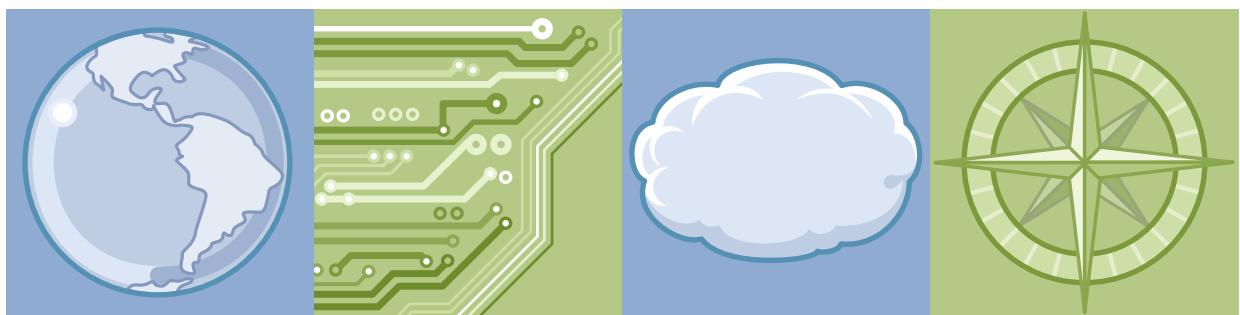


IBM Training

Student Notebook

Administration of IBM Business Process Manager Standard V8.5.6

Course code WB821 ERC 1.0



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Course description

Administration of IBM Business Process Manager Standard V8.5.6

Duration: 4 days

Purpose

This course teaches IBM Business Process Manager administrators how to install, configure, and administer IBM Business Process Manager Standard V8.5.6. You learn about IBM Business Process Manager Standard architecture, concepts, and terminology. You also learn how to deploy and manage business applications and how to troubleshoot the environment. This class is interactive with hands-on lab exercises.

Audience

This course is designed for systems administrators, solutions administrators, and operators who install, configure, manage, and troubleshoot the environment.

Prerequisites

Before taking this course, you should have a general knowledge of:

- The Linux operating system
- Java Platform, Enterprise Edition (Java EE) and Extensible Markup Language (XML)
- Administering multitier business applications
- Managing WebSphere Application Server
- Managing a database server, such as DB2, MS SQL Server, or Oracle database

Objectives

After completing this course, you should be able to:

- Configure and administer a Process Center environment
- Configure and administer a Process Server environment
- Describe the purpose and business value of the tools included in IBM Business Process Manager Standard V8.5.6: IBM Process Server and IBM Process Center
- Describe IBM Business Process Manager Standard architecture, concepts, and terminology

- Describe the deployment considerations for IBM Business Process Manager Standard components
- Create a Process Center clustered environment by using the Deployment Environment wizard
- Create a Process Server clustered environment by using the BPMConfig utility
- Deploy and manage process applications
- Work with the administrative console and management tools
- Deploy applications to an offline and an online Process Server environment
- Archive and purge in an IBM Business Process Manager environment
- Integrate with security providers to secure the environment
- Troubleshoot the environment

Agenda

Day 1

- Course introduction
- Unit 1. Overview of IBM Business Process Manager V8.5.6
- Unit 2. IBM Business Process Manager Standard installation
- Unit 3. IBM Business Process Manager Standard architecture overview
- Exercise 1. Installing IBM Business Process Manager Standard
- Exercise 2. Installing the IBM HTTP Server
- Unit 4. IBM Business Process Manager deployment topologies
- Exercise 3. Configuring the Process Center environment

Day 2

- Unit 5. Introduction to Process Center
- Exercise 4. Administering Process Center
- Unit 6. Managing users and groups
- Exercise 5. Adding users and groups
- Unit 7. Overview of Process Portal
- Exercise 6. Administering Process Portal

Day 3

- Unit 8. Overview of deployment scenarios
- Exercise 7. Configuring the Process Server environment
- Exercise 8. Managing offline and online Process Servers
- Unit 9. Managing snapshots
- Exercise 9. Creating and managing snapshots
- Unit 10. Advanced administration concepts

Day 4

- Unit 11. Archiving and purging
- Unit 12. Problem determination
- Exercise 10. Performance and troubleshooting
- Unit 13. Security and security providers
- Exercise 11. Implementing IBM Business Process Manager security
- Unit 14. Course summary

Unit 1. Overview of IBM Business Process Manager V8.5.6

What this unit is about

This unit provides an introduction to the principles of business process management (BPM). You learn the capabilities of IBM Business Process Manager Standard V8.5.6 for deploying IBM Business Process Manager solutions.

What you should be able to do

After completing this unit, you should be able to:

- Describe the concepts of business processes and business process management
- Describe business integration roles in IBM Business Process Manager
- Describe the IBM product editions
- Describe the capabilities of IBM Business Process Manager V8.5.6

How you will check your progress

- Checkpoint questions

References

IBM Business Process Manager V8.5 documentation in the IBM Knowledge Center:

http://www.ibm.com/support/knowledgecenter/SSFPJS_8.5.0/com.ibm.wbpm.main.doc/ic-homepage-bpm.html



Unit objectives

After completing this unit, you should be able to:

- Describe the concepts of business processes and business process management
- Describe business integration roles in IBM Business Process Manager
- Describe the IBM product editions
- Describe the capabilities of IBM Business Process Manager V8.5.6

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Figure 1-1. Unit objectives

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Notes:

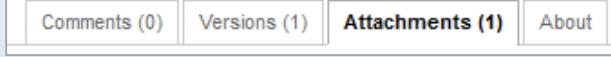


How to check online for course material updates



Note: If your classroom does not have Internet access, ask your instructor for more information.

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Notes:



Topics

- Introduction to business processes and business process management
- IBM Business Process Manager editions
- IBM Business Process Manager V8.5.6 features and capabilities

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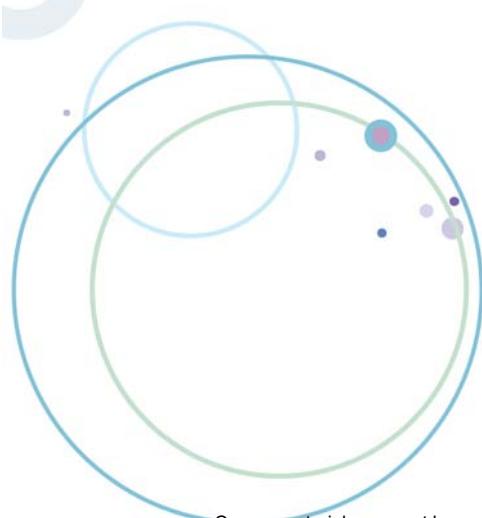
Figure 1-3. Topics

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Notes:

1.1. Introduction to business processes and business process management

Introduction to business processes and business process management



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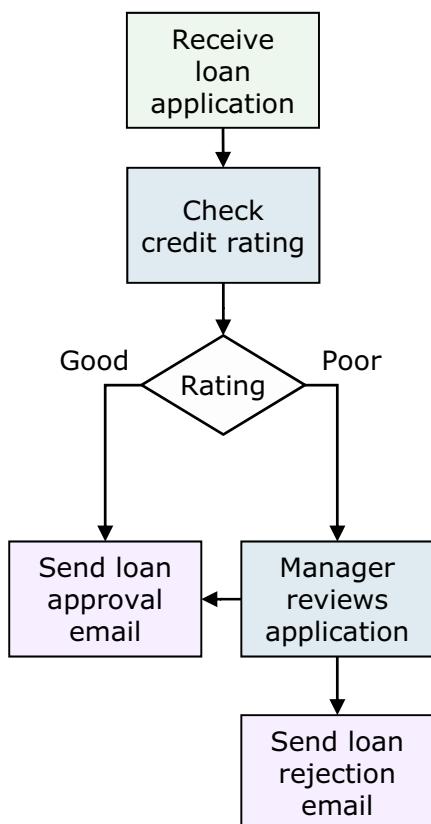
Figure 1-4. Introduction to business processes and business process management

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Notes:

Business processes

- A *business process* is a collection of service interactions and activities that are run to fulfill a business need
- A business process defines the potential execution order of services:
 - Defines how to coordinate interactions between a process instance and its partners
 - Specifies how to handle errors (faults)
 - Specifies other required technology patterns like compensation



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Figure 1-5. Business processes

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Notes:

A *business process* is a collection of service interactions and activities that are run to fulfill a business need.

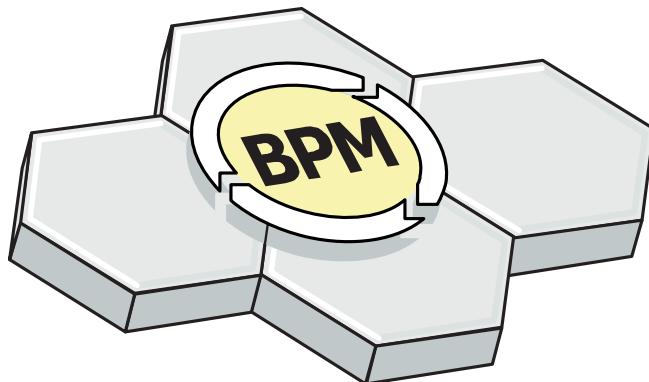
A business process defines the potential execution order of services.

The business process defines how to coordinate interactions between a process instance and its partners, and specifies how errors are handled.

In the context of a business process, partners define parties that interact with the process.

Business process management

- *Business process management (BPM)* is a systematic approach to improving business processes for an organization
 - BPM makes business processes more effective and efficient through a cycle of continuous improvement
- BPM often includes the steps:
 - Model, test, deploy, run, and monitor



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Figure 1-6. Business Process Management

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Notes:

Business process management (BPM) is a systematic approach to improving business processes for an organization. BPM makes business processes more effective and efficient through a cycle of continuous improvement.

BPM can include the steps of modeling, testing, deployment, running, and monitoring of the business processes.

IBM Business Process Manager

- IBM Business Process Manager gives you visibility into your business processes
 - Enables the development and management of business processes
 - Can be configured to support various levels of complexity and integration between IBM Business Process Manager components
 - An integrated runtime for all business processes, services, and enterprise applications
 - Tools for developers, administrators, and users
- Components of IBM Business Process Manager
 - IBM Process Server: The runtime platform
 - IBM Process Center: A unified BPM asset repository
 - IBM Integration Designer (available in Advanced edition only): An authoring environment for developing services and self-contained enterprise applications
 - IBM Process Designer: An authoring environment for developing process models

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Figure 1-7. IBM Business Process Manager

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Notes:

IBM Business Process Manager gives you the capability to model and run your business processes.

With IBM Business Process Manager, you get to choose the types of models and services you want to create, and the type of development environment you want to use.

For example, you decide whether you want to model the business processes by using Business Process Model and Notation (BPMN) or Business Process Execution Language (BPEL).

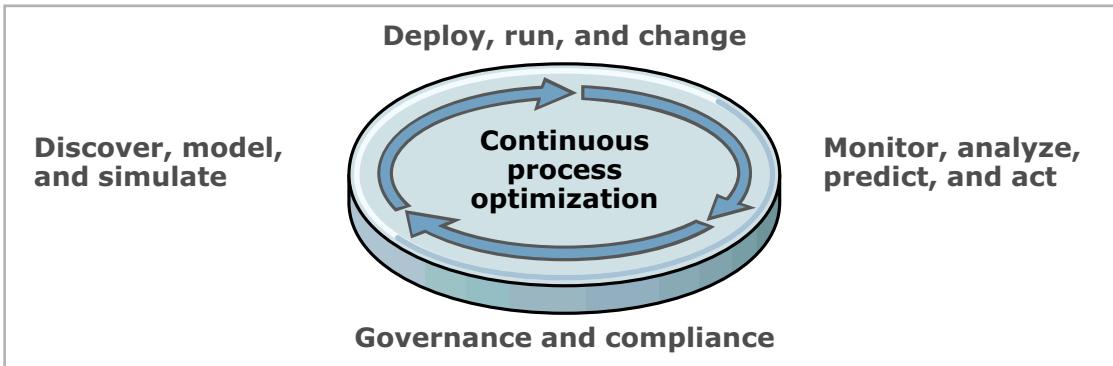
The integrated runtime supports both BPMN and BPEL (Advanced edition of the product only) for business processes, and support for services and enterprise applications.

The components of IBM Business Process Manager include:

- IBM Process Server: The runtime platform
- IBM Process Center: A unified BPM asset repository
- IBM Integration Designer (Advanced edition of the product only): An authoring environment for developing services and self-contained enterprise applications
- IBM Process Designer: An authoring environment for developing process models

IBM Business Process Manager lifecycle

- Implementing effective BPM involves a process of iterative optimization



- Processes are designed, simulated, and tested based on a set of assumptions about many factors: costs, activity durations, resource availability, and probabilities around various process paths
- As BPM solutions are deployed and used in production environments, real-world analytics can challenge some key assumptions
- Continuous process improvement is taking production-time insights and refactoring them into original process models to evolve them for optimal performance

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Figure 1-8. IBM Business Process Manager lifecycle

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Notes:

Processes are initially designed, simulated, and tested based on a set of assumptions about many factors that include costs, activity durations, resource availability, and probabilities around various process paths.

As BPM solutions are deployed to production environments, visibility into real-world analytics might challenge some of those key assumptions.

Continuous process improvement is about taking those production-time insights and refactoring them into your original process models to evolve them for optimal performance.

Business integration roles in BPM development

User role	Role definition
BPM process owner (line of business manager)	<ul style="list-style-type: none"> Limited programming experience Focus is on business strategy and performance
BPM analyst	<ul style="list-style-type: none"> Limited programming experience Focus is on business performance, process design, and optimization
Integration developer	<ul style="list-style-type: none"> Focus is on services and enterprise application infrastructure solutions, business process automation Some basic programming experience (loops, conditionals, string manipulation) Expects tools to simplify and abstract advanced IT implementation details
BPM developer (IT developer)	<ul style="list-style-type: none"> Focus is on development of application-specific business logic (for example, EJB files, Java, COBOL) for components and services that a business integration solution uses
BPM solution architect	<ul style="list-style-type: none"> Defines basic operational imperatives in the provision of IT services with a focus on resiliency, reuse, and adaptability
BPM solution administrator	<ul style="list-style-type: none"> Focus is on administration, management, and maintenance of deployed business solution

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Figure 1-9. Business integration roles in BPM development

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Notes:

Several roles are associated with IBM Business Process Manager. The BPM solution administrator is the focus for this course.

The IBM process management tools span the development cycle, allowing increased productivity and communication between different user roles. The definitions of the business integration user roles do not assume a one-to-one relationship. A single person can have multiple roles. For example, an application developer can take the role of integration developer. It is also common for several phases of the application development cycle to involve user roles.

1.2. IBM Business Process Manager editions

IBM Business Process Manager editions



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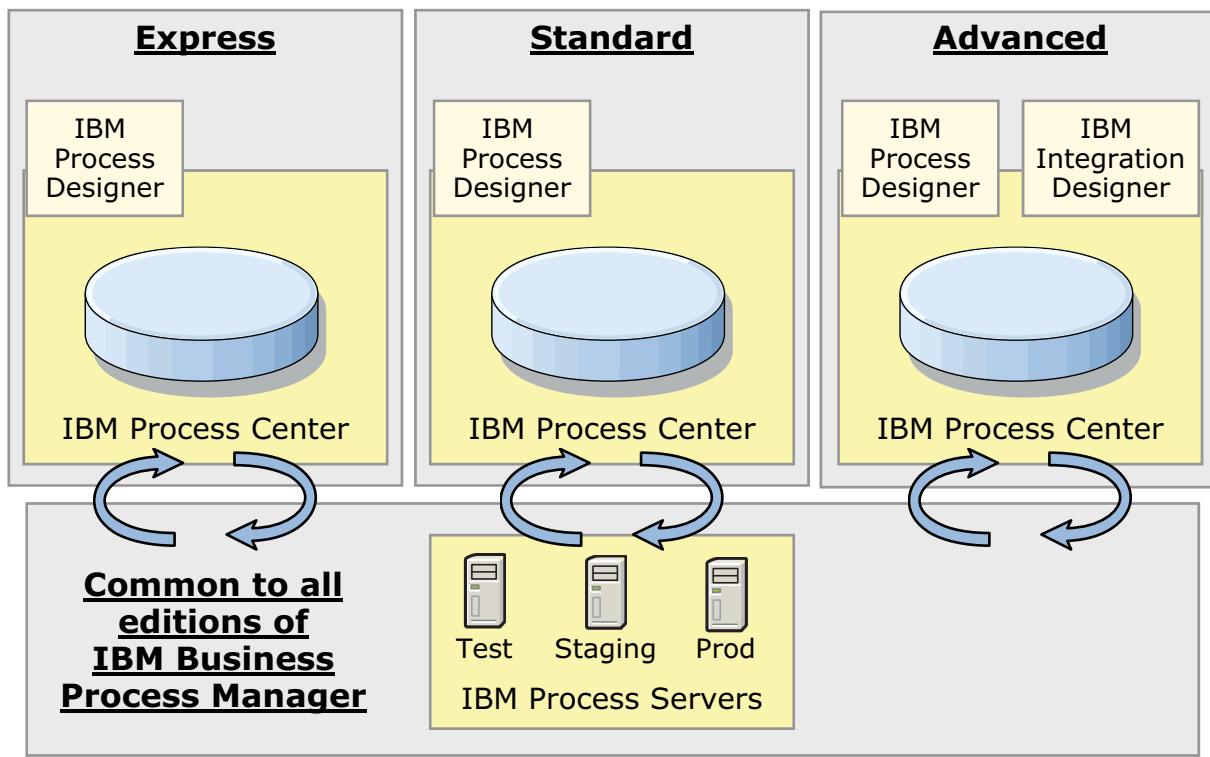
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Figure 1-10. IBM Business Process Manager editions

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Notes:

IBM Business Process Manager editions



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Figure 1-11. IBM Business Process Manager editions

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Notes:

Three different configurations of IBM Business Process Manager correlate with typical entry points or stages in a business process management program for a company. Each configuration matches increasing levels of functional complexity.

IBM Business Process Manager Express is designed for a small business process management (BPM) project. It is configured to operate with a few users or a single server, with no clustering.

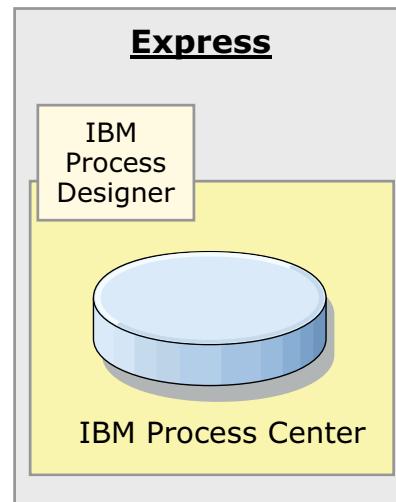
IBM Business Process Manager Standard is used for typical BPM projects. It is designed for multi-project improvement programs that have a high business involvement. The standard configuration offers an improved user productivity and basic system integration support.

IBM Business Process Manager Advanced offers the full set of advanced BPM capabilities. It extends the support for high-volume process automation, with high quality of service. The advanced configuration offers built-in service component architecture (SCA) components and all of the capabilities of IBM WebSphere Enterprise Service Bus.

You learn about Service Component Architecture and some of the capabilities of the IBM WebSphere Enterprise Service Bus in later units.

IBM Business Process Manager Express

- IBM Process Designer is limited to three authors
- IBM Process Center
 - Two development cores
 - No high availability
- Process Server
 - Run BPMN processes
 - Rules and monitoring support
 - No clustering support
 - No BPEL, SCA, or ESB support
- Small number of users
- Single server and no clustering
- Simple installation
- Low pricing



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Figure 1-12. IBM Business Process Manager Express

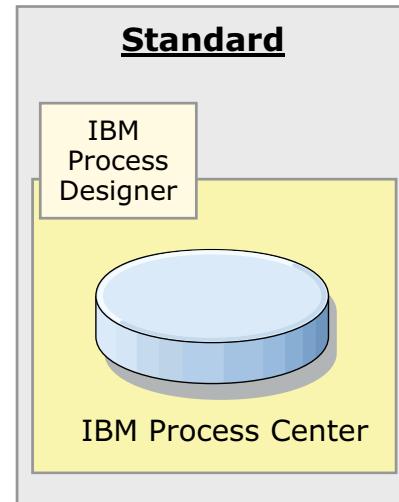
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Notes:

The entry level product is the IBM Business Process Manager Express and is good for a group just starting out with business process management. The IBM Business Process Manager Express contains functions that come from the WebSphere Lombardi Edition heritage. IBM Business Process Manager Express can be installed only in a stand-alone server with no clustering and has a simple installation process. The pricing is low so that you can get started with a business process management project without a major financial investment.

IBM Business Process Manager Standard (1 of 2)

- IBM Process Designer
- IBM Process Center
 - Able to version BPMN processes
 - Clustering supported
- Process Server
 - Run BPMN processes
 - Run monitoring support
 - No BPEL, SCA, or ESB support
- Includes basic system integration support
- Focus on improved workflow and productivity
- Larger number of users than Express configuration



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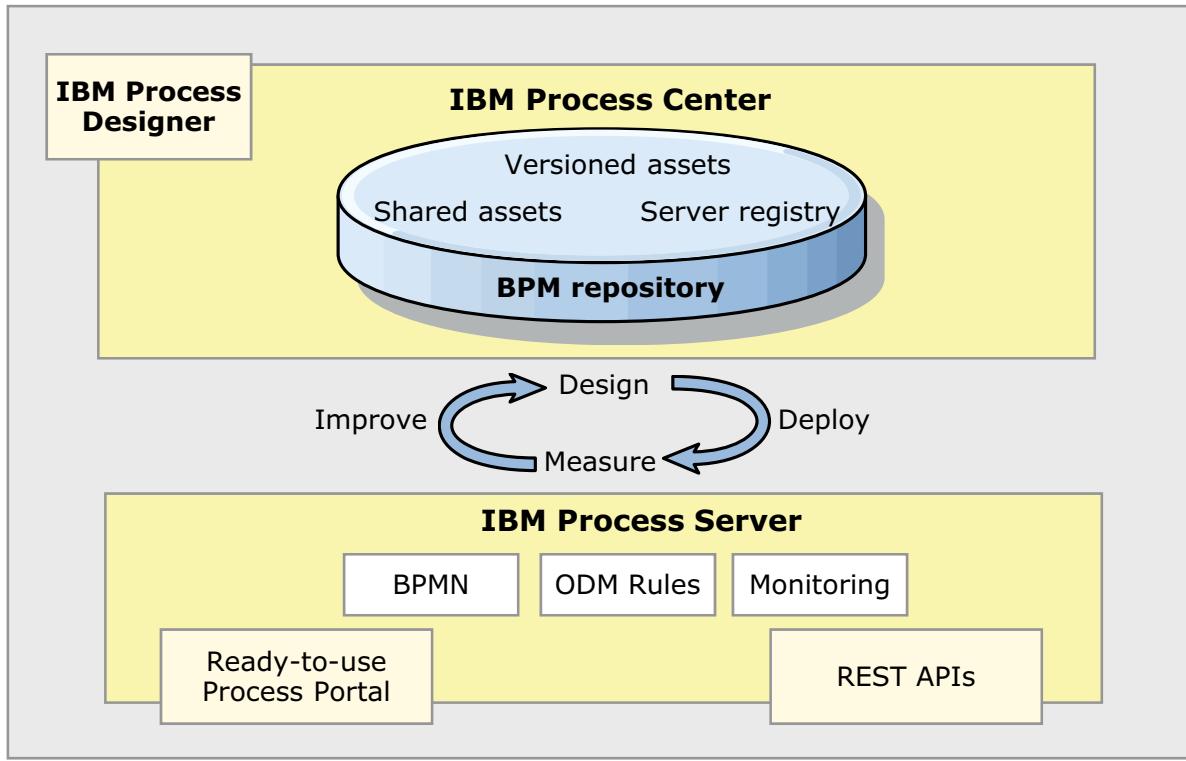
Figure 1-13. IBM Business Process Manager Standard (1 of 2)

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Notes:

IBM Business Process Manager Standard is used for typical business process management projects that require a deeper business user engagement and IT collaboration through the process improvement lifecycle.

IBM Business Process Manager Standard (2 of 2)



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Figure 1-14. IBM Business Process Manager Standard (2 of 2)

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Notes:

IBM Business Process Manager Standard provides new levels of interoperability between IBM software.

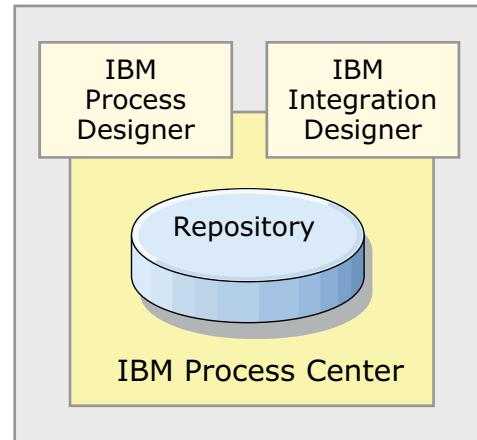
IBM Business Process Manager Standard uses a shared model for development artifacts that are authored in the IBM Process Designer. They share one common repository and a single representation of the solution.

The BPM component that is called the IBM Process Center realizes this shared model.

The IBM Process Center repository is implemented as tables within a database (commonly DB2).

IBM Business Process Manager Advanced (1 of 2)

- Tools for modeling, designing, implementing, and deploying business processes and services
- Includes:
 - **IBM Process Designer:**
An authoring environment that is used for creating process models in BPMN and BPD formats
 - **IBM Integration Designer:**
An authoring environment that is used for creating processes, including BPEL with human tasks, SCA components, and services
 - **IBM Process Center:**
Includes a repository for all processes, services, and other assets
 - **IBM Process Server:**
Includes a runtime environment for supporting process models and services



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Figure 1-15. IBM Business Process Manager Advanced (1 of 2)

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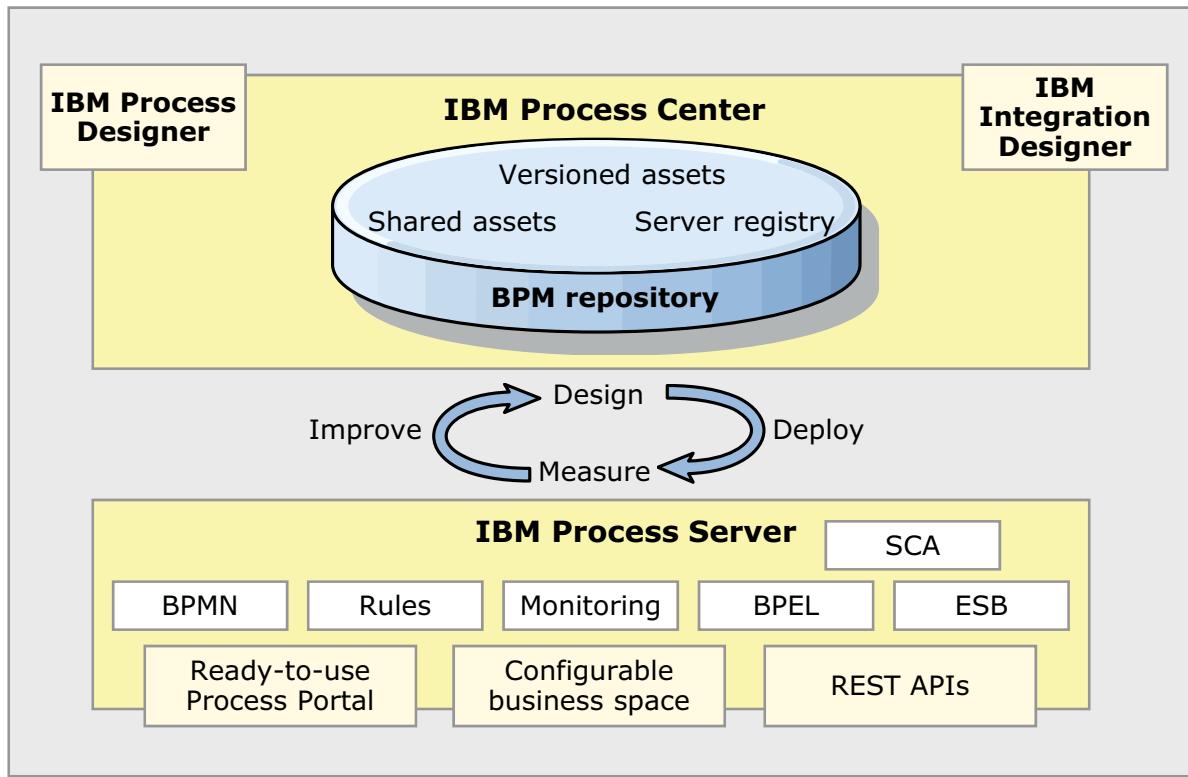
Notes:

IBM Process Designer is an authoring environment that is used to create process models that contain automated and human tasks that are developed with the Business Process Model and Notation (BPMN) and business process definition (BPD) formats.

IBM Integration Designer is an authoring environment that is used to create process models and advanced service implementations, including mediations, Service Component Architecture (SCA) modules, business rules, and Business Process Execution Language (BPEL) with human tasks.

IBM Process Center includes a repository for all processes, services, and other assets that are created in the authoring environments. IBM Process Server provides a single runtime environment for supporting process models, service orchestration, and integration capabilities.

IBM Business Process Manager Advanced (2 of 2)



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Figure 1-16. IBM Business Process Manager Advanced (2 of 2)

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Notes:

IBM Business Process Manager Advanced provides new levels of interoperability between IBM software.

IBM Business Process Manager Advanced supports high-volume automation and extensive system integration.

IBM Business Process Manager Advanced uses a shared model for development artifacts that are authored in either the IBM Process Designer or IBM Integration Designer. They share one common repository and a single representation of the solution.

The BPM component that is called the IBM Process Center realizes this shared model.

The IBM Process Center repository is implemented as tables within a database (commonly DB2).

1.3. IBM Business Process Manager V8.5.6 features and capabilities

IBM Business Process Manager V8.5.6 features and capabilities



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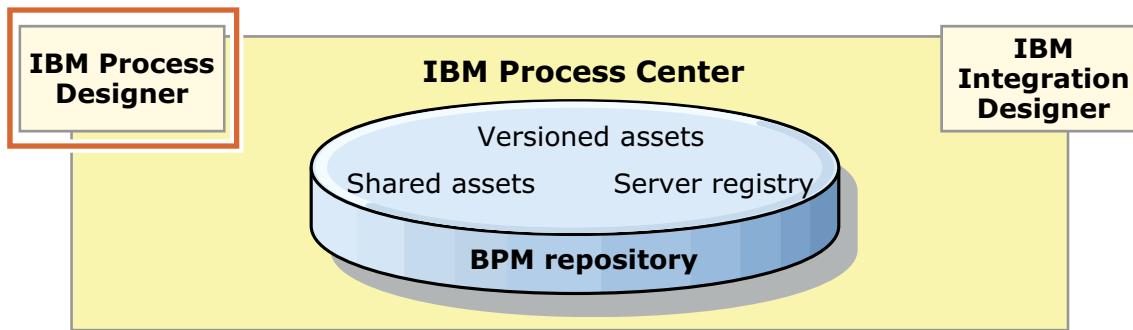
Figure 1-17. IBM Business Process Manager V8.5.6 features and capabilities

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Notes:

IBM Process Designer

- Tool to develop and manage business processes
- Model, simulate, and inspect business processes
- Artifacts: BPMN (Business Process Model and Notation) and BPD (business process definitions)



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Figure 1-18. IBM Process Designer

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Notes:

IBM Process Designer is an Eclipse-based tool that business process authors use. It offers capabilities to model and implement business processes as process applications. IBM Process Designer includes tools, the Process Inspector, and the Process Optimizer, for interacting with processes on the Process Center server (playback server) or a Process Server deployment target.

A process is the major unit of logic in IBM Business Process Manager. It is the container for all components of a process definition, including services, activities, and gateways; timer, message, and exception events; sequence lines, rules, and variables. When you model a process, you create a reusable business process definition (BPD).

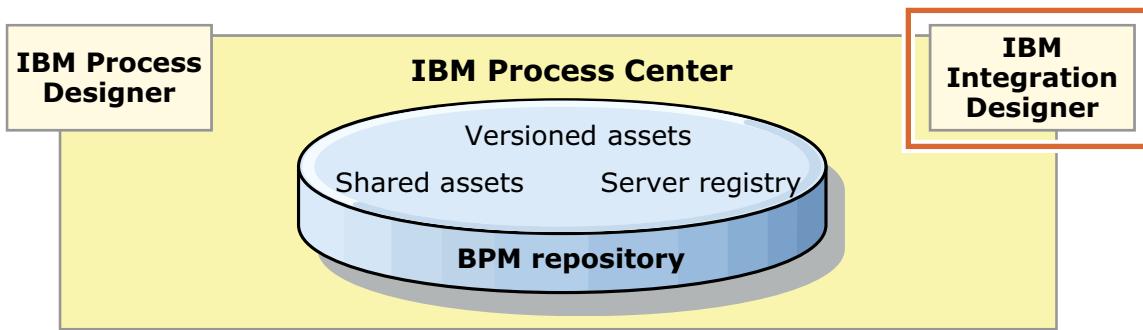
All Process Designer projects are contained in process applications. You store those process applications and associated artifacts in the Process Center repository.

Toolkits are containers that store library items (for example, BPDs) for reuse by process applications or other toolkits. Process applications can share library items from one or more toolkits, and toolkits can share library items from other toolkits.

Processes applications that are developed in Process Designer can run any time on the Process Center server or can be saved to a snapshot and deployed on the Process Server. The same is true of services that are developed in Integration Designer and associated with process applications.

IBM Integration Designer

- Available with Advanced edition of the product only
- Development tool for building SCA-based integration applications
- Provides a visual development environment for developing, assembling, testing, deploying, and managing integration modules and mediation modules
- Artifacts: Service Component Architecture (SCA) modules and libraries, and Advanced Integration services (AIS)



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Figure 1-19. IBM Integration Designer

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Notes:

IBM Integration Designer is an Eclipse-based tool that IT developers use. IBM Integration Designer is used to author complex integrations and fully automated processes that support process applications that are designed in the Process Designer.

It incorporates a fully integrated testing environment with test cases and test suites. Using IBM Integration Designer, IT developers build reusable SOA services, orchestrate those services, and access traditional systems.

The artifacts that are produced in IBM Integration Designer include:

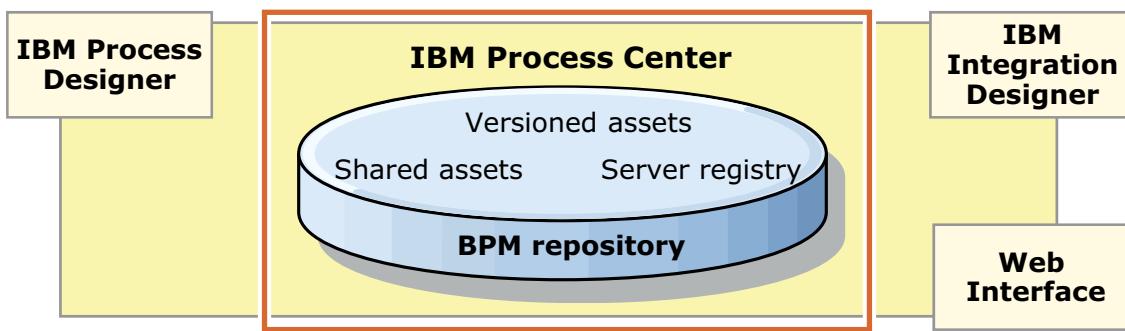
- SCA components that contain one or more modules and libraries and are deployable as EAR files.
- Advanced Integration services that are traditional BPEL processes.
- The SCA modules and libraries that are created with IBM Integration Designer can be associated with a process application by using the Process Center.

The artifacts that are produced in Integration Designer can be used as services by processes that are created in Process Designer.

In such cases, they are deployed with the process application.

IBM Process Center: Capabilities

- Repository for all Business Process Manager assets
- Lifecycle management and deployment of all applications
- Includes execution environment for development and testing
- Accessible from IBM Process Designer and from IBM Integration Designer
- Web interface by using IBM Process Center Console
- Includes Process Center server and the Business Performance Data Warehouse server



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Figure 1-20. IBM Process Center: Capabilities

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Notes:

You can use the IBM Process Center repository to share business process management assets with other users who are developing process applications and toolkits. These assets include process applications, reusable toolkits, monitor models, and more. It also can manage dependencies, versions, and deployment to servers.

The repository also maintains a registry of the Process Servers in the environment. The Process Center is involved in the modeling and development of process applications, running the applications during initial testing, and deploying of the applications to test and production servers.

The IBM Process Center includes two servers, the Process Center server and the Business Performance Data Warehouse server. These servers allow developers who are working in Process Designer to run their process applications and store performance data for testing and playback during development efforts. Business Performance Data Warehouse retrieves tracked data from Process Server or Process Center server at regular intervals.

Standard versus Advanced edition key capabilities (1 of 2)

Capability	Advanced edition	Standard edition
Process Designer: BPMN	X	X
Coach user interface	X	X
Process Portal	X	X
Reporting	X	X
Business Performance Data Warehouse	X	X
Process Center shared asset repository	X	X
Unlimited authors and users	X	X

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Figure 1-21. Standard versus Advanced edition key capabilities (1 of 2)

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Notes:

Standard versus Advanced edition key capabilities (2 of 2)

Capability	Advanced edition	Standard edition
WebSphere Process Server compatible execution	X	
Integration Designer: BPEL, SOA	X	
Transaction	X	
Adapters	X	
Business Space	X	
ESB	X	
Cluster	X	X
Advanced platform support: Linux on System z, IBM AIX, Solaris	X	X

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Figure 1-22. Standard versus Advanced edition key capabilities (2 of 2)

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Notes:

Some important terminology is defined as follows:

- **SCA:** SCA is a service-oriented component model for defining and invoking business services that publish or operate on business data. SCA is aimed at providing a simplified programming model for writing applications that run in a Java EE runtime environment. SCA is based on concepts and techniques that are refinements of existing Java EE technology. SCA is an open standard that OSOA (open service-oriented architecture) manages and includes contributions from companies such as IBM, Oracle, SAP, and Sun.

One of the important aspects of SCA is to provide a separation between application business logic and implementation details. To this end, SCA provides a single abstraction for service types that are already expressed as session beans, web services, Java classes, or business process applications that are written in Business Process Execution Language (BPEL). The ability to separate business logic from infrastructure logic is important to help reduce the IT resources that are needed to build an enterprise application. It gives developers more time to work on solving business problems rather than focusing on the details of which implementation technology to use.

- **BPEL** processes:

- Can invoke other SCA components
- Can be invoked as SCA components

An OASIS technical committee manages the BPEL specification:

<http://docs.oasis-open.org/wsbpel/2.0/OS/wsbpel-v2.0-OS.html>

BPEL is an SCA implementation type. Therefore, business processes are exposed as service components, and the caller is unaware that the service is rendered in BPEL. The interface (interface partner) provides the information of how to invoke the BPEL (operations that are provided and the types of inputs, outputs, and fault messages). Processes can be invoked as SCA components.

- **Transaction:** A transaction is an indivisible unit of work that updates multiple resources such that all or none of the updates are made permanent. The atomicity, consistency, isolation, and durability (ACID) properties describe the key characteristics of a transaction.

- Atomicity ensures that the system executes either all of the updates or none of the updates
- Consistency maintains that the system remains in a legal state when the transaction begins or ends
- Isolation ensures that changes that are made within the transaction are not visible to operations outside the transaction until it is committed
- Durability ensures that after a transaction is committed, the updates that the transaction makes will not be undone, even after system failure

- **Adapters:** As you design and assemble your SOA solutions, on many occasions you must integrate SOA applications with an existing IT asset. Ideally, you are able to access that asset as a service just as you access other components. If the asset does not have a service interface, examine the environment to see whether the service interface can be added easily. On some occasions, the environment cannot directly support a service interface. You can use adapters to access and include such assets in your SOA solutions.

Adapters also provide other services, such as event monitoring, transaction support, asynchronous communication, connection pooling, security (beyond web service), and a discovery utility for generating interfaces.

- **Business Space:** Business Space is a ready-to-use Web 2.0 BPM client for business users. It is a collection of related web content that provides you with insight into your business and the capability to react to changes within it. Business Space unifies the IBM Business Process Manager user interface space for business users. It allows users to use a single window when working with all of the business activities that take place in different products in the IBM Business Process Manager suite. Business Space is a mashup of BPM widgets that are targeted for a business user. Business Space is not part of the Express or Standard product but is bundled with IBM Business Process Manager Advanced.

- **ESB:** The ESB is, in a way, an architectural pattern for implementing an SOA and enabling its features, such as ease of service integration or flexible service associations. Layered on top of these basic features are other quality of service capabilities such as transaction handling, security, or reliable messaging. The ESB allows a service consumer to change providers

without affecting the consumer, for example. In this way, new service providers can be integrated into the enterprise application with minimal effort.

Comparison: IBM Integration Designer and IBM Process Designer

	IBM Integration Designer	IBM Process Designer
Container for integration artifacts	Module , which includes: <ul style="list-style-type: none"> • Integration logic (BPEL processes, human tasks, business rules) • Data and interfaces • Transformations 	Process App , includes: <ul style="list-style-type: none"> • Processes (BPD, human tasks, rules) • Data and services
Container for sharable artifacts	Library , which includes: <ul style="list-style-type: none"> • Integration logic • Data and interfaces • Transformations • Web service ports 	Toolkit , includes: <ul style="list-style-type: none"> • Processes • Data and services
Container for mediation services	Mediation module , which includes: <ul style="list-style-type: none"> • Mediation flows 	N/A

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Figure 1-23. Comparison: IBM Integration Designer and IBM Process Designer

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Notes:

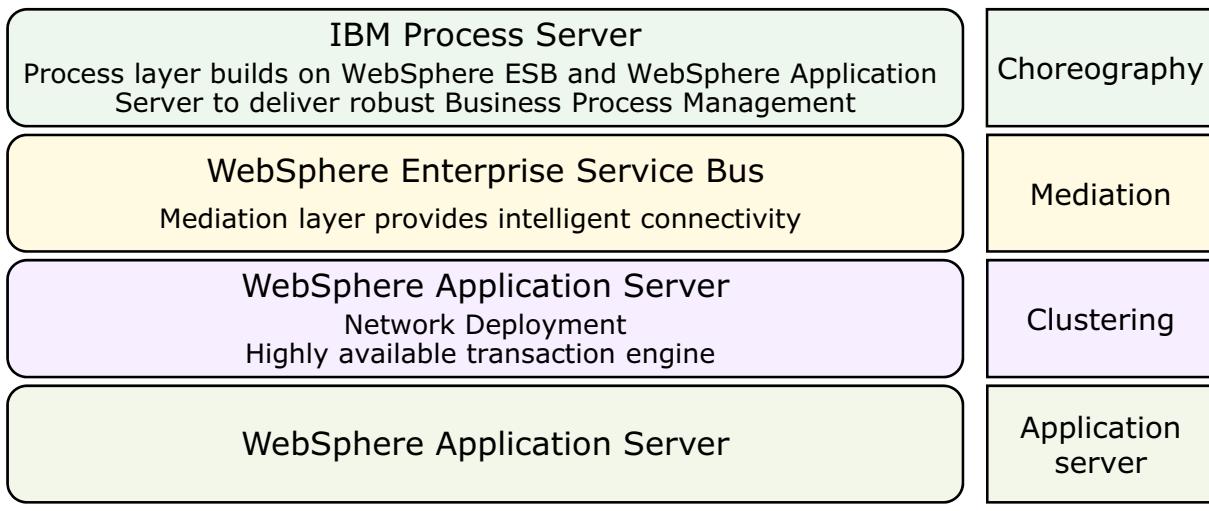
Modules and libraries contain multiple SCA artifacts that are grouped by type. Libraries are projects that are used to store shared resources and are accessed by adding them to module dependencies. Integration modules provide the business services, and mediation modules provide connectivity logic. Mediation flows and business services are modeled as SCA components. SCA components are wired together in the assembly diagram to form applications.

Process applications and toolkits in IBM Process Designer are analogous to modules and libraries in IBM Integration Designer. Some similarities include:

- Process applications (like modules) are deployed to the server.
- Toolkits (like libraries) are not deployed to the server.
- Process applications contain business process modeling artifacts.
- Process applications have dependencies on any number of toolkits.
- Toolkits have dependencies on other toolkits.

IBM Process Server: Foundation

- WebSphere Application Server Network Deployment provides high availability, workload management, and qualities of service
- WebSphere ESB integration provides a communication infrastructure for integrating services, applications, and data
- IBM Process Server adds business process management functions to the operating system



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Figure 1-24. IBM Process Server: foundation

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Notes:

At the lowest level, IBM Process Server is based on the WebSphere Application Server product. WebSphere Application Server implements the Java EE standard and allows applications that are written on top of it to be portable and efficient. To IBM, Java EE is a platform-neutral operating system that provides all of the richness of functions that are needed to build and run applications. Users of Java EE can divest themselves from concerns of security, transaction support, resource management, and much more, and leave those functions to the Java EE environment. In this way, programmers can focus on the specified business functions.

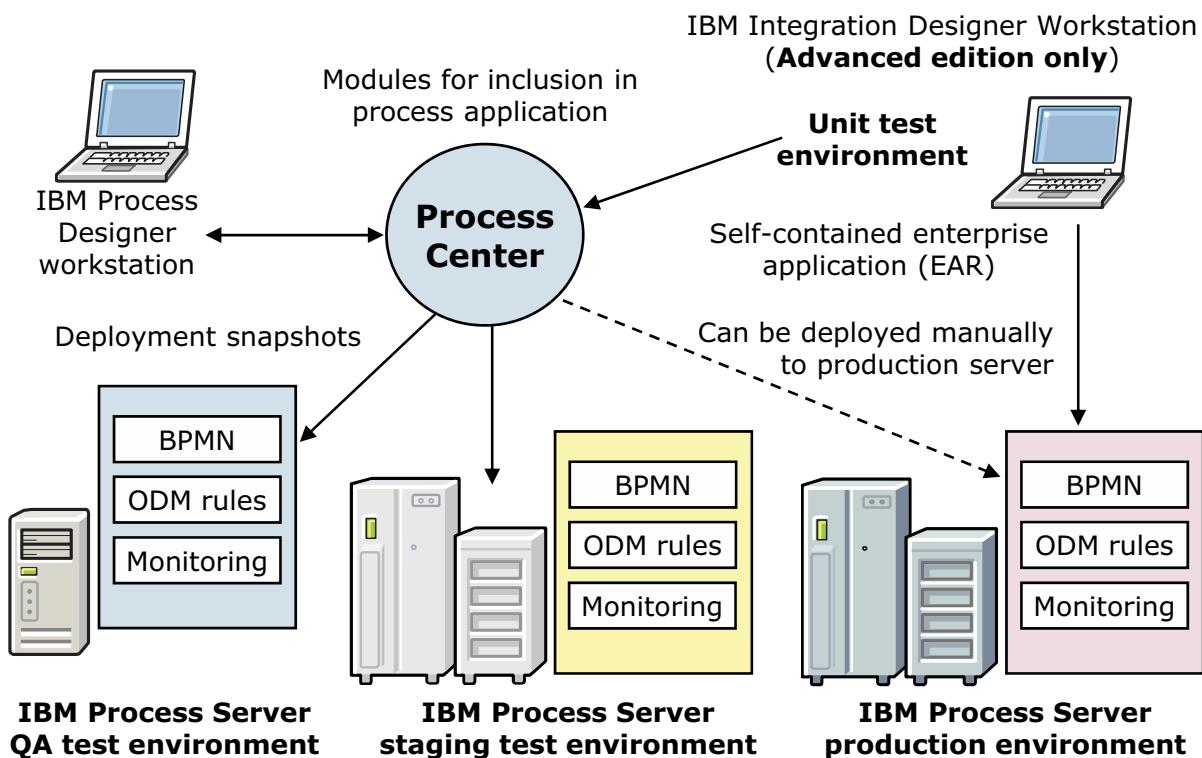
Although IBM Process Server is itself implemented on top of WebSphere Application Server, Java EE skills are not required to design and implement BPM solutions in IBM Process Server. IBM Process Server provides a higher level of abstraction, hiding its own implementation details.

Each layer encapsulates and builds on the lower layer. Everything begins with the application server. The higher abstraction layers indirectly use the application server or WebSphere Application Server Network Deployment for security, user registry, transactions, scalability, clustering, high availability, failover, platform messaging, and automated deployment.

WebSphere Enterprise Service Bus adds support for ESB service integration points, message mediation flows, and central management of integration logic and integration resources. IBM

Process Server adds the capabilities of business process development and choreography. IBM Integration Bus represents IBM's strategic ESB offering. It provides tools that help convert WebSphere Enterprise Service Bus assets so they can run on IBM Integration Bus.

Typical development and deployment scenario



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Figure 1-25. Typical development and deployment scenario

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Notes:

The diagram shows a typical development and deployment topology.

A unit test environment (UTE) is installed during the installation of IBM Integration Designer. In this mode, the unit tester can test SCA modules locally in the IBM Process Server running inside the UTE, or test them through the Process Center.

The IBM Process Designer workstation uses the Process Center Console to communicate directly with Process Center.

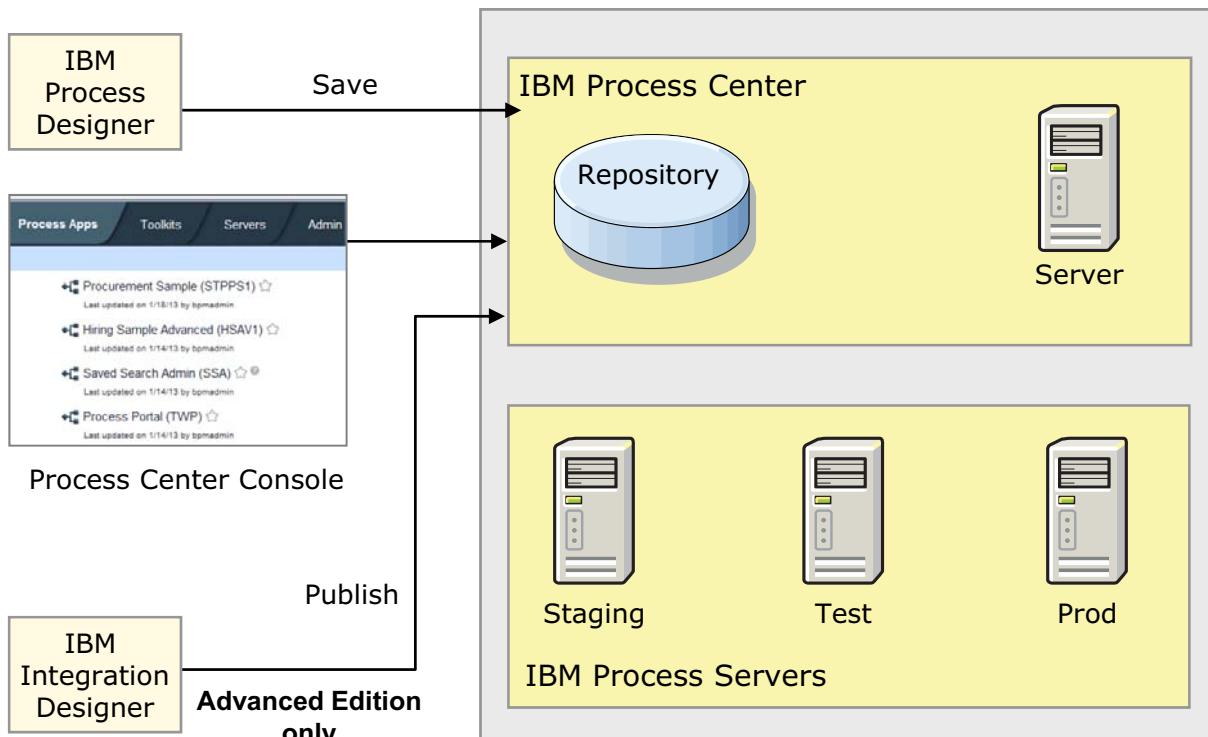
In the example, independent QA, staging, and production environments, each with its own full stand-alone IBM Process Server, can be connected to the central IBM Process Center. Artifacts are being published and synchronized back and forth between all of the environments while the IBM Process Center is managing the central repository.

This scenario is just a sample, and the topology can be modified to suit the organization requirements.

If you want to install a snapshot on an IBM Process Server that is not currently connected to the Process Center server (an offline server), then follow this procedure. Create an installation

package, extract it, and transfer it to the offline server. Then, use administrative commands on the server to install the package.

Administering Process Center artifacts



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Figure 1-26. Administering Process Center artifacts

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Notes:

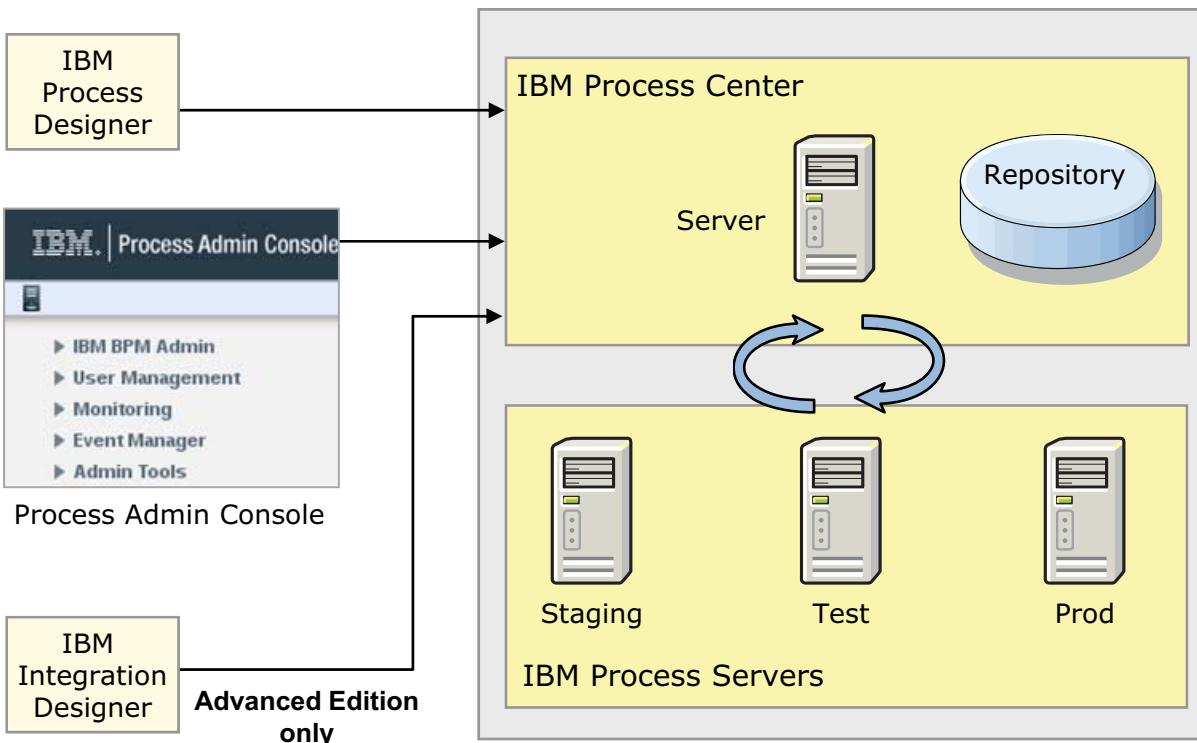
The Process Center Console is a tool that is intended for administrators and developers who must manage the lifecycle of application components.

Administrators and developers can create, export, clone, activate, or archive snapshots of process applications or toolkits and grant access to these applications.

The Process Center Console can be accessed in a number of ways.

- If you are primarily an administrator and do not actively work on the application development, you can use the web-based Process Center Console to view the Process Center Console. The Process Center Console is started with the web address:
`http://hostname:port/ProcessCenter`
- If you are a business analyst and work on the creation of business process definitions and associated assets, you can view the Process Center Console from inside IBM Process Designer.
- If you work as a developer on the Advanced Integration service assets of the process application, you can also view the Process Center Console in a separate perspective in IBM Integration Designer.

Managing Process Servers



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Figure 1-27. Managing Process Servers

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Notes:

You use the Process Admin Console to manage the Process Servers in your runtime environments, and the Process Center server that is part of the Process Center.

To access the Process Admin Console, enter the following URL:

`http://hostname:port/ProcessAdmin`

An IBM Process Server on IBM Process Center is used to run process applications on a Process Server that is connected to a Process Center. The server that is created can be a staging server, test server, or production server.

The capability of the Process Center server and any associated process (production) servers must match, both for server registration purposes and for process application snapshot testing and deployment purposes.

To import or test a snapshot on the Process Center server or deploy it on a production Process Server, the target server must support all of the functions in the process application. For example, you cannot import a process application with Service Component Architecture (SCA) modules unless the Process Center server supports IBM Business Process Manager Advanced.



Unit summary

Having completed this unit, you should be able to:

- Describe the concepts of business processes and business process management
- Describe business integration roles in IBM Business Process Manager
- Describe the IBM product editions
- Describe the capabilities of IBM Business Process Manager V8.5.6

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Figure 1-28. Unit summary

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Notes:



Checkpoint questions

1. A graphical console is intended for administrators and developers. Who must manage the lifecycle of application components?
 - A. Administrative console
 - B. Process Center Console
 - C. Process Admin Console
2. A business process is deployed and runs on which of the following products?
 - A. IBM Process Server
 - B. IBM Process Center
 - C. IBM Process Designer
3. Which of the following roles indicate an individual that needs no programming experience and their focus is on business performance, process design, and optimization?
 - A. IT architect
 - B. Business leader
 - C. Business analyst
 - D. Integration Designer

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Figure 1-29. Checkpoint questions

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Notes:

Write your answers here:

- 1.
- 2.
- 3.



Checkpoint answers

1. B. Process Center Console
2. A. IBM Process Server
3. C. Business analyst

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Figure 1-30. Checkpoint answers

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Notes:

Unit 2. IBM Business Process Manager Standard installation

What this unit is about

This unit provides an overview of IBM Business Process Manager Standard installation. You learn various methods to install the product, create profiles, and verify and troubleshoot the installation.

What you should be able to do

After completing this unit, you should be able to:

- List and describe the hardware and software prerequisites for IBM Business Process Manager Standard
- Install IBM Business Process Manager Standard by using the launchpad
- Install IBM Business Process Manager silently
- Create profiles by using the Profile Management Tool and the manageProfiles command
- Verify product installation and profile creation
- Troubleshoot a failed installation and a failed profile creation
- Uninstall IBM Business Process Manager Standard

How you will check your progress

- Checkpoint questions

References

IBM Business Process Manager V8.5.6 documentation in the IBM Knowledge Center:

http://www.ibm.com/support/knowledgecenter/SSFPJS_8.5.6/com.ibm.wbpm.main.doc/kc-homepage-bpm.html



Unit objectives

After completing this unit, you should be able to:

- List and describe the hardware and software prerequisites for IBM Business Process Manager Standard
- Install IBM Business Process Manager Standard by using the launchpad
- Install IBM Business Process Manager silently
- Create profiles by using the Profile Management Tool and the manageProfiles command
- Verify product installation and profile creation
- Troubleshoot a failed installation and a failed profile creation
- Uninstall IBM Business Process Manager Standard

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Figure 2-1. Unit objectives

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Notes:



Topics

- IBM Business Process Manager Standard installation overview
- IBM Installation Manager
- Installing the software
- Profiles
- Installation troubleshooting

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Figure 2-2. Topics

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Notes:



IBM Business Process Manager Standard installation overview



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10.1

Figure 2-3. IBM Business Process Manager Standard installation overview

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Notes:

Planning is essential

- Preliminary design of high availability environments is required
 - High availability solutions are complicated and resource-intensive
 - Good design prevents deployment bottlenecks (consider your naming topology, security, and more)
- Setup takes multiple days
 - Depends on infrastructure complexity (number of systems, LDAP, and more)
 - For novices, plan two weeks for successful deployment
 - Extra time might be needed for complicated or incomplete designs



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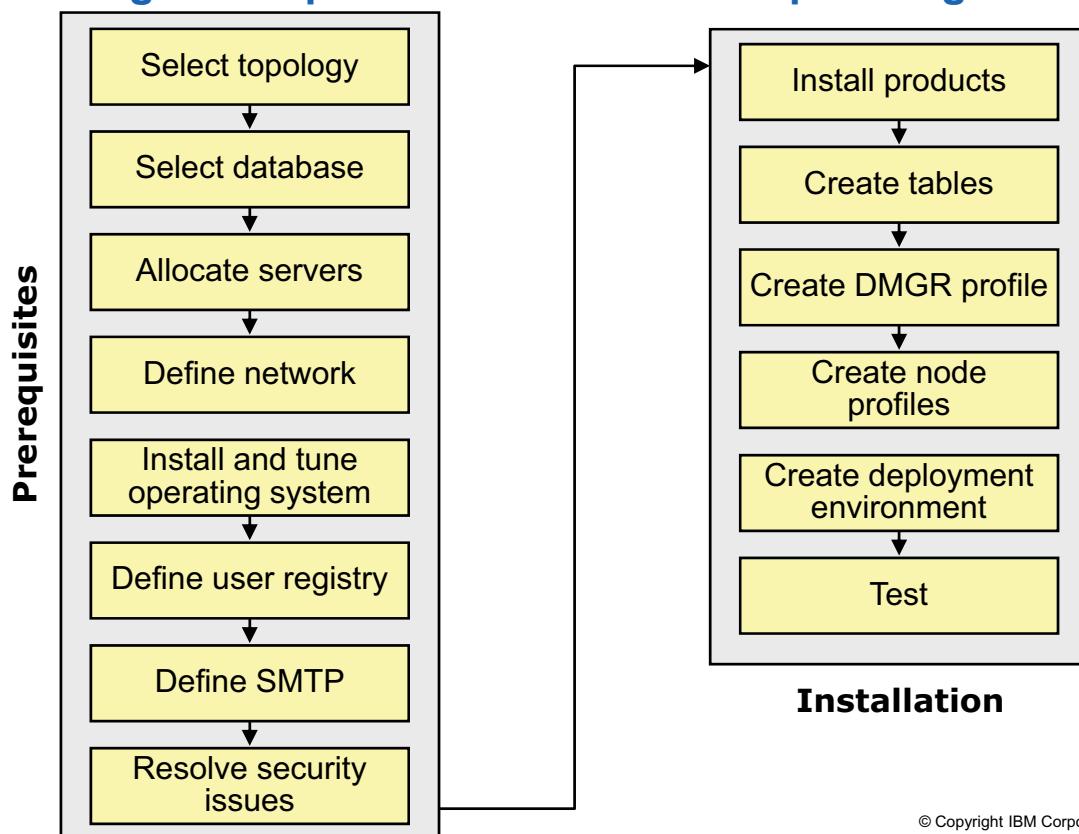
Figure 2-4. Planning is essential

WB8211.0

Notes:

To have a straightforward deployment and a setup that meets requirements, adequate planning is necessary. The setup (installation of binary files, fix packs, profile creation, Business Process Choreographer configuration, messaging engine configuration, and similar tasks) takes multiple days. The time that it takes depends on the number of systems that are used in the environment. It also depends on the complexity of other functions that are needed (like LDAP directory services, multiple HTTP servers, firewalls, and similar functions).

Planning: Prerequisites and installation planning



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Figure 2-5. Planning: prerequisites and installation planning

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Notes:

When the prerequisite steps are thoroughly executed, the installation process is likely to be fast and smooth. Ensure that you finish each of the steps and check that all components are configured and available.

Installation overview

- WebSphere product installation separates the core product binary data from the configuration data
 - Can have multiple sets of customized runtime environments
 - Each environment is known as a **profile**
 - Profiles share product binary files
- Must create profiles after installation of product binary files
 - Use the Profile Management Tool, `manageprofiles` command, or `BPMConfig` command
- Easier than multiple installations
 - Less disk space
 - Product update is simplified: updates are applied before or after profile creation

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Figure 2-6. Installation overview

WB8211.0

Notes:

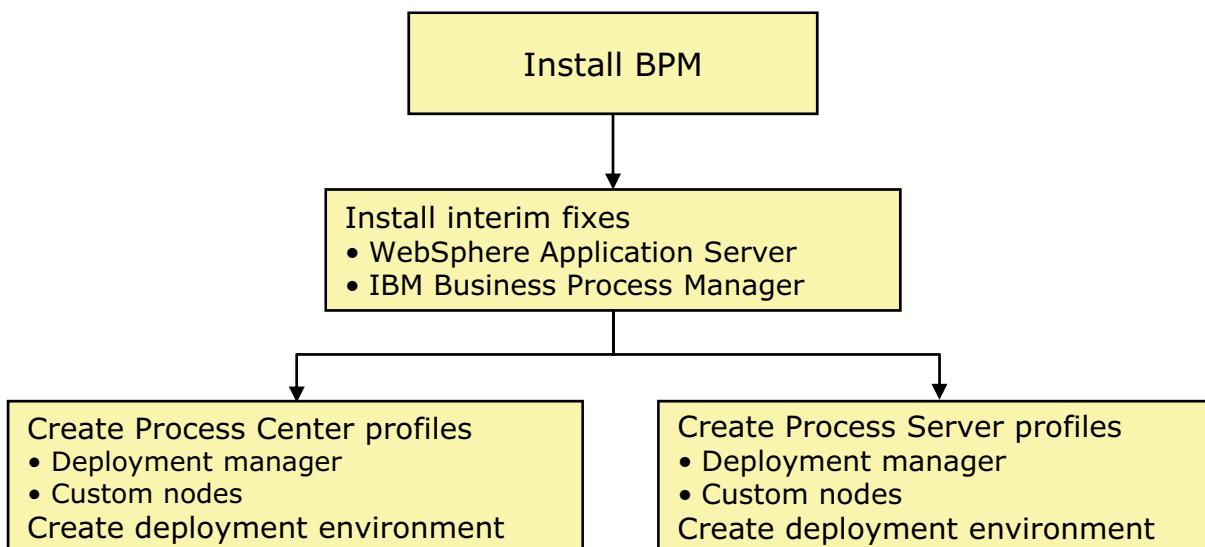
You can obtain the product code to install on distributed systems in either of the following ways:

- From the product media
- From the Passport Advantage site, where licensed customers can download installation images

The installation launchpad is available on the product disk and on downloaded installation images. The launchpad is the suggested method for installing components from the product media.

Installation

- IBM Business Process Manager can be:
 - Installed into its own environment
 - Can coexist with other IBM products



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Figure 2-7. Installation

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Notes:

In addition to installing an IBM Business Process Manager environment from scratch, it is possible to install IBM Business Process Manager in an existing WebSphere Application Server or Network Deployment environment. When IBM Business Process Manager is installed in an existing environment, IBM Business Process Manager features are added to the existing product installation.

Hardware and software prerequisites

- Examine the Business Process Manager Standard supported hardware and software page for current requirements:
 - <http://www.ibm.com/software/integration/business-process-manager/standard/sysreqs/>
- Select the link to the list of supported hardware and software for IBM Business Process Manager Standard
- Supported operating systems include:
 - AIX
 - Linux (Red Hat and SUSE)
 - Solaris
 - Windows (7, 8, 2008, 2012, and Vista)
 - z/OS

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Figure 2-8. Hardware and software prerequisites

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Notes:

See the WebSphere Application Server supported hardware and software page for current requirements: <http://www.ibm.com/software/webservers/appserv/doc/latest/prereq.html>



IBM Installation Manager



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10.1

Figure 2-9. IBM Installation Manager

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Notes:



IBM Installation Manager (1 of 2)

- Eclipse-based tool to manage the installation, update, modification, rollback, and uninstallation of product packages
 - Installation Manager installs automatically before the Business Process Manager installation package
- Includes a number of wizards that make it easy to maintain packages throughout their lifecycles:
 - Installation wizard: Guides you through the installation
 - Update wizard: Searches for updates to packages installed
 - Modify wizard: Modify certain elements of a package
 - Manage licenses wizard: Is used to set up licenses for packages
 - Import wizard: Adds existing packages that are installed by using other tools
 - Roll Back wizard: Provides capability to revert to a previous version of a package
 - Uninstall wizard: Removes a package from the computer
- Can be installed automatically, interactively, or silently
 - Stored in `<bpm_extract_root>/IM`

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Figure 2-10. IBM Installation Manager (1 of 2)

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Notes:

The Installation Manager is a program that helps you install, import, update, modify, and uninstall packages on your computer. The Installation Manager also provides tools for managing licenses for the packages that it installs, and for updating and modifying packages. If the Installation Manager is installed on your computer, it is updated to ensure that the most recent version is installed.

You must run Installation Manager on those systems on which you install or update product code. You normally need only one Installation Manager on a system because one Installation Manager can track any number of product installations.



Figure 2-11. IBM Installation Manager (2 of 2)

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Notes:

Wizards guide you through the steps that you must take to install, modify, update, roll back, or uninstall your IBM products. Use Installation Manager to install individual software packages on your local computer, or with the IBM Packaging Utility to install software for an enterprise.

IBM Installation Manager basics

- The IBM Installation Manager can be used to interactively install or update packages
 - Set repository preferences to indicate where to get the data for installing or updating packages
 - Default repository preferences is a service repository, which requires Internet connectivity
 - Can modify repository preference to use local repository
- Starting the IBM Installation Manager:
 - Use the Start menu
 - Use the `IBMIM` command in
`<install_root>/IBM/InstallationManager/eclipse`
- More information about the IBM Installation Manager can be found by using the IBM Knowledge Center
 - http://www.ibm.com/support/knowledgecenter/SSDV2W_1.5.0/welcome.html

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Figure 2-12. IBM Installation Manager basics

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Notes:

Working with IBM Installation Manager simplifies the installation process for many IBM products. The Installation Manager installation kit is delivered as part of the product download. Installation Manager might be installed per computer since one installation can handle the installation of multiple products. After it is installed, Installation Manager must be pointed to the appropriate repositories that contain product installation packages.

A repository is a place where the installation packages can be found. The repository includes metadata that describes the software version and how it can be installed. It has a list of files that are organized in a tree structure and can exist on a local directory or on a remotely reachable server.

Installation Manager command line

- When you cannot use the IBM Installation Manager user interface, you can use IBM Installation Manager command line to manage installations
 - In `<IM_install_root>/tools/imcl`
- Use imcl commands with either the installed version of Installation Manager or the Installation Manager installer
- From the command line, you can:
 - Manage installations
 - View repository contents, available packages, and fixes, and others
 - Run installation scripts that include commands and options for specifying the details of your installation
- Run the `help` command to view the available commands for Installation Manager
 - For example, `<IM_install_root>/tools/imcl -help`

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Figure 2-13. Installation Manager command line

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Notes:

You must run `imcl` commands from the tools directory. If an earlier version of Installation Manager is installed, you cannot use `imcl` from the Installation Manager installer. Include quotation marks around file paths that have spaces.



IBM Installation Manager repository (1 of 2)

- Contains one or multiple product offerings that have both metadata and actual payload for the offerings
- Metadata describes such aspects of the offering as
 - Name, version, supported operating systems, and other items
 - Components of the offering (optional or required feature)
 - Relationships between offerings and features of the offerings
- Repository normally contains full content that is required to install a certain offering of various operating systems
- Different IBM Installation Managers on different workstations can reference the same repository

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Figure 2-14. IBM Installation Manager repository (1 of 2)

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Notes:

A repository is a location that stores data for installing, modifying, rolling back, updating, or uninstalling packages. You can add, edit, or remove repositories and modify the repository order in the repository table. The IBM Installation Manager repository contains one or multiple product offerings that have both metadata and actual payload for the offerings. The offering metadata describes such aspects of the offering as name, version, supported operating systems, required and optional features and relationships, and dependency between offerings and features of offerings.

Normally, an IBM Installation Manager repository contains the full content that is required to install on various platforms and operating systems. Remote repositories are available for installation by using the web, or product images and fixes can be stored in local repositories and customized.



IBM Installation Manager repository (2 of 2)

- Repository topologies can be generalized in the following three categories
 - Public IBM hosted repository (accessible to general public using URL)
 - Enterprise hosted repository (located behind the firewall that multiple computers within the enterprise access)
 - Local Installation Manager repository (single user accesses repository, not shared with others)
- Tools are provided to copy offerings from one repository to another
 - IBM Package Utility or file transfer tools

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Figure 2-15. IBM Installation Manager repository (2 of 2)

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Notes:

Repositories can be referenced from different IBM Installation Managers on different computers, and the repository topologies can be generalized in three categories:

- Public repository that can be publicly accessible by using a URL with an internal connect or local share file system
- Enterprise repository that is usually behind the firewall and only accessed by multiple computers within the enterprise intranet
- Local repository that is used by a single user and not shared with others

Tools are available to copy offerings from one repository to another, for example, the IBM Package Utility. If you are using a third-party tool to transfer the repository between computers, you must use binary transfer mode.

Installing the software



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10.1

Figure 2-16. Installing the software

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Notes:

Installing IBM Business Process Manager

- Installation options:
 - Use Launchpad
 - Use the Installation Manager GUI (without Launchpad)
 - Install silently by using a response file tailored for your environment
- The installation software provides sample response files for each supported operating system and bit version for a silent installation
 - The sample response files provide detailed instructions and information about setting the values
- Sample response files are in the software binary directory in `responsefiles/BPM`
 - Files that are included for a root and non-root installation and 32-bit and 64-bit

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Figure 2-17. Installing IBM Business Process Manager

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Notes:



Information

Windows only: Installation paths must be kept as short as possible to avoid path limits. Avoid installing to `\Program Files`. Use installation paths that do not contain spaces, and install as close to the root directory as possible.

Silent installation

- You can do a silent installation by using the command line or by using a response file
 - Sample response files included with the installation files
 - Modify the response file for your environment and configuration requirements
- During the silent installation, the following tasks are done:
 - Installation Manager is installed or updated to the appropriate level
 - The required base products and IBM Business Process Manager are installed
- After installation, use the BPMConfig command to:
 - Generate database scripts
 - Configure a deployment manager and one or more managed node profiles
 - Create a pattern-based network deployment environment

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Figure 2-18. Silent installation

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Notes:

You can install IBM Business Process Manager silently by creating a response file and then running a command to use that response file to install the product.

Before you begin

If you do not have the prerequisite base products that are necessary for IBM Business Process Manager Express installation, you must install the base products as part of the silent installation. The required base products are:

- IBM Installation Manager
- WebSphere Application Server Network Deployment, including the ejbdeploy and thinclient features

If you are installing from downloaded images from Passport Advantage, ensure that you download all three required images for Windows. If you are installing from the DVD images, obtain the compressed files from the DVDs. In both cases, extract all of the files from the compressed files to the same location on your hard disk. If you are prompted to overwrite directories, do so.

About this task

By using response files, you can simplify the silent installation and reduce errors in the process. This simplification is possible because you set up your installation options one time in a saved, sharable file that can be used on one or more machines. The installation software provides sample response files for each supported operating system. You can use an unmodified sample response file to do a silent installation by using default settings, or you can modify the response file to set particular values. The comments in the sample response files provide detailed instructions and information about setting the values.

During the silent installation, the following tasks are done:

- Installation Manager is installed or updated to the appropriate level.
- The required base products and IBM Business Process Manager Express are installed.

Only one IBM Installation Manager is required to install multiple instances of IBM Business Process Manager.

Procedure

1. Optional: Run the following command to generate encrypted passwords by using IBM Installation Manager to securely connect to DB2 and the administrative console.

```
extract_directory/IM64/tools/imutilsc -silent -nosplash encryptString  
password_to_encrypt
```

2. Create the response file that installs the required base products and IBM Business Process Manager Advanced. Copy a sample response file, suitable for your user access level, from the following directory: `extract_directory/responsefiles/BPM/`

Alternatively, you can create a response file by recording your actions in Installation Manager. When you record a response file, the selections that you make in Installation Manager are stored in an XML file. When you run Installation Manager in silent mode, Installation Manager uses the data in the XML response file to do the installation.

3. The default values that are provided in the sample response files do a basic installation. However, you should review the file and its comments, and modify the parameters as needed for your environment and the access level of your user ID. Review the following parameters and values:

- Permissions: For non-root or installation group user IDs, check that all location variables point to locations for which the user or group has permissions.
- Repository location: If you are not installing directly from the `extract_directory/responsefiles/BPM/` directory, point to the location of your installation repository. The repository can be local or remote.
- Installation location: The `installLocation` directory where IBM Installation Manager is or is going to be installed.
- Product installation location: The location where IBM Business Process Manager Advanced is going to be installed. If you want to install the product into an existing supported instance of WebSphere Application Server Network Deployment, specify its directory.
- Eclipse location: The `eclipseLocation` directory. If you want to install into an existing supported instance of WebSphere Application Server Network Deployment, specify its Eclipse location directory.

- The list of features for the product
- Production or non-production use: Your selection is recorded in the product tag for inventory purposes, so select the license feature that matches the license that you purchased and want to use. No functional differences exist.
- If you are installing DB2 Express, follow the instructions in the response file to provide the necessary user IDs and passwords. Use the instructions in step 1 for generating the encrypted passwords to include in the response file
- Java 6 is always installed with WebSphere Application Server Network Deployment, but if you install Java 7, it is used. If you do not specify the Java 7 package option, Java 6 is used. If you install Java 7 but find that you still need to use Java 6, you can switch before you create profiles by using the `managesdk` command.

You can also optionally install IBM WebSphere SDK Java Technology Edition 7.1 (Java 7.1) to use instead of Java 6 or Java 7. If you install Java 7.1, you must also follow the instructions for switching Java versions in the topic [Switching the edition of Java used in IBM Business Process Manager](#).



Note

On Linux on Power LE systems, Java 7.1 is always installed and used.

4. Read and accept the license terms before installing. Adding `-acceptLicense` to the command line means that you accept all licenses.
5. Run the following command:

```
extract_directory/IM64/installc -acceptLicense input
extract_directory/responsefiles/BPM/response_file_name.xml -log
preferred_log_location/silent_install.log
```



Note

If the 32-bit Installation Manager is already installed, you can run the command from the `<extract_directory>/IM/tools` directory.

Results

Installation Manager installs the prerequisites and IBM Business Process Manager Advanced, and writes a log file to the directory that you specified.

What to do next

After you install IBM Business Process Manager, you must configure the product by creating profiles, setting up database tables, and configuring the network deployment environment. To do these configuration tasks in one step, use the `BPMConfig` command. Alternatively, you can do each

configuration step separately by using the Profile Management Tool, if it is supported on your operating system, and the Deployment Environment wizard.



Installation launchpad (1 of 2)

- Single point of reference for installing the entire application server environment by installing product binary files
- Two installation choices
 - Typical installation
 - Custom installation
- Typical installation
 - Fast and simple installation
 - Optional installation of DB2 Express
 - Creates an environment
- Custom installation
 - Install binary files only
 - Provides more installation options for configuring an environment

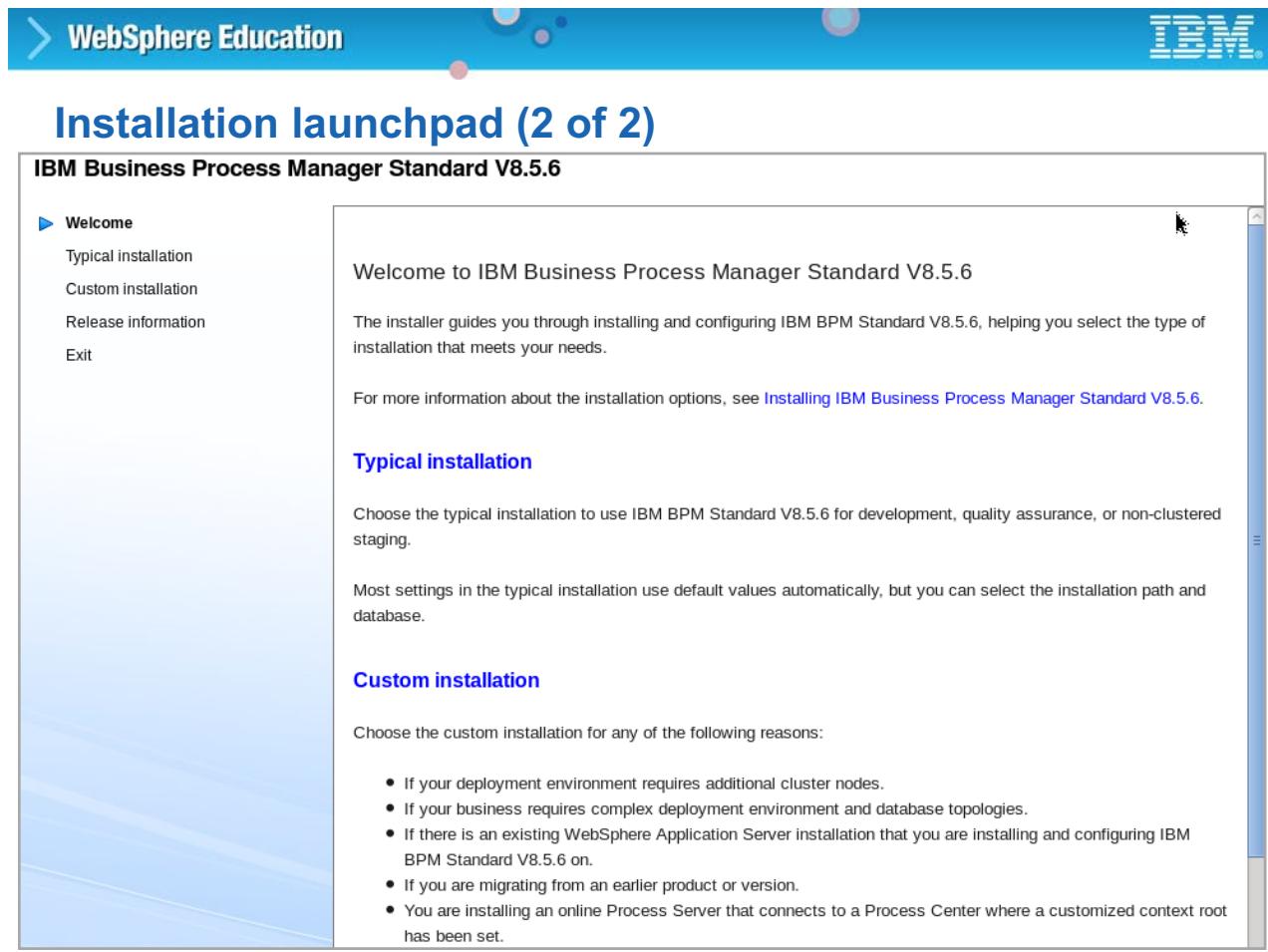
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Figure 2-19. Installation launchpad (1 of 2)

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Notes:

Using the product launchpad, the typical installation installs the software, configures the deployment manager and managed node profiles, and configures a single cluster deployment environment that consists of a single node and single server.



The screenshot shows the 'IBM Business Process Manager Standard V8.5.6' installation launchpad. The top navigation bar includes 'WebSphere Education' and the 'IBM' logo. The main title is 'Installation launchpad (2 of 2)'. The left sidebar has a 'Welcome' section with links: 'Typical installation', 'Custom installation', 'Release information', and 'Exit'. The right pane starts with a welcome message: 'Welcome to IBM Business Process Manager Standard V8.5.6. The installer guides you through installing and configuring IBM BPM Standard V8.5.6, helping you select the type of installation that meets your needs.' It also provides a link to 'Installing IBM Business Process Manager Standard V8.5.6'. Below this are two sections: 'Typical installation' (describing it for development, QA, or non-clustered staging) and 'Custom installation' (listing reasons like requiring additional cluster nodes or complex environments). A copyright notice at the bottom right reads '© Copyright IBM Corporation 2016'.

Figure 2-20. Installation launchpad (2 of 2)

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Notes:

The Welcome panel is the first panel that is displayed when the launchpad is started. Its right pane contains fast path links that start graphical user interface (GUI) installer programs. The left pane includes links to install Business Process Manager and get release information.



Custom installation (1 of 7)

IBM Business Process Manager Standard V8.5.6

Welcome
Typical installation
▶ **Custom installation**
Release information
Exit

Custom Installation

For more information about performing a custom installation, see [Installing using a custom installation and configuration path](#).

Specify whether you want to install as an administrative user, and then click **Install**.

Install as administrative user ([Help me decide](#))

When you install IBM BPM Standard, the required WebSphere Application Server Network Deployment is included.

Click **Install** to start the installation of IBM Business Process Manager Standard V8.5.6.
Important: Do not close this Launchpad until the installation is complete.

Install

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Figure 2-21. Custom installation (1 of 7)

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Notes:

You can choose to install Business Process Manager and WebSphere Application Server Network Deployment, or install on an existing WebSphere Application Server environment.

Custom installation (2 of 7)

- Installation Manager starts with preselected options that include:
 - IBM Installation Manager
 - WebSphere Application Server Network Deployment
 - IBM Business Process Manager Standard
 - IBM DB2 Express 64 bit

Installation Packages	Status	Vendor
▼ <input checked="" type="checkbox"/> IBM® Installation Manager		
<input checked="" type="checkbox"/> Version 1.8.1	Will be installed	IBM
▼ <input checked="" type="checkbox"/> IBM WebSphere Application Server Network Deployment		
<input checked="" type="checkbox"/> Version 8.5.5.5	Will be installed	IBM
▼ <input checked="" type="checkbox"/> IBM WebSphere SDK Java Technology Edition (Optional)		
<input checked="" type="checkbox"/> Version 7.0.8.10	Will be installed	IBM
▼ <input checked="" type="checkbox"/> IBM® Business Process Manager Standard		
<input checked="" type="checkbox"/> Version 8.5.6.0	Will be installed	IBM
▼ <input checked="" type="checkbox"/> IBM® DB2 Express 64 bit		
<input checked="" type="checkbox"/> Version 10.1.0.1	Will be installed	IBM

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Figure 2-22. Custom installation (2 of 7)

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Notes:

All suggested packages are preselected for installation.



Custom installation (3 of 7)

Install Packages
Select the fixes to install.

Fixes	Recommended	Vendor
IBM WebSphere Application Server Network Deployment 8.5.5.5		IBM
8.5.0.0-WS-WASJavaSDK-LinuxX64-IFPI35615 8.5.0.20150224_1408		
8.5.5.5-WS-WAS-IFPI35502 8.5.5005.20150225_1959		
8.5.5.5-WS-WASProd-IFPI35667 8.5.5005.20150225_1021		

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Figure 2-23. Custom installation (3 of 7)

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Notes:

This screen shows the list of interim fixes available for the software packages selected on the prior screen.

After this panel, the license agreement panel is shown. You must select to accept the license to continue with the installation.

Custom installation (4 of 7)

Install Packages

Select a location for the shared resources directory and a location for Installation Manager.

When you install packages, files are stored in two locations:

- 1) The shared resources directory - resources that can be shared by multiple packages.
- 2) The installation directory - any resources that are unique to the package that you are installing.

Important: You can only select the shared resources directory the first time you install a package with the IBM Installation Manager. For best results select the drive with the most available space because it must have adequate space for the shared resources of future packages.

Shared Resources Directory:

Installation Manager Directory:

Disk Space Information

Volume	Available Space
/	24.81 GB

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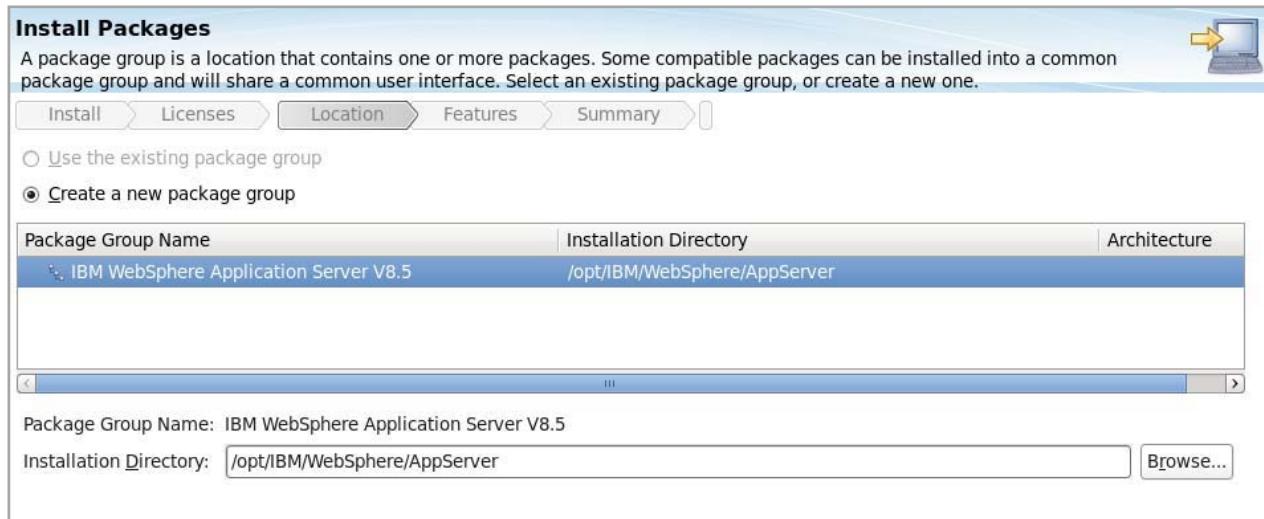
Figure 2-24. Custom installation (4 of 7)

WB8211.0

Notes:

The shared resources directory contains resources that multiple packages share. Shared resources can be software files, plug-ins, and packages. You can specify the shared resources directory the first time you install a package, and you cannot change the location while packages are being installed.

Custom installation (5 of 7)



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Figure 2-25. Custom installation (5 of 7)

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Notes:

A package is a software product that Installation Manager can install. It is a separately installable unit that can operate independently from other packages of that software. It can be a product, a group of components, or a single component that can be installed by using the Installation Manager. Each package has a name, a version, and an identifier. The packages are installed to a defined directory location in the file system. You can use Installation Manager to control where products are installed and at which level.

After this panel, the features panel is displayed and indicates the individual language packs for the runtime environment and the administrative console. English is the default selection.

Custom installation (6 of 7)

Install Packages
Select the features to install.

Install Licenses Location Features Summary

Features

- IBM® Installation Manager 1.8.1
- ▷ IBM WebSphere Application Server Network Deployment 8.5.5.5
- IBM WebSphere SDK Java Technology Edition (Optional) 7.0.8.10
- ▷ IBM® Business Process Manager Standard 8.5.6.0
 - Business Process Manager Standard Process Center License
 - Business Process Manager Standard Process Server Production License
 - Business Process Manager Standard Process Server Non-production License

Show dependencies
Selected by Installation Manager because of dependencies

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Figure 2-26. Custom installation (6 of 7)

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Notes:

This installation includes IBM WebSphere Application Server Network Deployment. This package provides an advanced, flexible runtime environment for large-scale application deployments. It offers near-continuous availability with advanced performance and management capabilities for mission-critical applications.

WebSphere Application Server Network Deployment provides improved integration for the software lifecycle, including application deployment and testing. This improved integration is made possible by the growing support from both IBM and third-party products for the WebSphere Application Server Liberty Profile computer network environment.

In addition, WebSphere Application Server Network Deployment offers flexibility in deployment. You can select the profile that best meets your operational and business needs. With this edition, you are fully entitled to use the Full Profile and Liberty Profile in development and production.

WebSphere Application Server Network Deployment provides:

- **Support for open standards and broad programming models**, including lightweight options for web application deployments in cloud and mobile environments.
- **Intelligent management and routing** to help deliver reliability and better business results.

- **Improved operations and resiliency** through advanced application availability, elasticity, and quality of service.
- **Enhanced security and control** that use integrated management and administrative tools.
- **Increased developer productivity** with the Liberty profile that delivers fast restart time and is small for building applications that do not require the full Java Enterprise Edition (Java EE) environment.

WebSphere Education

Custom installation (7 of 7)

Install Packages
Review the summary information.

Install Licenses Location Features Summary

Target Location

Package Group Name: IBM WebSphere Application Server V8.5
Installation Directory: /opt/IBM/WebSphere/AppServer
Shared Resources Directory: /opt/IBM/IMShared

Packages

Packages	
IBM® Installation Manager 1.8.1	
IBM WebSphere Application Server Network Deployment 8.5.5.5	
WebSphere Application Server Full Profile	
IBM WebSphere SDK for Java Technology Edition 6	
IBM WebSphere SDK Java Technology Edition (Optional) 7.0.8.10	
IBM® Business Process Manager Standard 8.5.6.0	
Business Process Manager Standard Process Center License	

Environment

English

Disk Space Information

Total Available Space
/ 24.81 GB

Total Download Size: 3.25 GB
Total Installation Size: 7.00 GB

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Figure 2-27. Custom installation (7 of 7)

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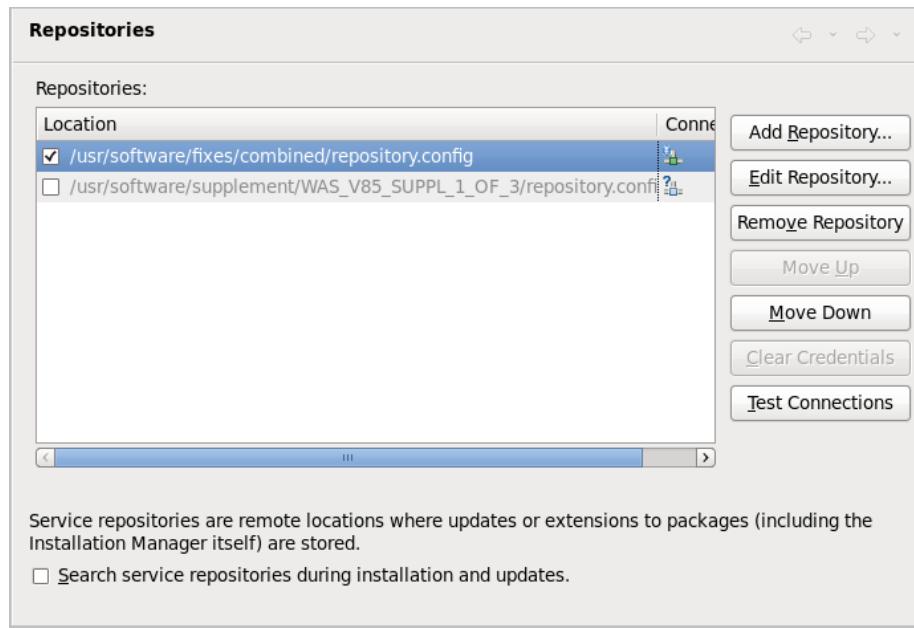
Notes:

The final step is that the summary results are displayed. You can review the details and continue with the installation. When finished, the installation log file is used to troubleshoot any problems that you might have during the installation.



Install fixes

- Use Update option in Installation Manager to install interim fixes or Fix Packs



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Figure 2-28. Install fixes

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Notes:

Be sure to add the fixes to the list of repositories in Installation Manager. Before you can update a package, Installation Manager must have access to the repository that contains the package updates. Internet access might be required. If you have an IBM Passport Advantage account, you can update packages from the Passport Advantage site. If you are installing updates from a repository that is not on the Passport Advantage site, you must specify the repository in the preferences before trying to update.



Uninstalling IBM Business Process Manager

- Use the IBM Installation Manager uninstall wizard to uninstall
 - Launch Installation Manager
 - Click uninstall
 - A pane with the list of all the installed packages is listed
 - For any dependency, you must uninstall all the products with dependencies before removing the dependency product
- Stop all server instances before uninstalling
- Select the package that you want to uninstall
- Always use the IBM Installation Manager to uninstall

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Figure 2-29. Uninstalling IBM Business Process Manager

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Notes:

You can use the uninstall option in the Installation Manager to uninstall packages from a single installation location. You can also uninstall all of the installed packages from every installation location. You can use the command line mode of the Installation Manager to uninstall IBM Business Process Manager.

To uninstall the packages, you must log in to the system by using the same user account that you used to install the product packages. A package cannot be uninstalled when another package has a dependency on it, unless the dependent package is also selected to be uninstalled.

2.1. Profiles



Profiles



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10.1

Figure 2-30. Profiles

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Notes:

What is a profile?

- A set of configurable files that use WebSphere product binary files to provide a WebSphere runtime environment
- Process Server and Process Center files are split into two categories:
 - Product files
 - Configuration files (profiles)
- Each profile uses the same set of product binary files
- Two types of Business Process Manager profiles:
 - Deployment manager profile
 - Managed node profile
- Each profile type has a template that is used when creating that type of profile

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Figure 2-31. What is a profile?

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Notes:

For a network deployment or IBM Process Server environment, a default runtime is not created during installation. After installation, profiles, nodes, and servers are created.

You can use the profile creation wizard to create a deployment manager profile, a stand-alone application server profile, or a custom profile. A profile consists of files that define the runtime environment for the deployment manager or the application server. Each environment has its own administrative interface except for a custom profile. A custom profile is an empty node that you can federate into a deployment manager cell and customize. No default server processes or applications are created for a custom profile.

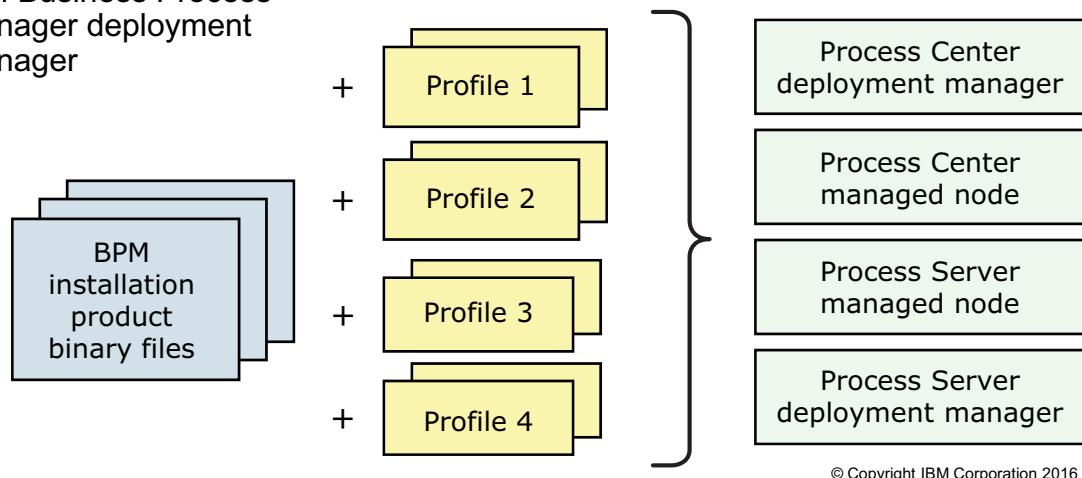
Each deployment manager or application server profile has its own first steps console. The command to start the first steps console is part of the profile. A prompt to start the first steps console that is associated with a profile is displayed on the last panel of the profile creation wizard.

The Process Server product installation is WebSphere Application Server Network Deployment with more features. Therefore, you can use a Process Server product installation to create all three profile types as well. You can use the IBM Process Server product installation to create Process Server runtimes in addition to WebSphere Application Server runtimes.

As Process Server also includes the WebSphere Enterprise Service Bus product, it is possible to create a WebSphere Enterprise Service Bus runtime with this product package. You do not create a WebSphere Enterprise Service Bus runtime in this course.

Profiles in network deployment

- Profiles represent the nodes
 - Multiple nodes can be installed on a single computer
 - Nodes can contain a single stand-alone application server
 - Nodes can be federated into a cell
- Each profile uses the same product files regardless of type:
 - IBM Business Process Manager managed node
 - IBM Business Process Manager deployment manager



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Figure 2-32. Profiles in network deployment

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Notes:

When a profile is created, the configuration details for the server are stored in a folder that is unique to the profile. You can think of the product files as the runtime component, and the profiles as the input for the runtime.



Creating profiles

- Use the Profile Management Tool (PMT):
 - From the Start menu (Windows only)
 - At the end of the installation wizard by using the IBM Installation Manager
 - The command-line tool `pmt.sh` found in
`<bpm_root>/bin/ProfileManagement`
 - From the First steps console
- PMT is available on 64-bit systems
 - Except on Solaris
- Manually using the `manageprofiles` command-line tool
 - Create profiles in silent mode by using `-silent` option
 - Location: `<bpm_root>/bin/manageProfiles.bat`

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Figure 2-33. Creating profiles

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Notes:

Profiles are created based on templates that are supplied with the product. Each template consists of a set of files that provide the initial settings for the profile and a list of actions to do after the profile is created. Currently, there is no support for modifying these templates or for creating templates that are based on existing application servers.

When creating a profile by using the command line tool, you must specify one of the following templates:

- DMgr (for deployment manager profiles)
- Managed (for custom nodes)

Profile creation by using the command line tool

- The `manageprofiles` script can:
 - Create a profile by using the command:
`manageprofiles -create -profileName -profilePath
-templatePath -cellName -hostname -nodeName`
 - List all profiles by using the command:
`manageprofiles -listProfiles`
 - Delete a profile by using the command:
`manageprofiles -delete -profileName`
- The `manageprofiles` script contains many more command parameters such as database host, database delay config, database user name, and password, and more

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Figure 2-34. Profile creation by using the command-line tool

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Notes:

The `manageprofiles` command line tool can be used as an alternative to the graphical profile creation wizard to create all runtime environments. The command creates profiles, which are the set of files that define the runtime environment for a deployment manager, a custom profile, or a stand-alone server profile. The command line tool can be used to create, delete, augment, unaugment, list, or validate profiles. It is in `<install root>\bin`.

Deleting a profile leaves a number of files behind, including the contents of the logs directory. If required, these files can be deleted manually.

The list of profiles and their properties can be found in the `<bpm_root>\properties\profileregistry.xml` file. More properties, such as log levels, can be found in the `wasprofile.properties` file in the `<bpm_root>\properties\` folder.

When you use the profile creation wizard, be sure to check the host name. The wizard might provide you with a fully qualified host name by default by adding the DNS suffix to the short name. This short name can cause problems if other profiles used only the short name. The form of the host name (short name or fully qualified name) is not important when the same form is used consistently.

For IBM Process Server profile creation, the profile template is:

<bpm_root>\profileTemplates\managed.wbiserver

For IBM Process Server Deployment Manager profile creation, the profile template is:

<bpm_root>\profileTemplates\dmgr.wbiserver



Enabling administrative security

- Administrative security is automatically configured during profile creation
- To enable global security, you must specify an ID for authenticating to the administrative tools:
 - User name
 - Password
- The administrative user is created in a repository within the Process Server or enterprise service bus
 - By default, a federated file-based repository is configured
- After installation finishes, you can add more:
 - Users
 - Groups
 - External user repositories (LDAP, database, custom)

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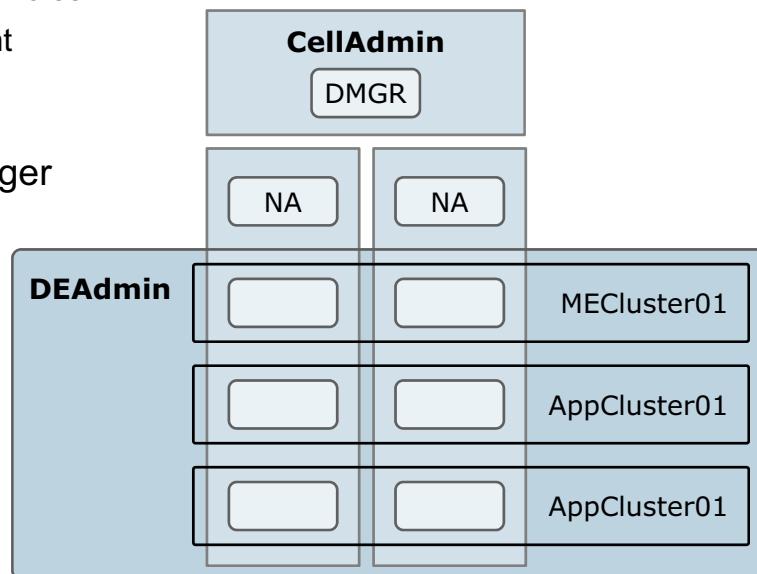
Figure 2-35. Enabling administrative security

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Notes:

Administrative users

- **CellAdmin** is the classic WebSphere administrator
 - WebSphere “primary admin”
 - Can assign admin security roles
 - Cell administrative account
- **DEAdmin** is the main Business Process Manager administrator
 - WebSphere “secondary admin”
 - Cannot assign admin security roles
 - Deployment environment administrative account



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Figure 2-36. Administrative users

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Notes:

Administrative users are as follows:

- CellAdmin: Make this user the primary user in WebSphere Application Server and to the groups defined as the admin and author groups in IBM Business Process Manager. The groups are either the tw_admins and tw_authors defaults, or if the groups are modified, they are defined by the bpmAdminGroup properties and bpmAuthorGroup.
- DEAdmin: Add the user to the administrator, deployer, and operator roles in WebSphere Application Server and to the groups defined as the admin and author groups in IBM Business Process Manager. The groups are either the tw_admins and tw_authors defaults, or if the groups are modified, they are defined by the bpmAdminGroup properties and bpmAuthorGroup.



First steps

WebSphere Application Server - First steps - DmgrProfile

WebSphere Application Server

First steps

- Installation verification**
Confirm that your server is installed and that it can start properly.
- Start the deployment manager**
Start the deployment manager and its applications.
- Administrative console**
Install and administer applications.
- WebSphere Customization Toolbox**
Launch this toolbox to access the Profile Management Tool and work with profiles, or to access the Migration Management Tool and migrate WebSphere Application Server 6.0, 6.1, 7.0 or 8.0 profiles to version 8.5.
- Information center for WebSphere Application Server**
Learn more about WebSphere Application Server and explore sample applications.
- IBM Education Assistant for WebSphere software**
Access multimedia content for WebSphere Application Server version 8.5 and other IBM software products.
- Exit**

- Postinstallation ease-of-use tool
- Windows: Run from Start menu or command line
- Can be used to verify the installation
- One per profile

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Figure 2-37. First steps

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Notes:



Installation verification

First steps

Installation verification
Confirm that your server is installed and that it can start properly.

Start the deployment manager

```

Server name is:dmgr
InsProfile name is:DmgrProfile
  Profile home is:/opt/IBM/WebSphere/AppServer/profiles/DmgrProfile
WeProfile type is:management
LaCell name is:bpmstdhostCell01
orNode name is:bpmstdhostCellManager01
SerCurrent encoding is:UTF-8
Start running the following command:/opt/IBM/WebSphere/AppServer/profiles/DmgrProfile/bin/startServer.sh dmgr -pro
Inf>ADMU0116I: Tool information is being logged in file
Lea  /opt/IBM/WebSphere/AppServer/profiles/DmgrProfile/logs/dmgr/startServer.log
IBN>ADMU0128I: Starting tool with the DmgrProfile profile
Ac>ADMU3100I: Reading configuration for server: dmgr
IBM>ADMU3200I: Server launched. Waiting for initialization status.
>ADMU3000I: Server dmgr open for e-business; process id is 15931
ExServer port number is:9060
IVTL0010I: Connecting to the bpmstdhost WebSphere Application Server on port: 9060
IVTL0015I: WebSphere Application Server bpmstdhost is running on port: 9060 for profile DmgrProfile
IVTL0035I: The Installation Verification Tool is scanning the /opt/IBM/WebSphere/AppServer/profiles/DmgrProfile/logs/d
[11/10/15 13:50:46:260 EST] 00000001 WSKeyStore  W CWPKI0041W: One or more key stores are using the default
  
```

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Figure 2-38. Installation verification

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Notes:

Use the installation verification tools to gain assurance that the product is successfully installed. IBM Process Server includes an installation verification tool.

The installation verification tool (IVT) tests deployment manager profiles and stand-alone server profiles to make sure that the server processes can start. The IVT program scans product log files for errors and verifies core functions of the product installation. Additionally, the IVT does a Health Monitor check and generates a report for stand-alone server profiles.



Administration options

- **Integrated Solutions Console:** Browser-based administration
 - Administrative security is enabled by default
 - Provides task filter mechanism for WebSphere Application Server, IBM Process Server, or user-defined tasks
 - Standard Java EE web application available at:
 http://<hostname>:9060/ibm/console
 https://<hostname>:9043/ibm/console
- **wsadmin:** Command line scripting environment
 - Administrative security is enabled by default
 - Jython or Jacl type scripts
 - Supports interactive or script execution modes
 - Available connection types: SOAP (default), RMI, NONE
 - Default scripting environment configuration that is stored in
`<profile_root>/properties/wsadmin.properties`

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Figure 2-39. Administration options

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Notes:

Process Server uses the same administrative model as WebSphere Application Server, which you can use to apply WebSphere administration skills directly to managing IBM Process Server.

The Integrated Solutions Console is a web application that provides a GUI for administering Process Server and Process Center. Before WebSphere Application Server V6.1, it was called the administrative console.

For wsadmin, Jacl is deprecated, even though it is the default scripting language (script extension `*.jac1`). Jython is the suggested scripting language (script extension `*.py`). To use the Jython scripting language, change the `defaultLang` parameter in the `wsadmin.properties` file, or use the `wsadmin` startup parameter `-lang jython`.

In the interactive mode, scripting commands are entered one at a time at the `wsadmin` command prompt. Script execution mode allows the administrator to run one or multiple scripts, such as scripts for configuring runtime resources and installing new applications simultaneously. As with changes in the Integrated Solutions Console, every configuration change must be saved in `wsadmin`. The save persists the changes to the master configuration.

A wsadmin.properties file in <profile_root>\properties\ specifies the default environment configuration for wsadmin. These settings might be explicitly overridden by applying optional startup parameters. The available startup parameters can be displayed by entering: wsadmin -help

Ant scripts and JMX-based applications provide further administrative options for IBM Process Server runtime configurations.



Profile deletion

- To properly delete a profile:
 - Use the `manageprofiles` command to delete a profile:
 - The command automatically unaugments the profile before deleting it
 - Manually delete the profile directory:
`<bpm_root>/profiles/<profile_name>`

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Figure 2-40. Profile deletion

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Notes:

You can use the `manageprofiles` command to delete a profile. If the command fails, you can use operating system commands to delete the profile.

If a node within a profile is federated to a deployment manager, before you delete the profile, stop the node and remove the node from the deployment manager. Otherwise, an orphan node is left in the deployment manager.

If you delete a profile that has augmenting templates that are registered to it in the profile registry, unaugment actions are attempted before the deletion.

You cannot delete a profile by using the Profile Management Tool.

2.2. Installation troubleshooting

Installation troubleshooting



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10.1

Figure 2-41. Installation troubleshooting

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Notes:

Verifying the product installation

- Determine current maintenance level

- Run the `versionInfo` command
- Examine the following file:

`<bpm_root>/properties/version/BPM.product`

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE product SYSTEM "product.dtd">
<product name="IBM Business Process Manager Standard">
  <id>BPMSTD</id>
  <version>8.5.6.0</version>
  <build-info
    date="3/4/15"
    level="20150304-164853"/>
</product>
```

- After interim fixes, fix packs, and refresh packs are installed:
 - Determine maintenance packages, use the command `versionInfo -maintenancePackages`
 - Generate various reports:

`historyInfo`, `genHistoryReport`, `genVersionReport`

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Figure 2-42. Verifying the product installation

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Notes:

The `historyInfo` command generates a report from data that is extracted from XML files in the `properties/version` folder and the `properties/version/history` folder. The report includes a list of changed components and a history of installed or uninstalled maintenance packages. The `historyInfo` tool displays important data about the product and its installed components, such as the build version and build date. History information for installation and removal of maintenance packages is also displayed in the report. This tool is useful when working with support personnel to determine the cause of any problem.

The `genHistoryReport` command generates the `historyReport.html` report file in the current working directory, which is usually the `bin` directory. The report includes a list of changed components and installed or uninstalled maintenance packages. The `genHistoryReport` script starts the `historyInfo` script, which specifies the correct parameters that are used to place the information that is generated into an HTML file in the current directory.

The `genVersionReport` command uses the `versionInfo` command to generate the `versionReport.html` report file in the current working directory, which is usually the `bin` directory. The report includes a list of changed components and installed or uninstalled maintenance packages. The `genVersionReport` script starts the `versionInfo` script, which specifies the correct

parameters that are used to place the information that is generated into an HTML file in the current working directory.



Verifying the installation

- Run the installation verification tool (IVT):
 - Run from the First Steps screen
 - Run from the command line by using `<profile_root>/bin/ivt` which requires server and profile names
 - Can be run against a *deployment manager profile* only
- After running IVT
 - Examine the IVT log file for error messages:
`<bpm_root>/profiles/<profile_name>/logs/ivtclient.log`
- Examine the output from the IVT and check the verification status for the following details:
 - Server starts successfully
 - Servlet engine
 - JavaServer Pages
 - Enterprise bean

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Figure 2-43. Verifying the installation

WB8211.0

Notes:

Run the installation verification test (IVT) tool to verify that the profile was created successfully.

Troubleshooting silent installations

- Check the response file option values that are provided
 - Verify the parameters in the script
 - Always use correct case with property names
 - Enclose values in double quotation marks
- Compare your response file to one included with the product:
 - <install_image>/responsefiles/BPM/
- Review error messages and examine log files
 - The <install_root>/logs/install/log.txt file records install details
- If the silent installation fails and no information is available in the installation logs, record entries for the events
 - <IM_install_root>/IBMIMc.sh -launcher.ini silent-install.ini -updateAll -log <log_path_and_name>

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Figure 2-44. Troubleshooting silent installations

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Notes:

If you are installing either the Standard or Advanced Process Server configurations of IBM Business Process Manager with Installation Manager, and you selected to install only the client, you might get the following warning message: The packages are installed with warnings. View Log file.

If you see this warning message after installing the client feature of Business Process Manager on a Windows system and only the client feature is selected, examine the logs.



Troubleshooting profiles

- Problems during profile creation
 - Examine the logs directory: `<bpm_root>/logs/manageprofiles/*`
- Problems during augmenting a profile
 - Examine
`<bpm_root>/logs/manageprofiles/`
`<profile_name>_augment_error.log`

A number of log files are created for each profile:

- First-failure data capture (FFDC) log and exception files that are common to all profile types
 - In `<profile_root>/logs/ffdc`
- Profile-specific logs
 - `SystemOut.log`
 - `SystemErr.log`
 - `startServer.log`
 - `stopServer.log`

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Figure 2-45. Troubleshooting profiles

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Notes:

Various log files are created during installation and uninstallation of IBM Business Process Manager and during profile creation, augmentation, and deletion. If problems occur during these procedures, consult the applicable logs.



Unit summary

Having completed this unit, you should be able to:

- List and describe the hardware and software prerequisites for IBM Business Process Manager Standard
- Install IBM Business Process Manager Standard by using the launchpad
- Install IBM Business Process Manager silently
- Create profiles by using the Profile Management Tool and the manageProfiles command
- Verify product installation and profile creation
- Troubleshoot a failed installation and a failed profile creation
- Uninstall IBM Business Process Manager Standard

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Figure 2-46. Unit summary

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Notes:



Checkpoint questions

1. True or false: The IBM Installation Manager is used to install updates to the underlying WebSphere Application Server Network Deployment installation.
2. Which log file is used to verify that the installation was successful?
 - A. SystemOut.log
 - B. log.txt
 - C. responsefile.log
 - D. startServer.log
3. True or false: To uninstall the IBM Installation Manager, you must uninstall all packages that the Installation Manager installed.

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Figure 2-47. Checkpoint questions

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Notes:

Write your answers here:

- 1.
- 2.
- 3.



Checkpoint answers

1. True
2. B. log.txt
3. True

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Figure 2-48. Checkpoint answers

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Notes:

Unit 3. IBM Business Process Manager Standard architecture overview

What this unit is about

This unit provides a technical overview of IBM Business Process Manager Advanced architecture.

What you should be able to do

After completing this unit, you should be able to:

- Define network deployment concepts and terminology
- Define clusters and cluster members
- Define administrative flow

How you will check your progress

- Checkpoint questions
- Lab exercises

References

IBM Business Process Manager V8.5.6 documentation in the IBM Knowledge Center:

http://www.ibm.com/support/knowledgecenter/SSFPJS_8.5.6/com.ibm.wbpm.main.doc/kc-homepage-bpm.html

Unit objectives

After completing this unit, you should be able to:

- Define network deployment concepts and terminology
- Define clusters and cluster members
- Define administrative flow

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Figure 3-1. Unit objectives

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Notes:



Topics

- Network Deployment concepts and terminology
- Clusters
- Network Deployment administration
- More concepts

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Figure 3-2. Topics

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Notes:

3.1. Network deployment concepts and terminology

Network deployment concepts and terminology



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10.1

Figure 3-3. Network deployment concepts and terminology

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Notes:

WebSphere architecture runtime

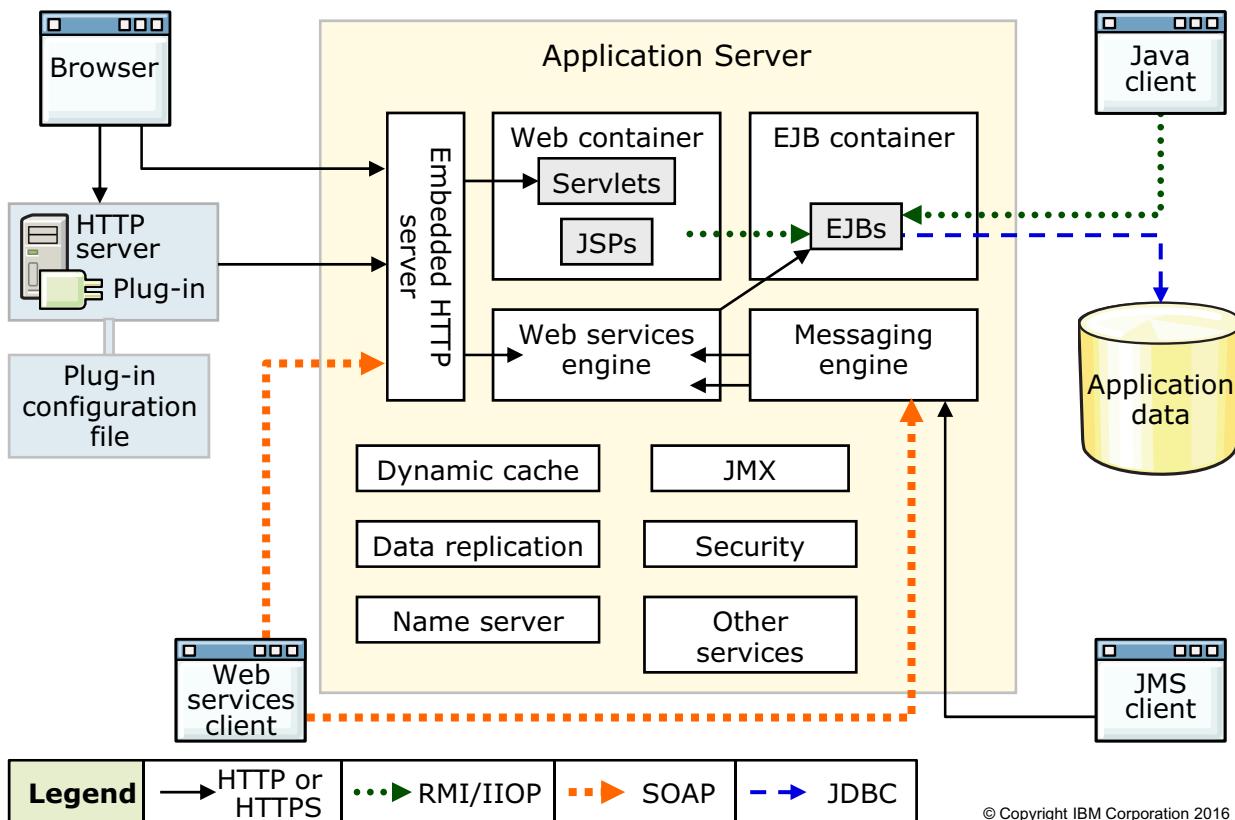


Figure 3-4. WebSphere architecture runtime

WB8211.0

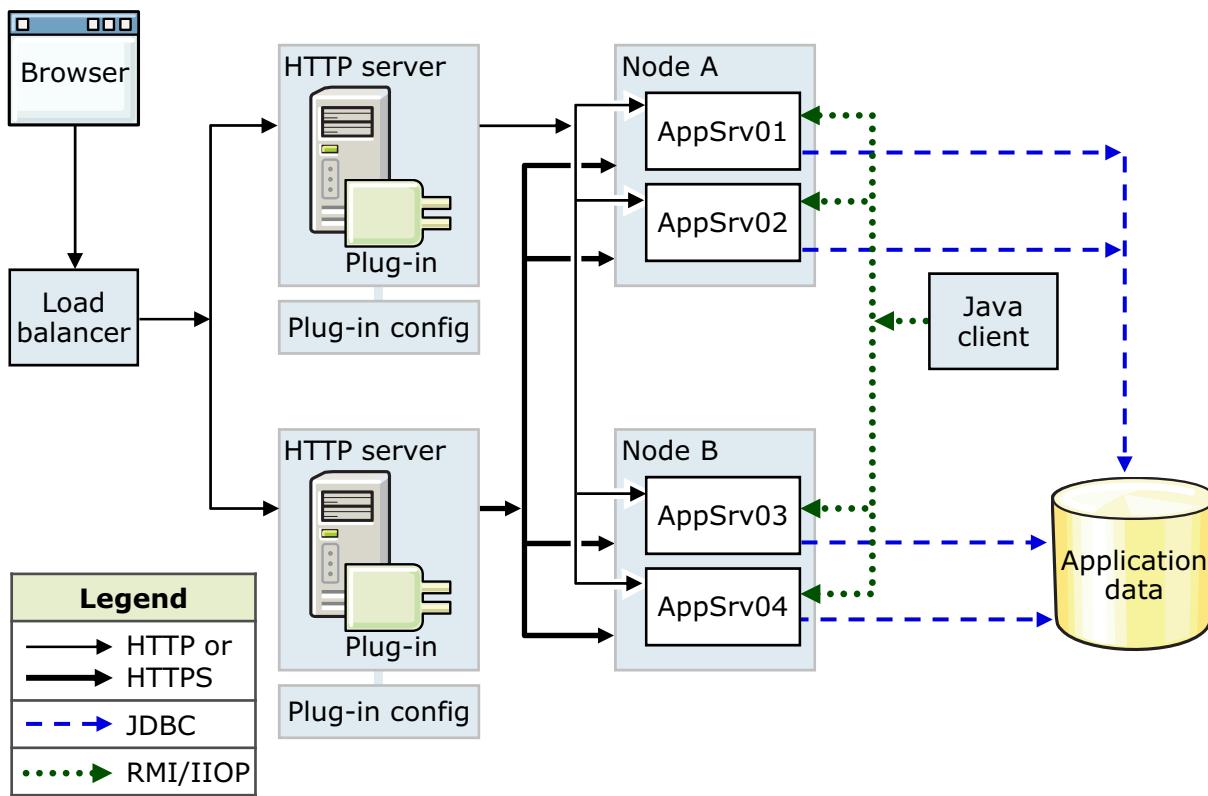
Notes:

This diagram illustrates the basic architecture of WebSphere Application Server, including several of the larger components.

The browser is the main interaction mechanism for users. A browser communicates with a web server (HTTP server). Requests are forwarded from the HTTP server plug-in that is loaded with the HTTP server to the embedded HTTP server within the application server. The embedded server forwards the request to the web container to either a servlet or a JSP page. If the servlets or JSP files must access distributed business logic or a database, the Java EE mechanism is through EJB files within the EJB container. EJB files (entity in this case) can communicate with the database to store, retrieve, query, and delete data. JDBC is one way that this communication can occur.

The browser can communicate directly with the embedded HTTP server (bypassing the external web server); this configuration is only for testing and development purposes. Browsers are not the only clients; a pure Java client can access EJB files directly through RMI/IOP. Web service clients can also access the application server, either through SOAP over HTTP and passing through the embedded HTTP server, or through direct communication with the messaging engine within the application server. JMS clients can directly communicate with the messaging engine.

Network deployment runtime flow



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Figure 3-5. Network deployment runtime flow

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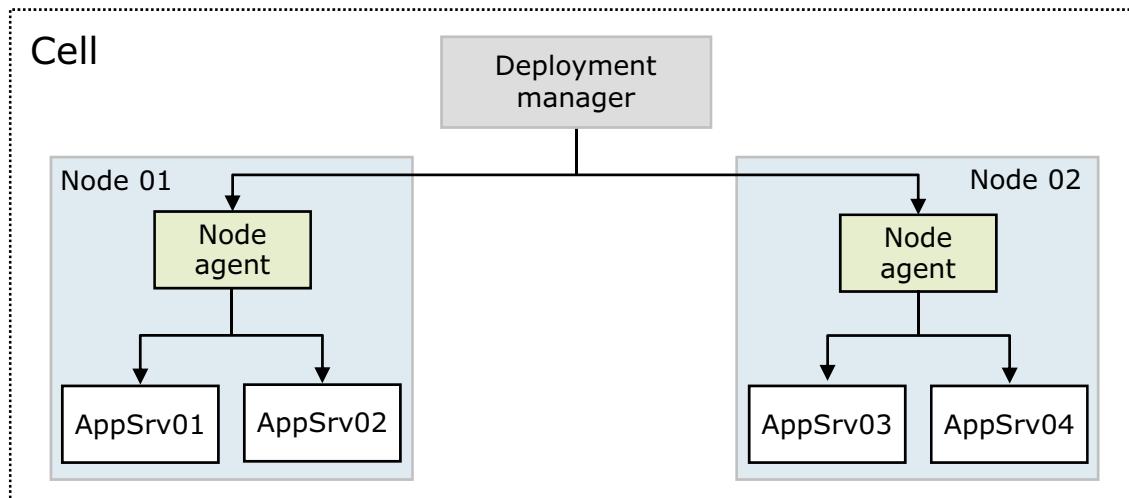
Notes:

The main theme with network deployment is distributed applications. While the “flow” of an application remains the same, it offers significant additions to the runtime of an application. Note the “load balancer”: this configuration allows for multiple HTTP servers. Users point their browsers to the load balancer, and their requests are workload managed to an HTTP server. When a request reaches one of the HTTP servers, the HTTP server plug-in load balances the requests between the application servers that it is configured to serve. After a request enters the application server, the flow is identical to how it was in Express and Base.

The Java client requests to EJB files can also be workload-managed so that the requests do not all go to one application server.

WebSphere cells

- A WebSphere cell defines an administrative domain
 - Available in WebSphere Application Server Network Deployment
 - A deployment manager provides centralized administration for entire cell
 - Nodes run application components in application servers



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Figure 3-6. WebSphere cells

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Notes:

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), which are administered from a single point that is called the deployment manager.

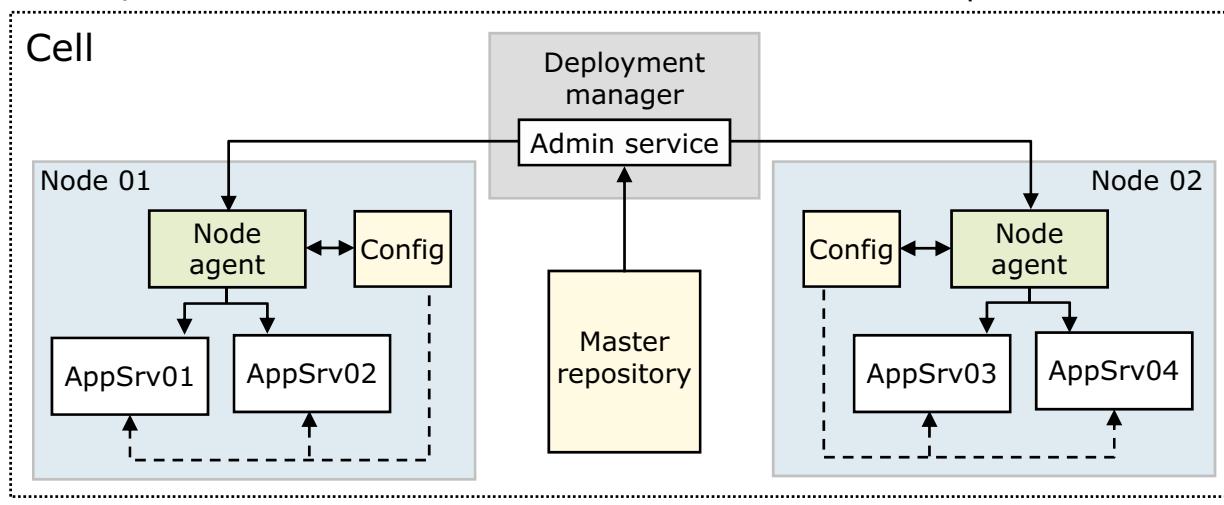
Network deployment concepts (1 of 2)

- **Deployment manager (dmgr)**

- Manages the node agents
- Holds the configuration repository for the entire management domain, called a **cell**
- Administrative service runs inside the dmgr
- The deployment manager is defined within a profile

- **Node**

- Logical grouping of servers
- A single **node agent** process manages the node
- Each node is defined within a profile



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Figure 3-7. Network deployment concepts (1 of 2)

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Notes:

WebSphere Network Deployment-based products use several logical components that slot together to form highly configurable and scalable application server environments.

- **Deployment manager:** The deployment manager is the central administration point of a cell that consists of multiple nodes in a distributed server configuration. The deployment manager communicates with the node agent to manage the application servers within one node.
- **Nodes:** A WebSphere node is a managed container for one or more application servers. Typically, a single node corresponds to a single server. A node comprises a node agent, by which the node is controlled, and the application servers that are hosted on that node.

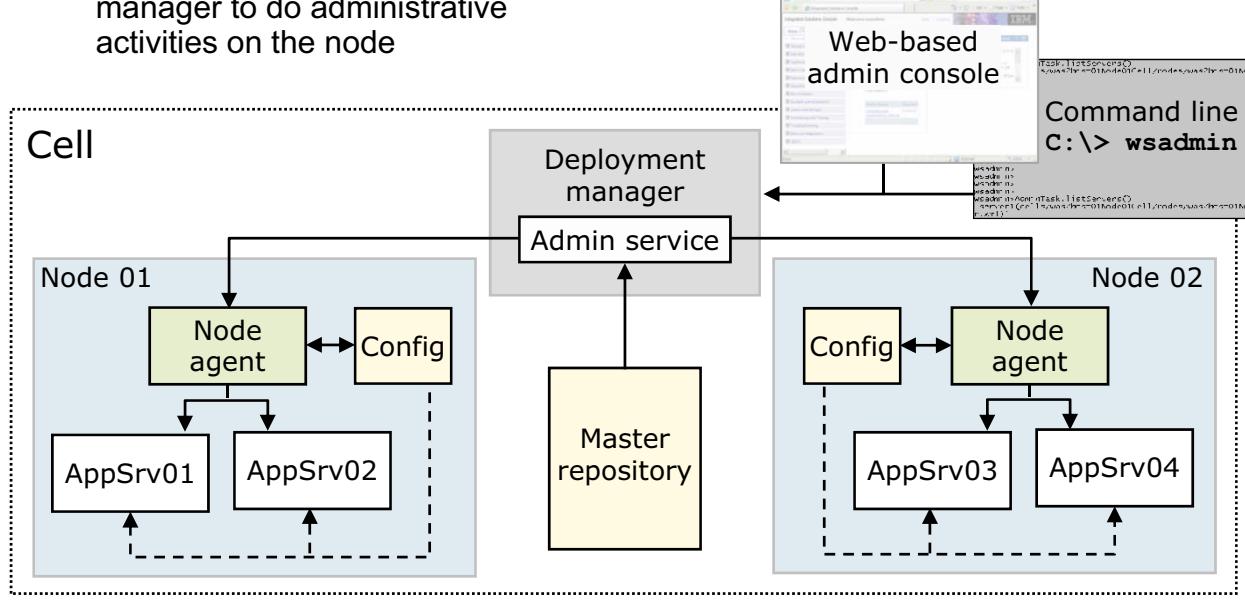
Network deployment concepts (2 of 2)

- **Node agent**

- Created and installed when a node is federated into a cell
- Works with the deployment manager to do administrative activities on the node

- **Administrative tools**

- Browser-based administrative console
- Command line, scripting, automation



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Figure 3-8. Network deployment concepts (2 of 2)

WB8211.0

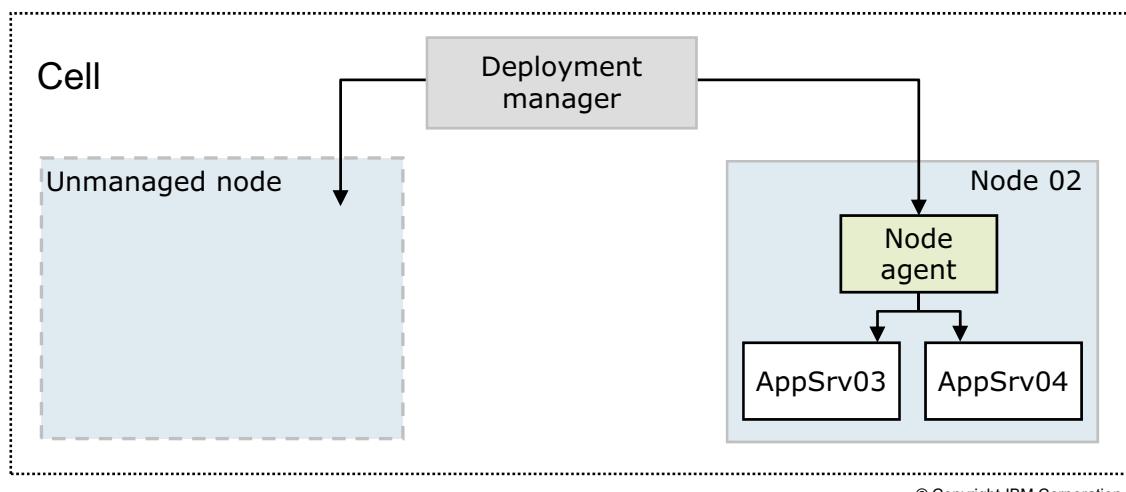
Notes:

Node agents: The WebSphere node agent is an architectural component by which the deployment manager for the cell can remotely manage the node, its application servers, and their applications.

Administrative tools: The deployment manager runs a single-application, web-based configuration front end, which is known as the administrative console, through which you can do nearly all management tasks. The wsadmin command line tool allows scripting and automation of management tasks.

Managed versus unmanaged nodes

- A managed node is a node that contains a node agent
- An unmanaged node is a node in the cell without a node agent
 - Enables the rest of the environment to be aware of the node
 - Useful for defining HTTP servers as part of the topology
 - Enables creation of different plug-in configurations for different HTTP servers



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Figure 3-9. Managed versus unmanaged nodes

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Notes:

A managed node is a node with an application server and a node agent that belongs to a deployment manager cell. An unmanaged node does not have a node agent or an administrative agent to manage its servers.

If you create custom web clients for your business process applications or for your human task applications, you need one or more web servers to handle HTTP client requests. You also need a web server to handle client requests from the included clients, such as Process Portal and Process Admin.

Typically, in large-scale deployments, you would create an entire tier of web servers that are reachable through a load balancer to provide HTTP workload management. This tier of web servers can contain your static HTTP content and can spray workload requests to your Process Server application cluster by using the HTTP plug-in.

The IBM HTTP Server plug-in is required for your HTTP server to direct client requests to the servers in your application cluster and your support cluster. The weighted workload capacity of the application server is used to distribute client requests to application servers. By default, all cluster members have a weighted workload capacity of two, which causes the plug-in to distribute requests in a round-robin fashion to each of the cluster members.

In order for the plug-in to correctly identify which applications are running in which cluster, the mapping of applications to server instances is recorded in the plug-in. The mapping is recorded when you generate the plug-in file at the deployment manager.

The Web Server Plug-ins Configuration Tool (PCT) is available for configuring web server plug-ins. The PCT creates one or more configurations for the web server plug-ins that can direct requests from a web client through the web server. The PCT edits the configuration file or files for a web server by creating directives that point to the location of the binary plug-in module and the plug-in configuration file.

3.2. Clusters

Clusters



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10.1

Figure 3-10. Clusters

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Notes:

Clusters and cluster members

- Creating more throughput within a cell cannot be done by installing one application on multiple application servers
 - Creates conflicts with the name space
 - Cluster members are created from templates
- Clusters allow for the same application server template to have multiple copies in a cell
 - Single point of management
 - Automatic workload management and failover
- Clusters are a set of application servers that have the same applications that are installed and grouped logically for workload management
- Applications that are installed to the cluster are automatically propagated to the cluster members

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Figure 3-11. Clusters and cluster members

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Notes:

Clustering is a key technique that you can use to improve the availability and the scalability of an IBM Process Server environment. With clustering, you can:

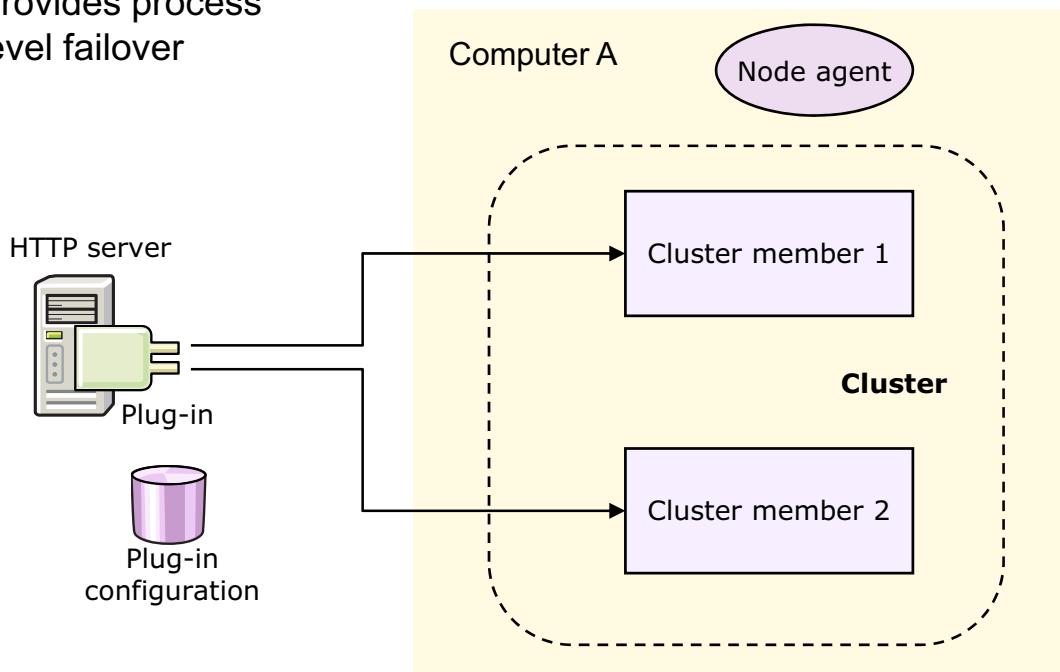
- Increase system availability by providing redundant JVM processes or hardware components that can ensure some level of continuity of service in case of failures
- Provide a mechanism to accommodate more workload scalability by making available more processes and systems to run transactions

You can think of a cluster as a group of servers that work together, but are displayed as one server to the outside world.

The concepts of failover and scalability are largely independent. You might find that a topology that ensures scalability might not be good at ensuring availability, and vice versa. With WebSphere, you can use clustering techniques in many different ways to address availability and scalability. You can do two types of clustering: vertical clustering and horizontal clustering.

Configurations: Vertical scaling

- Can provide better performance with multiple processors
- Provides process level failover



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Figure 3-12. Configurations: Vertical scaling

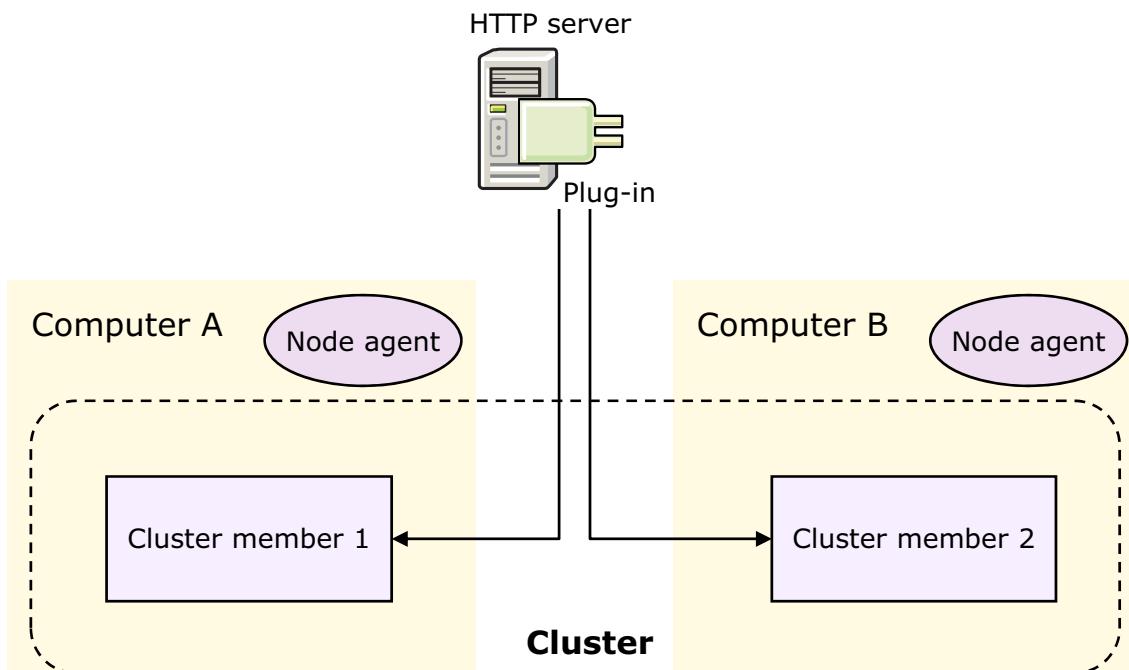
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Notes:

Clustering with vertical cluster members is the practice of defining cluster members of an application server on the same physical server. Experience shows that when a single JVM process implements a single memory server, then the application server cannot always fully use the processor power and RAM of a large multiprocessor server. Clustering with vertical cluster members provides a straightforward mechanism to create multiple JVM processes that together can fully use all of the processing power and memory available. However, if the hardware that is hosting the cluster fails, vertical clusters do not provide resiliency.

Configurations: Horizontal scaling

- Supports failover



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Figure 3-13. Configurations: Horizontal scaling

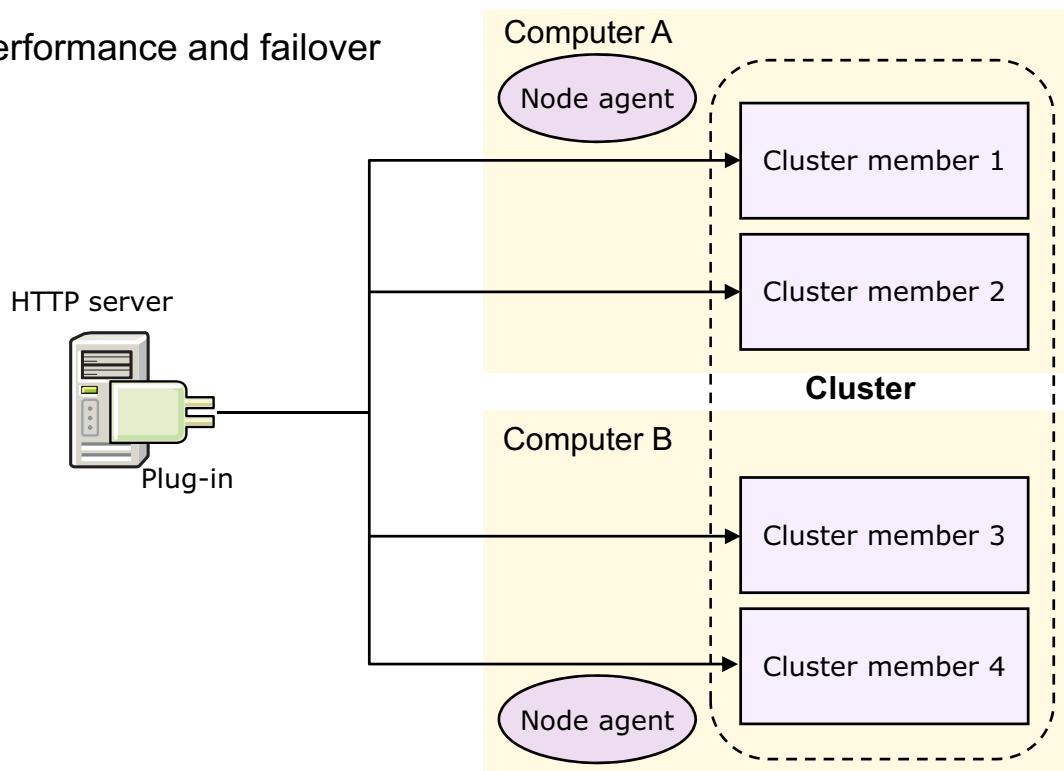
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Notes:

Clustering with horizontal cluster members is the traditional practice of defining cluster members of an application server on multiple physical computers, allowing a single application to span several computers while presenting a single system image. Clustering with horizontal cluster members can provide increased throughput and high availability. If one piece of hardware fails, other pieces of hardware with active servers in the cluster can pick up the load, so no outage occurs.

Configurations: Vertical and horizontal scaling

- Performance and failover



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Figure 3-14. Configurations: Vertical and horizontal scaling

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Notes:

Scaling both vertically and horizontally combines both system and process level failover.

3.3. Network Deployment administration

Network Deployment administration



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Figure 3-15. Network Deployment administration

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Notes:

Network deployment administration flow

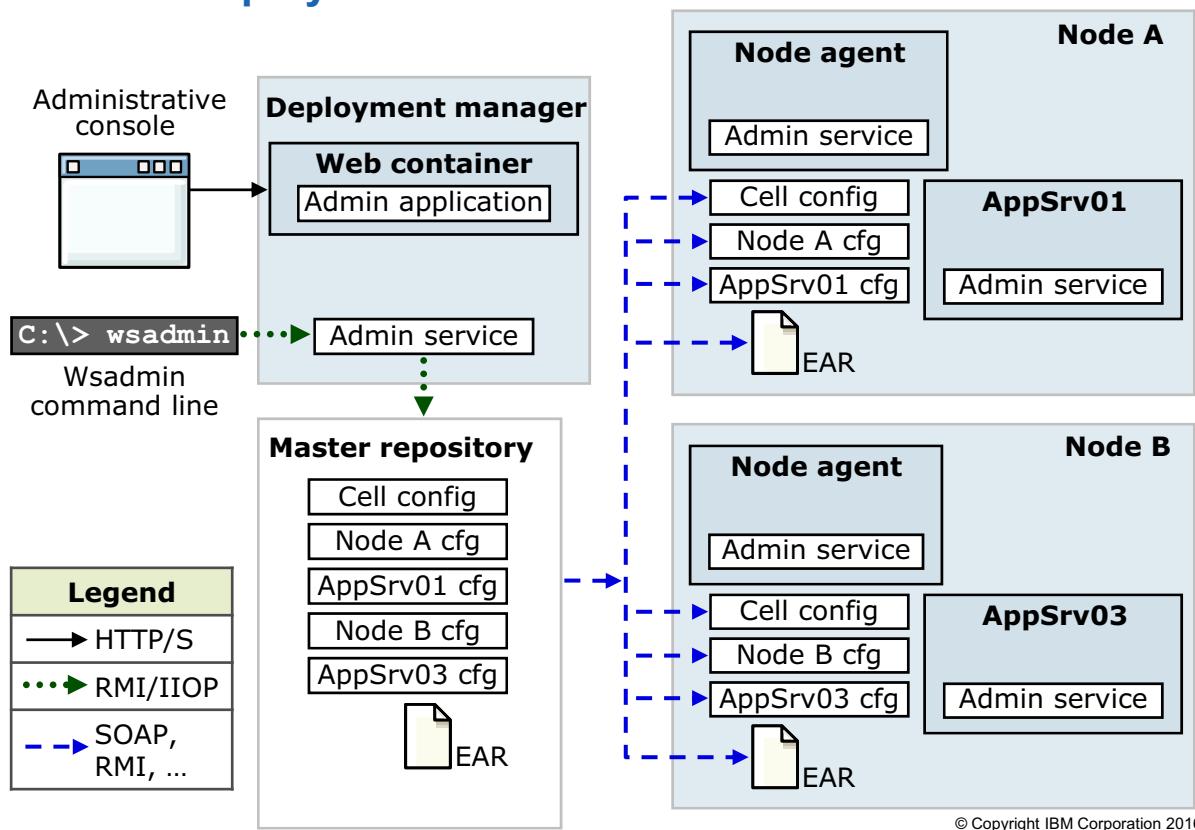


Figure 3-16. Network deployment administration flow

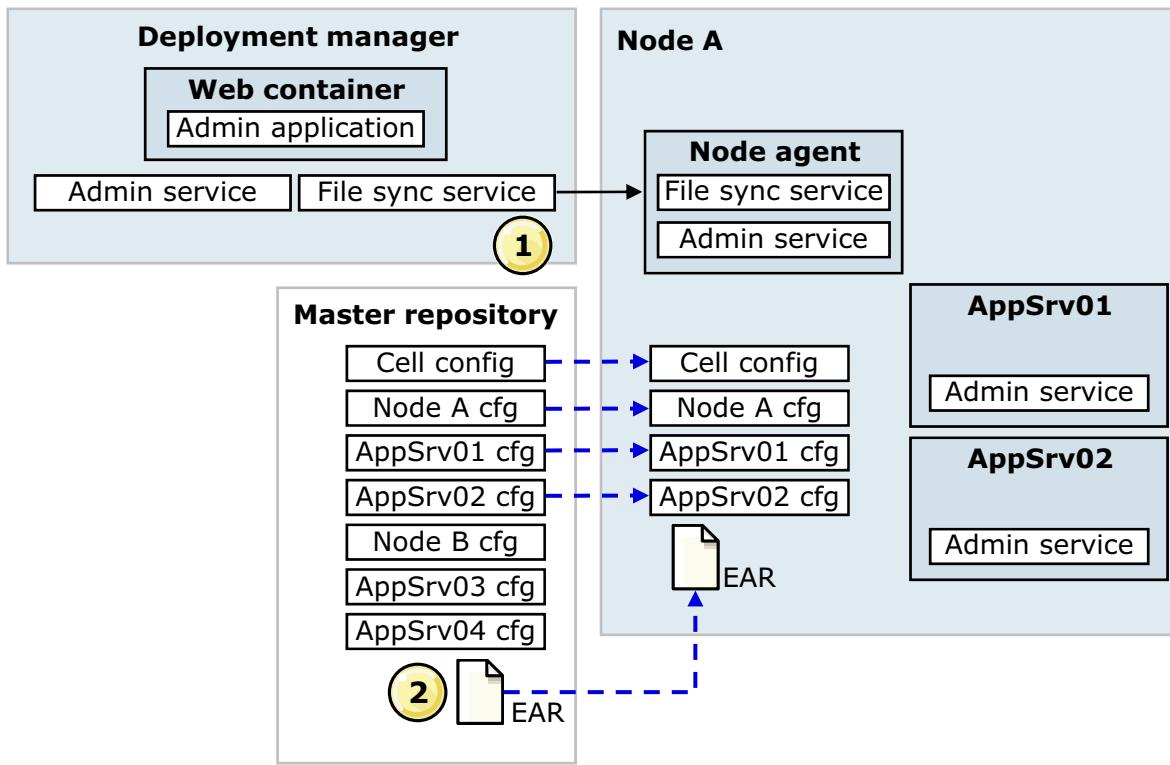
WB8211.0

Notes:

The administrative console and wsadmin are the two ways that the environment is administered. However, these tools communicate with the deployment manager and not with the application servers directly. The communication of these commands flows from the tools to the deployment manager and then to the node agents. Finally, it flows to the application servers. This flow allows for the administration of multiple nodes from a single focal point (the deployment manager). Each node can contain multiple application servers.

A cell contains one main (master) repository for the configuration files, and those files are associated with the deployment manager. All updates to the configuration files go through the deployment manager. You must be careful about directly connecting to an application server with wsadmin or the administrative console. Any changes that are made to the configuration files are only temporary and are overwritten with the configuration files from the master files (repository).

File synchronization



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Figure 3-17. File synchronization

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Notes:

Each managed process, node agent, and deployment manager starts with its own set of configuration files. The deployment manager contains the master configuration. Any changes that are made at the node agent or server level are local and overridden by the master configuration at the next synchronization (update).

Node agents synchronize their files with the master copy either automatically or manually. Automatic synchronization can be done at startup or scheduled periodically. Manual synchronization is done with the administrative console or from the command line.

During synchronization, the node agent asks for changes to the master configuration. Any new or updated files are copied to the node.

3.4. Additional concepts

Additional concepts



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Figure 3-18. Additional concepts

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Notes:

Flexible management

- Loose management coupling
- Coordinates management across a group of endpoints
 - One job to install application across a number of nodes
- Can manage through administrative agent or deployment manager

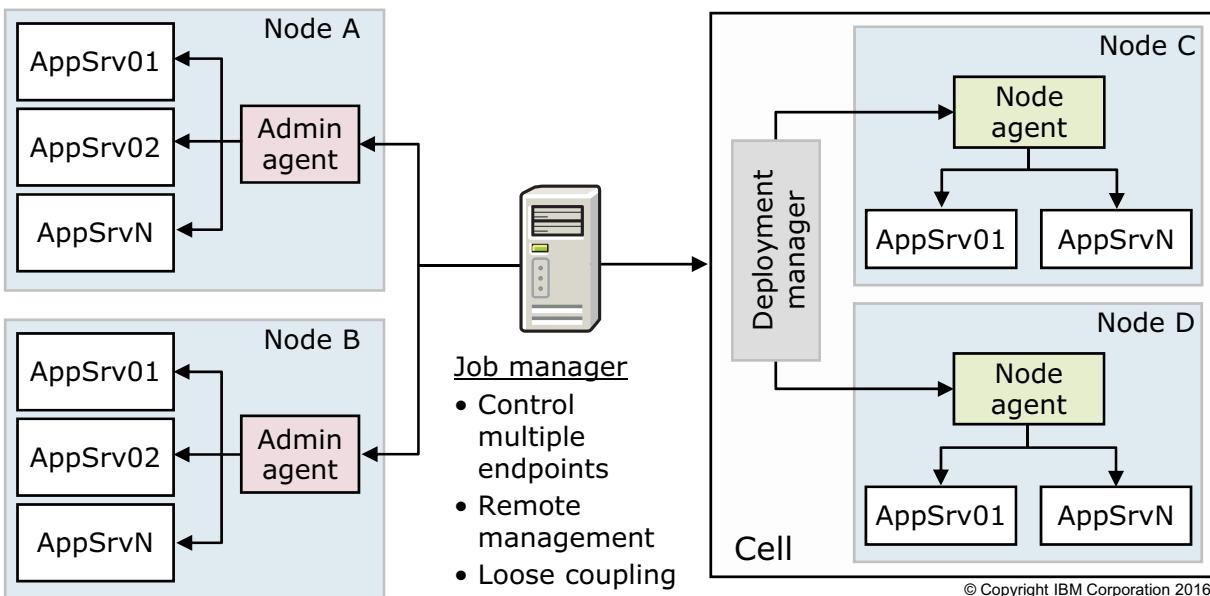


Figure 3-19. Flexible management

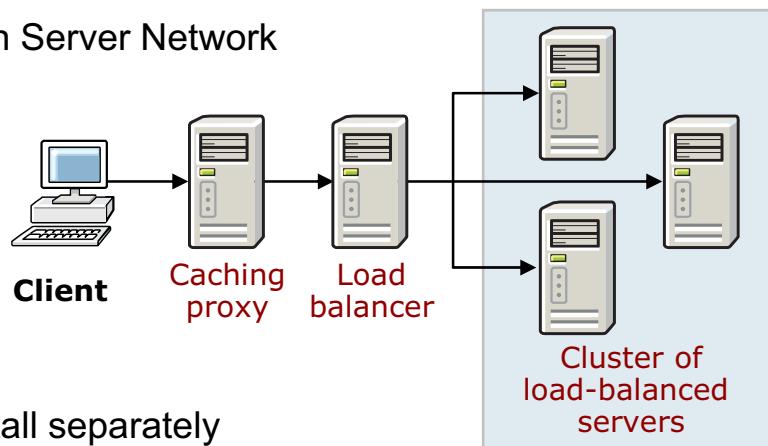
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Notes:

Flexible management is an approach that allows an administrator to manage multiple application servers or cells through a loose asynchronous interface. Flexible management is covered later in this course.

Edge Components

- WebSphere Application Server Network Deployment package contains the following Edge Components functions:
 - Load balancer
 - Caching proxy
- Edge Components install separately from WebSphere Application Server
- Load balancer is responsible for balancing the load across multiple servers that can be within either local area networks or wide area networks
- Purpose of caching proxy is to reduce network congestion within an enterprise by offloading security and content delivery from web servers and application servers



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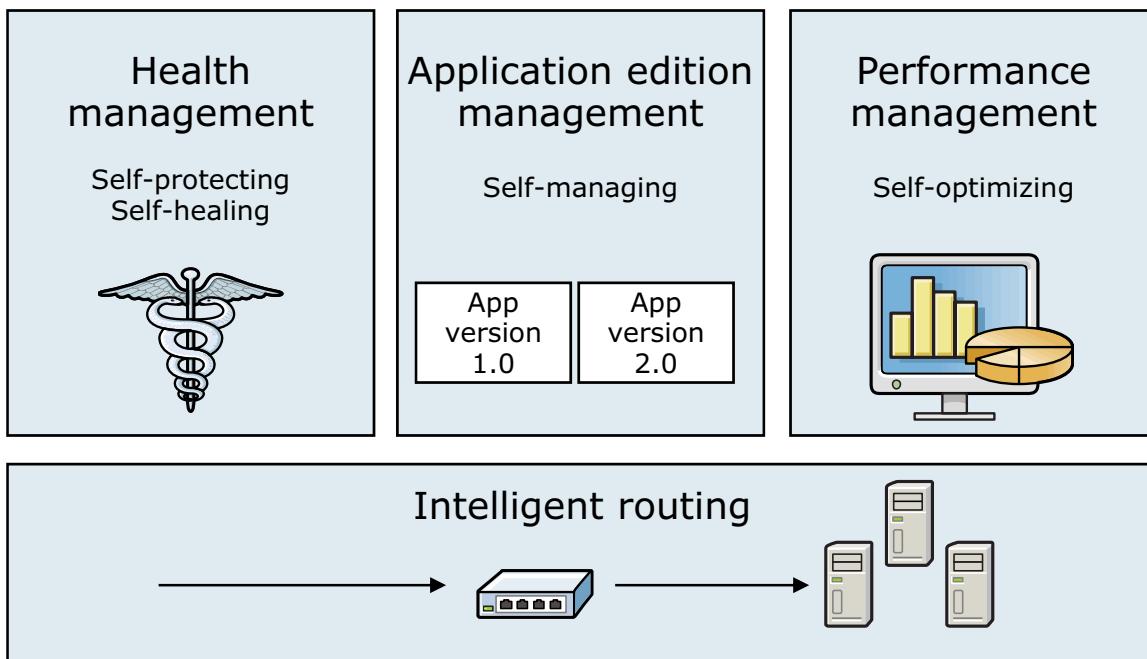
Figure 3-20. Edge Components

WB8211.0

Notes:

Edge Components are included the Network Deployment package. The Edge Components include a load balancer and a caching proxy. The load balancer distributes incoming client requests across servers, balancing workload and providing high availability by routing around servers that are not available. The caching proxy can satisfy subsequent requests for the same content by delivering it directly from the local cache, which is much quicker than retrieving it again from the content host. Cacheable content includes static web pages and JSP files with dynamically generated but infrequently changed fragments.

Intelligent Management Pack



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Figure 3-21. Intelligent Management Pack

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Notes:

Intelligent Management provides a virtualized infrastructure that redefines the traditional concepts of Java Platform, Enterprise Edition (Java EE) resources and applications and their relationships with one another. This application infrastructure virtualization facilitates the product's ability to automate operations in an optimal manner, increasing the quality of service. By introducing an automated operating environment with workload management, you can reduce total cost of ownership by doing more work with less hardware.

Unit summary

Having completed this unit, you should be able to:

- Define network deployment concepts and terminology
- Define clusters and cluster members
- Define administrative flow

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Figure 3-22. Unit summary

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Notes:

Checkpoint questions

1. Which managed processes can be part of a cell?
 - A. Deployment manager
 - B. Node agent
 - C. Load balancer
 - D. Application server
2. Which of the following list provides an environment for running servlets?
 - A. Client module
 - B. Web container
 - C. EJB module
3. What is the default protocol type for wsadmin?
 - A. SOAP
 - B. RMI
 - C. None

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Figure 3-23. Checkpoint questions

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Notes:

Write your answers here:

- 1.
- 2.
- 3.



Checkpoint answers

1. A. Deployment manager
- B. Node agent
- C. Application server

2. B. Web container

3. A. SOAP

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Figure 3-24. Checkpoint answers

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Notes:

Exercise 1



Installing IBM Business Process Manager Standard

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Figure 3-25. Exercise 1

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Notes:



Exercise objectives

After completing this exercise, you should be able to:

- Use a response file to install IBM Business Process Manager Standard and its base products
- Verify the installation

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Figure 3-26. Exercise objectives

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Notes:

Exercise 2

Installing the IBM HTTP Server

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Figure 3-27. Exercise 2

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Notes:



Exercise objectives

After completing this exercise, you should be able to:

- Install and configure the IBM HTTP Server
- Install and configure the web server plug-ins
- Install the WebSphere Customization Toolbox
- Verify the installation

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Figure 3-28. Exercise objectives

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Notes:

Unit 4. IBM Business Process Manager deployment topologies

What this unit is about

This unit provides an overview of the IBM Business Process Manager Advanced deployment topologies and deployment environment creation.

What you should be able to do

After completing this unit, you should be able to:

- Explain the purpose of a deployment environment
- Identify and explain the clustered topologies for IBM Business Process Manager Standard
- Explain the benefits of a federation server
- Explain how to create a deployment environment with multiple tools
- Explain how to create a deployment environment with the BPMConfig command
- Create a backup of an initial configuration
- Clone a deployment environment

How you will check your progress

- Checkpoint questions
- Lab exercise

References

IBM Business Process Manager V8.5.6 documentation in the IBM Knowledge Center:

http://www.ibm.com/support/knowledgecenter/SSFPJS_8.5.6/com.ibm.wbpm.main.doc/kc-homepage-bpm.html

Unit objectives

After completing this unit, you should be able to:

- Explain the purpose of a deployment environment
- Identify and explain the clustered topologies for IBM Business Process Manager Standard
- Explain the benefits of a federation server
- Explain how to create a deployment environment with multiple tools
- Explain how to create a deployment environment with the BPMConfig command
- Create a backup of an initial configuration
- Clone a deployment environment

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Figure 4-1. Unit objectives

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Notes:



Topics

- Overview of deployment environment topologies
- Process federation
- Messaging concepts
- Single cluster topology
- Application, remote messaging, and remote support topology
- Creating a deployment environment with multiple tools
- Creating a deployment environment with the BPMConfig command

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Figure 4-2. Topics

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Notes:

4.1. Overview of deployment environment topologies

Overview of deployment environment topologies



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Figure 4-3. Overview of deployment environment topologies

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Notes:

Deployment environment patterns

- A topology is the physical layout of the deployment environment that is required to meet your business needs for capacity, availability, and scalability
 - A network deployment environment can have many topologies
 - Can be created from several standard topology patterns
- Two IBM-supplied patterns from which to choose

Select a cluster pattern for the deployment environment.

Select	Deployment Environment Pattern	Description
<input checked="" type="radio"/>	Application, Remote Messaging, and Remote Support	Defines one cluster for application deployment, one remote cluster for the messaging infrastructure, and one remote cluster for the supporting applications
<input type="radio"/>	Single Cluster	Defines one application deployment target cluster, which includes the messaging infrastructure and supporting applications

Next | **Cancel**

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Figure 4-4. Deployment environment patterns

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Notes:

A deployment environment topology pattern specifies the constraints and requirements of the components and resources that are involved in a deployment environment. IBM supplies topology patterns for each topology layout. These topology patterns provide rules and guidelines for component interaction that are characteristic of the most commonly used BPM topology patterns. The IBM-supplied topology patterns are based on well-known and tested configuration scenarios. They contain a repeatable and automated method of creating a deployment environment.

Selecting a topology

- Selecting a topology depends on a number of factors, including:
 - Available hardware resources and operating system
 - Types of business processes that you plan to implement
 - Resource requirements and constraints
 - Scalability requirements
 - Administrative effort that is involved
 - Proof-of-concept (POC), testing, demonstration, or a fully functional production environment
- Consider the advantages and disadvantages of each topology pattern
 - Application, remote messaging, and remote support is the preferred pattern for IBM Business Process Manager Standard
- The design characteristics of each topology are captured as *topology patterns* that are supplied as configuration templates with the product

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Figure 4-5. Selecting a topology

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Notes:

A topology is the physical layout of the deployment environment. You can create the topology that best addresses your business needs by choosing an IBM-provided pattern or by creating your own customized pattern.

Selecting an appropriate topology for your deployment environment depends upon several factors. When you select a topology pattern, consider these factors:

- Available hardware resources
- Application invocation patterns
- Types of business processes that you plan to implement (interruptible versus non-interruptible)
- Individual scalability requirements
- Administrative effort that is involved

The IBM-supplied topologies can be applied to both Process Server and Process Center topologies. Therefore, Process Center and Process Server network deployment environments can be organized in a similar way.

The procedures for creating environments for Process Server and Process Center that are based on IBM-supplied topologies are also similar. The only difference that is related to IBM-supplied patterns is the suggested patterns for a production environment, and the components that are configured on the clusters for those patterns.

Deployment environment requirements

- For a network deployment environment, you need the following required databases:
 - The Common database (CMNDB)
 - The Process database (BPMDB)
 - The Business Performance Data Warehouse database (PDWDB)
- Understanding the function that each cluster can provide in an IBM-supplied topology pattern
- The number of clusters in your deployment environment depends on the topology pattern that you are using
 - Application deployment target
 - Support infrastructure
 - Messaging engine infrastructure
- A deployment environment administrative user (DeAdmin)

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Figure 4-6. Deployment environment requirements

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Notes:

Before you plan your deployment environment, finish the following tasks:

- Choose a database type.
- Identify available resources.
- Identify necessary security authorizations.

Application deployment target: An application deployment target is the set of servers (cluster) to which you install your applications (for example, human tasks, business processes, and mediations). Depending on which deployment environment topology pattern you choose, the application deployment target might also provide messaging infrastructure and supporting infrastructure functions. Select the appropriate product, which depends on the type of applications that you intend to deploy. In a single cluster topology pattern, the application deployment target provides the entire functions of the deployment environment.

Supporting infrastructure: The supporting infrastructure includes the following services. These services include business rules, selectors, human tasks, and business processes. The business rules are not tied to the supporting infrastructure cluster. In fact, business rules can exist and work everywhere in the cell. The business rules administrative function (from the business rules

manager) can be deployed on the supporting infrastructure cluster (in a three cluster configuration). The same principle applies to the human tasks and business processes. The human tasks and business processes that run on the application deployment target cluster because that is where the human task and business process containers are configured. However, you administer processes and tasks from the Business Process Choreographer Explorer, which can run on the supporting infrastructure cluster (in a three cluster configuration).

Messaging engine infrastructure: The messaging infrastructure is the set of servers (cluster) where the messaging engines are located. The messaging infrastructure is used to provide asynchronous messaging support for your applications and for the internal messaging needs of the IBM Business Process Manager components. The messaging engines enable communication among the nodes in the deployment environment.

Deployment environment types (1 of 2)

- After product installation, you can create a network deployment configuration that is based on the topology pattern templates that are packaged with the software
- The following template types are included:
 - Standard Process Center deployment environment
 - Standard Process Server deployment environment
- Various methods to create deployment environments
 - Multiple tools to create profiles and deployment environment
 - BPMConfig command

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Figure 4-7. Deployment environment types (1 of 2)

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Notes:

Setting up a network deployment environment involves many decisions, such as the number of physical workstations and the type of pattern you choose. Each decision affects how you set up your deployment environment. When you plan the layout of interconnected servers, you must decide. These decisions influence trade-offs that you make between the available hardware and physical connections, the complexity of the management and configuration and requirements such as performance, availability, scalability, isolation, security, and stability.

You can configure a standardized network deployment environment that is based on a topology pattern template included with the software, and you can implement it using the BPMConfig command or the Deployment Environment wizard.



Deployment environment types (2 of 2)

- Standard Process Center deployment environment
 - Run and administer process applications and toolkits that are developed in Process Designer
- Standard Process Server deployment environment
 - Run processes that are deployed from Process Center
- Multiple deployment environments per cell are supported
 - For Process Server deployment environments only

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Figure 4-8. Deployment environment types (2 of 2)

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Notes:

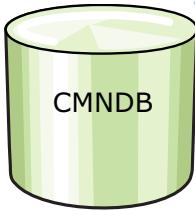
The following options are available based on your installation:

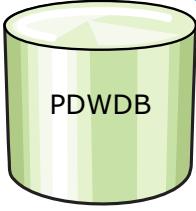
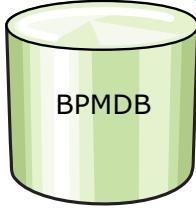
For IBM Business Process Manager Standard

Standard Process Center: For storing, testing, and administering process applications and toolkits that are authored in Process Designer.

Standard Process Server: For running processes, and services that are contained in process applications that are deployed from the Standard Process Center.

Required databases for a topology

- Schema: SharedDB
 - Components: Messaging, Failed Event Manager, and Business Space

- Schema: PerformanceDB
 - Components: Business Performance Data Warehouse
- Schema: ProcessServerDB
 - Components: Process Server and EmbeddedECM

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Figure 4-9. Required databases for a topology

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Notes:

The Process Server and Business Performance Data Warehouse components do not support case-sensitive databases. These databases must *not* be case-sensitive.

For Microsoft SQL Server and Oracle databases, the following restrictions apply:

For Microsoft SQL Server databases, components other than Process Server or Business Performance Data Warehouse require that their databases be case-sensitive.

For Oracle databases, the Process Server, Business Performance Data Warehouse, and Common database components must use a separate schema/user. They can use the same instance.

4.2. Process federation

Process federation



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Figure 4-10. Process federation

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Notes:



IBM Process Federation Server

- Optional component for IBM Business Process Manager Standard and Advanced environments
- Creates a single point of access for the user task list and launch list, regardless of the back-end system on which the process artifacts are stored
- Aggregates both BPD and BPEL-related tasks from:
 - Multiple servers
 - Multiple different versions of IBM Business Process Manager
 - Multiple versions of a process
- Allows the organization to phase out process applications that are running on previous versions, while new instances of the process run on the newest server and newest release of IBM Business Process Manager

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Figure 4-11. IBM Process Federation Server

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Notes:

IBM Process Federation Server is an optional component for IBM Business Process Manager environments. Install this component to create a federated process environment that provides business users with a single point of access to their task list and launch list. This single point of access is independent of the type of process that they are working on and the IBM Business Process Manager back-end system on which the process artifacts are stored.

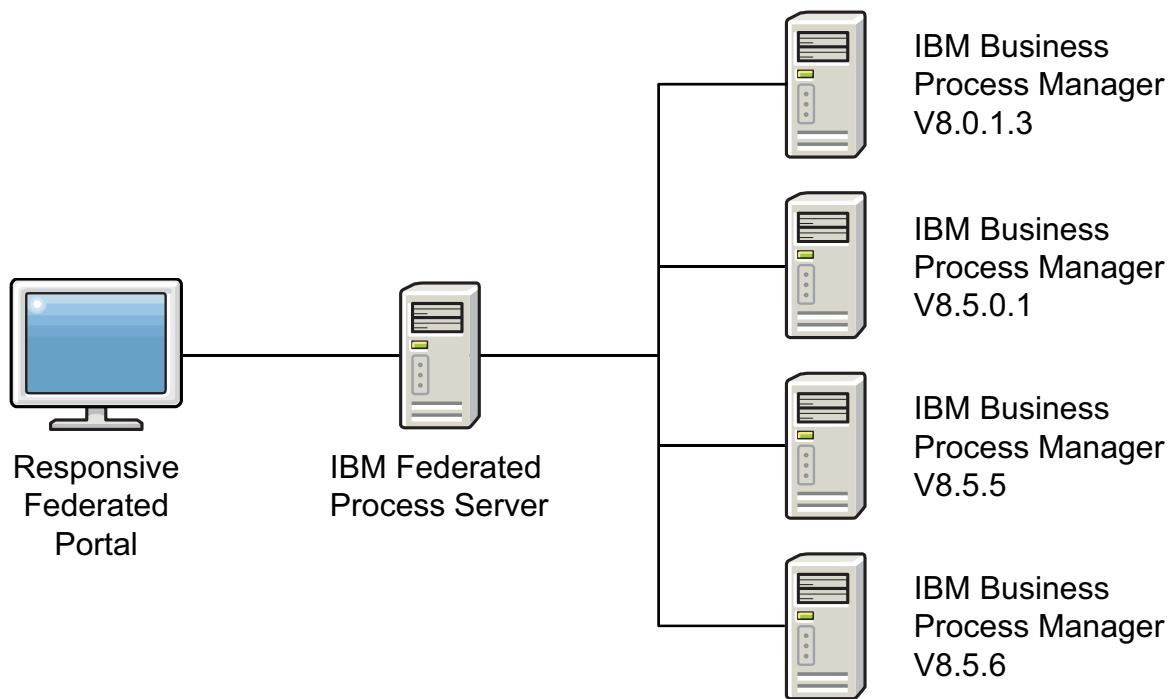
Consider installing Process Federation Server in the following situations:

- Your process applications are deployed on different IBM Business Process Manager deployment environments. Your users must log on to several different Process Portals to get their work done.
- Your users work with both BPD-related and BPEL-related processes and tasks.
- Your IBM Business Process Manager environment contains multiple versions of IBM Business Process Manager that each runs a different version of the same process application. Your users need to work with the older versions of the process applications while process instances are still running. Therefore, they need to log on to the Process Portal application that runs on the associated version of IBM Business Process Manager.

Process Federation Server aggregates both BPD and BPEL-related tasks from all of the IBM Business Process Manager back-end systems, including systems that run previous versions of IBM Business Process Manager. Process Federation Server supports. You can take advantage of this support to gradually phase out process applications that are still running on previous versions, while new versions of the process applications run on the newest release of IBM Business Process Manager.

You can install, configure, and enable Process Federation Server in environments that are run either IBM Business Process Manager Standard or Advanced.

Typical IBM Federated Process Server topology



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Figure 4-12. Typical IBM Federated Process Server topology

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Notes:

The following figure shows an overview of a federated environment and how Process Federation Server provides a single point of access to business users for all of their tasks. This single point of access is independent of the IBM Business Process Manager system on which the tasks are stored.

Responsive Federated Portal is a new sample coach-based portal that you can use as a starting point for creating and extending your own portals. It is available as a technology demonstration from IBM Bluemix DevOps Services. You can configure Responsive Federated Portal to work on a single system by using the BPD-related REST APIs that are provided with IBM Business Process Manager Standard. For federated environments, configure Responsive Federated Portal to use the REST APIs that are provided with Process Federation Server.



Important

Because Process Portal does not use federated APIs, you can use it only on single IBM Business Process Manager systems.

4.3. Messaging concepts

Messaging concepts



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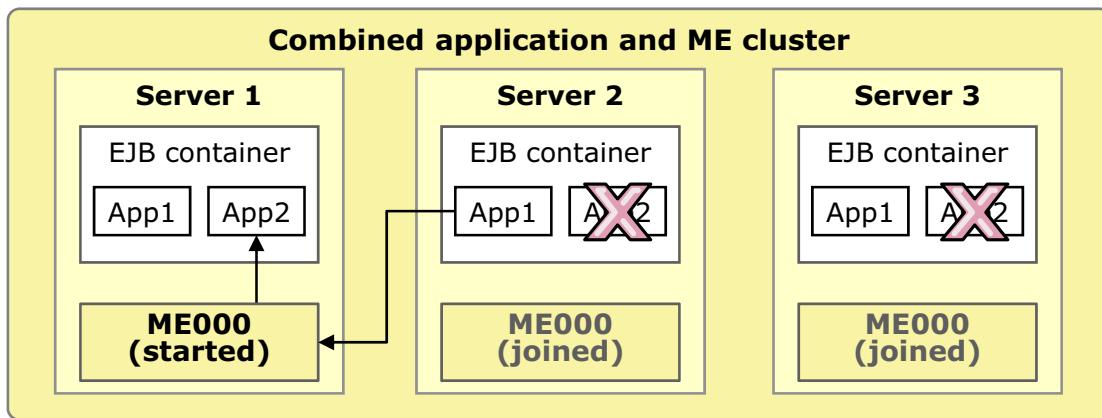
Figure 4-13. Messaging concepts

WB8211.0

Notes:

Applications and MEs in the same cluster

- Combined application and ME clusters do not allow for load balancing
 - App1 interacts with App2 asynchronously
 - App1 writes message to the ME that is on Server 1 to call App2
 - According to the default, a local consumer is called
- HA messaging engine and applications
- No scalability (App2 never runs on Server 2 and Server 3)
- No workload balancing: Workload is transferred onto Server 1



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Figure 4-14. Applications and MEs in the same cluster

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Notes:

The first situation is a combined application and messaging engine cluster. In other words, the application and ME run within the same cluster member. Only one ME is active for the entire cluster. This setup leads to an unbalanced situation for the cluster in case of asynchronous communication between applications.

Details on the slide include:

App1, which is running on cluster member Server 2, communicates asynchronously with App2.

The only active ME is on Server 1, so App1 writes a message into a queue that is on Server 1 to call App2.

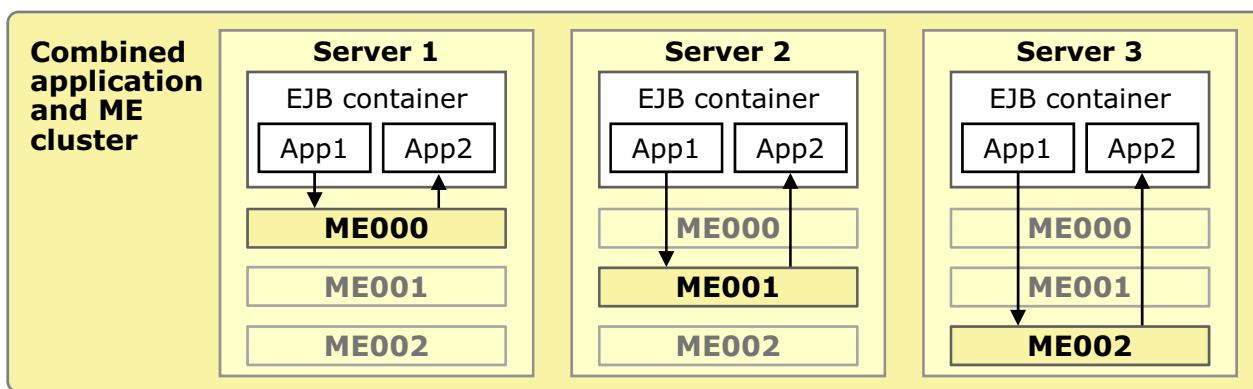
By default, a local consumer is always called, so App2 is called on cluster member Server 1.

Thus, App2 never runs on cluster member Server 2 or Server 3, and most of the workload is transferred onto Server 1.

Scalability solution

- More active MEs (Server 2 and Server 3) create partitioned queues

- App1 interacts with App2 asynchronously
 - App1 writes to ME on local Server 1 to call App2
 - According to the default, a local consumer is called
- | |
|--|
| <input checked="" type="checkbox"/> HA messaging engine
<input checked="" type="checkbox"/> ME scalability
<input checked="" type="checkbox"/> Application scalability
<input checked="" type="checkbox"/> Lost message order
<input checked="" type="checkbox"/> Possible stranded messages |
|--|



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Figure 4-15. Scalability solution

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Notes:

The first solution to this problem is:

Add active messaging engines (one for each cluster member), thus creating a topology with partitioned queues.

This topology provides HA for applications and messaging engines and allows scalability. Because the application prefers the local ME on each cluster member, App1 does not call App2 on another cluster member. For cases in which the scalability limit of a cluster member is reached. Another member might be added. As you already saw on previous slides, this solution (partitioned queues) requires administration effort because more MEs and policies must be created and maintained manually.

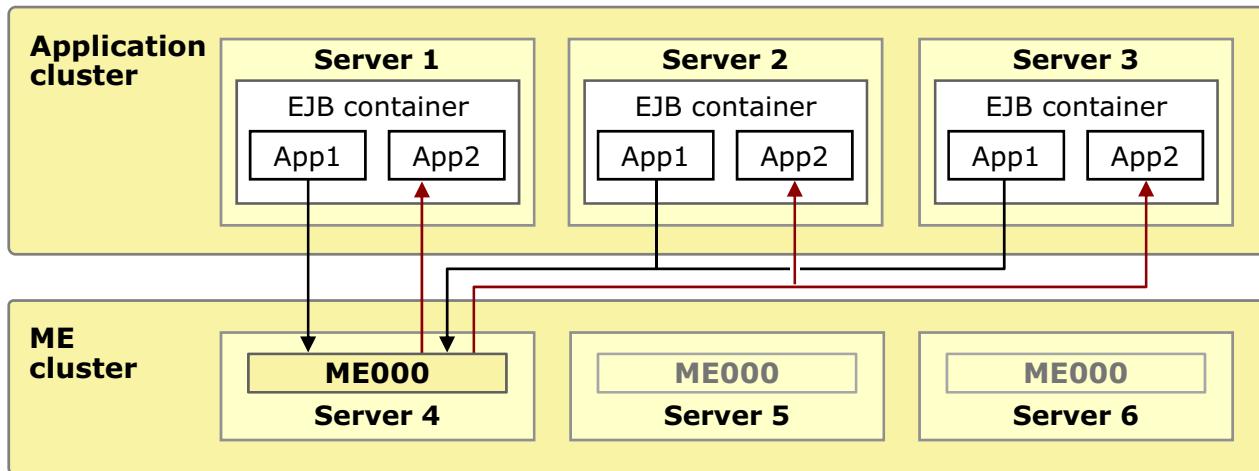
Within a clustered environment, multiple messaging engines can be created to share any workload that is associated with queue destinations deployed to the cluster.

If the cluster has only one messaging engine, the destination is local to that messaging engine. This topology has the advantage of being highly available. To achieve scalability, more MEs can be added manually. If there is more than one messaging engine in the cluster, the destination is partitioned across all messaging engines in the cluster. Each messaging engine deals with a subset

of the messages that the destination handles. The availability characteristics of a partition are the same as the characteristics of the messaging engine through which it is localized.

High availability solution

- Create dedicated clusters for applications and MEs
 - App1 interacts with App2 asynchronously
 - App1 writes message to the ME that is on Server 4 to call App2
- | | |
|--|---|
| <input checked="" type="checkbox"/> HA messaging engine, applications | <input checked="" type="checkbox"/> Application scalability
(App2 runs on each member) |
| <input checked="" type="checkbox"/> Limited ME scalability
(within Server 4 capabilities) | |



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Figure 4-16. High availability solution

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Notes:

Solution two:

Split the application and messaging engine into two dedicated clusters.

The application cluster is not a bus member (only the ME cluster is a bus member).

This topology provides HA for applications and messaging engines, and allows for application scalability. The asynchronous calls of App1 can reach App2 on each cluster member. The messaging resources are located by using JNDI (Java Naming and Directory Interface) names.

Scalability for this solution is limited because it depends on the capabilities of the Server 4 system.

Applications and MEs with partitioned queues in separate clusters (1 of 2)

- Separate application and ME clusters might result in unprocessed messages
 - App1 interacts with App2 asynchronously
 - Message is put on ME000 by App1
 - App2 does not receive from ME000
- HA messaging engine, applications
 Application and ME scalability
 “Unprocessed message situation”

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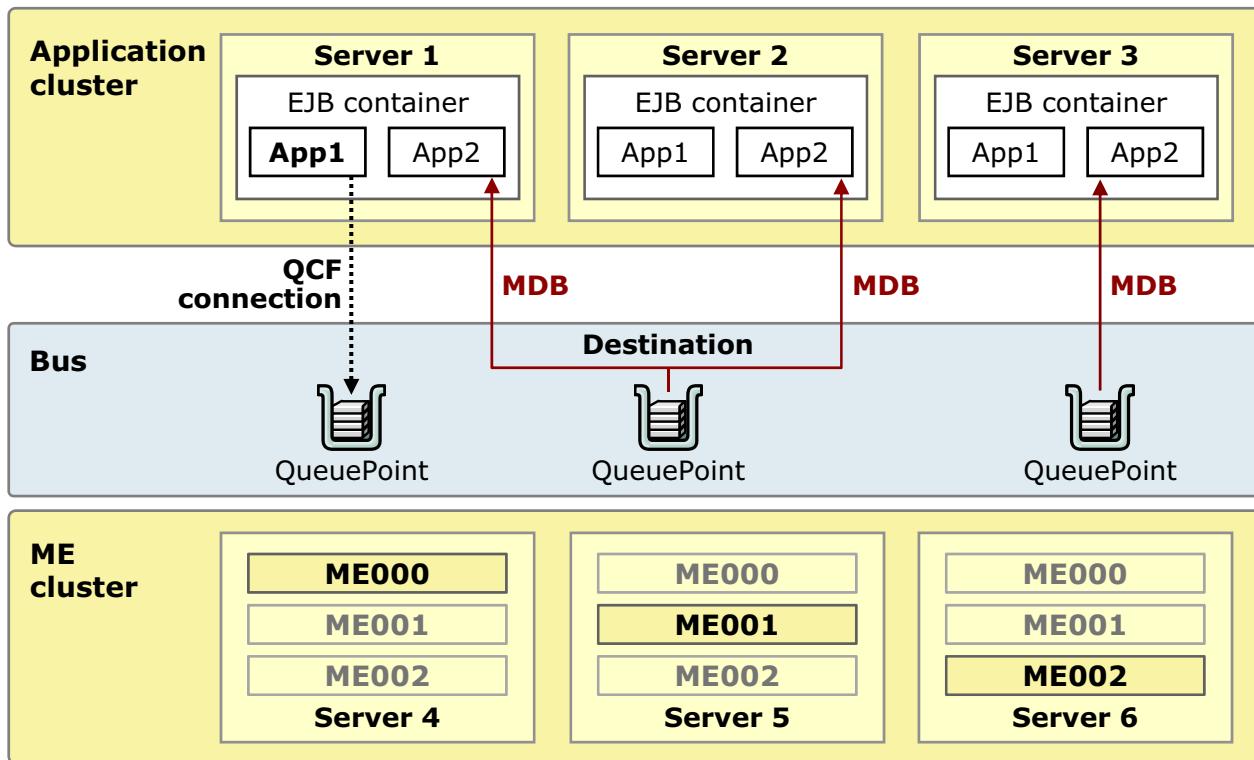
Figure 4-17. Applications and MEs with partitioned queues in separate clusters (1 of 2)

WB8211.0

Notes:

This topology provides application and messaging engine scalability. However, the main drawback is the possibility of unprocessed messages, which leads to “hanging” applications.

Applications and MEs with partitioned queues in separate clusters (2 of 2)



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Figure 4-18. Applications and MEs with partitioned queues in separate clusters (2 of 2)

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Notes:

The reason for the behavior of the components that are involved in messaging include:

App1 communicates asynchronously with App2.

Depending on the queue connection that is established at run time, the message is stored in one of the available MEs (in the sample, it is stored in ME000).

Message-driven beans (MDB) are responsible for delivering the message to App2.

Depending on the established “binding” of the MDB, only messages in the dedicated ME can be processed.

If this “binding” is not established to the ME on which App1 puts the message, the message remains unprocessed in ME000.

4.4. Single cluster topology

Single cluster topology



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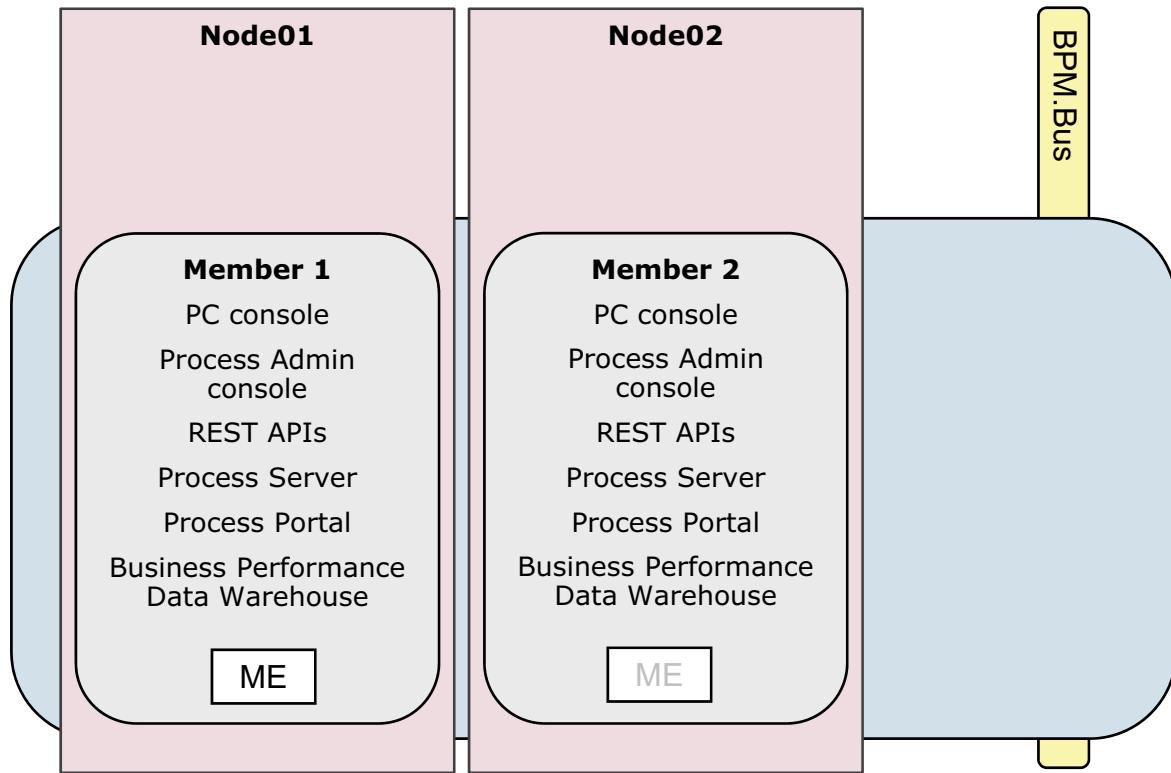
10.1

Figure 4-19. Single cluster topology

WB8211.0

Notes:

Single cluster topology (1 of 2)



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Figure 4-20. Single cluster topology (1 of 2)

WB8211.0

Notes:

Typically, this topology is used for testing, proofs of concept, and demonstration environments. Note the following aspects of this example:

All of the components are configured in a single cluster.

The Application deployment target cluster is a member of the BPM bus. All of the supporting infrastructure applications are configured in the cluster. Each cluster member is an application deployment target. Cluster member 1 has the active messaging engine. Cluster member 2 has a joined messaging engine.

The behavior of the messaging engines in a single cluster topology is different from the behavior that occurs when the messaging engines are in a remote cluster. When the messaging engines and the applications are co-located, the default behavior is for message producers and consumers to always use a local active messaging engine when one is available. For example, a situation might happen in which two applications communicate asynchronously deployed to each cluster member. After each message producer places messages in the queues, the message consumer on the computer where the engine is local always consumes all of the messages that are produced. Thus, the consuming application processes messages on only one server, which is the server with the local messaging engine.

Read and write local also creates a unique set of issues when you attempt to partition the destinations. If you create more than one active set of messaging engines, partitioning results, and the active messaging engines of each server contain a portion of the queues that are assigned to that engine. Thus, you can attain more throughput with active messaging engines on each server. However, this configuration can create issues for your applications.

If you partition destinations when the applications and messaging engines are in the same cluster, you no longer can maintain message order. In addition, partitioned destinations can create unpredictable behavior if one or more messaging engines fail in a single cluster topology. If you are prepared to endure possible unpredictable behavior and the loss of message order, partitioning the destinations in a single cluster topology might be acceptable. However, this configuration is discouraged.

Single cluster topology (2 of 2)

- The cell consists of:
 - One deployment manager node
 - One or multiple nodes
 - One or multiple servers per node
 - One cluster
- The deployment manager node runs:
 - The administrative console, the relationship manager, and the failed event manager
- All other components are in one cluster
 - The business process and human task containers
 - The Business Process Choreographer Explorer, business rules manager, and Business Space
 - The Process Center, Process Admin, Process Portal, and Performance Admin Consoles
 - The messaging engine
 - The Business Performance Data Warehouse and Process Server

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Figure 4-21. Single cluster topology (2 of 2)

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Notes:

In a Single Cluster topology pattern, all deployment environment functions and components are run on a single cluster.

A deployment environment is a logical concept. It is a collection of configured clusters, servers, and middleware that collaborate to provide an environment to host product components and process applications.

Through the administrative console on the deployment manager, you administer the deployment environments that are defined on the deployment manager. You can also create, delete, import, and export deployment environments from the administrative console.

Decision criteria

- Advantages:
 - Can run on limited hardware (fewer computers)
 - Easier to set up and administer
 - Scalability is easy: add new cluster members or new nodes
 - Requires more hardware resources, but less than a full remote messaging and remote support topology
- Disadvantages:
 - Memory requirements are much greater
 - Performance tuning is much more critical
 - Extensive use of the messaging infrastructure interferes with application processing as they are in the same cluster
 - Infrastructure components cannot be scaled independently; components are scaled at the same rate
 - Adding a cluster member adds capability to every component

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Figure 4-22. Decision criteria

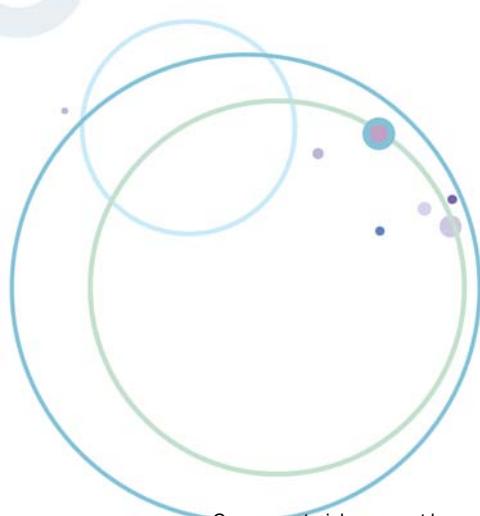
WB8211.0

Notes:

From an administrative and scalability perspective, the Single Cluster topology pattern has advantages. A single cluster, where each member runs all of the IBM Business Process Manager components, is simpler to administer. Instead of several server instances in multiple clusters, you have a single cluster with fewer members. If the needs of your environment grow, scaling the infrastructure is a simple matter of adding more nodes and cluster members. Thus, the process of adding capability is simple, but all components are scaled at the same rate. For example, each additional cluster member adds component processing whether you need it or not. If the messaging engines that are spread across server members use policies, some additional administrative effort in creating and maintaining the policies might be necessary.

4.5. Application, remote messaging, and remote support topology

Application, remote messaging, and remote support topology



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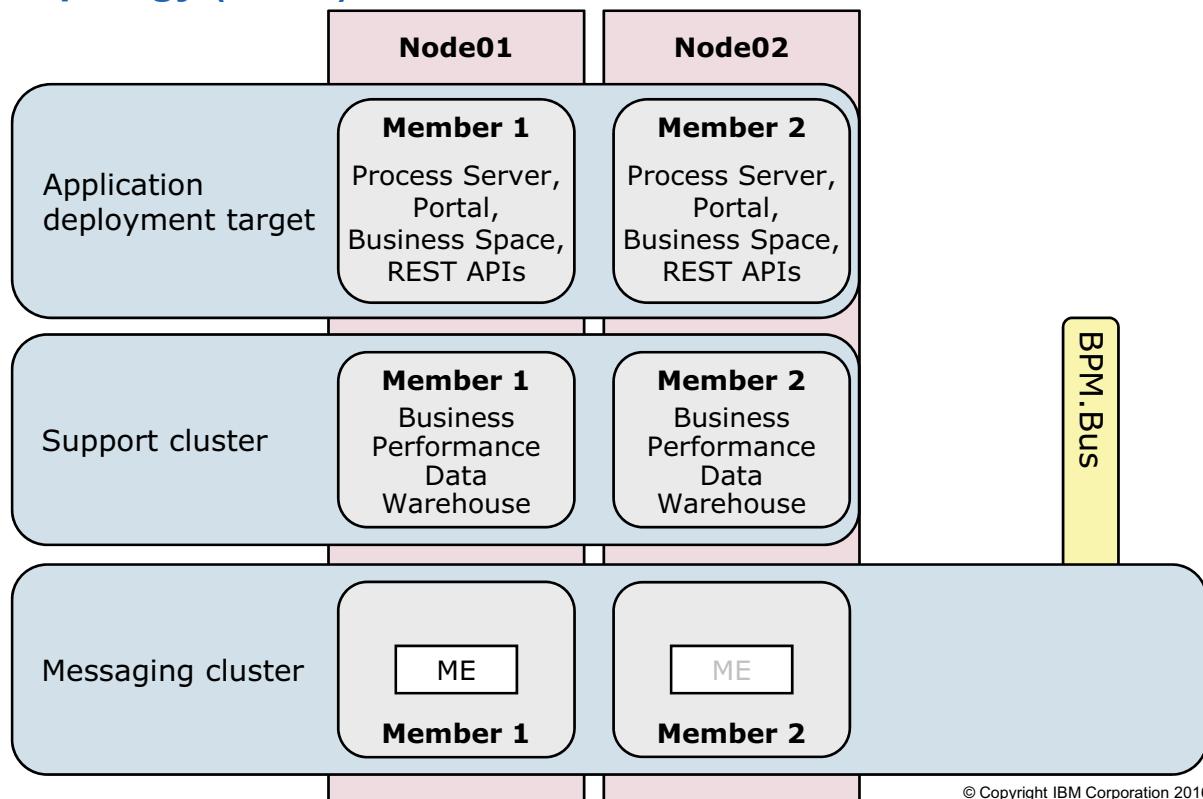
10.1

Figure 4-23. Application, remote messaging, and remote support topology

WB8211.0

Notes:

Application, remote messaging, and remote support topology (1 of 2)



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Figure 4-24. Application, remote messaging, and remote support topology (1 of 2)

WB8211.0

Notes:

The application, remote messaging, and remote support topology pattern is a topology for production environments. This topology provides three separate clusters:

A remote messaging cluster

A remote support cluster

An application deployment target cluster

Note the following aspects of this example:

All of the applications are deployed to the Application deployment target cluster.

The messaging cluster is a member of the required BPM bus.

Supporting infrastructure applications are configured in the Support cluster.

The behavior of the messaging engines in an application, remote messaging, and remote support topology is different from the behavior that occurs when the messaging engines are co-located with the applications. Because the messaging engines are in a remote cluster, the message producers and consumers have no preference for them over a local messaging engine. Each member of the

Application deployment target cluster connects to the appropriate bus and uses the remote messaging engine for that bus.

This behavior creates issues if you attempt to partition the destinations in the remote messaging cluster. When you create more than one active set of messaging engines, partitioning results. The active messaging engines of each server contain a portion of the queues that are assigned to that engine. Thus, if active messaging engines are on each member of the messaging cluster, you can attain more throughput. However, this configuration can create issues for your applications. If you partition destinations when the application and messaging engines are in separate clusters, you no longer can maintain message order. Any time you partition destinations, you lose message order.

In addition, partitioned destinations can create other issues when the messaging engines are remote. By default, you have no control over which active messaging engine your applications use at run time. This behavior can create situations in which two applications on the same server attach to two different messaging engines. If one application produces messages for one engine, and the message consumer is using a different engine, then stranded messages can result. Thus, partitioned destinations are discouraged in a remote messaging and remote support scenario.

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Application, remote messaging, and remote support topology (2 of 2)

- The cell consists of:
 - One deployment manager node
 - One or multiple Process Server nodes
 - One or multiple servers per node
 - Three clusters
- Three clusters include:
 - A messaging engine cluster
 - A support cluster with the Business Process Choreographer Explorer and Business Performance Data Warehouse
 - An application cluster with the business process container and the human task container, Process Server, business rules manager, Process Portal, and REST API services
- The deployment manager node runs
 - The administrative console, the relationship manager, and the failed event manager

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Figure 4-25. Application, remote messaging, and remote support topology (2 of 2)

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Notes:

The application, remote messaging, and remote support topology pattern provides an ideal environment for long-running business processes, state machines, human tasks, and asynchronous interactions (including JMS and MQ/JMS bindings).

Because the application deployment target cluster runs your business integration applications only, performance tuning and diagnostic messages are much simpler than in the topology patterns where the application target cluster has extra responsibilities. The application, remote messaging, and remote support topology pattern is also ideal for environments that make extensive use of monitoring and auditing (including environments with IBM Business Monitor).

Decision criteria

- Advantages
 - Ideal from a performance perspective as each component can be tuned independently
 - Each component can be scaled independently
 - Good topology for long-running processes, human tasks
 - Independent messaging cluster allows extensive use of asynchronous communication
 - Independent support cluster
- Disadvantages
 - Three clusters, many nodes, many servers
 - Must performance tune all clusters
 - Scalability of messaging is still limited
 - Multiple active messaging engines are not supported
- You must also configure a routing server to ensure that requests that are intended for Process Portal are directed to the correct cluster

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Figure 4-26. Decision criteria

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Notes:

For large computing infrastructures, the application, remote messaging, and remote support topology pattern is the preferred environment. The hardware requirements for distributed platforms are more intensive. However, you have greater flexibility in adjusting and tuning memory usage for the Java virtual machines (JVMs) when you have three or more clusters with multiple members that do specific functions.

When you create three clusters, each with specific functions and applications, you add another administrative burden. As you add clusters and cluster members, your performance tuning plan and the troubleshooting burden can expand greatly. Spreading messaging engines across the members of the messaging cluster also adds to the administrative burden associated with creating and maintaining policies.

From a scalability standpoint, the application, remote messaging, and remote support topology pattern provides the most flexibility. Because each of the distinct functions within IBM Business Process Manager is divided among the three clusters, you can pinpoint performance bottlenecks and adjust the cluster size fairly easily. If you need more processing capability for your business processes or human tasks, you can add more nodes and members to the application target cluster. Because expanding the messaging infrastructure beyond three cluster members has no effect on

processing capability, the scalability limitations of the application, remote messaging, and remote support topology pattern apply.

4.6. Creating a deployment environment with multiple tools

Creating a deployment environment with multiple tools



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10.1

Figure 4-27. Creating a deployment environment with multiple tools

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Notes:

Configuring by using multiple tools

- You can use multiple tools to configure the profiles and the deployment environment
- Profiles must be created first by using multiple tools
 - Profile Management Tool
 - The `manageprofiles` command line utility
- The deployment environment is created by using the Deployment Environment wizard in the administrative console
- Databases must be created before running the Deployment Environment wizard
 - Database administrator can create the tables beforehand, or the Deployment Environment wizard creates the tables during configuration

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Figure 4-28. Configuring by using multiple tools

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Notes:

You can use multiple tools to configure the profiles and the network deployment environment. You can use the `manageprofiles` command line utility or the Profile Management Tool to create or augment the network deployment profiles, and the Deployment Environment wizard to create the network deployment environment.

When you use the Deployment Environment wizard to create a three-cluster deployment environment, the process might take more time to complete. In that case, you can do one of the following steps to create the three cluster environment:

- Increase the transaction timeout value by using the Deployment Manager and create the deployment environment again.
- Do not create tables during the deployment environment creation. After creating the environment, you create the databases and tables, and then run the bootstrap command.



Creating profiles by using the Profile Management Tool

Environment Selection

Select a specific type of environment to create.

Environments:

- ▽ WebSphere Application Server
 - Cell (deployment manager and a federated application server)
 - Management
 - Application server
 - Custom profile
 - Secure proxy (configuration-only)
- ▽ IBM Business Process Manager
 - IBM BPM deployment manager**
 - IBM BPM managed node
- ▷ Other

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Figure 4-29. Creating profiles by using the Profile Management Tool

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Notes:

After you install the product, you must create or augment a deployment manager and one or more managed node profiles to define the runtime environment.



Creating a deployment environment (1 of 10)

- Deployment environments are a simplified means to configure a clustered environment
- Templates help you to set up clusters
- The wizard is available from the administrative console of the deployment manager

The screenshot shows the Integrated Solutions Console interface. The left sidebar has a 'View' dropdown set to 'All tasks'. Under 'Servers', 'Deployment Environments' is selected. The main panel title is 'Deployment Environments' with the sub-instruction: 'Select the deployment environments to manage. You can manage deployment environment that are created using patterns.' Below this are 'Start', 'Stop', and 'New...' buttons, and a toolbar with icons for creating, deleting, and managing environments. A table lists one deployment environment: 'PCenter_DE' (Status: Error), 'IBM BPM Standard Process Center' (Features: Single Cluster). The bottom of the table shows 'Total 1'.

Select	Status	Deployment Environment Name	Features	Pattern	Description
<input type="checkbox"/>		PCenter_DE	IBM BPM Standard Process Center	Single Cluster	

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Figure 4-30. Creating a deployment environment (1 of 10)

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Notes:

Deployment environments are an easy way to set up a clustered environment. Templates are available to help you to set up clusters. From the administrative console, a wizard supports the process of creating a deployment environment. The figure shows an empty list of deployment environments after creating a profile for the deployment manager and federating a node into the cell.



Creating a deployment environment (2 of 10)

- Two administrative roles are created
 - Cell administrator (one per cell)
 - Deployment environment administrator (one per deployment environment)

Create a Deployment Environment

Enter the deployment environment name and the deployment environment administrator user name and password.

* Deployment environment name

* Deployment environment administrator user name

* Password

* Confirm password

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Figure 4-31. Creating a deployment environment (2 of 10)

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Notes:

Deployment environments can be exported and imported, so you can configure identical topologies, for example, for preproduction and production.

Creating a deployment environment (3 of 10)

- Select the type of environment that you intend to build

Select the type of deployment environment.

Select	IBM BPM Deployment Environment Type	Description
<input checked="" type="radio"/>	Standard Process Center	Store, test, and administer process applications and toolkits that are authored in Process Designer.
<input type="radio"/>	Standard Process Server	Run processes and services in process applications that are deployed from the Standard Process Center.

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Figure 4-32. Creating a deployment environment (3 of 10)

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Notes:

To begin building the deployment environment, select the type of environment that you intend to build. Select one of the templates.



Creating a deployment environment (4 of 10)

- Select a template to define the clusters in the environment and how functions are distributed across those clusters

Select a cluster pattern for the deployment environment.

Select	Deployment Environment Pattern	Description
<input type="radio"/>	Application, Remote Messaging, and Remote Support	Defines one cluster for application deployment, one remote cluster for the messaging infrastructure, and one remote cluster for the supporting applications
<input checked="" type="radio"/>	Single Cluster	Defines one application deployment target cluster, which includes the messaging infrastructure and supporting applications

Next **Cancel**

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Figure 4-33. Creating a deployment environment (4 of 10)

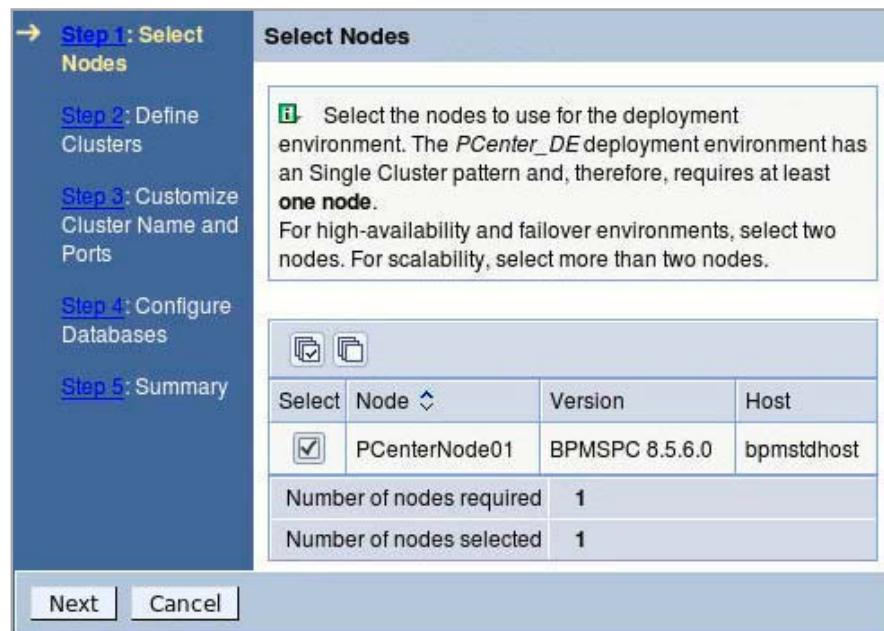
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Notes:

Select the deployment environment pattern template. Templates define the number of clusters in your environment and how functions are distributed across those clusters.

Creating a deployment environment (5 of 10)

- Add nodes to participate in the deployment environment



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Figure 4-34. Creating a deployment environment (5 of 10)

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Notes:

Add nodes to participate in the deployment environment. In this example, a single node was federated into the cell, so only one node is available to select. However, if you have just a single node, it is good practice to build a managed cell with a deployment manager and multiple clusters. By following this practice, you can increase the size of the cell.



Creating a deployment environment (6 of 10)

- Specify number of servers per cluster to create on the individual nodes

The screenshot shows a step-by-step wizard for creating a deployment environment. The current step is 'Step 2: Define Clusters'. The interface includes a sidebar with navigation links for steps 1 through 5. The main area displays a table titled 'Define Clusters' with the instruction: 'Map each cluster to the listed nodes by indicating the number of cluster members per node.' The table has three columns: 'Node', 'Version', and 'Application Deployment Target'. A single row is shown for 'PCenterNode01' with version 'BPMSPC 8.5.6.0' and the target set to '1'. At the bottom are 'Previous', 'Next', and 'Cancel' buttons.

Node	Version	Application Deployment Target
PCenterNode01	BPMSPC 8.5.6.0	1

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Figure 4-35. Creating a deployment environment (6 of 10)

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Notes:

You can specify the number of servers per cluster to create on the individual nodes. By default one cluster member is assigned on each node for each function. You change the number by replacing the number in each column.



Creating a deployment environment (7 of 10)

- Specify a name for each cluster, cluster member, and starting port

Customize Cluster Name and Ports

Customize a cluster and its cluster members by entering names or port numbers. Starting ports in the cluster members must have a difference of at least 20 between their port numbers.

Application Cluster

* Cluster Name		
PCenter_DE.AppCluster		
Node Name	Cluster Member Name	Starting Port
PCenterNode01	PCenter_DE.AppCluster.member1	

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Figure 4-36. Creating a deployment environment (7 of 10)

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Notes:

On the Customize Cluster Name and Ports page, customize the cluster names or cluster member names for the cluster type. You can use the default values provided, or customize the cluster details, and click Next.

You can specify the starting port for the cluster members. The system generates default values for cluster member names and the starting port. Ensure that the starting port numbers you specify are at least 20 ports apart. Port numbers are reserved and assigned to each node for the cluster members by using the port number that is specified. If you specify an initial port when you create the deployment environment, that same initial port specified would be assigned to the cluster member. For example, if the port number for the first cluster member is 2000, it would use the port numbers 2000, 2001, 2002, . . . The port number of the second cluster member would be 2020 and the port numbers would be 2020, 2021, 2022, . . . The port number of the third cluster member would be 2040.

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Creating a deployment environment (8 of 10)

Configure Process Server

Configure the Process Server properties.

Process Server

* Environment name:

Environment type:

Process Center Connection Information

Use server offline

Protocol:

Host name or virtual host in a load-balanced environment:

Port:

User name:

Password:

Confirm password:

- Specify configuration settings for the Process Server

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Figure 4-37. Creating a deployment environment (8 of 10)

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Notes:

This panel is only for configuring a Process Server deployment environment.

Creating a deployment environment (9 of 10)

- Databases must exist
- The wizard can create the tables during configuration, or a database administrator can manually create the tables

Configure Databases

Edit the database parameters for the data sources that are used by this deployment environment.

* Select provider: DB2

Shared parameters:

* User name: db2inst1	* Password: *****
* Server: bpmstdhost	* Port: 50000

Databases:

Common database:

* Name: PCCMNDB

Process database:

* Name: PCBPMDB

Performance Data Warehouse database:

* Name: PCPDWDB

- If manual table creation, you must load the database with system information after you create the deployment environment

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Figure 4-38. Creating a deployment environment (9 of 10)

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Notes:

On this page, define the following database information for the components that are included in this deployment environment. Where possible, the wizard supplies default information for the parameters, but change those values to match the values that you defined when you planned the environment. The database that is specified in this panel must exist. Deployment environment configuration never creates a database.

The parameters include the following options:

- User name: Type the user name to connect to the database.
- Password: Type the password for the user name.
- Confirm password: Type to confirm the password for the user name.
- Server: Type a server name where the database is located.
- Port: Type the port number to connect to the database.
- Create Tables: Select to create the required tables.

If you want to create the tables manually instead of using the configuration wizard to create the tables automatically, you can clear the Create Tables check box. The scripts to create tables are

generated in the <BPM_Install>/profiles/DmgrProfile/dbscripts/ directory. You can run the scripts from the dbscripts folder and do not need to generate scripts by using the BPMConfig command.

You can edit all key parameters, such as the database name, whether to create tables and the data source runtime user name for the deployment environment. You can select which database to use for the particular component.



Creating a deployment environment (10 of 10)

- Review the summary
- Final options
 - Export for Scripting
 - Generate Deployment Environment

Data Sources			
Name	Database Name	Database Provider	Database Host
SharedDb	PCCMNDB	DB2	bpmstdhost
PerformanceDB	PCPDWDB	DB2	bpmstdhost
ProcessServerDB	PCBPMDB	DB2	bpmstdhost

Previous | Export for Scripting | **Generate Deployment Environment** | Cancel

- When the deployment generation is completed and saved, the deployment environment is available

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Figure 4-39. Creating a deployment environment (10 of 10)

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Notes:

Review the summary of deployment environment settings. Be sure to scroll the entire list since it is lengthy.

If you postponed the Process database table creation by clearing the create table option on the Database page, create the tables and load the database with system information by running the `bootstrapProcessServerData` command. If the Process database table creation is selected on the Database page wizard, the bootstrap code runs automatically.

4.7. Creating a deployment environment by using the BPMConfig command

Creating a deployment environment with the BPMConfig command



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10.1

Figure 4-40. Creating a deployment environment by using the BPMConfig command

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Notes:



BPMConfig command utility

- The `BPMConfig` command is used to create or extend a typical network deployment environment
 - An alternative to the Deployment Environment wizard
- The `BPMConfig` command can also be used to:
 - Create the database scripts
 - Create the database tables
 - Create profiles
 - Start and stop the deployment environment
 - Validate the deployment environment configuration
- The `BPMConfig` command uses a properties file which contains all of the values that are used in the configuration of your deployment environment
 - Sample properties files are provided for you to copy and customize to configure your own environments

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Figure 4-41. BPMConfig command utility

WB8211.0

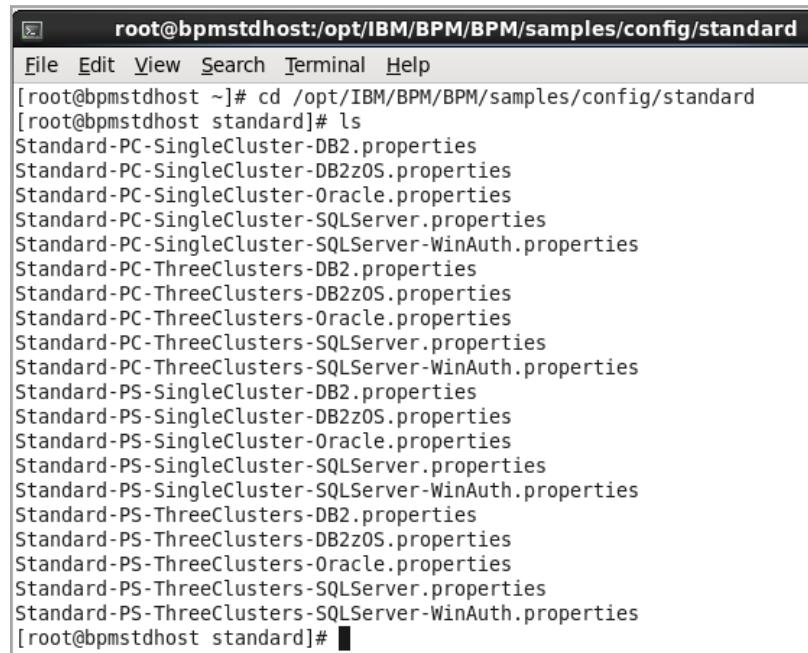
Notes:

The `BPMConfig` command is used to create or extend a typical network deployment environment. It can also be used to create the database scripts and profiles, start and stop the deployment environment, and validate the deployment environment configuration.

Before you process the customization definition for a deployment manager, you must ensure that the `BPMConfig` properties file contains the required IBM Business Process Manager configuration settings for the profile and databases to be created.

Sample properties files

- Begin with the sample file that most closely resembles the environment that you want to configure



```
root@bpmsstdhost:/opt/IBM/BPM/BPM/samples/config/standard
File Edit View Search Terminal Help
[root@bpmsstdhost ~]# cd /opt/IBM/BPM/BPM/samples/config/standard
[root@bpmsstdhost standard]# ls
Standard-PC-SingleCluster-DB2.properties
Standard-PC-SingleCluster-DB2zOS.properties
Standard-PC-SingleCluster-Oracle.properties
Standard-PC-SingleCluster-SQLServer.properties
Standard-PC-SingleCluster-SQLServer-WinAuth.properties
Standard-PC-ThreeClusters-DB2.properties
Standard-PC-ThreeClusters-DB2zOS.properties
Standard-PC-ThreeClusters-Oracle.properties
Standard-PC-ThreeClusters-SQLServer.properties
Standard-PC-ThreeClusters-SQLServer-WinAuth.properties
Standard-PS-SingleCluster-DB2.properties
Standard-PS-SingleCluster-DB2zOS.properties
Standard-PS-SingleCluster-Oracle.properties
Standard-PS-SingleCluster-SQLServer.properties
Standard-PS-SingleCluster-SQLServer-WinAuth.properties
Standard-PS-ThreeClusters-DB2.properties
Standard-PS-ThreeClusters-DB2zOS.properties
Standard-PS-ThreeClusters-Oracle.properties
Standard-PS-ThreeClusters-SQLServer.properties
Standard-PS-ThreeClusters-SQLServer-WinAuth.properties
[root@bpmsstdhost standard]#
```

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Figure 4-42. Sample properties files

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Notes:

The `BPMConfig` command uses a properties file to configure your environment according to the settings that you specify. Your Business Process Manager Standard installation includes several sample configuration files that are provided as a starting point for your configuration. These sample files are composed of common properties and settings for different IBM Business Process Manager 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.

Customizing the BPMConfig properties file

- The BPMConfig properties file is formed of name-value pairs of configuration settings
- The properties file provides input to the BPMConfig script
 - The script runs during the configuration process to create the deployment environment and generate database scripts for creating the required databases

```
#####
# Deployment environment basic properties. #
#####
bpm.de.name=PServer DE
# Options: true, false If this is set false, database tables are created
# BPMConfig is run with the create de action . If set to true, the tables
bpm.de.deferSchemaCreation=true
# Type of product configuration: Express, Standard, Advanced or Advanced
bpm.de.type=Standard
# Type of deployment environment: Process Center or Process Server
bpm.de.environment=Process Server
bpm.de.psServerName=PROD-ProcessServer
# The intended purpose for this deployment environment. Options: Test, S
bpm.de.psPurpose=Production
# Options: true, false. Set to false if the Process Server is online and
bpm.de.psOffline=true
# The transport protocol to access the Process Center specified above. O
bpm.de.psProcessCenterTransportProtocol=http
# The host name of the Process Center specified above.
bpm.de.psProcessCenterHostname=bpmstdhost
# The port number for the Process Center specified above.
bpm.de.psProcessCenterPort=
```

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Figure 4-43. Customizing the BPMConfig properties file

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Notes:

Before you create a deployment environment, you must create all of the databases manually that are specified in the properties file. The BPMConfig command does not create the databases. It creates the schema and tables. You also must create all of the users that you specify in the properties file.

Creating the deployment environment

- Use the following command to create the deployment environment:

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

- The `create` command does the following functions:
 - Creates the deployment manager that is based on the values in the properties file and starts the deployment manager
 - Creates a managed node that is based on the specified values, or each node that is specified in the configuration properties file
 - Federates each managed node and adds the node to the deployment environment
 - Generates the deployment environment
 - Creates any profiles that are specified in the configuration properties file that do not exist
 - Creates or defers the creation of the database tables
 - Runs the bootstrap utility to load the Process database with system information so that you do not need to do this step manually when tables are created

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Figure 4-44. Creating the deployment environment

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Notes:

Run the `BPMConfig` command on the computer that has the deployment manager, passing it the name of the properties file you created.

The deployment manager and node agents must be restarted for the cell scoped configuration to take effect. The restart is required only for the first deployment environment that you create.

Unit summary

Having completed this unit, you should be able to:

- Explain the purpose of a deployment environment
- Identify and explain the clustered topologies for IBM Business Process Manager Standard
- Explain the benefits of a federation server
- Explain how to create a deployment environment with multiple tools
- Explain how to create a deployment environment with the BPMConfig command
- Create a backup of an initial configuration
- Clone a deployment environment

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Figure 4-45. Unit summary

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Notes:



Checkpoint questions

1. Which topology is typically used for testing, proofs of concepts, and demonstration environments?
 - A. Single cluster
 - B. Application, remote messaging, and remote support
2. Which topology is ideal from a performance perspective and the best topology for long-running processes and human tasks?
 - A. Single cluster
 - B. Application, remote messaging, and remote support
3. The number of clusters in the deployment environment depends on which of the following patterns?
 - A. Topology pattern
 - B. Database usage pattern
 - C. Business process pattern
4. True or false: You can use a single tool to configure the profiles and the deployment environment.

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Figure 4-46. Checkpoint questions

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Notes:

Write your answers here:

- 1.
- 2.
- 3.
- 4.



Checkpoint answers

1. A. Single cluster
2. B. Application, remote messaging, and remote support
3. A. Topology pattern
4. False. You can use multiple tools to configure the profiles and the deployment environment.

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Figure 4-47. Checkpoint answers

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Notes:



Exercise 3



Configuring the Process Center environment

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10.1

Figure 4-48. Exercise 3

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Notes:



Exercise objectives

After completing this exercise, you should be able to:

- Create the Process Center deployment manager and a custom profile
- Federate the custom profile
- Edit the `soap.client.props` file
- Verify the database configuration
- Back up the initial configuration
- Create the three required databases
- Create a Process Center deployment environment
- Verify the configuration of the database tables

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Figure 4-49. Exercise objectives

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Notes:

Unit 5. Introduction to Process Center

What this unit is about

This unit introduces you to deploying, testing, and managing process applications with Process Center.

What you should be able to do

After completing this unit, you should be able to:

- Describe the purpose and business value of Process Center
- Define the components of Process Center
- Describe how to manage the Process Center repository
- Describe how to deploy, test, and manage process applications with the Process Center Console
- Manage access to Process Center
- Configure Process Center sharing

How you will check your progress

- Checkpoint questions
- Lab exercise

References

IBM Business Process Manager V8.5.6 documentation in the IBM Knowledge Center:

http://www.ibm.com/support/knowledgecenter/SSFPJS_8.5.6/com.ibm.wbpm.main.doc/kc-homepage-bpm.html

Unit objectives

After completing this unit, you should be able to:

- Describe the purpose and business value of Process Center
- Define the components of Process Center
- Describe how to manage the Process Center repository
- Describe how to deploy, test, and manage process applications with the Process Center Console
- Manage access to Process Center
- Configure Process Center sharing

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Figure 5-1. Unit objectives

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Notes:



Topics

- Introduction to Process Center
- Components of Process Center
- Using Process Center to test, deploy, and manage process applications
- Managing access to Process Center
- Process Center sharing

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Figure 5-2. Topics

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Notes:

5.1. Introduction to Process Center

Introduction to Process Center



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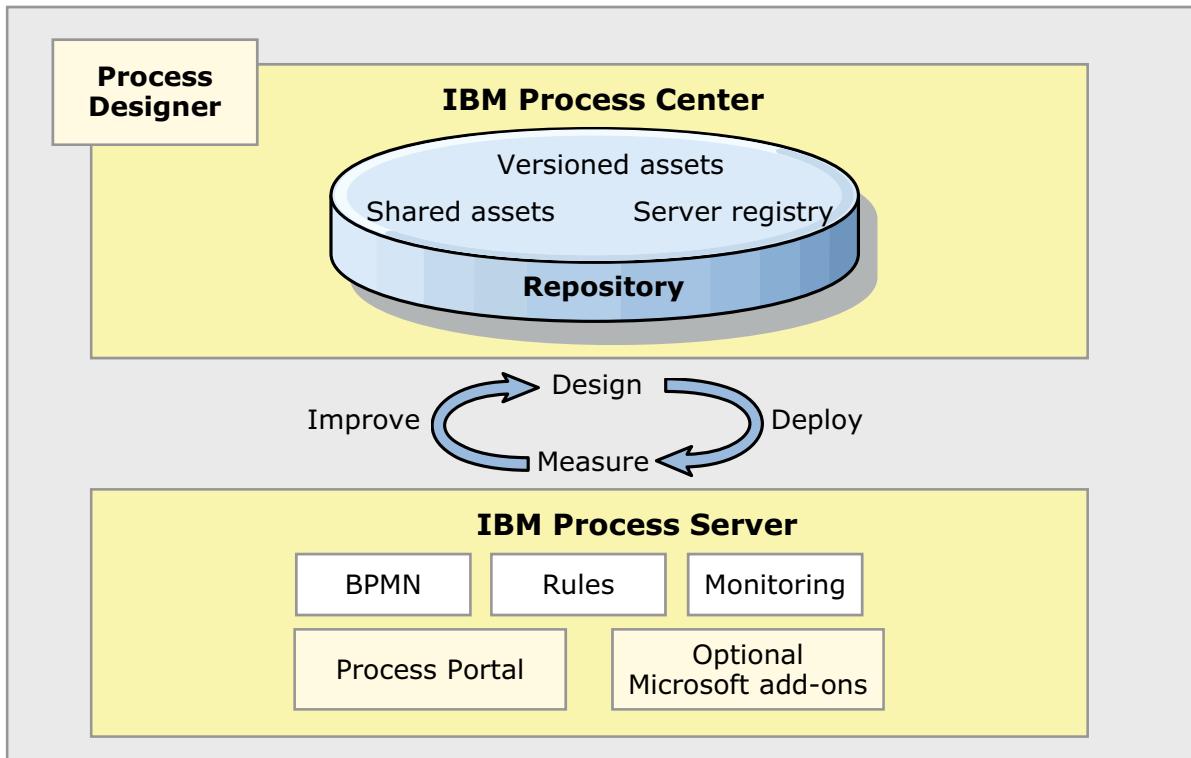
10.1

Figure 5-3. Introduction to Process Center

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Notes:

IBM Business Process Manager Standard V8.5



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Figure 5-4. IBM Business Process Manager Standard V8.5

WB8211.0

Notes:

IBM Business Process Manager Standard V8.5.6 uses a concept that is called the shared model. In simple terms, the shared model means that no matter what is being done within the overall solution, it has only one common repository and a single representation of that solution. Because of this representation, it is impossible to get two phases of the same solution out of sync with each other.

The BPM components realize this shared model through the Process Center. Process Center is a key component within IBM Business Process Manager Standard V8.5.6. Part of Process Center is a data repository, which is called the repository. Within the repository, there exists the representation of the solution. The BPM tools connect as clients to the Process Center to obtain copies of the solution for working on. When a user makes and saves changes, the results are written back to the repository.

The Process Center repository is implemented as tables within a database (commonly DB2).



Process Center capabilities

- Repository for all BPM assets
 - Process applications, reusable toolkits, monitor models, and many more
- Lifecycle management and deployment of all applications
 - Manage dependencies, versions, deployment to servers
- Includes execution environment for development and testing
- Sharing of toolkits from one repository with other Process Centers
- Central governance
- Web interface with Process Center Console

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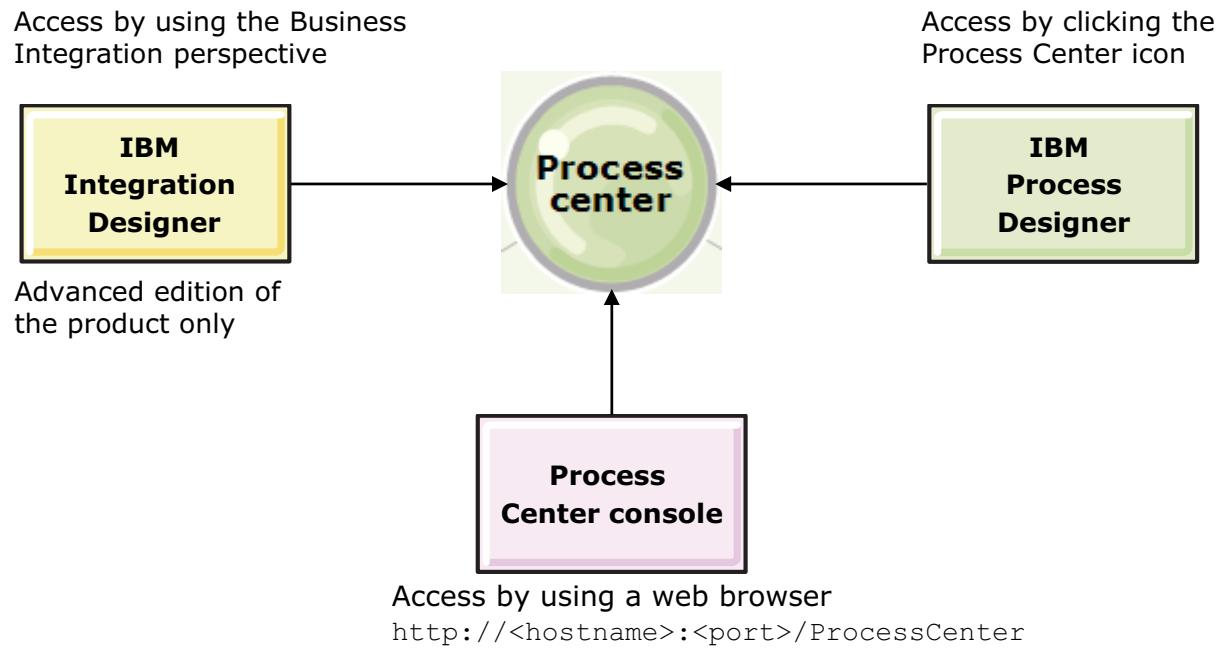
Figure 5-5. Process Center capabilities

WB8211.0

Notes:

You can use the Process Center repository to share artifacts with other users who are developing process applications and toolkits.

Accessing Process Center



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Figure 5-6. Accessing Process Center

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Notes:

Process Center can be accessed in the following ways:

- Click the Process Center icon at the upper right in the IBM Process Designer
- Use a web browser at the default URL: `http://localhost:9080/ProcessCenter`

The Process Center view and capability might vary slightly depending which tool you use.

5.2. Components of Process Center

Components of Process Center



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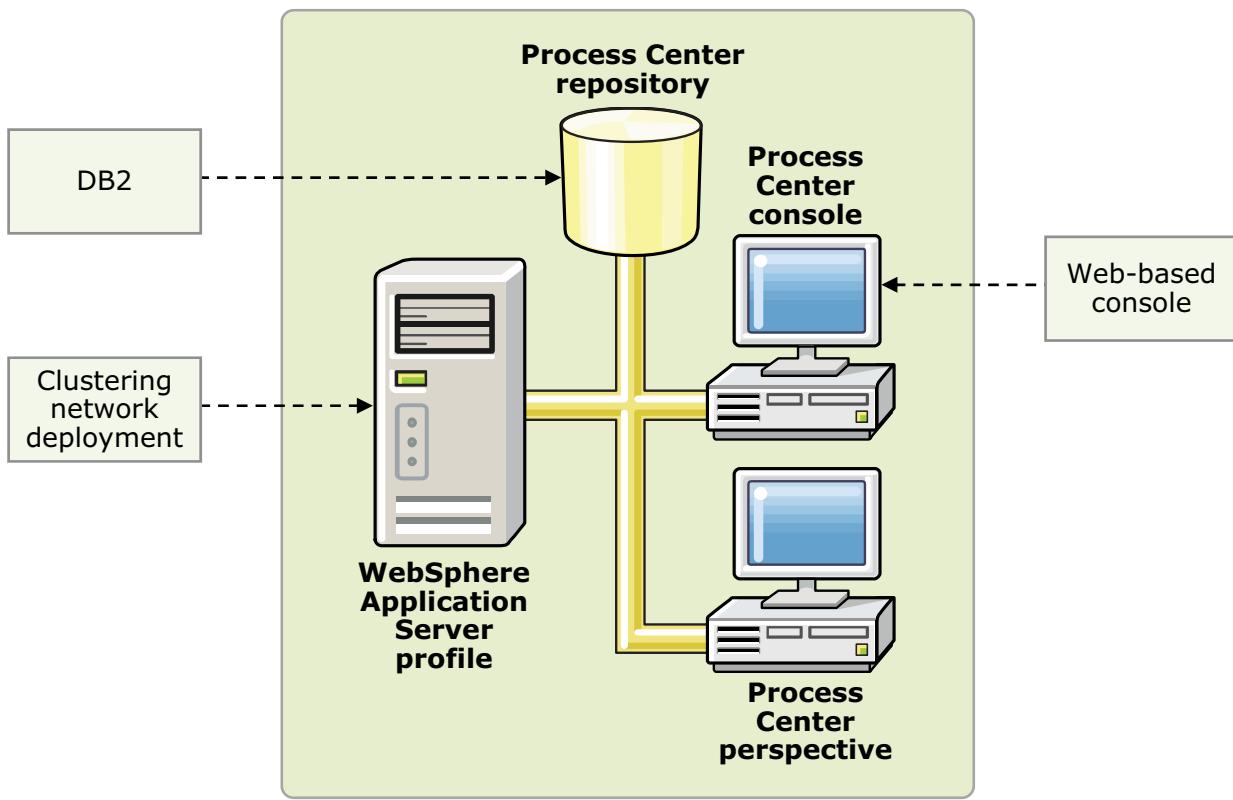
10.1

Figure 5-7. Components of Process Center

WB8211.0

Notes:

About Process Center



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Figure 5-8. About Process Center

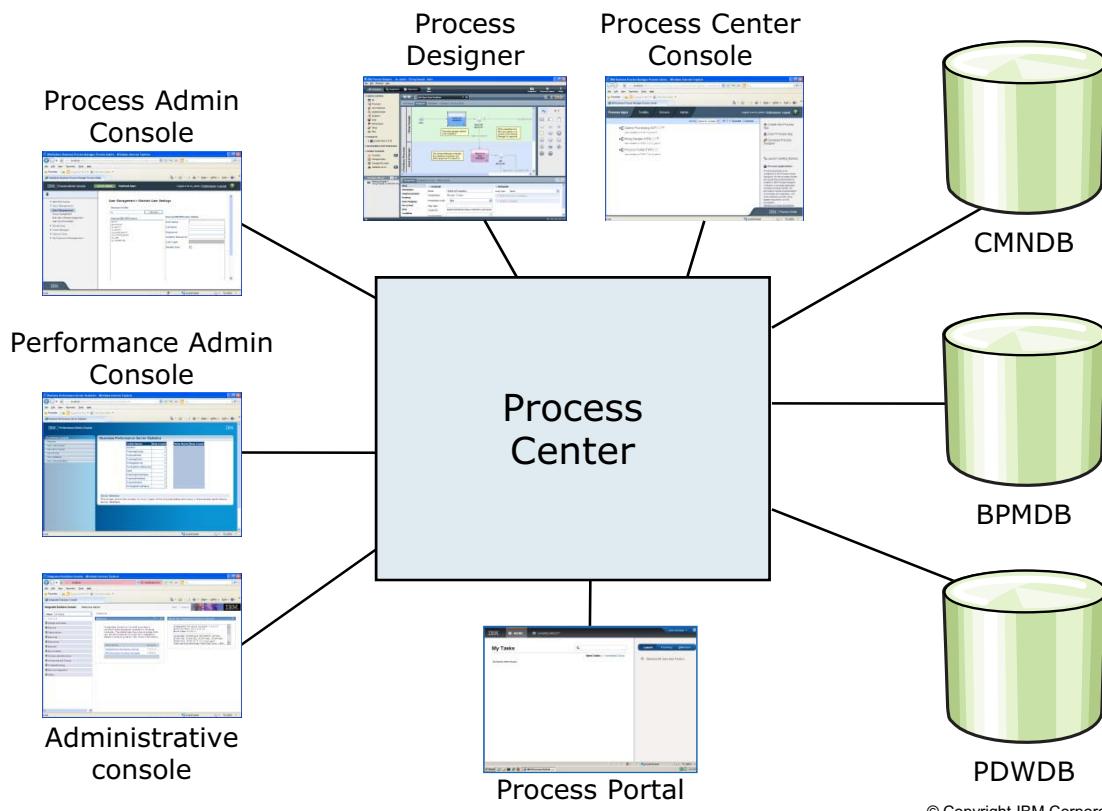
WB8211.0

Notes:

Process Center is a centralized tool that uses WebSphere Application Server and a database as a repository. The tool provides perspectives that allow developers to work with assets stored in the Process Center repository. The components of Process Center include:

- Application server: A WebSphere Application Server profile that offers all of the expected functions of WebSphere Application Server Network Deployment, including clustering and a runtime engine. In the Express configuration of IBM Business Process Manager, clustering is not supported. Process Center is used as the runtime engine for the Express and Standard configurations, but not for the Advanced configuration.
- Database: Process Center uses a repository, which by default is based on DB2 Express. The repository might be installed on other databases at installation time.
- Administration console: Process Center offers a web-based administration console, which can be started from a browser. This same interface is also offered in development tool perspectives (IBM Process Designer).

Architecture (1 of 2)



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Figure 5-9. Architecture (1 of 2)

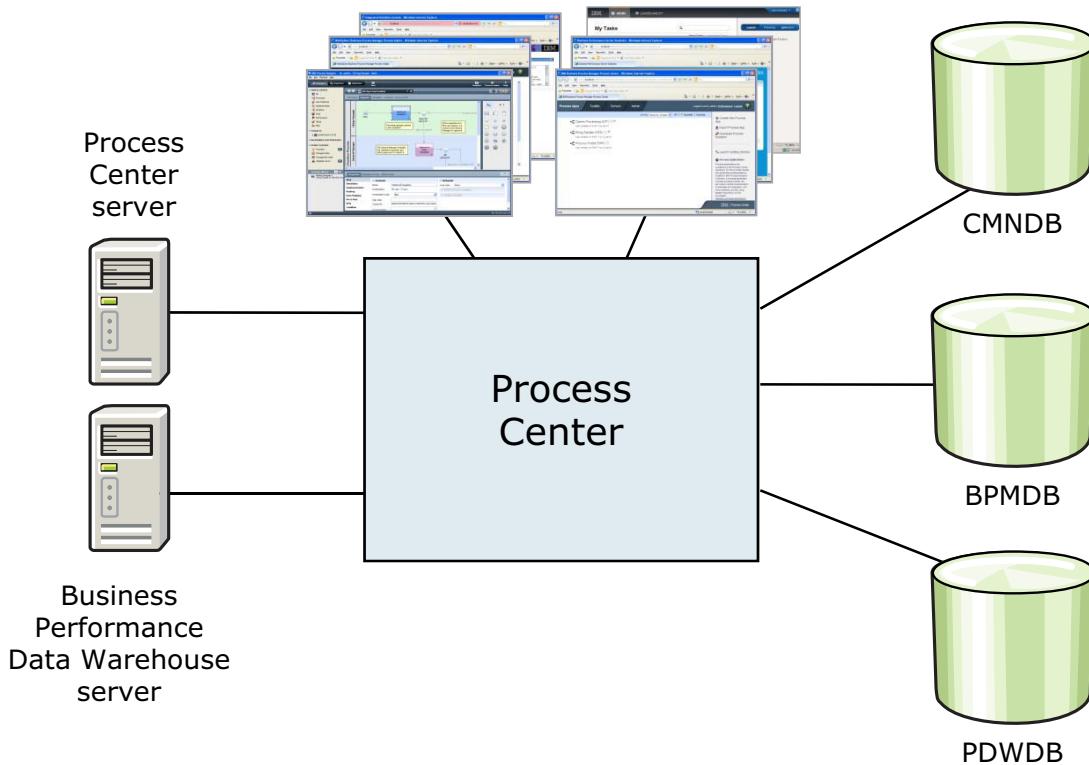
WB8211.0

Notes:

Process Center also supports numerous administrative functions. From the Process Center Console, administrators install process applications that are ready for staging, testing, or production on the Process Servers. The administrators can also manage the instances of process applications in configured environments.

From the Process Admin Console and Performance Admin Console, administrators can manage and maintain all runtime servers. Use the Process Admin Console to manage the Process Center server and Process Servers in your runtime environments. Use the Performance Admin Console to identify performance bottlenecks and to capture instrumentation data for further analysis.

Architecture (2 of 2)



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Figure 5-10. Architecture (2 of 2)

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Notes:

The Process Center includes two servers, the Process Center server and the Business Performance Data Warehouse server. These servers allow developers that are working in Process Designer to run their process applications and store performance data for testing and playback during development efforts. Business Performance Data Warehouse retrieves tracked data from Process Server or Process Center server at regular intervals.



Process Center Console

- The Process Center Console provides a web-based interface for managing the Process Center maintained projects
- It provides the tools that are needed to maintain the repository

 A screenshot of the IBM Process Center login interface. It features a dark header with the "IBM Process Center" logo. Below the header is a light-colored input form containing fields for "User name" (with "pcdeadmin" typed in) and "Password" (with several dots indicating the password). At the bottom of the form is a blue "Log In" button. At the very bottom of the page, there is small text: "Licensed Materials - Property of IBM. © Copyright IBM Corporation 2000, 2014." and "© Copyright IBM Corporation 2016".

Figure 5-11. Process Center Console

WB8211.0

Notes:

The Process Center Console provides a web-based interface for managing the Process Center maintained projects. The default URL for Process Center Console is:

<http://localhost:9080/ProcessCenter>

The Process Center includes a repository for all processes, services, and other assets. The Process Center Console provides the tools that you need for maintaining the repository.

From the Process Center Console:

- You can create process applications and toolkits and grant other users access to those process applications and toolkits.
- Administrators can install process applications that are ready for testing or production on the Process Servers in those environments.
- Administrators manage running instances of process applications in configured environments.



Process Center: Process Apps

- A process application is the container for a solution
- Initially created with the Process Center Console
- Identified by the following details:
 1. Name
 2. Tag that is called an acronym
- The process application and its artifact contents are stored in the Process Center repository

The screenshot shows the 'Process Apps' section of the Process Center. It lists three entries:

- Hiring Sample (HSS) - Last updated on 9/8/15 by pcdeadmin
- Saved Search Admin (SSA)** - Last updated on 9/8/15 by pcdeadmin (highlighted with a red box and circled with number 1)
- Process Portal (TWP) - Last updated on 9/8/15 by pcdeadmin

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Figure 5-12. Process Center: Process Apps

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Notes:

A process application is the container for a solution. You can loosely think of it as a project. The process application is initially created with the Process Center Console. It is given a name and a tag that is called an acronym. The acronym must be unique and can be no more than 7 characters in length. After the process application container is created, artifacts can then be further created within it by using the IBM Process Designer.

The process application and its artifact contents are stored within a Process Center repository. The main Process Apps page has a button to create a process application.

Process Center: Toolkits

- Container for artifacts that are used in solutions
- Toolkits are not deployable applications
- Toolkits can be:
 - “Included” or “Used” by process applications, similar to library with artifacts
 - Can be added as a dependency to a process application
- With sharing capability, you can share toolkits in one Process Center repository with other Process Centers

Process Apps	Toolkits	Servers
	SAP Guided Workflow (SGW) ★?	Last updated on 9/8/15 by pdeadmin
	System Governance (TWSYSG) ★?	Last updated on 9/8/15 by pdeadmin
	Dashboards (SYSD) ★?	Last updated on 9/8/15 by pdeadmin
	Content Management (SYSCM) ★?	Last updated on 9/8/15 by pdeadmin
	Coaches (SYSC) ★?	Last updated on 9/8/15 by pdeadmin
	System Data (TWSYS) ★?	Last updated on 9/8/15 by pdeadmin

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Figure 5-13. Process Center: Toolkits

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Notes:

Similar to a process application, a toolkit can also be thought of as a container for artifacts that are used in solutions. Unlike a process application, a toolkit does not result in a deployable application. Instead, the contents of the toolkit can be “included” or “used” by one or more process applications.

When Process Center is installed and configured, a toolkit that is called System Data is automatically imported into the repository. This toolkit is marked as read-only and is implicitly dependent on all other process applications and toolkits. The System Data toolkit contains the core definitions for data structures and other items common across all process applications.

Toolkits have their own tabs in the Process Center Consoles. From these tabs, new toolkits are managed in a similar fashion to process applications.

With Process Center sharing, you can share toolkits between Process Centers. From one Process Center, a toolkit can be declared to be sharable. Through an inter-Process Center registration process, other Process Centers can then subscribe to the shared toolkit. The toolkit and all of its dependencies are then copied to the subscribing Process Center.



Process Center: Snapshots

- A snapshot is a copy of the state of all artifacts in a process application or toolkit at the point in time when the snapshot was made
- Allows for creating a version of toolkits and process applications

Hiring Sample (HSS)

Snapshots

History Manage Governance

Sort Snapshots By: Date All

Current
Last changed on 9/8/15 by pcdeadmin

Standard Hiring Sample v8560 (SHSV856) (New)
Created on 9/8/15 by pcdeadmin
Not Yet Installed to Process Server

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Figure 5-14. Process Center: Snapshots

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Notes:

A snapshot is a copy of the state of all of the artifacts in a process application or toolkit at the point in time when the snapshot was made. The purpose of taking a snapshot is so that you can revert in time to the state of the snapshot when you need to do so. A snapshot can be captured by clicking the Snapshot icon in IBM Process Designer.

A snapshot is required in some circumstances, such as:

- A snapshot of a toolkit is required before it can be added as a dependency on other toolkits or process applications.
- A snapshot of a process application is required before that application can be installed on Process Server.
- A snapshot is required before a new “workspace” can be created.

Just like process applications, toolkits can have snapshots that are taken of them, allowing all of the artifacts in a toolkit to be controlled according to version.

To add a toolkit as a dependency to a process application, the toolkit must first have a snapshot that is associated with it. This requirement is because the dependency added to the process application is not just the name of the toolkit, but is instead a specific snapshot of that toolkit.

The screenshot shows the 'Process Center: Servers' page. At the top, there's a navigation bar with tabs: 'Process Apps', 'Toolkits', 'Servers' (which is highlighted with a red box), 'Admin', and 'Logout'. Below the navigation bar, there's a search bar with a magnifying glass icon. The main content area displays a single server entry: 'PROD_ProcessServer' (PRODUCTION - Status: Offline). To the right of the server entry are two buttons: 'Edit' and 'Remove Offline Server'. The entire screenshot is framed by a light gray border.

- The Servers tab lists the Process Servers that are connected to the Process Center
 - Process Server that is connected can be a stand-alone server
 - Process Server that is connected can be a server that is running inside the Integration Designer test environment (Advanced edition only)
 - Multiple servers can be connected
 - Multiple environments can be connected which include development, testing, staging, and production

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Figure 5-15. Process Center: Servers

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Notes:

The servers that are shown are Process Servers that are connected to the Process Center. Authorized users can install snapshots of process applications on connected Process Servers. For each server, you can view the snapshots that are currently installed.

The Servers tab in the Process Center Console shows the list of Process Server environments that the Process Center manages.

Clicking Configure Server in a listed Process Server takes you to the Process Admin Console corresponding to that particular Process Server.

Offline Process Server environments can be created by clicking Add a New Offline Server on the right side panel. It is a good practice to manage the Process Server environments that are used for production purposes in offline mode.

The process applications can be installed to offline servers by creating a deployment package specific to that environment. See the documentation in the IBM Knowledge Center for details on what commands to run to install the deployment package:

http://www.ibm.com/support/knowledgecenter/SSFPJS_8.5.6/com.ibm.wbpm.admin.doc/topics/t_installsnapshots_custom_scripting.html?cp=SSFPJS_8.5.6&lang=en

The screenshot shows the 'Process Center: Admin' interface. At the top, there are tabs for 'Process Apps', 'Toolkits', 'Servers', and 'Admin'. The 'Admin' tab is highlighted with a red box. Below the tabs, there are three buttons: 'Manage Users' (green), 'Activity Log' (grey), and 'Registration' (grey). On the left, a sidebar titled 'Admin' lists two groups: 'tw_admins' (selected, indicated by a checkmark) and 'tw_authors'. To the right of the list is a 'Remove' button. On the far right of the sidebar is a question mark icon labeled 'Admin'. On the right side of the main area, there are two buttons with plus signs: 'Add Users' and 'Add Groups'. The 'Add Groups' button is also highlighted with a red box.

- Admin tab displays a list of users and groups
 - You can provide users and groups access to the Process Center repository
- Best way to manage access to the Process Center repository is by using groups
 - Add groups of users to tw_authors, which is the default group with access to the repository
 - Add groups of users to tw_admins, which is the default group with administrative access to the repository

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Figure 5-16. Process Center: Admin

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Notes:

Granting users authority to access the repository allows them to log in to the Process Center Console. The authority does not give privileges to work on or even see all of the process applications in the environment. Process applications and toolkits are individually controlled with their own access control lists. From within the process applications section of the IBM Process Designer or the Process Center Console, you can select an application and select the Manage tab to manage. The Manage tab has a section into which users and groups might be associated which define the permissions for those entities.

Users or groups are assigned one of three roles:

- Read: Allows a user or group to see the project and artifacts within it. The read role cannot be removed without removing the user or group association completely. If a user or group is not associated with the process application, then the user or group has no authorities on that application. If a user with read authority opens an artifact, the artifact is flagged as read-only in the editor.
- Write: Allows the user or group to update or add artifacts into the process application.
- Admin: Allows the user or group to administer the process application.

The Process Admin console provides configuration and management tools for the Process Servers in your IBM Business Process Manager environment.

The Process Admin console enables you to manage IBM BPM users, as well as the queues and caches for particular servers. The console also provides tools to help you configure the process applications installed on the servers in your runtime environments.

To work with the Process Admin console:

- Use this Server Admin page to perform server administration tasks and view status information for process instances and applications.
- Use the Process Inspector page to view and manage process instances for process applications.
- Use the Installed Apps page to view and manage snapshots of installed process applications.

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Figure 5-17. Process Admin Console

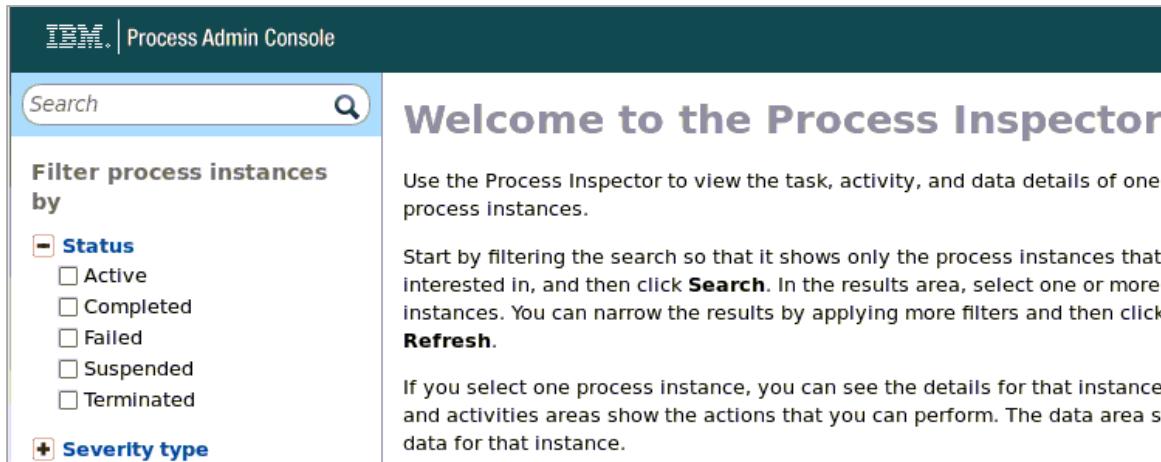
WB8211.0

Notes:

Administrators can use the Process Admin Console to manage the Process Servers in the runtime environments (staging, test, production). The Process Admin Console is also available to manage the Process Center server that is part of the Process Center.

The most important management tasks are managing user accounts and managing installed applications (activating and deactivating applications, migrating in-flight instances).

Process Inspector



- A tool that can be used to view and manage process instances that are running on a specific Process Server
 - Users can search for process instances on a Process Server by specifying different filtering criteria
- Provides detailed information about a specific instance
- Started from the Process Admin Console

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Figure 5-18. Process Inspector

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Notes:

Process Inspector is a tool that can be used to view and manage process instances that run on a specific Process Server. You can use the Process Inspector to search for process instances on a Process Server by specifying different filtering criteria. Criteria include status, process application name, person, date range or searching for specific text.

When you select a process instance in the Process Inspector, specific details are displayed in a separate panel. You can view detailed information about one specific process instance or view a summary of information about an entire group that you select. The sample screen capture shows details of one failed process instance. The process instance details panel shows information about the process instance you selected. This information includes process instance status such as Active and all actions that are possible on the process instance, such as Terminate and Delete. Also included are open and completed tasks, and date and time information such as the starting time or when the item is due.

When to use which console?

- Process Center Console
 - To create and grant users access to process applications and toolkits
 - To deploy process applications on the Process Servers
 - To activate, deactivate, or clone snapshots that are deployed on a Process Server
- Process Admin Console
 - To activate, deactivate, stop, or undeploy snapshots that are deployed on a Process Server
- Administrative console
 - To stop and start BPEL templates that are associated with process applications
 - To create and manage JDBC providers, data sources, authentication aliases, and other tasks
- Performance Admin Console
 - To work with Business Performance Data Warehouse queues, manage data transfer errors, and monitor overall performance
- Process Portal
 - For business users who must work with business processes and human services

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Figure 5-19. When to use which console?

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Notes:

The purpose of this slide is to talk about the scenarios in which you might switch to the other two administrative consoles. After a process application is installed to a Process Server, the administrative operations on the snapshot are different. The Process Admin Console is used for operations that include activate, deactivate, undeploy, and similar tasks.

When BPEL processes are used as part of the process application, the WebSphere Application Server administrative console can be used to stop and start the associated templates. Also, you can use this console for creating resources like JDBC providers, data sources, and authentication aliases.

Remember two things when using other consoles. The administrative console cannot be used for modifying the states of a deployed snapshot. And after a snapshot is deployed to Process Server, the Process Admin is the only console that is used for all other operations corresponding to that snapshot.

5.3. Using Process Center to test, deploy, and manage process applications

Using Process Center to test, deploy, and manage process applications



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10.1

Figure 5-20. Using Process Center to test, deploy, and manage process applications

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Notes:



Overview of deployment of a process

- **Import** process application from Process Center repository
- **Associate** any modules or libraries
- **Synchronize** versions in workspace and Process Center repository
- **Publish** synchronized process application to Process Center repository
- **Deploy** process application to Process Server

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Figure 5-21. Overview of deployment of a process

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Notes:

A process application snapshot can be deployed to a Process Server by using the Process Center Console. After the snapshot is deployed, you use the Process Admin Console corresponding to that server to do the administrative operations on the snapshot.

Deactivating a snapshot allows all existing Business Process Definition instances to complete, but no new instances can be started. Using the Deactivate action from the Process Admin Console does not stop a BPEL process that is part of a process application.

You use the administrative console to stop the BPEL processes manually.

Governance

- Provides control over the installation of process app snapshots
 - Make sure that testing is done and approvals are secured before installation
- When governance is enabled, a custom built governance process receives snapshot installation requests made from Process Center
 - Snapshot is installed, only if the approvals defined in the process are completed
- Custom governance process uses the system governance toolkit
 - Triggered, even when a snapshot is installed to an offline Process Server
 - Runs as tip on the Process Center server
 - If more than one governance process is defined, each is notified during snapshot installation
 - If a wsadmin command is used for installing snapshots, it does not trigger

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Figure 5-22. Governance

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Notes:

The governance of process applications provides a level of control over the installation of Process App snapshots. A system governance toolkit is provided to enable this control. Using the artifacts in the toolkit, you can build your own custom governance processes that conform to the requirements of your organization.

The governance of snapshot installation feature provides you with control over the installation of process application snapshots. Users can create a governance process that defines the approvals that are required before a snapshot can be installed. When this governance process is in place and enabled on a process application, requests made from Process Center to install a snapshot of that process application pass through the governance process. The snapshot is installed on a Process Server only after the defined approvals are completed. In addition to snapshot installation, the governance feature is also extended to tracking snapshot status. This feature sends notification events every time a new snapshot gets created or a status of the snapshot gets changed. The administrators are allowed to do the snapshot status governance on both the process applications and toolkits. The governance process that you defined to control the snapshot installation always runs on the Process Center server.



Deploy (1 of 2)

Two types of runtimes for a Process Servers:

- **Online or connected:** An online Process Server runtime that is configured during installation and is automatically discovered and shown in the web-based Process Center Console
- **Offline:** An offline server is a Process Server runtime that is not connected to a Process Center
 - Offline servers can still be used when deploying snapshots of process applications
- The method for deploying process application snapshots to an offline Process Server differs from the method for deploying process application snapshots to an online Process Server
- Process applications snapshots can be deployed to configured Process Servers
 - Applications are deployed directly to the online Process Server
 - An installation package is created, extracted, and installed to the offline Process Server

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Figure 5-23. Deploy (1 of 2)

WB8211.0

Notes:

Snapshots can be deployed to offline or online Process Servers.

Both the Process Center server and the Process Server where the application is being deployed must be running.

When deployed, dependencies are deployed as well.

The screenshot shows the WebSphere Education interface. At the top, there's a blue header bar with the IBM logo on the right. Below it, the main title is "WebSphere Education". The main content area has a dark header with tabs: "Process Apps", "Toolkits", "Servers", and "Admin". A search bar with a magnifying glass icon is on the right. The main content area displays the "Mortgage Application Process (MAP)" with a star icon. Below the title, there are four tabs: "Snapshots" (which is selected and highlighted in green), "History", "Manage", and "Governance". A sorting menu "Sort Snapshots By:" includes options "Date", "All", "Installed", and "Archived". The "Current" snapshot is listed first, showing it was last changed on 10/14/15 by pcdeadmin. The "V5 (V5)" snapshot is listed second, marked as "(New)" and "Currently Installed". It shows it was created on 10/14/15 by pcdeadmin. To the right of the "V5" entry are "Export" and "Install" buttons, with "Install" being highlighted with a red border. Below these entries are links for "Server Details" and "Installation details". At the bottom right of the content area, there's a copyright notice: "© Copyright IBM Corporation 2016".

Figure 5-24. Deploy (2 of 2)

WB8211.0

Notes:

Snapshots can be deployed to offline or online Process Servers.

Both the Process Center server and the Process Server where the application is being deployed must be running.

When deployed, dependencies are deployed as well.

The screenshot shows the 'Manage' section of the WebSphere Education interface. At the top, there's a navigation bar with tabs for 'Process Apps', 'Toolkits', 'Servers', and 'Admin'. On the right of the navigation bar are icons for help, search, and user profile. Below the navigation bar is a toolbar with a 'Sort By' dropdown set to 'Recently Updated', buttons for 'All', 'Favorites', and 'Archived' (which is highlighted with a red box), and a magnifying glass icon. The main content area displays a single process application entry: 'Verification Project (VP821)' with a star icon, last updated on 11/1/15 by pcdeadmin. To the right of the application name are 'Restore' and 'Delete' buttons, with 'Delete' also highlighted with a red box. The entire interface has a dark blue header and a light blue footer.

- Removing process applications from the Process Center repository
 - Use the Process Designer to first archive the process application and then delete it

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Figure 5-25. Manage

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Notes:

5.4. Managing access to Process Center

Managing access to Process Center



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10.1

Figure 5-26. Managing access to Process Center

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Notes:

Managing access to the Process Center

- Administrators control user access to process applications in the Process Center Console
- The Process Center Console displays security groups and users from the following sources:
 - IBM Business Process Manager internal security provider
 - External security provider
- Groups added in the administration section gain access to log in to IBM Business Process Manager through the authoring environment
- Users and groups are managed by using the Process Admin Console

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Figure 5-27. Managing access to the Process Center

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Notes:

The best way to manage access to Process Center and its repository is by using groups. For example, the easiest way to manage access to the Process Center repository is to add preexisting groups of users from your external provider to tw_authors. The tw_authors group is an IBM Business Process Manager group whose members have access to the repository by default. Then, when changes are required, you can add or remove individual users from the groups that exist in your external security provider. This practice makes sure that the security maintenance that you complete in your external provider does not require more work in IBM Business Process Manager.

The same is true for administrative access to the Process Center repository. You can add preexisting groups of users from your external provider to tw_admins, which is an IBM Business Process Manager group whose members have administrative access to the repository by default.



Configuring IBM Process Designer access

- The groups `tw_authors` and `tw_admins` are authorized to access the Process Center repository by default
 - These accounts can log in to IBM Business Process Manager, but `tw_authors` do not have administrative privileges
- To add more groups of users:
 - Click **Manage Users > Add Users or Groups**
 - Groups now have access to log in to IBM Business Process Manager through Process Designer

A screenshot of the IBM Process Designer Admin interface. The top navigation bar includes links for Process Apps, Toolkits, Servers, Admin, and search. The Admin section is active. Below the navigation is a sub-menu with Manage Users (selected), Activity Log, and Registration. The main content area shows a list of users under the heading 'Admin'. Two users are listed: 'tw_admins' (with a checked checkbox) and 'tw_authors'. To the right of the list is a 'Remove' button and a vertical scroll bar. On the far right, there is a sidebar with three buttons: '+ Add Users', '+ Add Groups', and a question mark icon labeled 'Admin'.

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Figure 5-28. Configuring IBM Process Designer access

WB8211.0

Notes:

You must restart the server for Process Designer to recognize any new WebSphere Application Server Virtual Member Manager (VMM) user repository security groups or LDAP user repository security groups. After you restart the server, click **Add Group** to add the new groups.



Configuring administrator access

- By default, every user account in the tw_admins group has access to administer in the Process Center Console
- DeAdmin role can grant administrative access to other users
- Administrators can also create process applications and toolkits
 - To add more security groups or users as Process Center administrators, open the Process Center Console and click **Admin**
- Click **Manage Users**, then add users or groups
- Enable **Admin** access in the left column

A screenshot of the IBM Business Process Manager Admin interface. The top navigation bar includes 'Process Apps', 'Toolkits', 'Servers', and 'Admin'. The 'Admin' tab is selected. Below the navigation is a secondary menu with 'Manage Users' (highlighted in green), 'Activity Log', and 'Registration'. The main content area is titled 'Admin' and shows a list of users. There are two entries: 'tw_admins' and 'tw_authors'. Each entry has a small icon: a checkmark for 'tw_admins' and a grey circle for 'tw_authors'.

User Group	Status
tw_admins	✓
tw_authors	●

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Figure 5-29. Configuring administrator access

WB8211.0

Notes:

By default, IBM Business Process Manager includes the user in the DeAdmin role, which provides administrative access to the Process Center repository. This default administrator can grant administrative access to other users.

Configuring process application and toolkit access

- Set different levels of access to process applications and toolkits
 - Select the process application or toolkit
 - Click **Manage**
 - Click **Add Users/Groups** and select the access level
- Three different access levels:
 - Read access
 - Write access
 - Admin access

Read	Write	Admin	Remove
tw_admins			

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Figure 5-30. Configuring process application and toolkit access

WB8211.0

Notes:

Managing access involves three access levels:

- **Read access:**
 - Can view process application or toolkit in Process Center console
 - Can view all library items included in process application or toolkit in Designer view
 - Edits are not allowed
 - Mostly intended for use with toolkits
- **Write access:**
 - Can view process application or toolkit in Process Center console
 - Can create, edit, or delete library items in the Designer view
 - Can also create and edit snapshots of process application or toolkit either in the Process Center console or Designer view
- **Admin access:**

- All capabilities are included with write access, with more actions in the Process Center console
- Can edit process application and toolkit settings
- Can create, edit, or archive workspaces
- Can archive snapshots
- Can modify user access to the process application or toolkit



Creating groups and adding users

User Management > Group Management

Select Group to Modify: %%

New Group	Remove
Debug	(-)
tw_admins	(-)
tw_allusers	(-)
tw_allusers_managers	(-)
tw_authors	(-)
tw_managers	(-)
tw_portal_admins	(-)
tw_process_owners	(-)
twem	(-)

tw_admins

Team Manager Group (deprecated): No Team Manager Group

Add Users Add Groups Remove

bpmaadmin (bpmaadmin)	(-)
pcdeadmin (pcdeadmin)	(-)

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Figure 5-31. Creating groups and adding users

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Notes:

To create and maintain groups, log in as an administrative user, such as the default administrative user account, or an account that you added during installation that has administrator privileges. If you added a new administrative user, the user is added to the tw_admins user group. Members in the administrators group, by default tw_admins, can administer Process Servers, Business Performance Data Warehouses, and internal users and groups.

If you configured IBM Business Process Manager to work with an external security provider, you can view the groups from that external provider in the Process Admin Console, but you cannot edit the external groups. However, you can add users and groups from your external provider to any IBM Business Process Manager security groups that you create. You can also combine accounts from different providers into one group.

5.5. Process Center sharing

Process Center sharing



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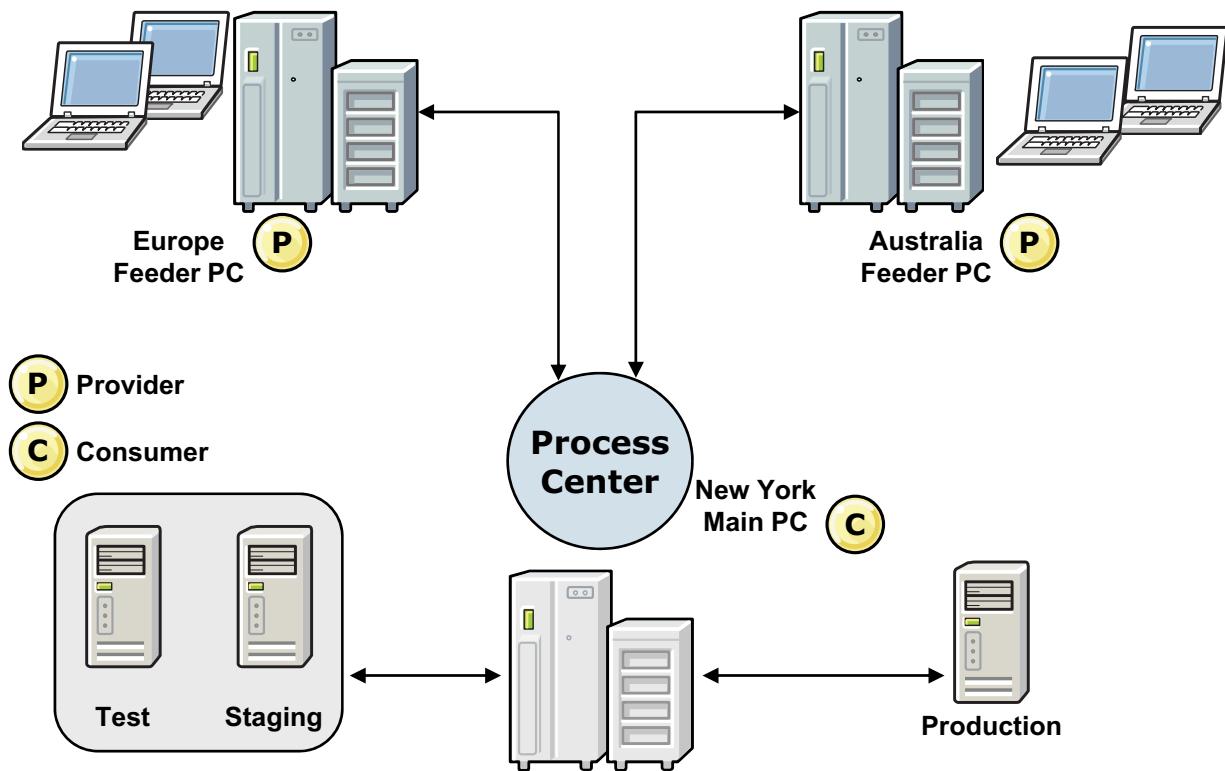
10.1

Figure 5-32. Process Center sharing

WB8211.0

Notes:

Process Center satellite sharing



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Figure 5-33. Process Center satellite sharing

WB8211.0

Notes:

With sharing, you can share toolkits with remote Process Center environments.

- Consumer Process Center subscribes to the shared toolkit on a provider Process Center.
- The toolkit and all of its dependencies are imported into the consuming Process Center.
- The consumer Process Center gets a copy of a toolkit snapshot from the provider Process Center.
- Consumer Process Center can check for status and get a copy of a new snapshot.

Process Center sharing

- To share toolkits between the two Process Centers, the various participants do the following tasks:
 - An administrator enables both Process Centers for sharing
 - An administrator registers the consumer Process Center that accesses the shared toolkit
 - The author of the toolkit that is shared selects a snapshot of the toolkit and releases it
 - The author of the toolkit that is shared selects that toolkit and shares it with other Process Centers, enabling that toolkit to be shared with any Process Center that is registered to the sharing Process Center
- The shared toolkit is downloaded to the subscribing Process Center as a read-only copy
 - The subscriber cannot modify or share the subscribed toolkit

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Figure 5-34. Process Center sharing

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Notes:

You can revoke a Process Center registration when you are no longer sharing toolkits. When you revoke a registration, toolkits can no longer be shared with that Process Center. The Process Center with a revoked registration is removed from the list of registered Process Centers.

P Manage Users Activity Log **Registration**

C Manage Users Activity Log **Registration**

C Manage Users Activity Log **Registration**

Enable Registration and Sharing

Enable Registration and Sharing

Enable Registration and Sharing

Create Registration

Register

From this page, you can perform administrative tasks such as granting access to the Process Center repository.

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Figure 5-35. Process Center sharing configuration

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Notes:

You can share toolkits with other users, even if those users are working in a different Process Center. It is no longer necessary to first export the toolkits from one Process Center and then import them into another Process Center.

To share toolkits between two Process Centers, administrators enable the Process Centers to be registered with each other. The supported protocols are HTTPS (HTTP over Secure Sockets Layer) and HTTP. Before specifying the HTTPS protocol, you must set up security between the participating Process Centers.

The screenshot shows the WebSphere Education provider configuration interface. At the top, there's a navigation bar with links for Process Apps, Toolkits, Servers, Admin, Logout, and a search bar. Below this, a specific toolkit named "Order Fulfillment (ORDFUL2)" is selected. The toolkit details include its name ("Order Fulfillment"), acronym ("ORDFUL2"), and a description ("Create an order, send it to order fulfillment and change the data in the order"). On the right side, there are several management options: "Archive Toolkit", "View Archived Tracks", "Share Toolkit with other Process Centers" (with a cursor icon pointing at it), and "Allow other Proces".

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Figure 5-36. Provider configuration

WB8211.0

Notes:

When both Process Centers are registered, the toolkit author can release a toolkit snapshot to be shared. The toolkit author can also see which subscribers are using the toolkit, and which versions they are using. When the toolkit author updates a toolkit and releases the changes in a new snapshot, the subscriber can view the changes. The subscriber can then decide to update the dependency with the new snapshot.

The screenshot shows the Consumer Process Center interface. At the top, there's a blue header bar with the WebSphere Education logo on the left and the IBM logo on the right. Below the header is a dark navigation bar with tabs for "Process Apps", "Toolkits" (which is selected), "Servers", and "Admin". On the far right of the navigation bar are "Logout", a help icon, and a search bar.

The main content area has a light blue header with a "Sort By" dropdown set to "Recently Updated" and buttons for "All", "Favorites", "Subscriptions", "Shared", and "Archived". Below this, two toolkit entries are listed:

- Coaches (SYSC)** (with a star icon and a question mark icon) - Last updated on 10/31/15 by pcodeadmin
- System Data (TWSYS)** (with a star icon and a question mark icon) - Last updated on 10/31/15 by pcodeadmin

To the right of the toolkit list, a dropdown menu is open under the heading "Scope". It includes options like "All", "Process Designer", "Integration Designer", "Services", "Business Objects", "Location", "Local", and "Subscribing PC".

Below the toolkit list, there's another navigation bar with tabs for "Process Apps", "Toolkits" (selected), "Servers", and "Admin". A search bar shows the query "Ordful".

The main content area now displays search results for "Ordful" with the subtitle "(Subscribing PC, All)". It shows one result entry:

- Order Fulfillment (Toolkit)** (with a star icon and a question mark icon) - Last updated on 10/31/15 by pcodeadmin. This entry is highlighted with a green background. To its right is a "Subscribe" button with a hand cursor icon over it, and below it is a link "Subscribe to and reuse".

Figure 5-37. Consumer Process Center

WB8211.0

Notes:

If you are a user on a registered Process Center, you can search for and subscribe to shared toolkits on other registered Process Centers. When you subscribe to an already imported toolkit, the imported toolkit is converted to a subscription. If modifications were made to the imported toolkit that is in the subscribing Process Center before the toolkit was subscribed to, the subscription to the toolkit fails.



Provider Process Center

- Provider Process Center shows that a remote Process Center subscribes to this toolkit

A screenshot of a web-based application interface. At the top, there is a dark navigation bar with four tabs: "Process Apps", "Toolkits", "Servers", and "Admin". The "Toolkits" tab is currently selected. Below the navigation bar is a light blue header bar with the text "Sort By: Recently Updated" followed by a dropdown arrow, "All", and a link to "Favorites" which is underlined. The main content area displays a toolkit entry for "Order Fulfillment (ORDFUL2)". This entry includes a small icon of a briefcase, the toolkit name, a star icon, a question mark icon, and a people icon. Below the toolkit name, it says "Last updated on 10/31/15 by pcdeadmin".

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Figure 5-38. Provider Process Center

WB8211.0

Notes:

The people icon indicates that a remote Process Center subscribes to this toolkit.

Unit summary

Having completed this unit, you should be able to:

- Describe the purpose and business value of Process Center
- Define the components of Process Center
- Describe how to manage the Process Center repository
- Describe how to deploy, test, and manage process applications with the Process Center Console
- Manage access to Process Center
- Configure Process Center sharing

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Figure 5-39. Unit summary

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Notes:

Checkpoint questions

1. The authoring environment for BPMN processes is:
 - A. Process Center
 - B. Process Server
 - C. Integration Designer
 - D. Process Designer
2. True or false: Toolkits are deployable applications from Process Center.
3. True or false: Process Center serves as a repository for process applications, reusable toolkits, and monitor models.

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Figure 5-40. Checkpoint questions

WB8211.0

Notes:

Write your answers here:

- 1.
- 2.
- 3.



Checkpoint answers

1. C. Process Designer
2. False. Toolkits are not deployable applications. Toolkits can be included as a dependency to a process application.
3. True

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Figure 5-41. Checkpoint answers

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Notes:

Exercise 4

Administering Process Center



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10.1

Figure 5-42. Exercise 4

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Notes:



Exercise objectives

After completing this exercise, you should be able to:

- Administer the Process Center environment
- Administer the Process Center repository
- Explore the Process Center Console to examine process applications

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Figure 5-43. Exercise objectives

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Notes:

Unit 6. Managing users and groups

What this unit is about

This unit introduces you to managing users and groups.

What you should be able to do

After completing this unit, you should be able to:

- Describe access to Process Center and Process Server
- Customize user access to administration consoles
- Describe teams

How you will check your progress

- Checkpoint questions
- Lab exercises

References

IBM Business Process Manager V8.5.6 documentation in the IBM Knowledge Center:

http://www.ibm.com/support/knowledgecenter/SSFPJS_8.5.6/com.ibm.wbpm.main.doc/kc-homepage-bpm.html



Unit objectives

After completing this unit, you should be able to:

- Describe access to Process Center and Process Server
- Customize user access to administration consoles
- Describe teams

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Figure 6-1. Unit objectives

WB8211.0

Notes:



Topics

- Configuring access to the Process Center and Process Server
- Configuring user access

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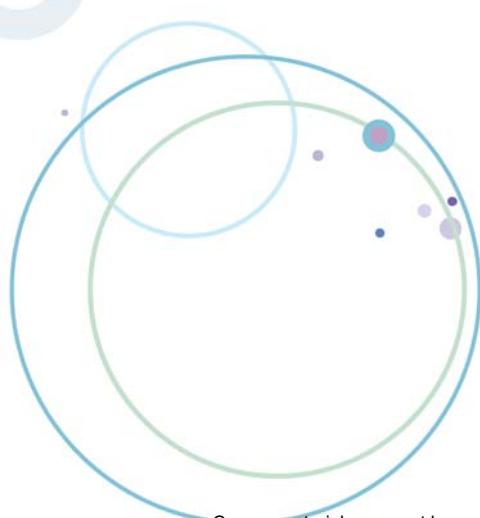
Figure 6-2. Topics

WB8211.0

Notes:

6.1. Configuring access to the Process Center and Process Server

Configuring access to the Process Center and Process Server



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Figure 6-3. Configuring access to the Process Center and Process Server

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Notes:



Configuring access to the Process Center

- Administrators control user access to process applications in the Process Center console
- The Process Center console displays security groups and users from the following sources:
 - IBM Business Process Manager internal security provider
 - External security provider
- Groups added in the administration section gain access to log in to IBM Business Process Manager through the authoring environment

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Figure 6-4. Configuring access to the Process Center

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Notes:

Configuring IBM Process Designer access

- In the screen capture shown, all of the groups are authorized to use the Process Center
 - These accounts can log in to IBM Business Process Manager, but only users who to the tw_admins group have administrative privileges
- To add more groups or users:
 - Open the Process Center console
 - On the Admin tab, click **Manage Users > Add Users or Add Groups**
 - As soon as they are added, the groups have access to log in using the Process Designer

The screenshot shows the 'Admin' tab selected in the top navigation bar. Under 'Manage Users', a list of groups is displayed:

Group	Description	Action
Business Analysts		Remove
Claims Project Team Members		Remove
General Managers		Remove
IT Development Team		Remove
tw_admins		Remove
tw_authors		Remove

To the right, there are links for 'Add Users' and 'Add Groups'. A sidebar provides information about the Admin page.

Figure 6-5. Configuring IBM Process Designer access

WB8211.0

Notes:



Configuring administrator access

- By default, every user account in the tw_admins group has access to administer user access in the Process Center console
- Administrators can also create process applications and toolkits
 - To add more security groups or users as Process Center administrators, open the Process Center console and click **Admin**
- Click **Manage Users**, then add users or groups
- Enable **Admin** access in the left column

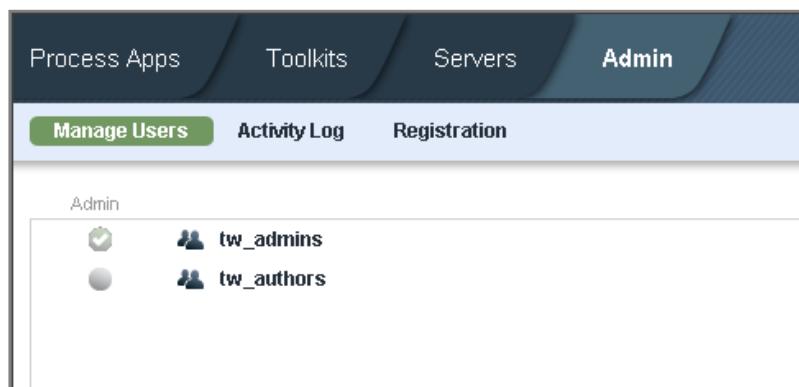


Figure 6-6. Configuring administrator access

WB8211.0

Notes:



Configuring process application and toolkit access

- Set different levels of access to process applications and toolkits
 - In Process Center console, select the process application or toolkit
 - Click **Manage**
 - Click **Add Users/Groups** and select the access level
- Three different access levels:
 - Read access
 - Write access
 - Admin access

The screenshot shows a user interface titled "Manage Access to Process Library". At the top, there is a button labeled "Add Users/Groups". Below this, there are three columns: "Read", "Write", and "Admin", each with a checked checkbox icon. To the right of these columns, the text "Administrator (admin)" is displayed next to a small user icon. On the far right, there is a "Remove" button with a minus sign and a scroll bar. At the bottom right of the interface, the text "© Copyright IBM Corporation 2016" is visible.

Figure 6-7. Configuring process application and toolkit access

WB8211.0

Notes:

Access levels for applications and toolkits

Read access	<ul style="list-style-type: none"> Can view process application or toolkit in Process Center console Can view all library items included in process application or toolkit in Designer view Edits are not allowed Mostly intended for use with toolkits
Write access	<ul style="list-style-type: none"> Can view process application or toolkit in Process Center console Can create, edit, or delete library items in the Designer view Can also create and edit snapshots of process application or toolkit either in the Process Center console or Designer view
Admin access	<ul style="list-style-type: none"> Have all capabilities included with write access, with more actions in the Process Center console Can edit process application and toolkit settings Can create, edit, or archive workspaces Can archive snapshots Can modify user access to the process application or toolkit

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Figure 6-8. Access levels for applications and toolkits

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Notes:



Authorization key information

- Users with Process Designer access can create process applications
 - If a user creates a process application, the user is automatically granted Admin rights to that application
- Process Server access
 - Useful to view progress in IBM Business Process Manager
 - Allows users to see how to interact with the application
 - Can be granted to business users or managers

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Figure 6-9. Authorization key information

WB8211.0

Notes:

If you want business users or managers to view progress, give them access to a Process Server instead of the Process Designer. It allows them to see how they interact with the application.

Administration of process applications

- If developers have administration access to a process application, they can authorize users and groups on that application
 - The Process Center console allows them to look up users and groups, and then add those users or groups directly to process applications they administer
- Many developers might add users instead of groups
 - If they are not in close communication with IBM Business Process Manager administrators, they likely do not know the members of each security group

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Figure 6-10. Administration of process applications

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Notes:

6.2. Configuring user access

Configuring user access



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Figure 6-11. Configuring user access

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Notes:



Creating a team

- A team represents the groups of users in your enterprise that can be assigned a task in a swimlane or assigned directly to an activity

The screenshot shows the 'Team' configuration window in the IBM Process Designer. The title bar says '* Insurance Processors'. The main area is titled 'Team'.

Common tab (selected):

- Name: Insurance Processors
- Modified: we_author
- Documentation: (Edit) - A text area with placeholder text: "Click [Edit](#) to add or edit text."
- Specify Team Using Service:

Simulation Properties tab:

- Capacity: Use Estimated Capacity
- % Availability:
- % Efficiency:
- Cost per Hour: 10.00

Members tab:

- Select: Standard Members
- we_author
- we_user1

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Figure 6-12. Creating a team

WB8211.0

Notes:

A team represents the groups of users in your enterprise that can be assigned a task in a swimlane or assigned directly to an activity. Developers can use the Process Designer to create teams and add users to that group.

The IBM Process Designer Team interface is used to assign members to a team. Because they might have other requirements to assign members in the different Process Server environments, system administrators can make the team assignments with the administrative screens on the various environments.

A team contains the users who complete the runtime activities that are modeled in each lane. Team lane assignments ensure that any activities that are not routed to a specific user have an automatic default assignment.

Assigning teams to lanes

- Team lane assignments ensure that any activities that are not routed to a specific team or user have an automatic default assignment
- Each lane that you create is assigned to the All Users team by default
- You can use this default team for running and testing your BPD in the Inspector
- The All Users team includes all users in the system who are members of the tw_allusers security group

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Figure 6-13. Assigning teams to lanes

WB8211.0

Notes:

To assign teams to lanes:

- In the BPD diagram, click the lane in which you want to make the assignment.
- In the Behavior section of the properties, click **Select** to choose the team that you want to use as the default team for this lane. You need a default lane assignment to ensure that any activities that are not otherwise routed have an automatic default assignment.
- Choose the team from the library.
- Click **Save** in the main toolbar.

Unit summary

Having completed this unit, you should be able to:

- Describe access to Process Center and Process Server
- Customize user access to administration consoles
- Describe teams

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Figure 6-14. Unit summary

WB8211.0

Notes:



Checkpoint questions

1. True or false: The Process Center console can display security groups and users from the internal IBM Business Process Manager security provider and from external security providers.
2. True or false: A developer with Admin access on a process app can administer users and groups on that process app.
3. True or false: Process Center controls access for Process Center users only, not for users.

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Figure 6-15. Checkpoint questions

WB8211.0

Notes:

Write your answers here:

- 1.
- 2.
- 3.



Checkpoint answers

1. True
2. True
3. False. Although not customary, the Process Center console can administer user access as well.

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Figure 6-16. Checkpoint answers

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Notes:



Exercise 5



Adding users and groups

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10.1

Figure 6-17. Exercise 5

WB8211.0

Notes:



Exercise objectives

After completing this exercise, you should be able to:

- Create groups
- Add users to groups
- Grant access to users and groups on specific projects
- Explore the Process Admin Console and examine its components

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Figure 6-18. Exercise objectives

WB8211.0

Notes:

Unit 7. Overview of Process Portal

What this unit is about

This unit provides an overview of Process Portal.

What you should be able to do

After completing this unit, you should be able to:

- Explain the capabilities of Process Portal
- Set preferences for Process Portal
- Work with assigned tasks
- Grant authorization to the Team and Process Performance dashboards
- Modify the Process Portal runtime behavior
- Customize and rebrand interfaces

How you will check your progress

- Checkpoint questions
- Lab exercise

References

IBM Business Process Manager V8.5.6 documentation in the IBM Knowledge Center:

http://www.ibm.com/support/knowledgecenter/SSFPJS_8.5.6/com.ibm.wbpm.main.doc/kc-homepage-bpm.html

Unit objectives

After completing this unit, you should be able to:

- Explain the capabilities of Process Portal
- Set preferences for Process Portal
- Work with assigned tasks
- Grant authorization to the Team and Process Performance dashboards
- Modify the Process Portal runtime behavior
- Customize and rebrand interfaces

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Figure 7-1. Unit objectives

WB8211.0

Notes:

- Provides capability for business users to work with business processes and human services that are authored in Process Designer
 - Users can start and stop processes, manage and run tasks for each process, and view the performance of individuals, teams, and processes
- Provides capability for users to complete the tasks that result from running processes on the Process Center server or a Process Server in a runtime environment

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Figure 7-2. Overview of Process Portal

WB8211.0

Notes:

Process Portal allows users to run and test the business process applications in the various test and quality assurance environments. It has features for monitoring and managing all aspects of the business processes. Developers can customize Process Portal. For example, they can restrict access to Process Portal functions, change preferences such as email options, set the language, set the log-in authentication options, and customize the look of the Process Portal.



Features of Process Portal

- The ability to request help from experts and collaborate with experts and other users in real time to complete work
- The ability to add comments and attach documents to a specific process or task
- Subscription to process instances that a user is interested in, providing process-related notifications and activity updates
- Activity streams that show activity updates, such as task creation and completion, user comments and actions, and notifications
- Ability to bookmark a page to replace the default Process Portal start page
- Support for IBM Connections integration
- Enhanced user profile information, including avatars and configuration of notifications

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Figure 7-3. Features of Process Portal

WB8211.0

Notes:



Process Portal interface

- Use a web browser to access Process Portal

`http://<host>:<port>/portal`

`https://<host>:<port>/ProcessPortal`

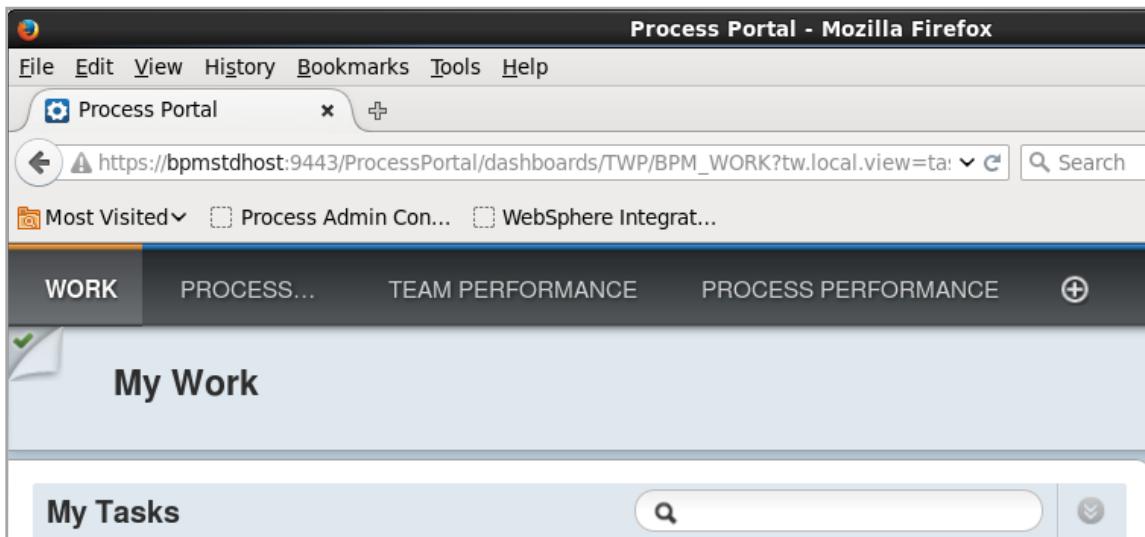


Figure 7-4. Process Portal interface

WB8211.0

Notes:

You can view the Process Portal by using the first HTTP URL. By using the HTTP URL, you are redirected to the HTTPS secure site URL.

- The start page icon: Your designated start page is shown whenever you log in to Process Portal. You can bookmark a different page, including a search results page or a dashboard page, to be your start page.
- The Work page: This page contains both the tasks that you claimed to work on and the tasks that are available for you to claim.
- The Team Performance dashboard: Use this dashboard to monitor the performance of your teams and their members, and to balance workload across members of a team. You must be a member of a team of managers to access this dashboard.
- The Process Performance dashboard: Use this dashboard to monitor the performance of processes, and the progress of individual process instances. You must be a process owner to access this dashboard.
- The organize tabs icon: Click the icon to display a list of all of the dashboards and saved searches that are available to you. Drag pages in the list to reorder the tabs and to designate

which pages are visible. Click links to your user preferences page and Logout. Click your name to work with your user preferences – for example, to update your business card information or to change your notification preferences.

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Figure 7-5. Profile preferences

WB8211.0

Notes:

You can change the following settings in your user profile:

- Contact information, including a photo. Your photo can be shown in your posts and comments.
- Portal preferences. These preferences include settings for your working language, receiving confirmation messages when you claim a task or unfollow a process, and receiving notifications by email.
- Notification preferences. By default you receive a notification when an event occurs that affects you – for example, a task is assigned to you, or you are mentioned in a post. In addition, the lists of tasks in your Open Tasks and Saved Searches views are refreshed automatically.

To access the user profile, use the drop-down menu next to the user name in the upper right part of the browser window. The first thing that you see is the profile picture, which is optional and can be changed at any time. The user information, such as title and contact information, comes from the user registry. It can be managed by using the bulk user attributes in the Process Admin Console or by directly editing the values in the profile. If you hover the mouse over the email address, telephone number, or title, the edit pencil is shown, indicating that you can edit this field. The rest of

the profile is for configuring your preferences, such as language, calendar type, and notifications. You can choose not to receive a confirmation message every time you claim a new task.

My Tasks

Search: duedate:[20150410 TO 20150511]

Open Tasks | Completed Tasks

Overdue (1)

- Do the test (Product Test:167) Due: 3/28/15 6:37 PM

At Risk (1)

- Create an order (Regular Order:4) Due: 4/10/15 9:01 PM

Due Today (3)

- Create an order (Regular Order:453) Due: 4/9/15 6:08 PM
- Create an order (Regular Order:454) Due: 4/9/15 6:08 PM
- Create an order (Regular Order:455) Due: 4/9/15 6:08 PM

Showing 4 of approximately 13 results

Launch Following @Mentions

- Claim Process
- Dispatch Order
- ECM Document BPD
- HR Open New Position (Hiring Sample Advanced HSA/1)
- HR Open New Position (Hiring Sample HSS)
- HR Open New Position (List)
- Loan Processing**
- New Computer Order
- Order Fulfillment Test
- Regular Order
- ReplenishmentBPD
- Simple Flight Search Process
- VersioningDemo
- Work Request

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Figure 7-6. Process Portal: Tasks

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Notes:

At Risk grouping for tasks includes:

- Overdue
- At Risk
- Due Today
- Due Tomorrow
- Due This Week
- Due Later

The Process Portal is transformed to incorporate features for collaboration, notification, and risk management. It is based on IBM Business Space and Web 2.0 technology. The first time that you log in as a user, you see that your tasks are listed in the leftmost pane, on the My Tasks page. The tasks are grouped based on risk criteria, which are determined from the due date and the length of time since the start of the task. On the right side of the screen, you see a toolbar with options labeled Launch, Following, and @Mentions. Currently, the Launch option is selected, and the process applications that you have the authority to start are listed.

The Following option lists the business process instances that you indicated you want to follow. This option is like favorites in a browser. Selecting a business process instance opens the stream for that business process instance. A stream is where the conversation that is related to the business process instance is shown and managed. In the stream, you can post comments, read comments by others, and see the history of the tasks that are already completed or are currently active. From the stream, you can also go to a view of the business process diagram and see the currently active task and the tasks that are completed. The @Mentions option is where you can see all of the business process instances where you are mentioned and from where you can go to a specific instance. The instance view is where you see the associated stream.

A notification system is built into the Process Portal. You can use it to be notified when you have a new task to work on, when someone mentions you in a post, or when someone makes a request for you to collaborate on a task. The notifications are displayed in the upper right of the screen for a short time and are then recorded in the stream.

The screenshot shows the WebSphere Education Process Portal interface. At the top, there's a blue header bar with the WebSphere Education logo on the left and the IBM logo on the right. Below the header, the main content area has a title "Process Portal: Tabs".

My Tasks Tab:

- Section: Overdue (2)**
 - Step: Flight Search Service** Due: 3/28/15 11:59 AM
 - Task: ApproveReplenishmentOrder** Due: 3/28/15 12:00 PM
- Section: Due Today (2)**
 - Step: Flight Search Service** Due: 3/28/15 5:14 PM
 - Do the Analysis** Due: 3/28/15 5:16 PM
Engineers

Showing 4 of approximately 4 results

@Mentions Tab:

- Launch**, **Following**, **@Mentions** tabs are at the top.
- Clear all** button is on the right.
- Jane mentioned you in a post in Product Test:162**
March 28, 2015 4:17 PM
"Harry can you help with instance 162"
- Jane invited you to collaborate on the Do the test task for Product Test:162**
March 28, 2015 4:17 PM
"I would like to work with you on the 'Do the test' task for 'Product Test:162'."
- Jane mentioned you in a post in Product Test:162**
March 28, 2015 3:50 PM
"Harry - Can you follow this instance?"

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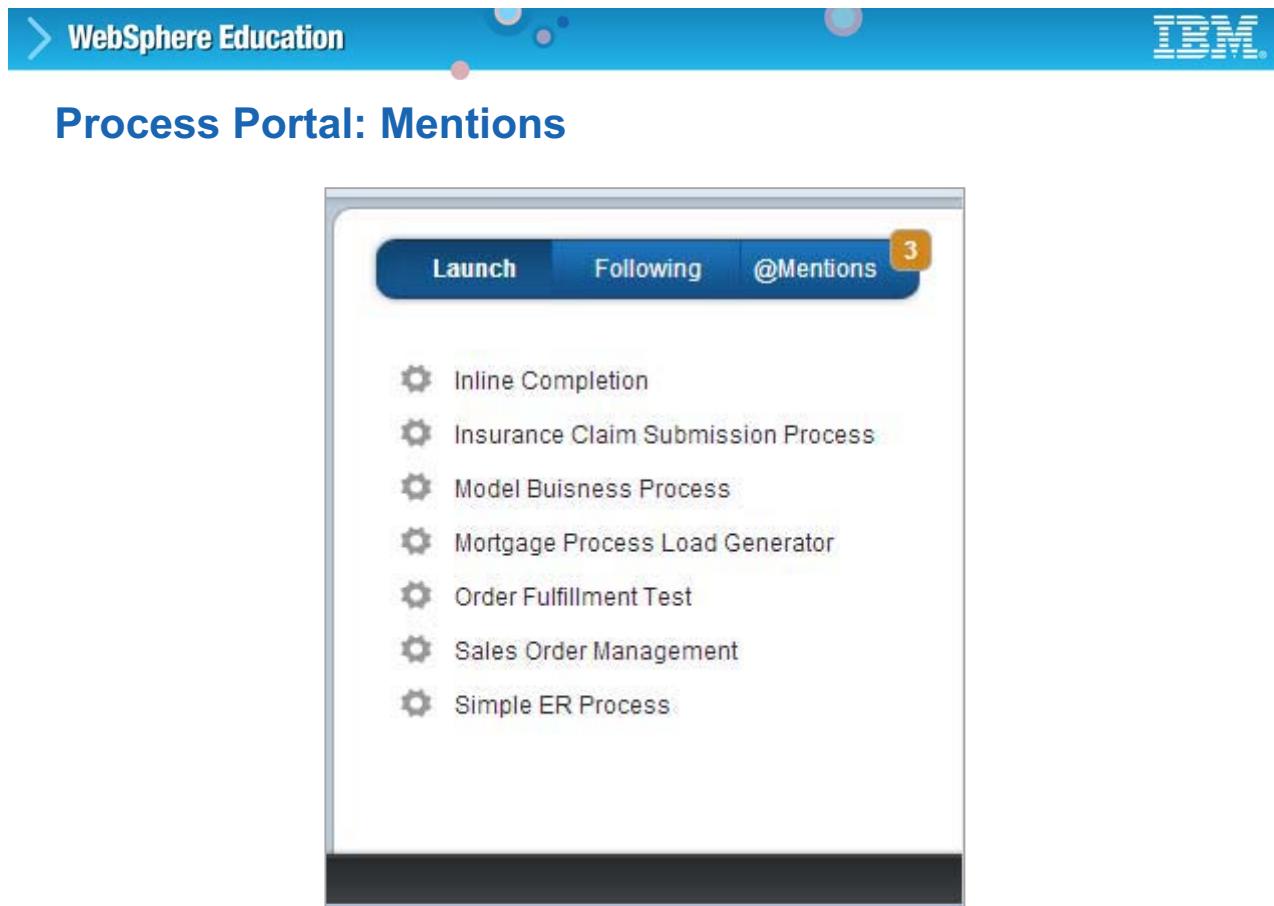
Figure 7-7. Process Portal: Tabs

WB8211.0

Notes:

The tabs that are shown here depend on whether you are working with your list of tasks in the My Tasks tab, or working on an individual task to complete the work. When the My Tasks tab is shown, this area contains the following tabs:

- **Launch:** Use this tab to launch processes and human services.
- **Following:** Use this tab to follow the work that is done on a specific process and add your comments to it.
- **@Mentions:** Use this tab to see a list of your collaboration invitations and posts that mention your name.



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Figure 7-8. Process Portal: Mentions

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Notes:

After logging in, users see how many mentions they received since there were logged in last time.



Team Performance dashboard

- Shows quick overview of a team status (At Risk, Overdue, On Track)
- Each chart links to a dashboard to explore the team performance more deeply



Figure 7-9. Team Performance dashboard

WB8211.0

Notes:

A dashboard uses charts and graphs to help you visualize status data for one or more business processes. To analyze and manage the work on your business processes, you can use the ready-to-use dashboards that Process Portal includes or the company-specific dashboards that your installation might provide.

Team Performance shows the status of the tasks for teams for which you are the designated team manager. You can manage the workload for the team and individual.

To see the Team Performance dashboard, you must be a member of the Managers team. To manage a team's tasks, you must be a member of a team of managers.



Team Performance: Overview



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Figure 7-10. Team Performance: Overview

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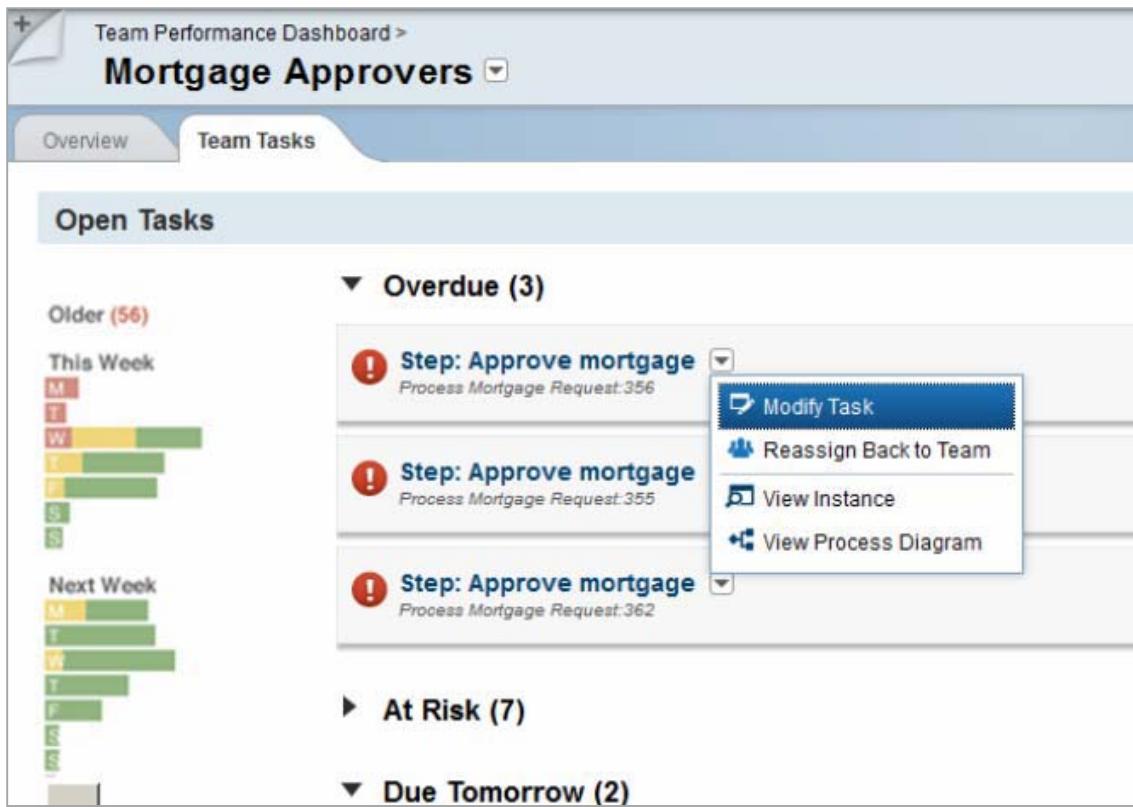
Notes:

The Overview tab contains the following sections:

- **Quick Stats:** Provides an overview of the tasks that are assigned to the team. This section includes counts for the open tasks and the completed tasks for today. The open tasks are categorized as overdue, at risk, or on track. The average time to complete a particular type of task determines an *at risk* task. For example, if a task is due today but people need three days on average to complete this type of task, then the task is considered to be at risk.
- **Turnover Rate:** Provides an overview of the rate at which tasks are started and completed over time. The trend line indicates whether the team is catching up or falling behind with its work based on the difference between the task arrival and completion rates.
- **Roster:** The list of team members. For each team member, the list includes counts for the assigned tasks and the completed tasks for today for all of the teams to which the person belongs.



Team Performance: Team Tasks



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Figure 7-11. Team Performance: Team Tasks

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Notes:

This page gives you a breakdown of the work in progress for the team. The information can help you to understand the status of your team's work and whether reallocating tasks to balance workloads is necessary. Use the search filter to display tasks in the list that meet certain filter criteria. All days and times are based on your time zone.

The Team Tasks page has the following sections:

- **Time period histogram:** Histogram of the task due date and status over a time period. The histogram is not available for completed tasks.
- **Tasks list:** The list of all of the tasks that are assigned to the team. By default, the list of tasks contains both assigned and unassigned open tasks. You can change the view to show completed tasks or just the open, unassigned tasks.
- **Roster:** The list of team members. For each team member, the list includes the counts of the assigned tasks and the completed tasks for today, for all of the teams to which the person belongs.

The screenshot shows the 'Team Performance Dashboard > Mortgage Approvers' page. On the left, there's a histogram for 'This week' with bars for Monday (M), Tuesday (T, highlighted in yellow), Wednesday (W), Thursday (F), and Friday (S). Below it, the 'Open Tasks' section shows 'Older (0)' and 'Overdue (3)'. Two task cards are listed under 'Overdue (3)': 'Step: Approve mortgage' (Process Mortgage Request 356) due May 22, 2015, 2:58 PM, assigned to 'Allen'; and another 'Step: Approve mortgage' (Process Mortgage Request 357) due May 22, 2015, 2:58 PM, assigned to 'Allen'. A tooltip for the second task says 'Reassign Back to Team'. To the right, the 'Roster' section shows 'Individual counts are total counts for all teams. People at the top of the roster have open tasks in the task list.' It lists 'Allen' with 'Assigned Tasks: 1' and 'Tasks Completed Today: 5'. At the bottom right, a modal window titled 'Assign: Step: Approve mortgage' has a red border around its input field. The input field contains 'Paul' and a blue 'Assign' button is visible.

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Figure 7-12. Team Performance: Reassign tasks

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Notes:

Actions that you can take include the following actions:

- See the tasks for a specific due date and who they are assigned to by clicking a bar in the histogram. The tasks list shows the associated tasks. The people at the top of the roster own the tasks in the filtered list.
- Filter the tasks in the list by entering a search filter. The people at the top of the roster own the tasks in the filtered list. The histogram is also filtered to show only the tasks that apply to the search filter. Clear the filter by clicking the X icon at the end of the search filter field.
- Assign or reassign tasks in the list by hovering over an assigned name.
- See the dashboard for an individual team member by selecting the person's name in the roster.
- See the business data for the task by clicking the shaded area of the task.
- Act on the task by clicking the arrow to the right of the task name and selecting an action from the list.

Search functions

The screenshot shows a 'Roster' dashboard from the WebSphere Education Process Portal. On the left, a search interface displays a list of fields such as Assigned, At Risk Date, Business Process, Creation Date, Due Date, Instance ID, Instance Name, Priority, Process Application, Subject, Task, Task ID, Team, User Full Name, User Name, Requisition Number, Department, Employment Status, Gm Approval, Hiring Manager, Location, and Order ID. A cursor is hovering over the 'Assigned' field. On the right, the 'Roster' section lists four users with their assigned tasks and completion status:

User Profile	User Name	Role	Assigned Tasks	Tasks Completed Today
	de_admin	HR Manager	7	
	Kelly		2	
	Mel		0	
	cell_admin		0	

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Figure 7-13. Search functions

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Notes:

While you are working with process instances or tasks in the Process Portal dashboards, you can filter the processes or tasks that are shown.

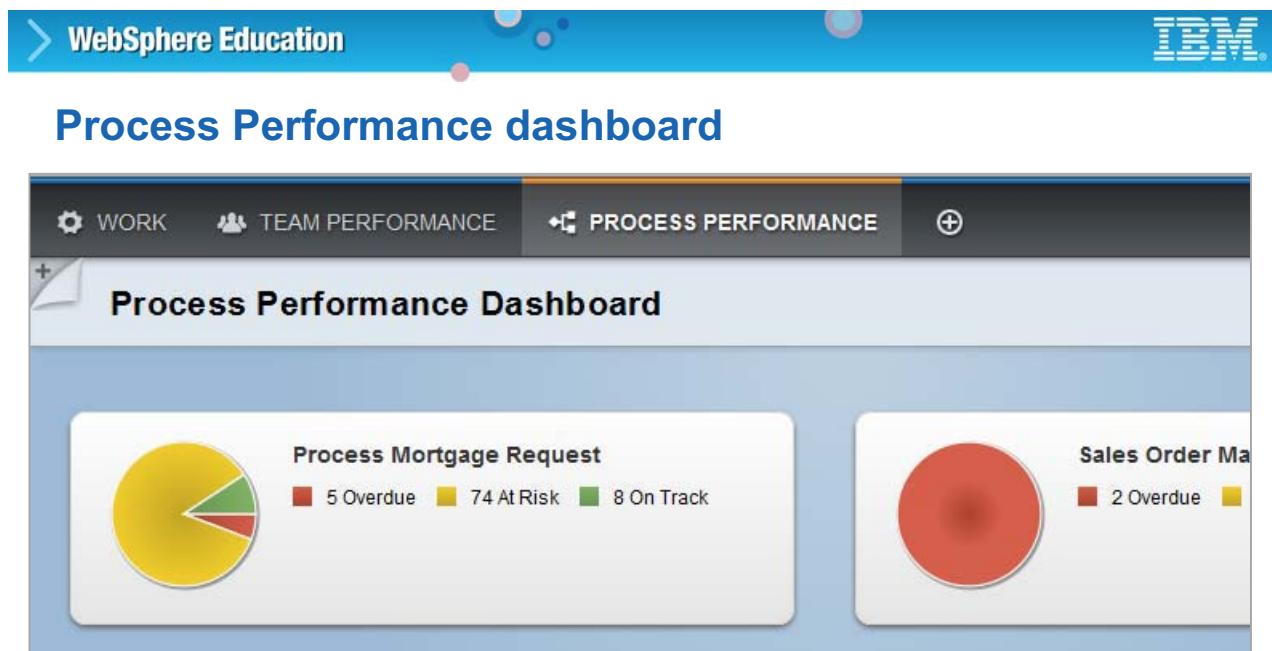
On dashboard pages, a filter can consist of a field, such as Task ID or Instance ID, and a term, or just an individual free-text search term. As you enter your filter, a list of the available fields is shown. Choose a field, or press Esc to continue entering your search term. Searches can include several filters.

End your filter by pressing the Spacebar key twice, or by pressing the right arrow key.

Apply your filters to the dashboard page by pressing Enter.

Clear the filters by clicking the X icon at the end of the search filter.

The default fields that are listed on the page are available for search filters on dashboard pages. You might see more business data fields that are specific to your environment. To see a list of all available fields, enter an asterisk (*) as the search filter.



- Access is given to team members of teams that are set in “Expose Performance Metrics” in Process Designer
- Shows quick overview of Process Status (At Risk, Overdue, On Track)
- Has a link to explore the process performance more deeply

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Figure 7-14. Process Performance dashboard

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Notes:

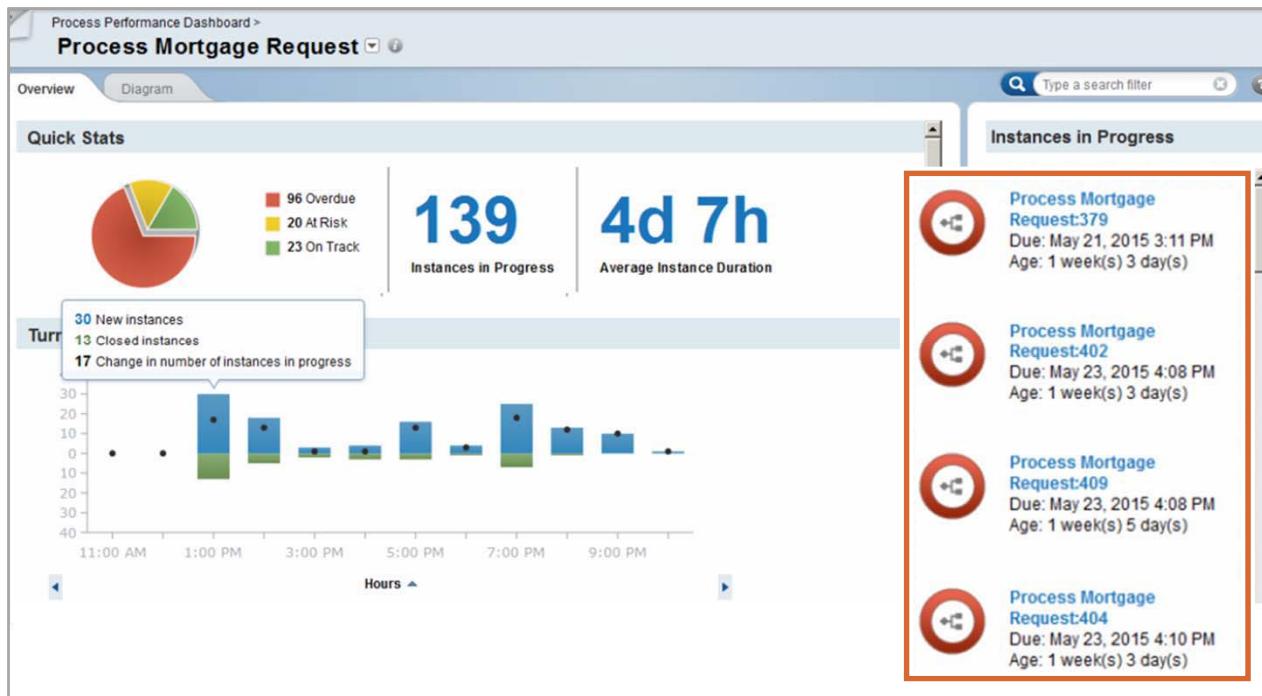
Process Performance shows the status of the active instances of particular processes in your organization. You can act on individual process instances to resolve issues, such as bottlenecks.

To see the Process Performance dashboard, you must be a member of the Process Owner team.

To see a specific process in the dashboard, you must be a member of the team that is assigned to the Expose Performance Metrics setting for the business process definition.

Other users can view the process instance that is associated with the task that they are working on.

Process Performance: Overview



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Figure 7-15. Process Performance: Overview

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Notes:

Click the red area under the Quick Stats to view the list of the overdue tasks on the right under Instances in Progress.



Process Performance: Gantt view

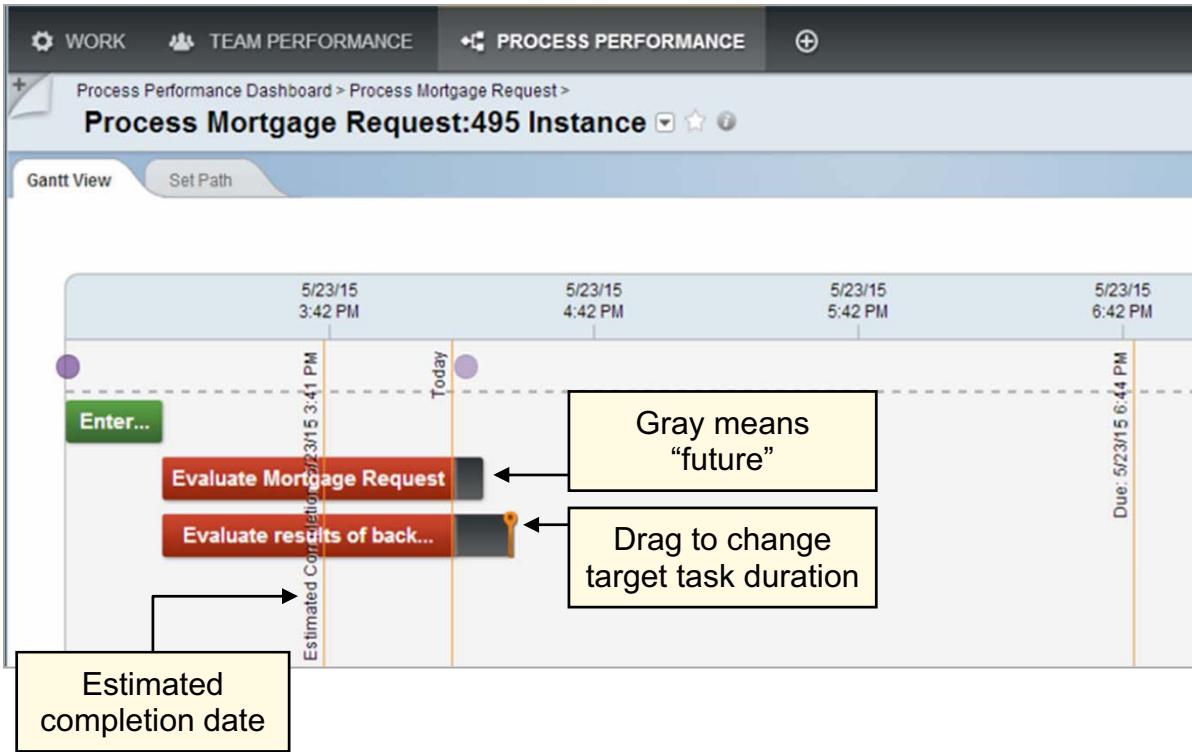


Figure 7-16. Process Performance: Gantt view

WB8211.0

Notes:

The Gantt view shows a predictive view of how (path) and when (completion) a process instance executes to completion. It helps to determine whether an instance that is in progress is on track for completion.

An extra bar on the chart indicates reworked tasks; a bar is added every time that the task is reworked.



Process Portal and Internet Explorer 8

- Process Portal works differently on Internet Explorer V8 than on other browsers and newer version of Internet Explorer
- Process Performance and Team Performance dashboards are not supported
- Process instance view is visible only by clicking the instance name and selecting **View Instance**
 - Other browsers show the process instance view on the Process Performance dashboard
- Projected path management visible from the instance view and selecting **Projected Path Management**
 - Other browsers show the Projected Path on the Process Performance dashboard for a process instance

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Figure 7-17. Process Portal and Internet Explorer 8

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Notes:



Team Performance Dashboard: Granting authorization

- The Team Performance dashboard shows statistics for all of the teams that you are assigned to
- Users are assigned to teams by using the Process Admin console

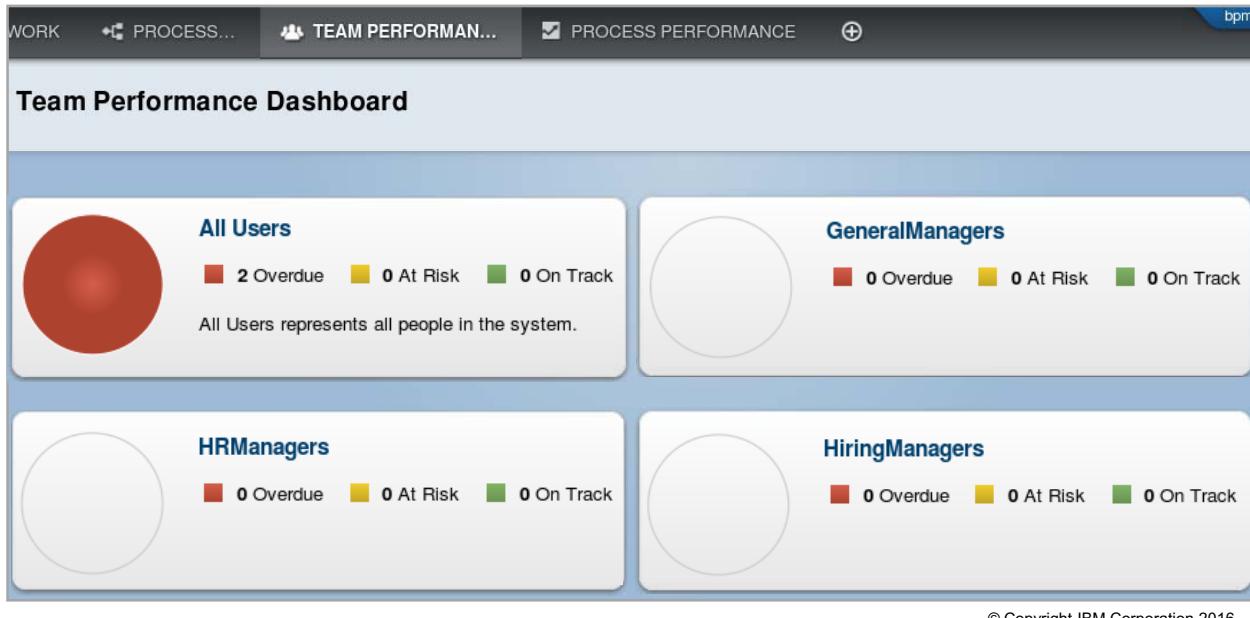


Figure 7-18. Team Performance Dashboard: Granting authorization

WB8211.0

Notes:

Notice that all users are assigned to the All Users team.



Process Performance Dashboard: Granting authorization

- In the Process Designer, the Expose Process Metrics setting allows users to view process performance metrics in the dashboard

Mortgage Approval Process

- 3 Overdue
- 0 At Risk
- 0 On Track

Standard HR Open New Position

- 0 Overdue
- 0 At Risk
- 0 On Track

This process covers how to fill a job position by submitting, approving, and routing a job requisition...

Exposing

Expose to Start:	All Users	System Data	Select...	New...	X
Expose Business Data:	All Users	System Data	Select...	New...	X
Expose Performance Metrics:	Managers	System Data	Select...	New...	X

Team

Instance Owners Team:	<none>	Select...	New...	X
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Figure 7-19. Process Performance Dashboard: Granting authorization

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Notes:

The Process Performance Dashboard is a standard dashboard inside the Process Portal. Users can view statistics about the processes they participate in. Developers use the Process Designer to expose performance metrics to teams of users when creating their processes.



Modifying the Process Portal

- In the Process Portal, you can customize a banner or a footer in many ways, including the following common changes:
 - Modify the appearance
 - Remove elements
 - Modify the location, appearance, or content of the Help link in the banner
 - Modify the Logout link in the banner to load a custom web page or run custom code when a user logs out
 - Modify the logo in the footer
- To customize the appearance and function in the banner
 - Edit the `theme.css` file by using a WebDAV client
 - Upload the CSS file to the server by using the WebDAV client
- You can also hide some or all of the Process Portal banner content without having to modify the entire theme

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Figure 7-20. Modifying the Process Portal

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Notes:

You can use a WebDAV client to customize the top or bottom sections of the portal by altering the Cascading Style Sheets (CSS) file. You can also make small changes to the banner content without having to modify the entire theme.

An administrator might consider customizing the banner in the following ways:

- Hide or show the entire banner area
- Customize the header area of the banner to hide or show elements at the top of page

Tip: If the banner is hidden, the logout option is not available to the user. Hide the banner only when Process Portal is loaded inside a frame element as part of another page. This way the outside page can control the logout and redirect the frame content to the correct logout URL.

The `theme.css` file contains code that controls the display of different sections in the banner. A line of code that consists of the `.processPortal banner element` controls the display of each element.

For example, the following line hides the Work page:

```
.processPortal #processPortalWorkTab {display: none; }
```

This code is commented out by default so that all elements in all sections are shown in the banner.

Procedure

1. Open the `theme.css` file in your WebDAV folder.
2. To hide particular elements, uncomment the corresponding line of code.
3. To hide all banner content, add `display: none;` to the following line of code:
`.processPortalBanner { display: none; }`

Customizing and rebranding interfaces

- You can customize the standard Process Portal theme
 - A theme defines the overall structure, appearance, and behavior of Process Portal
 - Consider modifying CSS rules instead of modifying the theme
 - Editing the theme is a much more complex undertaking, and has implications for maintenance, migration, and upgrades to later product versions
- You can also customize the Process Portal login page
 - You can customize a number of different elements of the Process Portal login page, such as the graphics, background color, and login field labels
 - The files are in the `WebDav` folder in the `/login` directory

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Figure 7-21. Customizing and rebranding interfaces

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Notes:

Important: Before you customize the theme, be aware that customizing a theme requires familiarity with HTML, CSS, JavaScript, the iWidget specification, and the Dojo widget library.

If you customize a theme, any IBM updates to the default theme artifacts are not applied during regular service or maintenance activities. You must update and maintain customized themes manually.

The Process Portal theme is designed so that it does not appear in Business Space. Therefore, you should make any updates directly in the Process Portal theme and not in a copy of the theme because it might cause problems within Process Portal. However, back up any files that you want to modify so that they can be restored if necessary.

The following files and folders define and control the theme for Process Portal:

- The `theme.html` file primarily defines the theme. You can modify the HTML code to customize how the page is structured and organized. You can add more JavaScript to extend the existing page behavior. You can also edit the dynamic content spots, which are special markups that define where generated content from server-side JavaServer Pages (JSP) files is going to be

added. Administrators use the administrative console to map the content spot identifiers and JSP pages. You can add, remove, or hide dynamic content spots.

- The stylesheets that control the appearance of the theme are `theme.css` and `collaboration.css`. If you plan to make style changes to the theme, you need to either edit these files, or create another CSS file. If you create a CSS file, it must be a peer of the `theme.css` and `collaboration.css` files, and you must add markup to the `theme.html` file to include it.
- The `banner` folder contains the dynamic content needed for the banner customization.
- The `img` folder contains the images used in the theme.
- The `menuDefinitions` and `metaData` folders are used internally and should not be modified.

For more information about customizing the Process Portal, see the IBM Knowledge Center:

http://www.ibm.com/support/knowledgecenter/SSFPJS_8.5.6/com.ibm.wbpm.admin.doc/topics/cadm_portal_customoverview.html?lang=en

Unit summary

Having completed this unit, you should be able to:

- Explain the capabilities of Process Portal
- Set preferences for Process Portal
- Work with assigned tasks
- Grant authorization to the Team and Process Performance dashboards
- Modify the Process Portal runtime behavior
- Customize and rebrand interfaces

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Figure 7-22. Unit summary

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Notes:



Checkpoint questions

1. Which dashboard is used to manage the work of the team members that you are responsible for?
 - A. Team Performance
 - B. Process Performance

2. Which dashboard is used to identify processes that need attention, go to individual instances, and act to bring them back on track?
 - A. Team Performance
 - B. Process Performance

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Figure 7-23. Checkpoint questions

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Notes:

Write your answers here:

1.

2.



Checkpoint answers

1. A. Team Performance
2. B. Process Performance

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Figure 7-24. Checkpoint answers

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Notes:

Exercise 6



Administering Process Portal

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10.1

Figure 7-25. Exercise 6

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Notes:



Exercise objectives

After completing this exercise, you should be able to:

- Explore Process Portal capabilities
- Modify Process Portal user preferences
- Work with tasks
- Collaborate on a task
- Customize the Process Portal login page

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Figure 7-26. Exercise objectives

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Notes:

Unit 8. Overview of deployment scenarios

What this unit is about

This unit covers deployment concepts for IBM Business Process Manager Standard, and explains the various configuration files that you use to manage the environment.

What you should be able to do

After completing this unit, you should be able to:

- Explain online and offline Process Server environments
- Work with an offline Process Server
- Deploy a process application to an offline Process Server
- Explain the various XML configuration files
- Deploy a process application to an online Process Server

How you will check your progress

- Checkpoint questions
- Lab exercises

References

IBM Business Process Manager V8.5.6 documentation in the IBM Knowledge Center:

http://www.ibm.com/support/knowledgecenter/SSFPJS_8.5.6/com.ibm.wbpm.main.doc/kc-homepage-bpm.html

Unit objectives

After completing this unit, you should be able to:

- Explain online and offline Process Server environments
- Work with an offline Process Server
- Deploy a process application to an offline Process Server
- Explain the various XML configuration files
- Deploy a process application to an online Process Server

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Figure 8-1. Unit objectives

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Notes:



Topics

- Offline and online Process Server environments
- Configuration files
- Deploying process applications

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Figure 8-2. Topics

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Notes:

8.1. Offline and online Process Server environments

Offline and online Process Server environments



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10.1

Figure 8-3. Offline and online Process Server environments

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Notes:

Business Process Manager environments (1 of 2)

- A typical Business Process Manager topology includes four environment types that support the development, staging, and eventual production-level execution of process applications
- Development
 - Build and refine process applications in IBM Process Designer
 - Using the Process Center Console, you can install the process applications on test Process Servers
- Test
 - Using the Process Center Console, you can install process applications on the Process Server in the test environment to implement formal quality assurance tests
 - You can use the Process Inspector and Process Portal to help verify and resolve issues

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Figure 8-4. Business Process Manager environments (1 of 2)

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Notes:

If you want to modify the environment type that was specified during installation, update the configuration properties in the `100Custom.xml` file. The environment type indicates how IBM Business Process Manager is used (for example, in a production, stage, or test environment). Process authors can set environment-specific variables for each process application and then define values for each type of environment in which a process runs.

Business Process Manager environments (2 of 2)

- Staging
 - After all issues are reported from formal testing are resolved, the process applications are installed on a staging Process Server that looks similar to the production environment
 - You should test and resolve all issues in the staging environment before moving the applications to production
- Production
 - After all issues that are reported from formal testing are resolved, use the Process Center Console to install process applications on the Process Server in the production environment
 - You can use the Process Inspector in Process Server to investigate and resolve any issues reported in the production environment

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Figure 8-5. Business Process Manager environments (2 of 2)

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Notes:

Some enterprises do not allow deployment from Process Center to a Process Server in production. The production servers might be segregated from the development server because of policy. Production servers can also be segregated from development servers physically, and the networks are incapable of communicating with each other. When the servers are unable to communicate, the production server is in offline mode. In this case, you create the offline installation package and use the scripted deployment procedure. Offline production Process Servers are the suggested configuration. This configuration prevents the periodic heartbeat to Process Center, thus reducing the database load.

Connecting Process Server and Process Center

- Process Center is the development hub for process applications while Process Servers act as the runtime environments for completing the work
- An online development and test Process Server is the preferred method of configuration
- An offline production Process Server is the preferred method of configuration
- For a Process Center to know about the Process Server, the Process Server configuration must be changed to refer to the target Process Center
 - The configuration file `99Local.xml` contains the configuration information

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Figure 8-6. Connecting Process Server and Process Center

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Notes:

During development, the applications are built and tested in the Process Center environment with its local or unit test runtime. However, when it is time to deploy to production, many customers want to manually install such solutions directly on their Process Servers instead of deploying from a Process Center. You can have many reasons for choosing manual installation. A primary reason is when you want an exact copy of the application so that the system can be re-created from artifacts that are stored on the file system. Another common reason for manual deployment is that it can be scripted for operations staff to do production installation and management. The script and associated artifacts can then be logged as the system of record for the production system.



Configuring the environment

- Configuration is done during either:
 - Deployment Environment configuration, or
 - Process Server component configuration
- Select the various environment types
- Provide Process Center connection information
 - Offline configuration
 - Online configuration

The screenshot displays a configuration interface for a 'Process Server'. At the top, under 'Process Server', there is a field for 'Environment name' containing 'Production_RMSW' and a dropdown for 'Environment type' set to 'Production'. Below this, the 'Process Center Connection Information' section includes a checked checkbox for 'Use server offline', a dropdown for 'Protocol' set to 'http://', and fields for 'Host name or virtual host in a load-balanced environment', 'Port', 'User name', and 'Password'.

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Figure 8-7. Configuring the environment

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Notes:

When you add a server, it must be registered with the Process Center server. The registration process checks to see whether the capabilities of the new server match the capabilities of the Process Center server; if they match, registration succeeds. If the capabilities are out of sync between the two servers, the new server is not registered with the Process Center server.

Using the Process Center Console

- The Process Center Console is used to configure and examine both online and offline Process Servers
- Process applications snapshots can be deployed to configured Process Servers
 - Applications are deployed directly to the online Process Server
 - An installation package is created, extracted, and installed to the offline Process Server
- If the selected offline server exists, installation packages are available in the Process Center server
 - If you remove the offline server, the installation packages for that server are also deleted

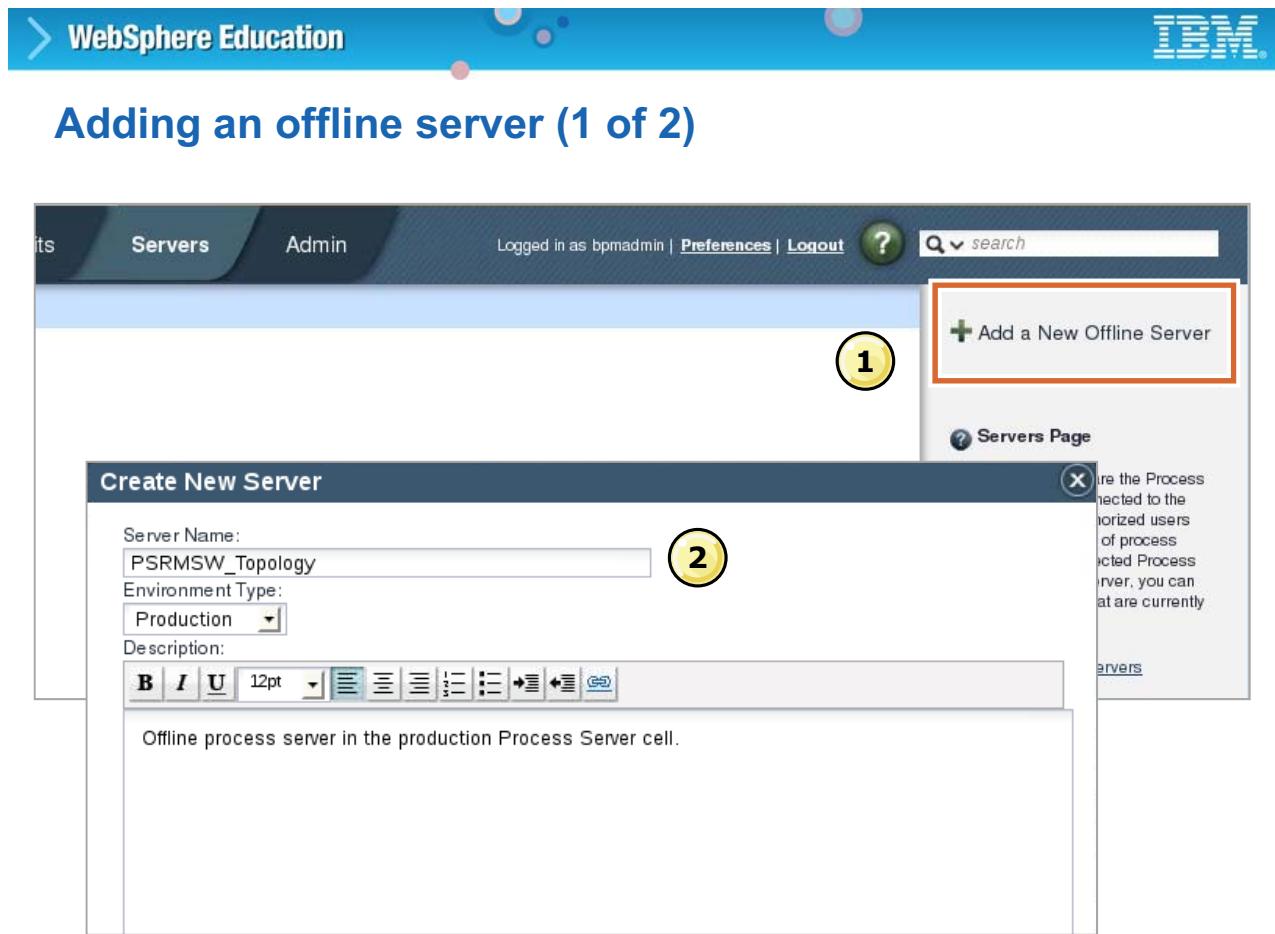
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Figure 8-8. Using the Process Center Console

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Notes:

Process applications can be deployed to multiple Process Server instances. To deploy an application, a snapshot of the application must first be taken. It is the content of the snapshot that is deployed. Changes that are made to the application after the snapshot will not be reflected in the deployed application until after a new snapshot is taken and that instance of the snapshot is deployed.



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Figure 8-9. Adding an offline server (1 of 2)

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Notes:

To complete a manual deployment of a solution, you must first export the package that represents the solution, which can be done from the Process Center Console. Before you can create and export an installation package, you must define the target environment as an offline server.



Adding an offline server (2 of 2)

A screenshot of a web application interface. At the top, there is a dark navigation bar with four tabs: "Process Apps", "Toolkits", "Servers", and "Admin". The "Servers" tab is highlighted in white. Below the navigation bar, the main content area has a light blue header bar. Underneath this, the main content area contains a single item: a small icon of a server rack next to the text "PSRMSW_Topo ?". Below the icon, the text "PRODUCTION - Status: Offline" is displayed. The rest of the content area is empty.

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Figure 8-10. Adding an offline server (2 of 2)

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Notes:



Adding an online server

- Process Center automatically discovers any online Process Servers that are configured during installation

A screenshot of the IBM Business Process Manager Process Center interface. The top navigation bar includes the IBM Business Process Manager logo, a search bar, and tabs for Process Apps, Toolkits, Servers (which is selected), and Admin. Below the navigation bar, a list displays a single entry: "PSRMSW_Topo... (bpmhost.ibm.com)" with a status of "PRODUCTION - Status: Connected".

IBM Business Process Manager Pr... +

Process Apps Toolkits **Servers** Admin

PSRMSW_Topo... (bpmhost.ibm.com) ?

PRODUCTION - Status: Connected

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Figure 8-11. Adding an online server

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Notes:

8.2. Configuration files

Configuration files



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10.1

Figure 8-12. Configuration files

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Notes:

Configuration file basics

- Default XML configuration files are created during installation of the product
- Core configuration files are in:
 - In a cluster configuration, `<core_directory>` in:
`<bpm_install>/profiles/<profile_name>/config/cells/<cell_name>/clusters/<cluster_name>`
 - Each cluster member configuration, `<core_directory>` in:
`<bpm_install>/profiles/<profile_name>/config/cells/<cell_name>/nodes/<node_name>/servers/<cluster_server_name>`
 - Process Server: `<core_directory>/process-server/config`
 - Process Center: `<core_directory>/process-center/config`
 - Business Performance Data Warehouse:
`<core_directory>/performance-data-warehouse/config`

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Figure 8-13. Configuration file basics

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Notes:



Configuration files (1 of 2)

- system/000Static.xml: Contains static properties so IBM Business Process Manager can run
- system/50AppServer.xml: Is used to manage the application server
- system/60Database.xml: Contains queries and some XML schema
 - Do not modify
- system/80EventManager.xml: Has different attributes for event manager, including error handling, loading, and queuing
- system/98Database.xml: Contains configuration for the database name, user and password, database location, and other attributes

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Figure 8-14. Configuration files (1 of 2)

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Notes:



Configuration files (2 of 2)

- system/99Local.xml: Contains local settings for your environment; commented heavily
- 100Custom.xml: File that is used to customize your environment
- TeamWorksConfiguration.running.xml: Contains the actual configuration values that are applied from merging all of the configuration files
 - Process Server: <core_directory>/process-server
 - Process Center: <core_directory>/process-center

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Figure 8-15. Configuration files (2 of 2)

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Notes:

In some cases, you might want to change the runtime configuration, such as modifying proxy settings, managing Enterprise Content Manager, and IBM Case Manager server settings, or modifying the IBM Process Server connection properties. Configuration updates are made either in the 100Custom.xml file or by using the Process Admin Console, depending on the type of change required.

How configuration files are used

- Configuration files are loaded in a sequence
 - Files that start with a letter of the alphabet are loaded first
 - Numbered files are loaded next in numerical order
- You can overwrite the settings from any of the default configuration files, which start with a number less than 100
- When you modify a server configuration, always make the changes to the `100Custom.xml` file, not to the original configuration file
- Files are merged to produce the overall configuration that Process Center or Process Server uses
 - Full and final configuration space is placed in `TeamWorksConfiguration.running.xml`

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Figure 8-16. How configuration files are used

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Notes:

At run time, only the settings from cluster member files are read. If you make configuration changes after deployment, you must make them in the cluster member version of the file for each server to have the changes take effect at run time.

- Always make configuration changes to any of these XML configuration files on the deployment manager (dmgr) server.
- Make configuration changes to cluster members. Change the XML file for each node but work in the deployment manager file system.
- Make configuration changes to the cluster level to ensure that each new cluster is created with your customizations.
- After any changes, select Full Resynchronize to replicate the settings from the deployment manager server to the individual nodes. If you edit these configuration files on an individual node, the changes might be lost in the next update.

The 100Custom.xml file

- To customize the environment, insert changes in the `100Custom.xml` file
- It is important to create a backup of this file before editing
 - Name of backup must not end with an `.xml` extension
 - Create a backup such as `100Custom.bak`
- If the `100Custom.xml` file does not yet exist (if, for example, you have not customized any of your configuration settings), you must create it
 - Open the appropriate `99Local.xml` file for your environment and save it as `100Custom.xml` in the correct directory
- XML configuration files on the cluster level are templates for XML configuration files that are created when new cluster members are added
 - If you change the file at the cluster member level, change the file at the cluster level also

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Figure 8-17. The 100Custom.xml file

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Notes:

To modify a Process Server configuration, update the `100Custom.xml` file for the server. Here, you can modify the elements that the server configuration comprises, including environment name, repository server information, and Business Performance Data Warehouse communication methods.

Merge attributes

- IBM Business Process Manager merges the changes that you make in the `100Custom.xml` file with the original configuration based on the value of the `merge` attribute
- The following values are used to merge attributes:
 - `append`: Appends the new tag
 - `mergeChildren`: Merges the new tag with the first of the existing tags; which is the default behavior
 - `replace`: Replaces all old tags with the new one
- Attribute values must be in quotation marks
- The first time that an element is loaded from a file, an entry is created in the merged configuration file
 - Use the attribute `replace` to overwrite an existing setting and change it in the merged file

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Figure 8-18. Merge attributes

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Notes:

Example: Modify the environment name

- Text from the 99local.xml file

```
<properties>
    <common merge="mergeChildren">
        <environment-name>Production_RMSW</environment-name>
    </common>
</properties>
```

- Text for the 100Custom.xml file

```
<properties>
    <common merge="mergeChildren">
        <environment-name merge="replace">RMSW</environment-name>
    </common>
</properties>
```

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Figure 8-19. Example: Modify the environment name

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Notes:

The XML in the 100Custom.xml file replaces the environment-name value found in the 99local.xml file.

Example: Loading of the configuration files

- Files in the `<core_directory>/process-server/config` directory are loaded in the following order:

```
./config/system/Copy of 99Local.xml  
./config/system/00Static.xml  
./config/system/50AppServer.xml  
./config/system/60Database.xml  
./config/system/80EventManager.xml  
./config/system/98Database.xml  
./config/system/99Local.xml  
./config/100Custom.xml
```

- Settings in `Copy of 99Local.xml` take effect first, and all settings in the `99Local.xml` are ignored
 - Include the **merge="replace"** attribute to use settings from both of the files

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Figure 8-20. Example: Loading of the configuration files

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Notes:

Modify the configuration by using BPMConfig

- The `updateBPMconfig` admin task is available to update the XML configuration files that include the `100Custom.xml` file
 - Updates the bootstrap URL, the environment type, and the environment name
- Update server settings by using the `wsadmin AdminConfig` commands
 - The `processCenterURL` variable
 - The `processCenterInternalUrl` variable
 - The `heartBeatInterval` variable
- After running these commands, restart the deployment manager and Process Server cluster

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Figure 8-21. Modify the configuration by using BPMConfig

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Notes:

The `updateBPMconfig` admin task is available to update the XML configuration files, including the `100Custom.xml` file, to provide a single file that has all of the changes applied to the environment. If the `100Custom.xml` file does not exist, the admin task creates it. If you have multiple versions of the custom file, such as `101Custom.xml` and `102Custom.xml`, then only the `100Custom.xml` file is updated.



Using TeamWorksConfiguration.running.xml (1 of 2)

- IBM Business Process Manager has many different configuration files that load in a determined order, so you can use an output file for troubleshooting and confirming edits
- This file represents the server's one merged configuration file
 - For example, you can view `TeamWorksConfiguration.running.xml` to see whether an edit of the environment name in `99Local.xml` was replaced with the new value that you specified in the `100Custom.xml` file

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Figure 8-22. Using TeamWorksConfiguration.running.xml (1 of 2)

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Notes:

The location for the Process Center file is:

`<configDir>\process-center\TeamWorksConfiguration.running.xml`

The location for the Process Server file is:

`<configDir>\process-server\TeamWorksConfiguration.running.xml`



Using TeamWorksConfiguration.running.xml (2 of 2)

- Do not edit this file
 - Your changes are not read or applied to the server, and editing the file can cause your system to be unstable
- This file exists for the Process Center, Process Server, and the Business Performance Data Warehouse, but most of your changes occur on the Process Center and Process Servers
- The location for the Process Center file is
 - <configDir>\process-center\
TeamWorksConfiguration.running.xml
- The location for the Process Server file is
 - <configDir>\process-server\
TeamWorksConfiguration.running.xml

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Figure 8-23. Using TeamWorksConfiguration.running.xml (2 of 2)

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Notes:

8.3. Deploying process applications

Deploying process applications



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Figure 8-24. Deploying process applications

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Notes:

Offline server: Deploying process application snapshots (1 of 2)

- To install a snapshot to a Process Server that is not currently connected to the Process Center server, you must:
 - Create an installation package
 - Extract the installation package
 - Transfer the installation package to the offline server
 - Use administrative commands on the server to install the installation package
- Common commands that pertain to offline deployment include the following commands:
 - BPMCreateOfflinePackage
 - BPMExtractOfflinePackage
 - BPMInstallOfflinePackage
 - installProcessAppPackage

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Figure 8-25. Offline server: Deploying process application snapshots (1 of 2)

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Notes:

Common commands that pertain to offline deployment are as follows:

- **BPMCreateOfflinePackage:** This command creates an installation package for a process application snapshot on the Process Center server. If you want to install a snapshot on an offline Process Server, use this command in connected mode from a Process Center server to create an installation package of a snapshot. This package is stored in the database. You can extract the package to a compressed file with the `BPMExtractOfflinePackage` command, and then install the compressed file on the offline Process Server with the `BPMInstallOfflinePackage` command.
- **BPMExtractOfflinePackage:** This command extracts the process application snapshot installation package from Process Center. If you want to install a snapshot on an offline Process Server, use the `BPMExtractOfflinePackage` command in connected mode from a Process Center server to extract the installation package to a file. You can then install the extracted file on the offline Process Server.
- **BPMInstallOfflinePackage:** This command installs a process application snapshot from a Process Center to an offline Process Server that is not currently connected to the Process Center. Use this command in connected mode from Process Server to install a process

application snapshot installation package on Process Server. The installation package must already be created and extracted on the server. After this command is complete, the installed snapshot is active. You can also use the `installProcessAppPackage` command to complete this task.

The screenshot shows the WebSphere Education interface with the title "Offline server: Deploying process application snapshots (2 of 2)".

The top navigation bar includes "Procurement Sample (STPPS1)", "Solutions", "History", "Manage", and "Governance". Below this is a toolbar with "Sort Snapshots By: Date" dropdown and buttons for "All", "Installed", "Deployed", and "Archived".

The main content area displays two application snapshots:

- Current:** Last changed on 1/10/16 by bpmadmin. Not Yet Deployed to Process Center Server.
- Procurement Sample v801 (New):** Created on 1/10/16 by bpmadmin. Not Yet Deployed to Process Center Server. Not Yet Installed to Process Server.

To the right of the second snapshot, there are "Export" and "Install" buttons. A red box highlights the "Install" button, and a yellow circle with the number "1" is placed over it.

A second window below shows the same application details with a red box highlighting the "Deployment Package Available" section, which contains "PSRMSW_Topoogy". A yellow circle with the number "2" is placed over this section.

At the bottom right of the interface, the text "© Copyright IBM Corporation 2016" is visible.

Figure 8-26. Offline server: Deploying process application snapshots (2 of 2)

WB8211.0

Notes:

In the Process Apps tab for the snapshot of the application that you want to deploy, click **Install**.

The screenshot shows the WebSphere Education interface with the following details:

Top Bar: WebSphere Education and IBM logo.

Title: Online server: Deploying process application snapshots

Current Application: Current (Last changed on 1/10/16 by bpmadmin, Not Yet Deployed to Process Center Server)

Hiring Sample Advanced v801 (New): Created on 1/10/16 by bpmadmin, Not Yet Deployed to Process Center Server, Not Yet Installed to Process Server. It has an **Install** button highlighted with a red box.

Step 1: A yellow circle with the number 1 highlights the "Install" button for the "Hiring Sample Advanced v801" application.

Step 2: A yellow circle with the number 2 highlights the "Currently Installed" status for the "Hiring Sample Advanced v801" application. Below it, a box highlights the "PSRMSW_Topo... - 0 instances" link, and the "Server Details" link is also visible.

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Figure 8-27. Online server: Deploying process application snapshots

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Notes:

Installing snapshots

- When you install snapshots on a Process Server, you must consider how to handle any running business process definition instances
- For an online server, you are prompted for how you want to handle the installation
 - Leave running instances on the current snapshot
 - Migrate running instances to the new snapshot
 - Delete running instances of the current snapshot (not available in production)
- For an offline server, you must make the necessary changes in the installation package
 - Leave
 - Migrate
 - Delete

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Figure 8-28. Installing snapshots

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Notes:

The options for installation include the following options:

- **Leave or Leave running instances on the current snapshot:** The instances currently running continue to completion by using the previously installed snapshot. Use this option when you want to use a policy file to manage orphaned tokens.
- **Migrate or Migrate running instances to the new snapshot:** Instances that are currently running are migrated to the new snapshot you are installing wherever the running instances are in the flow of the process. The new version is implemented for the next item or step.
- **Delete or Delete running instances of the current snapshot:** The instances currently running are immediately stopped and do not continue to completion. All records of the running instances are removed from the Process Server. The delete option does not delete BPEL process instances, human task instances, or business state machine instances.

When you install snapshots on a connected Process Server along with BPEL content, the Migrate or Delete options that you are presented with do not apply for your running BPEL process instances. The snapshot installation options to delete or migrate apply only to the Business Process Definition instances of the selected snapshot, and not to the BPEL instances.



Unit summary

Having completed this unit, you should be able to:

- Explain online and offline Process Server environments
- Work with an offline Process Server
- Deploy a process application to an offline Process Server
- Explain the various XML configuration files
- Deploy a process application to an online Process Server

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Figure 8-29. Unit summary

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Notes:



Checkpoint questions

1. True or false: A process application snapshot cannot be deployed to an offline server.
2. True or false: The environment can be customized by modifying the 100Custom.xml file.

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Figure 8-30. Checkpoint questions

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Notes:

Write your answers here:

1.

2.



Checkpoint answers

1. False. A process application can be deployed to an online or offline Process Server. An installation package is created and deployed for an offline Process Server.
2. True.

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Figure 8-31. Checkpoint answers

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Notes:

Exercise 7



Configuring the Process Server environment

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Figure 8-32. Exercise 7

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Notes:



Exercise objectives

After completing this exercise, you should be able to:

- Customize a sample deployment environment properties file
- Generate a deployment environment by using the BPMConfig utility
- Verify the creation of the deployment environment
- Start the deployment environment by using the BPMConfig utility
- Explore the deployment environment

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Figure 8-33. Exercise objectives

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Notes:

Exercise 8

Managing offline and online Process Servers

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Figure 8-34. Exercise 8

WB8211.0

Notes:

Exercise objectives

After completing this exercise, you should be able to:

- Create an offline server by using the Process Center Console
- Deploy a snapshot to an offline Process Server
- Change the configuration of an offline Process Server to an online Process Server
- Manage an online Process Server
- Deploy a snapshot to an online Process Server
- Deploy an installation package to a Process Server

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Figure 8-35. Exercise objectives

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Notes:

Unit 9. Managing snapshots

What this unit is about

This unit covers how to create and manage snapshots.

What you should be able to do

After completing this unit, you should be able to:

- Create a snapshot
- Install a snapshot on a Process Server
- Explain how to install a snapshot to an offline server
- Describe options for data migration
- Deactivate a snapshot

How you will check your progress

- Checkpoint questions
- Lab exercises

References

http://www.ibm.com/support/knowledgecenter/SSFPJS_8.5.6/com.ibm.wbpm.main.doc/kc-homepage-bpm.html

Unit objectives

After completing this unit, you should be able to:

- Create a snapshot
- Install a snapshot on a Process Server
- Explain how to install a snapshot to an offline server
- Describe options for data migration
- Deactivate a snapshot

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Figure 9-1. Unit objectives

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Notes:

9.1. Snapshots overview (1 of 3)



Snapshots overview (1 of 3)

- Snapshots overview
- Snapshot installation
- Data migration

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Figure 9-2. Snapshots overview (1 of 3)

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Notes:

Snapshots allow administrators to move processes to other environments to test and run in a production setting.

Snapshots allow for managing upgrades to processes and toolkits without disrupting current processes.

Your organization must develop a release and playback strategy for different process phases and include installing snapshots as part of that strategy.



Snapshots overview (2 of 3)

- For participants to run and test processes, you must create a snapshot of the process application
- You must then install your Process Applications to a Process Server
- Installing a snapshot also upgrades any dependent toolkits and process assets to a Process Server

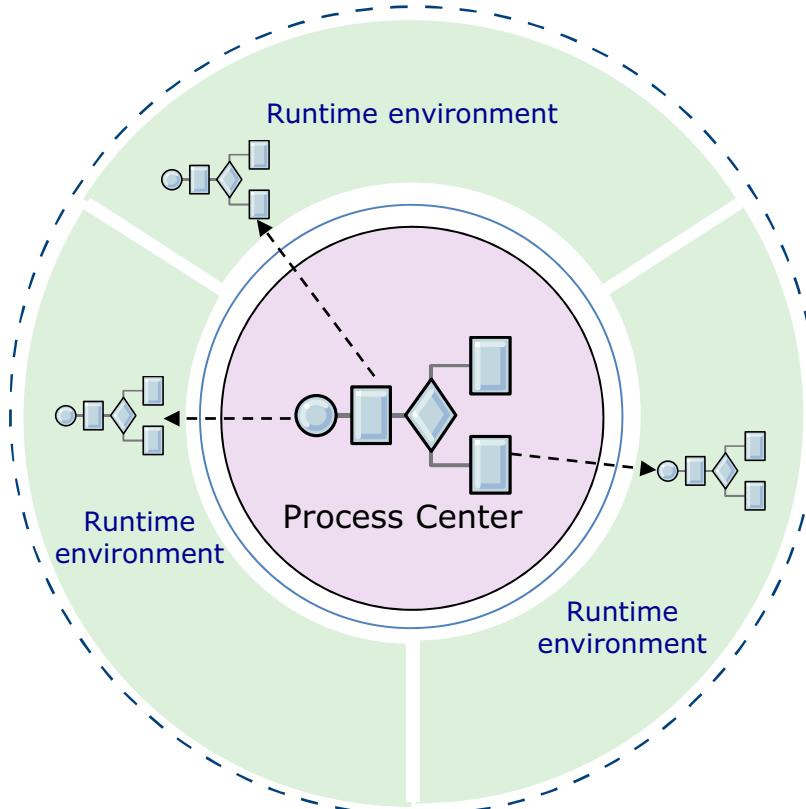
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Figure 9-3. Snapshots overview (2 of 3)

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Notes:

Snapshots overview (3 of 3)



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Figure 9-4. Snapshots overview (3 of 3)

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Notes:

The deployment is a hub and spoke approach.

9.2. Snapshot installation (1 of 3)



Snapshot installation (1 of 3)

- Snapshots overview
- Snapshot installation
- Data migration

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Figure 9-5. Snapshot installation (1 of 3)

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Notes:

Snapshots allow administrators to move processes to other environments for testing and running in a production setting.

Snapshots allow for managing upgrades to processes and toolkits without disrupting current processes.

Your organization must develop a release and playback strategy for different process phases and include installing snapshots as part of that strategy.



Snapshot installation (2 of 3)

- On occasion, an installation can fail
- You must understand the steps that are involved when installing a snapshot so that you can troubleshoot the movement of snapshots to different Process Servers

The screenshot shows the 'Installed Apps' section of the IBM Process Admin Console. At the top, there are tabs for 'Process Admin Console', 'Server Admin', 'Process Inspector', 'Installed Apps' (which is highlighted in green), and 'Preferences | Log out'. Below the tabs, there's a search bar labeled 'Sort Snapshots By:' with dropdown options 'Application Name', 'All', 'Active', and 'Default'. A table lists one application: 'Hiring Sample (HSS) - Standard Hiring Sample' (Status: Active, Default). Underneath the table, it says 'Standard HR Open New Position' - '1 instances'. To the right of the table is a sidebar titled 'Installed Apps' with a description of what the page shows and a link to 'Managing installed snapshots'.

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Figure 9-6. Snapshot installation (2 of 3)

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Notes:

Snapshot installation (3 of 3)

- When you install a snapshot, this sequence occurs the Process Server:
 1. Necessary library items, assets, and referenced toolkits for the Process Application are installed
 2. The installation services run for each toolkit
 3. The installation service runs for the process application
 4. If any business process definition instances are running, the data and process instances migrate
 5. Tracking definitions are sent to the Business Performance Data Warehouse
 6. Any scheduled undercover agents (UCAs) are activated
 7. Any advanced content is deployed (SCA modules and libraries)
 8. An “Installation complete” message is sent to the Process Center (online servers only)
- If step 1, 2, or 3 fails, your installation stops and does not progress
- If an installation does not complete step 4 or 5, it will progress normally and you can manually correct problems after the installation is complete

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Figure 9-7. Snapshot installation (3 of 3)

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Notes:

If developers customize installation services, they can handle some exceptions to help with failures. Otherwise, you must manually roll back installation changes before you attempt to install a snapshot again.

Logging and snapshot installation

- The logs on the targeted Process Server provide information about an installation
- The following log file records all progress and any errors during the installation
 - If a data migration failure occurs, it is recorded here:
`<installDir>\profiles\<profileName>\logs\<serverName>\<serverType>\SystemOut.log`

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Figure 9-8. Logging and snapshot installation

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Notes:

To troubleshoot snapshot installation, see the following page:

http://www.ibm.com/support/knowledgecenter/SSFTDH_8.5.0/com.ibm.wbpm.admin.doc/topics/troubleshooting_installations.html

Restricting installation access to Process Servers (1 of 3)

- By default, to install to Process Servers that are online, you must have access to the process application that you want to install as follows:
 - Administrative access to install to Process Servers in production environments
 - Write access to install to any non-production Process Server
 - Read access to install to Process Servers in development environments
- A user with administrative access to the Process Center repository can deploy snapshots to an online Process Server regardless of the process application settings
- Optionally, you can use the `processCenterInstall` or `offlineInstall` group settings for other ways to restrict access

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Figure 9-9. Restricting installation access to Process Servers (1 of 3)

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Notes:

Restricting installation access to Process Servers (2 of 3)

- To restrict installation access on a Process Server:
 - Start the `wsadmin` scripting tool. To start `wsadmin` by using the Jython language, run the following command from the `bin` directory of the server profile: `wsadmin -conntype NONE -lang jython`
 - Extract the properties of the `BPMProcessServer` configuration object:
`wsadmin> groups = AdminConfig.list('BPMServerSecurityGroups')`
`wsadmin> print AdminConfig.show(groups)`
Note: If `processCenterInstall` is missing, then no value is displayed.
 - View the output and note the `processCenterInstall` value.
For example: [processCenterInstall Existing_group_name]
 - Update the `processCenterInstall` value:
`wsadmin> AdminConfig.modify(groups, [['processCenterInstall', 'New-Group-Name']])`
Where the `New_group_name` variable represents the group of users to whom you want to grant access. You can use an existing group or create a new one. If you create a new group, ensure that it also exists on the Process Center.

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Figure 9-10. Restricting installation access to Process Servers (2 of 3)

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Notes:



Restricting installation access to Process Servers (3 of 3)

- To restrict installation access on a Process Server (continued):

5. Verify your update:

```
wsadmin> print AdminConfig.show(groups)
```

6. Save the changes and exit:

```
wsadmin> AdminConfig.save() wsadmin> exit
```

7. Restart the deployment manager.

8. Restart the Process Server cluster or server.

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Figure 9-11. Restricting installation access to Process Servers (3 of 3)

WB8211.0

Notes:

Advanced installation functions (1 of 2)

- When developers create a process application, an installation service is automatically created
 - This service does a basic installation, but can be customized to add features to snapshot installation
- Some advanced installation tasks that are often added to an installation service include:
 - Creating or updating external SOR database tables
 - Updating necessary environment variables
 - Determining which snapshots are already installed
 - Upgrading individual process instances
 - Creating custom time schedules

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Figure 9-12. Advanced installation functions (1 of 2)

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Notes:



Advanced installation functions (2 of 2)

- To edit a Process Application's installation service, open the process application and click **Installation Service** under the **Setup** category in the Process Designer

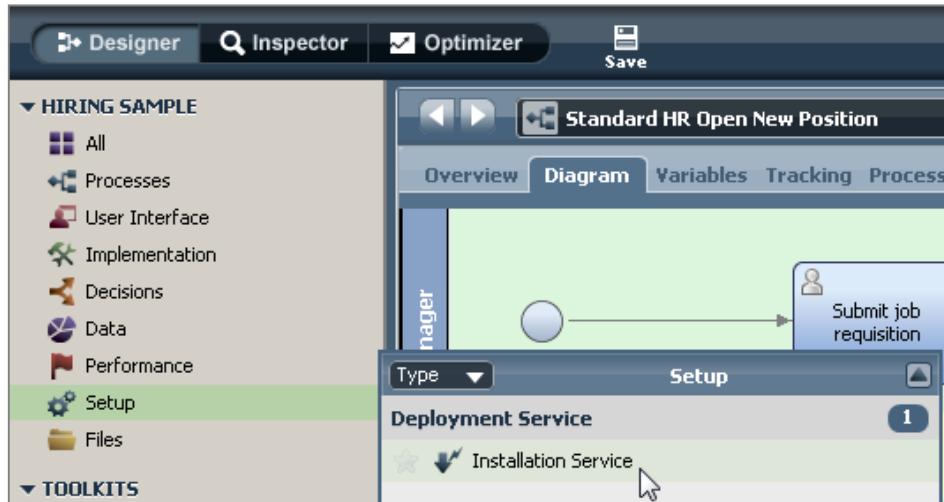


Figure 9-13. Advanced installation functions (2 of 2)

WB8211.0

Notes:



Installing snapshots

- To begin, create a snapshot of the process application
 - Creating this snapshot ensures that you move the most recent version of the application to the runtime server
- The description of the snapshot shows all validation errors
 - Developers must resolve these errors before installing a snapshot
- After taking a snapshot, select the snapshot in the Process Center, click **Install**, and choose the target Process Server

The screenshot shows the IBM Process Center interface with the following details:

- Header:** Hiring Sample (HSS) with a star icon, followed by tabs for **Snapshots** (highlighted in green), History, Manage, and Governance.
- Toolbar:** Sort Snapshots By: Date dropdown, followed by buttons for All, Installed, Deployed, and Archived.
- Current Snapshot:** A row for "Current" with a green circle icon. It shows "Last changed on 3/11/15 by we_author1" and an "Export" link.
- New Snapshot:** A row for "Standard Hiring Sample v8560 (SHSV856)" with a green circle icon. It shows "Created on 3/11/15 by we_author1" and "Not Yet Installed to Process Server". To the right of this row are "Export" and "Install" buttons, with the "Install" button highlighted by a red box.

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Figure 9-14. Installing snapshots

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Notes:

Offline Process Servers (1 of 2)

- To install a snapshot to an offline Process Server:
 - Create a snapshot of the process application to be installed
 - Add the offline server to the Process Center
- Make sure that you have the appropriate permissions for the process application
 - Administrative access to create an installment package for Process Servers in production environments
 - Write access to create an installment package for any non-production Process Server
 - Read access to create an installment package for Process Servers in development environments

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Figure 9-15. Offline Process Servers (1 of 2)

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Notes:

Offline Process Servers (2 of 2)

- Follow similar steps to install a snapshot to an offline server
 - After clicking **Install**, select **Create installment package**
- To create the installment package, in the `<installDir>\profiles\<profileName>\bin` directory, you can run the following batch file:
`retrieveProcessAppPackage.bat process_app_acronym
snapshot_name offline_server_name install_package_name`
- After transferring the installation package to the server, open a command prompt and run the installation package in the same process-installer directory on the Process Server:
`installProcessAppPackage.bat install_package_name`

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Figure 9-16. Offline Process Servers (2 of 2)

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Notes:

To install snapshots on offline Process Servers, see the following support page:

http://www.ibm.com/support/knowledgecenter/SSFTDH_8.5.6/com.ibm.wbpm.admin.doc/topics/releasing_installing_procs_D.html



Postinstallation tasks

- After installation, by using the Process Administration console on your targeted Process Server:
 - Configure environment variables
 - Configure role bindings (groups)
 - Configure exposure to processes and services

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Figure 9-17. Postinstallation tasks

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Notes:

For more information about environment variables, see the following URL:

http://www.ibm.com/support/knowledgecenter/SSFPJS_8.5.6/com.ibm.wbpm.admin.doc/topics/setting_env_vars.html

9.3. Data migration



Data migration

- Snapshots overview
- Snapshot installation
- Data migration

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Figure 9-18. Data migration

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Notes:

Snapshots allow administrators to move processes to other environments for testing and running in a production setting.

Snapshots allow for managing upgrades to processes and toolkits without disrupting current processes.

Your organization must develop a release and playback strategy for different process phases and include installing snapshots as part of that strategy.



Data migration

- If the process you are installing was installed previously and has running, or “inflight” instances, you are prompted to decide whether you want to upgrade (“migrate”) running process instances to the newly installed snapshot
- For example, a process called New Hire Orientation on the production server
 - The developers designated some existing business data variables to be tracked in the newest snapshot, and they want to upgrade the production process to include tracking
 - IBM Business Process Manager prompts the person who is installing the snapshot to upgrade (“migrate”) the data from the current production process to the new snapshot

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Figure 9-19. Data migration

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Notes:

Options for data migration

Online migration option	Offline migration option	Description
Leave running instances on current version of the snapshot	Leave	The instances currently running continue to completion with the previously installed version of the snapshot
Upgrade running instances to new version of the snapshot	Migrate	<ul style="list-style-type: none"> Currently, running instances are upgraded to the new snapshot you are installing Wherever the running instances are in the flow of the process, the new version is implemented for the next item or step
Delete running instances of current version of the snapshot	Delete	<ul style="list-style-type: none"> The instances currently running are immediately stopped and do not continue to completion All records of the running instances are removed from the Process Server

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Figure 9-20. Options for data migration

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Notes:

The delete option is not available for Process Servers in production environments.

Upgrading running instances

- If you choose to upgrade running instances to the new version of the snapshot, the following sequence happens:
 - Exposed process values (EPVs) are copied to the new snapshot
 - Participant group bindings from the most recent version are copied to the new snapshot
 - Default designations are copied to the new snapshot

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Figure 9-21. Upgrading running instances

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Notes:

Server version upgrades and migrating process instances

- When upgrading to a new version of IBM Business Process Manager, consider federating your servers and adding a server to the topology instead of upgrading an existing server to a new version
 - Leave running instances of the process on the current version of the snapshot
 - Existing instances eventually complete on the snapshot they were created on
 - Install fix packs for those processes that require them and migrate those instances on the same server
 - Developers upgrade process applications to the new version of IBM Business Process Manager
 - New process applications are deployed to the new server
 - New instances are created on the new server
 - This approach eliminates migrating instances due to IBM Business Process Manager version upgrades

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Figure 9-22. Server version upgrades and migrating process instances

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Notes:

9.4. Deactivating a snapshot

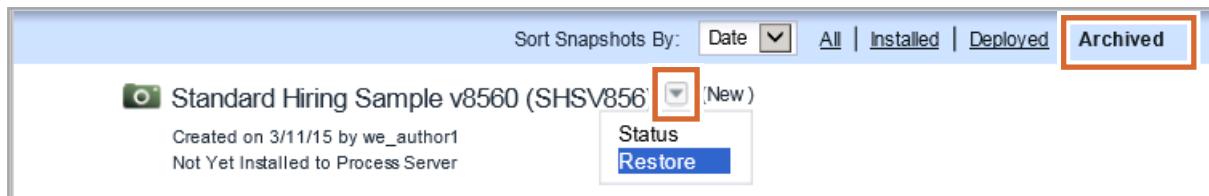


Deactivating a snapshot

- Open the menu next to the snapshot you want to archive and select **Archive**
 - You cannot archive snapshots with active instances



- To restore an archived snapshot, view the archived snapshot and select **Restore**



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Figure 9-23. Deactivating a snapshot

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Notes:



Unit summary

Having completed this unit, you should be able to:

- Create a snapshot
- Install a snapshot on a Process Server
- Explain how to install a snapshot to an offline server
- Describe options for data migration
- Deactivate a snapshot

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Figure 9-24. Unit summary

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Notes:



Checkpoint questions

1. Which topology is typically used for testing, proofs of concepts, and demonstration environments?
 - A. Single cluster
 - B. Application, remote messaging, and remote support
2. Which topology is ideal from a performance perspective and the best topology for long-running processes and human tasks?
 - A. Single cluster
 - B. Application, remote messaging, and remote support
3. The number of clusters in the deployment environment depends on which of the following patterns?
 - A. Topology pattern
 - B. Database usage pattern
 - C. Business process pattern
4. True or false: You can use a single tool to configure the profiles and the deployment environment.

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Figure 9-25. Checkpoint questions

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Notes:

Write your answers here:

- 1.
- 2.
- 3.
- 4.



Checkpoint answers

1. A. Single cluster
2. B. Application, remote messaging, and remote support
3. A. Topology pattern
4. False. You can use multiple tools to configure the profiles and the deployment environment.

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Figure 9-26. Checkpoint answers

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Notes:

Exercise 9



Creating and managing snapshots

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10.1

Figure 9-27. Exercise 9

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Notes:



Exercise objectives

After completing this exercise, you should be able to:

- Create a snapshot of a process application
- Manage the snapshot on a Process Server
- Migrate process instances between snapshot versions
- Deactivate a snapshot

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Figure 9-28. Exercise objectives

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Notes:

Unit 10. Advanced administration concepts

What this unit is about

This unit describes various options to add more processing capabilities. You learn about the high availability manager, how to create messaging engine policies, and log file high availability.

What you should be able to do

After completing this unit, you should be able to:

- Explain the reasons for extending a topology
- List options for increasing cluster member capacity in a cell
- Expand a topology
- Explain the purpose of the high availability manager and the concept of core groups
- Explain the structure and purpose of the default messaging and transaction manager policies
- Explain how policies are applied at run time
- Define the transaction manager high availability policy type and identify how transaction policies are applied
- Describe the IBM Process Federation Server

How you will check your progress

- Checkpoint questions

References

IBM Business Process Manager V8.5.6 documentation in the IBM Knowledge Center:

http://www.ibm.com/support/knowledgecenter/SSFPJS_8.5.6/com.ibm.wbpm.main.doc/kc-homepage-bpm.html

Unit objectives

After completing this unit, you should be able to:

- Explain the reasons for extending a topology
- List options for increasing cluster member capacity in a cell
- Expand a topology
- Explain the purpose of the high availability manager and the concept of core groups
- Explain the structure and purpose of the default messaging and transaction manager policies
- Explain how policies are applied at run time
- Define the transaction manager high availability policy type and identify how transaction policies are applied
- Describe the IBM Process Federation Server

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Figure 10-1. Unit objectives

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Notes:



Topics

- Extending a topology
- High availability framework
- Policies
- Transaction manager
- Introduction to IBM Process Federation Server

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Figure 10-2. Topics

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Notes:

10.1. Extending a topology

Extending a topology



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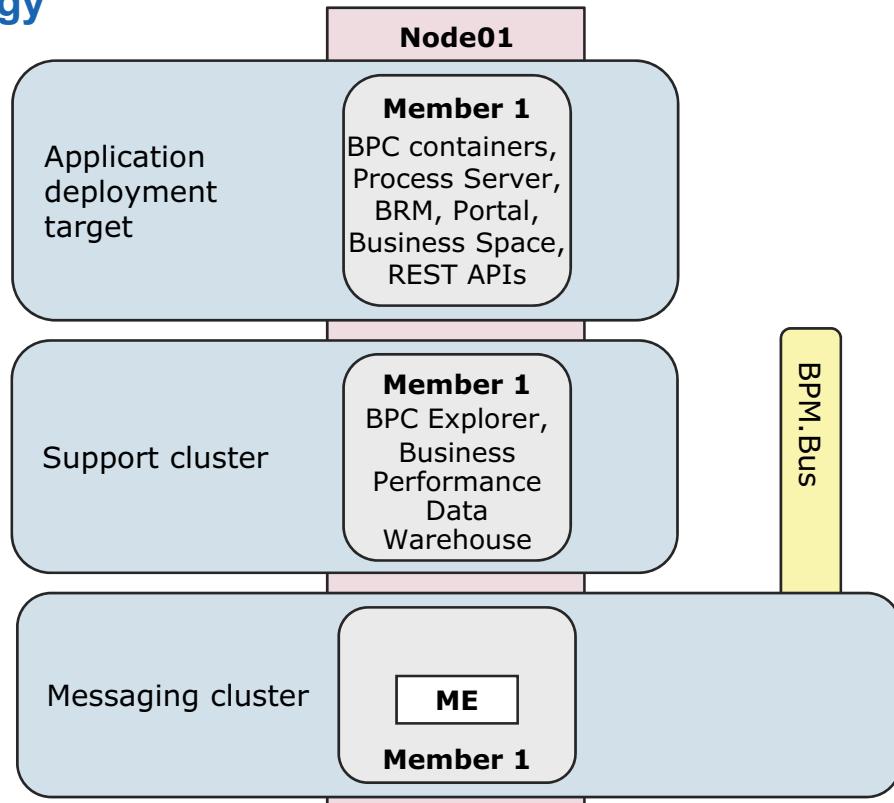
10.1

Figure 10-3. Extending a topology

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Notes:

Application, remote messaging, and remote support topology



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Figure 10-4. Application, remote messaging, and remote support topology

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Notes:

The application, remote messaging, and remote support topology pattern is a topology for production environments. This topology provides three separate clusters:

- A remote messaging cluster
- A remote support cluster
- An application deployment target cluster

Reasons for adding nodes and cluster members

- You are deploying new applications to your existing environment
- The need for increased application processing capability during peak usage times
 - For example, increased sales traffic during the fourth quarter
 - Increased accounting traffic at the end of the quarter
- Creating more capacity for migration or application updates
- The requirement to provide adequate failover capability
- An increasing number of applications are straining the system
 - Can be for the same or different business purposes
 - Does not push the entire system beyond capabilities
- Preparing more capacity for failover or migration

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Figure 10-5. Reasons for adding nodes and cluster members

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Notes:

Methods to extend your topology

- Adding cluster members
 - The easiest way to extend your infrastructure
 - Add nodes and cluster members independently or in combination
 - Can improve your application throughput
- Adding cells
 - Create another deployment environment in another cell
 - Gives you the most room for growth and the most flexibility for expanded functional requirements
 - Provides complete isolation for your applications
- Adding deployment environments
 - Create an independent deployment environment in the same cell
 - Advanced topology that requires research and planning
 - Feature is for Process Server only, not for Process Center

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Figure 10-6. Methods to extend your topology

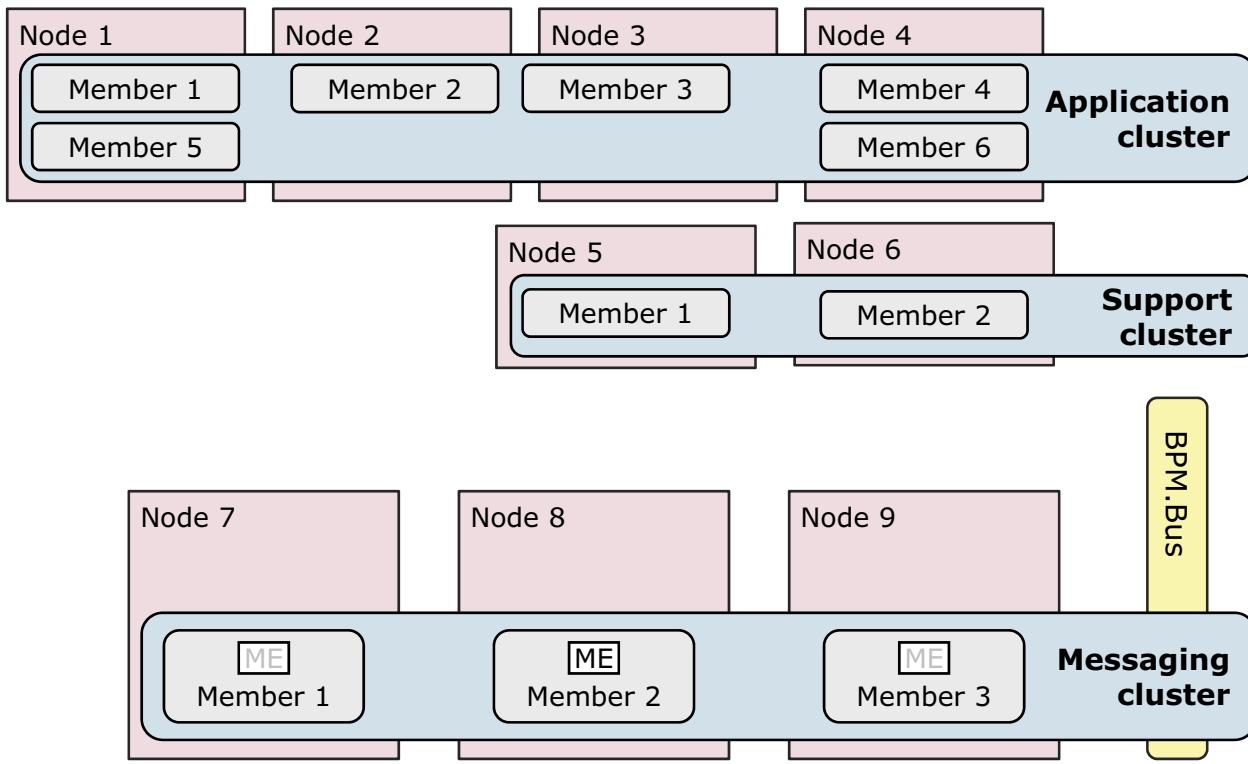
WB8211.0

Notes:

If you decide that expanding your existing clusters is not an appropriate solution, consider creating another deployment environment in another cell. This approach gives you the most room for growth, the most flexibility for expanded functional requirements, and complete isolation for your applications.

To add another cell, you duplicate common cell-level configurations, such as global security settings. You use multiple consoles to manage your applications, such as separate administrative consoles and failed event managers.

Adding nodes and cluster members



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Figure 10-7. Adding nodes and cluster members

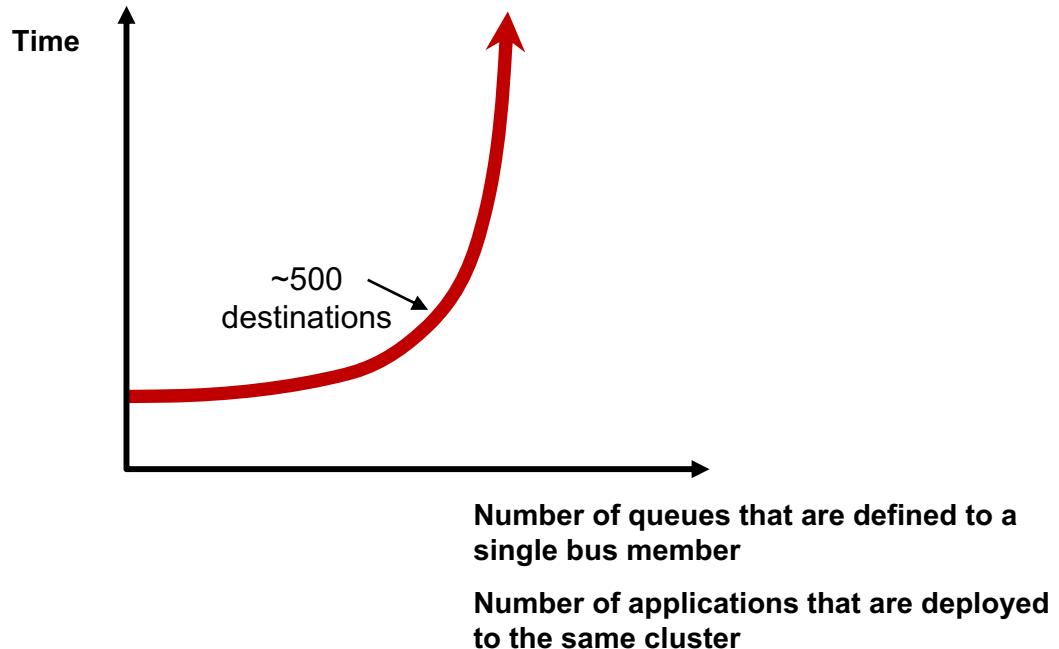
WB8211.0

Notes:

If you require extra processing capability to the application deployment target cluster, you have the option of adding more nodes and cluster members. Typical representations of the application, remote messaging, and remote support topology usually have two or three nodes, each with one cluster member, which is not mandatory. If you must add more cluster members to the application target cluster or the support cluster, it is possible to do so.

More cluster members cannot always be the answer

- Evaluate startup time (startup time affects failover time)



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Figure 10-8. More cluster members cannot always be the answer

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Notes:

The more applications that you deploy, the more destinations you create. As the number of destinations increases, the startup time of the ME is affected. At around 500 destinations, the startup or failover time increases dramatically.

You can measure startup time by subtracting the time that is recorded when the "state started" from the time that is recorded when the state is "ready for e-business."

Reasons where extending clusters is not appropriate

- The requirement to isolate application functions for the business units of your organization because of regulatory or governance requirements
 - You can deploy the applications for human resources to one cluster, while the applications for the accounting group are deployed to a separate cluster
- The requirement to isolate applications because they have unique runtime requirements
 - Heavy asynchronous traffic versus primarily synchronous traffic
- You want to isolate different application versions
- The need to provide more application processing capability
- The requirement to work around application bottlenecks
- You want to set up multiple test environments without having to configure security or nodes each time

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Figure 10-9. Reasons where extending clusters is not appropriate

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Notes:

In the following circumstances, extending clusters is not appropriate:

- Unique runtime requirements: For example, perhaps the original topology was optimized entirely for synchronous communications. If your new application is a heavy user of asynchronous communications, then the original topology might not properly support the requirements of the new application.
- Avoiding a bottleneck: To avoid the use of resources that are already heavily used.

Considerations for multiple deployment environments

- Maintenance considerations
 - It is more difficult with more than one deployment environment in the same cell
 - Applying interim fixes affects all servers, deployment environments, and clusters in the cell
 - You might need to stop all your servers to apply interim fixes for one set of clusters
- Application considerations
 - You cannot install two instances of the same SCA application in the cell
 - Each Process Portal has one view to each deployment environment and requires unique context roots
- Administration considerations
 - Each application cluster must have a corresponding support and messaging cluster
 - You must ensure unique names for all applications that contain SCA modules
 - You need to add databases and schemas for each application and messaging cluster

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Figure 10-10. Considerations for multiple deployment environments

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Notes:

You cannot install two instances of the same Service Component Architecture (SCA) application in the cell. You can install many SCA applications, but they must have different module names. You can use the **SCARename** utility to rename them. An example of this problem is if you create an environment with two deployment environments in the same cell and then try to import into both of them an IBM Business Process Manager export (.twx) file that contains BPEL processes. In this case, the second import fails because the SCA module names are the same and an SCA module name must be unique within a cell. To rename one of them, you must extract the EAR file from the TWX file, call the SCARename utility to rename it, and then package the new EAR file in the TWX file.

This problem can be managed in several ways:

- You can use module naming conventions that incorporate the name of the target deployment environment.
- If you are deploying the modules as part of a process application in Process Center, you can use process app naming conventions that incorporate the name of the target deployment environment.

- If you are deploying directly as an EAR file, you can use module versions, where the version name uses a naming convention that incorporates the name of the target deployment environment.

Extending an existing environment

- You can extend your deployment environment by using two methods
 - Deployment environment wizard
 - BPMConfig command
- Deployment environment wizard
 - Easiest way to extend your topology to add more cluster members
 - Various options in the administrative console to extend the topology
- BPMConfig command
 - Run the BPMConfig command by using the properties file to create new profiles or to add more nodes
 - You must use the BPMConfig command initially to create the initial deployment environment
 - Use the same properties file on all computers that participate in the deployment environment
 - Ensure that the deployment manager is running

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Figure 10-11. Extending an existing environment

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Notes:

Run the `BPMConfig` command with the `-create -de` option to add more managed nodes and profiles to your existing environment. When it runs, the `BPMConfig` command:

- Creates a new managed node for each new node specified in the configuration properties based on the specified values.
- 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.
- Creates any profiles that are specified in the configuration properties file that do not yet exist.

10.2.High availability framework

High availability framework



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Figure 10-12. High availability framework

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Notes:

High availability manager framework

- A set of services that WebSphere Application Server provides
- Allows WebSphere components to provide highly available services
- Some runtime components in WebSphere products provide services that must be highly available
 - There must always be at least one instance of the service that is active in some process in the cell
 - If the process that is hosting the service fails, the service must be activated in some other process in the cell
- Based on the principle of group communications system
- Consistent view of group membership across all members:
 - Servers going up and down cause view changes
 - New views are agreed upon by all members

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Figure 10-13. High availability manager framework

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Notes:

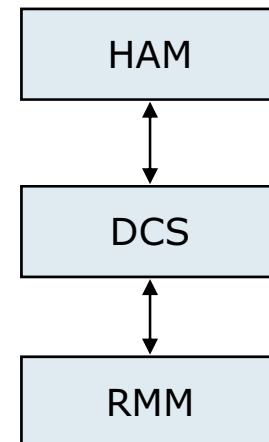
Some of the internal components of WebSphere Application Server require services that must be highly available in a cell. If an active instance of one of these services were to fail, some operations in the cell would not work successfully – for example, the transaction manager.

Some internal components of WebSphere Application Server require data from multiple sources to provide their service. Processes must be able to transfer data between themselves quickly and efficiently.

Group communications is not a new concept. Basically, it means that within a group, all of the members agree on which members of the group are currently participating and which members are not available. Also, when group members send messages, the order in which they are sent is guaranteed to be the order in which they are delivered to the other members.

High availability manager architecture

- High availability manager (HAM) services
 - High availability (HA) groups: Enforcement of HA policies
 - Bulletin board: For sharing state
 - Agent framework: For data replication service (DRS)
- Distribution and consistency services (DCS)
 - Group membership service that knows who is up and who is down
 - Messages are delivered in the originating order
 - Either all or no group members receive a message (optional)
- Reliable multicast messaging (RMM)
 - The transport layer for DCS
 - Multicast emulation for TCP communication
 - Provides failure detection



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Figure 10-14. High availability manager architecture

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Notes:

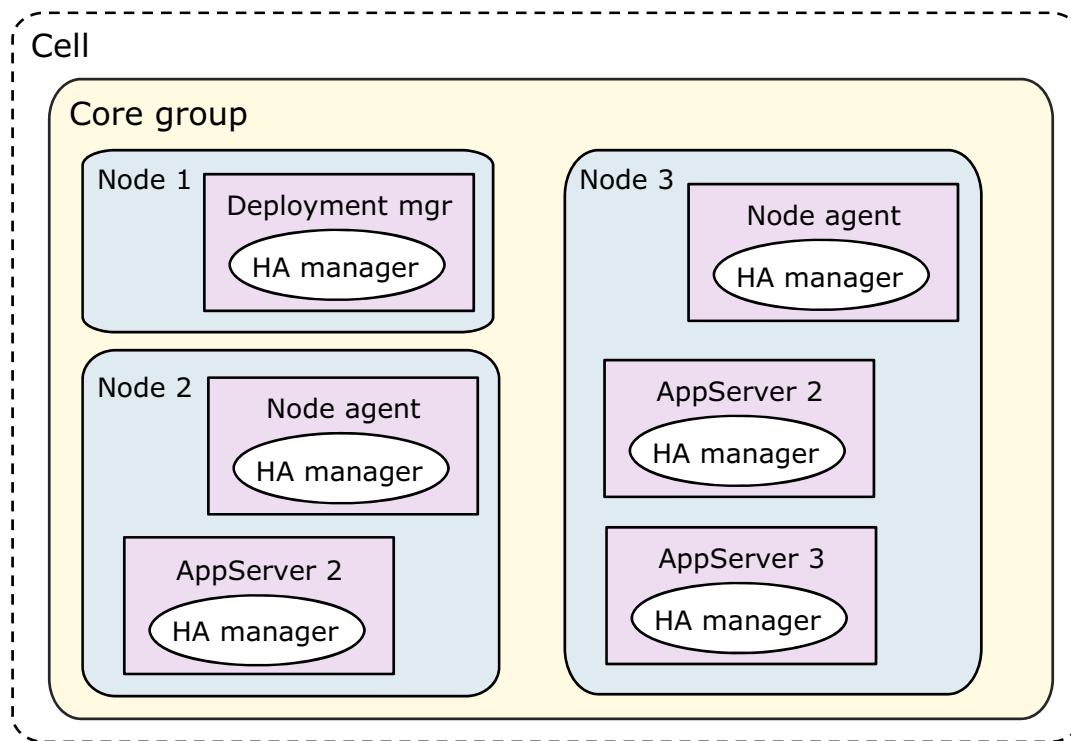
The high availability (HA) manager consists of a layered stack of components. This layered stack is collectively referred to as the HA manager. The components include:

- **The HA manager (HAM):** This component provides the abstractions that are directly used by other WebSphere services. These abstractions are generally based on a set of fine-grained group services that provide intragroup communications and group policies.
- **Distribution and consistency services (DCS):** The DCS layer provides coarse-grained group services, including reliable many-to-many messaging capabilities.
- **Reliable multicast messaging (RMM):** The RMM layer provides transport layer network functionality, including a multicast messaging abstraction over TCP connections.

DCS (which uses RMM) executes three protocols:

- Discovery Protocol: For detecting new JVMs
- Failure Detection Protocol: For detecting failed or unresponsive JVMs
- View Synchrony Protocol: For maintaining virtual synchrony

High availability manager runs on each server



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Figure 10-15. High availability manager runs on each server

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Notes:

The high availability framework of WebSphere Application Server eliminates single points of failure. It is called the WebSphere High Availability (HA) Manager, and it provides peer-to-peer failover for applications and processes that run within WebSphere. It also allows integration into the most recent storage technologies, and supports other high availability frameworks, such as HACMP (High Availability Cluster Multi-Processing).

The HA manager runs as a service within each application server process (deployment manager, node agents, or application servers). If it has a server failure, the HA manager will fail over services that were running on that server.

A WebSphere Application Server cell (main administrative domain) consists of one or more server processes that host resources such as applications or messaging engines. The cell is partitioned into groups of servers that are known as core groups, which the administrator defines. A core group cannot extend beyond a cell, or overlap with other core groups. It serves as physical grouping of JVMs in a cell. Each JVM process can be a member of only one core group. Naturally, cluster members belong to the same core group.

High availability groups

- WebSphere Application Server components that use HA manager failover services create or join a high availability group
 - Components create HA groups at run time
 - Members of the group are those processes where it is possible to activate the component
- Many HA groups can exist for the same set of servers
 - Messaging engine HA group
 - Transaction manager HA group
- Components define a unique *HA group name* that they use
 - An HA group name is a non-empty set of name-value pairs
- *High availability policies* determine the activation or failover characteristics of an HA group that is defined by HAM components or users

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Figure 10-16. High availability groups

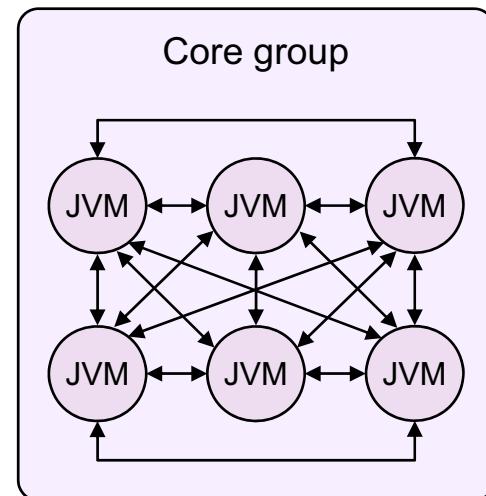
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Notes:

The HA group service has the most users, and it is the only service where administrative configuration might be required. Settings for the HA group service are exposed to the administrator by using the core group policies. An HA group name is really a set of name-value pairs, where each name and value is a String. Theoretically, a set like {a=b,c=d,e=f} can be a valid HA group name. All HA groups must have a group name that matches to only one policy.

Core group

- A collection of processes (JVMs) **fully connected** to each other for HA manager communications
- Types of processes include application servers, node agents, deployment manager, and proxies
- **DefaultCoreGroup** is automatically created and can never be deleted
 - Server creation or deletion adds or removes servers to or from a core group
- A server cannot exist in more than one core group



Important: All members of an HA group must be in the same core group

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Figure 10-17. Core group

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Notes:

Core group restrictions

- All members of an HA group must be in the same core group
 - A component service in one core group cannot fail over to a server in a different core group
 - HA group members in one core group cannot directly send information to other core groups by using DCS
 - Exception: A bulletin board service in one core group can use DCS to communicate with the bulletin board service in another core group
- Core groups do not scale indefinitely
 - Due to full mesh of connections between servers
 - Number of connections is $n*(n - 1) / 2$
 - For configurations with more than 50 servers, multiple core groups must be used

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Figure 10-18. Core group restrictions

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Notes:

Core group restrictions are as follows:

- A fully connected mesh has the advantage of low latency, fast failover, but also has a disadvantage of scalability considerations. The recommendation is to start with 50 members maximum per core group. With adequate CPU, memory, and network, the core group can be larger; but do not exceed 100 members.
- Multiple core groups must be connected by using the core group bridge service. This connection allows bulletin board messages to be communicated between core groups.
- A WebSphere process (JVM) can belong to only one core group.
- A core group cannot span cells. A cell can have more than one core group. A cluster cannot span core groups. A core group can have more than one cluster.
- Existing servers can be moved between core groups. New servers can be created in a selected core group.
- HA managed components do not communicate across core groups. The exception is the bulletin board service.



Bulletin board service

- Some information must be known cell-wide, even if you have multiple core groups
 - Workload Manager routing information
- This information is distributed throughout the cell by using the bulletin board service
- The bulletin board service must be able to communicate across core groups
- To communicate bulletin board information across core groups, you must build core group bridges
- No components other than the bulletin board service use core group bridges

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Figure 10-19. Bulletin board service

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Notes:

Core group coordinator (1 of 2)

- The (active) coordinator aggregates distributed state information from the individual processes
 - Where HA group members are located
 - Current state of all members
- Ensures that HA groups are compliant with the HA policy for the group
 - When a view changes, coordinator ensures that all policies are satisfied
- By default, you have one active coordinator per core group
- A single active coordinator does not introduce a single point of failure
 - If the active coordinator fails, a new coordinator is elected

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Figure 10-20. Core group coordinator (1 of 2)

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Notes:

The lexicographic sort uses the form **cell name / node name / server name**. In some installations, the deployment manager server gets elected as the active coordinator by default. However, it is suggested that you explicitly specify the preferred coordinator server.

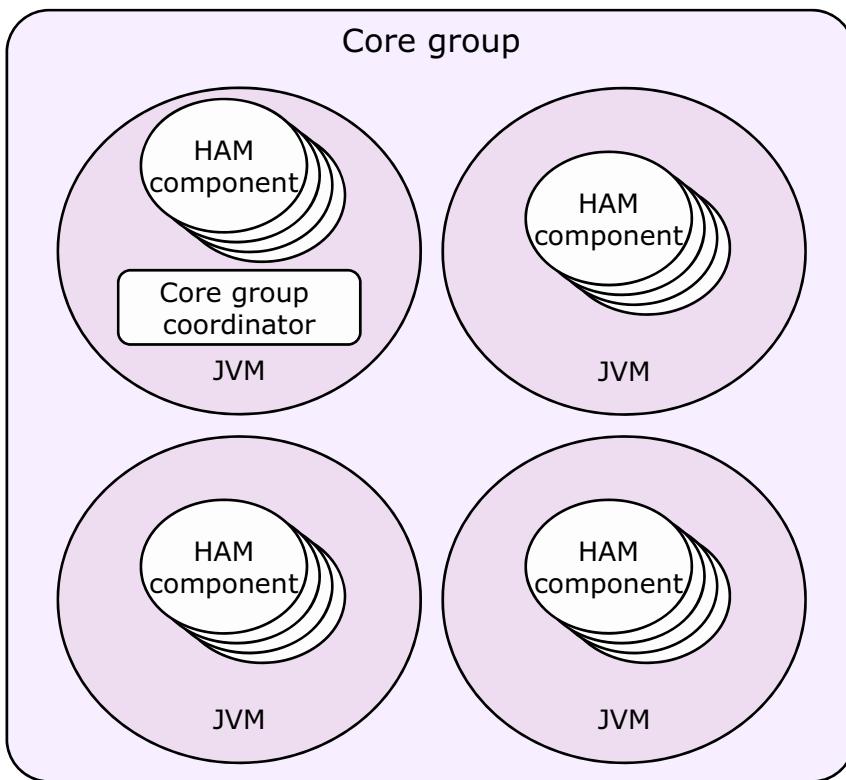
In large topologies, the preferred coordinator server can be tuned to have special settings, such as heap size. In such a case, proceed as follows:

- Set up a non-singleton list of ordered preferred coordinator servers.
- Set the appropriate tuning parameters in all of the members of the list.

Otherwise, if the most preferred coordinator fails, a domino-death effect due to conditions like “out of memory” can happen.

On smaller topologies, often the deployment manager or node agents are added to the preferred coordinator list. On large topologies, it is suggested that stand-alone servers be created to host both the active coordinator and bridge interface functions.

Core group coordinator (2 of 2)



- By default, the HA manager selects the lexicographically lowest-named server from the available core group members

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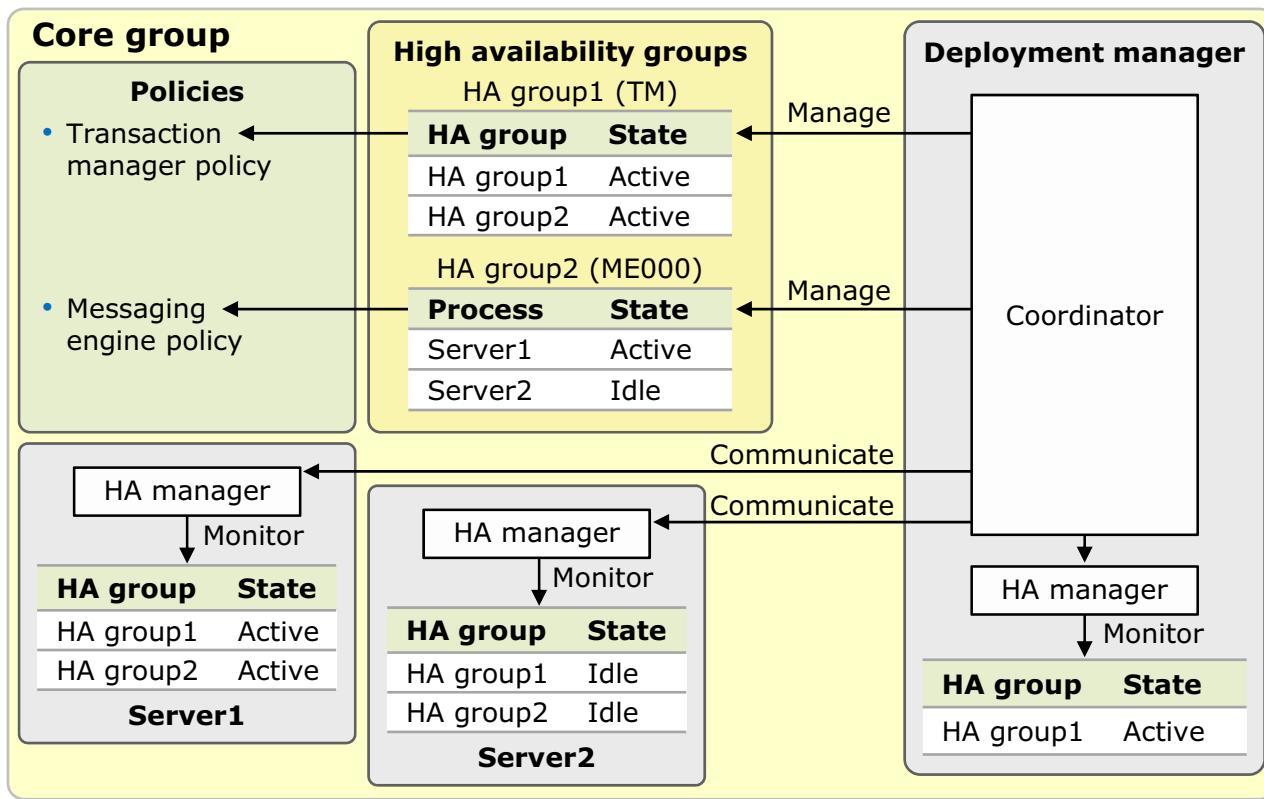
Figure 10-21. Core group coordinator (2 of 2)

WB8211.0

Notes:

By default, each core group has only one coordinator. But this setup is not a single point of failure. If necessary, an active coordinator can move to any process in the core group. The number of preferred coordinators should always be greater than the number of active coordinators. If the number of active coordinators = 1, then specify at least two preferred coordinator servers. If the number of active coordinators = 2, then specify at least three preferred coordinator servers.

Core group collections and the HA manager



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Figure 10-22. Core group collections and the HA manager

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Notes:

A closer look at the HA manager concept is needed to understand the relationship between core groups, high availability groups, and policies (this topic is discussed on the following slides). A core group is a component of the high availability manager function. A default core group, called `DefaultCoreGroup`, is created for each cell in the WebSphere Application Server environment. A core group can contain stand-alone servers, cluster members, node agents, and the deployment manager. A core group must contain at least one node agent or the deployment manager. The WebSphere Application Server administrator maintains the core groups.

After the membership of the core group stabilizes at run time, certain members are elected to act as coordinators for the core group. Coordinators can be assigned or chosen at random. A core group coordinator manages the following aspects:

- Maintaining group information (group name, group members, and group policy)
- Monitoring the members of the group as they start, stop, or fail
- Assigning services to group members and handling failover of services based on core group policies
- Managing the high availability groups (HA groups) within a core group

HA groups are created dynamically at run time. Each HA group represents a highly available service; for example, each messaging engine has an HA group. The active members in an HA group are ready to host the service at any time. Each core group can have a number of policies, which apply to particular HA groups and determine the high availability behavior of services that run within the HA group. Each HA group can have its own policy. A single policy can manage a set of HA groups that use a matching algorithm. Exactly one policy must manage each HA group.

During installation, two policies are automatically installed in the DefaultCoreGroup:

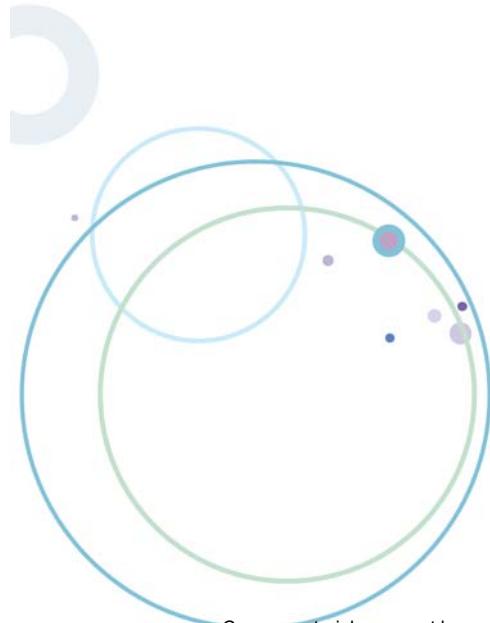
- Default SIBus policy: For messaging engines
- Clustered TM policy: For transaction manager

Since being a coordinator takes up more resources in the JVM, you might want to override the default election mechanism by providing your own list of preferred coordinator servers in the WebSphere administrative console. You can provide this list by selecting **Servers > Core groups > Core group settings > <core_group_name> > Preferred coordinator servers**.

10.3.Policies



Policies



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10.1

Figure 10-23. Policies

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Notes:

Messaging engine policies

- The administrative console provides messaging engine policy assistance where you can choose one of three predefined messaging engine policies:
 - High availability
 - Scalability
 - Scalability with high availability
- By default, messaging engine policy assistance is disabled
 - Must be enabled to configure a policy

Bus members are the servers, WebSphere MQ servers and clusters that have been added to the bus.

Preferences

Add	Remove		
You can administer the following resources:			
<input type="checkbox"/>	MECluster	Cluster	Disabled
Total 1			

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Figure 10-24. Messaging engine policies

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Notes:

The messaging engine policies are as follows:

- High availability policy:** By default, only one application server in a cluster has an active messaging engine on a bus. If the server fails, the messaging engine on another server in the cluster is activated. This activation provides failover, but no workload management. The server with the active messaging engine has local access to the bus, but the rest of the servers in the cluster access the bus remotely by connecting to the active messaging engine. Servers accessing the bus remotely can consume asynchronous messages from a remote messaging engine. However, an instance of a message-driven bean (MDB) deployed to the cluster can consume only from a local messaging engine.

Because everything is funneled through one messaging engine, performance might still be an issue.

- Scalability policy:** Each cluster member has its own ME. If one cluster member fails, its ME does not fail over to another cluster member.
- Scalability with high availability:** Each server in the cluster is able to host at most two MEs, its own and one for another cluster member.

Policy wizard

- After enabling messaging engine policy assistance, a wizard provides guidance for the cluster
- Guidance includes details about creating one or more messaging engines for the cluster and configuring the messaging engine behavior
- Select a particular policy type for the cluster
 - Policy type is now listed for the bus member

Messaging engine policy assistance settings		
Enabling messaging engine policy assistance enables a predefined or custom policy to be applied to the selected server cluster. Tooling will be enabled to assist in maintaining the policy if the server cluster changes in size. Restrictions will be placed on the changes that can be made to associated core group policies.		
Select	Policy type	Is further configuration required?
<input checked="" type="radio"/>	High availability	<p>⚠ The current configuration has a single point of failure because there is only a single node. Consider adding a cluster member configured on a separate node.</p> <p>⚠ You need to correct the following number of messaging engine policies: 1.</p>
<input type="radio"/>	Scalability	<p>⚠ You need to correct the following number of messaging engine policies: 1.</p>
<input type="radio"/>	Scalability with high availability	<p>⚠ The current configuration has a single point of failure because there is only a single node. Consider adding a cluster member configured on a separate node.</p> <p>⚠ You need to add the following number of messaging engines: 1.</p> <p>⚠ You need to correct the following number of messaging engine policies: 1.</p>
<input type="radio"/>	Custom	Advice is not available for a custom configuration.

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Figure 10-25. Policy wizard

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Notes:

High availability policies

- High availability policies are used to determine which members of an HA group should be activated at a time
- Associated with an HA group by using match criteria
 - List of name-value pairs to match against the HA group name
 - The number of name-value pair matches determines the “match weight factor” (match degree)
 - Most specific wins: The match with highest “match weight factor”
- HA policy types
 - *All active*: All members are made active
 - *M of N policy*: M members are made active (if available)
 - *No operation policy*: No members are made active
 - *One of N policy*: One member is made active
 - *Static policy*: The component is activated on an explicitly specified set of servers

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Figure 10-26. High availability policies

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Notes:

One of N is the most popular policy. It is the policy used by both the transaction manager and the service integration bus in Business Process Manager. One of N can also be viewed as a mechanism to configure relevant components in an ACTIVE-PASSIVE mode in a cluster that is inherently ACTIVE-ACTIVE in nature. One of N can be viewed as a special case of M of N ($M=1$). One of N is provided for usability and convenience. Important note: If all you need is a One of N policy, do not use M of N.

M of N and AllActive are not in use today.

High availability policy attributes

- Is alive timer:
 - How often to check health of group members
- Quorum:
 - No members are activated until $(n-1)/2$ members of the core group are available
 - Not currently used by any WebSphere components
 - Do not set
- The “Fail back” flag specifies that if a server with a higher-listed order becomes available again, the ME instance should be activated on that server
 - Failover time might impact whether it is wise to configure fail back
- The “Preferred servers only” flag restricts the ME instance to run **only on** the preferred servers
 - The list specifies on which preferred servers the ME instance should be activated
 - The list is ordered; the HA manager first tries to activate the ME instance of the first server in the list (the other MEs are in a joined state)
 - If the first server in the list is not available, the HA manager will activate the ME instance of the next server in the list

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Figure 10-27. High availability policy attributes

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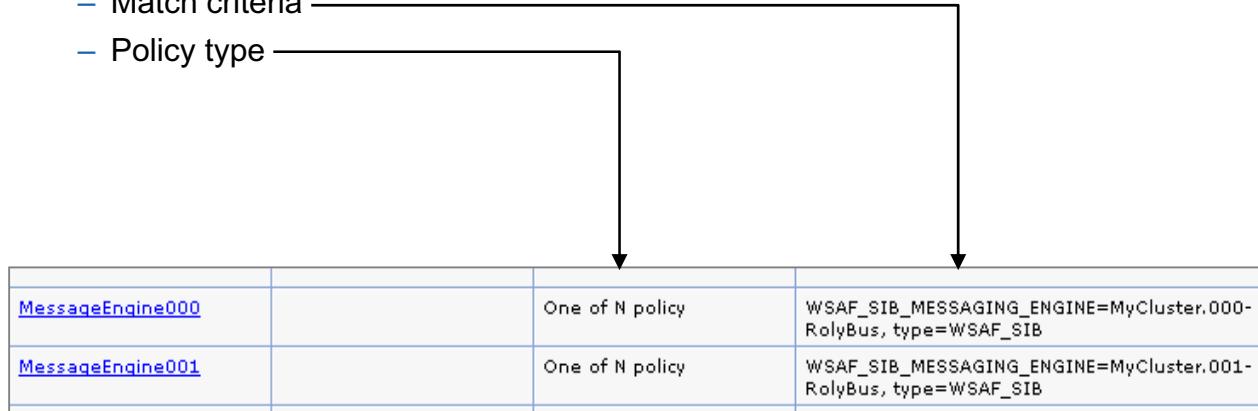
Notes:

The list of preferred servers within a policy defines on which server the ME instance should be activated on startup or failover. As the list of preferred servers is ordered, the HA manager tries to activate the ME on the first server in the list. If this server is not available, the next server in the list is chosen for ME activation. Additionally, a “Failback” flag can be checked for the policy. This flag specifies that if a server at a higher order in the preferred server list becomes available, the ME instance should be activated on that server. The “Preferred servers only” flag of the policy restricts the ME instance to run only on the servers in the list.

Scripts can be used for policy creation. The `CreateCoreGroupPolicy.jacl` file is available in `$WAS-INSTALL-ROOT/bin`. A template version of the `AddPolicy.properties` file is in the `$WAS-INSTALL-ROOT/properties` directory of WebSphere Application Server. To help HA manager performance, do not keep unused policies in the `coregroup.xml` file.

Creating policies

- To create a new policy, you define:
 - Preferred servers
 - Match criteria
 - Policy type



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Figure 10-28. Creating policies

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Notes:

High availability policies determine activation and failover characteristics of the ME. You can add, delete, or edit policies while the core group is running. Changes take effect immediately, without having to restart any JVM in a core group. Policies are defined and maintained by using the administration console and have properties like policy type, match criteria, and preferred servers.

Policy selection example

- Consider an HA group with the following properties:
 - **IBM_hc** = MECluster
 - **WSAF_SIB_BUS** = BPM.freyaCell.Bus
 - **WSAF_SIB_MESSAGING_ENGINE** = MECluster.000-BPM.freyaCell.Bus
 - **type** = WSAF_SIB
- *Default SIBus policy* (OneOfN) match criteria:
 - **type** = WSAF_SIB (match weight factor = 1)
- *MessagingEngine0 policy* (OneOfN) match criteria:
 - **WSAF_SIB_MESSAGING_ENGINE** = MECluster.000-BPM.freyaCell.Bus
 - **type** = WSAF_SIB (match weight factor = 2)
- The HA group name matches the MessagingEngine0 policy
- Result must match one policy; otherwise, the HA manager cannot assign a policy for the HA group

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Figure 10-29. Policy selection example

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Notes:

This graphic shows the policy selection sample, which uses the match criteria:

- An HA group is a non-empty set of key-value pairs. In this case, the HA group has four keys: IBM_hc, WSAF_SIB_BUS, WSAF_SIB_MESSAGING_ENGINE, and type.
- The core group in this sample has two policies: default SIBus policy and MessagingEngine0 policy. These two policies are both of type One of N, which specifies key-value pairs that are used to derive the so-called match weight factor.
- For each key match with the HA group keys, the match weight factor increases by 1. So in the sample, MessagingEngine0 policy is applied to the HA group because it has the higher match weight factor. Because only one policy can be applied, the occurrence of the same match weight factor with highest value results in a warning and no policy assignment.



Default SIBus policy: Match criteria and preferred servers

The figure consists of two side-by-side screenshots of the WebSphere Administration console.

Screenshot 1: Match criteria

- Panel Title:** Core groups > DefaultCoreGroup > Policies > Default SIBus Policy > Match criteria
- Description:** Define the match criteria for the policy. Match criteria consists of name and value pairs of data, where the name is a property key and the value is a string value.
- Buttons:** Preferences, New, Delete, and a toolbar with icons for copy, paste, and search.
- Table:**| Select | Name | Value | Description |
| --- | --- | --- | --- |
| | type | WSAF_SIB | Default SIBus MatchCriterion |

Total 1

Panel Title: Core groups > DefaultCoreGroup > Policies > Default SIBus Policy > Preferred servers

Description: Define the ordered list of preferred servers for the policy. The policy gives preference to the servers in this list when activating group members. Adjust the order of the list by clicking Move up or Move down.

Buttons: Configuration, General Properties.

Server Lists:

- Core group servers:** freyaMgr/dmgr, freyaNode/nodeagent, friggaNode/nodeagent, frevaNode/CMME1
- Preferred servers:** (empty)

Actions: Move up ^, Move down v, Add >>, Remove <<

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Figure 10-30. Default SIBus policy: Match criteria and preferred servers

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Notes:

This figure depicts screen captures of the configuration panels for the match criteria and preferred servers. If the list of preferred servers is empty, then the HA manager chooses the server to start the ME (that is, the first cluster member that is starting).

As you also use the default policy in the exercises, the ME is in the **started** state for the first cluster member started. The ME is in the **joined** state for the member that starts later.

10.4.Transaction manager

Transaction manager



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10.1

Figure 10-31. Transaction manager

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Notes:

Two-phase commit protocol in WebSphere Application Server (1 of 2)

- Two-phase commit involves a coordinator and two or more participants
 - The coordinator is the WebSphere Application Server transaction manager
 - The participants are also called resource managers (DBs, EISs, messaging, and others)
- First phase: Ready-to-commit
 - Transaction manager sends a “ready-to-commit” message to participants and waits for responses
 - All of the information that is required to commit or roll back the transaction must be written in a safe place (write-ahead storage) – in the transaction log file
- Second phase: Go ahead with commit (or rollback)
 - If all the participants agree to commit, the transaction manager sends a “go-ahead-with-commit” message
 - Otherwise, it sends a “rollback” message
 - Waits for acknowledgements from all the participants and then cleans the transaction logs

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Figure 10-32. Two-phase commit protocol in WebSphere Application Server (1 of 2)

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Notes:

Two-phase commit protocol in WebSphere Application Server (2 of 2)

- If a failure occurs between the first and second phase, the transaction is moved to the in-doubt state
 - Recovery occurs when the transaction manager and resource managers come back up (resynchronization)
 - Resynchronization requires an active transaction manager and the transaction log
 - Resource managers maintain any locks on their resources during that time
 - It is essential for HA that this recovery occurs as quickly as possible

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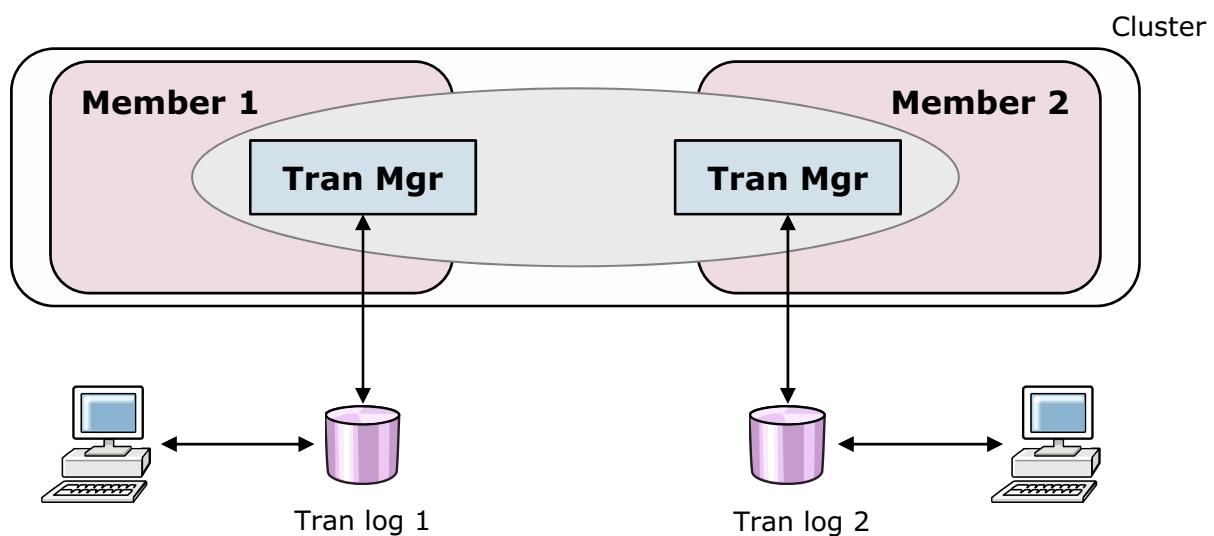
Figure 10-33. Two-phase commit protocol in WebSphere Application Server (2 of 2)

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Notes:

Recovering transactions (1 of 2)

- Scenario 1: Transaction log files not shared
- If one of the two members fails, in-doubt transaction recovery occurs only when (and if) the member comes back up



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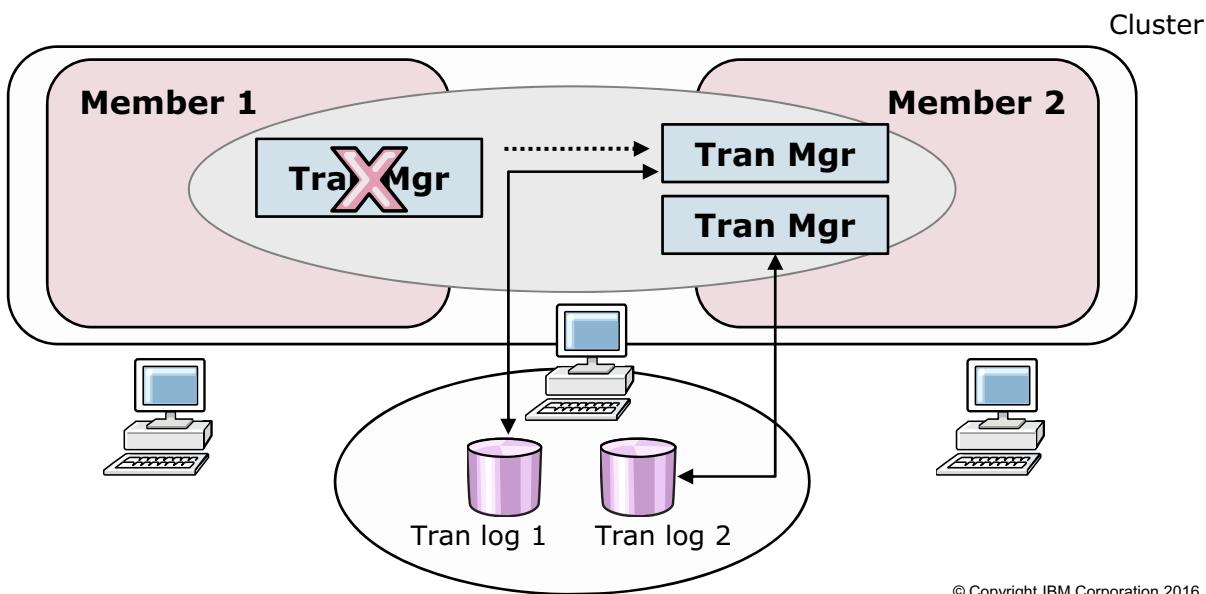
Figure 10-34. Recovering transactions (1 of 2)

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Notes:

Recovering transactions (2 of 2)

- Scenario 2: Transaction log files on a shared file system
- The HA manager can activate a new transaction manager on the surviving cluster member almost instantaneously



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Figure 10-35. Recovering transactions (2 of 2)

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Notes:



Default transaction manager policy

- Default transaction manager policy (like messaging engine policy) is One of N

General Properties							
* Name	Clustered TM Policy						
* Policy type	One of N policy						
Description							
TM One-Of-N Policy							
* Is alive timer <input type="text"/> 120 seconds							
<input type="checkbox"/> Quorum <input checked="" type="checkbox"/> Fallback <input type="checkbox"/> Preferred servers only							
<table border="1"> <thead> <tr> <th>Name</th> <th>Value</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>type</td> <td>WAS_TRANSACTIONS</td> <td>Default TM MatchCriteria</td> </tr> </tbody> </table>		Name	Value	Description	type	WAS_TRANSACTIONS	Default TM MatchCriteria
Name	Value	Description					
type	WAS_TRANSACTIONS	Default TM MatchCriteria					

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Figure 10-36. Default transaction manager policy

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Notes:



Sharing the transaction log file

- Sharing the transaction log file is critical to ensure a quick recovery of in-doubt transactions
 - In-doubt transactions might retain lock on the databases
 - Those locks can quickly reduce the system concurrency and availability
- The shared file system must be able to handle and quickly release file locks
 - Network File System (NFS) V4.0 (but *not* V3.0), IBM Storage Area Network (SAN), Windows Common Internet File System (CIFS) are valid options
- File system must also be highly available

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Figure 10-37. Sharing the transaction log file

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Notes:

10.5.Introduction to IBM Process Federation Server

Introduction to IBM Process Federation Server



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10.1

Figure 10-38. Introduction to IBM Process Federation Server

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Notes:



IBM Process Federation Server

- You can configure certain aspects of the Process Federation Server behavior and how Process Federation Server interacts with IBM Business Process Manager systems in federated environments
- Creating a roadmap guides you through the most common paths for configuring Process Federation Server and federated environments and helps you ensure that the federated environment is secure
- You can configure certain aspects of how Process Federation Server interacts with the federated IBM Business Process Manager systems in federated environments

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Figure 10-39. IBM Process Federation Server

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Notes:

The IBM Knowledge Center provides an excellent resource to create a roadmap for installing and configuring your IBM Process Federation Server.

http://www.ibm.com/support/knowledgecenter/SSFPJS_8.5.6/com.ibm.wbpm.main.doc/topics/cfg_fps_roadmap.html

Configuring IBM Process Federation Server

- To include an IBM Business Process Manager system in a federated environment, you must configure both the IBM Business Process Manager system and Process Federation Server
 - The distributed Process Federation Server index enables process participants to see a consolidated list of both BPD-related and BPEL-related tasks from all the IBM Business Process Manager systems in the federated environment
 - For data from a federated IBM Business Process Manager system to appear in the index, you must enable indexing on the system by using the properties in the Process Federation Server `server.xml` configuration file
- You must configure the Process Federation Server for secure outbound communications between Process Federation Server and each of the federated IBM Business Process Manager REST endpoints
- You must also secure communication between the Process Federation Server and any Elasticsearch nodes, LDAP servers, databases, and client applications

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Figure 10-40. Configuring IBM Process Federation Server

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Notes:



Cross-origin resource sharing

- If you are using a browser-based client application to access your federated environment, you must configure cross-origin resource sharing (CORS)
 - Because the browser-based client application makes requests to services that are not on the system that originated the web application, the federated components use CORS to enable the browser to trust the cross-origin requests
 - Therefore, you must configure a list of allowed origins for Process Federation Server and the federated IBM Business Process Manager system
- For example, if the web server that hosts your client application is available at `https://portal.mycompany.com:9443`, configure this URL to be an allowed origin on Process Federation Server, and on each federated IBM Business Process Manager system
 - The allowed origin indicates to Process Federation Server and IBM Business Process Manager systems that REST requests that originate from `https://portal.mycompany.com:9443` are trusted and should be allowed

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Figure 10-41. Cross-origin resource sharing

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Notes:

Unit summary

Having completed this unit, you should be able to:

- Explain the reasons for extending a topology
- List options for increasing cluster member capacity in a cell
- Expand a topology
- Explain the purpose of the high availability manager and the concept of core groups
- Explain the structure and purpose of the default messaging and transaction manager policies
- Explain how policies are applied at run time
- Define the transaction manager high availability policy type and identify how transaction policies are applied
- Describe the IBM Process Federation Server

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Figure 10-42. Unit summary

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Notes:

Checkpoint questions

1. True or false: You can use policies to distribute messaging engines across cluster members.
2. True or false: It can take several minutes for a messaging engine to start after the server is “ready for e-business.”

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Figure 10-43. Checkpoint questions

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Notes:

Write your answers here:

- 1.
- 2.



Checkpoint answers

1. True
2. True

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Figure 10-44. Checkpoint answers

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Notes:

Unit 11. Archiving and purging

What this unit is about

This unit describes various methods for archiving and purging in Process Center and Process Server environments.

What you should be able to do

After completing this unit, you should be able to:

- Archive and purge in the Process Center environment
- Archive and purge in the Process Server environment
- Purge process instances
- Archive in the Business Performance Data Warehouse

How you will check your progress

- Checkpoint questions
- Lab exercises

Unit objectives

After completing this unit, you should be able to:

- Archive and purge in the Process Center environment
- Archive and purge in the Process Server environment
- Purge process instances
- Archive in the Business Performance Data Warehouse

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Figure 11-1. Unit objectives

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Notes:



Topics

- Archiving and purging development in the Process Center
- Archiving and purging in a Process Server
- Archiving and purging Business Performance Data Warehouse data

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Figure 11-2. Topics

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Notes:

11.1. Archiving and purging development in the Process Center

Archiving and purging development in the Process Center



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10.1

Figure 11-3. Archiving and purging development in the Process Center

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Notes:

Archiving named process application snapshots in the Process Center

- Developers create “named” snapshots of their process applications for deployment
- Developers with administrative rights can archive process application snapshots by using the Process Designer client application
- Administrators can also archive snapshots by using the browser-based Process Center Console
- You cannot change archived snapshots, and you must select the archived filter to view them
- Archiving a snapshot removes it from the Process Center repository active list, but it does not delete the snapshot



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Figure 11-4. Archiving named Process Application snapshots in the Process Center

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Notes:

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Restoring archived named snapshots in the Process Center

- You must switch to the archive view to see all archived snapshots



- Restore the snapshot



- The snapshot is returned to the Installed list

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Figure 11-5. Restoring archived named snapshots in the Process Center

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Notes:

Deleting snapshots in the Process Center (1 of 2)

- Every time that a Process Designer user saves work, an “unnamed” snapshot is created
 - Hundreds of unnamed snapshots quickly accumulate
- To manually delete named and unnamed snapshots:
 - You must first install any server interim fixes
 - Run the **wsadmin BPMListProcessApplication** command on the Process Center server to show all process application snapshots on that server
 - Run the **wsadmin BPMShowProcessApplication** command to show details about the process application, including the process application acronym that is required to run the **BPMSnapshotCleanup** command
 - Set the **containerAcronym** parameter to identify the process application that contains the snapshots to be deleted
 - Set at least one optional parameter as a filter for determining which unnamed snapshots are deleted
 - You can also use one of the optional parameters, **deleteArchivedSnapshot**, to delete archived snapshots in addition to unnamed snapshots

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Figure 11-6. Deleting snapshots in the Process Center (1 of 2)

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Notes:

Deleting snapshots in the Process Center (2 of 2)

- To manually delete named and unnamed snapshots (continued):
 - Run the `BPMSSnapshotCleanup` command to delete all unnamed snapshots that fit within the parameters that you have defined
 - The command does not delete the first snapshot of each branch, even if it is unnamed or archived
 - The first snapshot is needed because it contains the information that shows in the Revision History window in Process Designer
- You can also configure the Process Center to automatically delete unnamed snapshots that you no longer need to keep on the server
 - You must be a repository administrator or development environment administrator to do this task
 - Automatic deletion never removes named snapshots
 - Removes unnamed snapshots in chunks of 100 to limit database contention
 - Set the configuration options in the `<server> <unnamed-snapshots-cleanup-config>` section of the `100Custom.xml` file to enable the feature and set the cleanup start time and duration, and set the “Clean after number named snapshots” setting

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Figure 11-7. Deleting snapshots in the Process Center (2 of 2)

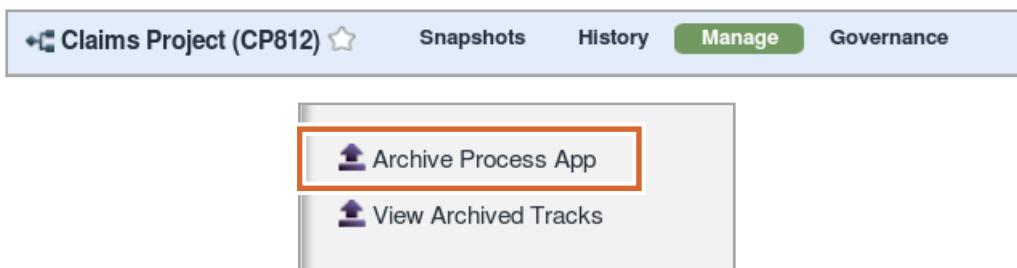
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Notes:



Deleting process applications in the Process Center (1 of 2)

- Delete process applications or toolkits from either the Process Designer application or from the Process Center console
 - You must be a member of the tw_admins group or have administrative rights to the repository to delete process applications or toolkits from the Process Center
- Deleting a process application:
 - Deletes all the snapshots
 - Deletes all instances
 - Undeploys all advanced artifacts
- Archive the process application by using the Manage menu



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Figure 11-8. Deleting process applications in the Process Center (1 of 2)

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Notes:



Deleting process applications in the Process Center (2 of 2)

- View the archived process applications from the Process Apps tab



- From the archive view, you can restore the process application or delete it permanently

A screenshot of a process application card for "Claims Project (CP812)". The card includes a thumbnail icon, the application name, a star rating, and a question mark icon. It also shows the last update date ("Last updated on 12/17/15 by bpmadmin") and two action buttons: "Restore" (with a download icon) and "Delete" (with a red X icon).

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Figure 11-9. Deleting process applications in the Process Center (2 of 2)

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Notes:



Archiving snapshots

- To archive (move process applications or toolkits to an auxiliary storage location):
 - Export one or all process applications and toolkit snapshots as `.twx` files and store them in whatever medium is appropriate
 - Archive and then delete the snapshots or project from the Process Center by using `BPMSSnapshotCleanup`, or by using the process app or toolkit delete capability on archived projects

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Figure 11-10. Archiving snapshots

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Notes:

11.2. Archiving and purging in a Process Server

Archiving and purging in a Process Server



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10.1

Figure 11-11. Archiving and purging in a Process Server

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Notes:

Common archiving and purging tasks for Process Servers

- You can delete named snapshots in a Process Server the same way as it is done in the Process Center
 - Process Servers do not create unnamed snapshots
- The most common task when working with Process Servers is to delete the data left behind from completed process instances
- Completed BPD instances are not deleted from the system automatically
 - To prevent disk space issues and long waits in Process Portal, remove all completed process definition (BPD) instances that you no longer need, along with their runtime data, from the Process Server database
 - Use the `wsadmin BPMProcessInstancesCleanup` command to periodically clean the completed, failed, and terminated process instances based on filter criteria that you specify
 - Run the query during an off period or maintenance window, when thousands of instances and data are purged
 - This process might cause a strain on the `LSW_TASK` and `LSW_BPD_INSTANCE` tables, which are core product tables

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Figure 11-12. Common archiving and purging tasks for Process Servers

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Notes:

Before you begin

Run the query during an off period or maintenance window. When thousands of instances and data are purged, this process might cause a strain on the `LSW_TASK` and `LSW_BPD_INSTANCE` tables, which are core product tables. Running a cleanup job outside of normal business hours is a good practice.

About this task

Completed BPD instances are not deleted from the system automatically. After a process instance is completed, the instance is typically no longer needed, so it can be removed from the Process Server database. Use the `BPMProcessInstancesCleanup` periodically to delete old process instances.

Note: The stored procedure that is described in previous versions of IBM Business Process Manager is still available for offline cleanup, but the `wsadmin` command is generally used because it provides broader capabilities, such as filtered cleanup and multi-instance delete. See “Using the `LSW_BPD_INSTANCE_DELETE` stored procedure”:

https://www.ibm.com/support/knowledgecenter/SSFTN5_8.5.0/com.ibm.wbpm.admin.doc/adminguide/topic/removing_proc_instances_stored_procedure.html

When an instance completes and all of its associated tasks are closed, future work is not possible with the instance. You cannot restart it, assign it to someone, or edit old work. When a user logs in to Process Portal, various tables are queried to gather data on the active tasks for that user. The operation involves full table scans, so that even if only 35% of the data is relevant, it is going to take a while to pull the tasks needed for the user. If the other 65% is deleted, then less data needs to be scanned.

If you do not delete old completed instances, your team experiences slow performance on Process Portal and a potentially unusable state. Ignoring increases in database size causes an increase in backup time and disk space.

Deleted processes and their tasks can no longer be opened in the Process Portal inbox. When you run the cleanup command, you can specify that only completed processes that are older than a specified age are deleted. Store any data that you really need in the performance database or another system of record for auditing or metrics.

How often you delete old instances depends on the following factors:

- How many instances are closed in a specified time period (for example, a week or month)
- How large the data is in each task (including execution context and document attachments)
- How many tasks are in a process instance

The most common reasons for runtime data growth are documents and execution context. If you have many documents and you must reference them later, consider a document management solution. Execution context is all of the data that is carried from activity to activity. If the solution has many variables with large amounts of data, this scenario quickly uses database space. In this case, reviewing your solution is a good idea to reduce the amount of processor usage in the application.

You can use the `BPMProcessInstancesCleanup` command to safely clean up data that is created as a result of runaway processes. The command ensures that even instances with a large amount of associated data are deleted in a consistent fashion.

The cleanup functions provided in the Admin Console remove task data only, not all of the BPD instance data. The `BPMProcessInstancesCleanup` command deletes both the instance and task data that is associated with the BPD. Therefore, it is a much more thorough way to clean out BPD instances. You might want your system administrator to set up a scheduled job that invokes the `BPMProcessInstancesCleanup` command periodically with the correct filter settings for your environment.

If you are using stand-alone services, try the Process Admin Console after you run the `BPMProcessInstancesCleanup` command because the `BPMProcessInstancesCleanup` command does not remove data that is associated with a stand-alone service.

Purging Business Process Choreographer objects on an IBM Business Process Manager Advanced Process Server

- Numerous scripts can be run to help with cleaning tasks and processes associated with Integration Designer development
 - Use the `deleteCompletedTaskInstances.py` administrative script to selectively delete from the Business Process Choreographer database or Business Process Archive database any top-level task instances that reach an end state of finished, terminated, expired, or failed
 - Use the `deleteInvalidProcessTemplate.py` administrative script to delete, from the Business Process Choreographer database, BPEL process templates that are no longer valid
 - Use the `deleteInvalidTaskTemplate.py` administrative script to delete, from the Business Process Choreographer database, human task templates that are no longer valid
 - Use the `cleanupUnusedStaffQueryInstances.py` administrative script to remove unused people query results from the database

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Figure 11-13. Purging Business Process Choreographer objects on an IBM Business Process Manager Advanced Process Server
WB8211.0

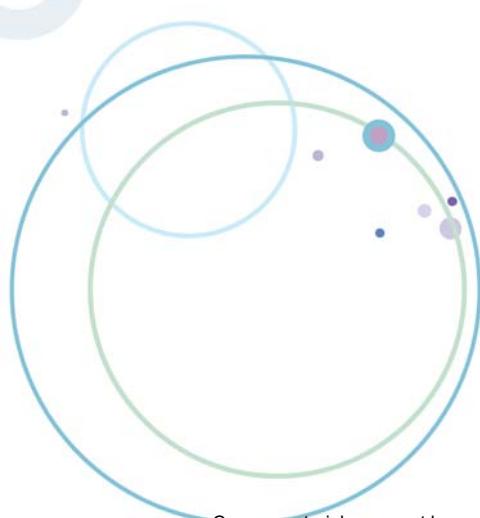
Notes:

For more information about deleting Business Process Choreographer objects, see the IBM Knowledge Center:

http://www.ibm.com/support/knowledgecenter/SSFPJS_8.5.6/com.ibm.wbpm.bpc.doc/topics/tadmin_scripts_delete.html

11.3. Archiving and purging Business Performance Data Warehouse data

Archiving and purging Business Performance Data Warehouse data



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10.1

Figure 11-14. Archiving and purging Business Performance Data Warehouse data

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Notes:

Archiving Business Performance Data Warehouse data

- The Business Performance Data Warehouse is the organizational system of record for process performance data
- You can archive snapshots and mark all the metadata in those snapshots with an ARCHIVED time stamp
 - IBM Business Process Manager does not use archived metadata when it generates the Business Performance Data Warehouse schema and views
 - You use the archive command to mark records in the Business Performance Data Warehouse with an ARCHIVED time stamp
 - You use the restore command to null out the ARCHIVED time stamp
 - Both commands leave the database in a pending state, and you use the pending command to complete the archive or restore operation
- When you use one of the commands, an SQL script is generated, which you can use to make the appropriate database changes
 - You can run the resulting SQL scripts by using the database application appropriate for your environment, or you can use the execute argument that is included with the command-line tool

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Figure 11-15. Archiving Business Performance Data Warehouse data

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Notes:

Purging Business Performance Data Warehouse data

- Use the `prune` command to remove data that you no longer need from the Business Performance Data Warehouse database
 - Run the `prune` command during a time when the server is not busy
 - The `prune` command is an argument of the `perfDWTool.bat` or `perfDWTool.sh` command
 - You must supply the age of the data that should be removed as part of the `perfDWTool` command
- To purge all data from the Business Performance Data Warehouse, you can proceed as follows:
 - Stop the servers and make a backup of the databases
 - Truncate the `LSW_PERF_DATA_TRANSFER` table in the Process Server database
 - Drop the Business Performance Data Warehouse schema or remove all of the tables, views, and indexes from the Business Performance Data Warehouse user schema
 - Re-create the tables for the Business Performance Data Warehouse by using the SQL script at: `install_root\dbscripts\PerformanceDW\`

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Figure 11-16. Purging Business Performance Data Warehouse data

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Notes:



Unit summary

Having completed this unit, you should be able to:

- Archive and purge in the Process Center environment
- Archive and purge in the Process Server environment
- Purge process instances
- Archive in the Business Performance Data Warehouse

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Figure 11-17. Unit summary

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Notes:



Checkpoint questions

1. True or false: Named snapshots are created manually by the developers, and unnamed snapshots are created by the system when developers save their process applications
2. True or false: When you archive a named snapshot, it is deleted from the system and cannot be recovered
3. True or false: The only way to purge Business Performance Data Warehouse data is to drop the tables and views and re-create them by using SQL scripts.

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Figure 11-18. Checkpoint questions

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Notes:

Write your answers here:

- 1.
- 2.
- 3.



Checkpoint answers

1. True.
2. False. You can restore archived named snapshots
3. False. You can also prune the Business Performance Data Warehouse database tables based on time.

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Figure 11-19. Checkpoint answers

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Notes:

Unit 12. Problem determination

What this unit is about

This unit provides an overview of problem determination methods and tools.

What you should be able to do

After completing this unit, you should be able to:

- Describe problem determination
- Identify resources for problem determination
- Describe tools for troubleshooting
- Describe how to configure logs and tracing
- Explain how to use tracing to determine problems
- Describe common troubleshooting facilities
- Identify common database configuration pitfalls
- Use the IBM Business Process Manager data collector
- Optimize performance

How you will check your progress

- Checkpoint questions

Unit objectives

After completing this unit, you should be able to:

- Describe problem determination
- Identify resources for problem determination
- Describe tools for troubleshooting
- Describe how to configure logs and tracing
- Explain how to use tracing to determine problems
- Describe common troubleshooting facilities
- Identify common database configuration pitfalls
- Use the IBM Business Process Manager data collector
- Optimize performance

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Figure 12-1. Unit objectives

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Notes:



Topics

- Problem determination approach
- Log files and console messages
- Diagnostic tracing
- IBM Process Server troubleshooting
- Troubleshooting database-related problems

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Figure 12-2. Topics

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Notes:

12.1. Problem determination approach

Problem determination approach



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Figure 12-3. Problem determination approach

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Notes:

Problem categories and symptoms

- Categorize and describe the problem that is based on diagnostic data
 - What are the symptoms of the problem?
 - Where does the problem occur?
 - When does the problem occur?
 - Does the problem occur after a recent configuration change?
 - Can the problem be reproduced?
- The common types of symptoms that you might see are:
 - The system is not responding
 - An application failed to start
 - An application does not respond to incoming requests
 - An application produces unexpected results
 - An application cannot connect to an external system or resources
 - An application works slowly or its performance degrades over time

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Figure 12-4. Problem categories and symptoms

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Notes:

General observations about problem determination are as follows:

- Problem determination is not an exact science.
- Problem determination is **not** complicated.
- Problem determination is often a cooperative and iterative process.
- An obstacle to problem determination is poor communication.
- Not every problem requires the most complex problem determination skills and techniques.

Problem determination goals

In any troubleshooting situation, you have three goals:

- Quickly provide a temporary solution so that the affected users can get back to work, while you look for the permanent solution
- Find and implement the right, permanent solution
- Make sure that a similar problem will not occur again in the future
 - If it does, you will be as prepared as possible to deal with it after what you learned from this problem

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Figure 12-5. Problem determination goals

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Notes:

A major challenge of problem determination is dealing with unanticipated problems. It is much like detective work: finding clues, making educated guesses, verifying suspicions, and various other steps. The most important skills are common sense, focus, thoroughness, and rigorous thinking. The first step in the troubleshooting process is to describe the problem completely.



Resources for investigating a problem

Resources to help investigate your problem:

- Product support pages
- WebSphere support page
- IBM Knowledge Center
- IBM Support Assistant

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Figure 12-6. Resources for investigating a problem

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Notes:

Resources for troubleshooting IBM Business Process Manager include:

- A strategy for troubleshooting and diagnosing problems
- A list of error messages and specific troubleshooting documentation about the tasks you are doing in IBM Business Process Manager
- Documentation about tools that help you track and monitor errors in your deployed applications
- Links to technical support websites

IBM Support Portal:
www.ibm.com/support/entry/portal/overview

- The support pages provide easy access to valuable troubleshooting information

Product finder:

Share your list of recently viewed products

Search support:

My support programs

Accelerated Value Program	<input type="button" value="+"/>
IBM Call Home Web	<input type="button" value="+"/>
Maintenance and technical support	<input type="button" value="+"/>
My contracts	<input type="button" value="+"/>
My inventory	<input type="button" value="+"/>

Common support links

- Sign out
- Download fixes & PTFs (Fix Central)
- Service requests for hardware and software (PMRs)
- Support handbooks
- Support notifications
- Support registrations
- Directory of worldwide contacts

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Figure 12-7. Searching the product support pages

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Notes:

The IBM Support Portal is a unified, customizable view of all technical support tools and information for all IBM systems, software, and services. It brings all of the support resources available for IBM hardware and software offerings together in one place and is replacing all IBM technical support sites. The overview page includes links to news, alerts, notifications, training, and services.

For more information, see: <https://www.ibm.com/support/entry/myportal/support>

The portal is customizable. You can select any IBM products and get links relevant to those products.

The screenshot shows the IBM Support Portal interface. At the top, there's a blue header bar with the "WebSphere Education" logo on the left and the "IBM" logo on the right. Below the header is a navigation bar with links for "Industries & solutions", "Services", "Products", "Support & downloads", and "My IBM". A "Search" button is on the far right. A yellow banner above the main content area says "Support Portal" and has a "Translate this page" dropdown. The main content area features a large graphic of interlocking gears in blue and white. The title "IBM Business Process Manager Advanced 8.5.6" is prominently displayed. Below the title are sections for "Product finder" (with a dropdown menu and a "Share your list of recently viewed products" link), "Search support" (with a search bar and a "Tips" link), and "Downloads" (with links to fixes, PTFs, and specific fix lists for various versions). To the right, there's a "Product support content" section with links to documentation, installation guides, bulletins, troubleshooting, and all support content.

Figure 12-8. Choose a product in the IBM Support Portal

WB8211.0

Notes:

After you choose a product in the IBM Support Portal, you see support shortcuts to fixes (downloads), opening a new service request, product documentation, problem resolution, and more.

In the example, the product IBM Business Process Manager Advanced 8.5.6 is selected.



MustGather: Collecting diagnostic data

- Before calling IBM support, gather troubleshooting data (*MustGather* data) for problems with IBM Process Server
- The term “MustGather” represents the diagnostic data that is required to resolve a problem such as:
 - System information
 - Problem symptoms
 - Log and trace files
- By collecting MustGather data early, you help IBM support to quickly determine the following details:
 - Whether symptoms match known problems
 - Whether you have a non-defect problem that can be identified and resolved
 - Whether a workaround exists for the defect to reduce severity
 - Whether locating the root cause can speed development of a code fix

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Figure 12-9. MustGather: Collecting diagnostic data

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Notes:

Collecting diagnostic data (MustGather) aids in problem determination and saves time when resolving problem management records (PMRs) for IBM Process Server. You must know what documentation to collect (MustGather) so that the IBM Business Process Manager support team can diagnose your problem. If you gather this documentation before contacting support, it expedites the troubleshooting process and saves you time.

The Troubleshooting tab on the IBM Support Portal gives advice on how to collect troubleshooting data for the IBM Business Product Manager products.



IBM Knowledge Center: Troubleshooting and searching

The screenshot shows the IBM Knowledge Center interface. At the top left is the "WebSphere Education" logo. At the top right is the "IBM" logo. Below the header is a navigation bar with three horizontal lines and a magnifying glass icon. The main content area is titled "Table of Contents". Under this, there is a tree view of topics:

- Customizing and rebranding interfaces
- Customizing Process Portal
 - Accessing the Responsive Federated Portal technique
 - Connecting to the WebDav folder
 - Customizing the login page
 - Customizing banners and footers
 - Customizing themes
 - Building Process Portal spaces
 - Customizing translation strings
 - Customizing Process Portal spaces
 - Customizing the IBM Business Process Manager dashboard
 - Customizing Business Process Choreographer Explorer
 - Measuring and improving business processes
 - Participating in processes
 - Programming IBM Business Process Manager
- My Collections
- Search Results

- Specific problem areas are documented, and a search facility is provided

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Figure 12-10. IBM Knowledge Center: Troubleshooting and searching

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Notes:

The IBM Knowledge Center is a good resource for troubleshooting. Specific problem areas are documented, and a search facility is provided.



IBM Support Assistant

- The IBM Support Assistant is a *free, stand-alone application* that you can install on any workstation
- It can be enhanced by installing plug-in modules for the IBM products you use
- Benefits of the IBM Support Assistant include:
 - Saves time when searching product, support, and educational resources
 - Helps opening a problem management record (PMR)
 - Allows for easy location and installation of useful product support tools by using a support tool framework
- IBM Support Assistant can be downloaded from
<http://www.ibm.com/software/support/isa/>

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Figure 12-11. IBM Support Assistant

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Notes:

The IBM Support Assistant provides a framework for IBM software products to deliver customized self-help information into the different tools within it. Customize your IBM Support Assistant client by using the built-in update capability to find and install new product features or support tools.

IBM Support Assistant is a complimentary, downloadable troubleshooting workbench that runs on your workstation. With the Support Assistant, you can:

- Search for solutions to any questions, locate fixes, and find information specific to the IBM products that you use
- Run diagnostic and analysis tools that can do varying functions, including remote assistance from IBM, to analysis of logs, heap dumps, and javacores
- Automate collection of logs and other data relevant to the analysis and resolution of the problem that use symptom-specific data collectors

The main page of the IBM Support Assistant contains a menu bar. The top menu bar contains File, Administration, Update, Window, and Help. Under File, you can set preferences for many IBM Support Assistant features. Under Administration, you can start the Case Manager, explore remote

systems, and configure remote agents. Help provides detailed help content on all IBM Support Assistant features and troubleshooting support.

First steps and tutorials are useful for helping you to get started with using IBM Support Assistant.

The Latest News section helps you keep up to date with new IBM Support Assistant features and tools.



IBM Support Assistant: Product information component

- Select **Find Information > Product Information > Select a product**
- Product add-ons can be downloaded for many software brands
 - DB2
 - Rational
 - Tivoli
 - WebSphere
 - Others
- Find links to:
 - Support
 - Newsgroups and forums
 - Skills enhancement
 - Troubleshooting resources
 - News flashes
 - APARs (authorized program analysis reports, problems that require fixes or workarounds)

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Figure 12-12. IBM Support Assistant: Product information component

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Notes:

The IBM Support Assistant is an application that enables a wide array of support, data collection, and skills enhancement activities. To maximize its value, you install the add-ons that are relevant to the work that you do. Specifically, these include product add-ons and tool add-ons.

The IBM Support Assistant provides certain common functions with the base installation. Many products provide more function, and after installing IBM Support Assistant, more tools and product add-ons can be installed. You can use the tools to customize your IBM Support Assistant workbench to suit your needs.

Product add-ons are used to customize IBM Support Assistant to meet your particular IBM product environment. A product add-on contains the product-specific information that is used to customize IBM Support Assistant. Product add-ons contribute to several IBM Support Assistant areas.

12.2.Log files and console messages

Log files and console messages



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Figure 12-13. Log files and console messages

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Notes:

General troubleshooting tool: Logging and tracing

- When you encountered a problem, the first place to look for more information is the **logs** and **traces**
 - Troubleshooting pane in the administrative console to view errors
 - *Log Analyzer* accessible through IBM Support Assistant
 - Specialized tracing and runtime checks such as connection leak detection by tracing a specific component or setting a specialized custom property
- First-failure data capture (FFDC)
 - Always enabled
 - Automatically captures key information when a potentially abnormal situation occurs
 - Data is collected in the `<profile_root>\<profile_name>\logs\ffdc` directory
 - If an FFDC record is written, it does not necessarily mean that a serious problem occurred

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Figure 12-14. General troubleshooting tool: Logging and tracing

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Notes:

IBM Business Process Manager offers a comprehensive set of log files to help you identify and resolve problems during installation, configuration, and run time. Various log files are created during the installation and uninstallation of IBM Business Process Manager and during profile creation, augmentation, and deletion. Examine these logs when problems occur during the product installation and configuration process.

WebSphere logs

- JVM logs
 - Created by redirecting the `System.out` and `System.err` streams of the JVM to independent log files
 - One set of JVM logs for each server and all of its applications that are located by default in `<profile_root>\<profile_name>\logs\<server_name>`
 - `SystemOut.log` and `SystemErr.log` files
- Process logs
 - Contain two output streams (stdout and stderr) that are accessible to traditional code that is running in the process
 - One set for each application server
 - `native_stderr.log` and `native_stdout.log` files
- IBM service log
 - Contains both the WebSphere messages that are written to the `System.out` stream and some special messages that contain extended service information
 - One per profile (node)
 - `activity.log` file

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Figure 12-15. WebSphere logs

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Notes:

The JVM logs (SystemOut and SystemErr) are text files and can be viewed from the administrative console or any text editor. The process logs (native_stdout and native_stderr) are text files and can be viewed with any text editor. The IBM service log (activity.log) is not a text file and must be viewed with a tool such as Log Analyzer.

To view JVM logs:

- Click **Troubleshooting > Logs and Trace** in the administrative console navigation tree and view in the console.
- Browse to `<profile_root>\<profile_name>\logs\<server_name>` on the computer where logs are stored.
- Open the `SystemOut.log` file or `SystemErr.log` file in a text editor.

To view process logs:

- Browse to `<profile_root>\<profile_name>\logs\<server_name>` on the computer where logs are stored.
- Open the `native_stdout.log` file or `native_stderr.log` file in a text editor.

To view the IBM service log:

- It is stored at `<profile_root>\<profile_name>\logs\activity.log`
- Use Log Analyzer in IBM Support Assistant to view.



Instrumentation files (1 of 2)

- Compacted binary files that are produced in Process Admin Console
- Must be decoded before read
- Show every command that is issued on Process Server and the time that it takes to run
- Process Admin Console: **Monitoring > Instrumentation**
 - BPD instances that completed, failed, started, or terminated
 - Inbound and outbound web service connectors
 - Event manager and tasks
 - Cache hits and misses
 - Persistence services on searches

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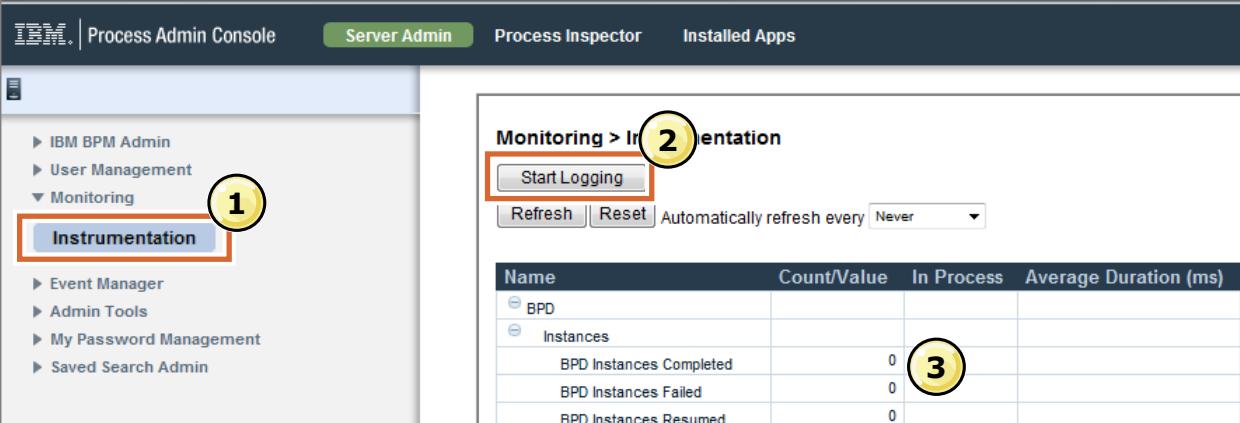
Figure 12-16. Instrumentation files (1 of 2)

WB8211.0

Notes:




Instrumentation files (2 of 2)



Name	Count/Value	In Process	Average Duration (ms)
BPD			
Instances			
BPD Instances Completed	0		
BPD Instances Failed	0		
BPD Instances Resumed	0		

Decode instrumentation files:

```
java -Xmx1024M -cp svrcoreclnt.jar
com.lombardisoftware.instrumentation.log.tools.NonXMLDump
logFile.dat > logFile.txt
```

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Figure 12-17. Instrumentation files (2 of 2)

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Notes:

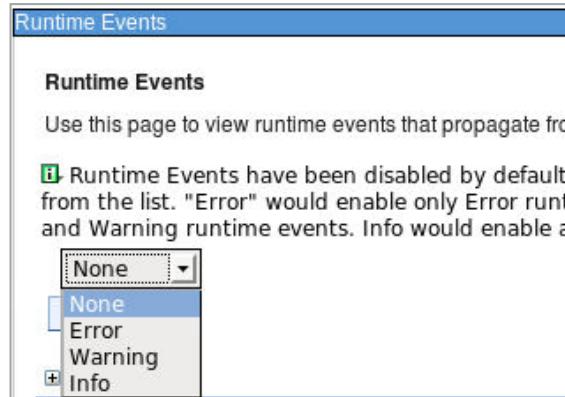
1. Instrumentation logging is available in the Process Admin Console. Administrators control access to the Instrumentation tools with console configuration files.
2. Click **Start Logging** to begin capturing instrumentation data. Data can be set to automatically refresh on periodic intervals, but this process affects system performance.
3. Data is captured and displayed in the instrumentation screen. The log files are stored physically in the `logs` directory of the Process Center profile, for example:
`/opt/ibm/BPM/V8.0/profiles/ProcCtr01/logs`

The log file and location are shown when the administrator stops logging.

Instrumentation log files contain a `.dat` extension. To work with the instrumentation log files, they must be decoded.

Viewing runtime messages in the console

- Grouping of runtime events by severity level: Error, Warning, Information
- To view, select **Troubleshooting > Runtime Messages >**
 - Runtime Error
 - Runtime Warning
 - Runtime Information



- Runtime events are disabled by default
- Select **Info** to enable all runtime events

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Figure 12-18. Viewing runtime messages in the console

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Notes:

When viewing runtime messages, first select the Error, Warning, or Info category link (a count of zero means nothing is available). Then, the details for the selected category are shown. Selecting one of these links gives you detailed information. You might have multiple pages of messages. You can use the option on the bottom of the page to view and read all of them.

12.3.Diagnostic tracing

Diagnostic tracing



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Figure 12-19. Diagnostic tracing

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Notes:

Diagnostic tracing

- Trace files show the time and sequence of methods that WebSphere base classes call, and you can use these files to pinpoint the failure
 - Tracing is enabled by default
- Trace output can be directed to:
 - File (default)
 - \${ SERVER_LOG_ROOT }/trace.log
 - Memory ring buffer that is dumped after trace stops
- Tracing has a significant impact on performance
 - Enable temporarily for problem determination
 - Trace to file is slower than trace to memory ring buffer **runtime** tab

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Figure 12-20. Diagnostic tracing

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Notes:

To take advantage of tracing, you must do the following tasks:

- Enable tracing of one or more WebSphere components
- Configure and view trace logs
- Interpret trace log and trace messages

Trace output allows administrators to examine processes in the application server and diagnose various issues. On an application server, trace output can be directed either to a file or to an in-memory circular buffer. If trace output is directed to the in-memory circular buffer, it must be dumped to a file before it can be viewed. On an application client or stand-alone process, trace output can be directed either to a file or to the process console window. In all cases, trace output is generated as plain text in the basic, advanced, or log analyzer format that the user specifies. The basic and advanced formats for trace output are similar to the basic and advanced formats that are available for the JVM message logs.



Setting the log detail level

Configuration Runtime

General Properties

Change Log Detail Levels

Components	Groups
*	=info

- Log detail level affects tracing **and** regular logging
 - Setting levels below **info** reduces the amount of data in logs
 - *=**off** disables logging altogether
- Trace levels (fine, finer, finest) are not displayed in the trace file unless logging is enabled

* [All Components]

- ArtifactLoader
- BB_STATS
- BOAttributeProperty
- BOChangeSummary
- BOCopy
- BOCore
- BODataObject
- BODataType
- BOElementProperty
- BOEquality

- Log string can be typed in or set by using the graphical menu
 - Default is *=**info**
- User-created applications can be instrumented as well, and can be included in the trace output

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Figure 12-21. Setting the log detail level

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Notes:

Log levels control which events the Java logging processes.

WebSphere controls the levels of all loggers in the system. The level value is set from configuration data when the logger is created and can be changed at run time from the administrative console.

Trace information, which consists of events at levels fine, finer, and finest, can be written to the trace log. Therefore, if you do not enable diagnostic trace, setting the log detail level to fine, finer, or finest does not affect the data that is logged.

12.4. IBM Process Server troubleshooting



IBM Process Server troubleshooting



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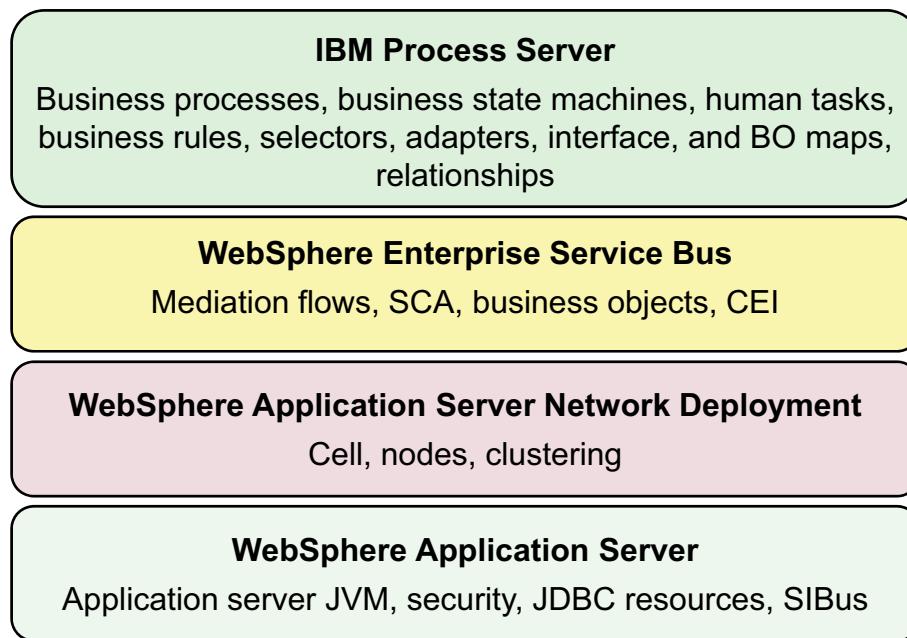
Figure 12-22. IBM Process Server troubleshooting

WB8211.0

Notes:

IBM Process Server product stack

- Multiple products and multiple interacting components suggest that an *isolation* approach can be used for problem determination



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Figure 12-23. IBM Process Server product stack

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Notes:

Use the information in this group of topics to identify and resolve problems that can occur while you are administering the runtime environment. The idea is to narrow the specific component that is causing the problem and use various problem determination tools to solve the problem.



IBM Process Server: Specific problems

- Since IBM Process Server runs on top of WebSphere Application Server, all of the application server problem determination methods apply as well
- In addition, the SCA components of IBM Process Server can introduce more potential issues, such as:
 - SCA communication
 - Event sequencing
- For more information, look in the Troubleshooting and Support section of the IBM Business Process Manager Advanced IBM Knowledge Center

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Figure 12-24. IBM Process Server: Specific problems

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Notes:

Cross-Component Trace identifies whether a Service Component Architecture (SCA) operation completed successfully. You can use it to identify `SystemOut.log` or `trace.log` data that is associated with IBM Business Process Manager and WebSphere Enterprise Service Bus modules and components. The log records associated with the WebSphere Enterprise Service Bus applications hold information about errors or events that occurred during processing, and IBM Integration Designer can use them for problem determination.

 WebSphere Education 

Troubleshooting IBM Business Process Manager configuration issues

- The *BPMConfig* command-line utility is used to create or extend a typical network deployment environment
 - Can also create the database scripts and profiles
 - Validate the deployment environment configuration
 - Uses a properties file that contains all of the values that are used in the configuration of your deployment environment
 - 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 file
`<install_root>/logs/config/BPMConfig.log`
 - Check the log for the message: *BPMConfig completed successfully*

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Figure 12-25. Troubleshooting IBM Business Process Manager configuration issues

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Notes:

The *BPMConfig* command-line utility is used to create or extend a typical network deployment environment.

The *BPMConfig* utility can also be used to create the database scripts and profiles, start and stop the deployment environment, and validate the deployment environment configuration.



Troubleshooting the failed event manager

- Problems entering values in the *By Date* tab of the Search page:
 - Requires correctly formatted locale-dependent values such as **January 1, 2016 00:00:00 GMT**
- Deleting expired events:
 - Failed event manager might seem to hang when events contain a large amount of business data or many events are in the current search results
- If failed events are not being created, ensure the following are accurate:
 - The wpsFEMgr application is running
 - The failed event manager database is created and connection is tested
 - Failed event destinations are created on the SCA system bus, one for each deployment target
 - The quality of service Reliability qualifier is set to **Assured** for any SCA implementation, interface, or partner reference

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Figure 12-26. Troubleshooting the failed event manager

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Notes:

Ensure that the quality of service (QoS) reliability qualifier is set to **Assured** for any Service Component Architecture (SCA) implementation, interface, or partner reference that participates in events you want the recovery service to handle.

12.5.Troubleshooting database-related problems

Troubleshooting database-related problems



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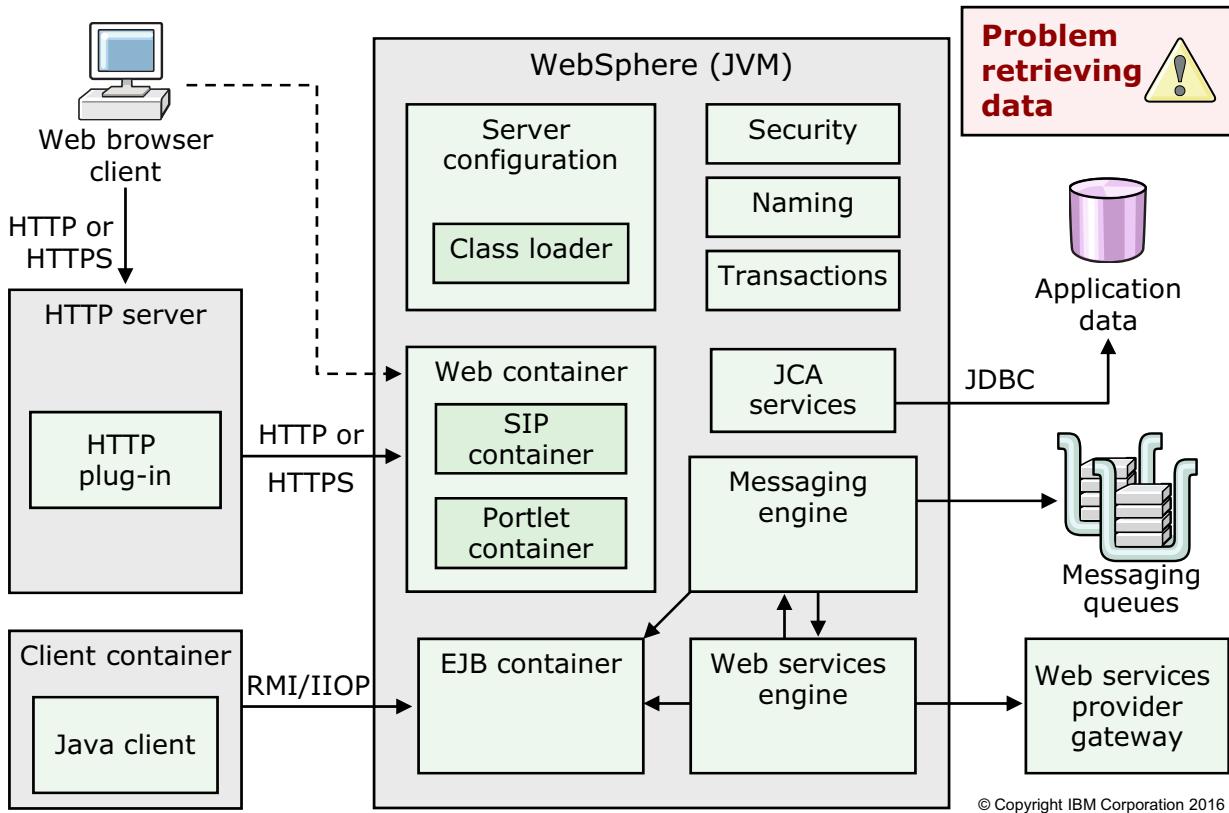
10.1

Figure 12-27. Troubleshooting database-related problems

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Notes:

WebSphere database connection problems



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Figure 12-28. WebSphere database connection problems

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Notes:

WebSphere diagnostic tools provide services to help troubleshoot database connection problems. Additionally, the IBM website provides flexible searching capabilities for finding documented solutions to database-specific connection problems.

For a comprehensive list of database-specific troubleshooting tips, see the WebSphere Application Server product support page. In the Search Support field, type a database vendor name among your search terms.



Creating a database connection: Common problems

- Typical problems that arise when configuring a database connection are:
 - Spelling or typographical errors when entering the parameter values
 - Client JAR files necessary to the JDBC provider are not present
 - Lack of user permissions on the database server
 - Connectivity problems because of network topology or a database that is not started
- The problems that are encountered when configuring a database connection are easy to fix if you know what to look for and where to look:
 - WebSphere provides immediate feedback when testing a connection
 - The `SystemErr.log` contains explicit information about the actual exception

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Figure 12-29. Creating a database connection: Common problems

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Notes:

The data source parameters are focused on the actual database access information such as the database name, server name, port number, and access credentials. The database values can usually be verified through a Telnet session to the database server as follows:

A simple Telnet test is as follows:

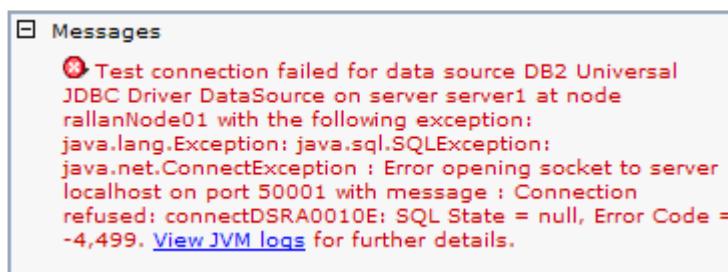
1. Use Telnet to connect to the server with the server name value that you are using for the data source.
2. Start a database session by using the JCA credentials.
3. Perform a sample of the operations that the application does, such as a simple query.
4. Disconnect from the server.

If you are successful in doing this simple test, then the data source parameters are probably correct. However, keep in mind that some differences can arise, such as using a server short name as opposed to the fully qualified domain name. If the application server is on a different computer from where you are doing the Telnet test, host resolution issues might occur. Also, the Telnet test does not exercise the port number parameter. If the port is incorrect, then the data source fails. You can verify the port number that the database is listening on by exporting the instance parameters.

Alternatively, you can contact your database administrator and request confirmation of the parameters.

Data source database parameter problems: Identification

- The data source is the connection between the application server and the database
- Common configuration problems consist of:
 - Incorrectly specified database server parameters
 - Incorrect user authentication credentials
- Use the **Test Connection** service and examine the error message:



- As this error message suggests, the JVM logs are a good place to begin the problem determination activity

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Figure 12-30. Data source database parameter problems: Identification

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Notes:

The `SystemErr.log` file holds the complete stack trace of the exceptions that occur when a data source connection test fails. The administrative console provides various views in the troubleshooting section of the left menu. Exception events can be viewed separately, or a portion of the log files can be viewed. Because the log files can become large, the administrative console includes a range filter for the number of lines that are displayed.

When inspecting the log files directly from the file system, it is important to remember that the log files from the node that contains the failure include the exceptions and trace information. For a JDBC connection, runtime exceptions are typically available from the log files of the deployment manager. However, if the JDBC provider scope is focused at the node or server level, it is necessary to inspect the logs on the node that raised the exception.

Data source database parameter problems: Diagnosis and resolution

```
1/8/16 11:13:22:458 MST] 0000000a SystemErr R java.net.SocketException:  
Operation timed out: connect:could be due to invalid address at  
java.net.PlainSocketImpl.socketConnect(Native Method)
```

- The `SystemErr.log` points that the address provided was invalid for the connection
- A connectivity problem might be as a result of an incorrect database name, server name, or port number
 - The database administrator must be consulted to verify that database name is accurate
 - You can verify that the server name is correct by attempting a ping of the server or a Telnet session
 - The port number might be changed to something other than the default
 - If it is a DB2 database, the port number can be discovered through the DB2 Configuration Assistant or by using the DB2 Control Center to export the instance parameters

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Figure 12-31. Data source database parameter problems: Diagnosis and resolution

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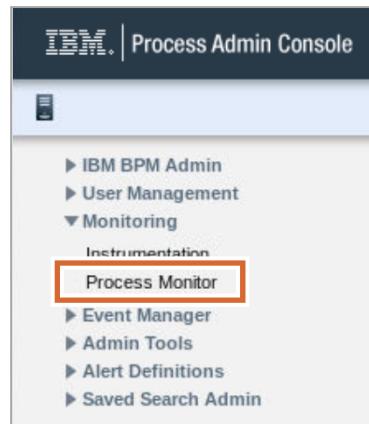
Notes:

Determining the database name, server name, and port number varies depending on the database vendor. In a development environment, it is common for development teams to administer the database themselves. Therefore, access to the server and the configuration of the database are something that the developers can discover for themselves. Since administrators control server access in a production environment, it might be necessary to engage the database administrator to resolve the connectivity issue.



Optimizing performance (1 of 6)

- You can monitor IBM Business Process Manager processes by using **Process Monitor** utility in Process Admin Console
- The **Summary** page provides an overview of active and most expensive processes and services
- The **Processes** page shows the details of the process app
 - You can view the duration of each step in the process, including the type of activity, such as event, gateway
 - You can also view the list of services that are running and the total duration of each service



The screenshot shows the 'Monitoring > Process Monitor' page. At the top, it displays the server information: 'Server: cell=PCenterCell,node=PCenterNode01,process=PCenter_DE.AppCluster.member1'. Below this are three tabs: 'Summary' (highlighted with a red box), 'Processes', and 'Services'. The 'Summary' section contains two tables:

Active Processes Currently Executing	0
Active Services Currently Executing	0

Below these tables is a section titled 'Most Expensive Services' with a table:

Process App	Service Name
No data available	

At the bottom right of the screenshot, there is a copyright notice: '© Copyright IBM Corporation 2016'.

Figure 12-32. Optimizing performance (1 of 6)

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Notes:

Optimizing performance (2 of 6)

- System performance can be improved by cleaning up completed tasks
 - Clean up deleted tasks by using **Task Cleanup** utility in Process Admin Console
 - You can select the required option to clean up the tasks that are marked as DELETED, CLOSED, or SENT



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Figure 12-33. Optimizing performance (2 of 6)

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Notes:



Optimizing performance (3 of 6)

- Administrators should establish blackout periods to specify times when events cannot be scheduled, for example, due to a holiday or when regular system maintenance is scheduled
- The event manager takes blackout periods into account when scheduling and queuing events, event subscriptions, and undercover agents (UCAs)

Event Manager > Blackout Periods

Blackout Periods

Blackout Period Details

Date/Time Range	
<input checked="" type="radio"/>	From <input type="text" value="12/25/2015"/> <input type="text" value="08:00"/>
<input type="radio"/>	To <input type="text" value="12/26/2015"/> <input type="text" value="08:00"/>
(M/d/yy) (HH:mm)	

Weekday/Time Range	
<input type="radio"/>	From <input type="text" value="Monday"/> <input type="text"/>
<input type="radio"/>	To <input type="text" value="Monday"/> <input type="text"/>
(HH:mm)	

Delete Add Update Clear

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Figure 12-34. Optimizing performance (3 of 6)

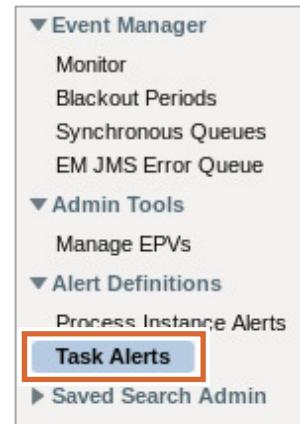
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Notes:



Optimizing performance (4 of 6)

- In the Process Admin Console, you can create alert definitions
- APIs can then be used to check the status of these alert definitions to, for example, notify administrators of potential issues
- The alert definitions pages in the Process Admin Console display the alert definitions
 - They do not display whether alerts are triggered
 - An application, service, or dashboard must be created to display or otherwise handle the alert definitions and to display whether they are triggered or not



Add Alert Definition

Name	<input type="text" value="Type in a name"/>		
Process App	All	Snapshot	All
Instance status	All	Task status	All
Threshold	> <input type="text" value="Type in a number"/>		
<input type="button" value="Apply"/> <input type="button" value="Clear"/>			

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Figure 12-35. Optimizing performance (4 of 6)

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Notes:



Optimizing performance (5 of 6)

- You can use the Manage Caches page in the Process Admin Console to view all caches and their status and reset each cache
- For performance reasons, IBM Business Process Manager caches some information about the Process Server
 - The caches for IBM Business Process Manager refresh automatically, and so resetting these caches should be required only when an issue exists that a reset might rectify



IBM BPM Admin > Manage Caches

Name	Description	CA	UCA	UCP	Last A.	Status	Actions
E@GroupInfoCache	Stores UserGroup objects by GroupName and GroupId	7,702	0	0%	1:54 AM	ON	(Show) (Reset)
E@UserInfoCache	Stores UserInfo objects by UserName and UserId	558,161	18	0%	1:55 AM	ON	(Show) (Reset)
GroupCache	Caches group information and list of groups with information.	0	0	Inf	7:00 PM	ON	(Show) (Reset)

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Figure 12-36. Optimizing performance (5 of 6)

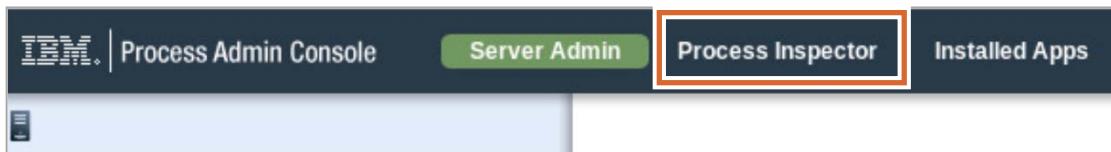
WB8211.0

Notes:



Optimizing performance (6 of 6)

- The Process Inspector feature can be started from inside the Process Admin Console



- Process Inspector is a tool that can be used to view and manage process instances, running on a specific Process Server
- You can use the Process Inspector to search for process instances on a Process Server by specifying different filtering criteria such as status, process application name, person, by date range, or by searching for specific text

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Figure 12-37. Optimizing performance (6 of 6)

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Notes:

Unit summary

Having completed this unit, you should be able to:

- Describe problem determination
- Identify resources for problem determination
- Describe tools for troubleshooting
- Describe how to configure logs and tracing
- Explain how to use tracing to determine problems
- Describe common troubleshooting facilities
- Identify common database configuration pitfalls
- Use the IBM Business Process Manager data collector
- Optimize performance

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Figure 12-38. Unit summary

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Notes:

Checkpoint questions

1. True or false: IBM Support Assistant is a free, stand-alone workbench that you can install on any workstation; and it can help you search products, support, and educational resources.
2. The default location for the WebSphere logs is:
 - A. <install_root>\profiles\logs
 - B. <install_root>\profiles\<profile_name>\logs
 - C. <install_root>\logs
3. True or false: Tracing cannot be started while the server is running.

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Figure 12-39. Checkpoint questions

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Notes:

Write your answers here:

- 1.
- 2.
- 3.



Checkpoint answers

1. True
2. B. <install_root>\profiles\<profile_name>\logs
3. False. Tracing can be started while the server is stopped or running.

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Figure 12-40. Checkpoint answers

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Notes:

Exercise 10

Performance and troubleshooting



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10.1

Figure 12-41. Exercise 10

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Notes:

Exercise objectives

After completing this exercise, you should be able to:

- View performance metrics with the Tivoli Performance Viewer
- Read an instrumentation file and clean up the tasks
- Create blackout periods
- Monitor processes by using the Process Monitor utility
- Create an alert definition
- Reset caches by using the Manage Caches utility
- Manage process instances by using Process Inspector
- Configure the business process definition queue size and worker thread pool
- Gather logs, heap dumps, and other resources for troubleshooting

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Figure 12-42. Exercise objectives

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Notes:

Unit 13. Security and security providers

What this unit is about

This unit provides an overview of problem determination methods and tools.

What you should be able to do

After completing this unit, you should be able to:

- Describe the key WebSphere Application Server security concepts
- Describe the user registries that are available in IBM Business Process Manager
- Explain how to interact securely with an IBM Business Process Manager Server
- Describe some common security holes and how to fix them
- Synchronize users and groups

How you will check your progress

- Checkpoint questions
- Lab Exercises

References

IBM Business Process Manager V8.5.6 documentation in the IBM Knowledge Center:

http://www.ibm.com/support/knowledgecenter/SSFPJS_8.5.6/com.ibm.wbpm.main.doc/kc-homepage-bpm.html



Unit objectives

After completing this unit, you should be able to:

- Describe the key WebSphere Application Server security concepts
- Describe the user registries that are available in IBM Business Process Manager
- Explain how to interact securely with an IBM Business Process Manager Server
- Describe some common security holes and how to fix them
- Synchronize users and groups

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Figure 13-1. Unit objectives

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Notes:



Topics

- WebSphere Application Server security concepts
- User registries
- Securing IBM Business Process Manager
- Common security holes
- Synchronizing users and groups

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Figure 13-2. Topics

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Notes:

13.1. WebSphere Application Server security concepts

WebSphere Application Server security concepts



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10.1

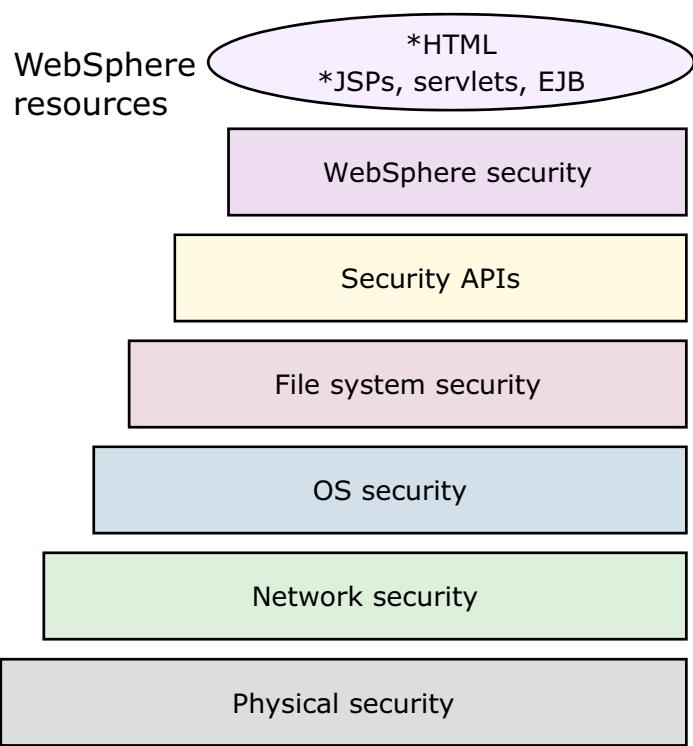
Figure 13-3. WebSphere Application Server security concepts

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Notes:

WebSphere Application Server security overview

- Security can be applied at different levels



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Figure 13-4. WebSphere Application Server security overview

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Notes:

IBM Business Process Manager is packaged with and is installed upon WebSphere Application Server, an application server that is compliant with Java Platform, Enterprise Edition. A number of concepts specific to each of these products require understanding before you can implement security in a typical Business Process Manager environment.

Many levels are involved in securing an environment. WebSphere provides only part of the total security that must be applied.

Physical security refers to the protection of the hardware itself. Is it kept in a safe and secure area? Who has physical access to it?

Network security can involve setting up firewalls to protect an intranet, or a DMZ where the web servers are going to run.

Operating system security is the security infrastructure of the underlying operating system. It provides certain security services to the WebSphere security application. These services include the file system security support to secure sensitive files in WebSphere product installation. The WebSphere system administrator can configure the product to obtain authentication information

directly from the operating system user registry, for example, the NT Security Access Manager (SAM).

File system security is especially a concern about protecting your configuration files and key ring files.

Security APIs are as follows:

- JVM: The JVM security model provides a layer of security above the operating system layer.
- CORBA security: Any calls that are made among secure ORBs are over a Secure Association Service (SAS) or CSIV2 layer that sets up the security context and the necessary quality of protection. After the session is established, the call is passed up to the enterprise bean layer. This layer is for a distributed environment only.
- Java EE security: The security collaborator enforces Java EE-based security policies and supports Java EE security APIs.
- WebSphere security: WebSphere security enforces security policies and services in a unified manner on access to web resources and enterprise beans. It consists of WebSphere security technologies and features to support the needs of a secure enterprise environment.

Types of security

- Administrative security
 - Protects resources such as administrative console, wsadmin, scripts
- Application security
 - Protects access to the applications
- Java 2 security
 - Protects the local systems



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Figure 13-5. Types of security

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Notes:

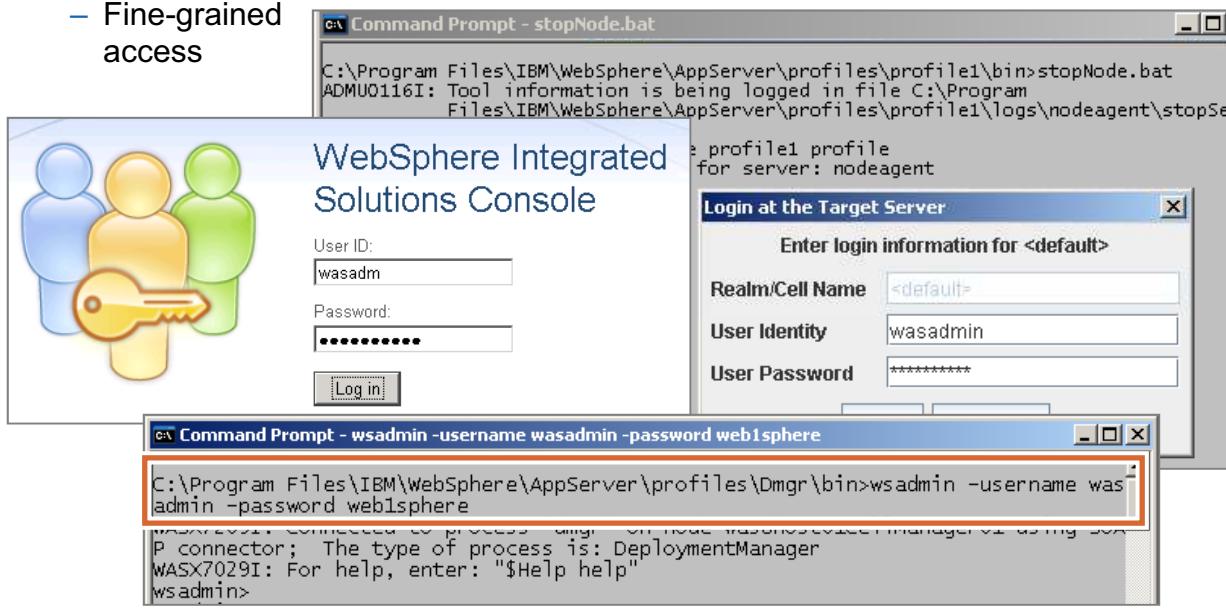
Within WebSphere, a number of different types of security can be configured. These types of security are covered in more detail during this lecture. They include:

- Administrative security
- Application security
- Java 2 security



Administrative security

- Protects administrative console, scripts, wsadmin, and others
- Access can be restricted by using:
 - Administrative roles
 - Fine-grained access



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Figure 13-6. Administrative security

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Notes:

Administrative security allows the administrator to restrict access to the administrative interfaces, including the administrative console, the administrative scripts, and wsadmin.

Authentication and authorization: What is the difference?

- Authentication and authorization are two distinct concepts:
 - Authentication → Who are you?
 - Authorization → When authenticated, what are you allowed to do?

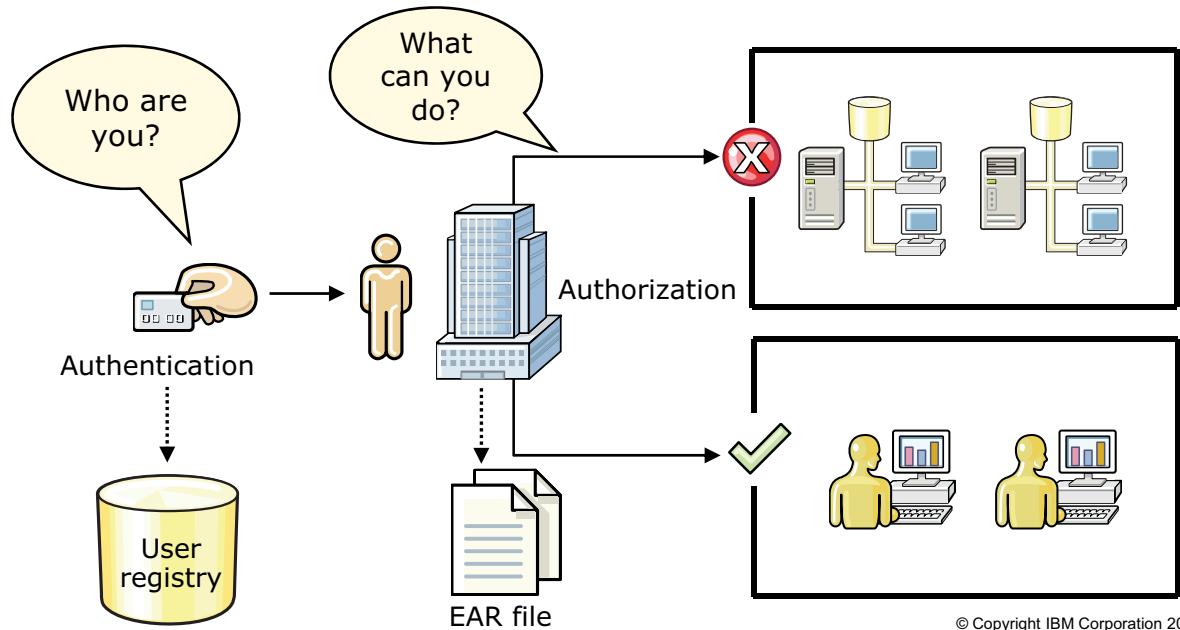


Figure 13-7. Authentication and authorization: What is the difference?

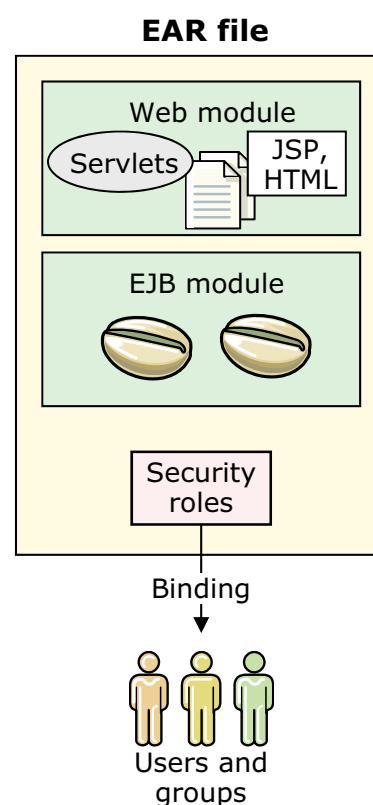
WB8211.0

Notes:

Authentication information can be found in a user registry. Authorization information can be found within the EAR file. The WebSphere security service is responsible for making sure that protected resources are accessible only to authenticated and correctly authorized users.

Security roles: Application authorization

- Use security roles to do authorization
 - Specify security at an abstract level without knowledge of actual users and groups
- Security roles are then applied to the web and EJB application components
 - Web URIs or EJB methods
- Binding of the users and groups to the security roles is generally done at the application installation time
 - Can be done postinstallation as well



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Figure 13-8. Security roles: Application authorization

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Notes:

Java EE security is concerned with controlling access to application resources, not system resources.

Administrative security

- Turning on administrative security enables many features, including:
 - Authentication of HTTP and IIOP clients
 - Administrative console security
 - Naming security
 - Use of SSL transports
 - Role-based authorization checks of servlets, EJBs, and MBeans
 - Propagation of identities (RunAs)
 - The common user registry
- Console and other administrative tools: access is initially restricted to only the primary user
 - You must create your administrative users and groups
 - Fine-grained access can be defined for console users
- For example:
 - Bob can be configured to have administrative access to application servers A and B
 - Fred can be configured to have operator access to only servers C and D

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Figure 13-9. Administrative security

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Notes:

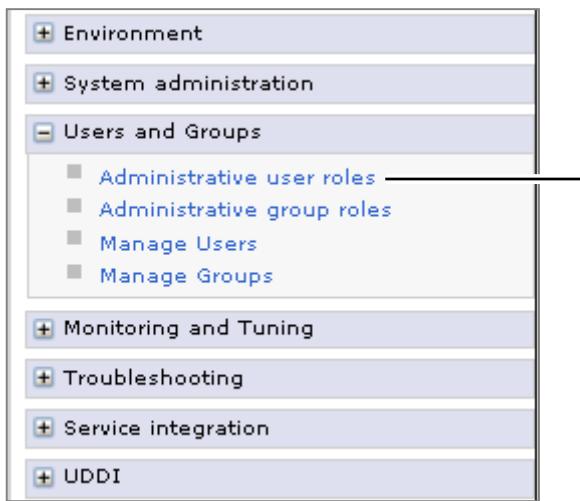
Administrative security protects not only the administrative tools, but also enables a number of other security features:

- Authentication of HTTP and IIOP clients
- Administrative console security
- Naming security
- Use of SSL transports
- Role-based authorization checks of servlets, EJB files, and MBeans
- Propagation of identities (RunAs)
- The common user registry



Console security: Mapping users and groups

- To set up console security
 - Turn on administrative security
 - Create console users and groups
 - **Map users and groups to administrative roles**



Administrative user roles

[Administrative user roles > User](#)

Use this page to add, update or to remove administrative roles to users enables them to administer application console or through wsadmin scripting.

* Role(s)

Admin Security Manager
Administrator
Auditor
Configurator

Search and Select Users

Decide how many results to display, enter a search string (Search). Select users from the Available list and add them to the Mapped to role list. Users which have already been mapped to a role will not be returned.

Search string: *

Maximum results to display: 20

Available	Mapped to role

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Figure 13-10. Console security: Mapping users and groups

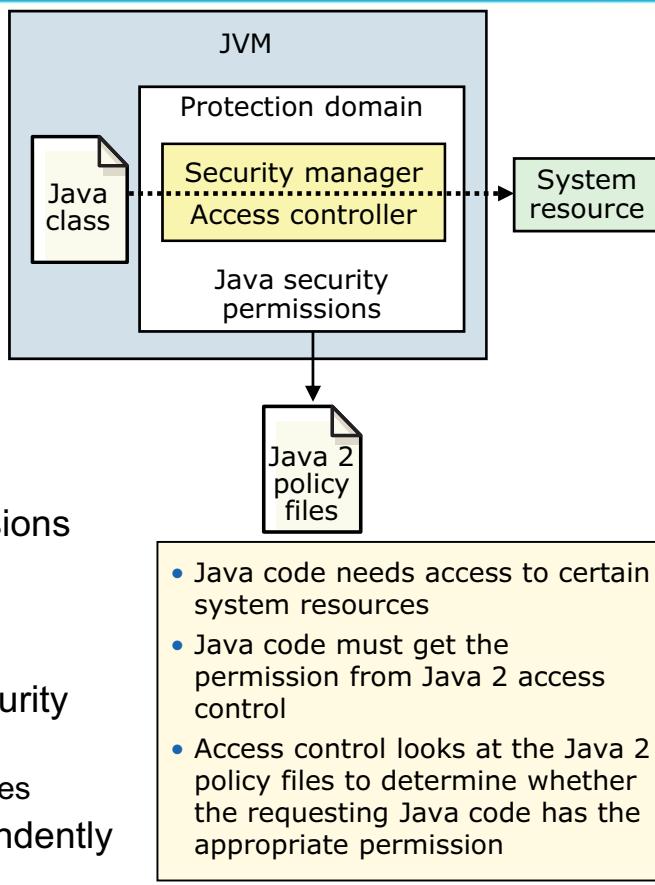
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Notes:

This diagram shows the mapping of users to specific console security roles. The interface for mapping administrative groups is virtually the same.

Java security overview

- Protects the system from the applications
- Provides an access control mechanism to manage the application access to system level resources
 - File I/O, network connections (sockets), property files
 - Policy-based
- Policies define a set of permissions available from various signers and code locations
 - Stored in policy files
- All Java code runs under a security policy
 - Grants access to certain resources
- Can be turned on or off independently of administrative security



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Figure 13-11. Java security overview

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Notes:

Orthogonal to Java role-based security, Java 2 security is about protecting system resources. It is policy-based (several .policy files control it) and provides fine-grained access control to system resources, such as:

- File I/O
- Sockets
- Properties

To find Java 2 access exceptions, look for the following string:

`java.security.AccessControlExceptions`

Look in the `SystemOut.log` or `SystemError.log` file.

WebSphere Education

Enabling Java 2 security

Global security

Use this panel to configure administration and the default application security policy for all administrative functions and is used as a default security policy override and customize the security policies for user applications.

Security Configuration Wizard Security Configuration Report

Administrative security

- Enable administrative security
 - [Administrative user roles](#)
 - [Administrative group roles](#)
 - [Administrative authentication](#)

Application security

- Enable application security

Java 2 security

- Use Java 2 security to restrict application access to local resources
 - Warn if applications are granted custom permissions
 - Restrict access to resource authentication data

Authentication

Authentication mechanisms and expiration

- LTPA
- Kerberos and LTPA
 - [Kerberos configuration](#)

Authentication cache settings

- Web and SIP security
- RMI/IOP security
- Java Authentication and Authorization Service
- Enable Java Authentication SPI (JASPI Providers)
- Use realm-qualified user names

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Figure 13-12. Enabling Java 2 security

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Notes:

When Java 2 security is enabled in WebSphere, the security manager component by default throws a `java.security.AccessControlException` when a permission violation occurs. This exception, if not handled, often causes a runtime failure. This exception is also logged in the `SystemOut.log` file.

However, when the JVM `com.ibm.websphere.java2secman.norethrow` property is set, and has a value of true, the Security Manager does not throw the `AccessControlException`: it is only logged.

Note: This property is intended for a sandbox or debug environment only since it instructs the security manager not to throw the `AccessControlException`. By not rethrowing the exception, Java 2 security is not truly enforced. Do not use this property in a production environment where a relaxed Java 2 security environment weakens the very integrity that Java 2 security is intended to produce.

The JVM parameter entered on the command line starts the server, usually in the script `startServer`. Enter as: `-Dcom.ibm.websphere.java2secman.norethrow=true`

Look in the log for the next line to verify that the `norethrow` parameter is in place:

SecurityManag W SECJ0381I: Warning, the `com.ibm.websphere.java2secman.norethrow` property is true.

The WebSphere Java 2 Security Manager is not rethrowing `AccessControl` exceptions. Do not use this debug setting in a production environment. See the IBM Knowledge Center for Java 2 Security debugging features.

13.2. User registry

User registry



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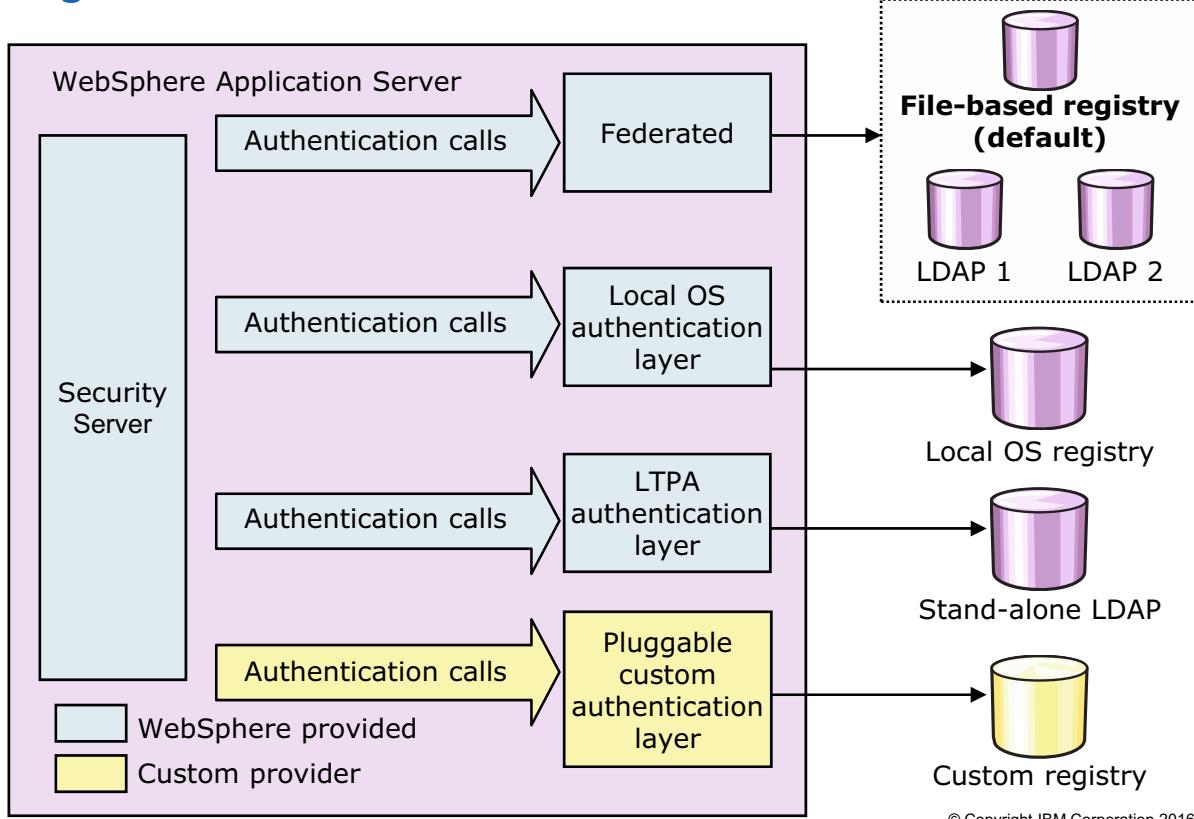
10.1

Figure 13-13. User registry

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Notes:

Registries and authentication mechanisms



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Figure 13-14. Registries and authentication mechanisms

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Notes:

The user registries that are supported include local operating system, stand-alone LDAP, custom user registry, and federated registry. The federated registry effectively combines multiple repositories into a single view. It can support multiple LDAP servers, file-based repositories, database repositories, and custom repositories.

- **Authentication mechanisms:** An authentication mechanism defines rules about security information, such as whether a credential can be forwarded to another Java process, and the format of how security information is stored in both credentials and tokens.

Authentication is the process of establishing whether a client is who or what it claims to be in a particular context. A client can be either a user, a computer, or an application. An authentication mechanism in WebSphere Application Server typically collaborates closely with a user registry. The user registry is the user and groups account repository that the authentication mechanism consults when completing authentication. The authentication mechanism is responsible for creating a credential, which is an internal product representation of a successfully authenticated client user. Not all credentials are created equal. The configured authentication mechanism determines the abilities of the credential.

LTPA is the only authentication mechanism available in a Network Deployment environment.

- User registries: In WebSphere Application Server, a user registry or repository authenticates a user and retrieves information about users and groups to complete security-related functions, including authentication and authorization. The information about users and groups is within a registry or repository. WebSphere Application Server uses the user registry or repository to make access control decisions.

WebSphere Application Server provides implementations that support multiple types of registries and repositories, including the local operating system registry, a stand-alone Lightweight Directory Access Protocol (LDAP) registry, a stand-alone custom registry, and federated repositories.

These authorization mechanism choices are valid for all user registries and repositories, such as virtual member manager. The exception is Tivoli Access Manager, which is supported for stand-alone LDAP registry configuration only.

With WebSphere Application Server, a user registry or a repository, such as virtual member manager, authenticates a user and retrieves information about users and groups to complete security-related functions, which include authentication and authorization.

With WebSphere Application Server, a user registry or repository is used for:

- Using basic authentication, identity assertion, or client certificates to authenticate a user
- Retrieving information about users and groups to complete security-related administrative functions, such as mapping users and groups to security roles

Although WebSphere Application Server supports different types of user registries, only one user registry can be active. All of the product server processes share this active registry.

- Stand-alone custom user registries: A stand-alone custom registry is a customer-implemented registry that implements the UserRegistry Java interface, as the product provides. A custom-implemented registry can support virtually any type of account repository from a relational database or flat file. The custom user registry provides considerable flexibility in adapting product security to various environments. In these environments, some form of a registry or repository other than federated repositories, stand-alone Lightweight Directory Access Protocol (LDAP) registry, or local operating system registry is already present in the operational environment.

WebSphere Application Server security provides an implementation that uses various local operating system-based registries and various stand-alone Lightweight Directory Access Protocol (LDAP)-based registries. However, situations can exist where your user and group data is in other repositories or custom user registries, such as a database. Moving this information to either a local operating system registry or a stand-alone LDAP registry implementation might not be feasible. For these situations, WebSphere Application Server security provides a service provider interface (SPI) that you can implement to interact with your current registry. The custom registry feature supports any user registry that WebSphere Application Server does not implement.

Global security

Use this panel to configure administration and the default application security policy. This security policy for all administrative functions and is used as a default security policy for user applications. You can override and customize the security policies for user applications.

Administrative security

Enable administrative security [Administrative user roles](#)
 [Administrative group roles](#)
 [Administrative authentication](#)

Application security

Enable application security

Java 2 security

Use Java 2 security to restrict application access to local resources
 Warn if applications are granted custom permissions
 Restrict access to resource authentication data

User account repository

Realm name: defaultWIMFileBasedRealm
 Current realm definition: Federated repositories
 Available realm definitions:

- Federated repositories
- Federated repositories (selected)
- Local operating system
- Standalone LDAP registry
- Standalone custom registry

Configure... Set as current

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Figure 13-15. Defining user registries

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Notes:

Defining which user registry is used and how it is configured can be done through the console, through a manual interface or through a wizard. Generally speaking, the wizard is considered too simplistic to be used for configuring anything but the simplest user registry.

User account repository

Realm name: defaultWIMFileBasedRealm

Current realm definition: Federated repositories

Available realm definitions:

- Federated repositories
- Federated repositories (selected)
- Local operating system
- Standalone LDAP registry
- Standalone custom registry

Configure... Set as current

Global security

Global security > Federated repositories

By federating repositories, identities stored in multiple repositories can be managed in a single, virtual realm. The realm can consist of identities in the file-based repository that is built into the system, in one or more external repositories, or in both the built-in repository and one or more external repositories.

General Properties

- Realm name: defaultWIMFileBasedRealm
- Primary administrative user name: wasadmin

Server user identity

- Automatically generated server identity (radio button selected)
- Server identity that is stored in the repository

Server user ID or administrative user on a Version 6.0.x node:

Password:

Ignore case for authorization

Allow operations if some of the repositories are down

Repositories in the realm:

Add Base entry to Realm...	Use built-in repository	Remove	
Select	Base Entry	Repository Identifier	Repository Type
You can administer the following resources:			
<input checked="" type="checkbox"/>	o=defaultWIMFileBasedRealm	InternalFileRepository	File

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Figure 13-16. Manual security configuration

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Notes:

These diagrams show some of the windows that are used to configure federated repositories.

Federated repositories

- Why might you have multiple registries in a federated repository?
 - Perhaps two companies merged
 - Perhaps your applications require access to multiple LDAP servers
- **Users must be unique** within the whole federated repository
 - If the federated repository finds multiple entries for a user that is attempting to authenticate, it returns a failure
- **All members of the federated repository must be available** for authentications to succeed
 - If not, you cannot be sure that the user was unique (it can return a false positive)
 - This behavior can be turned off

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Figure 13-17. Federated repositories

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Notes:



Custom registries

- **Custom registries** can be written to allow other kinds of registries to be supported
 - For example: When a special database has your user information, you can write certain methods that would take care of validating the user
 - You can also tell WebSphere to issue the appropriate credentials (for example, the LTPA token)
 - These methods are documented in the IBM Knowledge Center
 - Sample code is also available in the IBM Knowledge Center
 - It is frequently more difficult to do correctly than anticipated
- **Custom pluggable registries** can be written to add a custom registry through the federated repository
 - Typically more difficult to write than a stand-alone custom registry
 - It has the advantage of being more likely to work with stack products as some support only federated repositories

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Figure 13-18. Custom registries

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Notes:

13.3. Securing IBM Business Process Manager

Securing IBM Business Process Manager



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10.1

Figure 13-19. Securing IBM Business Process Manager

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Notes:



IBM Business Process Manager administration tools

- Integrated solutions console
 - The main administrative application for the embedded WebSphere Application Server
 - Using this console, you do some generic hardening steps, you start or stop the IBM Business Process Manager servers within your environment, and you define the universe of users who are allowed to access the servers
- Process Admin Console
 - The main administrative application, which you can use to associate users with specific roles that are defined within the Business Process Manager process applications and individual process models
 - You can define different sets of users for each of your Business Process Manager deployment environment
- Process Center Console
 - By using the main administrative application, you can grant IBM Business Process Manager process analysts, process authors, and software developers access to the various Business Process Manager process applications and process models in your organization
 - You can selectively grant certain developers access to process applications by privilege level, process application, and environments

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Figure 13-20. IBM Business Process Manager administration tools

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Notes:

Business Process Manager includes the following three web applications, which support your security hardening and ongoing security management:

- Integrated solutions console: This console is the main administrative application for WebSphere Application Server. Using this console, you complete some generic hardening steps, you start and stop the IBM Business Process Manager servers within your environment, and you define the set of users who are allowed to access the servers.
- Process Admin Console: The main administrative application, which you can use to associate users with specific roles that are defined within the Business Process Manager process applications and individual process models. You are able to define different sets of users for each of your Business Process Manager deployment environments.
- Process Center Console: The main administrative application, which you can use to grant permissions to IBM Business Process Manager process analysts and process authors. Also, it provides software developers access to the various Business Process Manager process applications and process models in use at your organization. You are able to selectively grant certain developers access to process applications by privilege level, process application, and environments.

Administrative security roles

- **Monitor:** Can view the configuration and the current state of the server
- **Configurator:** Can edit the configuration
- **Operator:** Has monitor privileges, plus the ability to modify the runtime state
- **Administrator:** Is a combination of configurator and operator roles plus extra privileges that granted solely to the administrator role
- **ISC admin:** Is available only for administrative console users and not for wsadmin users
- **Deployer:** Can do both configuration actions and runtime operations on applications
- **Admin security manager:** Can map users to administrative roles
- **Auditor:** Can view and modify the configuration settings for the security that is auditing subsystem

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Figure 13-21. Administrative security roles

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Notes:

Several administrative security roles are provided as part of the IBM Business Process Manager installation.

Eight roles are provided within the administrative console. These roles grant permission to ranges of functions within the administrative console. When administrative security is enabled, a user must be mapped to one of these roles to access the administrative console. The first user to log in to the server after installation is mapped to the administrator role.

- The monitor role can view the IBM Business Process Manager configuration and the current state of the server.
- The configurator role can edit the IBM Business Process Manager configuration.
- The operator role has monitor privileges, plus the ability to modify the runtime state (that is, start and stop the server).
- The administrator role is a combination of configurator and operator roles plus more privileges that are granted solely to the administrator role. Examples include:
 - Modifying the server user ID and password

- Mapping users and groups to the administrator role

The administrator also has the permission that is required to access sensitive information, such as Lightweight Third Party Authentication (LTPA) passwords.

- The ISC Admins role is available only for administrative console users and not for wsadmin users.
- The deployer role can complete both configuration actions and runtime operations on applications.
- The Admin Security Manager role can map users to administrative roles.
- The auditor role can view and modify the configuration settings for the subsystem that audits security.

IBM Business Process Manager security roles

- **CellAdmin:** This role maps to an authentication alias that contains the cell administrator user, which is the primary administrator at the WebSphere Application Server level
- **DEAdmin:** This role maps to an authentication alias that contains the deployment environment administrator user, which is the primary administrator at the IBM Business Process Manager level
- **BPMAuthor:** This role maps to an authentication alias for a user that requires the authority to access and deploy snapshots to the runtime Process Server
 - Is also used to access the Process Server from the Process Inspector, which is part of the IBM Process Designer
- **SCADeploymentUser:** This role maps to an authentication alias for a user that has authorization to deploy SCA applications

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Figure 13-22. IBM Business Process Manager security roles

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Notes:

A IBM Business Process Manager role maps to an authentication alias for a user ID that is authorized to access applications that run in IBM Business Process Manager.

The cell administrator user:

- Has authorization in all deployment environments
- Can assign other administrator roles
- Is responsible for the administration of the cell and topology
- Has access to all interfaces, enabling users to alter or delete all types of available library items and assets, including process applications and toolkits
- Enables administration of Process Servers, Business Performance Data Warehouses, and internal users and groups

The deployment environment administrator user:

- Has authorization in the assigned deployment environments
- Has administrative access to Process Center and Process Admin Console

- Has access to all interfaces, enabling users to alter or delete all types of available library items and assets, including process applications and toolkits
- Is authorized to administer Process Servers, Business Performance Data Warehouses, and internal users and groups



Default groups in IBM Business Process Manager

- IBM Business Process Manager has an internal security provider that includes several default groups

User Management > Group Management

Select Group to Modify:	%%
New Group	Remove
Debug	[remove]
tw_admins	[remove]
tw_allusers	[remove]
tw_allusers_managers	[remove]
tw_authors	[remove]
tw_managers	[remove]
tw_portal_admins	[remove]
tw_process_owners	[remove]
twem	[remove]

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Figure 13-23. Default groups in IBM Business Process Manager

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Notes:

IBM Business Process Manager has an internal security provider that includes several default users and groups. For each default user account, default authentication aliases are provided for external components to connect to the Process Server.

- Debug: You can use this account to restrict access to service debugging in the Inspector in the Process Designer.
- tw_admins: Members of this group have full access to all interfaces, assets, servers, and security.
- tw_allusers: This group is the default lane assignment for non-system lanes when creating business process definitions (BPDs) in the Designer in the Process Designer. The reports and scoreboards that you create in the Process Designer are available to this group by default.
- tw_allusers_managers: This group contains the team of managers for the tw_allusers group. In the Team Performance dashboard in Process Portal, members of this group can see the dashboard for the All Users team and the sample teams that are delivered with the product.
- tw_authors: Members of this group have access to the Designer and other interfaces in the Process Designer, including the Process Center console. From the Process Center console,

members of this group can create process applications and toolkits and control access to projects. For example, they can control access to other process applications and toolkits (projects) and the assets they contain that Process Center repository administrators control.

- **tw_managers:** Members of this group can see the Team Performance dashboard in Process Portal. To see dashboards for individual teams, the group member must also be a member of a managers team that is defined in Process Designer.
- **tw_portal_admins:** Because of functional changes in IBM Business Process Manager V8, members of this group no longer have any special access rights.
- **tw_process_owners:** Members can use critical path analysis tools in Process Portal.

Integrating with LDAP

- When integrating with external security providers (LDAP):
 - Can view the LDAP groups in Process Admin Console
 - Cannot edit those external groups
 - Can add the users and groups from the LDAP to the IBM Business Process Manager security groups
 - Can combine accounts from different groups into one group
- Must add LDAP to the federated repository

The screenshot shows a user interface for managing federated repositories. At the top, there's a navigation bar with 'Global security' and 'Federated repositories'. Below it, a sub-navigation bar shows 'Manage repositories'. The main area has a heading 'Repositories that are configured in the system are listed in the following table. You can add or delete them here.' There are three buttons: 'Add' (highlighted with a red box), 'Delete', and 'Preferences'. A dropdown menu is open over the 'Add' button, showing options: 'LDAP repository', 'Custom repository', and 'File repository'. Below these buttons are two dropdown menus: 'Select Repository Identifier' and 'Repository Type'. Underneath, a section titled 'You can administer the following resources:' lists a single item: 'InternalFileRepository' under 'File'. At the bottom left, it says 'Total 1'.

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Figure 13-24. Integrating with LDAP

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Notes:

If you configured IBM Business Process Manager to work with an external security provider, you can view the groups from that external provider in the Process Admin Console, but you cannot edit the external groups. However, you can add users and groups from your external provider to any IBM Business Process Manager security groups that you create. You can also combine accounts from different providers into one group.

The default installation of IBM Business Process Manager provides a federated repository that includes the following items, depending on your installation type:

- Stand-alone environment: The federated repository contains the internal security provider and file repository.
- Network deployment environment: The federated repository contains the file repository.

To implement an external security provider, which uses a different user registry than the internal security provider, you must add the provider to the federated repository. Several types of repositories are supported, including the local operating system registry, a stand-alone LDAP registry, a stand-alone custom registry, and federated repositories.

13.4.Common security holes

Common security holes



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Figure 13-25. Common security holes

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Notes:

Topology and installation

- Regarding the topology and installation choices, the most common security holes are in the following areas:
 - 100% trust in firewalls
 - Failure to use SSL between IBM Business Process Manager and database server
 - Failure to encrypt data at rest
 - Failure to use SSL between Process Center and Process Server
 - Overuse of trust in certificate authorities

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Figure 13-26. Topology and installation

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Notes:

Regarding the topology and installation choices, the most common security holes are in the following areas:

- 100% trust in firewalls:

Without doubt, the biggest security hole is an overly optimistic belief in the security of a corporate, perimeter-wide firewall. You often hear the phrase “it is the internal network, so it is secure.” Taking this posture can be dangerous. Can you completely trust that your firewall vendors never release a software update that has a security exposure in it? How often is your notebook’s operating system updated with security fixes?

Security breaches do not have to be the result of malice. They can be the result of simple, honest mistakes. But in the end, it does not matter. The security breach occurs, and you must deal with the consequences.

- Failure to use SSL between BPM and database server:

Everyone recognizes that database user accounts should be password-protected. What some fail to recognize is how easy it is to observe database traffic while it is in transit. If hackers can view unencrypted text on its way to the database, they also have the opportunity to store this

data in their own systems. By viewing such data, they might gain knowledge of how your SQL statements are formed, possibly leading to SQL injection attacks.

The solution to this security exposure is simple: Secure Sockets Layer (SSL). The specific steps to ensure SSL between your Business Process Manager and database servers are unique to the database vendor that you selected and to your company's certificate management strategy. However, the SSL concept is simple enough, and should be familiar to your database analysts and administration team.

- Failure to encrypt data at rest:

Most security breaches and identity thefts that are widely publicized in the mass media create a sense of urgency to find solutions. Government agencies and regulators push for more restrictions and legislation to govern how data is stored and exchanged, and new reporting requirements when security breaches are detected.

- Failure to use SSL between Process Center and Process Server:

During the installation of Process Server, you turn to the WebSphere Application Server Integrated Solutions Console and run a wizard to create the deployment environment. This wizard includes a step where the Process Server specifies the host name of the Process Center that it is using as its repository. The protocol defaults to http://. During Process Server startup, the runtime environment uses this information to communicate back to the Process Center, notifying the Process Center of the runtime Process Server's availability to receive deployments of process application snapshots. This communication between Process Server and Process Center includes a URL, a user account, and the corresponding password. This information is all that an attacker needs to be able to deploy new snapshots of process applications, which can effectively change the way that you do business. An attacker might also deploy a malware application, which monitors the network, carries out denial of service attacks, and spreads other types of malware to other systems in the same network. This exposure might not be restricted to the systems to which your process applications connect, but might extend to any systems that can be reached.

- Overuse of trust in certificate authorities:

The certificate authority (CA) digitally signs a web server's certificate, and if the browser holds a certificate from that CA, the browser might choose to trust the web server based on the certificate.

Certificate authorities are not guaranteed to check the identities of the parties who purchase certificates from them. It is hard to imagine that a low-cost certificate is subject to a great deal of scrutiny.

You must reduce the number of certificate authorities in use within your organization to the minimum needed. Start with a minimum of certificates, and add only those certificates that you need for specific purposes.

Authentication

- Regarding the authentication choices, the most common security holes are in the following areas:
 - Weak password policies
 - Failure to change default passwords
 - Faith in firewalls
 - Insecure LDAP connections
 - Insecure single sign-on solutions

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Figure 13-27. Authentication

WB8211.0

Notes:

Regarding authentication choices, the most common security holes are in the following areas:

- Weak password policies:

When asked to create a password, individuals often create passwords that are easy to remember. Easy to remember usually means easy to guess. Often, people use names of people, pets, or locations with which they are familiar. Or perhaps they use some geometric pattern on the keyboard (like “asdf”). When they do think to include numbers within the password, they often use a few digits that represent milestone years, birthdates, or anniversaries, in some combination with the choices referenced earlier.

- Failure to change default accounts and passwords:

You should remove these default accounts, and instead map actual users in your organization into the groups and roles that these accounts fill by default.

- Faith in firewalls:

Encrypt the communications channels, and eliminate the possibility of attacks before the opportunity arises.

- Insecure LDAP connections:

Unless you secure your LDAP server by using encryption (SSL), you are leaving your corporate LDAP server open to browsing every time a Business Process Manager user logs in to the /portal inbox.

- Insecure single sign-on solutions:

Many SSO technologies rely upon cookies or HTTP headers to carry the user's credentials with each HTTP request. Often, these credentials are encrypted. Unfortunately, such encryption might not be enough since the header can still be copied, and injected into a hacker's browser HTTP requests.



Authorization

- Regarding the authorization choices, the most common security holes are in the following areas:
 - Overuse of administrator privileges
 - Failure to map participant groups
 - Overpopulation of groups
 - Faith in firewalls

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Figure 13-28. Authorization

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Notes:

Do not underestimate the amount of information that a curious, motivated, or mischievous user can gather. If users can sniff the network traffic, then they can analyze it. If they can analyze it, they can spoof it. It is a short path from unencrypted network traffic to unauthorized access.

Specifically, given Business Process Manager's ability to do instance-based authorization based on runtime criteria, it is conceivable that someone might be able to sniff an in-flight process and alter its authorization criteria.

Encrypt all communications links between the following components:

- Business Process Manager and LDAP
- Business Process Manager and database
- Business Process Manager and web or proxy servers
- Business Process Manager and any web services hosts
- Process Center and Process Server
- Process Center and Process Designer

- Process Center and Integration Designer
- Process Servers and users



Integration

- Regarding the integration choices, the most common security holes are in the following areas:
 - Failure to secure web services passwords
 - Faith in firewalls

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Figure 13-29. Integration

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Notes:

An important aspect in Business Process Manager security is integration.

Any user who has access to a process application in ProcessCenter, even read-only access, has full visibility to the values of the web services passwords. It does not matter whether the passwords are hardcoded into the Properties tab (under Implementation or Security) or referenced from environment variables. In each of these cases, they are visible to anyone who cares to look.

A “faith in firewalls” can lead to a huge security hole because of the nature of Business Process Manager’s reliance upon HTTP basic authentication for web service credentials. It is suggested that all communications between Business Process Manager and each server that hosts web services be encrypted with SSL/TLS.

13.5. Synchronizing users and groups

Synchronizing users and groups



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Figure 13-30. Synchronizing users and groups

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Notes:

IBM Business Process Manager security providers

- The default installation of IBM Business Process Manager provides a federated repository that contains an internal security provider
- IBM Business Process Manager can be configured to use an external security provider by adding the provider to the WebSphere federated repositories list
 - Several types of repositories are supported, including the local operating system registry, a stand-alone Lightweight Directory Access Protocol (LDAP) registry, a stand-alone custom registry, and federated repositories

Repositories in the realm:

Add repositories (LDAP, custom, etc)...	Use built-in repository	Remove	
Select	Base Entry	Repository Identifier	Repository Type
You can administer the following resources:			
<input type="checkbox"/>	o=defaultWIMFileBasedRealm	InternalFileRepository	File
Total 1			

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Figure 13-31. IBM Business Process Manager security providers

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Notes:



Synchronizing users and groups (1 of 2)

- IBM Business Process Manager implicitly synchronizes external users and groups between the WebSphere Application Server user registry and the IBM Business Process Manager database in response to certain triggers
 - You can trigger synchronization explicitly by using administrative scripts or the Process Admin Console

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Figure 13-32. Synchronizing users and groups (1 of 2)

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Notes:

Synchronizing users and groups (2 of 2)

- IBM Business Process Manager synchronizes external users and groups based on the following triggers:
 - Upon startup of a cluster member or server, all available groups (without members) are synchronized
 - When a user logs in to an IBM Business Process Manager web application for the first time, that user is created in the IBM Business Process Manager database
 - When a new or existing user logs in to an IBM Business Process Manager web application, that user's full name and group memberships are queried from the external user registry, and the IBM Business Process Manager database content is updated
 - If a user that was newly registered in a federated repository (by using an LDAP server) is not yet known to IBM Business Process Manager, a REST call might be triggered
 - In this case, synchronization with IBM Business Process Manager occurs, and this synchronization is done only one time

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Figure 13-33. Synchronizing users and groups (2 of 2)

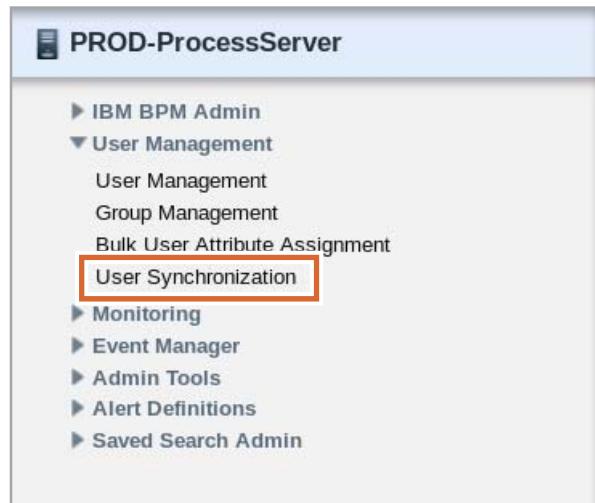
WB8211.0

Notes:



Manual user synchronization

- You can use the administrative scripts to trigger the synchronization of user availability between the WebSphere Application Server user registry and the IBM Business Process Manager database explicitly
- You can use the usersSync and usersFullSync scripts to do a manual synchronization
- Synchronization of user availability can also be triggered from the Process Admin Console



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Figure 13-34. Manual user synchronization

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Notes:

For more information about manual synchronization, see the IBM Knowledge Center:

http://www.ibm.com/support/knowledgecenter/SSFPJS_8.5.6/com.ibm.wbpm.admin.doc/topics/sync_users_and_groups.html?lang=en

Manual group synchronization

- The `syncGroupMembershipForGroups` and `syncGroupMembershipForAllGroups` commands trigger synchronization of group membership by groups between the WebSphere Application Server user registry and the IBM Business Process Manager database
 - Synchronization for group membership considers only users that are already in the IBM Business Process Manager database
 - These users are logged in to IBM Business Process Manager or synchronized to IBM Business Process Manager by using one of the available user synchronization commands
 - All other users are not considered to be group members according to the synchronization commands

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Figure 13-35. Manual group synchronization

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Notes:



Unit summary

Having completed this unit, you should be able to:

- Describe the key WebSphere Application Server security concepts
- Describe the user registries that are available in IBM Business Process Manager
- Explain how to interact securely with an IBM Business Process Manager Server
- Describe some common security holes and how to fix them
- Synchronize users and groups

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Figure 13-36. Unit summary

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Notes:

Checkpoint questions

1. True or false: In federated repositories, you can connect similar repositories, such as two flat file repositories.

2. Which type of security restricts access to the operating system?
 - A. Administrative security
 - B. Application security
 - C. Java 2 security
 - D. File system security

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Figure 13-37. Checkpoint questions

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Notes:

Write your answers here:

1.

2.



Checkpoint answers

1. False. In federated repositories, you can connect any mixture of heterogeneous repositories, including flat file and LDAP servers, or multiple LDAP servers.
2. C. Java 2 security

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Figure 13-38. Checkpoint answers

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Notes:

Exercise 11



Implementing IBM Business
Process Manager security

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Figure 13-39. Exercise 11

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Notes:



Exercise objectives

After completing this exercise, you should be able to:

- Federate a repository with LDAP
- Access the deployment manager administrative console by using an LDAP user and group
- Synchronize LDAP users
- Access LDAP users in Process Admin Console

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Figure 13-40. Exercise objectives

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Notes:

Unit 14. Course summary

What this unit is about

This unit summarizes the course and provides information for future study.

What you should be able to do

After completing this unit, you should be able to:

- Explain how the course met its learning objectives
- Access the IBM Training website
- Identify other IBM Training courses that are related to this topic
- Locate appropriate resources for further study

References

IBM Business Process Manager V8.5.6 documentation in the IBM Knowledge Center:

http://www.ibm.com/support/knowledgecenter/SSFPJS_8.5.6/com.ibm.wbpm.main.doc/kc-homepage-bpm.html

Unit objectives

After completing this unit, you should be able to:

- Explain how the course met its learning objectives
- Access the IBM Training website
- Identify other IBM Training courses that are related to this topic
- Locate appropriate resources for further study

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Figure 14-1. Unit objectives

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Notes:



Course learning objectives (1 of 2)

After completing this course, you should be able to:

- Configure and administer a Process Center environment
- Configure and administer a Process Server environment
- Describe the purpose and business value of the tools included in IBM Business Process Manager Standard V8.5.6: IBM Process Server and IBM Process Center
- Describe IBM Business Process Manager Standard architecture, concepts, and terminology
- Describe the deployment considerations for IBM Business Process Manager Standard components
- Create a Process Center clustered environment by using the Deployment Environment wizard
- Create a Process Server clustered environment by using the BPMConfig utility

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Figure 14-2. Course learning objectives (1 of 2)

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Notes:

Course learning objectives (2 of 2)

After completing this course, you should be able to:

- Deploy and manage process applications
- Work with the administrative console and management tools
- Deploy applications to an offline and online Process Server environment
- Archive and purge in an IBM Business Process Manager environment
- Integrate with security providers to secure the environment
- Troubleshoot the environment

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Figure 14-3. Course learning objectives (2 of 2)

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Notes:



To learn more on the subject

- IBM Training website:
www.ibm.com/training
- IBM Redbooks:
www.redbooks.ibm.com
- To stay informed about IBM training, see the following sites:
 - IBM Training News: <http://bit.ly/IBMTainEN>
 - YouTube: youtube.com/IBMTaining
 - Facebook: facebook.com/ibmtraining
 - Twitter: twitter.com/websphere_edu

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Figure 14-4. To learn more on the subject

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Notes:



Identify other IBM Training courses

- Training paths:

<http://www-304.ibm.com/jct03001c/services/learning/sites.wss/us/en?pageType=page&c=a0003096>

- Identify the next courses in this sequence

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Figure 14-5. Identify other IBM Training courses

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Notes:



Resources for further study

- IBM Business Process Manager help topics
 - These help topics can be found inside of the IBM Business Process Manager Process Designer tool
- IBM Community Wikis
 - Move beyond the information that this student book provides by going to the IBM community wiki
 - The URL for the wiki is:
<https://www.ibm.com/developerworks/community/wikis/home?lang=en#!/wiki/WebSphere%20Education%20Wiki>

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Figure 14-6. Resources for further study

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Notes:

Unit summary

Having completed this unit, you should be able to:

- Explain how the course met its learning objectives
- Access the IBM Training website
- Identify other IBM Training courses that are related to this topic
- Locate appropriate resources for further study

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Figure 14-7. Unit summary

WB8211.0

Notes:

Appendix A. List of abbreviations

A

ACID atomicity, consistency, isolation, and durability
AIS Advanced Integration service
APAR authorized program analysis report
API application programming interface

B

BO business object
BPC Business Process Choreographer
BPD business process definition
BPD Business Process Diagram
BPEL Business Process Execution Language
BPM business process management
BPMN Business Process Modeling Notation
BRM Business Rules Manager

C

CA Cache Access
CEI Common Event Infrastructure
CIFS Common Internet File System
COBOL Common Business Oriented Language
CORBA Common Object Request Broker Architecture
CORS cross-origin resource sharing
CP Claims project
CPU central processing unit
CSlv2 Common Secure Interoperability Version 2
CSS Cascading Style Sheets

D

DB database
DB2 Database 2
DCS distribution and consistency services
DE deployment environment
DMZ demilitarized zone
DNS domain name server
DRS data replication service

E

EAR enterprise archive
EE Enterprise Edition
EIS enterprise information system
EJB Enterprise JavaBeans
EPV exposed process value

ERC edition revision code

ESB enterprise service bus

F

FFDC first-failure data capture

G

GMT Greenwich mean time

GUI graphical user interface

H

HA high availability

HACMP High Availability Cluster Multi-Processing

HAM high availability manager

HTML Hypertext Markup Language

HTTP Hypertext Transfer Protocol

HTTPS Hypertext Transfer Protocol Secure

I

ID identification

IETF Internet Engineering Task Force

IIOP Internet Inter-ORB Protocol

I/O input/output

IP Internet Protocol

ISC Integrated Solutions Console

IT information technology

IVT installation verification tool

J

J2C Java EE Connector architecture

JAAS Java Authentication and Authorization Service

JCL Java Command Language

JAR Java archive

JCA Java EE Connector Architecture

JDBC Java Database Connectivity

JMS Java Message Service

JMX Java Management Extensions

JNDI Java Naming and Directory Interface

JSP JavaServer Pages

JVM Java virtual machine

K

L

LDAP Lightweight Directory Access Protocol

LTPA Lightweight Third Party Authentication

M

MAP Mortgage Application Process
MBean managed bean
MDB message-driven bean
ME messaging engine
MQ Message Queue
MS Microsoft

N

ND Network Deployment
NFS Network File System
NT network termination

O

OAGIS Open Applications Group Integration Specification
ORB Object Request Broker
OS operating system
OSOA open service-oriented architecture

P

PC Process Center
PCT Plug-ins Configuration Tool
PDF Portable Document Format
PMR problem management record
PMT Profile Management Tool
POC proof-of-concept

Q

QA quality assurance
QoS quality of service

R

RAM random access memory
REST Representational State Transfer
RGB red, green, and blue
RMI Remote Method Invocation
RMI/IOP Remote Method Invocation over Internet InterORB Protocol
RMM reliable multicast messaging

S

SAM Security Access Manager
SAN storage area network
SAP Systems Applications and Products (data processing)
SAS Secure Association Service
SCA Service Component Architecture
SDK software development kit

SIB service integration bus

SIBus service integration bus

SIP Session Initiation Protocol

SMTP Simple Mail Transfer Protocol

SOA service-oriented architecture

SOAP a lightweight, XML-based protocol for exchanging information in a decentralized, distributed environment. Usage note: SOAP is not an acronym; it is a word (formerly an acronym for Simple Object Access Protocol)

SOR system of record

SPI service provider interface

SQL Structured Query Language

SSL Secure Sockets Layer

SSO single sign-on

T

TCP Transmission Control Protocol

TLS Transport Layer Security

TM Transaction Manager

TWX teletypewriter exchange service

U

UCA undercover agent

UCA Unrefreshed Cache Access

UCP Unrefreshed Cache Percentage

UNIX Uniplexed Information and Computing System

URI Uniform Resource Identifier

URL Uniform Resource Locator

UTE unit test environment

V

VM virtual machine

VMM virtual member manager

VP Verification project

W

WebDAV Web-based Distributed Authoring and Versioning

WSDL Web Services Description Language

WWW World Wide Web

X

XML Extensible Markup Language

Y

Z

z/OS zSeries operating system

Appendix B. Resource guide

Completing this IBM Training course is a great first step in building your IBM Middleware skills. Beyond this course, IBM offers several resources to keep your Middleware skills on the cutting edge. Resources available to you range from product documentation to support websites and social media websites.

Training

- **IBM Training website**
 - Bookmark the IBM Training website for easy access to the full listing of IBM training curricula. The website also features training paths to help you select your next course and available certifications.
 - For more information, see: <http://www.ibm.com/training>
- **IBM Training News**
 - Review or subscribe to updates from IBM and its training partners.
 - For more information, see: <http://bit.ly/IBMTrainEN>
- **IBM Certification**
 - Demonstrate your mastery of IBM Middleware to your employer or clients through IBM Professional Certification. Middleware certifications are available for developers, administrators, and business analysts.
 - For more information, see: <http://www.ibm.com/certify>
- **Training paths**
 - Find your next course easily with IBM training paths. Training paths provide a visual flow-chart style representation of training for many IBM products and roles, including developers and administrators.
 - For more information, see:
<http://www-304.ibm.com/jct03001c/services/learning/ites.wss/us/en?pageType=page&c=a0003096>

Social media links

Connect with IBM Middleware Education and IBM Training, and learn about the latest courses, certifications, and special offers by seeing any of the following social media websites.

- **Twitter**
 - Receive concise updates from Middleware Education a few times each week.

- Follow Middleware Education at: twitter.com/websphere_edu
- **Facebook:**
 - Follow IBM Training on Facebook to keep in sync with the latest news and career trends, and to post questions or comments.
 - Find IBM Training at: facebook.com/ibmtraining
- **YouTube:**
 - See the IBM Training YouTube channel to learn about IBM training programs and courses.
 - Find IBM Training at: youtube.com/IBMTutorial

Support

- **Middleware Support portal**
 - The Middleware Support website provides access to a portfolio of downloadable support tools, including troubleshooting utilities, product updates, drivers, and Authorized Program Analysis Reports (APARS). The Middleware Support website also provides links to online Middleware communities and forums for collaboratively solving issues. You can now customize the IBM Support website by adding or deleting portlets to show the most important information for the IBM products that you work with.
 - For more information, see:
<http://www.ibm.com/software/websphere/support>
- **IBM Support Assistant**
 - The IBM Support Assistant is a local serviceability workbench that makes it easier and faster for you to resolve software product issues. It includes a desktop search component that searches multiple IBM and non-IBM locations concurrently and returns the results in a single window, all within IBM Support Assistant.
 - IBM Support Assistant includes a built-in capability to submit service requests; it automatically collects key problem information and transmits it directly to your IBM support representative.
 - For more information, see: <http://www.ibm.com/software/support/isa>
- **IBM Education Assistant**
 - IBM Education Assistant is a collection of multimedia modules that are designed to help you gain a basic understanding of IBM software products and use them more effectively. The presentations, demonstrations, and tutorials that are part of the IBM Education Assistant are an ideal refresher for what you learned in your IBM Training course.

- For more information, see:
<http://www.ibm.com/software/info/education/assistant/>

Middleware documentation and tips

- **IBM Redbooks**
 - The IBM International Technical Support Organization develops and publishes IBM Redbooks publications. IBM Redbooks are downloadable PDF files that describe installation and implementation experiences, typical solution scenarios, and step-by-step “how-to” guidelines for many Middleware products. Often, Redbooks include sample code and other support materials available as downloads from the site.
 - For more information, see: <http://www.ibm.com/redbooks>
- **IBM documentation and libraries**
 - IBM Knowledge Centers and product libraries provide an online interface for finding technical information on a particular product, offering, or product solution. The IBM Knowledge Centers and libraries include various types of documentation, including white papers, podcasts, webcasts, release notes, evaluation guides, and other resources to help you plan, install, configure, use, tune, monitor, troubleshoot, and maintain Middleware products. The Knowledge Center and library are located conveniently in the left navigation on product web pages.
- **developerWorks**
 - IBM developerWorks is the web-based professional network and technical resource for millions of developers, IT professionals, and students worldwide. IBM developerWorks provides an extensive, easy-to-search technical library to help you get up to speed on the most critical technologies that affect your profession. Among its many resources, developerWorks includes how-to articles, tutorials, skill kits, trial code, demonstrations, and podcasts. In addition to the Middleware zone, developerWorks also includes content areas for Java, SOA, web services, and XML.
 - For more information, see: <http://www.ibm.com/developerworks>

Services

- IBM Software Services for Middleware are a team of highly skilled consultants with broad architectural knowledge, deep technical skills, expertise on suggested practices, and close ties with IBM research and development labs. The Middleware Services team offers skills transfer, implementation, migration,

architecture, and design services, plus customized workshops. Through a worldwide network of services specialists, IBM Software Service for Middleware makes it easy for you to design, build, test, and deploy solutions, helping you to become an on-demand business.

- For more information, see:

<http://www-935.ibm.com/services/us/en/it-services/systems/middleware-e-services/>

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