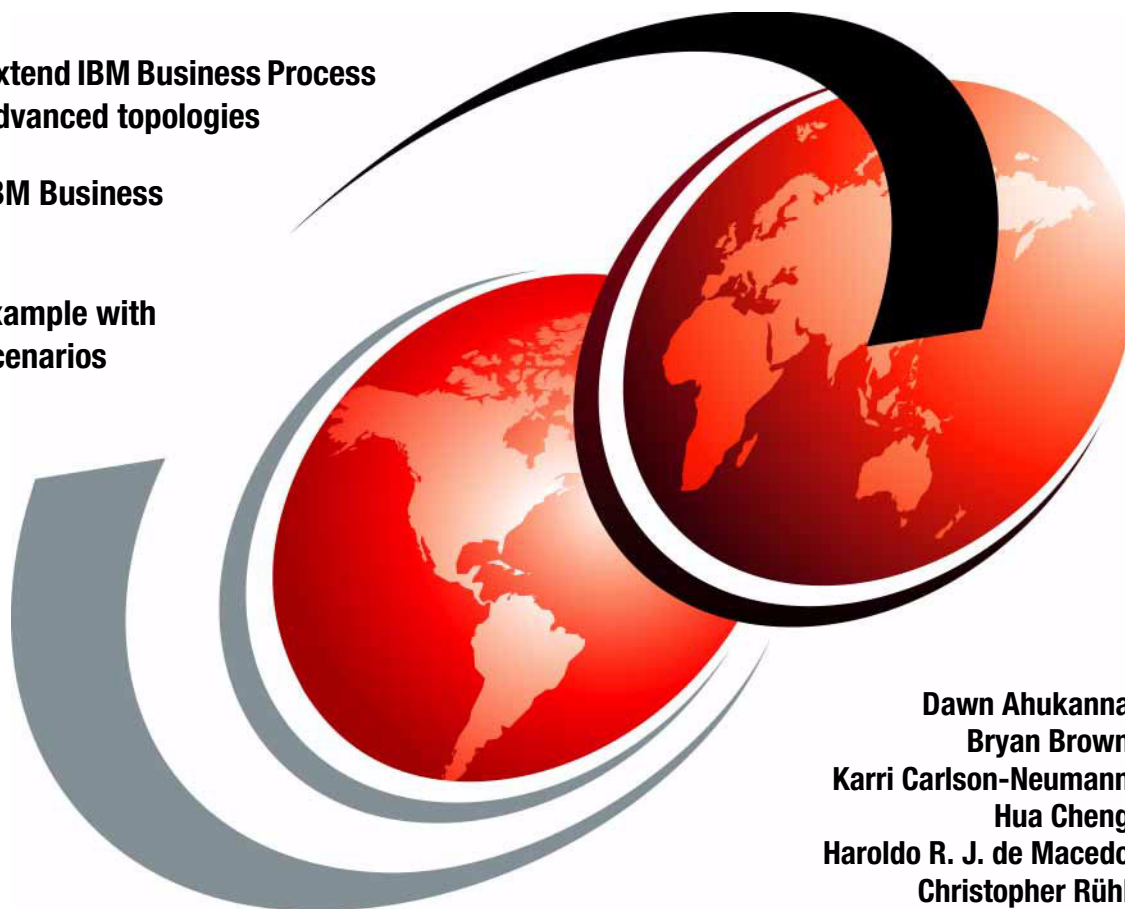


IBM Business Process Manager V7.5 Production Topologies

Build and extend IBM Business Process Manager Advanced topologies

Integrate IBM Business Monitor

Learn by example with practical scenarios



Dawn Ahukanna
Bryan Brown
Karri Carlson-Neumann
Hua Cheng
Haroldo R. J. de Macedo
Christopher Rühl



International Technical Support Organization

**IBM Business Process Manager V7.5 Production
Topologies**

October 2011

Note: Before using this information and the product it supports, read the information in “Notices” on page ix.

First Edition (October 2011)

This edition applies to Version 7, Release 5, of IBM Business Process Manager.

© Copyright International Business Machines Corporation 2011. All rights reserved.

Note to U.S. Government Users Restricted Rights -- Use, duplication or disclosure restricted by GSA ADP Schedule Contract with IBM Corp.

Contents

Notices	ix
Trademarks	x
Preface	xi
The team who wrote this book	xi
Now you can become a published author, too!	xiv
Comments welcome	xiv
Stay connected to IBM Redbooks	xiv
Part 1. Overview	1
Chapter 1. Overview of IBM Business Process Manager V7.5	3
1.1 IBM Business Process Manager	4
1.1.1 IBM Business Process Manager configurations	4
1.1.2 IBM Business Process Manager architecture	6
1.2 IBM Business Process Manager life cycle	8
1.3 Overview of Process Server	9
1.4 Overview of Process Center	9
1.5 IBM Business Monitor	10
Chapter 2. Product and topology concepts	11
2.1 Introduction	12
2.2 Business process management environment	12
2.2.1 BPM environment for Business Process Manager Advanced	15
2.2.2 BPM environment for Business Process Manager Standard	16
2.2.3 BPM environment for Business Process Manager Advanced that does not utilize Process Center	18
2.3 Network deployment environment concepts	19
2.3.1 WebSphere network deployment environment cell structure	19
2.3.2 Additional WebSphere network deployment environment concepts	22
2.4 Product components	23
2.4.1 Database tables and schemas	23
2.4.2 Service integration buses	25
2.4.3 Process Center server	27
2.4.4 Process Server server	27
2.4.5 Business Performance Data Warehouse	28
2.4.6 Business Process Choreographer	28
2.4.7 Business Process Choreographer Explorer (BPC Explorer)	28
2.4.8 Business Rules Manager	29

2.4.9	Common event infrastructure	29
2.4.10	Business Space powered by WebSphere	29
2.4.11	Monitor action services	29
2.4.12	Monitor scheduled services	30
2.4.13	IBM Cognos	30
2.4.14	IBM HTTP Server and plug-in	31
2.4.15	WebSphere proxy server	31
2.5	Business process management cell topologies	32
2.5.1	BPM cell topologies for Process Center and Process Server	33
2.5.2	Deployment environments	34
2.5.3	Other cell topologies	34
Chapter 3.	Clustered topology choices	37
3.1	Topology choice factors	38
3.2	Single Cluster topology	39
3.3	Remote Messaging topology	43
3.4	Remote Messaging Remote Support topology	46
3.5	Remote Messaging, Support, and Web topology	50
3.6	Five-cluster topology	54
3.7	Comparison of clustered topologies	57
Chapter 4.	Process Center and Process Server concepts	59
4.1	Process Center and Process Server concept overview	60
4.2	Repository components and concepts	62
4.2.1	Process Center	62
4.2.2	Process Application life cycle	63
4.3	Design components and concepts	64
4.3.1	Authoring environments	64
4.3.2	Design assets	65
4.4	Runtime components and concepts	68
4.5	Business Process Management Environment concepts	72
4.5.1	Process Center and Process Server combinations	72
4.5.2	Advanced topic: Satellite Process Center and Process Server combination	75
Part 2.	Building production topologies	81
Chapter 5.	Preparing your topology	83
5.1	Installation overview	84
5.2	Prerequisite steps	85
5.2.1	Selecting the topology	85
5.2.2	Selecting a database	85
5.2.3	Allocating servers	86
5.2.4	Defining the network	86

5.2.5	Installing and tuning the operating system	86
5.2.6	Defining the user registry	87
5.2.7	Defining SMTP	87
5.2.8	Creating SSL certificates	87
5.3	Installing the software	88
5.3.1	Installation order	90
5.3.2	Creating a software repository	90
5.3.3	Installing the products	90
5.3.4	Applying the fixes	102
5.3.5	Installing and applying fixes all-in-one	103
5.4	Database tables and schema creation	107
5.4.1	The common database	108
5.4.2	The Process Server tables	109
5.4.3	The Performance Data Warehouse tables	109
5.4.4	The Business Process Choreographer tables	110
5.4.5	The messaging engine tables	110
5.4.6	The Business Process Reporting tables	111
5.4.7	The Business Space tables	111
5.4.8	The MONITOR tables	112
5.4.9	The Cognos content store	113
5.5	Creating the profiles	113
5.5.1	Creating a Process Center deployment manager profile	114
5.5.2	Creating Process Center custom profiles	116
5.5.3	Federating a custom profile into the cell	117
5.5.4	Creating a process server dmgr profile	117
5.5.5	Creating process server custom profiles	124
5.5.6	Federating the process server custom profiles	127
5.6	Configuring LDAP as the user account registry	127
5.7	Other software used	135
5.7.1	IBM HTTP Server	136
5.7.2	IBM DB2	136
5.7.3	IBM Tivoli Directory Server	136
5.7.4	Adding IBM HTTP Server to the cell	136
Chapter 6.	Single Cluster topology	143
6.1	Topology summary	144
6.2	Configuring Deployment Environment Topology	147
6.2.1	Using the Integrated Solutions Console	147
6.2.2	Using the command line	164
6.3	Post-creation configuration	165
6.3.1	Checking database connectivity	165
6.3.2	Bootstrap data command execution	166
6.3.3	Configuring host aliases	168

6.3.4	Configuration for the web router	169
6.3.5	Configuring bus security	174
6.3.6	Sharing transaction and recovery logs	175
6.4	Verification	181
6.4.1	Restarting the deployment manager	181
6.4.2	Checking that CEI event persistence is disabled	183
6.4.3	Verification: Application Cluster can start successfully	183
6.4.4	Verification: Process Center function	184
6.4.5	Verification: Business Space	191
6.4.6	Verification: Human task manager	192
6.4.7	Verification: Business Process Choreographer engine	196
Chapter 7. Remote Messaging, Remote Support, and Web topology		199
7.1	Topology summary	200
7.2	Prerequisites for creating this topology	205
7.3	Configuring Deployment Environment topology	208
7.3.1	Using the Integrated Solutions Console	209
7.3.2	Using the command line	229
7.4	Post-creation configuration	231
7.4.1	Checking database connectivity	231
7.4.2	Bootstrap data command execution	234
7.4.3	Restarting the deployment manager	236
7.4.4	Configuring for IBM HTTP Server	237
7.4.5	Changing the virtual host hostname	245
7.4.6	Checking that CEI event persistence is disabled	247
7.4.7	Securing the Process Server and Performance Data Warehouse service integration buses	247
7.4.8	Sharing transaction and recovery logs	248
7.5	Verification	254
7.5.1	Verification: The application cluster can start successfully	255
7.5.2	Verification: Process Center functions	260
7.5.3	Verification: Business Space	267
7.5.4	Verification: Human Task manager	268
7.5.5	Verification: Business Process Choreographer	276
Chapter 8. Remote Messaging, Support, and Web topology with IBM Business Monitor		277
8.1	Topology summary	278
8.2	Prerequisites for creating this topology	281
8.3	Configuring the deployment environment topology	284
8.3.1	Using the Integrated Solutions Console	284
8.3.2	Using the command line	301
8.4	Post-creation configuration	302

8.4.1	Checking database connectivity	303
8.4.2	Bootstrap data command execution	304
8.4.3	Configuring host aliases	305
8.4.4	Configuration for the router	307
8.4.5	Securing the Process Server and Performance Data Warehouse service integration buses	311
8.4.6	Sharing transaction and recovery logs	311
8.5	Verification.	317
8.5.1	Verification: Deployment manager and node agents start cleanly .	317
8.5.2	Verification: Common Event Infrastructure persistence is disabled	318
8.5.3	Verification: The messaging cluster starting cleanly	318
8.5.4	Verification: The Support cluster starting cleanly	320
8.5.5	Verification: The AppTarget cluster starting cleanly	320
8.5.6	Verification: The Web cluster starting cleanly	321
8.5.7	Verification: Process Center and Process Server function	321
8.5.8	Verification: Business Space.	324
8.5.9	Verification: Business Process Choreographer.	325
Chapter 9.	Cross-cell topology with IBM Business Monitor	335
9.1	Topology overview	336
9.2	Event Delivery	337
9.2.1	Table-based event delivery	337
9.2.2	Queue-based event delivery	338
9.3	Planning to install IBM Business Monitor	338
9.4	Installing the topology	341
9.5	Post-creation configuration	341
9.5.1	Event Service Configuration across multiple cells	342
9.5.2	Event delivery configuration across multiple cells.	342
Chapter 10.	Advanced topics	345
10.1	Overview	346
10.2	Extending a topology.	346
10.2.1	Reasons to extend a topology.	346
10.2.2	Implications of extending a topology	348
10.2.3	Extending a topology with vertical or horizontal clustering	349
10.2.4	Extending the topology by adding new clusters	350
10.2.5	Multi-cell and double Remote Messaging, Support, and Web topologies	350
10.3	Monitor topics	351
Part 3.	Appendixes	355
Appendix A.	Additional material	357
	Locating the web material	357

Using the Web material	357
Appendix B. Database design tool	359
Overview of database design tool	360
Overview of database design file	360
Using the database design tool	361
Creating a database design file	362
Generating the database scripts	369
Using the database design file	372
Creating a profile with PMT	373
Creating a profile with manageprofile	373
Creating a deployment environment with the admin console	374
Quick reference	374
Appendix C. Configuring IBM Business Process Manager V7.5 configuration settings	377
Configuration file overview and explanation	379
Scope of configuration settings and dependencies	379
Network-specific configuration dependencies and settings	380
Operating system specific configuration dependencies and settings	380
Java Platform, Enterprise Edition Application Server specific configuration dependencies and settings	380
Business Process Modelling Notation engine specific configuration settings . 381	
Configuration file details	384
Backing up existing config files	385
Overriding configuration settings	386
Using the merge attribute	388
Troubleshooting custom settings	389
Examples	389
Typical Process Server environment configuration overrides	390
Typical IBM Business Process Manager Version 7.5 zone configuration overrides	391
Abbreviations and acronyms	397
Related publications	399
IBM Redbooks	399
Help from IBM	399

Notices

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

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

IBM may have patents or pending patent applications covering subject matter described in this document. The furnishing of this document does not give you any license to these patents. You can send license inquiries, in writing, to:

IBM Director of Licensing, IBM Corporation, North Castle Drive, Armonk, NY 10504-1785 U.S.A.

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

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

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

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

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

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


COPYRIGHT LICENSE:

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

Trademarks

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

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

AIX®	developerWorks®	Redbooks (logo)  ®
CICS®	IBM®	Tivoli®
Cognos®	IMS™	WebSphere®
DB2®	Redbooks®	

The following terms are trademarks of other companies:

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

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

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

Intel, Intel logo, Intel Inside, Intel Inside logo, Intel Centrino, Intel Centrino logo, Celeron, Intel Xeon, Intel SpeedStep, Itanium, and Pentium are trademarks or registered trademarks of Intel Corporation or its subsidiaries in the United States and other countries.

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

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

Preface

This IBM® Redbooks® publication describes how to build production topologies for IBM Business Process Manager Advanced V7.5. It is aimed at IT Architects and IT Specialists who want to understand and implement these topologies. Use this book to select the appropriate production topologies for a given environment, then follow the step-by-step instructions included in this book to build these topologies.

Part one introduces IBM Business Process Manager and provides an overview of basic topology components, and Process Server and Process Center. This part also provides an overview of the production topologies that we describe in this book, including a selection criteria for when to select a given topology.

Part two provides a series of step-by-step instructions for creating production topology environments using deployment environment patterns. This includes topologies that incorporate IBM Business Monitor. This part also discusses advanced topology topics.

The team who wrote this book

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

Dawn Ahukanna is currently a BPM Principal Technical Architect within the European IBM Software Services Tech Practice for WebSphere®, BPM and SOA. Her main role includes implementing Java/JEE-based BPM Technology, designing BPM system architecture platforms and BPM Integration design patterns, as well as authoring technical white papers and onsite client . She has BPM project delivery experience across a number of client industries including Telecoms, Finance, Media, Education, Healthcare and Automotive verticals. She also has a background and previous experience in implementing ECM, CRM, Artificial Intelligence and Expert Systems, graduating with a BSc in Chemistry with microelectronics from Kingston University, UK.

Bryan Brown is an advisory engineer in the US with the BPM SWAT team. He has 20 years of experience in the software engineering field, and has worked at IBM for 9 years. His area of expertise is the WebSphere Software Portfolio, focusing on deep technical solutions.

Karri Carlson-Neumann is an Advisory Software Engineer on the IBM BPM SWAT team, and is based in the development lab in Rochester, Minnesota. She has spent all 11 of her years at IBM in the WebSphere product family. Her areas of expertise include WebSphere Process Server and IBM Business Process Manager Advanced topologies and migration. When not busy solving customer and development issues, Karri enjoys riding motorcycles with her husband and watching college football.

Hua Cheng (Ted) is currently the Team Lead for IBM Business Process Management Test at the IBM China Development Lab in Beijing, China. He has 5 years experience in BPM products including WebSphere Lombardi, Process Server, and Integration Designer. He holds a master degree in Computer Science from China Academy of Science. His areas of expertise include BPM, WAS, SOA, Agile and Java and J2EE development. He has written extensively on BPM field, including more than 6 articles published on IBM developerWorks® and the IBM Support site.

Haroldo R. J. de Macedo is an IT Specialist at IBM Software Services working for IBM Software Group based in São Paulo, Brazil. He has been working for IBM since 2005 with WebSphere Application Server and lately with the IBM BPM suite. Haroldo has a history in middleware architecture design and software development. He is experienced in implementing J2EE/Java and service-oriented architecture (SOA) solutions, having worked on large projects in government, bank and telecommunication companies. In IBM his main role is to help customers to plan, implement and maintain their WebSphere infrastructure. He also teaches several IBM WebSphere courses. He has graduated at UFRJ as a Bsc in Mathematics (Computer Science) in Rio de Janeiro.

Christopher Rühl is a corporate student in Germany. He has been 2 years with IBM and has gained experience with many IBM products. He is aiming for a degree in International Business Information Technology from University of Corporate Education Mannheim. Christopher participated on this book while on an internship.

Thanks to the following people for their contributions to this project:

- ▶ Martin Keen, IBM Redbooks Project Leader
- ▶ Lisa Dyer, IBM Business Process and Decision Management
- ▶ Stephen Gibney, IBM Software Services for WebSphere
- ▶ Steve Lindauer, Business Process Management Architecture
- ▶ Srikanth Bhattiprolu, Business Process Management Development
- ▶ Zeenat Lainwala, Business Process Management Development
- ▶ Ekkehard Voesch, IQA Test Architect

- ▶ Christoph Gremminger, Business Process Management Test, IBM BBL
- ▶ Marco X Lezajic, Business Process Management Test, IBM BBL
- ▶ Sabine Sprengel, Business Process Management Test, IBM BBL
- ▶ Dieter Koenig1, WebSphere BPM Architecture, IBM BBL
- ▶ Zi Hui Duan, Business Process Management Test, IBM China
- ▶ John Alcorn, BAM Platform Architect - IBM Business Monitor
- ▶ Andy Garratt, IBM Software Services for WebSphere
- ▶ David Screen, IBM Software Services for WebSphere
- ▶ Scott Feinstein, IBM BPM On-Demand Consulting
- ▶ Adam Cotner, IBM Technical Sales
- ▶ Zachary Roadhouse, IBM Application and Integration Middleware Software Chief Engineer
- ▶ Gregory Harley, IBM Application and Integration Middleware Software Product Designer
- ▶ Trevor Pearson, IBM On Demand Consulting Manager
- ▶ Scott Feinstein, IBM Principal Technical Consultant
- ▶ Andrew Forget, IBM Principal Technical Consultant
- ▶ J. Keith Wood, IBM Managing Consultant
- ▶ Rigeto Zhao, IBM Software Services for WebSphere
- ▶ Uday Pillai, IBM Software Group
- ▶ Carl Cabou, IBM BPM Technical Consultant
- ▶ David Screen, IBM IT Specialist, Senior Inventor
- ▶ Sergey Tsymbal, Technical Consultant
- ▶ Ian Oeschger, Information Architect, Business Process Management
- ▶ Charlie Redlin, IBM WebSphere Services
- ▶ Shane Claussen, IBM STSM, BPM Architecture
- ▶ Michele Haglund, IBM Information Developer
- ▶ Eric Herness, IBM Application and Integration Middleware Software BPM Chief Architect
- ▶ Mike McKinley, Editor, IBM BPM Information Development
- ▶ Ashok Iyengar, WebSphere Lab Services
- ▶ Wendy Butt, IBM Business Process Management SWAT
- ▶ Andrew Tharp, IBM Business Process Management SWAT

Now you can become a published author, too!

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

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

ibm.com/redbooks/residencies.html

Comments welcome

Your comments are important to us!

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

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

ibm.com/redbooks

- Send your comments in an email to:

redbooks@us.ibm.com

- Mail your comments to:

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

Stay connected to IBM Redbooks

- Find us on Facebook:

<http://www.facebook.com/IBMRedbooks>

- Follow us on Twitter:

<http://twitter.com/ibmredbooks>

- ▶ Look for us on LinkedIn:
<http://www.linkedin.com/groups?home=&gid=2130806>
- ▶ Explore new Redbooks publications, residencies, and workshops with the IBM Redbooks weekly newsletter:
<https://www.redbooks.ibm.com/Redbooks.nsf/subscribe?OpenForm>
- ▶ Stay current on recent Redbooks publications with RSS Feeds:
<http://www.redbooks.ibm.com/rss.html>

Part 1



Overview



Overview of IBM Business Process Manager V7.5

This chapter provides a general overview of IBM Business Process Manager 7.5 Advanced. It contains the following sections:

- ▶ IBM Business Process Manager
- ▶ IBM Business Process Manager life cycle
- ▶ Overview of Process Server
- ▶ Overview of Process Center
- ▶ IBM Business Monitor

1.1 IBM Business Process Manager

IBM Business Process Manager is the successor of two products (Figure 1-1):

- ▶ IBM WebSphere Lombardi Edition
- ▶ IBM WebSphere Process Server

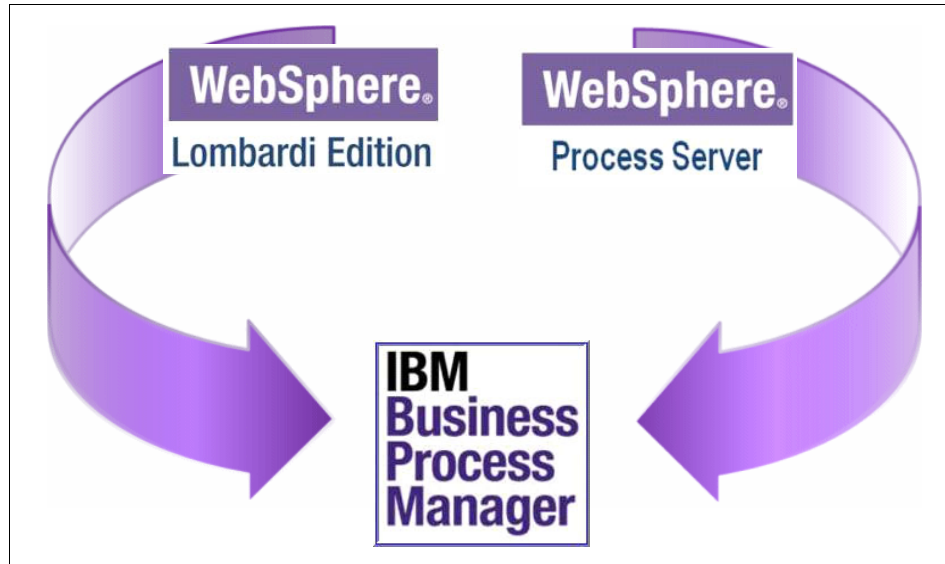


Figure 1-1 IBM Business Process Manager - Unifying two market-leading platforms

IBM Business Process Manager aims to deliver a solution for complex business problems by simplifying operations, centralizing visibility, and improving the overall experience for managing your business processes. Furthermore, IBM Business Process Manager is highly scalable.

1.1.1 IBM Business Process Manager configurations

There are three versions of the IBM Business Process Manager that are designed to match increasing levels of functional complexity:

- ▶ *IBM Business Process Manager Express* is designed for a small, perhaps first, Business Process Management (BPM) project. It is configured to operate with a small number of users or a single server, with no clustering. This version of IBM Business Process Manager also offers a low entry price and an easy installation routine.
- ▶ *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. Additionally, the standard configuration offers an improved user productivity and basic system integration support.

- *IBM Business Process Manager Advanced* offers the complete set of advanced BPM capabilities. It extends the support for high-volume process automation, with high quality-of-service. The advanced configuration also offers a built-in service-oriented architecture (SOA) components for extensive enterprise-wide service integration and orchestration. The advanced configuration also includes all of the capabilities of WebSphere Enterprise Service Bus.

Table 1-1 provides an overview of the differences between all three editions on the application and service level.

Table 1-1 Overview of the capabilities of individual editions

Service and application	Advanced edition	Standard edition	Express edition
WebSphere Application Server Administration, SI Bus, Naming, Security	Yes	Yes	Yes
Supports WebSphere clustering HA Manager	Yes	Yes	No
IBM Business Process Manager Process Server Process Portal, Process Admin, Repository	Yes	Yes	Yes
Performance Data Warehouse	Yes	Yes	Yes
SCA Failed Event Manager	Yes	No	No
Business Space Business Space Manager, REST Services Gateway, various widgets	Yes	No	No
Business Process Choreographer BPC/HTM Containers, BPC Tools	Yes	No	No
Common Event Infrastructure Event Service	Yes	No	No

Further information: For more information see the following resources:

- ▶ IBM BPM configurations
http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/topic/com.ibm.wbpm.main.doc/topics/cbpm_configurations.html
- ▶ IBM BPM configuration capabilities
http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/index.jsp?topic=/com.ibm.wbpm.main.doc/topics/cbpm_wbpm_pkg.html

1.1.2 IBM Business Process Manager architecture

IBM Business Process Manager consists of several components, including:

- ▶ Process Server
See 1.3, “Overview of Process Server” on page 9, for a more detailed explanation.
- ▶ Process Center including the Business Process Manager Repository
See 1.4, “Overview of Process Center” on page 9, for a more detailed explanation.
- ▶ Process Designer
- ▶ Integration Designer

Figure 1-2 shows the components of IBM Business Process Manager mentioned above.

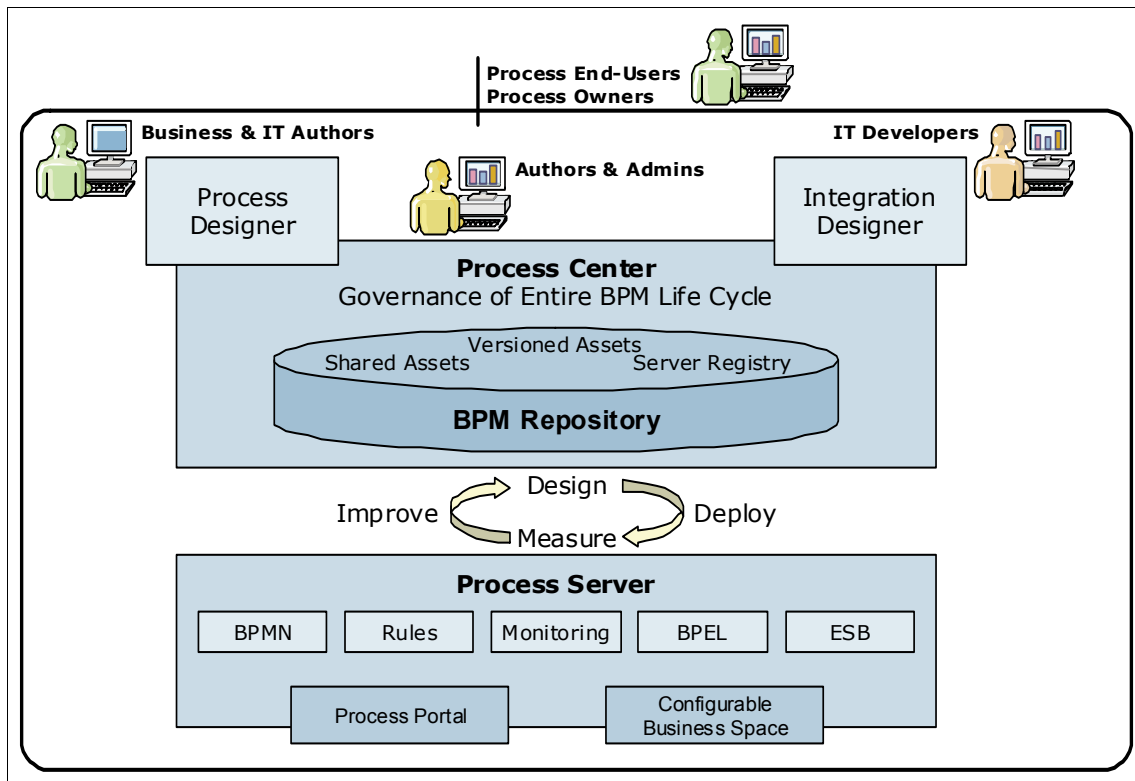


Figure 1-2 Component overview of IBM Business Process Manager

The way that IBM Business Process Manager operates is that processes are authored in the Process Center, governing the entire life cycle of the process. The business processes can be developed (and authored) using the Process Designer and IBM Integration Designer. These processes are subsequently published to the process server for runtime operation.

1.2 IBM Business Process Manager life cycle

Figure 1-3 shows the life cycle of a business process.

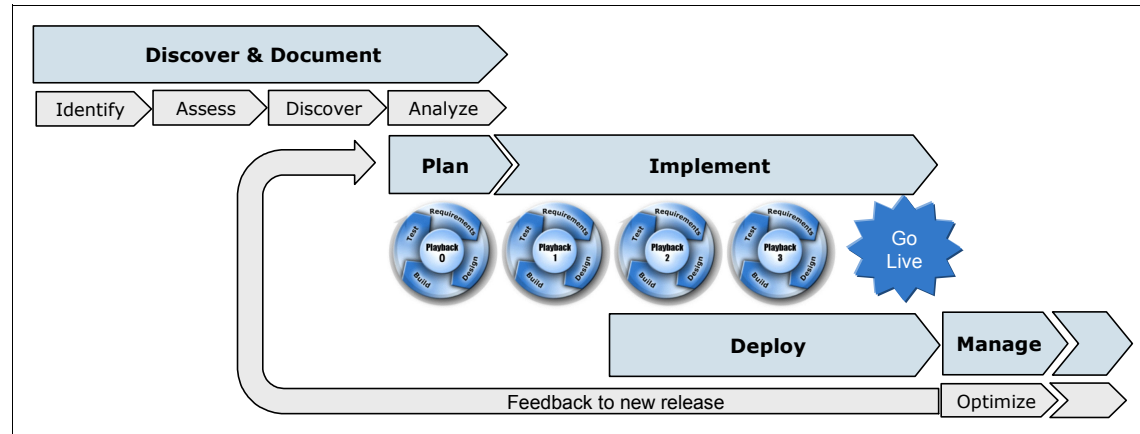


Figure 1-3 Life cycle of a business process

As shown in Figure 1-3, the life cycle of a business process consists of the following stages:

- ▶ Discover and document
- ▶ Plan
- ▶ Implement
- ▶ Deploy
- ▶ Manage

As long as a process is being used there are always actions related to it. Process improvement activity related to the process life cycle does not stop after deploying it, but it must also be managed.

The first stage of the life cycle is used to identify the requirements for a business process and analyze how the process can be modelled in IBM Business Process Manager.

The *plan* and *implement* phases are when the actual development of the business process occurs.

In the *deploy* phase, the newly developed business process is distributed to the environment where it will be executed and used by a business organization.

The *manage* phase concentrates on process improvement activities related to the business process, such as optimizing and initiating updates to the process.

1.3 Overview of Process Server

The Process Server is the runtime environment for business process applications. The Process Server includes capabilities from both IBM WebSphere Process Server V7.0 and IBM WebSphere Lombardi Edition V7.2 and is 100% compatible with existing IBM WebSphere Process Server and IBM WebSphere Lombardi Edition solutions. Note that some WebSphere Lombardi Edition V7.2 libraries might need to be upgraded to V7.5 for the process to be executable.

The Process Server also provides a number of tools, for example, the Process Admin Console. This console enables the management of the Process Servers and deployed applications.

A second tool is the Process Portal, which can be used to give individual users access to execute and manage the tasks of the business processes. In addition, the Process Portal measures performance of business processes, teams, and individuals. The Process Portal delivers an accurate overview covering all aspects of the governed running business processes.

1.4 Overview of Process Center

The Process Center provides the repository used for business process management and the tools used to govern the life cycle of business processes.

Lifecycle management includes the deployment of processes to Process Server runtimes and creating and maintaining snapshot data. In Process Center, a tool known as the Process Center Console provides the ability to maintain the repository, deploy process applications to Process Server environments, and manage running instances of process applications in configured environments.

The Process Center includes a Process Center server (the playback server) and performance data warehouse, allowing users working in the authoring environments to run processes and store performance data for testing and playback purposes.

The repository in the Process Center is where the authored artifacts are saved. IBM Business Process Manager utilizes two authoring environments:

- ▶ *IBM Process Designer* (formerly known as Lombardi Authoring Environment) is an Eclipse-based tool used by business process authors. It offers capabilities to model and implement business processes as process applications. IBM Process Designer includes additional tooling, the Process Inspector and the Process Optimizer, for interacting with processes running on the Process Center Server (playback server) or a Process Server deployment target.
- ▶ *IBM Integration Designer* (formerly known as WebSphere Integration Developer) is an Eclipse-based tool used by IT developers. IBM Integration Designer is used to author complex integrations and fully automated processes that support process applications designed in the Process Designer. It incorporates a fully integrated testing environment using test cases and test suites. Using IBM Integration Designer, IT developers build reusable SOA services, orchestrate those services, and access back-end systems.

1.5 IBM Business Monitor

IBM Business Monitor is comprehensive business activity monitoring (BAM) software that provides an up-to-date view of your business performance. It also provides predictions so that you can take action before process problems occur. Personalized business dashboards process business events and data, and calculate key performance indicators (KPIs) and metrics.

IBM Business Monitor can collect events and data from a wide variety of sources. Sources might include business applications running in either an IBM BPM Express, Standard, or Advanced Process Server runtime environment. Besides IBM BPM environments, events and data can be routed to IBM Business Monitor from other sources, including WebSphere Message Broker, WebSphere MQ Workflow, WebSphere Business Events, WebSphere Enterprise Service Bus, IBM CICS®, and more.

IBM Business Monitor also offers the ability to link strategic organization goals to operational metrics, has capabilities to handle in-flight processes, and improves end-to-end process monitoring by capturing events from many IBM middleware and application sources.



Product and topology concepts

This chapter provides an introduction to the IBM Business Process Manager approach to an end-to-end business process management (BPM) environment and BPM cell topologies. This chapter also provides an overview of the concepts and components that support these environments and topologies.

2.1 Introduction

IBM Business Process Manager V7.5 and IBM Business Monitor V7.5 provide an end-to-end story for business process management. This comprehensive BPM platform provides visibility and management for your business processes.

When this story is approached from a point of view focused on logical layout, there are two levels of consideration to keep in mind:

- ▶ Business process management environment
- ▶ Business process management cell topology

At the highest level, a BPM environment is the arrangement of the unified BPM repository, authoring environments, and runtime execution environments. A typical BPM environment includes authoring environments, a Process Center, and multiple Process Server environments.

Each Process Center environment and each Process Server environment is built on a WebSphere cell. A BPM cell topology is a cell-level view of the nodes, servers, clusters, resources, and functional configuration for a specific cell. WebSphere administration and functional capabilities support the BPM components configured in each cell. In addition, the BPM components are arranged within the cell in order to best meet the requirements.

2.2 Business process management environment

Business process management addresses end-to-end process management and brings order to problems faced by distributed organizations. A Business Process Manager V7.5 environment supports an end-to-end story.

Figure 2-1 illustrates a BPM environment.

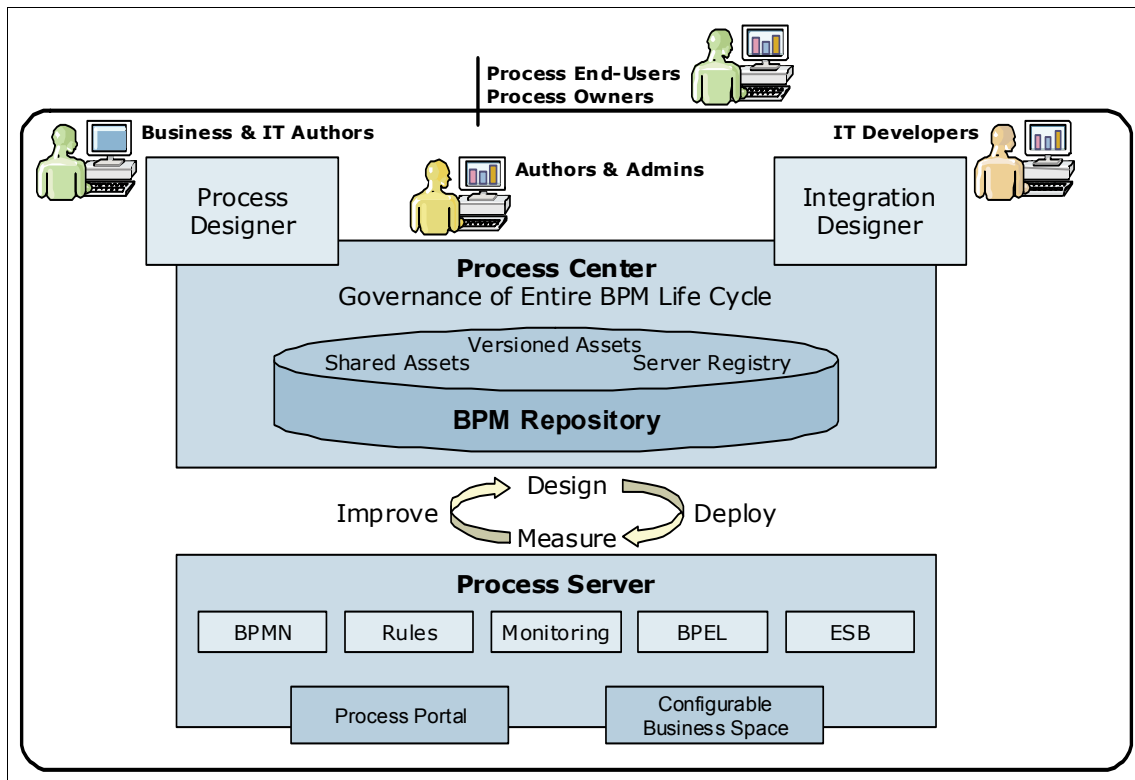


Figure 2-1 A high-level view of a BPM topology

At the core of the BPM environment is the Process Center. The Process Center provides governance over the entire life cycle of a business process. It includes the central repository for multiple process authors working with process application artifacts. The Process Center includes a Process Center Server and a Performance Data Warehouse, which facilitate the building and running of process applications, and also to store performance data for testing and playback purposes during development efforts.

The Process Center is described in detail in Chapter 4, “Process Center and Process Server concepts” on page 59.

On the authoring side of the BPM environment, two authoring environments are utilized:

- ▶ IBM Process Designer
- ▶ IBM Integration Designer

IBM Process Designer is available with all configurations of IBM Business Process Manager V7.5. Each developer downloads his own copy of IBM Process Designer from the Process Center, and the mapping between the authoring environment and the repository is established.

IBM Integration Designer is used with the Advanced configuration of IBM Business Process Manager V7.5. IBM Integration Designer is installed as a stand-alone tool, but a mapping to a Process Center repository can be established.

The business processes created in each of these authoring environments can use built-in tooling and runtime support for integrated business activity monitoring using IBM Business Monitor.

Each of these authoring environments is integral to the overall BPM life cycle, and each offers unique capabilities (Figure 2-2). Authoring environments are also discussed in Chapter 4, “Process Center and Process Server concepts” on page 59.

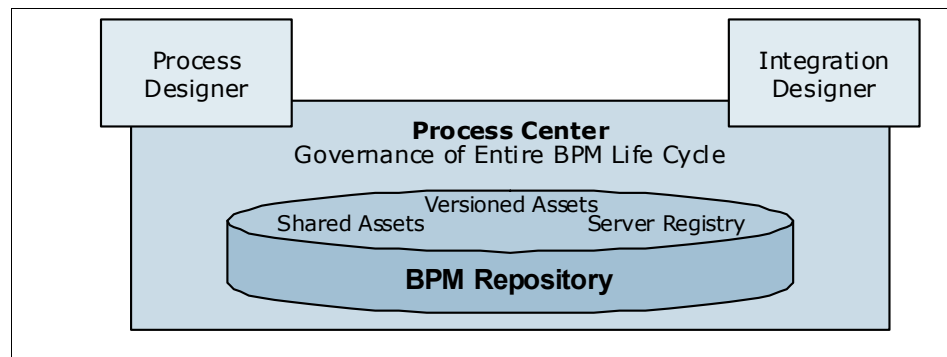


Figure 2-2 Process Center with authoring environments

A Process Server is the runtime environment for process applications. The Process Server provides a runtime environment that can support a range of business processes, service orchestration, and integration capabilities (Figure 2-3).

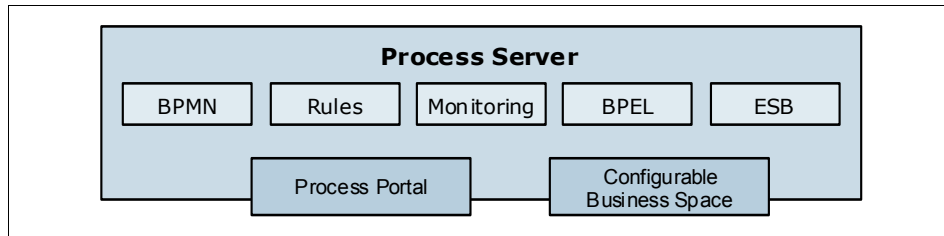


Figure 2-3 Process Server

The arrangement of the authoring environments, Process Center, and runtime environments might vary between BPM environments. The most basic variations to this arrangement include:

- ▶ A BPM environment for Business Process Manager Advanced
- ▶ A BPM environment for Business Process Manager Standard
- ▶ A BPM environment in Business Process Manager Advanced that does not utilize Process Center

2.2.1 BPM environment for Business Process Manager Advanced

For Business Process Manager Advanced, a typical BPM environment includes one Process Center, multiple instances of authoring environments (both IBM Process Designer and IBM Integration Designer), and multiple runtime environments (Process Servers).

Figure 2-4 illustrates an example IBM BPM Advanced environment with multiple authoring environments and multiple runtime environments centered around a single Process Center. This example indicates three Process Server runtime environments. Each of these Process Servers can be utilized in a different capacity. One Process Server can be used for testing, another Process Server can be used for staging, and the final Process Server can be used for production.

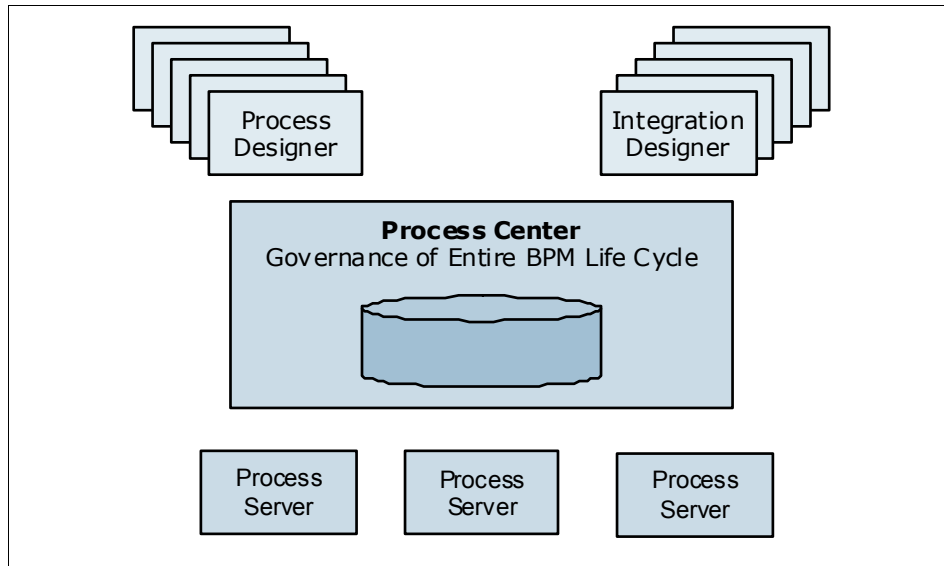


Figure 2-4 A Process Center is at the core of multiple authoring environments and runtime environments

The specific number of instances of the authoring tooling or Process Server runtime environments does not matter to the definition of this pattern. For example, there were three Process Servers illustrated in Figure 2-4. However, even if there are many more Process Server runtime environments configured as deployment targets for this Process Center, that would still be the same basic pattern.

2.2.2 BPM environment for Business Process Manager Standard

Although this book focuses on IBM Business Process Manager Advanced, the basic tenets described for the BPM environment apply to both the Standard and Advanced configurations of the product. However, at this level the main difference is that there is no use of IBM Integration Designer in IBM Business Process Manager Standard.

For Business Process Manager Standard, a typical BPM environment includes one Process Center, multiple instances of IBM Process Designer, and multiple runtime environments (Process Servers).

Figure 2-5 illustrates an example IBM BPM Standard environment with multiple IBM Process Designers and multiple runtime environments centered around a single Process Center. This example indicates three Process Server runtime environments. Each Process Server can be utilized in a different capacity. One Process Server can be used for testing, another Process Server can be used for staging, and the final Process Server can be used for production.

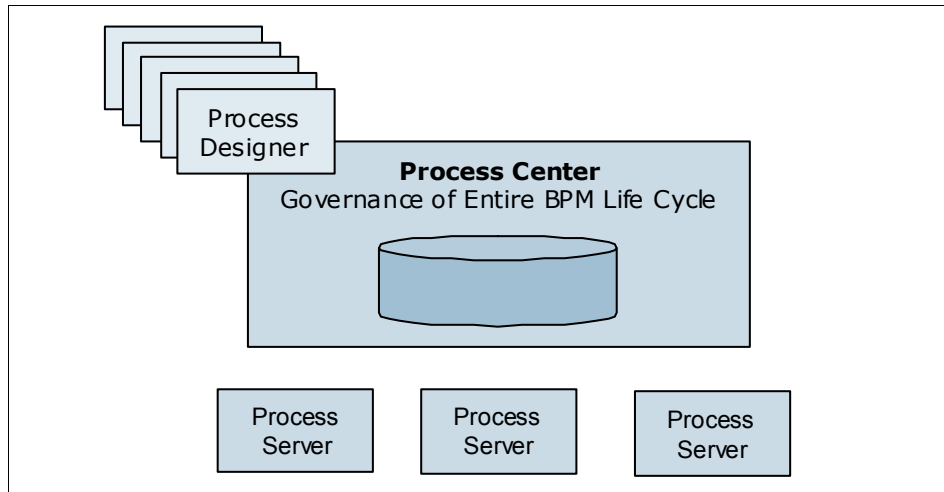


Figure 2-5 A BPM topology for standard utilizes a Process Center, multiple instances of Process Designer, and multiple runtime environments

The specific number of instances of the authoring environment tooling or Process Server runtime environments does not matter to the definition of this pattern. For example, Figure 2-5 illustrated three Process Servers. However, even if there are many more Process Server runtime environments configured as deployment targets for this Process Center, that would still be the same basic pattern.

The runtime functionality provided in the Standard configuration is a subset of the functionality provided in advanced configuration. Chapter 1, "Overview of IBM Business Process Manager V7.5" on page 3, described the differences between the two configurations.

2.2.3 BPM environment for Business Process Manager Advanced that does not utilize Process Center

Specifically regarding Business Process Manager Advanced, there are two scenarios regarding the utilization of Process Center:

- ▶ The environment is enabled for Process Center.
- ▶ The environment is a progression of WebSphere Process Server.

The former is a full and holistic view of the business process management environment. This view applies to both Advanced and Standard editions, and is pertinent to people who are new to BPM, people who are arriving to IBM Business Process Manager via WebSphere Lombardi Edition, and people who are arriving via WebSphere Process Server. Everyone is encouraged to utilize the capabilities provided in a full IBM Business Process Manager environment.

The latter is a subset of the full Business Process Management environment. This view is pertinent only to Advanced edition, and specifically to people who are arriving to IBM Business Process Manager via previous versions of WebSphere Process Server and WebSphere Business Monitor (Figure 2-6).

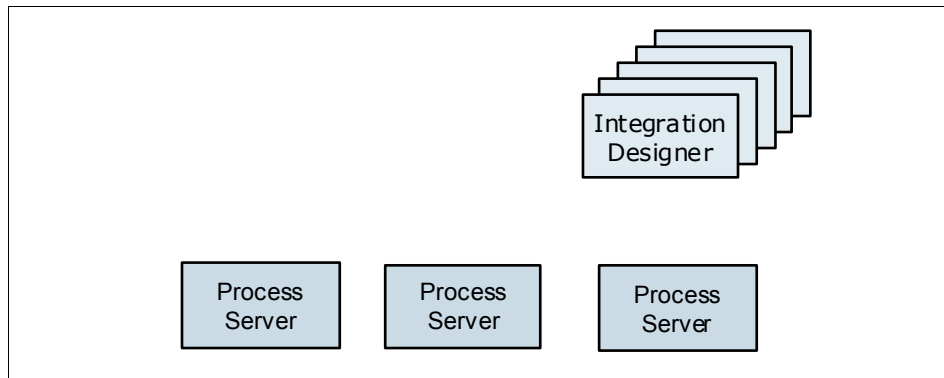


Figure 2-6 A BPM environment that utilizes only the IBM Integration Designer authoring environment and Process Server runtime environments

It is possible to utilize the IBM Integration Designer as the only authoring environment. In this scenario, the Process Center repository is not utilized. The artifacts created in IBM Integration Designer are not associated with process applications and will not be included in a Process Center repository. The artifacts are exported from IBM Integration Designer and deployed directly to the Process Server runtime environments. These actions are exactly the same as the actions performed in the prior versions of WebSphere Integration Developer and WebSphere Process Server.

Because this scenario does not include the BPM repository of Process Center, it is expected that people utilize their own separate managed code repository system and lifecycle management procedures.

It is expected that people progressing into an IBM Business Process Manager V7.5 environment from a prior WebSphere Process Server environment might utilize a BPM topology that does not include a Process Center for some time. However, this is ultimately a transitional configuration. It is expected that the utilization of process applications and the Process Center repository will be introduced as projects permit at an appropriate future time.

2.3 Network deployment environment concepts

IBM Business Process Manager V7.5 is built on WebSphere Application Server V7, and takes advantage of the structures, functionalities, and services provided by WebSphere Application Server.

This section defines basic concepts provided in a WebSphere network deployment environment.

2.3.1 WebSphere network deployment environment cell structure

A WebSphere environment uses a cell structure. When building a cell topology, it is important to understand the parts of this structure and how they are related to each other.

Figure 2-7 illustrates the basic parts of a cell structure. These parts are further described below.

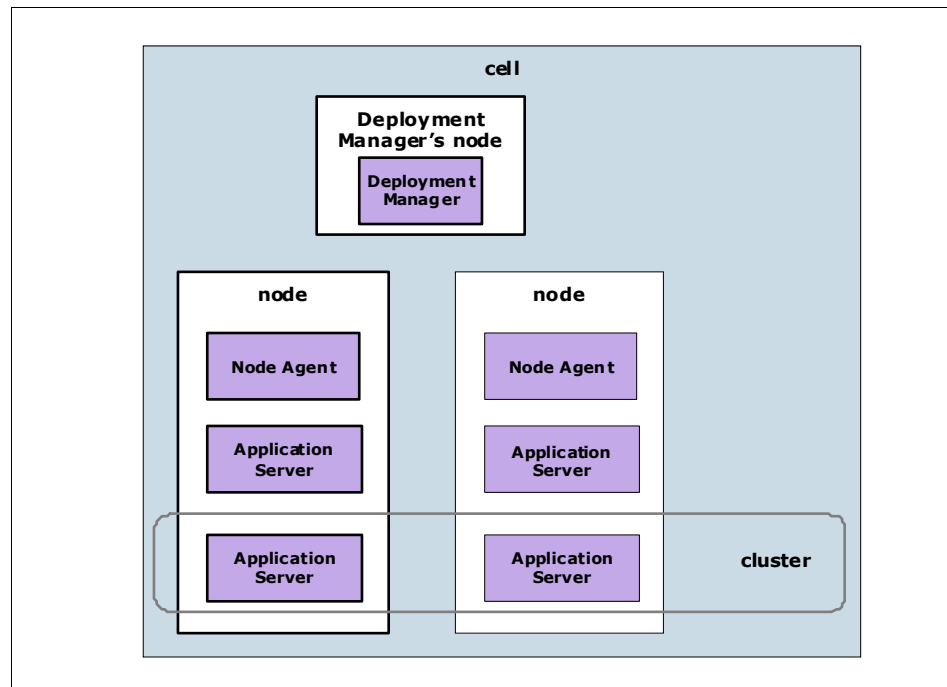


Figure 2-7 Basic components of a cell structure

Cell

A WebSphere cell is an administrative domain. A cell is a grouping of nodes and servers that are centrally managed and have access to shared resources. Nodes within a cell typically control one or more application servers. Each application server hosts one or more applications.

Deployment manager

A WebSphere deployment manager is the central point of administration of a cell. A deployment manager is a specific type of application server whose primary task is the management and configuration of the cell in which it exists.

You can administer the cell using either the Integrated Solutions Console or command-line scripting (wsadmin). Both communicate with the deployment manager (not directly to the application servers). The deployment manager communicates with node agents, which communicate with application servers on the nodes. This allows central administration of the cell through the deployment

manager, which maintains the master repository of configuration information and other artifacts for the cell.

A deployment manager is implemented as a Java Virtual Machine (JVM).

Nodes

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

Node agents

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

Application servers

An application server is a Java virtual machine (JVM) running user applications. Application servers use Java technology to extend web server capabilities to handle web application requests. An application server makes it possible for a server to generate a dynamic, customized response to a client request.

Clusters

Clusters are sets of servers that are managed together and participate in workload management. Clusters enable enterprise applications to scale beyond the amount of throughput achievable with a single application server. Clusters also enable enterprise applications to be highly available if requests are automatically routed (via the IHS Plugin) to the running servers in the event of a failure.

The members of each cluster can be distributed across multiple nodes (referred to as horizontal clustering). Such clusters can increase throughput and provide resilience to both application server and hardware failure.

Multiple members of each cluster could also be created on the same node (referred to as vertical scaling). This might provide better use of available resources, and it can increase throughput and provide resilience to application server failures. Vertical clusters do not provide resilience to hardware failure.

For information about clusters and workload management, see:

http://publib.boulder.ibm.com/infocenter/wasinfo/v7r0/index.jsp?topic=/com.ibm.websphere.nd.multiplatform.doc/info/ae/ae/crun_srvgrp.html

2.3.2 Additional WebSphere network deployment environment concepts

In addition to the basic cell structure, this section describes additional concepts provided in a WebSphere network deployment environment.

Profiles

A profile is a collection of files that defines a runtime environment.

Installing the product onto a machine places the product binaries onto the file system. After the product is installed, creating a profile generates a collection of files specific to the profile type. There are several profile types:

- ▶ Deployment Manager profile
- ▶ Custom profile
- ▶ Standalone Server profile

A profile is created through the **manageprofiles** command or the Profile Management Tool (PMT) graphical user interface.

Note: The PMT graphical user interface is not available on 64-bit operating systems. Use the **manageprofiles** command instead.

A profile corresponds to a node. In a network deployment environment, you will create a deployment manager profile and a number of custom profiles.

The `<app_server_root>/profiles` directory is the default directory in which the profiles are created.

Service integration bus

WebSphere Application Server includes a default messaging provider that uses the service integration bus as the messaging system.

The service integration bus provides a managed communications framework that supports a variety of message distribution models, reliability options, and network topologies. It provides support for traditional messaging applications, as well as enabling the implementation of SOAs within the WebSphere Application Server environment.

There are a number of key concepts related to the service integration bus:

- ▶ Bus member

A bus member is simply an application server, or a cluster, that has been added to a bus. This automatically defines a number of resources on the bus member in question. A key resource automatically defined is the messaging engine.

- ▶ Messaging engine

A messaging engine is a component, running inside a server, that manages messaging resources for a bus member. Applications are connected to a messaging engine when accessing a service integration bus.

2.4 Product components

The IBM Business Process Manager Advanced environment utilizes Process Server and Process Center environments. Each Process Server or Process Center is a WebSphere cell.

Some of the components described below might be familiar from general utilization in WebSphere cells, whereas some components are unique to IBM Business Process Manager or IBM Business Monitor.

2.4.1 Database tables and schemas

IBM Business Process Manager and IBM Business Monitor are configured to use multiple sets of database tables and schemas. The following sets of tables are used to hold, store, and track information:

- ▶ Process Server tables

The Process Server tables are used to hold, store, and track the data for the process application repository, and include all business process definition (BPD) information.

The Process Server tables are utilized in both Process Server and Process Center cells.

Note: The name *Process Server* refers to the IBM Business Process Manager Process Server runtime environment functionality. These tables are not related to, and were not used for, the old WebSphere Process Server product.

- ▶ Performance Data Warehouse tables
The Performance Data Warehouse tables support the Performance Data Warehouse server component.
- ▶ Common database tables (Common or CMNDB tables)
The Common database tables are a group of tables used as a repository for various components, including Mediations, Relationships, Event Sequencing, and Failed Event Manager. There is one set of common database tables per cell. This set of tables must be created prior to starting the IBM Business Process Manager Advanced V7.5 deployment manager.
- ▶ Business Process Choreographer tables (BPEDB tables)
The BPEDB tables are used by the Business Flow Manager and the Human Task Manager, and contain all BPEL process template and instance information. These tables must be created prior to starting BPC components. There is one set of these tables for each Business Process Choreographer deployment target.
- ▶ Business Process Reporting tables (OBSRVDB)
This set of tables can be created in a dedicated database but are typically created as an additional schema in the same database as the BPEDB tables if event collection is not heavily used. These tables are used by the BPC Explorer reporting function to store event information from the Common Event Infrastructure (CEI) bus in an event collector table.
- ▶ Business Space tables (BSPACE tables)
The BSPACE tables are used by the Business Space applications to store configuration data for the various user profiles, space definitions, and page definitions.
- ▶ Monitor tables (MONITOR tables)
The MONITOR tables are used by IBM Business Monitor to store the IBM Business Monitor configuration, monitor model metadata, and monitored data. These tables must be created prior to starting the IBM Business Monitor deployment manager.
- ▶ Cognos® tables (COGNOSCS tables)
IBM Business Monitor requires a set of tables that will be used by Cognos. The IBM Cognos Business Intelligence configuration is stored in these tables.
- ▶ Messaging engine tables (MEDB tables)
Each messaging engine requires a unique set of database tables. There are multiple messaging engines in any BPM environment. There are messaging engines for use by the Process Server bus, the Performance Data Warehouse bus, the Service Component Architecture (SCA) system and application

buses, the CEI bus, the business monitor bus, and the Business Process Choreographer bus. Because each messaging engine needs a separate set of tables, these tables are often created using separate schemas within the same database.

- Common Event Infrastructure tables (EVENT tables)

The EVENT tables contain the persisted common base events (CBEs).

The EVENT tables can be used during development to verify the content of CBEs. In a production environment, the persistence of events into this database is typically disabled because of performance implications. In IBM Business Process Manager Advanced V7.5, these tables are no longer automatically required when configuring a deployment environment.

When the entire collection of tables is considered, the arrangement of sets of tables per database has some flexibility. The arrangement that is best for you depends on the type of database to be used and your requirements.

Chapter 5, “Preparing your topology” on page 83, describes the database tables in additional detail.

2.4.2 Service integration buses

A service integration bus supports applications using message-based and service-oriented architectures. A bus is a group of interconnected servers and clusters that have been added as members of the bus. Applications connect to a bus at one of the messaging engines associated with its bus members. IBM Business Process Manager and IBM Business Monitor are configured to use multiple Service Integration Buses.

- Process Server bus

This bus is used for transmitting messages internally for Process Server functionality.

Note: The name *Process Server* refers to the IBM Business Process Manager Process Server runtime environment functionality. This service integration bus is not related to, and was not used for, the old WebSphere Process Server product.

- Performance Data Warehouse bus

This bus is used for transmitting messages internally for Performance Data Warehouse functionality.

► SCA system bus

This bus is used to host queue destinations for SCA modules. The SCA runtime uses these queue destinations to support SCA asynchronous interactions between components and modules.

► SCA application bus

The SCA Application Bus is a default bus for the purpose of providing a service integration bus for use by modules where no SCA service integration logic is needed. For example, the default behavior is to use this bus to support the asynchronous communication of the WebSphere Business Integration Adapters or application components deployed with JMS bindings.

► Business Process Choreographer bus

This bus is used for transmitting messages internally in the Business Flow Manager.

► Common Event Infrastructure bus

This bus is used to transmit common base events asynchronously to a CEI server, and can be used to distribute common base events from CEI to Event Group destinations.

► Monitor bus

This bus is used in the processing of events delivered to various JMS queues associated with monitor models. If table-based event delivery (formerly known as *queue bypass*) is configured, IBM Business Monitor connects directly to the Monitor database. However, the bus is still required for:

- The error queue destination for events that a monitor model failed to process
- The *JMS emitter* queue destination for JMS TextMessages that are to be transformed into Common Base Events (CBEs) and then further routed through the Common Event Infrastructure.

2.4.3 Process Center server

The Process Center server includes a repository for all process applications, business process diagrams, service components, and other assets created in the Business Process Manager authoring environments. The Process Center server also provides a number of tools:

- ▶ Process Center Console enables you to maintain the repository.
- ▶ Process Admin Console enables you to manage the configuration of process servers across the set of runtime environments. In addition to managing these process server instances, the Process Admin Console also manages deployed processes and users.
- ▶ Using Process Portal, you can complete the tasks that result from running artifacts generated by IBM Process Designer. In addition, if you have the associated permission, you can use Process Portal to start and stop BPMN processes, manage and run tasks for each BPMN process, and view the performance of individuals, teams, and BPMN processes.

The functionality provided in a Process Center server is further clarified in Chapter 4, “Process Center and Process Server concepts” on page 59.

2.4.4 Process Server server

The runtime environment of a Process Server cell is referred to as the Process Server server. The Process Server server is a runtime environment where process applications are exposed and made available to execute and manage process tasks. The Process Server server also provides a number of tools:

- ▶ The Process Admin Console provides the functionality to allow you to manage the process servers in your runtime environments. The Process Admin Console also manages deployed processes and users.
- ▶ The Process Portal provides the functionality to allow you to complete the tasks that result from running processes on a process server in a runtime environment. In addition, if you have the associated permission, you can use Process Portal to start and stop processes, manage and run tasks for each process, and view the performance of individuals, teams, and processes.

Chapter 4, “Process Center and Process Server concepts” on page 59, further clarifies the functionality provided in a Process Server server.

2.4.5 Business Performance Data Warehouse

The Business Performance Data Warehouse component collects and aggregates process data from running processes. You can use this data to improve your business processes.

2.4.6 Business Process Choreographer

Business Process Choreographer container (BPC) is an enterprise workflow engine that supports BPEL business processes and human tasks with transactionality. The core of the BPC configuration consists of the following components:

- ▶ Business Flow Manager (BFM)

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

- ▶ Human Task Manager (HTM)

This component manages human tasks. The BPC Explorer can be used to dynamically change the behavior of human tasks, such as transferring ownership of a task or assigning an expiration date at run time. It also allows for programmatic control of the human task flow

2.4.7 Business Process Choreographer Explorer (BPC Explorer)

Business Process Choreographer Explorer is a web application that can be installed as part of the configuration of the business process container. Before you can start using Business Process Choreographer Explorer from a web browser, you must have installed the business process container, human task container, and the Business Process Choreographer Explorer application. The event collector application must be installed and running in order to use the reporting function.

Depending on your user role, you can use Business Process Choreographer Explorer to manage BPEL business processes and human tasks, or to work with your assigned tasks. While BPEL business processes and tasks are running, the runtime can emit events that contain information about state changes of process instances and their related activities. Using reporting, you can retrieve statistical information based on these events and create reports on processes and activities.

2.4.8 Business Rules Manager

The Business Rules Manager is a web-based tool that assists the business analyst in browsing and modifying business rule values.

Business rules are designed and developed in IBM Integration Designer using if/then rule sets and decision tables to implement their operations. The rule sets and decision tables are set into templates. The templates control which aspects of a business rule you can modify and by exactly how much. They define the structure of if/then rules, condition cases, and actions for decision tables.

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

2.4.9 Common event infrastructure

A business event is a significant occurrence in a business process that warrants monitoring over time. A business process component can be configured to generate an event. These events are then used to evaluate whether an aspect of the business reaches predefined goals. IBM Business Process Manager uses the CEI for basic event management services and IBM Business Monitor uses the CEI as a source of events that are analyzed historically. Events can be published to the CEI server for possible distribution to JMS queues and topics. If enabled for non-production environments, events might also be persisted to a database.

2.4.10 Business Space powered by WebSphere

Business Space powered by WebSphere is a browser-based graphical user interface that allows the customization of content. It provides a common presentation layer for application users to manipulate the web interfaces of BPM applications.

2.4.11 Monitor action services

Monitor action services is a component of IBM Business Monitor that invokes responses to defined situation events emitted by IBM Business Monitor and other applications. The actions performed are based on user-defined action templates. For example, IBM Business Monitor action services might respond by sending dashboard alerts or e-mail notifications when it receives defined situation events.

2.4.12 Monitor scheduled services

IBM Business Monitor utilizes several scheduled services. Because multiple services require scheduled execution, you can configure and use the Monitor scheduled services component to control when and how often you run some services. You can use the administrative console to schedule and manage services specific to each monitor model.

Using the Monitor scheduled services component, you can:

- ▶ Suspend and resume services.
- ▶ Indicate how often to run a service.
- ▶ View the status, duration, and last completion time of the scheduled service at the model or model version level.

It is possible to assign a priority to each scheduled service.

You can view and schedule the following Monitor data services:

- ▶ Data Movement Service
Before scheduling this service, you must enable it.
- ▶ KPI History Calculation
This runs once every hour.
- ▶ KPI Prediction Calculation
This runs once every hour.
- ▶ Dynamic Alert Evaluation
- ▶ Cube Summary Table (MQT) refresh
Before scheduling this service, you must enable it.
- ▶ Cognos Cache Clearing
- ▶ Purge and Archive Instance Data

2.4.13 IBM Cognos

IBM Business Monitor uses a fully integrated IBM Cognos Business Intelligence Server Version 10.1.0.1 for analysis and reporting on historical data. In IBM Business Monitor V7.5, new embedded technology from Cognos Business Intelligence provides an updated graphical interface. Also new in IBM Business Monitor V7.5 is the use of Cognos Business Intelligence self-learning in-memory caching.

2.4.14 IBM HTTP Server and plug-in

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

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

The BPM cell topologies described in this book use this load-balancing functionality to route requests from Business Space widgets to the Representational State Transfer (REST) gateway services, from the BPCEXplorer UI to the BPEContainer and HTMContainer REST services. Essentially, this is to decouple the web UI interfaces from the backend data requests by acting as a HTTP sprayer.

2.4.15 WebSphere proxy server

The WebSphere proxy server is used to classify, prioritize, and route HTTP and SIP requests to servers in the enterprise and cache server content. It can be used in the BPM cell topologies described in this book in a similar way to the IBM HTTP Server and plug-in.

2.5 Business process management cell topologies

There are many cells in a BPM environment. Figure 2-8 illustrates three cells, as indicated by the blue boxes. The Process Center and each Process Server are cells and each utilize a BPM cell topology. The authoring tools, IBM Process Designer and IBM Integration Designer, are not cells and are not included in the figure. However, each IBM Process Designer and IBM Integration Designer requires connectivity to the Process Center cell in order to publish artifacts to the BPM repository.

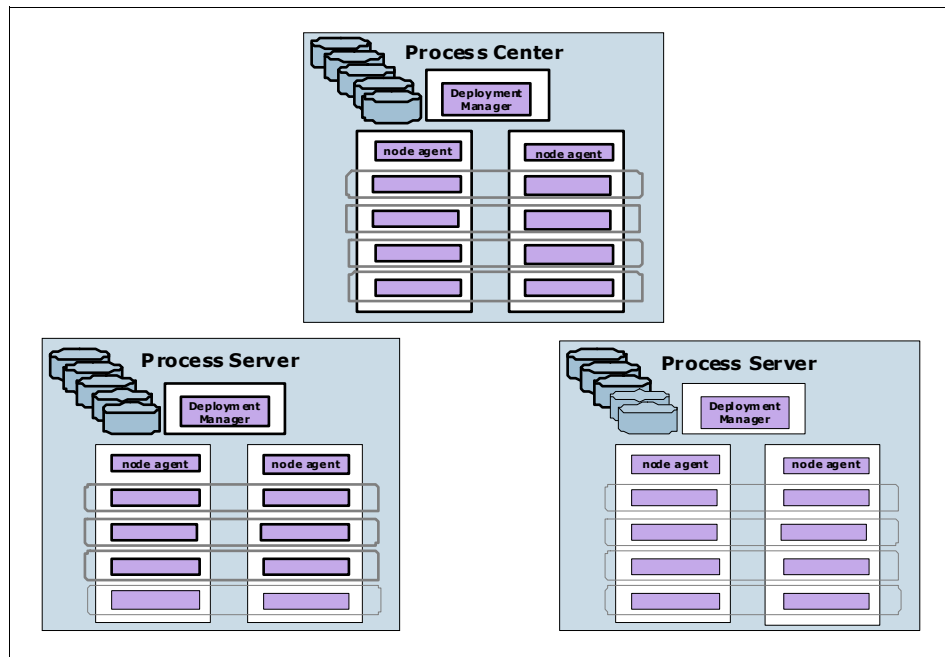


Figure 2-8 The Process Center and each Process Server are cells and will each have a cell topology

A business process management cell topology is the logical layout of the deployment environment required to meet your business needs for capacity, availability, and scalability. Key aspects of the BPM cell topology design are:

- ▶ The number and location of physical machines (in distributed environments)
- ▶ The number of application servers (on distributed platforms, each application server is a JVM) on those machines
- ▶ The number of application server clusters needed to provide your production environment with the processing capabilities required by your business.

In addition, a production deployment topology includes other supporting resources such as a user registry (for security), one or more HTTP servers (for web content or IP spraying), necessary firewalls, load balancers, and so forth.

The production deployment topology must be carefully planned, and it must include the following considerations:

- ▶ Number of physical machines and hardware resources that are required to support your business
- ▶ Number of clusters and cluster members required to support your business
- ▶ Number of database instances required
- ▶ Authentication roles and security considerations
- ▶ Method that you will use to implement the deployment environment
- ▶ The cost of software and hardware

To make the topology design and implementation process easier, a set of deployment environment patterns that represents common production topologies have been defined. These patterns are offered via the Deployment Environments wizard and wsadmin scripting. Both mechanisms for topology generation also can be customized.

Note: The BPM cell topologies described in this document do not specifically consider software-licensing costs. Investigate these costs as part of any production topology decision.

2.5.1 BPM cell topologies for Process Center and Process Server

The layout of the BPM cell topologies used for Process Center and Process Server cells follow the same general pattern.

The primary difference between a Process Center cell and a Process Server cell is the use of the cell. A Process Server cell used as a production runtime environment might be expected to support a constant and high volume of traffic. A Process Center cell used as the master repository of the BPM environment is expected to support a known set of developers and administrators. Although it might not have a significant number of users accessing it at any given time, it is the master repository and playback server, and therefore might need to cope with a large number of process applications.

The Process Center cell might differ in topology from the Process Server cells associated with it. In addition, Process Server cell topologies might differ from each other.

2.5.2 Deployment environments

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.

You can easily build a deployment environment via the deployment environment wizard provided in IBM Business Process Manager and IBM Business Monitor.

The following deployment environment patterns are available in an IBM Business Process Manager Standard or Advanced:

- ▶ Single cluster
- ▶ Remote messaging
- ▶ Remote messaging and remote support
- ▶ Remote messaging, support, and web

In an IBM Business Process Manager Standard environment, the 3-cluster topology, remote messaging and remote support, is typically the suggested topology. This applies to both a Process Center cell and a Process Server cell.

In an IBM Business Process Manager Advanced environment, the 4-cluster topology, Remote Messaging, Support, and Web, is typically the suggested topology. This applies to both a Process Center cell and a Process Server cell.

The following deployment environment patterns are available for creating IBM Business Process Manager plus IBM Business Monitor topologies:

- ▶ Single cluster
- ▶ Remote messaging, support, and web

In an IBM Business Process Manager plus IBM Business Monitor environment, the 4-cluster topology, Remote Messaging, Support, and Web, typically is the suggested topology.

Chapter 3, “Clustered topology choices” on page 37, further describes these cell topologies.

2.5.3 Other cell topologies

The deployment environment wizard provided in IBM Business Process Manager and IBM Business Monitor provides a simplified path for creating and configuring deployment targets. However, using the deployment environment wizard is not the only way to create and configure the clusters in your cell. If all runtime requirements are well understood, it is possible to piece together an optimized cluster configuration.

Note: The IBM Business Process Manager and IBM Business Monitor Information Centers provide help for piecing together a customized cluster configuration. Configuration actions can be performed via the AdminConsole or via the command line.

- ▶ IBM Business Process Manager v7.5 InfoCenter, “Creating a customized network deployment configuration”
http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/index.jsp?topic=%2Fcom.ibm.wbpm.imuc.ebpmps.doc%2Ftopics%2Fccnfg_env_using_console.html
- ▶ IBM Business Monitor v7.5 InfoCenter, “Configuring the environment manually”
http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/index.jsp?topic=%2Fcom.ibm.wbpm.mon.imuc.doc%2Finst%2Fadmin_configmanual_ov.html

Some topologies that are regularly utilized are:

- ▶ Five-cluster topology
The 5-cluster topology distributes the monitor model workload away from the business process workload. Assistance for building this topology pattern is not offered through the deployment environments wizard. This topology can be built manually.
- ▶ Multiple deployment targets in one cell
In some Process Server runtime environments, there might be requirements that are best met via the use of multiple deployment targets in one cell. Be aware that each deployment target for Business Process Manager process applications requires unique resources, including its own set of Process Server tables, Performance Data Warehouse tables, and Business Process Choreographer tables.
The topic of multiple deployment targets in one cell is acknowledged in Chapter 10, “Advanced topics” on page 345.
- ▶ Integrating additional products
In some cases, it might be possible to install and configure an additional WebSphere product in the same cell as your Process Center environment or your Process Server environment. In this case, new clusters that are dedicated to the additional product can be created and configured.
Be aware that the artifacts used by these additional products might or might not be included in the Process Center repository. Take proper considerations to package artifacts accordingly so that such artifacts can be manually

deployed to servers or clusters that are not enabled for IBM Business Process Manager.



Clustered topology choices

In Chapter 2, “Product and topology concepts” on page 11, two levels of topology were described:

- ▶ The topology of the end-to-end BPM environment
- ▶ The topology of each cell

This chapter focuses on the topology choices of each cell. There is a cell for the Process Center environment and a cell for each Process Server environment.

This chapter describes cell topologies and the factors involved in selecting an appropriate topology for each cell. Various deployment requirements can be fulfilled by different topology choices, including:

- ▶ Single Cluster topology
- ▶ Remote Messaging topology
- ▶ Remote Messaging and Remote Support
- ▶ Remote Messaging, Support, and Web
- ▶ Five-cluster topology

The chapter includes discussions and suggestions about how to select a production topology to meet your requirements.

3.1 Topology choice factors

In 2.5, “Business process management cell topologies” on page 32, we introduce key aspects of the cell topology design. The goal of building and configuring any cell in the BPM environment is to meet your business needs for functionality, capacity, availability, and scalability. These factors include, but are not limited to:

- ▶ The components to be utilized and how heavily each is to be used.
For example:
 - Types of business processes to be implemented
 - Business Space
 - Common Event Infrastructure
- ▶ Application invocation patterns.
- ▶ Load on the system, including numbers of users or applications.
- ▶ The number of application server clusters and cluster members needed to provide your production environment with the processing capabilities required by your business.
- ▶ Individual scalability requirements.

In addition to the factors listed above, the selection of an appropriate topology for each of your cells can be influenced by additional factors unique to your situation. In this case, trade-offs might be necessary. These additional factors include, but not limited to:

- ▶ Available hardware resources
- ▶ Hardware and software costs
- ▶ Administrative effort involved

When selecting a cell topology, a good place to start is to examine the suggested topology (sometimes referred to as a *golden topology*) to understand how that topology stacks up to your requirements. The suggested topology varies with the products involved. For an IBM Business Process Manager Standard environment, the Remote Messaging and Remote Support topology is the typical topology. For an IBM Business Process Manager Advanced environment, the Remote Messaging, Support, and Web topology is the typical topology. For an IBM Business Process Manager Standard or Advanced plus IBM Business Monitor, the Remote Messaging, Support and Web topology is the typical topology.

A number of topologies, including the suggested topologies, are commonly utilized. The Deployment Environments wizard, found in the Integrated Solutions Console, helps you create and configure these well-known topologies. The

following deployment environment patterns are available in an IBM Business Process Manager Standard or Advanced:

- ▶ Single Cluster
- ▶ Remote Messaging
- ▶ Remote Messaging and Remote Support
- ▶ Remote Messaging, Support, and Web

The following deployment environment patterns are available for creating IBM Business Process Manager plus IBM Business Monitor topologies:

- ▶ Single Cluster
- ▶ Remote Messaging, Support, and Web

Your choice of topology ultimately depends on your individual business requirements. It is possible that your business requirements, along with a detailed understanding of the products, will lead to a topology that is slightly different from those created via the Deployment Environments wizard. In this case, it is possible to piece together an optimized cluster configuration. Of the topologies described in the following sections, the Five Cluster topology falls into this category, as the Deployment Environment wizard can be utilized to create a Remote Messaging, Support, and Web topology, and then you can manually create the fifth cluster and configure for monitor.

Topology selection: As you plan for your production environment, carefully consider the advantages and disadvantages of each of these common topology patterns.

3.2 Single Cluster topology

A Single Cluster topology is available for the following environments:

- ▶ IBM Business Process Management Standard
- ▶ IBM Business Process Management Advanced
- ▶ IBM Business Process Management Standard or Advanced plus IBM Business Monitor environment

It can be easily created via the Deployment Environment wizard.

Figure 3-1 shows a sample configuration of the Single Cluster topology for IBM Business Process Management Advanced. In this topology, the lone cluster hosts:

- ▶ Six messaging engines
- ▶ Process Center server (including the Process Center Console, Process Admin Console, and Process Portal) or Process Server server (including the Process Admin Console and Process Portal)
- ▶ Performance Data Warehouse
- ▶ Business Process Choreographer (for BPEL)
- ▶ Business Process Choreographer Explorer (for BPEL)
- ▶ Business Space
- ▶ Business Rules Manager

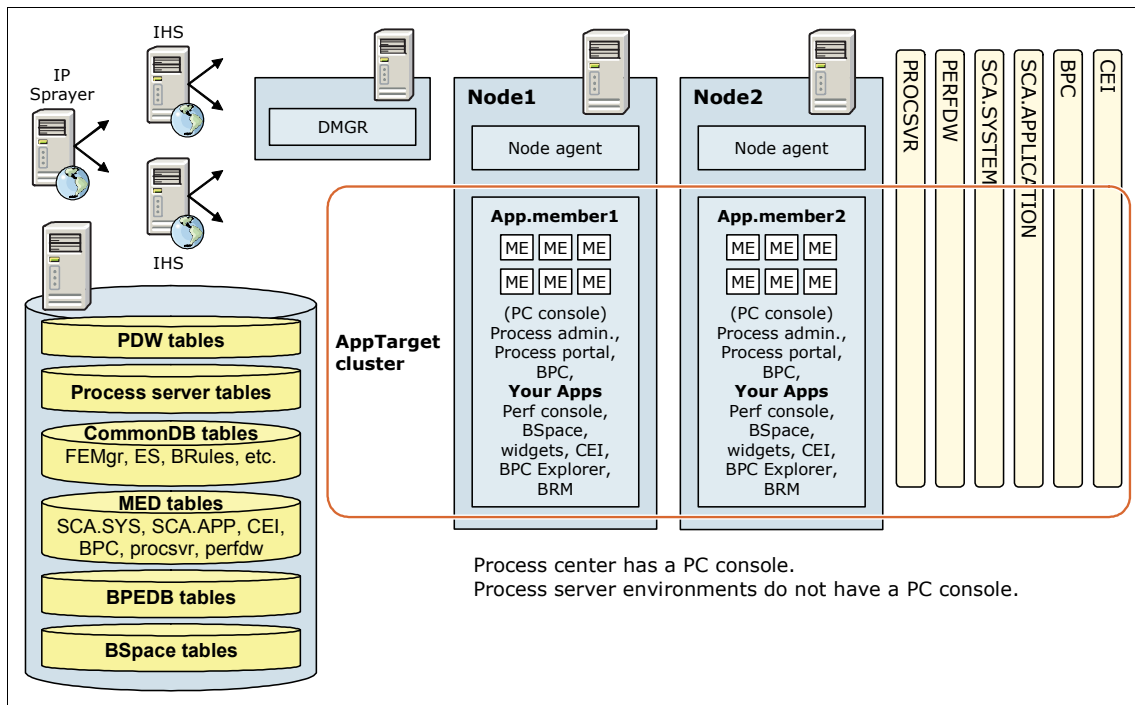


Figure 3-1 Single Cluster topology sample configuration

To this cluster, you will also deploy the process applications that you create via IBM Process Designer and IBM Integration Designer. The WebSphere Integrated Solution Console runs in the Deployment Manager. This cell also utilizes many sets of database tables:

- ▶ The Common database tables
- ▶ Process Server tables
- ▶ PDW tables
- ▶ Six sets of messaging engine tables
- ▶ BPEDB tables
- ▶ Tables for the BPC Reporting function
- ▶ Tables for Business Space

Note: The following information applies to the Single Cluster topology for IBM Business Process Manager Standard:

- ▶ The lone cluster hosts:
 - Two messaging engines (one for Process Server, one for PDW)
 - Process Center server (including the Process Center Console, Process Admin Console, and Process Portal) or Process Server server (including the Process Admin Console and Process Portal)
 - Performance Data Warehouse
- ▶ To this cluster, you will also deploy the process applications that you create via IBM Process Designer.
- ▶ The WebSphere Integrated Solution Console runs in the Deployment Manager.
- ▶ This cell also utilizes many sets of database tables:
 - The Process Server tables
 - PDW tables
 - Two sets of messaging engine tables

Note: The following applies to the Single Cluster topology when IBM Business Monitor is included:

- ▶ The lone cluster also hosts:
 - A messaging engine for Monitor
 - A messaging engine for Common Event Infrastructure
 - If Business Process Manager Advanced and Monitor are configured together, then a single messaging engine for CEI is shared.
 - The Cognos application
 - Business Space
 - If Business Process Manager Advanced and Monitor are configured together, then a single Business Space is shared.
 - Monitor widgets
- ▶ To this cluster, you will also deploy your Monitor Models.
- ▶ This cell utilizes additional tables for Monitor, Cognos, each messaging engine, and Business Space.
- If Business Process Manager Advanced and Monitor are configured together, then a single Business Space and Business Space tables are shared.

The Single Cluster topology is most suitable for environments with limited workload isolation requirements and limited hardware. This topology is most frequently utilized for early test environments. Because all of the components are installed in the same cluster, there are fewer total application server processes in the cell. Because each application server process requires runtime memory, and there are fewer application server processes, it might be possible to utilize smaller hardware. However, each server instance must run the supporting applications and your integration applications. Therefore, the memory requirements for the individual Java Virtual Machines (JVMs) are much greater (which becomes a limitation in a 32-bit JVM). In addition, one or more members of the cluster must also run the messaging engines required for asynchronous interactions.

Combining all aspects of the Business Process Management environment into a single cluster has other implications aside from the increased memory requirements for each server process. All types of workload, including business processes, CEI, and Business Space, are performed in every cluster member. In addition, any cluster member hosting an active messaging engine has messaging workload. Because all of these components are running in the same

server process, a failure in a server process will impact all of the work in that server process.

From an administrative perspective, there is only one cluster to be started and stopped, and only one cluster's worth of cluster members' logs, such as `SystemOut.log`, to be monitored. However, because the cluster is hosting every type of component, the cluster members' log files, such as `SystemOut.log`, contain the output from all types of workload.

From a scalability perspective, the ability to do more work can be increased by increasing the memory available to the existing cluster members or by adding another member to the cluster. The most common pattern for adding a cluster member is to create another node and add another cluster member on that node.

All components are scaled at the same rate, with the exception of the messaging engines, because each messaging engine is a singleton. In Figure 3-1 on page 40, the active messaging engines are indicated by the lighter icons, and the standby messaging engines are indicated by the shaded icons. It is possible to disperse the messaging workload across the cluster by creating a Core Group policy for each active messaging engine.

3.3 Remote Messaging topology

The Remote Messaging topology is the two-cluster topology. It can be created in IBM Business Process Manager Standard or Advanced via the Deployment Environment wizard.

The most visible difference between the Remote Messaging topology and the Single Cluster topology is the location of the messaging engines. In the Remote Messaging topology, the messaging engines are located in a cluster separate from the rest of the functionality. Not only does this relieve the other cluster of the messaging workload, but it is also valuable because it limits the impact of specific failure scenarios.

Figure 3-2 shows a sample configuration of the Remote Messaging topology for IBM Business Process Management Advanced.

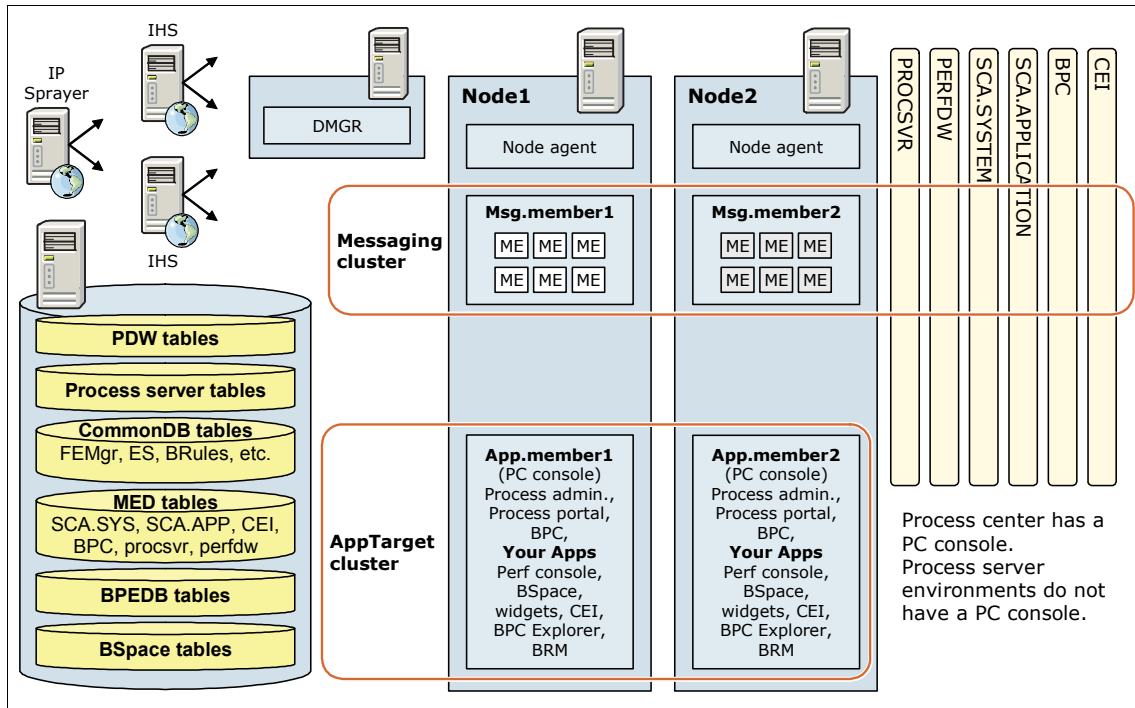


Figure 3-2 Remote Messaging topology sample configuration

Note: The following information applies to the Remote Messaging topology for IBM Business Process Manager Standard:

- ▶ The messaging cluster hosts: Two messaging engines (one for Process Server, one for PDW).
- ▶ The application cluster hosts:
 - Process Center server (including the Process Center Console, Process Admin Console, and Process Portal) or Process Server server (including the Process Admin Console and Process Portal)
 - Performance Data Warehouse
- ▶ To the application cluster, you will also deploy the process applications that you create via IBM Process Designer.
- ▶ The WebSphere Integrated Solution Console runs in the Deployment Manager.
- ▶ This cell also utilizes many sets of database tables:
 - The Process Server tables
 - PDW tables
 - Two sets of messaging engine tables

From a scalability perspective, the ability to do more work can be increased by:

- ▶ Increasing the memory available to the existing cluster members
- ▶ Adding another member to the application cluster
- ▶ Adding another member to the messaging cluster and creating a core group policy for each active messaging engine so that the active messaging engines are dispersed across the cluster members

The most common pattern for adding a cluster member is to create another node and add another cluster member on that node.

When adding another member to a cluster, all components configured on that cluster are scaled at the same rate. In this topology, this applies to the application cluster. If you require a more fine-grained scalability of the specific components used in the application cluster, the Remote Messaging topology is not the correct choice.

The messaging cluster's purpose is to host the messaging engines. Because each messaging engine is a singleton, merely adding another member to the Messaging cluster has no effect. In Figure 3-2 on page 44, the active messaging engines are indicated by the lighter icons, and the standby messaging engines are indicated by the shaded icons. It is possible to disperse the messaging

workload across the cluster by creating a Core Group policy for each active messaging engine. Spreading the messaging engines across server members using policies can allow you to split the messaging burden across the cluster's members. However, even when utilizing core group policies, adding more cluster members to the messaging cluster than you have active messaging engines has no scaling effect on the processing capability of the messaging infrastructure.

From an administrative perspective, there are two clusters' worth of cluster members' logs, such as `SystemOut.log`, to be monitored, and two clusters to be started and stopped. The application cluster is dependant on the messaging cluster for the messaging engines. Although generally benign, to avoid errors or warnings during startup of the application cluster, it is suggested that you start the messaging cluster first and ensure that all of the messaging engines start cleanly. Likewise, to avoid errors or warnings when stopping the clusters, stop the application cluster first, then stop the messaging cluster.

3.4 Remote Messaging Remote Support topology

The Remote Messaging Remote Support topology is a three-cluster topology. It can be created in IBM Business Process Manager Advanced or Standard via the Deployment Environment wizard. This topology is the suggested topology for IBM Business Process Manager Standard without IBM Business Monitor.

The most visible difference between the Remote Messaging Remote Support topology and the Remote Messaging topology is the location of the components that support the execution of your process applications, but are not required to be in the same server process as your process applications. Support components include the Performance Data Warehouse and the Common Event Infrastructure. In this topology, the support cluster also includes Business Space, the Business Process Choreographer Explorer, and the Business Rules Manager. Not only does this relieve the application cluster from the workload of the supporting components, but it is also valuable because it limits the impact of specific failure scenarios.

Figure 3-3 shows a sample configuration of the Remote Messaging Remote Support topology for IBM Business Process Management Advanced.

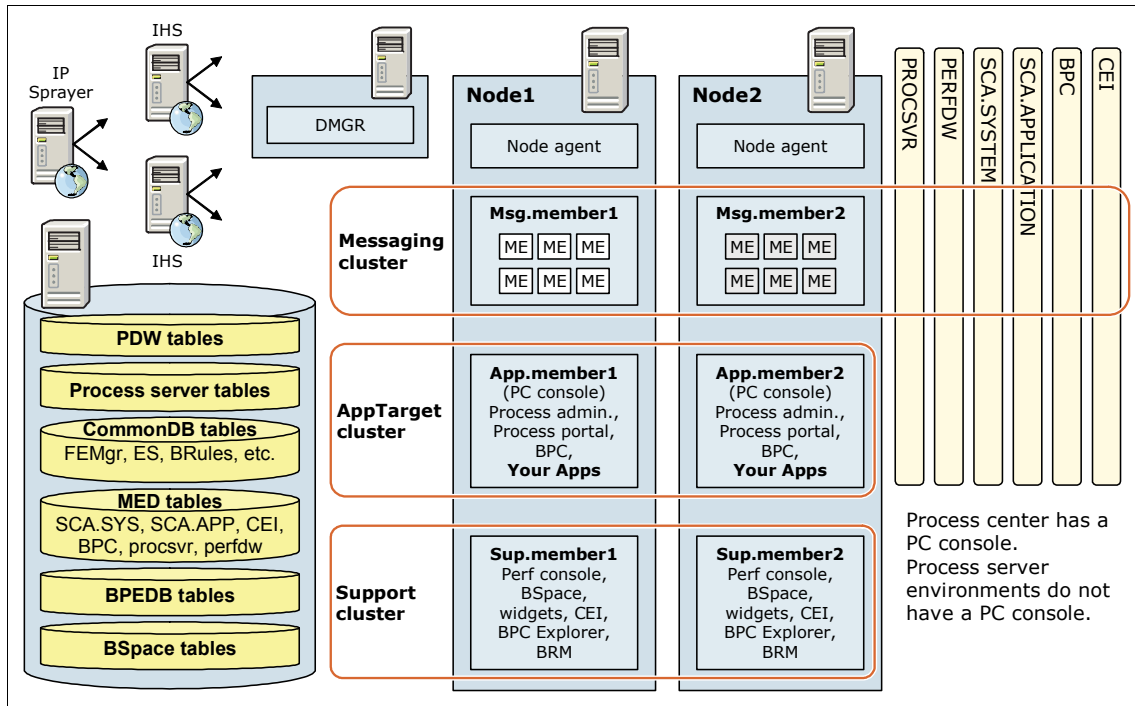


Figure 3-3 Remote Messaging Remote Support topology sample configuration

Note: The following applies to the Remote Messaging topology for IBM Business Process Manager Standard:

- ▶ The messaging cluster hosts: Two messaging engines (one for Process Server, one for PDW).
- ▶ The application cluster hosts:
Process Center server (including the Process Center Console, Process Admin Console, and Process Portal) or Process Server server (including the Process Admin Console and Process Portal)
- ▶ The support cluster hosts: Performance Data Warehouse.
- ▶ To the application cluster, you will also deploy the process applications that you create via IBM Process Designer.
- ▶ The WebSphere Integrated Solution Console runs in the Deployment Manager.
- ▶ This cell also utilizes many sets of database tables:
 - The Process Server tables
 - PDW tables
 - Two sets of messaging engine tables

The hardware requirements for distributed platforms are more intensive, but having more clusters performing specific functions allows greater flexibility when adjusting and tuning memory and CPU usage for the JVMs.

This three-cluster topology has more administrative burden than the smaller Single Cluster or Remote Messaging topologies. There are three clusters' worth of cluster members' logs, such as `SystemOut.log`, to be monitored and three clusters to be started and stopped.

Your performance-tuning plan must address all three clusters. However, due to the greater division of workload among the three clusters, you can pinpoint performance bottlenecks and adjust the configuration fairly easily.

From a scalability standpoint, the Remote Messaging and Remote Support topology provides more flexibility than Remote Messaging topology. The ability to do more work can be increased by:

- ▶ Increasing the memory available to the existing cluster members
- ▶ Adding another member to the application cluster
- ▶ Adding another member to the support cluster
- ▶ Adding another member to the messaging cluster and creating a core group policy for each active messaging engine so that the active messaging engines are dispersed across the cluster members

The most common pattern for adding a cluster member is to create another node and add another cluster member on that node.

When adding another member to a cluster, all components configured on that cluster are scaled at the same rate. In this topology, this applies to the application cluster and to the support cluster. However, because the application cluster and the support cluster are configured to host different components, they can be scaled independently. For example, if you need additional CEI processing, you can simply add a cluster member to the support cluster and not do anything to the application cluster. Similarly, if you need more processing capability for your business processes or human tasks, you can add cluster members to the application target cluster.

The messaging cluster's purpose is to host the messaging engines. Because each messaging engine is a singleton, merely adding another member to the messaging cluster has no effect. In Figure 3-3 on page 47, the active messaging engines are indicated by the lighter icons, and the standby messaging engines are indicated by the shaded icons. It is possible to disperse the messaging workload across the cluster by creating a core group policy for each active messaging engine. Spreading the messaging engines across server members using policies can allow you to split the messaging burden across the cluster's members. However, even when utilizing core group policies, adding more cluster members to the messaging cluster than you have active messaging engines has no scaling effect on the processing capability of the messaging infrastructure.

The Remote Messaging and Remote Support topology is more preferred than a Single Cluster or Remote Messaging topology when requirements include extensive use of the Performance Data Warehouse or the Common Event Infrastructure.

Because the support cluster is still responsible for running your web applications and your business integration applications, it might be overloaded when there are heavy web UI interactions (for example, heavy use of Business Space

functions). In this scenario, the suggested topology is Remote Messaging, Support, and Web, which is addressed in the following section.

3.5 Remote Messaging, Support, and Web topology

The Remote Messaging, Support, and Web topology is a four-cluster topology. It can be created in IBM Business Process Manager via the Deployment Environment wizard. This topology is the suggested topology for IBM Business Process Manager Advanced and IBM Business Process Manager Standard or Advanced with IBM Business Monitor.

The most visible difference between the Remote Messaging, Support, and Web topology and the Remote Messaging Remote Support topology is the location of the Business Space, BPC Explorer, and the Business Rules Manager. In the Remote Messaging, Support, and Web topology, these are hosted in the web cluster. Not only does this relieve the support cluster from the workload of the supporting components, but it is also valuable because it limits the impact of specific failure scenarios.

Figure 3-4 shows a sample configuration of the Remote Messaging, Support, and Web topology for IBM Business Process Management Advanced.

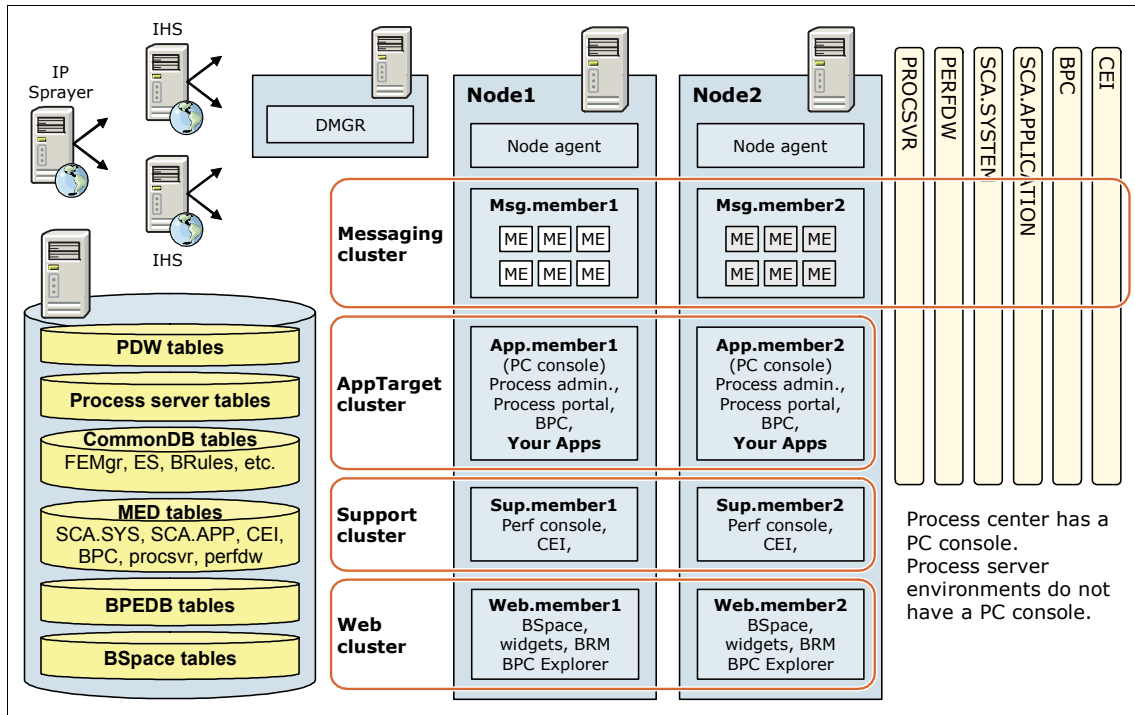


Figure 3-4 Remote Messaging, Support, and Web topology sample configuration

Note: For Business Process Manager Standard, the Remote Messaging, Support, and Web topology does not provide any greater use than the Remote Messaging Remote Support pattern because the web cluster is not utilized to host any Business Process Manager Standard functions.

Note: The following information applies to the Remote Messaging Support and Web topology when IBM Business Monitor is included:

- ▶ The messaging cluster also hosts:
 - A messaging engine for Monitor
 - A messaging engine for Common Event Infrastructure

If Business Process Manager Advanced and Monitor are configured together, then a single messaging engine for CEI is shared.
 - ▶ The support cluster also hosts the Cognos application.
 - ▶ The web cluster also hosts:
 - Business Space

If Business Process Manager Advanced and Monitor are configured together, then a single Business Space is shared.

 - Monitor widgets
 - ▶ To the application cluster, you will also deploy your Monitor Models.
 - ▶ This cell utilizes additional tables for Monitor, Cognos, each messaging engine, and Business Space.
- If Business Process Manager Advanced and Monitor are configured together, then a single Business Space and Business Space tables are shared.

Figure 3-5 on page 53 shows an example of the Remote Messaging, Support, and Web topology with IBM Business Process Manager Advanced plus IBM Business Monitor.

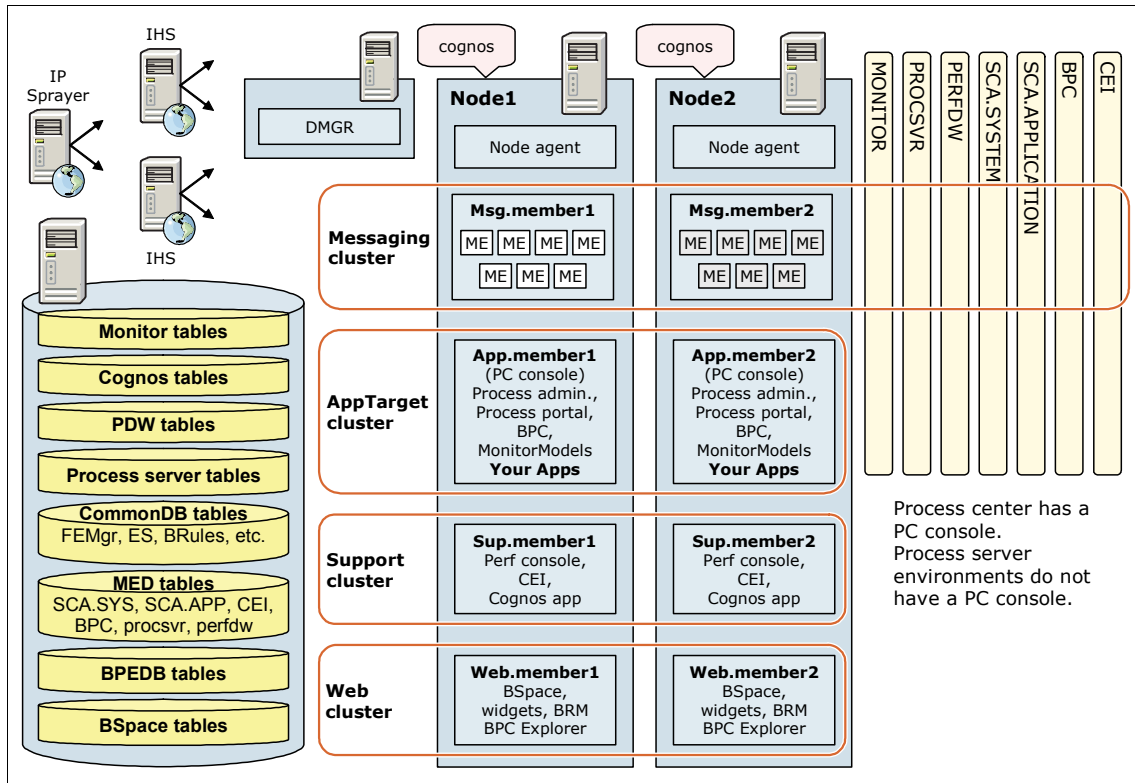


Figure 3-5 Remote Messaging, Support, and Web topology for BPM plus Monitor

This four-cluster topology has more administrative burden than the smaller Single Cluster or Remote Messaging topologies. There are four clusters' worth of cluster members' logs, such as `SystemOut.log`, to be monitored, and four clusters to be started and stopped.

Your performance-tuning plan must address all four clusters. However, due to the greater division of workload among the four clusters, you can pinpoint performance bottlenecks and adjust the configuration fairly easily. On distributed platforms, having more clusters performing specific functions allows greater flexibility when adjusting and tuning memory and CPU usage for the JVMs.

From a scalability standpoint, the Remote Messaging, Support, and Web topology provides more flexibility than Remote Messaging Remote Support topology. The ability to do more work can be increased by:

- ▶ Increasing the memory available to the existing cluster members
- ▶ Adding another member to the application cluster

- ▶ Adding another member to the support cluster
- ▶ Adding another member to the web cluster
- ▶ Adding another member to the messaging cluster and creating a core group policy for each active messaging engine so that the active messaging engines are dispersed across the cluster members

The most common pattern for adding a cluster member is to create another node and add another cluster member on that node.

When adding another member to a cluster, all components configured on that cluster are scaled at the same rate. In this topology, this applies to the application cluster, the support cluster, and the web cluster. However, because the application cluster, support cluster, and web cluster are configured to host different components, they can be scaled independently. For example, if you need additional CEI processing, you can simply add a cluster member to the support cluster and not do anything to the application cluster or web cluster.

The messaging cluster's purpose is to host the messaging engines. Because each messaging engine is a singleton, merely adding another member to the messaging cluster has no effect. In Figure 3-5 on page 53, the active messaging engines are indicated by the lighter icons, and the standby messaging engines are indicated by the shaded icons. It is possible to disperse the messaging workload across the cluster by creating a core group policy for each active messaging engine. Spreading the messaging engines across server members using policies can allow you to split the messaging burden across the cluster's members. However, even when utilizing core group policies, adding more cluster members to the messaging cluster than you have active messaging engines has no scaling effect on the processing capability of the messaging infrastructure.

The Remote Messaging, Support, and Web topology is more preferred than a Remote Messaging Remote Support topology when requirements include extensive use of the Business Space or BPC Explorer.

3.6 Five-cluster topology

The five-cluster topology can be utilized with IBM Business Process Manager Advanced plus IBM Business Monitor. This topology is not one of the patterns offered via the Deployment Environment wizard. However, the five-cluster topology can be created by first creating a Remote Messaging, Support, and Web topology via the Deployment Environments wizard, then manually creating the fifth cluster and completing the configuration for Monitor.

This topology is most useful in cases that require heavy use and isolation of Monitor models. In addition, this topology might be familiar to you if you have previously used WebSphere Process Server and WebSphere Business Monitor.

The most visible difference between the five-cluster topology and the Remote Messaging, Support, and Web topology is the location of the Monitor models. In the five-cluster topology, these are hosted in the Monitor cluster. Not only does this relieve the application cluster from the workload of the supporting monitor model execution, but it is also valuable because it limits the impact of specific failure scenarios.

Note: To utilize this topology, your Monitor models must be packaged separately from your process applications. The Monitor models are deployed to a separate deployment target (the Monitor cluster) from the process applications (the application cluster).

You *cannot* use the five-cluster topology if your Monitor model is associated with a process application. All parts of a process application (such as BPMN processes and their Monitor models) are packaged together and must be installed to the same deployment target. There is no support for deploying part of a process application to the application cluster while the other part gets deployed to the Monitor cluster.

If the Monitor models are being created via Process Designer and published to the Process Center repository, then the Monitor model *must* be part of the process application. Therefore, the five-cluster topology cannot be utilized as a target run time.

If you use IBM Integration Designer to create the Monitor models, they can be exported from Integration Designer in their own EAR file. This EAR file *can* be deployed to the Monitor cluster.

Figure 3-6 shows a sample configuration of the five-cluster topology for IBM Business Process Management Advanced plus IBM Business Monitor.

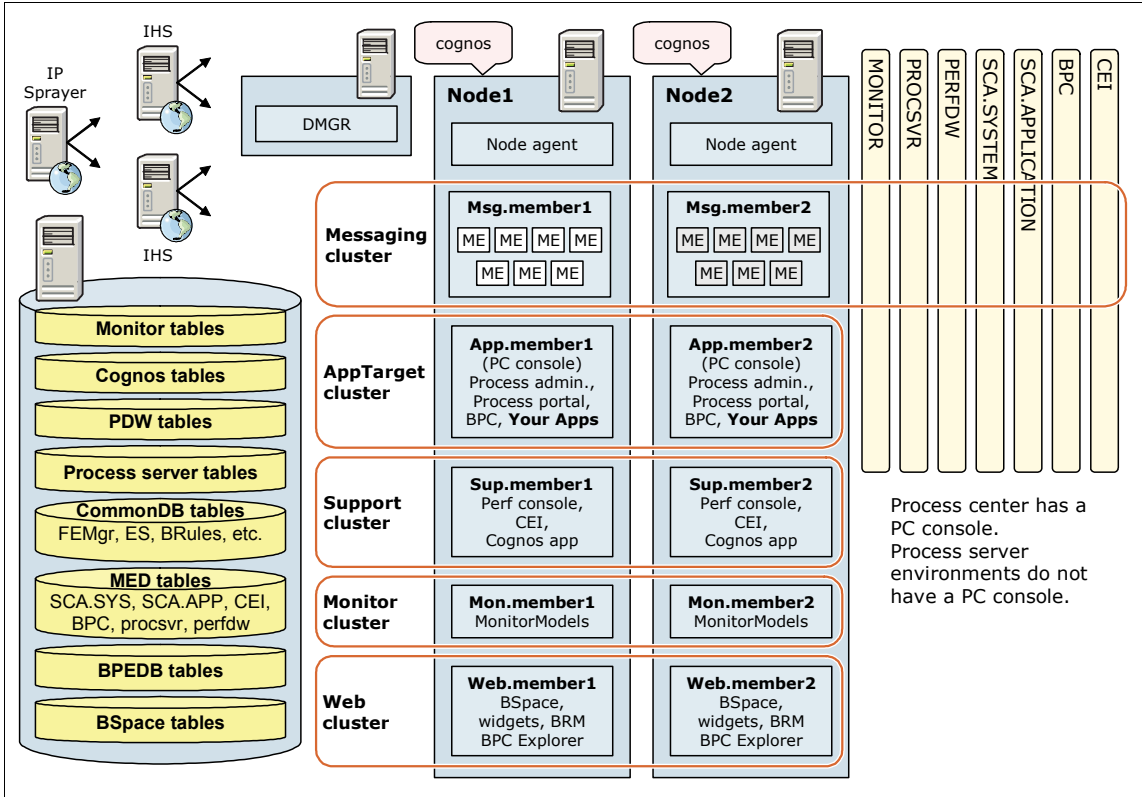


Figure 3-6 Five-cluster topology sample configuration

3.7 Comparison of clustered topologies

Table 3-1 shows the matrix of the topologies discussed in the previous sections.

Table 3-1 Matrix of topologies

Topology	BPM Standard	BPM Advanced	BPM Std+Monitor	BPM Adv+Monitor
Single Cluster	► Offered via Deployment Environments wizard	► Offered via Deployment Environments wizard	► Offered via Deployment Environments wizard.	► Offered via Deployment Environments wizard.
Remote Messaging	► Offered via Deployment Environments wizard	► Offered via Deployment Environments wizard	► No DE wizard support.	► No DE wizard support.
Remote Messaging and Remote Support	► Recommended ► Offered via Deployment Environments wizard	► Offered via Deployment Environments wizard	► No DE wizard support.	► No DE wizard support.
Remote Messaging, Support and Web	► No better than Remote Messaging Remote Support ► Offered via Deployment Environments wizard	► Recommended ► Offered via Deployment Environments wizard	► Recommended. ► Offered via Deployment Environments wizard.	► Recommended. ► Offered via Deployment Environments wizard.
Five Cluster	► Does not apply	► Does not apply	► Create a 4-cluster configuration via DE wizard, then create fifth cluster.	► Create a 4-cluster configuration via DE wizard, then create fifth cluster.

Table 3-2 is a brief summary of the pros and cons for each topology.

Table 3-2 Comparison of topologies

Topology	Pros	Cons
Single Cluster	<ul style="list-style-type: none"> ▶ Excellent for test environments ▶ Suitable for limited hardware ▶ Minimum number of clusters to administer 	<ul style="list-style-type: none"> ▶ Least granular scalability ▶ Lack of isolation ▶ Each server process doing all kinds of work, might max out memory
Remote Messaging	<ul style="list-style-type: none"> ▶ Messaging load isolated 	<ul style="list-style-type: none"> ▶ Second least granular scalability ▶ Application cluster members doing most kinds of work, might max out memory
Remote Messaging and Remote Support	<ul style="list-style-type: none"> ▶ Messaging load isolated ▶ Support load isolated ▶ Application cluster can do more focused processing 	<ul style="list-style-type: none"> ▶ More clusters implies need for more hardware/memory
Remote Messaging, Support and Web	<ul style="list-style-type: none"> ▶ Messaging load isolated ▶ Support load isolated ▶ Web load isolated ▶ Good granularity, flexibility for scalability 	<ul style="list-style-type: none"> ▶ More clusters implies need for more hardware/memory
Five Cluster	<ul style="list-style-type: none"> ▶ Messaging load isolated ▶ Support load isolated ▶ Web load isolated ▶ Monitor model load isolated 	<ul style="list-style-type: none"> ▶ More clusters implies need for more hardware/memory ▶ Manually setup instead of GUI tool ▶ Monitor models packaged separately



Process Center and Process Server concepts

This chapter describes concepts introduced by the IBM Business Process Manager V7.5 Process Center Server and Process Server. The following topics are addressed in this chapter:

- ▶ Process Center and Process Server concept overview
- ▶ Repository components and concepts
- ▶ Design components and concepts
- ▶ Runtime components and concepts
- ▶ Business Process Management Environment concepts

4.1 Process Center and Process Server concept overview

IBM Business Process Manager V7.5 is the successor to two previous Business Process Management (BPM) products:

- ▶ IBM WebSphere Lombardi Edition
- ▶ IBM WebSphere Process Server

As a result of this product integration, there is now a richer set of concepts to consider.

Depending on your knowledge of the predecessor products, some of the concepts might be new and others familiar. While many of the later chapters focus on WebSphere topology cell-related aspects, this chapter focuses on the unique business process management concepts of the Process Center Server, Process Server, and Business Process Management (BPM) environment.

From an overview perspective, IBM Business Process Manager V7.5 embraces a number of capabilities that center around the BPM Repository. These include tooling for development and design (IBM Process Designer) and integration (IBM Integration Designer), and governance of the BPM life cycle (Process Center) and runtime environments (Process Servers). Figure 4-1 shows the business process management components.

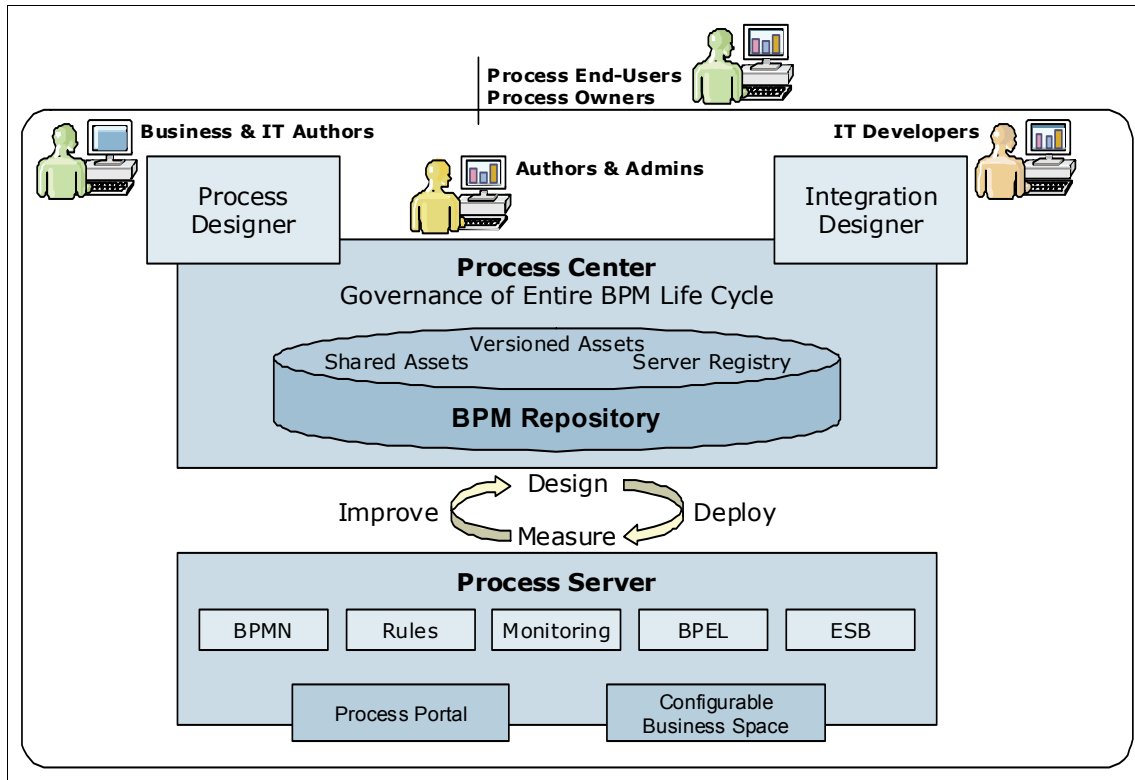


Figure 4-1 Business Process Management environment

The capabilities can be divided into the following high-level categories:

- ▶ Repository components and concepts
- ▶ Design components and concepts
- ▶ Runtime components and concepts
- ▶ Environment components and concepts

Note: In addition to the information provided in this document, the IBM Business Process Manager product overview and a business process management overview are offered in the Information Center. See the following website:

http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/topic/com.ibm.wbpm.main.doc/topics/cbpm_wbpm_gsg.html

4.2 Repository components and concepts

At the heart of the business process management environment is a repository. Essentially, all other capabilities of a business process management environment are concerned with submitting assets into, managing assets within, or deploying assets out of this repository. This section focuses on describing the Process Center.

4.2.1 Process Center

The Process Center is the master repository for all process assets designed and developed within a organization to address and optimize business process issues.

The Process Center environment comprises a unified repository for all shared assets produced using the IBM Process Designer and IBM Integration Designer authoring environments (Figure 4-2).

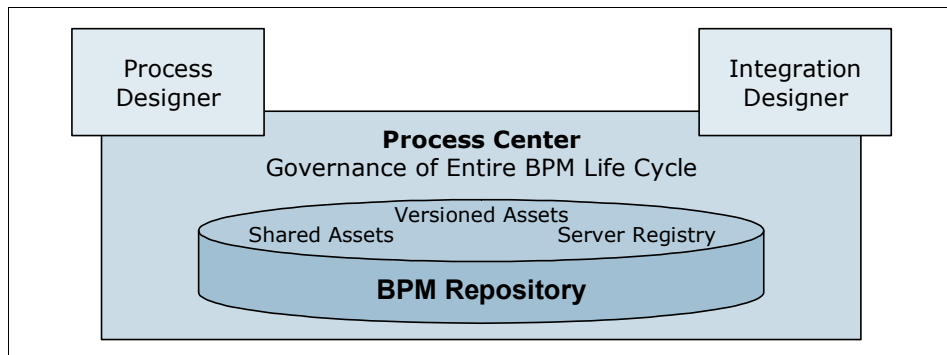


Figure 4-2 Process Center Server

The IBM Business Monitor authoring environment can also be used. Chapter 8, “Remote Messaging, Support, and Web topology with IBM Business Monitor” on page 277, provides installation and configuration details.

The shared assets include:

- ▶ Process application models and their versioned snapshots. These are logical containers of functionality packaged to address specific business issues.
- ▶ Reusable Toolkit libraries and their versioned snapshots.
- ▶ Service integrations modules.

The Process Center has a web-based administration console that is a convenient location in which to create and maintain high-level containers such as Process Applications and reusable toolkits, manage the deployment of Process Application snapshots to Process Server environments, and manage user access permissions.

It also includes the following components:

- ▶ Built-in playback runtime or process execution functionality for interactive unit testing of the designed assets before deploying the versioned snapshots to a runtime Process Server environment

This also provides a web-based Process Server Administration console, Process Portal for user tasks, Business Space and Business Process Choreographer Explorer.

- ▶ The Performance Data Warehouse (PDW) functionality that collects and tracks business process statistics

This is used for process reporting and feedback into the process improvement and optimization stages of the process life cycle.

This also provides a web-based Performance Server Administration console for managing and maintaining operational functionality.

Note: For more Process Center details, see the following website:

http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/index.jsp?topic=/com.ibm.wbpm.main.doc/topics/cbpm_processcenter.html

4.2.2 Process Application life cycle

The Process Application life cycle includes deploying, migrating snapshots between versions, and managing snapshot states. Versioning considerations are also part of the life cycle.

When developing processes, you can take full advantage of the iterative approach supported by the tools within the Process Designer. Processes evolve over time, initially from a development state, through testing, and finally are released in to production. Even in production, your processes might continue to evolve due to changing requirements. Preparation for the ongoing life cycle of your processes is important and will help you design effectively from the outset.

Note: See the following website for more process life cycle details:

http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/index.jsp?topic=/com.ibm.wbpm.admin.doc/topics/cadm_pal_overview.html

4.3 Design components and concepts

A key part of an end-to-end business process management environment is the design and development of artifacts, described as design assets, as well as the tooling used to create these assets. The assets created in the authoring environments are stored and managed in the Process Center repository.

4.3.1 Authoring environments

IBM Business Process Manager V7.5 offers two authoring environments:

- ▶ IBM Process Designer
- ▶ IBM Integration Designer

Use IBM Process Designer to efficiently model business processes that involve human tasks, web services, enterprise data sources, and messaging. Use IBM Integration Designer to build services, focused on system automation and high-throughput transactions, that are self-contained or that invoke other existing services such as web services, enterprise resource applications, or applications running in CICS and IMS™.

IBM Process Designer is available in all editions of the product. In addition to IBM Process Designer, IBM Business Process Manager Advanced also utilizes IBM Integration Designer.

Note: For more Process Designer details, see the following website:

http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/topic/com.ibm.wbpm.main.doc/topics/cbpm_ae.html

IBM Process Designer

IBM Process Designer enables development of business processes. With an easy-to-use graphics-oriented tool, you can create a sequence of actions that compose a business process, and you can redesign that process over time as business requirements evolve.

IBM Process Designer is obtained by downloading and installing a package from an IBM Business Process Manager V7.5 Process Center environment on a developer's local system.

Typically, BPMN assets are produced within the IBM Process Designer.

Note: For more details about IBM Process Designer system requirements, see the following website:

http://www-01.ibm.com/common/ssi/ShowDoc.jsp?docURL=/common/ssi/rep_ca/2/897/ENUS211-092/index.html#techinfo

IBM Integration Designer

IBM Integration Designer provides editors and aids developers in creating complex automated processes and services.

IBM Integration Designer provides functionality to create integrations to large, complex back-end systems or services that provide data for the business process, if one or more activities require access. Using a simple interface, an activity in Process Designer can call a service created in Integration Designer.

IBM Integration Designer is offered as a separate product download.

Typically, BPEL assets are produced within the IBM Integration Designer.

Note: For more details about IBM Integration Designer system requirements, see the following website:

<http://www-01.ibm.com/support/docview.wss?uid=swg27022441>

4.3.2 Design assets

Design assets are created using IBM Business Process Manager V7.5 Advanced authoring environments, IBM Process Designer, and IBM Integration designer.

A process model or definition is the major unit of logic in IBM Business Process Manager V7.5. A Process Application 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 are creating reusable Business Process Definitions (BPDs).

Process components enable you to define the process workflow for end users, creating logic inside a process application and integrating with other enterprise applications, services, and data sources. To understand what occurs inside a process at run time, it is important to understand the components that make up a process at design time.

The same process model is used or shared between the runtime Process Server environment and the design-time Process Center environment.

Design assets are contained and distributed in Process Applications managed in the Process Center repository. Figure 4-3 illustrates a number of Process Applications and the snapshots associated with each one.

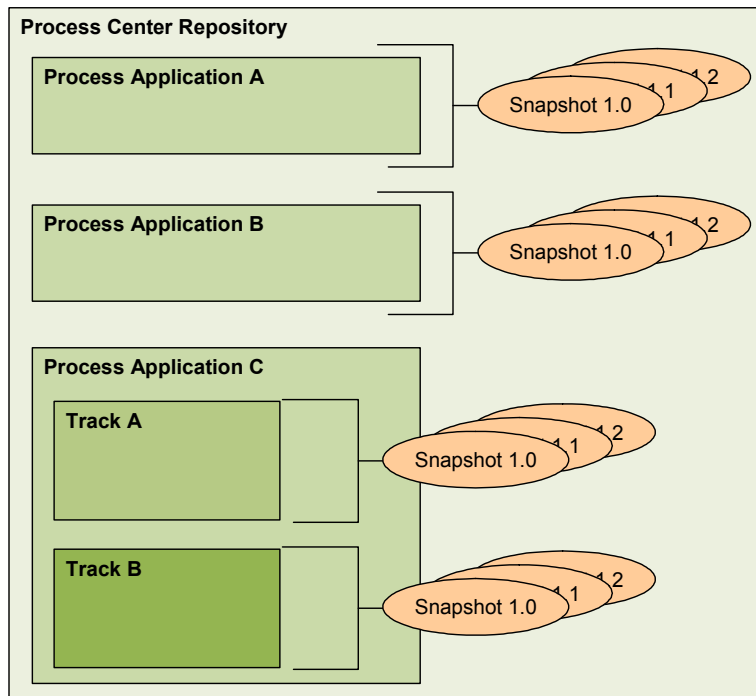


Figure 4-3 Process applications and their associated snapshots exist in the Process Center repository

Note: For more details regarding the management of process applications, tracks, and snapshots, see the following website:

http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/topic/com.ibm.wbpm.main.doc/managinglib/topic/managing_procs_workspaces.html

The following section discusses some the key high-level design assets.

Process Applications

Process Applications are containers for the process models and supporting implementations that BPM analysts and developers create using IBM Process Designer.

Snapshots and tracks

Tracks, also known as branches, are optional subdivisions in a Process Application based on project tasks or Process Application release versions. You can determine whether additional tracks are necessary for each process application and, if so, enable them at any time.

Snapshots record the state of the items within a process application or track at a specific point in time. From the Process Center console, you can create snapshots of your process applications. You can *only* deploy specific snapshots of your process applications to Process Servers in staging, test, and production runtime environments.

Toolkits

Toolkits are packaged reusable, versioned, shared libraries of functionality.

Toolkits are created to enable Process Designer users to share common library items across Process Applications. Toolkits are used by Process Applications by creating dependencies between toolkits and Process Applications. When a Process Application is deployed to a runtime Process Server, all required dependencies and their specific snapshot versions are also deployed.

Note: For more details, see the following website:

http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/topic/com.ibm.wbpm.main.doc/managinglib/topic/managinglib_introduction.html

Process Advanced Integration

Process Advanced Integration services are packaged as discreet self-contained modules that are incorporated into a Process Application. These are developed either using the IBM Process Designer or the IBM Integration Designer authoring environments.

Note: For more Process Advanced Integration details, see the following website:

http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/topic/com.ibm.ws.icp.devbp.doc/shared/dev_guide/devbp/r_bpintimplapprch.html

4.4 Runtime components and concepts

The artifacts stored in the Process Center repository are deployed to and executed in runtime Process Server environments.

Process Server

A Process Server provides a single runtime and execution environment that can support a range of business processes, service orchestration, and integration capabilities for deployed and released Process Application snapshots. Figure 4-4 shows the high-level capabilities.

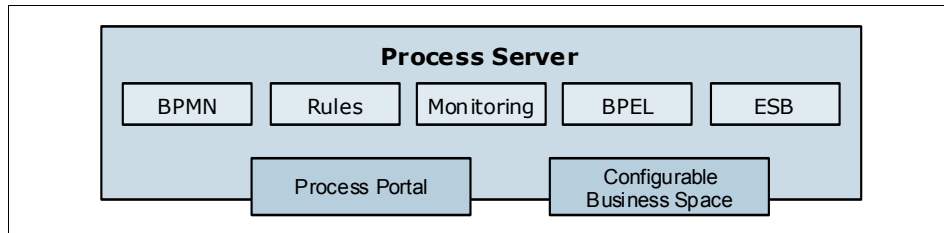


Figure 4-4 Process Server

There are two types of runtime Process Server:

- Online or connected

An online runtime Process Server configured during IBM Business Process Manager V7.5 installation is automatically discovered and displayed in the web-based Process Center console.

- Offline

An offline server is a runtime Process Server that is not connected to a Process Center. Offline servers can still be used when deploying snapshots of Process Applications. However 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.

Note: For more details about online and offline Process Servers, see the following website:

http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/topic/com.ibm.wbpm.admin.doc/topics/deploying_introduction.html

Process Servers also include the following components:

- ▶ Runtime or process execution functionality released versioned snapshots
This also provides a web-based Process Server Administration console, Process Portal for user tasks, Business Space and Business Process Choreographer Explorer.
- ▶ The Performance Data Warehouse functionality that collects and tracks business process statistics
This is used for process reporting and feeding into the process improvement and optimization stages of the process life cycle. This also provides a web-based Performance Server Administration console for managing and maintaining operational functionality.

Note: For more Process Server details, see the following websites:

- ▶ http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/topic/com.ibm.wbpm.main.doc/topics/cbpm_ps.html
- ▶ http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/topic/com.ibm.wbpm.main.doc/managinglib/topic/managing_twks_servers.html

Runtime environment

A runtime environment consists of one or more Process Server environments (Figure 4-5).

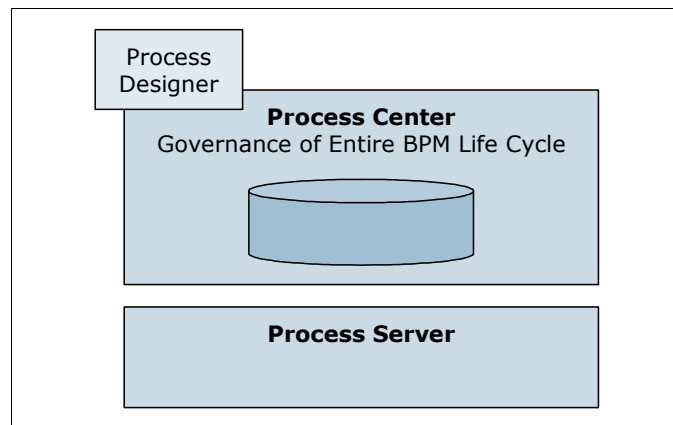


Figure 4-5 Process Center with Runtime Environment consisting of multiple Process Servers

Process Center

A Process Center is used to build and refine your process applications in IBM Process Designer. Create your process models and implement the steps in those models using the Designer. Using the Inspector, demonstrate your development progress in playback sessions to quickly evaluate and refine your prototype. Using the Process Center console, deploy your process applications to test, staging, and production runtime environments.

There are three types of runtime environments installed and configured in a typical setup. They are:

- ▶ **Test**

Using the Process Center console, deploy your process applications to the Process Server in your test environment to implement formal quality assurance and functional tests. For online Process Servers, the Process Inspector is used to help verify and resolve issues.

- ▶ **Staging**

Using the Process Center console, deploy your process applications to the Process Server in your pre-production environment to implement system integration and non-functional quality assurance tests. For online Process Servers, the Process Inspector is used to help verify and resolve issues.

- ▶ **Production**

Process Server environment for final production releases of Process Application snapshots. Usually, after the issues reported during formal testing are resolved, the Process Center console is used to deploy the Process Application snapshots to a Process Server environment designated for production use. For online Process Servers, the Process Inspector is used to help verify and resolve issues in the production environment.

Note: For more details on the runtime environment, see the following website:

http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/topic/com.ibm.wbpm.admin.doc/topics/cadm_pal_overview.html

For online runtime Process Server environments, it is possible to connect the Process Inspector. This capability is not currently available for offline runtime Process Server environments.

Note: For more details about Process Server and Process Inspector, see the following website:

http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/topic/com.ibm.wbpm.main.doc/managinglib/topic/managing_twks_servers_A.html

4.5 Business Process Management Environment concepts

This section addresses the following topics:

- ▶ Process Center and Process Server combinations
- ▶ Advanced topic: Satellite Process Center and Process Server combination

4.5.1 Process Center and Process Server combinations

A Business Process Management environment can consist of the combinations of Process Centers and Process Server Environments listed in Table 4-1.

Table 4-1 Valid Process Center and Process Server environment combinations

Process development combinations	Business Process Environment components			
	Process Center environment (development and repository)	Process Server environment (runtime and execution)	Process Designer (BPMN process application design)	Integration Designer (BPEL process application design)
1. Process development for process models using IBM Business Process Manager Advanced	Yes	Yes	Yes	Yes
2. Process development for process models using IBM Business Process Manager Standard	Yes	Yes	Yes	
3. Process development for process models using IBM Business Process Manager Advanced without a Process Center		Yes		Yes

BPM Environment combination 1 and 2: Process Center Environment and Process Server Environment

This is the default environment combination where there is one central Process Center environment deploying to a number of associated Process Server environments, with either just Process Designer (Option 2) or both Integration Designer and Process Designer (Option 1). This is typically set up in an online Process Server configuration, as depicted in Figure 4-6 on page 74. The numbers in Figure 4-6 on page 74 depict the development and deployment life cycle of a Process Application snapshot within the environment:

1. The process application snapshot is created.
2. The process application snapshot is released for playback with the business.
3. The process application snapshot is released for functional testing.
4. The process application snapshot is released for staging or pre-production testing.
5. The process application snapshot is released for distribution to production.

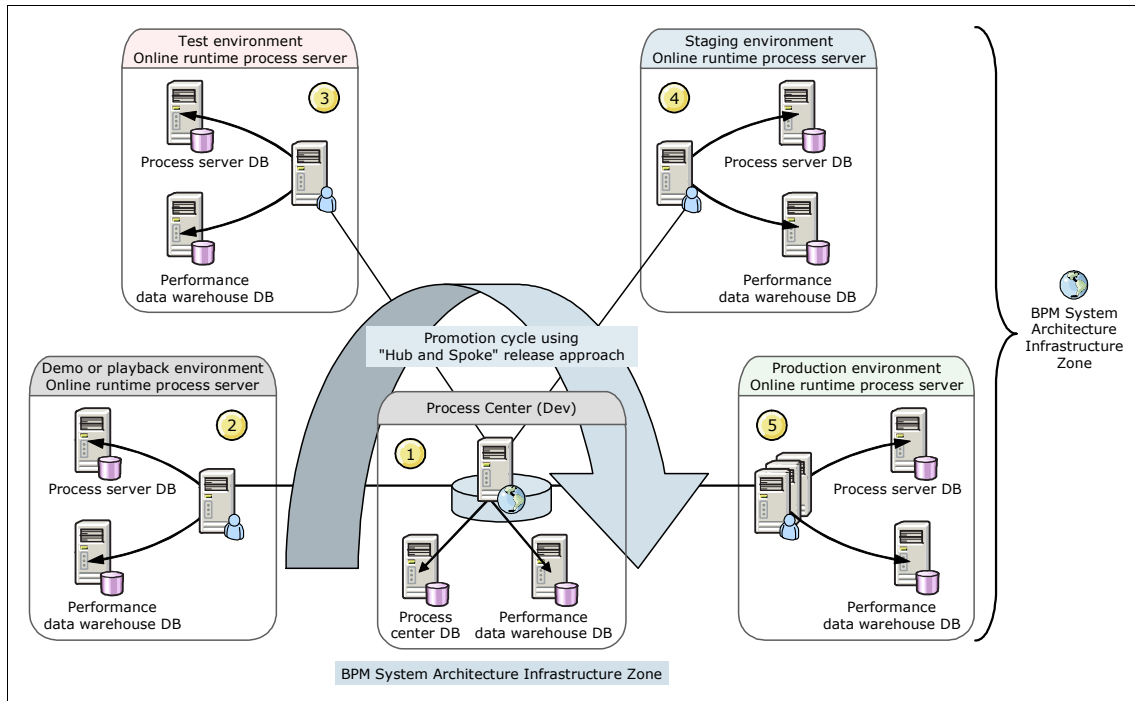


Figure 4-6 BPM environment

Environment combination 3: Process Server Environment

This BPM environment combination is where there is no central, sole Process Center. Artifacts developed within the Integration Designer are deployed directly to a number of Process Server environments, not via the Process Center repository.

4.5.2 Advanced topic: Satellite Process Center and Process Server combination

The following considerations should be used to qualify the application of the advanced architectural pattern, Satellite Process Center and Process Server mentioned in this section:

- ▶ Currently, for an offline Process Server environment, it is not possible to use the process inspector functionality for troubleshooting issues.

Note: IBM BPM 7.5.1 will have a web-based process inspector functionality for offline servers.

- ▶ There are a number of system requirements:
 - Network separation between *online* Process Server environments and Process Center environments, including geographical separation between locations.
 - Make use of the Process Center deployment capabilities between the server combination mentioned above.
- ▶ This configuration provides separate or isolated line-of-business development environments that will submit implemented business processes to a corporate center of excellence for further release testing and finally production release. (for instance, using the feeder Satellite Process Center and Process Server pattern).
- ▶ The possible license implications and costs of introducing additional Process Center servers are not an obstacle to applying the design pattern.

Usually, a Process Center environment provides a number of functions, including a repository for design assets and a mechanism for packaging and deploying those assets to a runtime environment for execution. A runtime environment consists of a least one Process Server environment. Using the Satellite Process Center and Process Server pattern, it is possible that a runtime environment could consist of a number of Process Server environments (Figure 4-11 on page 80), effectively creating a cluster farm environment of Process Servers.

Figure 4-7 further details the usual functions provided by a Process Center. This demonstrates the functional split between the different types of Satellite environments that include at least a Process Center environment and one or more Process Server environments.

Process center functionality	Process center types			
	Default Setup Only one process center	Satellite setup Multiple process centers		
		Master-1	Satellite-2 (Deployment)	Satellite-3 (Feeder)
1. Process development	✓	✓		✓
2. Process repository	✓	✓		
3. Process deployment	✓	✓	✓	
4. Process import	✓	✓	✓	
5. Process export	✓	✓		✓
6. Process execution space (unit test or run)	✓	✓	✓	✓
7. Operations and administration management	✓	✓	✓	✓
8. Security configuration	✓	✓	✓	✓

Figure 4-7 Functional split of satellite Process Center

The term *satellite* is used to describe the secondary Process Center that has been introduced to effectively act as an extension to the central, main Process Center.

Due to specific restrictions (for example, specific networking restrictions, geographical separation of different process development teams, building a utility system platform, the lack of the process inspector component for the offline runtime Process Server, and so on), it is not always possible to rely on a central, *sole* Process Center. The need to distribute and restrict the functionality of the Process Center has given rise to the Satellite BPM environment system design pattern (Figure 4-11 on page 80).

There are currently three types of Satellite BPM environments patterns that have been used to solve specific client system architecture requirements. To transfer assets between these Satellite BPM environments, the import and export capabilities of the Process Center are utilized.

The separate BPM environments that make up the overall multiple Process Center design (Figure 4-11 on page 80) are described in the following sections.

Master BPM environment

The Master BPM environment has the same capabilities as the default, sole BPM environment (Figure 4-7 on page 76). It also has one or more connected Process Servers primarily for the testing life cycle (Figure 4-8), used as the master repository, for developing Process Applications and releasing sanctioned Process Applications snapshots to production. Most likely, the servers installed in this environment would apply to the four-cluster, Remote Messaging, Remote Support, and Web deployment environment pattern detailed in Chapter 7, “Remote Messaging, Remote Support, and Web topology” on page 199.

Figure 4-8 shows the BPM environment. The numbers in Figure 4-8 depict the development and deployment life cycle of a Process Application snapshot within the environment:

1. The process application snapshot is imported or modified to meet compliance for corporate Business Process implementation or governance (or both).
2. The process application snapshot is released for functional testing.
3. The process application snapshot is released for staging or pre-production testing.

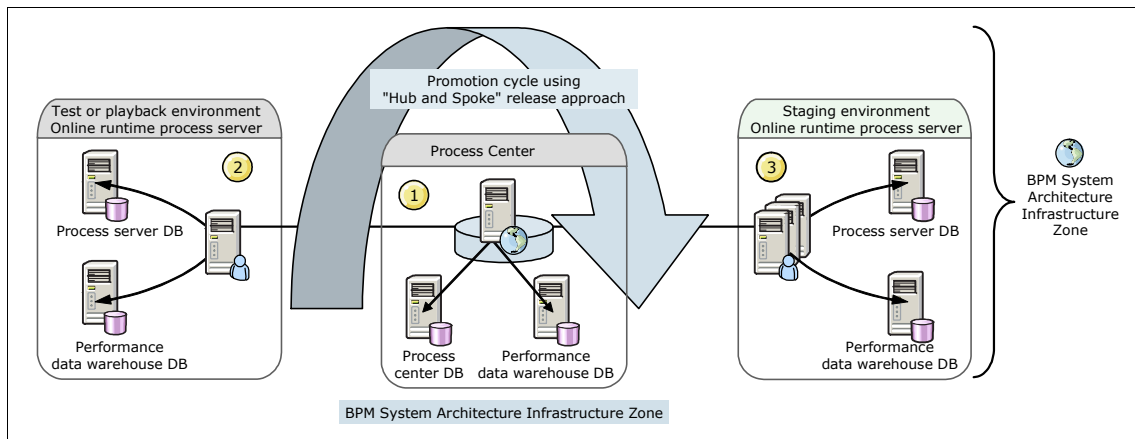


Figure 4-8 Master Satellite BPM environment

Deployment Satellite BPM environment

The Deployment Satellite BPM environment is primarily concerned with supporting an isolated environment for production. It could be separated by the network, physical geography, or at some system level, and is only a recipient for deploying tested and signed-off snapshot versions of a Process Application. Having the Process Server connected to a restricted Process Center ensures that any issues in this environment can use the Process Inspector for trouble shooting. This would typically use the four-cluster, Remote Messaging, Remote

Support, and Web deployment environment pattern detailed in Chapter 7, “Remote Messaging, Remote Support, and Web topology” on page 199. Figure 4-9 shows the Deployment Satellite BPM environment. This would ensure that any unit deployment and unit testing carried out on the satellite Process Center would replicate the conditions in the target Process Server runtime environment.

The numbers in Figure 4-9 depict the development and deployment life cycle of a Process Application snapshot within the environment:

1. The process application snapshot is imported only from the main central repository.
2. The process application snapshot is released for production distribution.

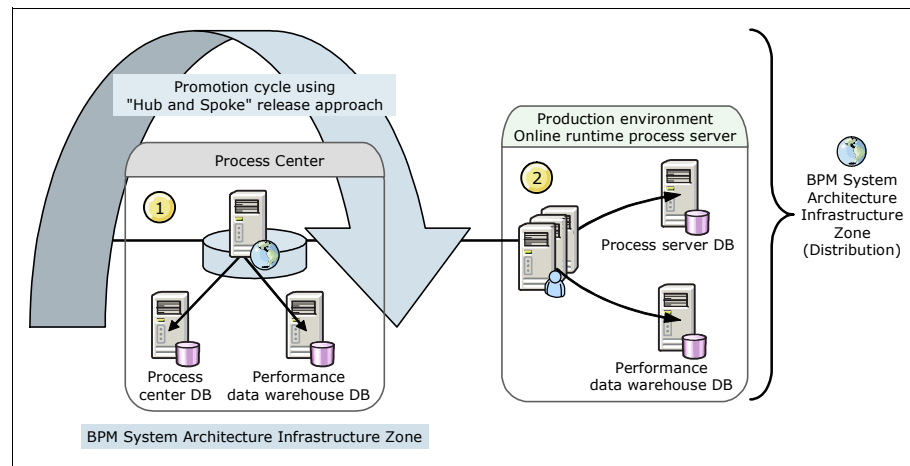


Figure 4-9 Deployment Satellite BPM environment

Feeder Satellite

The Feeder Satellite BPM environment is primarily concerned with supporting a local or isolated development environment for a small department or team working on a specific process project. It could be separated by the network, physical geography, or at a system level from the master satellite zone and is only a provider for supplying code-complete, unit-tested, and signed-off snapshot versions of a Process Application. Having a Process Server connected to a restricted Process Center ensures that any issues in this environment could use the Process Inspector for troubleshooting. After the specific development cycle is complete, the environment can be recycled and returned to a general pool of development environments, maximizing efficiency, minimizing hardware costs and maintenance, and providing the business agility required to continually improve processes and manage project costs. Typically, apply the single cluster deployment environment pattern, detailed in Chapter 6, “Single Cluster topology”

on page 143, or even the stand-alone server deployment environment pattern. Figure 4-10 shows the Feeder Satellite BPM environment.

The numbers in Figure 4-10 depict the development and deployment life cycle of a Process Application snapshot within the environment:

1. The process application snapshot is created by the local line-of-business.
2. The process application snapshot is released for local functional and unit testing prior to submission to the main central Process Center repository.

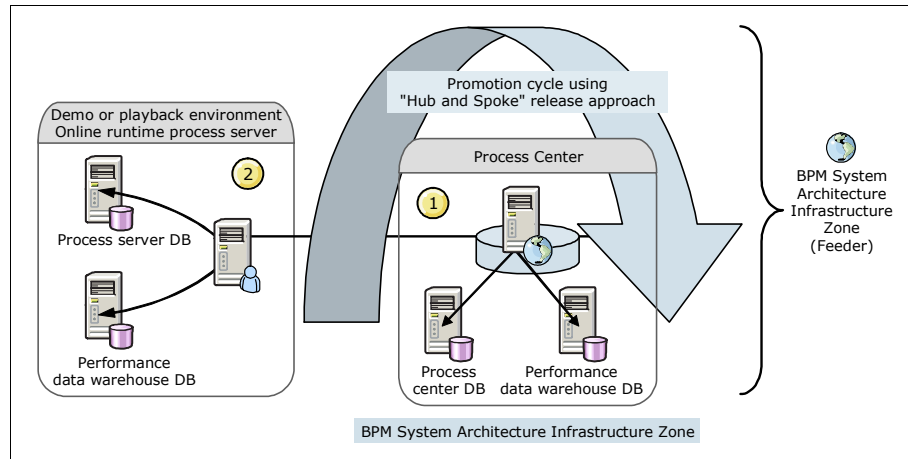


Figure 4-10 Feeder Satellite BPM environment

Figure 4-11 shows a sample combined environment overview with all the Satellite BPM environments combined. The combinations in Figure 4-11 effectively provide a flexible solution to the challenges that arise when designing an enterprise architecture for a complex, geographically separated, and distributed system.

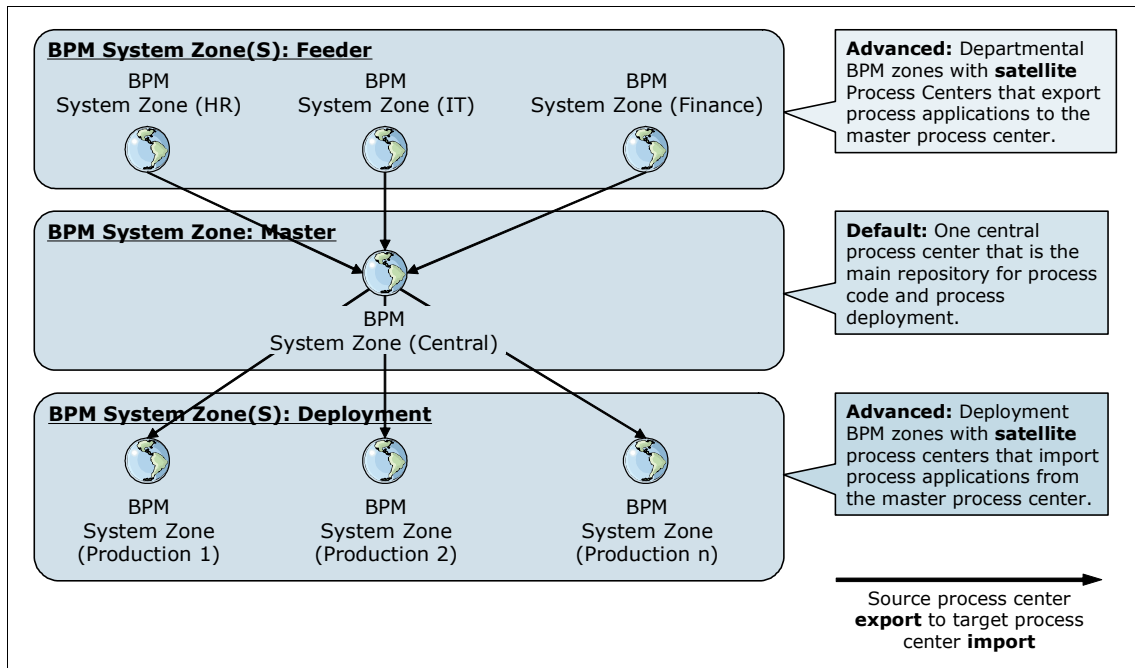


Figure 4-11 Combined Satellite BPM environments



Part 2

Building production topologies



Preparing your topology

This chapter describes how we created the infrastructure that we used in this book. We provide information about the software that we used, how we installed and configured the software, the database names that we used, the schemas and other objects, why and how we created the profiles, and the installation of other software components necessary to prepare the topologies shown.

This chapter includes the following topics:

- ▶ Prerequisite software installation
- ▶ Installing the software
- ▶ Database tables and schema creation
- ▶ Profiles creation
- ▶ Other software installations

By the end of this chapter you should have all databases available, a LDAP repository populated with users, a deployment manager with security, two nodes created (and federated), and other software required for your specific product and topology.

5.1 Installation overview

The installation steps that we describe in this chapter are based on multiple installations on many clients and represent the preferred practices. Follow the steps that we describe to install Business Process Manager successfully on a production environment.

Figure 5-1 shows the steps to execute during the installation process. Figure 5-1 is divided into prerequisite steps and installation steps. Certain prerequisite steps can be done in parallel. We suggest that you execute all the prerequisite steps before installing the software.

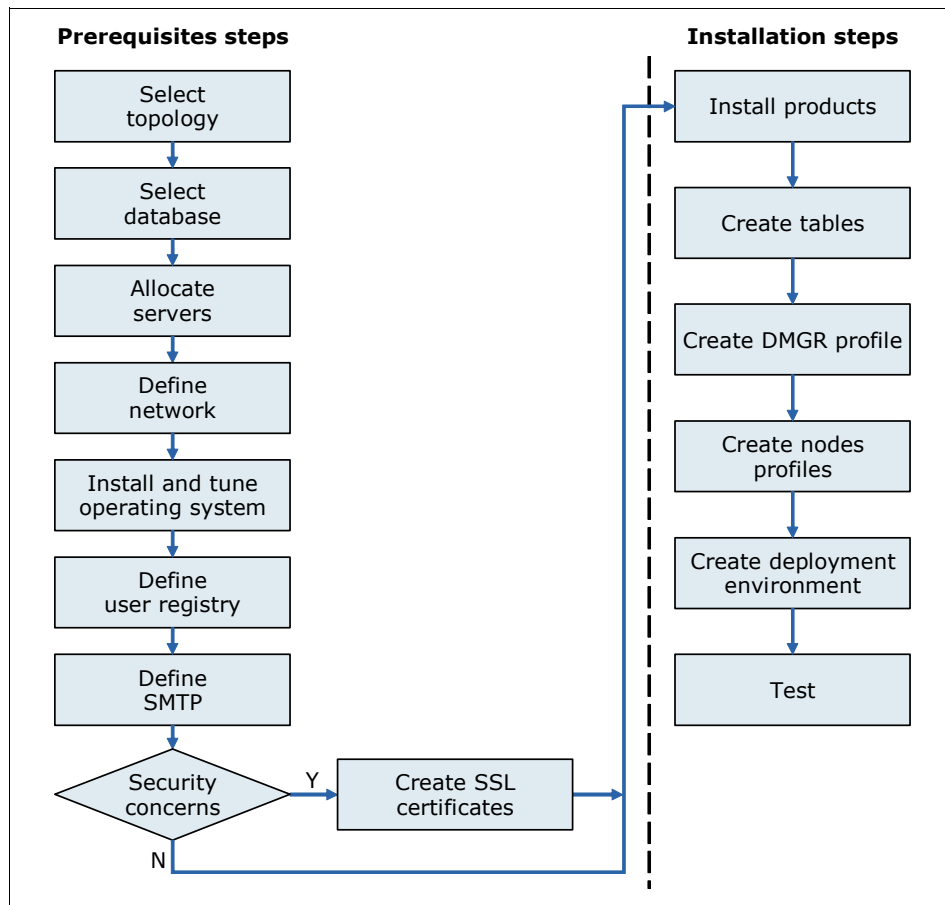


Figure 5-1 Suggested steps to install BPM 7.5 software

When the prerequisites steps are thoroughly executed, the installation process will likely be fast and smooth. Ensure that you have gone through each of the steps and checked that all the components are configured and available.

Before starting the software installation in a production environment, ensure that you have all the infrastructure ready.

5.2 Prerequisite steps

This section lists the prerequisite steps to take before you install and configure your system.

5.2.1 Selecting the topology

The first and most important step is to select the topology that you are going to use on your production environment. This definition is based on your requirement and any constraints that you might have for your solution. The remaining chapters of this book can help you with selecting the most appropriate topology for your environment. Business Process Manager 7.5 is highly scalable. Therefore, you can implement your topology with a subset of servers that you are planning to have. As your load grows, you can add more nodes or servers to your environment. The selected topology must allow your environment to grow easily and graciously.

With a good topology definition you can start small and grow as the load on your system increases and as new applications are deployed.

5.2.2 Selecting a database

A database is a key component in a IBM Business Process Manager V7.5 and IBM Business Monitor V7.5 installation. These products will only configure and run if there is a database installed and available for them.

This book use DB2® as its database. On your environment you can choose DB2 or any other database provider that is supported by IBM BPM products. For a complete list of supported databases, access the Information Center.

DBA team involvement in the early phases of the installation process is essential for a timely installation and acceptable performance of your BPM project.

5.2.3 Allocating servers

The host machines where you plan to run IBM Business Process Manager 7.5 must be installed and running. They should have enough capacity, RAM memory, and disk space to run the topology that you created.

The operating system must also comply with the software prerequisites and be configured accordingly. Verify the operating system's prerequisites and set up the system accordingly before installing Business Process Manager 7.5.

Resource: To verify the hardware and software prerequisites for Business Process Manager Advanced 7.5 see the following website:

<http://www-01.ibm.com/software/integration/business-process-manager/advanced/sysreqs/>

Servers to run database, LDAP (or any user registry), SMTP, and any other component must be available too. The Business Process Manager relies on these components to be configured and to run.

5.2.4 Defining the network

A production topology installation can include a variety of components that are spread across many host servers. These components use the network to communicate changing runtime request information and WebSphere internal administration data. If your network is misconfigured, problems might arise during the installation or when running the production environment. Verify that the network components are working and are set up properly, including firewalls, host names and IPs, DNS, latency time, and other components.

5.2.5 Installing and tuning the operating system

After you have decided on your topology, allocated the servers (or at least a subset of them), and configured your network, you can install the operational system. Some configuration might apply depending on the operating system on which you are planning to install IBM Business Process Manager V7.5. Be sure that you completed all configuration indicated in the Business Management Process Advanced V7.5 and IBM Business Monitor V7.5 installation manuals.

Recourse: You can find information about operating system prerequisites at the following website:

http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/index.jsp?topic=/com.ibm.wbpm.imuc.doc/topics/prep_bpm_os.html

5.2.6 Defining the user registry

The user registry is the repository of all user names, passwords, groups, and other information that is necessary to run the system securely through an authentication process. Most environments use LDAP as the user registry. In IBM Business Process Manager 7.5 you can use all registries that are available for WebSphere Application Server, because IBM Business Process Manager 7.5 relies on the WebSphere security mechanism to authenticate users and authorize access.

Regardless of the repository that you use on your environment (LDAP, custom, operating system, or federated repositories), the repository must be available with at least the necessary administrative users and groups defined. Table 5-5 on page 127 lists a basic example of users and groups that can be used.

Before installing the product, check with your security team that all users who need to install and run IBM Business Process Manager V7.5 were created and are available.

5.2.7 Defining SMTP

It is a good practice to define a SMTP service before installing or configuring IBM Business Process Manager. BPM's processes can use the SMTP service to send automatic emails for escalations or alerts. You might need an SMTP service available for the Business Process Manager installation while creating the deployment environment.

5.2.8 Creating SSL certificates

SSL certificates are created automatically during the process of profile creation. These certificates are self-signed certificates and can be configured during the profile creation.

All communications that happen among IBM WebSphere Application Server components are secured using SSL. IBM Business Process Manager runs on top of IBM WebSphere Application Server and inherits this security mechanism.

For external communication (for example, to expose your services to the internet), create your own signed certificate. In certain environments your the security team must define or create the SSL certificates for you even for internal intraprocess communication.

5.3 Installing the software

The servers that we used for this book run on RedHat Linux 64 bit. To take advantage of security and the database of a production environment, we used LDAP as the user registry and DB2 as the database.

We left the default options unchanged for most of the software installation options for this book. In a production installation you can change them as needed for your configuration.

We used the following software versions in this book:

- ▶ Linux RedHat 5.5 64 bit
- ▶ IBM Business Process Manager Advanced Version 7.5.0.0
- ▶ IBM DB2 Enterprise Server Edition 9.7.4 for Linux 64bit
- ▶ IBM HTTP Server v7.0.0.17
- ▶ IBM Tivoli® Directory Server v6.3.0.0
- ▶ IBM Business Monitor V7.5.0.0 for Linux
- ▶ IBM Cognos Business Intelligence Server Version 10.1.0.1

Installation note: During our installation we enhanced the Linux limit of open files as describe at:

http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/index.jsp?topic=/com.ibm.wbpm.imuc.ebpm.doc/topics/tins_typical_installation_pc.html

We also installed the products listed in Table 5-1.

Table 5-1 Installed products

Product	Part numbers	Fixes applied	Installed directory
IBM Business Process Manager Advanced V7.5	CI0BFML CI0BGML CI0BHML	JR39751 JR39750 JR39657	/opt/IBM/WebSphere/Ap pServer
IBM Installation Manager 1.4.3	Comes with Business Process Manager Advanced 7.5 package		/opt/IBM/Installation Manager

Product	Part numbers	Fixes applied	Installed directory
IBM Monitor Server V7.5	CI0D3ML, CI0D4ML, CI0D5ML, CI0D6ML, CI0D7ML	(none)	/opt/IBM/WebSphere/AppServer
IBM HTTP Server V7.0 Web Server Plug-ins	C1G36ML	FP17	/opt/IBM/HTTPServer
IBM Cognos Business Intelligence Server V10.1.0.1	Comes with IBM Monitor Server V7.5 package		
DB2 9.7 Advanced Configuration	CZVG5EN	FP4	/opt/ibm/db2
IBM Tivoli Directory Server V6.3.0.4	CZKG4ML	FP4	Installed in another server

During the chapter description, some directory abbreviations are used to simplify the examples. Table 5-2 summarizes the abbreviations and the directory used in this book's lab.

Table 5-2 Directory abbreviations used in examples

Abbreviation	Description	Example
<download_dir>	Location to which all files are downloaded	/opt/repository
<base_dir>	Product installer directory Fix or fix pack directory	/opt/repository/BPM_Adv_V7.5
<BPM_install_dir>	Installation directory of the IBM Business Process Manager	/opt/IBM/WebSphere/AppServer
<IM_install_dir>	Installation directory of the IBM Installation Manager	/opt/IBM/WebSphere/InstallationManager
<fixpack_dir>	Location to which fixes and fix packs are unpacked	/opt/repository/bpm.7.5.0.0.fixes

Note: In this book we used the WebSphere default installation directory /opt/IBM/WebSphere/AppServer. Therefore, any directory could be used. For instance, /opt/IBM/BPM for the IBM Business Process Manager installation is a good choice.

5.3.1 Installation order

After you complete the prerequisite steps as described in 5.2, “Prerequisite steps” on page 85, you can install your BPM environment.

For this book, we installed the software stack in the following order:

1. Installed DB2 and applied DB2 fix packs.
2. Created DB2 instances using the `db2icrt` command.
3. Installed IBM Tivoli Directory Server and imported the LDIF file.
4. Installed the IBM HTTP Server, the plug-in, and the applied fix pack.
5. Installed the IBM Business Process Manager and IBM Business Monitor software.
6. Applied the fixes or fix packs.

We do not include the detailed installation steps for DB2, IBM HTTP Server, and IBM Tivoli Directory Server. You can find such information in the info center. Only the installation for IBM Business Process Manager and IBM Business Monitor products and related fixes are included in the following section, with both the GUI method and the command-line method.

Installing the IBM Business Process Manager and IBM Business Monitor V7.5 product is a similar process for all configurations. We run through a IBM Business Process Manager Advanced V7.5 installation. You use IBM Installation Manager to install the product using either the command line or the GUI. Both methods require a software repository.

We use the root user to perform the installation.

5.3.2 Creating a software repository

The repository is a directory that contains all the binary installation products and fixes. We created this repository to organize the installation job. It helps the installation process, making it easier to configure IBM Installation Manager during installations and updates.

We used the `/opt/repository` directory as the repository for this book. We stored all installation software and fix files for this book in this directory.

5.3.3 Installing the products

This section describes the steps to install the products (Table 5-2 on page 89).

Note: To install or run IBM Business Process Manager or IBM Business Monitor on Windows 7, Windows Vista, or Windows Server 2008, you must elevate your Microsoft Windows user account privileges by right-clicking the command prompt where you will run the silent installation command and selecting **Run as administrator**. This is required for both administrative and nonadministrative users. This is documented in multiple places, including the IBM Business Process Manager Information Center:

http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/index.jsp?topic=%2Fcom.ibm.wbpm.imuc.ebpm.doc%2Ftopics%2Ftins_inst_silent.html

Installing IBM Installation Manager

The IBM Business Process Manager V7.5 and IBM Business Monitor V7.5 installation process now uses only the IBM Installation Manager to install it. When you start the installation process, Installation Manager starts and guides you through the installation process using an installation wizard.

IBM Installation Manager manages the installation and uninstallation of IBM Business Process Manager and IBM Business Monitor softwares and fixes. It offers GUI wizards that lead you through the entire installation process. Alternatively, you can use a silent mode installation using response files.

Installation Manager can download fixes and fix packs from the internet when you have internet connectivity. We did not use that feature in this book because most production environments do not have access to the internet. Thus, in our environment, we downloaded all necessary files first and then copied those files to the software repository directory.

On systems where IBM Installation Manager is not already installed, the installation process installs IBM Installation Manager automatically with the IBM Business Process Manager V7.5 or IBM Business Monitor V7.5.

The only way to install IBM Business Process Manager V7.5 and IBM Business Monitor V7.5 is using IBM Installation Manager. Thus, when you install any IBM Business Process Manager V7.5 or IBM Business Monitor V7.5 product, IBM Installation Manager is installed too. You can, if you want, install the IBM Installation Manager first and then install the other products.

Additional resources: You can find documentation about IBM Installation Manager v1.4 at:

<http://publib.boulder.ibm.com/infocenter/install/v1r4/>

Additional resources: If you prefer installing IBM Installation Manager before the other products, see:

<http://www-304.ibm.com/support/docview.wss?uid=swg24028743>

For information about how to install silently, see:

http://publib.boulder.ibm.com/infocenter/install/v1r4/index.jsp?topic=/com.ibm.silentinstall12.doc/topics/t_silent_installIM_IMinst.html

Using the installation manager command line

The installation manager command line (**imcl**) is a tool that comes with the IBM Installation Manager version. It allows installation, uninstallation, and modification of software packages, and update and rollback of fixes using the command line, without a response file.

To install IBM Installation Manager with **imcl**, take the following steps:

1. Go to the `<base_dir>/IM/tools` directory.
2. Execute the following command:

```
./imcl install com.ibm.cic.agent -repositories <base_dir>/IM  
-installationDirectory <IM_install_dir>/eclipse -accessRights admin  
-acceptLicense
```

Additional resource: For more information about installing Information Manager using **imcl**, refer to:

http://publib.boulder.ibm.com/infocenter/install/v1r4/index.jsp?topic=/com.ibm.cic.commandline.doc/topics/t_imcl_install_im.html

Installing IBM Business Process Manager Advanced

Whether you want to create a Process Center cell or a Process Server cell, you have to install the IBM Business Process Manager V7.5. It contains all the binary code to configure as a Process Center and a Process Server. You configure a Process Center or a Process Server during the profile creation.

We used the IBM Business Process Manager V7.5 Advanced configuration in this book. It contains all the components needed and is the most appropriated for the topology described in this book.

Additional resource: For information about how to install Business Process Manager Advanced V7.5, refer to:

<http://www-01.ibm.com/software/integration/business-process-manager/library/documentation/>

Installing from the command line

In this section we provide the steps for installation using the command line.

Note: The instructions to install Business Monitor silently are described in the following Information Center article:

http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/index.jsp?topic=/com.ibm.wbpm.mon.imuc.doc/topics/tins_inst_silent.html

Note: You can create the response file executing the steps on the GUI IBM Installation Manager interface and use it later. To find out how to do this, see the following website:

http://publib.boulder.ibm.com/infocenter/install/v1r4/index.jsp?topic=/com.ibm.silentinstall12.doc/topics/t_silent_create_response_files_IM.html

To install IBM Business Process Manager:

1. In `<base_dir>/responsefiles/BPM`, copy and rename the template response `template_response.xml` file to `BPM_Install.xml`.
2. Edit the copied `BPM_Install.xml` file.

There are a few changes that we must make to this file. Basically, we define the location of the repository file and the location where BPM will be installed. We also define that this is a 64bit installation, DB,2 and passwords:

- a. Define where the IBM Installation Manager will be installed by changing the following information:

```
<profile kind='self'
installLocation='/opt/IBM/InstallationManager' id='IBM
Installation Manager'>
<data key='eclipseLocation'
value='/opt/IBM/InstallationManager'/>
```

- b. Define the IBM Installation Manager repository directory in:

```
<repository location='/opt/repository/BPM_Adv_V7.5/IM'
temporary='true'/>
```

- c. As we are installing on a 64-bit server, define the 64-bit repository directory:

```
<repository  
location="/opt/repository/BPM_Adv_V7.5/repository/repos_64bit/" />
```

- d. Remove or comment the line for the 32-bit repository:

```
<!-- <repository location="../../repository/repos_32bit/" /> -->
```

- e. In a 64-bit installation, define true in the following statement:

```
<data key='user.select.64bit.image,com.ibm.websphere.ND.v70'  
value='true' />
```

- f. Set the following properties to false to not try internet access:

```
offering.service.repositories.areUsed  
com.ibm.cic.common.core.preferences.searchForUpdates
```

- g. Include the BPM feature so that Business Process Manager gets installed:

```
<offering profile="Business Process Manager Advanced"  
id="com.ibm.ws.WPS75"  
features='wps.client.feature,wps.server.feature' />
```

- h. For our lab, we commented the DB2 feature installation, because we installed the DB2 Advanced configuration instead. If you are installing DB2 Express, change this line to include the DB2 feature that you want to install, 32 or 64 bit.

```
<!-- <offering profile="Business Process Manager Advanced"  
id="com.ibm.ws.DB2EXP97.linuxia32" /> -->
```

3. Execute the **<base_dir>/IM/installc -acceptLicense input BPM_Install.xml -log install.log** command.

The installation takes a little bit of time. After the installation is complete you can verify the installation using the following command:

```
<BPM_install_dir>/bin/versionInfo.sh
```

Change **<BPM_install_dir>** to suit your product installation.

For the IBM Installation Manager, you can verify with the following command:

```
cd <IM_install_dir>/eclipse/tools  
./imcl version
```

Installing Business Monitor

At the time that we wrote this book there were no fixes or fix packs available for Business Monitor, so we simply install the base product. We show how to install the product using the command line or the GUI. The command line is

suggested for consistency and repeatability. It can also be scripted for unattended installation.

Installing using the GUI

This section describes how to install WebSphere Business Monitor binaries using the IBM Installation Manager.

In our lab, we installed IBM Business Monitor V7.5.0.0 and IBM Cognos Business Intelligence v10.1.0.1. We have already installed IBM WebSphere Application Server and IBM DB2.

You might want to install all the components at once. In this case, the IBM WebSphere Application Server will be installed together with IBM Business Process Manager or IBM Business Monitor in a single step. If you want to install everything in one step, see 5.3.5, “Installing and applying fixes all-in-one” on page 103.

At the time of writing there were no fixes or fix packs available for Business Monitor, so we simply install the base product.

1. Run the `<base_dir>/launchpad.sh` shell script. The window shown in Figure 5-2 opens. Click **Install**.

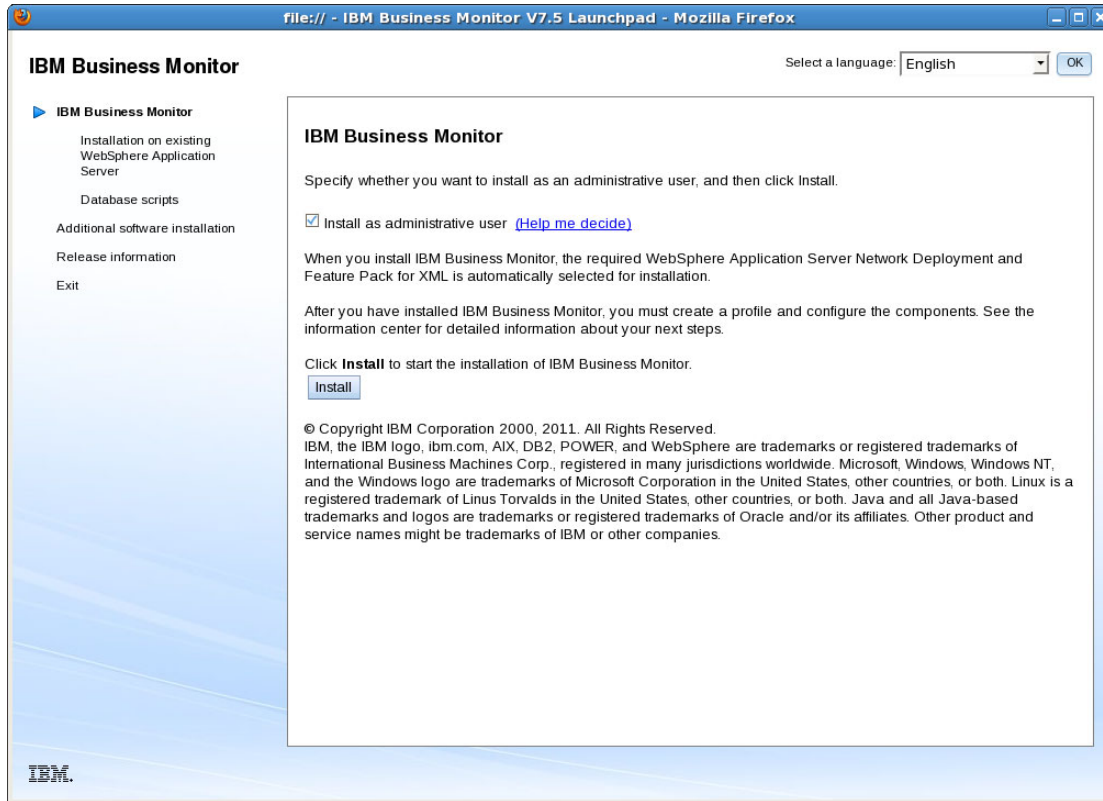


Figure 5-2 Launchpad initial window

2. Accept the license agreement by choosing **I accept the terms in the license agreement** and clicking **Next**.

3. Choose the software that you want to install. In our case, we choose **Business Monitor** and **IBM Cognos Business Intelligence 64 bit** (Figure 5-3), then click **Next**.

Note: We installed a 64-bit IBM Cognos because this matches our 64-bit IBM Business Monitor and 64-bit IBM Business Process Manager. If you have installed a 32-bit IBM Business Monitor and a 32-bit IBM Business Process Manager, then you must install a 32-bit IBM Cognos.

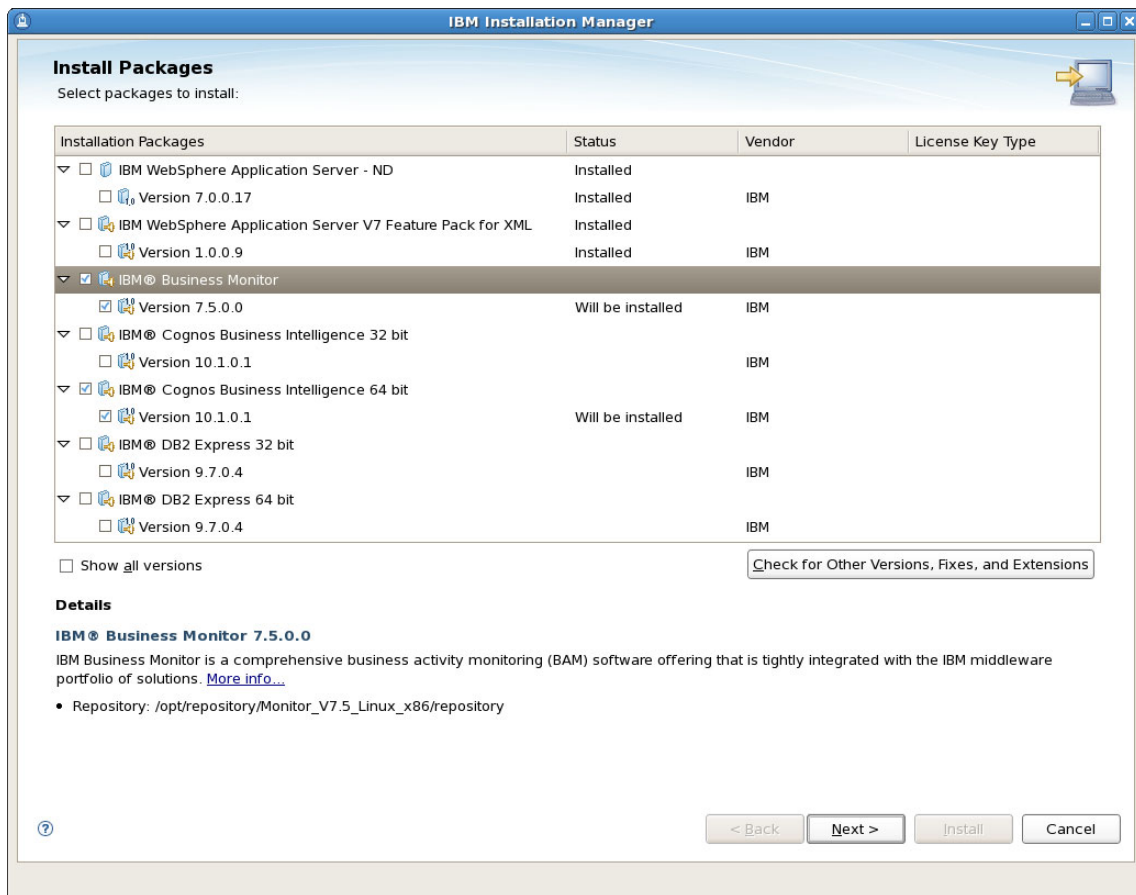


Figure 5-3 Select install package window

4. Verify the information on the Location page. **Use existing package group** should be selected, and the installation directory should correspond to what you have chosen on the first page of the Launchpad window (Figure 5-4). Also verify that you have enough disk space on the destination drive. When you are done, click **Next**.

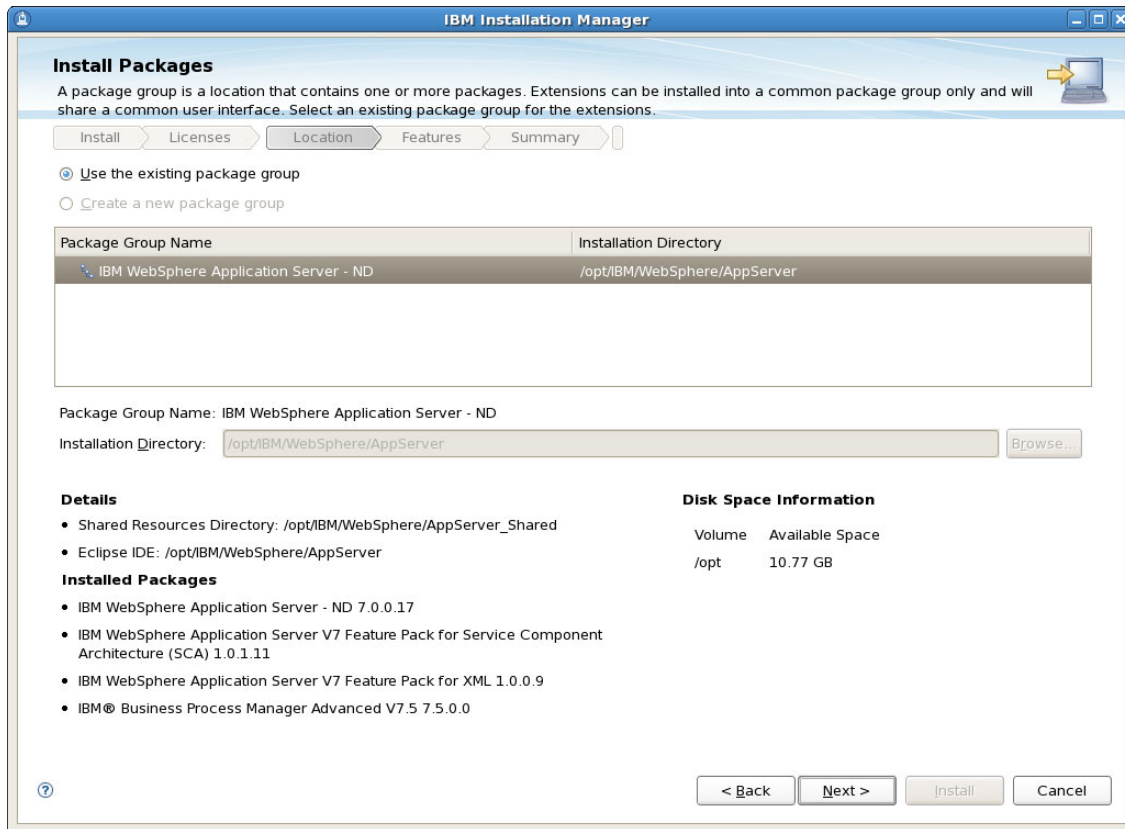


Figure 5-4 Package group window

5. On the next page (Figure 5-5), leave the default values unchanged and click **Next**. Do not select any of these features. If selected, profiles will be created during the installation. They are useful for development and test environments. We will create the profiles later.

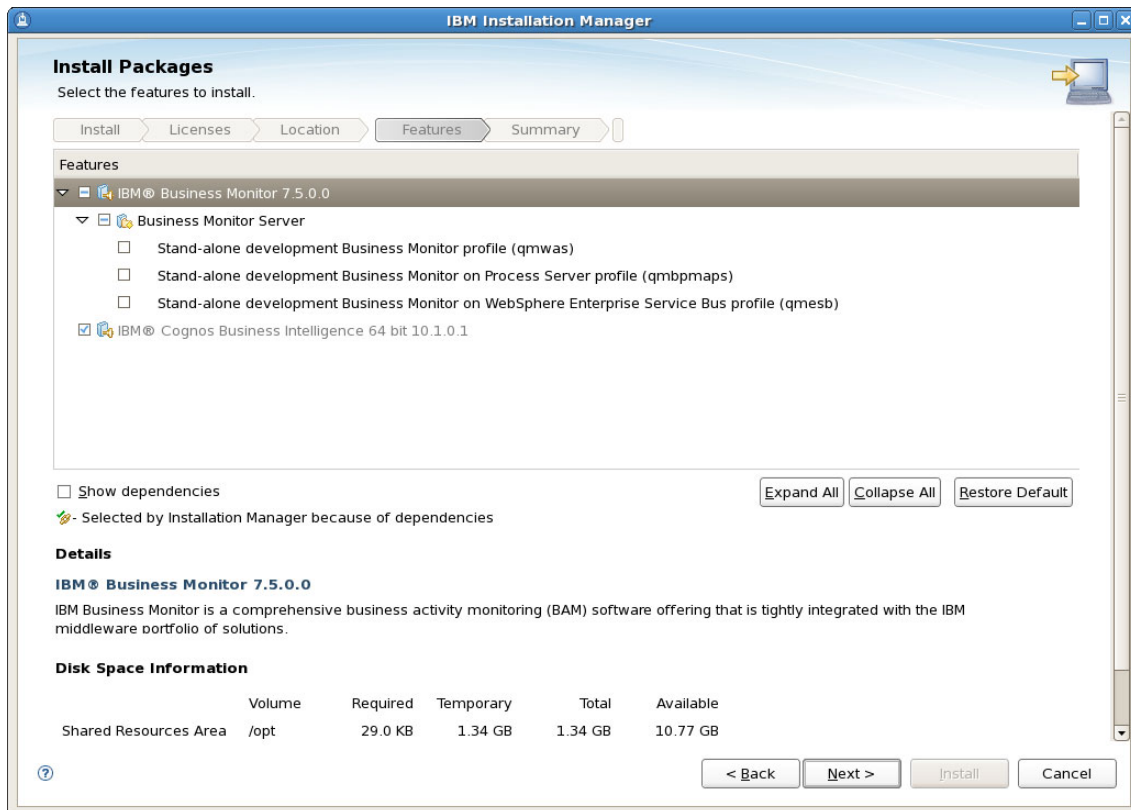


Figure 5-5 Select feature to install window

6. Check the summary page to see that all information is correct. Click **Install** to start the installation (Figure 5-6).

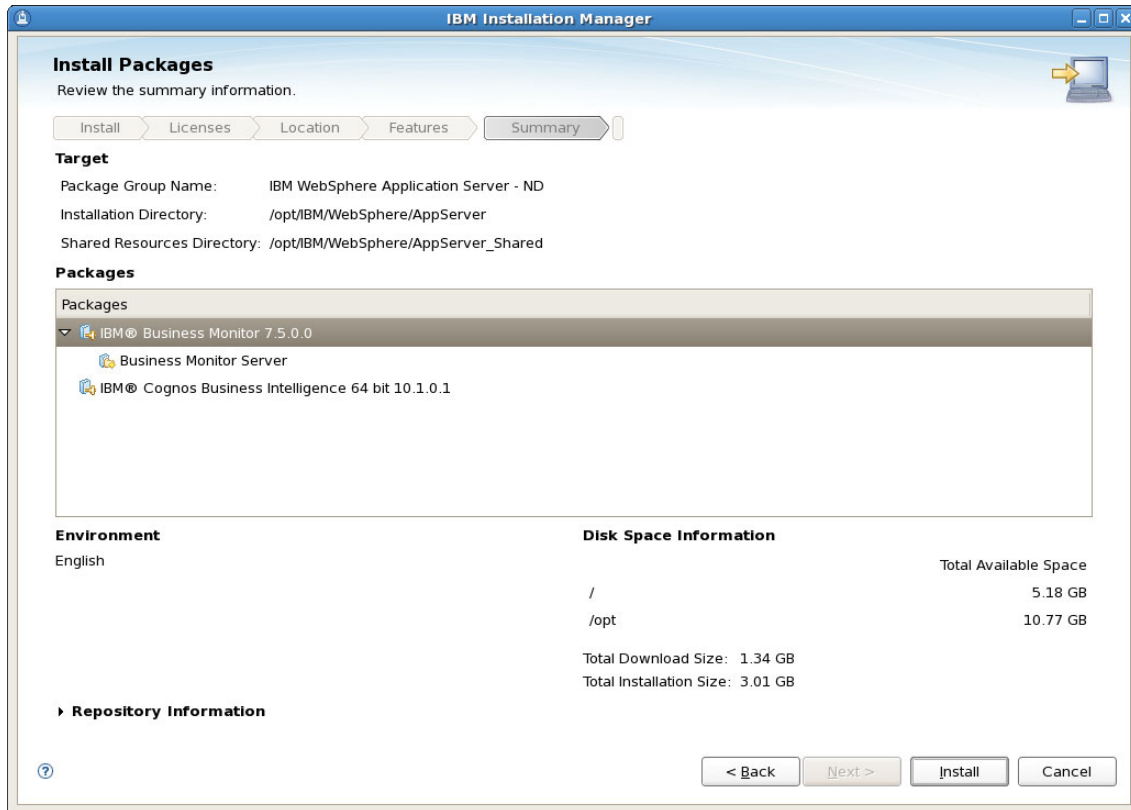


Figure 5-6 Summary page

7. Verify that the installation was successful. The page should resemble Figure 5-7. Click **None** on the Which Package do you want to start? panel and click **Finish** to close the IBM Installation Manager. If the installation was not successful, consult the log file by clicking **View Log File** to determine the cause of the failure.

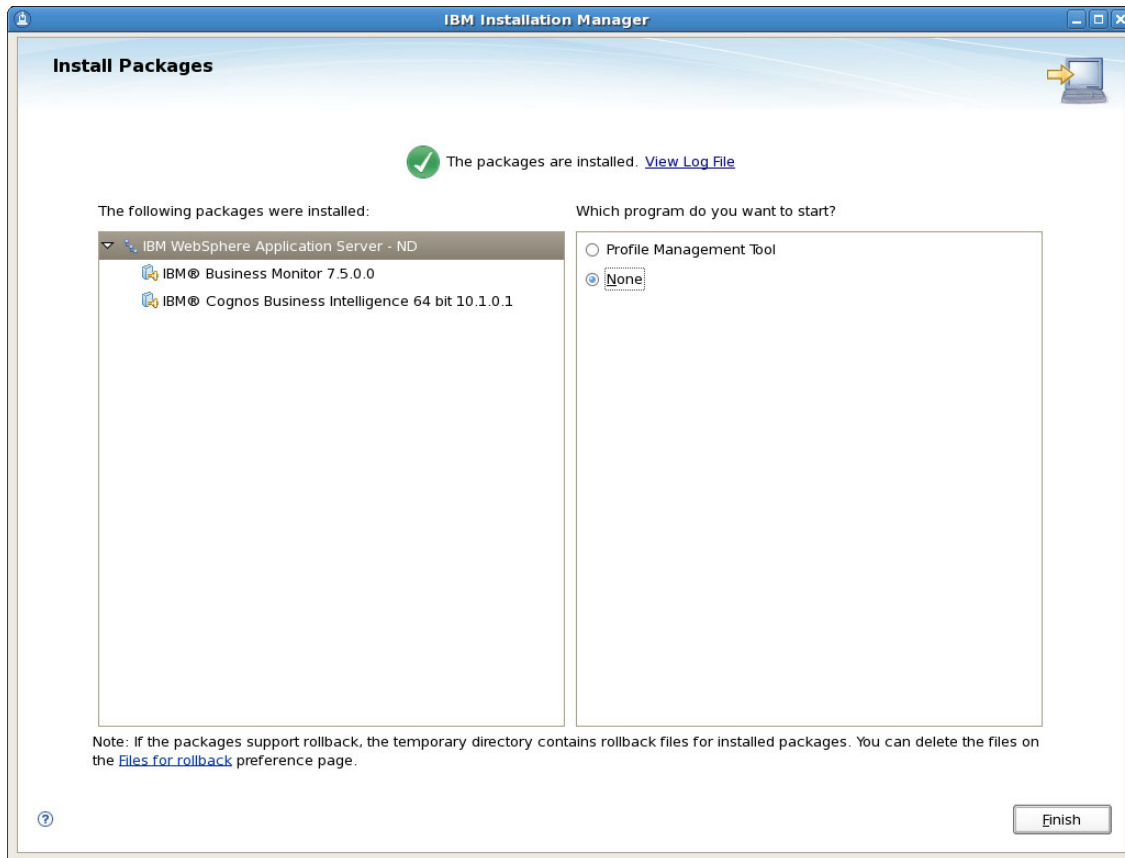


Figure 5-7 Final page showing that the installation was successful

The launchpad has installed IBM Business Monitor V7.5.0 and IBM Cognos Business Intelligence 10.1.0.1. There are no fix packs for IBM Business Monitor, so this completes the software installation. After the installation you can verify the installation using the following command:

```
<BPM_install_dir>/bin/versionInfo.sh
```

5.3.4 Applying the fixes

The process of applying fixes and fix packs is very similar. First you download the latest fixes or fix packs that you want to install. Then you copy these files to the repository directory and run the Installation Manager.

Fix pack note: AT the time this book was written, no fix packs were available.

You can install a fix or fix pack in IBM Business Process Manager V7.5 using the **imcl** command without a response file or using a response file.

We describe both methods in the sections that follow. In both examples, we show how to apply the fixes that were available at time of writing.

Installing from the command line

To do this:

1. Download the fix or fix pack that you want to install. The only two fixes available at time of writing were:
 - 7.5.0.0-WS-BPM-MultiOS-IFIC76549
 - 7.5.0.0-WS-BPM-IFIC76648
2. Go to the eclipse/tools directory in the IBM Installation Manager installation CD *<IM_install_dir>/eclipse/tools* directory.
3. Execute the following command:

```
./imcl install <version_id> -repositories <base_dir>  
-installationDirectory <BPM_install_dir>
```

Example 5-1 shows how we applied fix 7.5.0.0-WS-BPM-MultiOS-IFIC76549.

Example 5-1 Installing a fix with imcl, no response file

```
./imcl install 7.5.0.0-WS-BPM-MultiOS-IFIC76549 -repositories  
/opt/repository/bpm.7.5.0.0.fixes/7.5.0.0-WS-BPM-MultiOS-IFIC76549/  
-installationDirectory /opt/IBM/WebSphere/AppServer/
```

Installing with the response file

To install a fix or fix pack using a response file:

1. Copy the template response file (BPM_Patch.xml) found in Appendix A, “Additional material” on page 357, to your home directory.
2. Edit the response file to point to your repositories. Example 5-2 on page 103 shows our change on the response file.

3. Ensure that the preference values for the following variables are set to false:
 - `com.ibm.cic.common.core.preferences.searchForUpdates`
 - `offering.service.repositories.areUsed`
4. Save your changes and run the Installation Manager. Go to the `<base_dir>/IM/eclipse/tools` directory in the IBM Installation Manager installation directory and execute the `imcl` command:


```
./imcl -acceptLicense input ~/BPM_Patch.xml
```

Example 5-2 Changes on the response file

```
...
<server>
<repository location="/opt/repository/bpm.7.5.0.0.fixes" />
...
<install modify='false'>
  <offering id='7.5.0.0-WS-BPM-MultiOS-IFIC76549' profile='Business
Process Manager Advanced' features='-'/>
  <offering id='7.5.0.0-WS-BPM-IFIC76648' profile='Business Process
Manager Advanced' features='-'/>
</install>
...
```

5. At the end of the installation verify that the fixes or fix packs installed successfully using the following command:


```
<install_dir>/bin/versionInfo.sh -maintenancePacakages
```

5.3.5 Installing and applying fixes all-in-one

It is possible to install and patch a product in a single step. We describe how to do that in this section. We begin with the assumption that no products have been installed, including the IBM Installation Manager.

To install all-in-one you must define all the repositories that you are going to use. In this sample we install the IBM Installation Manager, IBM Business Process Manager V7.5, IBM Business Monitor V7.5, and the fixes available.

Using the command line

To do this:

1. Ensure that you have created the `<base_dir>` and `<fixpack_dir>` repositories.
2. From Appendix A, “Additional material” on page 357, copy the template response file (`BPM_Mon_InstallAndPatch.xml`) to your root directory.

3. Edit this response file to point to your repositories. Example 5-3 shows our specific folders.
4. Save your changes and run the Installation Manager. Go to the `<base_dir>/IM/eclipse/tools` directory in the IBM Installation Manager installation directory and execute the `imcl` command:

```
./imcl -acceptLicense input ~/BPM_Mon_InstallAndPatch.xml
```

Example 5-3 Specific folders

```
...
<server>
  <repository location='/opt/repository/BPM_Adv_V7.5/IM'
temporary='true' />
  <repository
location="/opt/repository/BPM_Adv_V7.5/repository/repos_64bit/" />
    <repository location="/opt/repository/Monitor_V7.5/repository" />
    <repository location="/opt/repository/bpm.7.5.0.0.fixes/" />
  </repository>
</server>

...

<install>
  <offering profile="IBM Business Process Manager Advanced and Monitor"
id="com.ibm.websphere.ND.v70"
features='core.feature,samples,import.productProviders.feature,import.conf
gLauncher.feature,consoleLanguagesSupport.feature,runtimeLanguagesSupport.f
eature' installFixes='all' />
  <offering profile="IBM Business Process Manager Advanced and Monitor"
id="com.ibm.websphere.XML.v10" installFixes='all' />
  <offering profile="IBM Business Process Manager Advanced and Monitor"
id="com.ibm.websphere.SCA.v10" installFixes='all' />
  <offering profile="IBM Business Process Manager Advanced and Monitor"
id="com.ibm.ws.WPS75" features='wps.client.feature,wps.server.feature'
installFixes='all' />
</install>
  <offering profile="IBM Business Process Manager Advanced and Monitor"
id="com.ibm.ws.WBM75"
features='wbm.core.feature,wbm.abx.feature,wbm.server.feature'
installFixes='all' />
  <offering profile="IBM Business Process Manager Advanced and Monitor"
id="com.ibm.ws.cognos.linuxia64" installFixes='all' />
...

```

Using the GUI

To do this, install IBM Installation Manager:

1. In the `<base_dir>/IM` directory, ensure that you have made the changes shown in 5.3.2, “Creating a software repository” on page 90.
2. From the `<base_dir>/IM` folder run the `launchpad.sh` script.
3. On the opening page, click **New installation**.
4. Check the install location and click the **Install WebSphere Application Server** link.
5. A pop-up window appears reminding you to close any existing running versions of the IBM Installation Manager. Click **OK**.
6. The installation of WebSphere Application Server and the IBM Installation Manager take several minutes to complete. A pop-up window is displayed at the end. Click **OK**.
7. When the installation is finished, click **Exit**.

You can verify that IBM Installation Manager is installed by opening a shell and using the following commands:

```
cd /opt/IBM/InstallationManager/eclipse/tools
./imcl version
```

We can now run the IBM Installation Manager as a standalone application:

```
/opt/IBM/InstallationManager/eclipse/IBMIM
```

When the welcome page is displayed, change the list of repositories as follow:

1. Click **File** → **Preferences** and remove the `public.dhe.ibm.com` repository by clicking the repository name and then clicking **Remove Repository**.
2. Click **Add Repository** and enter `<base_dir>/repository/repos_64bit` as the location to install IBM Business Process Manager V7.5. Click **OK** and it appears in the list of repositories.
3. Add the IBM Business Monitor V7.5 installation directory, including `<base_dir>/repository/Monitor_V7.5` as a repository location.
4. Add all the fixes and fix pack repositories. For this book, we included only `<fixpack_dir>/bpm.7.5.0.0.fixes`.
5. Uncheck the Search service repositories during installation and updates option, then click **OK**. This returns you to the main Installation Manager page.
6. Click **Install**.
7. Select all packages and click **Next**.
8. Select the fixes and fix packs that you want to install and click **Next**.

9. Click **I accept the terms in the license agreements**, and then click **Next**.
10. On the next page, select the **Shared resource directory** and click **Next**.
11. Select **Use the existing package group** and click **Next**.
12. On the Features page, click **Next**.
13. Choose to install 64 or 32 bits and click **Next**.
14. On the final page (Figure 5-8), validate the installation and click **Install**.

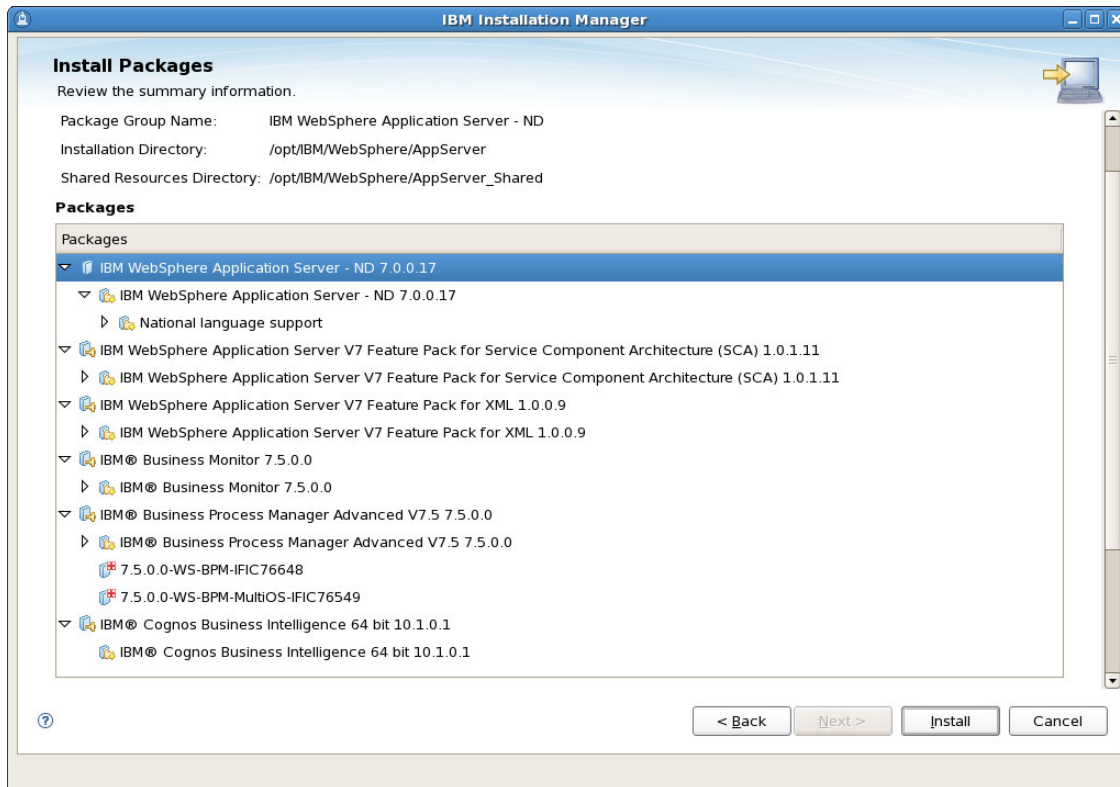


Figure 5-8 Installation summary

15. The installation takes some time to complete. When it is complete click **Finish** and **File** → **Exit** to close the installation manager.

Use the following command to check the installation:

```
<BPM_install_dir>/bin/versionInfo.sh
```

5.4 Database tables and schema creation

In DB2, the (UNIX) login user is the same as the instance owner. The instance owner manages a number of databases. Each database can have different schemas (collections of tables) (Table 5-3) where the MEDB database has seven schemas. All these databases are normally managed by a single instance owner. In Table 5-3, where no explicit schema is listed, the default is to use the instance owner as the schema name.

Table 5-3 Databases used and schema names

Database name	Schema name	Functionality supported
CMNDB		The common database.
BPMDB		Process Server database.
PDWDB		Performance Data Warehouse database.
BPEDB	CMNBE00	The Business Process Choreographer database.
BPEDB	CMNBC00	This database is used by the Business Process Choreographer tools (BPC Observer and BPC Explorer).
MEDB	CMNSS00	The Service Component Architecture (SCA) system messaging data store.
MEDB	CMNSA00	The SCA application messaging data store.
MEDB	CMNCM00	The Common Event Infrastructure (CEI) messaging data store.
MEDB	CMNBM00	The Business Process Choreographer messaging data store.
MEDB	BPMPRS00	Process Server messaging data store.
MEDB	BPMPER00	Performance Data Warehouse data store.
MEDB	MONME00	The IBM Business Monitor messaging data store.
BSPACE	CMNBS00	The database for Business Space.
MONDB	MONME00	The database used by IBM Business Monitor.
COGNOSCS		Database used by Cognos content store.

Note: We used only one database instance to create either Process Center and Process Server databases in our lab. To differentiate these databases, we used a convention to insert the letter C as a suffix for the database names. So, for instance, CMNDB is the common database for the Process Server cell, while CMNDBC is the database for the Process Center cell.

Table 5-4 DB2 Instance Owners

Product	DB2 Instance Owner
Business Process Manager	bpm1inst
Business Monitor	moninst
IBM Cognos BI	coginst

The creation of databases, schemas, tables, and other objects in the following sections is based on database script files. These database script files contains most of the commands executed to create these objects and statements to populate some of the tables. For our example, the database script files were created in the dbscript subdirectory of the user home directory.

These files were generated by the DDT, the database design tool. This tool is explained in detail in Appendix B, “Database design tool” on page 359.

5.4.1 The common database

Create the common database using the appropriate instance owner on the DB2 server and verify it:

```
cd ~/dbscripts/DB2-distributed-CommonDB
db2 "connect reset"
./configCommonDB.sh createdB
```

Enter your instance owner password when prompted.

```
db2 "connect to CMNDB"
db2 "list tables for schema bpm1inst"
db2 "connect reset"
```

Note: If you want to create the common database on the command line without being prompted for a user name use:

```
./createDBTables.sh bpm1inst CMNDB CMNDB00 createdB
```

The parameters are instance owner, database name, schema name, and the string 'createdB'.

The output of the “**list tables ...**” commands should be approximately 44 tables in the bpm1inst schema.

5.4.2 The Process Server tables

Create the Process Server database using the appropriate instance owner on the DB2 server. Create the tables and verify:

```
cd ~/dbscripts/DB2-distributed-BPM_ProcessServer
db2 "connect reset"
db2 -tf createDatabase.sql

db2 "connect to BPMDB user bpm1inst using itso4you"
db2 -tf createTable_ProcessServer.sql
db2 -tdGO -vf createProcedure_ProcessServer.sql

db2 "list tables for schema bpm1inst"
db2 "connect reset"
```

The output of the “**list tables ...**” command should be approximately 187 tables.

5.4.3 The Performance Data Warehouse tables

Create the Performance Data Warehouse database using the appropriate instance owner on the DB2 server. Create the tables and verify:

```
cd ~/dbscripts/DB2-distributed-BPM_PerformanceDW
db2 "connect reset"
db2 -tf createDatabase.sql

db2 "connect to PDWDB"
db2 -tf createTable_PerformanceDW.sql
db2 "list tables for schema bpm1inst"
db2 "connect reset"
```

The output of the “**list tables ...**” command should be approximately 22 tables.

5.4.4 The Business Process Choreographer tables

Create the Business Process Choreographer database using the appropriate instance owner on the DB2 server. Create the tables and verify:

```
cd ~/dbscripts/DB2-distributed-BPC
db2 "connect reset"
CREATE DATABASE BPEDB USING CODESET UTF-8 TERRITORY en-us PAGESIZE 8 K;

db2 -tf createDatabase.sql
db2 "connect to BPEDB"
db2 "CREATE SCHEMA CMNBE00"
db2 -tf createTablespace.sql
db2 -tf createSchema.sql

db2 "list tables for schema CMNBE00"
db2 "connect reset"
```

The output of the “**list tables ...**” command should be approximately 187 tables.

5.4.5 The messaging engine tables

There are many messaging engines sets of tables. They are grouped by schema. For a full production environment including IBM Business Process Manager Advanced and IBM Business Monitor, you must have at least seven messaging engine schemas.

To create the messaging engine database using the appropriate instance owner on the DB2 server:

```
db2 "connect reset"
db2 "CREATE DATABASE MEDB USING CODESET UTF-8 TERRITORY EN-US PAGESIZE
8 K"
```

The script directory has one directory for each messaging engine schema. You must enter these directories and run the following commands to create the tables and verify.

For each messaging engine script directory:

```
cd ~/dbscripts/DB2-distributed-SibME/<ME_script_dir>
db2 "connect to MEDB"
db2 -tf DB2-distributed-SibME.sql
```



```
db2 "list tables for schema <ME_schema>"
db2 "connect reset"
```

The output of the “**list tables ...**” commands should be nine tables per schema.

Note: Table 5-3 on page 107 provides a list of the messaging engine schema names used in our lab.

5.4.6 The Business Process Reporting tables

Create the Business Process Reporting database using the appropriate instance owner on the DB2 server and verify:

```
cd ~/dbscripts/DB2-distributed-BPCReporting

db2 "connect reset"
CREATE DATABASE OBSVRDB USING CODESET UTF-8 TERRITORY en-us;

db2 "connect to OBSVRDB user bpm1inst using itso4you"
db2 "CREATE SCHEMA CMNBC00"
db2 -tf createTablespace_Observer.sql
db2 -tf createSchema_Observer.sql

db2 "list tables for schema CMNBC00"
db2 "connect reset"
```

The output of the “**list tables ...**” command should be eight tables.

5.4.7 The Business Space tables

We created the Business Space tables in the CMNDB database. The common database might have been created at this point. If not, see 5.4.1, “The common database” on page 108.

```
cd ~/dbscripts/DB2-distributed-BSpace
./configBusinessSpaceDB.sh
```

Note: An alternative to this command is to run:

```
./createDBTables.sh bpm1inst CMNDB
```

The parameters are instance owner and database name.

Both the **configBusinessSpaceDB.sh** and the **createdBTables.sh** command prompt for the instance owner password:

```
db2 "connect to CMNDB"
db2 "list tables for schema CMNBS00"
db2 "connect reset"
```

The output of the “**list tables ...**” command should be 38 tables.

5.4.8 The MONITOR tables

Perform the following actions on the DB2 server:

```
cd ~/dbscripts/DB2-distributed-Monitor
db2 "connect reset"
db2 -tf createDatabase.sql

db2 "connect to MONDB"
db2 "CREATE SCHEMA MONITOR"
db2 -tf createTables.sql

db2 "list tables for schema MONITOR"
db2 "connect reset"
```

The output of the “**list tables ...**” command should be 92 tables.

Monitor messaging engine: The IBM Business Monitor messaging engine database might not yet exist. You must create it before running Business Monitor. The process of creating the messaging engine database is the same for any messaging engine.

If your messaging engine database is not created, create it using the instructions in 5.4.5, “The messaging engine tables” on page 110.

CEI messaging engine: If WebSphere Business Monitor is installed in its own cell, then we also need a CEI messaging schema in the messaging engine database.

If your messaging engine database is not created, create it using the instructions in 5.4.5, “The messaging engine tables” on page 110.

Business space: If you are going to use business space, you may reuse a business space that exists in the cell. Otherwise, the business space database must be created.

If your business space database is not created, create it using the instructions in 5.4.7, “The Business Space tables” on page 111.

5.4.9 The Cognos content store

Perform the following actions on the DB2 server:

```
cd ~/dbscripts/DB2-distributed-Cognos
db2 "connect reset"
db2 -tf createDatabase.sql
```

No tables are created, only the Cognos database and some objects.

5.5 Creating the profiles

At this point we are ready to complete the installation of the Business Process Manager. In this section we create two cells, one for the Process Center and the other for the Process Server. These cells are the base configuration to the creation of any of the topologies.

We can create the profiles silently using a response file or using a GUI. For the Process Center example we use silent profile creation running the **manageprofile** command. For the Process Server, we use the GUI process manager tool for the cell creation.

You can use either silent profile creation or the GUI to create any of these profiles. We used the silent profile creation for the Process Center and the GUI for the Process Server just for the purpose of our examples.

Note: The PMT graphical user interface is not available on 64-bit operating systems. Use the **manageprofiles** command instead.

5.5.1 Creating a Process Center deployment manager profile

The following steps describe the procedure to create a deployment manager profile using the **manageprofile** command.

1. To create an IBM Business Process Manager deployment manager profile, create the response file with a name like `PC_Dmgr.response` and content similar to that shown in Example 5-4.

Example 5-4 Response file to create a Business Process Manager deployment manager profile

```
create
serverType=DEPLOYMENT_MANAGER
templatePath=/opt/IBM/WebSphere/AppServer/profileTemplates/BPM/dmgr.procctr
.adv

profileName=DmgrProcCenter
hostName=Dmgr.PC.itso.ral.ibm.com
cellName=ProcCenter
nodeName=NodeDmgrProcCenter
enableAdminSecurity=true
adminUserName=bpmadmin
adminPassword=itso4you
profilePath=/opt/IBM/WebSphere/AppServer/profiles/DmgrProcCenter

dbType=DB2_UNIVERSAL
dbServerPort=50000
dbCreateNew=false
dbName=CMNDBC
dbUserId=db2admin
dbPassword=itsodb2.itso.ral.ibm.com
dbJDBCClasspath=/opt/IBM/WebSphere/AppServer/jdbcd drivers/DB2
```

Note: When creating an IBM Business Process Manager deployment manager for a Process Server cell, be sure to specify the proper template:

```
templatePath=/opt/IBM/WebSphere/AppServer/profileTemplates/BPM/dmgr.procsvr.adv
```

2. Go to the `<BPM_install_dir>/bin` directory and run the following command:
`./manageprofile.sh -response ~/PC_Dmgr.response`

At the end of the profile creation process, the following message displays:

```
INSTCONFSUCCESS: Success: Profile DmgrProcServer now exists. Please  
consult  
/opt/IBM/WebSphere/AppServer/profiles/DmgrProcCenter/logs/AboutThisP  
rofile.txt for more information about this profile.
```

3. If the cell is to include IBM Business Monitor, then the deployment manager profile must be augmented. Create another response file with a name like `PC_Dmgr_augment_Monitor.response` and content similar to the information shown in Example 5-5.

Example 5-5 Response file to augment a deployment manager profile for IBM Business Monitor

```
augment  
templatePath=/opt/IBM/WebSphere/AppServer/profileTemplates/wbmonitor/dmgr  
adminUserName=bpmadmin  
adminPassword=itso4you  
dbType=DB2_UNIVERSAL  
wbmDBDelayConfig=true  
wbmDBSchemaName=MONITOR  
wbmDBName=MONDB  
wbmDBUserId=db2admin  
wbmDBPassword=itso4you  
wbmDBJDBCClasspath=/opt/IBM/WebSphere/AppServer/jdbcdrivers/DB2  
wbmDBHostName=itsodb2.itso.ra1.ibm.com  
wbmDBServerPort=50000  
wbmCognosDBName=COGNOSCS  
wbmCognosDBUserId=db2admin  
wbmCognosDBPassword=itso4you
```

Note: The deployment manager profile template for IBM Business Monitor is the same for both a Process Center cell and a Process Server cell.

4. Go to the `<BPM_install_dir>/bin` directory and run the following command:
`./mangeprofile.sh -response ~/PC_Dmgr_augment_Monitor.response`
5. At the end of the profile creation process, a success message is displayed.

5.5.2 Creating Process Center custom profiles

The creation of a custom profile is much easier than the dmgr profile. The following steps describe the procedure to create a custom profile using the **manageprofile** command.

1. To create an IBM Business Process Manager custom profile, create the response file with content similar to Example 5-6.
2. Be sure that you have set the `federateLaterBPM` parameter to true.
3. Go to the `<BPM_install_dir>/bin` directory and run the following command:
`./manageprofile.sh -response <response_file>`

At the end of installation the following message is displayed:

```
INSTCONFSUCCESS: Success: Profile Node01ProcCenter now exists.  
Please consult  
/opt/IBM/WebSphere/AppServer/profiles/Node01ProcCenter/logs/AboutThisProfile.txt for more information about this profile.
```

Example 5-6 Response file to create a Business Process Manager custom profile

```
create  
templatePath=/opt/IBM/WebSphere/AppServer/profileTemplates/BPM/managed.procctr.adv  
  
profileName=Node01ProcCenter  
hostName=Node01.PC.itso.ra1.ibm.com  
nodeName=Node01ProcCenter  
profilePath=/opt/IBM/WebSphere/AppServer/profiles/Node01ProcCenter  
federateLaterBPM=true  
  
dbType=DB2_UNIVERSAL
```

Note: When creating an IBM Business Process Manager custom profile for a Process Server cell, be sure to specify the proper template:

```
templatePath=/opt/IBM/WebSphere/AppServer/profileTemplates/BPM/managed.procsvr.adv
```

4. If the cell is to contain IBM Business Monitor, the next step is to augment the custom profile. Create the response file with the content similar to Example 5-7.

Example 5-7 Response file to augment a custom profile for IBM Business Monitor

```
augment
  templatePath=/opt/IBM/WebSphere/AppServer/profileTemplates/wbmoni
    tor/managed

  profileName=Node01ProcCenter
  federateLater=true
  wbmDBType=DB2_UNIVERSAL
  wbmDBJDBCClasspath=/opt/IBM/WebSphere/AppServer/jdbcdrivers/DB2
```

Note: The custom profile template for IBM Business Monitor is the same for both a Process Center cell and a Process Server cell.

5. Go to the `<BPM_install_dir>/bin` directory and run the following command:
`./mangeprofile.sh -response <response_file>`
6. At the end of the profile creation process, a success message is displayed.

5.5.3 Federating a custom profile into the cell

The federation is the process that makes a custom profile become a node of cell. The **addNode** command is used to federate a Process Center custom profile to a Process Center deployment manager or to federate a Process Server custom profile to a Process Server deployment manager. To federate, execute the following command:

```
./addNode.sh dmrg.pc.itso.ral.ibm.com -user bpmadmin -password itso4you
```

The parameters that you pass are the host name, admin user name, and password. Change them accordingly to your environment.

Note: Each custom profile becomes a node in the cell. Repeat the steps to create, augment, and federate a custom profile for each node.

5.5.4 Creating a process server dmgr profile

This example illustrates the use of the Profile Management Tool GUI to create the deployment manager profile for a Process Server cell. Alternatively, you can

utilize the **manageprofiles** command, as illustrated in the previous examples for Process Center. You can use the Profile Management Tool on 32-bit systems.

Note: To install or run the Profile Management Tool on Windows 7, Windows Vista, or Windows Server 2008, you must elevate your Microsoft Windows user account privileges. Whether you are an administrative user or a non-administrative user, right-click the **pmt.bat** file and select **Run as administrator**. Alternatively, use the **runas** command at the command line. For example:

```
runas /user:ADMINNAME /env pmt.bat
```

Non-administrative users are prompted for the administrator password.

To create the IBM Business Process Manager deployment manager profile using the GUI, take the following steps:

1. Log in to the deployment manager machine and start the Profile Management Tool:

```
<install_dir>/bin/ProfileManagement/pmt.sh
```
2. A welcome page displays. Click **Launch Profile Management Tool**.
3. On the Profiles window, click **Create**.

4. The Environment Selection window displays a list of available environments to create. Navigate to **IBM Business Process Manager Advanced: Process Server** → **IBM BPM Advanced, Process Server deployment manager profile** (Figure 5-9), and click **Next**.

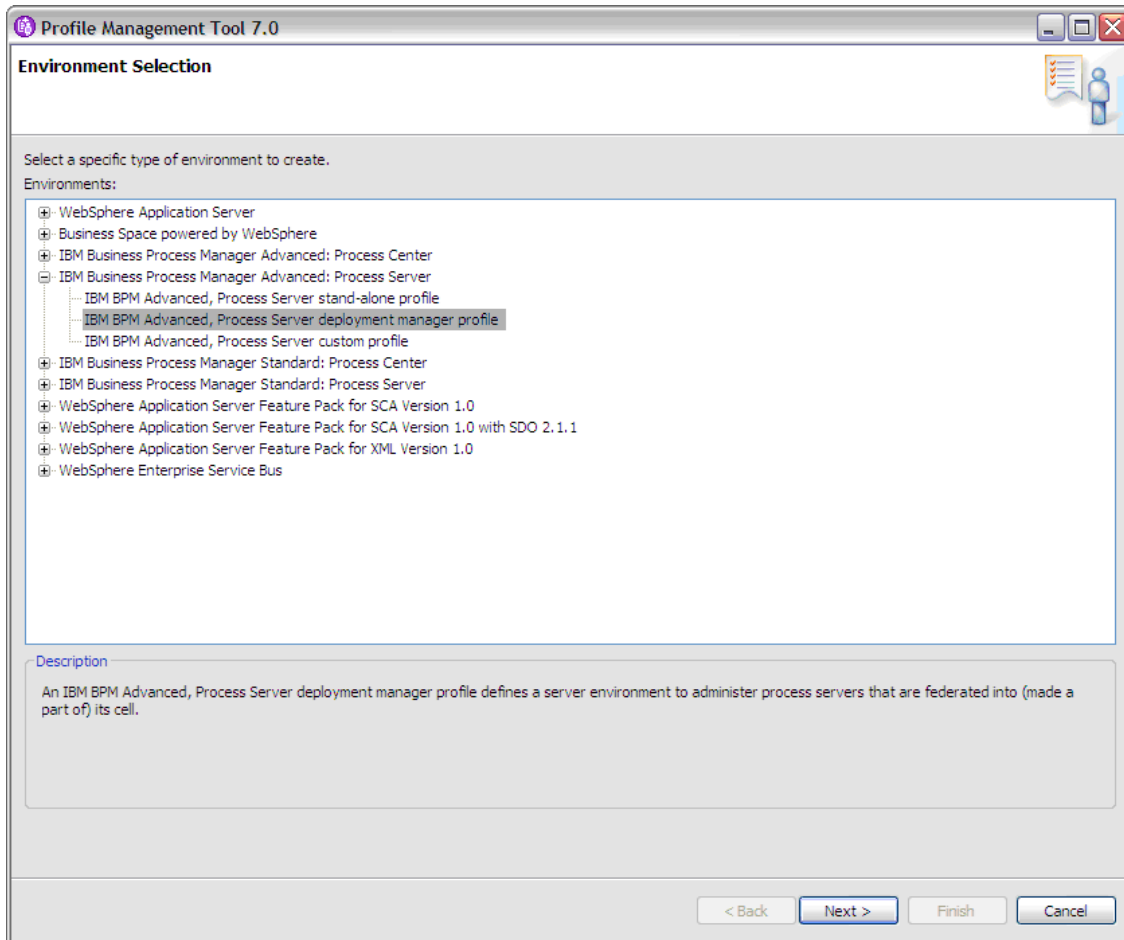


Figure 5-9 Choosing the process server dmgr profile

5. From the Profile Creation Options window, select **Advanced profile creation** (Figure 5-10). Click **Next**.

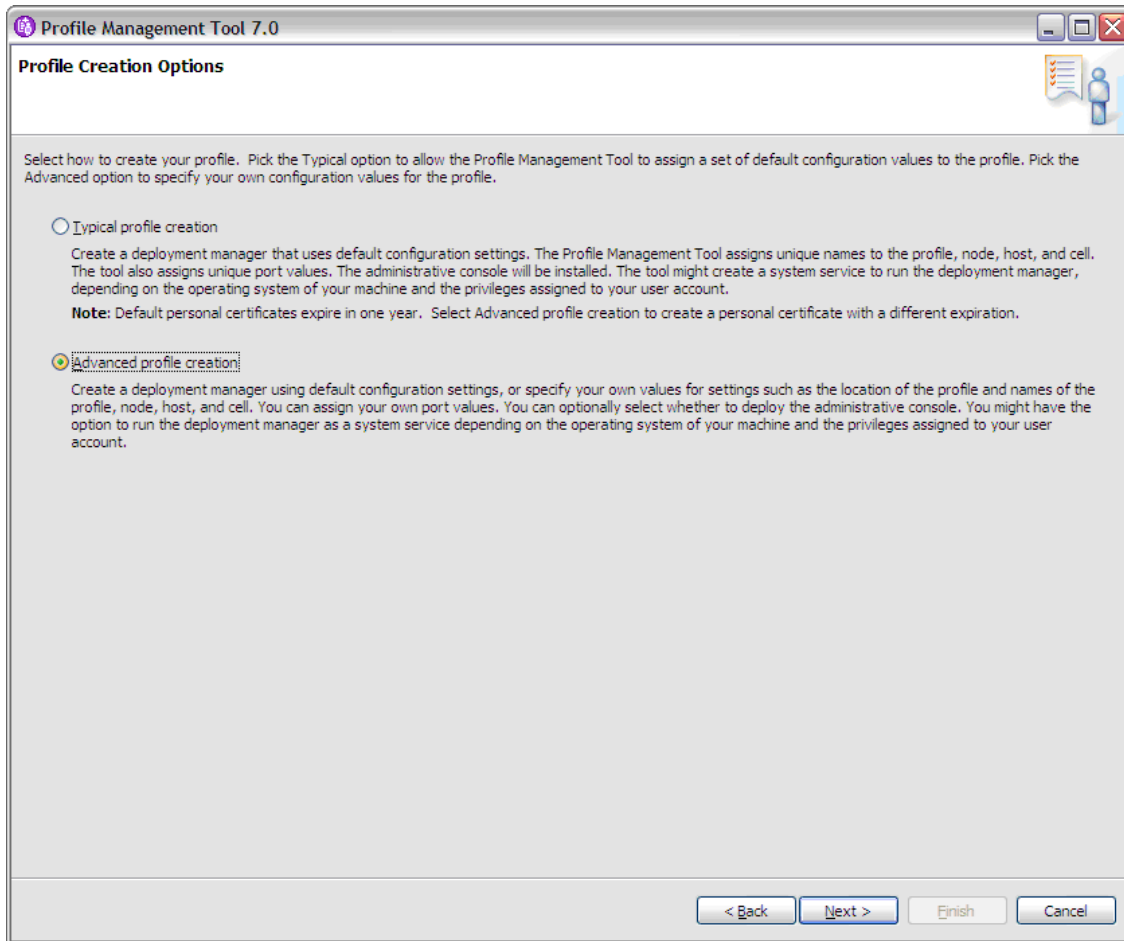


Figure 5-10 Choosing the advanced profile creation

6. From the Optional Application Deployment window, accept the default option to **Deploy the administrative console**. Click **Next**.
7. From the Profile Name and Location window, enter the values for the profile name and profile directory as follows, then click **Next**:
 - Profile name: DmgrProcServer
 - Profile directory:
/opt/ibm/WebSphere/AppServer/profiles/DmgrProcServer

8. From the Node, Host, and Cell Names window, enter the values for the node name, host name, and cell name as follows, then click **Next**:
 - Node name: NodeDmgrProcServer
 - Host name: Dmgr.PS.itso.ral.ibm.com
 - Cell name: ProcServer
9. From the Administrative Security window, enter the values for the user name and password, then click **Next**.
10. From the Security Certificate (Part 1) window, accept the default to **Create a new default personal certificate** and to **Create a new root signing certificate**, then click **Next**.
11. From the Security Certificate (Part 2) window, accept the default certificate information. The default key store password is WebAS. Click **Next**.

12. From the Port Values Assignment window, enter the port values for the deployment manager. Make sure that these ports are available and do not conflict with any process on this machine. Figure 5-11 shows the default ports. Click **Next**.

Profile Management Tool 7.0

Port Values Assignment

The values in the following fields define the ports for the deployment manager and do not conflict with other profiles in this installation. Another installation of IBM Business Process Manager Advanced Edition - Process Server or other programs might use the same ports. To avoid run-time port conflicts, verify that each port value is unique.

Administrative console port (Default 9060):	9060
Administrative console secure port (Default 9043):	9043
Bootstrap port (Default 9809):	9809
SOAP connector port (Default 8879):	8879
Administrative interprocess communication port (Default 9632) (X):	9632
SAS SSL ServerAuth port (Default 9401):	9401
CSIV2 ServerAuth listener port (Default 9403):	9403
CSIV2 MultiAuth listener port (Default 9402):	9402
QRB listener port (Default 9100):	9100
Cell discovery port (Default 7277) (G):	7277
High availability manager communication (DCS) port (Default 9352):	9352
DataPower appliance manager secure inbound port (Default 5555):	5555

< Back Next > Finish Cancel

Figure 5-11 Ports used for the deployment environment

13. From the Service Definition window, accept the default to not run the process server process as a service. Click **Next**.

14. From the Database Design window, check **Use a database design file for database configuration** and **Delay execution of database scripts**. Enter the fully qualified path name of the database design file. The database design file must have the .dbDesign extension (Figure 5-12). Click **Next**.

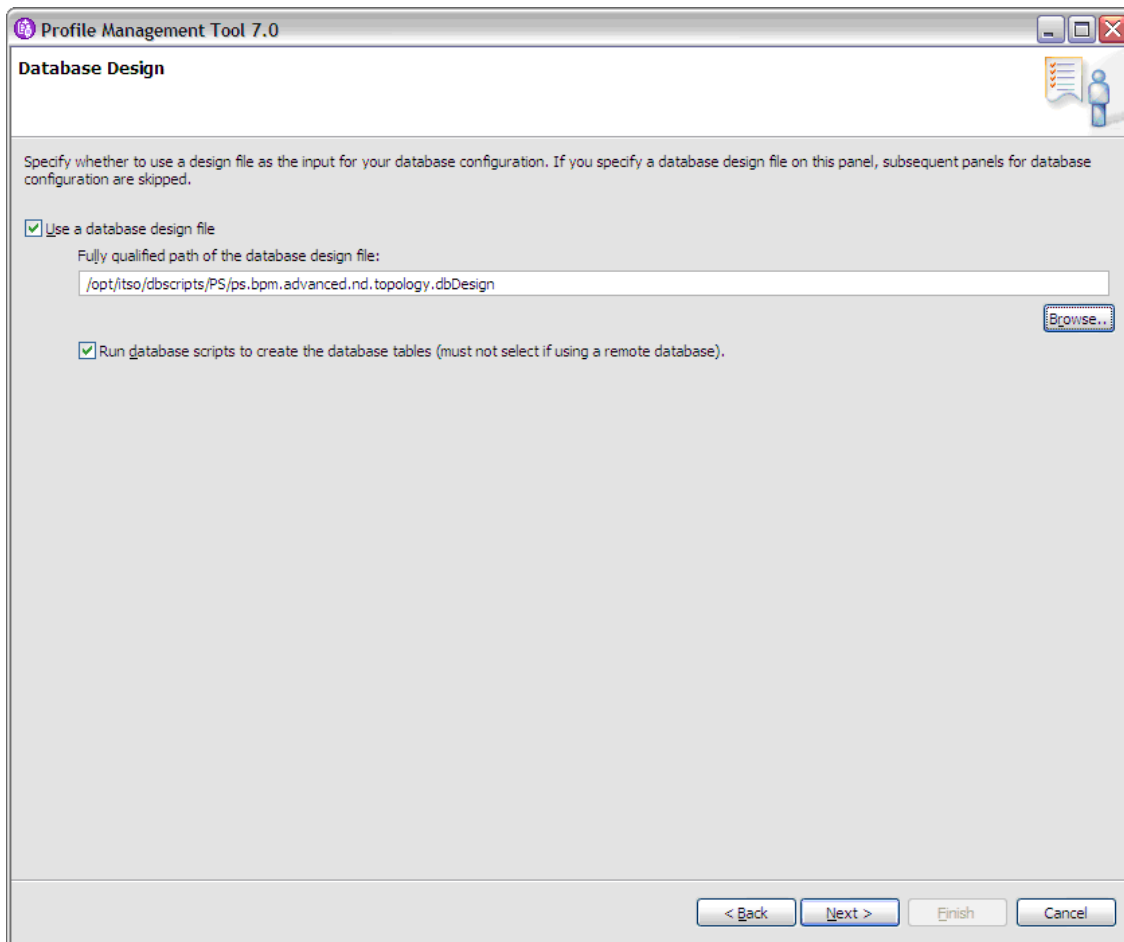


Figure 5-12 Defining the database design

15. From the Profile Creation Summary window, verify the information. Click **Create**.
16. From the Profile Creation Complete window, the Profile Management Tool created the profile successfully message is displayed. Un-check the **Launch the First Steps console** box. Click **Finish**.
17. From the Profiles window, the created deployment manager profile is listed. Click **File** → **Exit**.

Note: If the cell is to contain IBM Business Monitor, this deployment manager profile must be augmented. Instructions for augmenting the deployment manager profile are documented in the Information Center:

http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/index.jsp?topic=%2Fcom.ibm.wbpm.mon.imuc.doc%2Finst%2Fpmt_dm_augment.html

5.5.5 Creating process server custom profiles

This example illustrates the use of the Profile Management Tool GUI to create the deployment manager profile for a Process Server cell. Alternatively, you can utilize the **manageprofiles** command, as illustrated in the previous examples for Process Center. You can use the Profile Management Tool on 32-bit systems.

To create the IBM Business Process Manager custom profile, execute the following steps:

1. Log in to the deployment manager machine and start the Profile Management Tool:

```
<install_dir>/bin/ProfileManagement/pmt.sh
```
2. A welcome page displays. Click **Launch Profile Management Tool**.
3. On the Profiles window, click **Create**.
4. The Environment Selection window displays a list of available environments to create. Navigate to **IBM Business Process Manager Advanced: Process Server** → **IBM BPM Advanced, Process Server custom profile**. Click **Next**.
5. From the Profile Creation Options window, select **Advanced profile creation**. Click **Next**.
6. From the Profile Name and Location window, enter the values for the profile name and profile directory as follows, then click **Next**:
 - Profile name: CustomProcServer01
 - Profile directory:
`/opt/ibm/WebSphere/AppServer/profiles/CustomProcServer01`

7. In the Node, Host, and Cell Names window, enter the values for the node name and host name as follows, then click **Next**:
 - Node name: NodeProcServer01
 - Host name: Node01.PS.itso.ral.ibm.com
8. On the federate windows, choose to federate later by clicking the **Federate this node later** check box (Figure 5-13). Then click **Next**.

Profile Management Tool 7.0

Federation

You must federate this node later using the **addNode** command if the deployment manager:

- is not running
- has the SOAP connector disabled

☒ **Federate this node later**

Specify the host name or IP address and the SOAP port number for an existing deployment manager. Federation can occur only if the deployment manager is running.

Deployment manager host name or IP address:

Deployment manager SOAP port number (Default: 8879):

Deployment manager authentication
Provide a user name and password that can be authenticated:

User name:

Password:

< Back Next > Finish Cancel

Figure 5-13 Federate profile windows

9. In the Security Certificate (Part 1) window, accept the defaults to **Create a new default personal certificate** and to **Create a new root signing certificate**, then click **Next**.
10. In the Security Certificate (Part 2) window, accept the default certificate information. The default key store password is WebAS. Click **Next**.

11. Choose the database type and the location of the JDBC drivers (Figure 5-14).

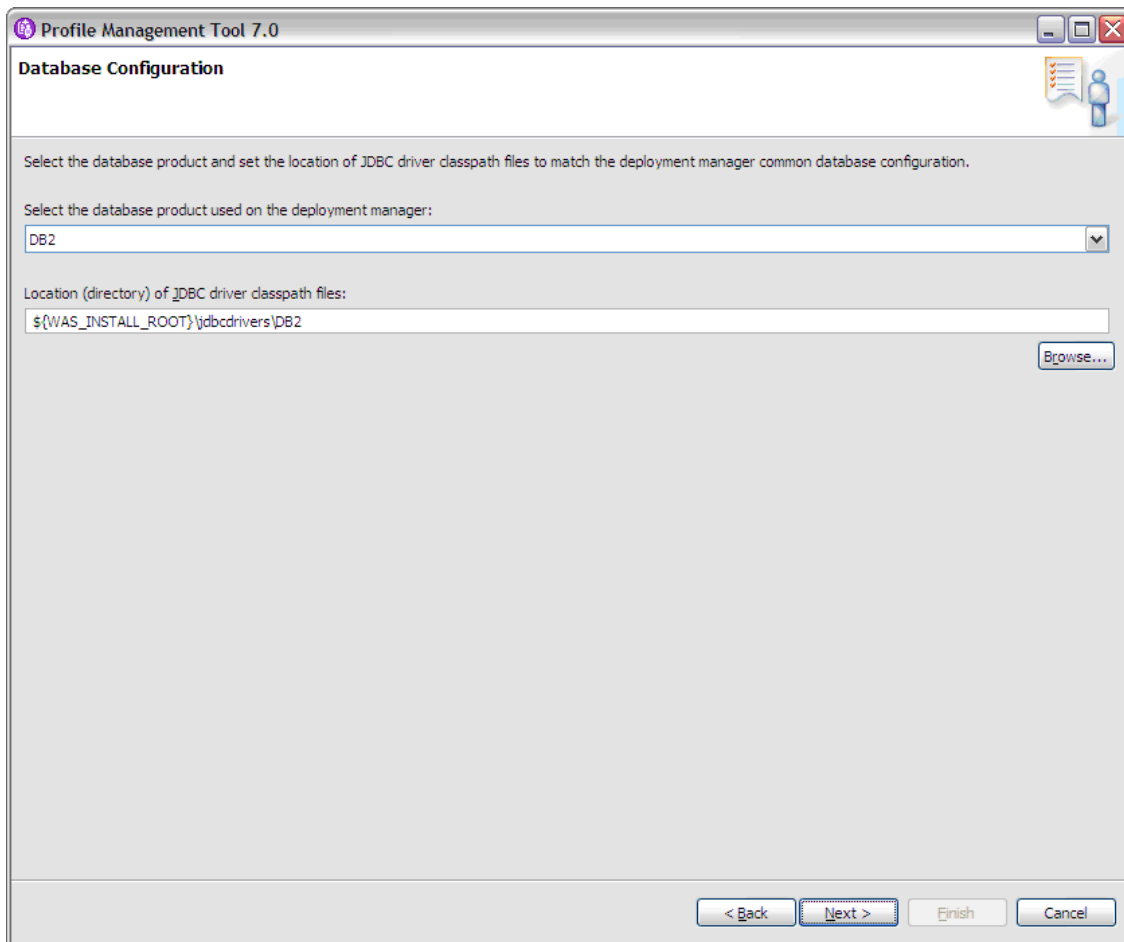


Figure 5-14 Data base type and JDBC driver path

12. In the Profile Creation Summary window, verify the information. Click **Create**.
13. In the Profile Creation Complete window, the Profile Management Tool created the profile successfully message is displayed. Un-check the **Launch the First Steps console** box. Click **Finish**.
14. From the Profiles window, the created deployment manager profile is listed. Click **File** → **Exit**.

Note: If this node is going to host IBM Business Monitor, this custom profile must be augmented. Instructions for augmenting the custom profile are documented in the Information Center:

http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/index.jsp?topic=%2Fcom.ibm.wbpm.mon.imuc.doc%2Finst%2Fpmt_custom_augment.html

5.5.6 Federating the process server custom profiles

After the custom profile has been created (and augmented for IBM Business Monitor), federate the profile into the process server cell's deployment manager. See 5.5.3, "Federating a custom profile into the cell" on page 117, for information about how to federate a profile.

5.6 Configuring LDAP as the user account registry

This section describes the procedure to configure LDAP as the user registry. Table 5-5 lists the users expected within LDAP.

Table 5-5 LDAP users by product

	Business Monitor	Business Process Manager
Primary administrative user for Business Process Manager	bpmadmin	bpmadmin
User for the business flow and human task monitor role		bpcmon
JMS API Authentication		jmsapi
User for connection to CEI Messaging Bus	ceijms	ceijms
User for connection to SCA Messaging Buses		sca

	Business Monitor	Business Process Manager
User for connection to BPC Messaging Bus		bpcjms
User for connection to Monitor Messaging Bus	monjms	

The steps are:

1. Start the deployment manager if it is not already started:
`<BPM_install_dir>/profiles/<dmgr_profile_name>/bin/startManager.sh`
2. Log in to the Integrated Solutions Console.
3. Navigate to **Security** → **Global security**.
4. Select the **Enable administrative security** check box.

In the User account repository panel (Figure 5-15), from the Available realm definitions list, the default realm is Federated repositories. Click **Configure**.

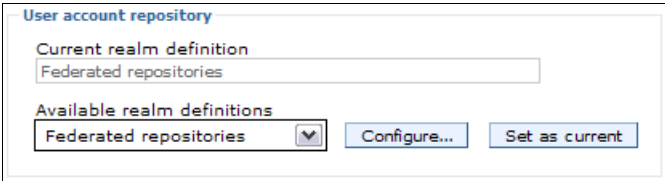


Figure 5-15 User account repository

5. From the Federated repositories window, under Related Items, click **Manage Repositories** (Figure 5-16).

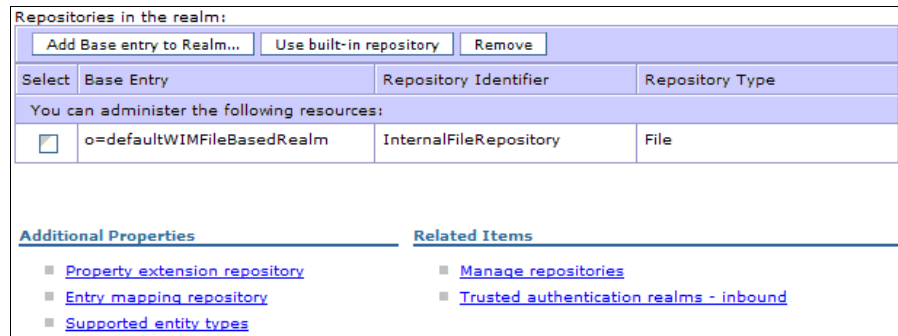


Figure 5-16 Repositories in the realm

6. On the **Manage repositories** panel, click **Add** (Figure 5-17).



Figure 5-17 Manage repositories

7. On the New Repository panel (Figure 5-18), set the following attributes:
 - a. Set Repository identifier to `itdsLDAP`.
 - b. For Directory type select **IBM Tivoli Directory Server**.
 - c. Set the primary host name to `itsoldap.itso.ral.ibm.com`.
 - d. Ensure that port is set to 389.
 - e. Set the bind distinguished name to `ou=SAMPLE`.
 - f. Set the bind password to `itso4you`.
 - g. Set the login properties to `uid`.
 - h. Click **Apply**.
 - i. Click **Save**.

Cell=ProcCenter4Clusters, Profile=DmgrProcCenter4Clusters

Global security ?

[Global security](#) > [Federated repositories](#) > [Manage repositories](#) > **New**

Specifies the configuration for secure access to a Lightweight Directory Access Protocol (LDAP) repository with optional failover servers.

General Properties

* Repository identifier
itdsLDAP

LDAP server

* Directory type
IBM Tivoli Directory Server

* Primary host name
9.42.171.196

Port
389

Failover server used when primary is not available:

Delete

Select	Failover Host Name	Port
None		

Add

Support referrals to other LDAP servers
ignore

Security

Bind distinguished name
cn=root

Bind password

Login properties
uid

LDAP attribute for Kerberos principal name

Certificate mapping
EXACT_DN

Certificate filter

☐ Require SSL communications

☒ Centrally managed
■ [Manage endpoint security configurations](#)

☐ Use specific SSL alias
CellDefaultSSLSettings ■ [SSL configurations](#)

The additional properties will not be available until the general properties for this item are applied or saved.

Additional Properties

- Performance
- LDAP entity types
- Group attribute definition

Apply OK Reset Cancel

Figure 5-18 Creating a new LDAP repository

There are now two repositories (Figure 5-19).

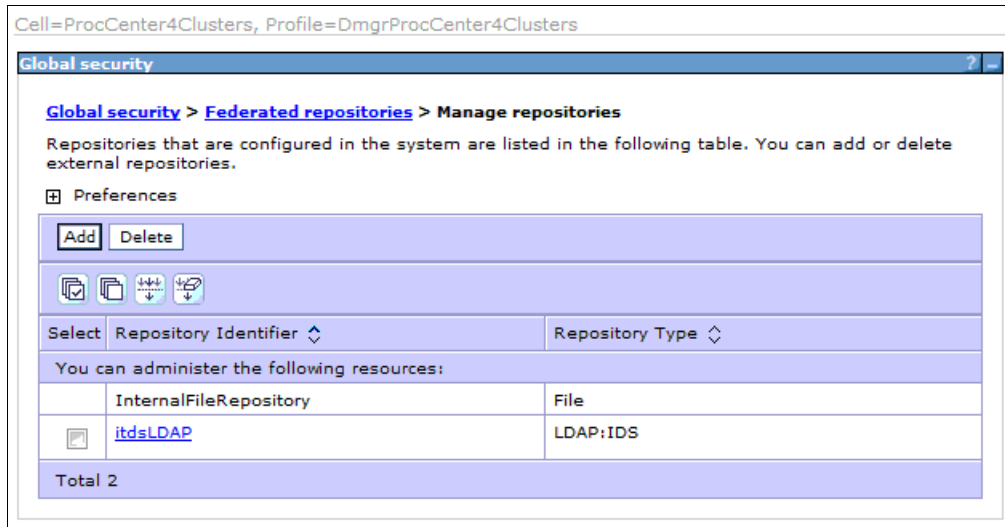


Figure 5-19 Installed repositories

8. Click the **Federated Repositories** link at the top of the page.
9. From the Federated Repositories panel, in the Repositories in the realm section, click **Add Base entry to Realm** (Figure 5-20).

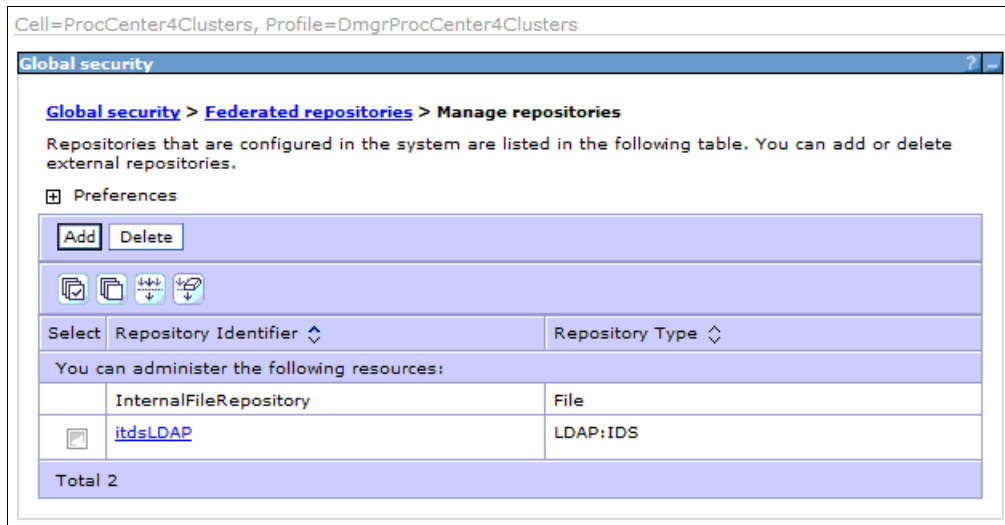


Figure 5-20 Repositories in the realm

10. From the Repository reference panel (Figure 5-21), enter the following attributes:
 - a. For the “Distinguished name of a base entry that uniquely identifies this set of entries in the realm” field enter `ou=IBM,o=ITSO`.
 - b. For the “Distinguished name of a base entry in this repository” field enter `ou=IBM,o=ITSO`.
 - c. Click **OK**.
 - d. Click **Save**.

Global security > **Federated repositories** > **ou=IBM,o=ITSO**

Specifies a set of identity entries in a repository that are referenced by a base entry into the directory information tree. If multiple repositories are included in the same realm, it might be necessary to define an additional distinguished name that uniquely identifies this set of entries within the realm.

General Properties

* **Repository**
 ITSO LDAP ▼ Add Repository...

* **Distinguished name of a base entry that uniquely identifies this set of entries in the realm**
 ou=IBM,o=ITSO

Distinguished name of a base entry in this repository
 ou=IBM,o=ITSO

Apply OK Reset Cancel

Figure 5-21 ITSO LDAP repository

The Federated Repositories panel displays two repositories (Figure 5-22).

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
<input checked="" type="checkbox"/>	ou=IBM,o=ITSO	ITSO LDAP	LDAP:IDS

Figure 5-22 Federated repositories with InternalFileRepository and LDAP

11. In the Federated Repositories panel, in the Repositories in the realm section, remove the InternalFileRepository repository as follows:
 - a. Select the **InternalFileRepository** check box.
 - b. Click **Remove**.
 - c. Click **Save**.

The Federated Repositories panel only shows the ITSO LDAP repository (Figure 5-23).

The screenshot shows a web interface titled "Repositories in the realm:". At the top, there are three buttons: "Add Base entry to Realm...", "Use built-in repository", and "Remove". Below these is a table with three columns: "Select", "Base Entry", "Repository Identifier", and "Repository Type". The table contains one row with a checkbox in the "Select" column, the text "ou=IBM,o=ITSO" in the "Base Entry" column, "ITSO LDAP" in the "Repository Identifier" column, and "LDAP:IDS" in the "Repository Type" column. Below the table, there is a text label "You can administer the following resources:".

Select	Base Entry	Repository Identifier	Repository Type
<input type="checkbox"/>	ou=IBM,o=ITSO	ITSO LDAP	LDAP:IDS

You can administer the following resources:

Figure 5-23 Federated repositories with only LDAP

12. From the Federated Repositories panel, enter the following attributes:
 - a. Set the realm name to `itsoldap`.
 - b. Set the primary administrative user name to `bpmadmin`.
 - c. Click **Server identity that is stored in the repository**.
 - d. Set the server user ID or administrative user to `cn=bpmadmin,ou=IBM,o=ITSO`.
 - e. Set the password to `its04you`.
 - f. Click **OK**.
 - g. Click **Save**.
13. Log out from the Integrated Solutions Console.
14. Restart the deployment manager.

Adding administrative groups

To do this:

1. Log on to the Integrated Solutions Console.
2. Navigate to **Users and Groups** → **Administrative group roles** and click **Add**.
3. On the Roles select panel select the appropriate roles for your topology.
4. Click **Search**. The available groups are displayed from the LDAP repository.
5. Select the group for this role (for example, `wasadmins` for IBM Business Process Manager) and click the arrow to add to "Mapped to role."

6. Click **OK**. The panel is shown in Figure 5-24.
7. Save your configuration.

Cell=wpscell01, Profile=wps1dmgr

Administrative group roles

[Administrative group roles](#) > Group

Use this page to add, update or to remove administrative roles to groups. Assigning administrative roles to groups enables them to administer application servers through the administrative console or through wsadmin scripting.

* Role(s)

Admin Security Manager
Administrator
Auditor
Configurator

☐ Select from special subjects

Special subjects
ALL AUTHENTICATED

☒ Map Groups As Specified Below

Decide how many results to display, enter a search string (use * for wildcard), and click Search. Select groups from the Available list and add them to the Mapped to role list. Groups which have already been mapped to a role will not be returned in the search results.

Search string
* Search

Maximum results to display 20

Available

bpcadmins@itsoldap
bpcmons@itsoldap
bspusers@itsoldap
fabadmins@itsoldap
wpsmons@itsoldap

Mapped to role

wasadmins@itsoldap

Select All Deselect All

Select All Deselect All

OK Reset Cancel

Figure 5-24 Adding administrative groups

You should now be able to log in to the Integrated Solutions Console using any of the users defined in the wasadmins group.

5.7 Other software used

The other software used completes the environment where IBM Business Process Manager and IBM Business Monitor run. This software is the database, LDAP, and web server.

We assume that this software is already installed, configured, and running. In this section we provide information about how the software is installed and how to configure the web server in the cell, using the administrative console.

The installation of this software is necessary to the profile creation and the deployment environment creation, and to run IBM Business Process Server and IBM Business Monitor, as you will see in the following chapters when we explain each of the topologies.

Each topology that we implemented was created in its own sandbox. This way, one implementation of a topology does not interact with another topology's implementation. Each topology shares the same server names for the database, HTTP Server, and LDAP, though they use separate physical servers.

We assume that the following software is installed:

- ▶ IBM HTTP Server (Web Server)
- ▶ IBM DB2 (Database)
- ▶ IBM Tivoli Directory Server (LDAP)

Table 5-6 shows the installation information of the other used software. All user names have the same password, that is, `itso4you`.

Table 5-6 Other installed softwares

Product	Location	Admin user	Ports
IBM HTTP Server	webserver.itso.ra1.ibm.com	ihsadmin	80, 443 8080 (admin)
IBM DB2	itsodb2.itso.ra1.ibm.com	bpm1inst	50000
IBM Tivoli Directory Server	itsoldap.itso.ra1.ibm.com	cn=root	389

5.7.1 IBM HTTP Server

We assume that one IBM HTTP Server and HTTP Server Plugin is installed. The IHS is used to spread the http requests among the cluster members. The configuration of the web server is shown in 5.7.4, “Adding IBM HTTP Server to the cell” on page 136.

5.7.2 IBM DB2

We assume that there is a DB2 database installed and configured, and that there is a database instance running. In 5.4, “Database tables and schema creation” on page 107, we show how to create the databases, tables, and other database objects in DB2 in this database instance.

5.7.3 IBM Tivoli Directory Server

We assume also that there is an IBM Tivoli Directory Server installed and running. IBM Tivoli Directory Server is configured as the LDAP user repository. Information about how to configure LDAP, using the IBM Tivoli Directory Server, is provided in 5.6, “Configuring LDAP as the user account registry” on page 127.

5.7.4 Adding IBM HTTP Server to the cell

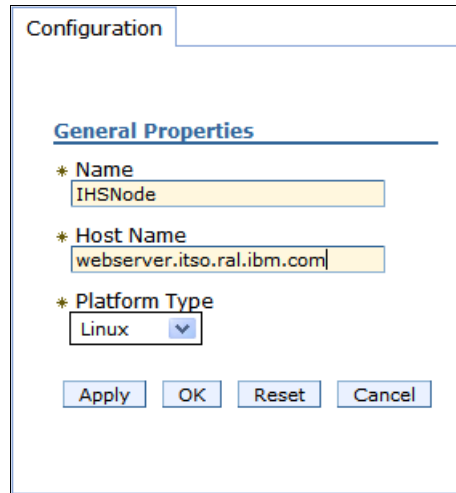
This section explains how to add the IBM HTTP Server to the deployment manager as a web server. Make sure that the deployment manager is running before starting this section.

Using the Integrated Solutions Console

To do this:

1. Launch the Integrated Solutions Console.
2. Add an unmanaged node to the WebSphere cell:
 - a. Click **System Administration** → **Nodes**.
 - b. Click **Add Node**.
 - c. On next panel click **Unmanaged node** and then **Next**.

- d. Enter **IHSNode** as the name and **webserver.itso.ral.ibm.com** as the host name. Select **Linux** from the Platform Type drop-down menu and click **OK** (Figure 5-25).



Configuration

General Properties

* Name
IHSNode

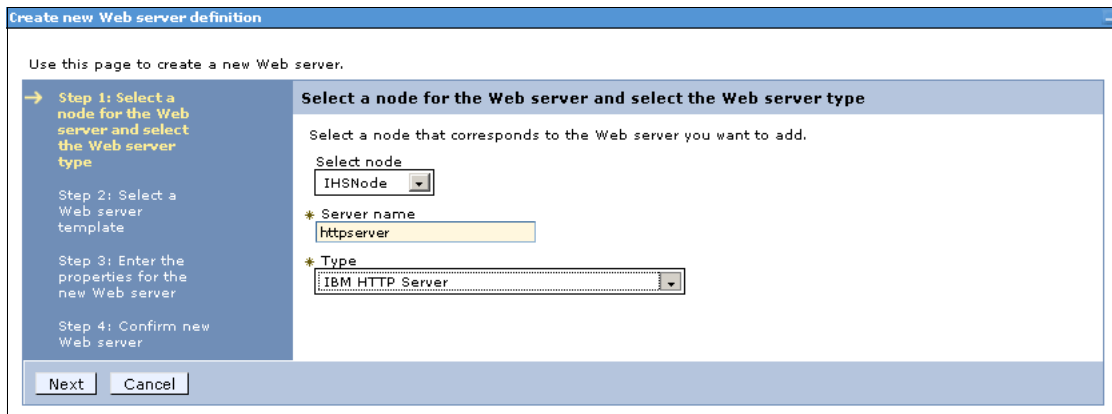
* Host Name
webserver.itso.ral.ibm.com

* Platform Type
Linux

Apply OK Reset Cancel

Figure 5-25 New unmanaged node

3. Add IHS to the cell:
- Click **Server** → **Server Types** → **Web servers**.
 - On top of the empty table click **New**.
 - In the next dialog choose the newly created node **IHSNode** in the Choose Node selection list, type **httpserver** in the Server Name field, and choose **IBM HTTP Server** in the Type selection list (Figure 5-26). Click **Next**.



Create new Web server definition

Use this page to create a new Web server.

→ Step 1: Select a node for the Web server and select the Web server type

Step 2: Select a Web server template

Step 3: Enter the properties for the new Web server

Step 4: Confirm new Web server

Select a node for the Web server and select the Web server type

Select a node that corresponds to the Web server you want to add.

Select node
IHSNode

* Server name
httpserver

* Type
IBM HTTP Server

Next Cancel

Figure 5-26 Define the new http server

- d. Click the radio button next to IHS template on next page and click **Next**.
- e. Enter the following values (Figure 5-27) and click **Next**:
 - Port: 80
 - Web server installation location: /opt/IBM/HTTPServer
 - Plug-in installation location: /opt/IBM/HTTPServer/Plugins
 - Application mapping to the web server: **All**
 - Administration Server Port: 8008
 - Username: ihsadmin
 - Password and Confirm password: itso4you

Figure 5-27 IBM HTTP Server details

- f. Review the details in the summary and click **Finish**.
4. Save your configuration.
5. Verify that the IHS Administration server is started by executing the following command:


```
/opt/IBM/HTTPServer/bin/adminctl start
```

- Go back to the Integrated Solutions Console, click the check box next to the new IHS server, and click **Start** (Figure 5-28).

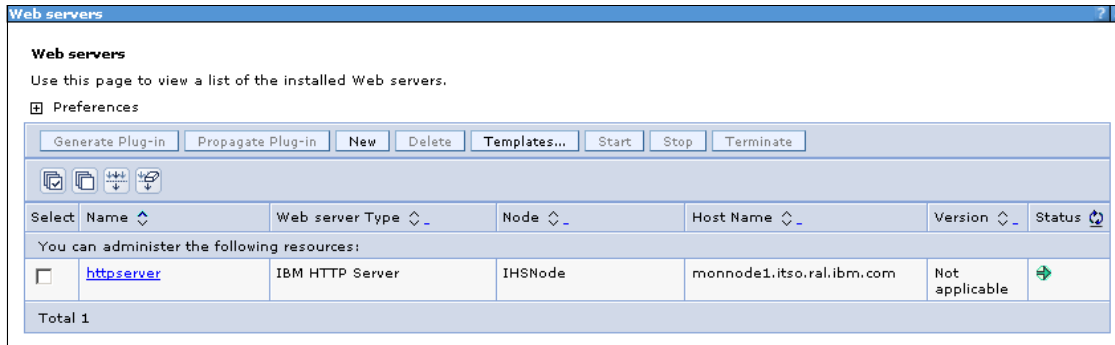


Figure 5-28 List of IHS server and run status

- Verify that the Status icon changes from a red cross to a green circle.
- Check the box next to the new web server and click **Generate Plug-in**.
- Check the box next to the new web server and click **Propagate Plug-in** to copy the plug-in XML file to the IHS server.

Using the command line

During the installation of the IBM HTTP Server Plug-in, a configureWebserver script is produced by the install process on the web server machine. In this environment, this file is located at the following path:

```
/opt/IBM/HTTPServer/Plugins/bin/configurethttpserver1.sh
```

To configure an IBM HTTP Server called httpserver to the deployment environment, perform the following steps:

- From the deployment manager, copy this script to the bin directory of the deployment manager profile. In our environment, copy this script from the IHS server to the following directory:

```
/opt/ibm/WebSphere/ProcServer/profiles/DmgrProcCenter/bin
```

- Run the configureWebserver script to configure the web server:

```
cd /opt/ibm/WebSphere/ProcServer/profiles/DmgrProcCenter/bin
./configurethttpserver1.sh -profileName DmgrProcCenter -user wpsadmin
-passwd itso4you -ihsAdminPassword itso4you
```

Note: The configureWebserver script automatically maps all web application modules to the web server. Otherwise, you must manually map these web modules.

On the Web server machine, start the IBM HTTP Server administrative server:

```
/opt/IBM/HTTPServer/bin/adminctl start
```

Verify the new configured web server in the deployment environment:

1. Log in to the Integrated Solutions Console as an administrative user.
2. Click **Servers** → **Server Types** → **Web servers**.
3. From the Web servers pane, select the web server and click **Start**. The arrow should turn green.

Enabling SSL on the HTTP Server

By default, SSL is not enabled on the IBM HTTP Server. Enabling SSL can be done through the Integrated Solutions Console as follows:

1. In the Integrated Solutions Console navigate to **Servers** → **Server Types** → **Web servers** to display the list of configured HTTP servers.
2. Click **httpserver** to display the IBM HTTP server configuration page.
3. Click **Configuration Settings** → **Web Server Virtual Hosts** to display the virtual host configuration page.
4. On the web server virtual hosts page click **New**.
5. On the first page of the new web server virtual host wizard click **Security enabled virtual host**, then click **Next** (Figure 5-29).

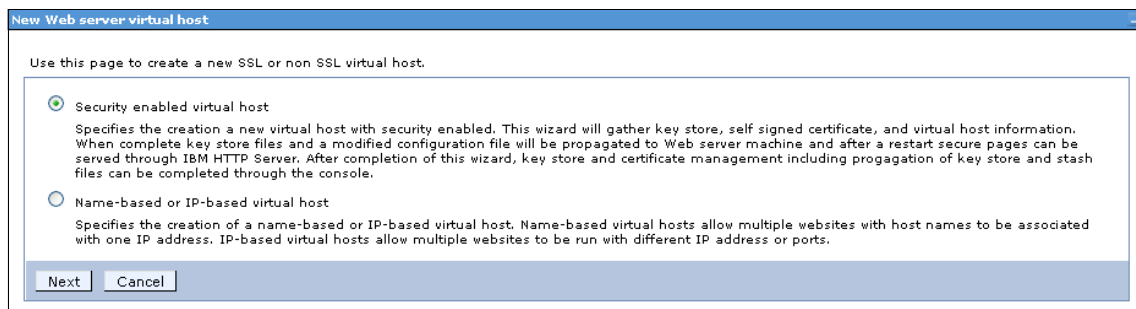


Figure 5-29 Create a new security-enabled virtual host

6. On the second page, in the Key store file name field enter `httpserver`. In the Target key store directory field enter `${WEB_INSTALL_ROOT}/conf`. In the Key store password and Verify key store password fields type `itso4you`. In the Certificate alias field enter `selfSigned` (Figure 5-30). Click **Next**.

The screenshot shows a wizard window titled "Create new security enabled virtual host". On the left, a sidebar lists three steps: "Step 1: Specify key store properties" (highlighted with a yellow arrow), "Step 2: Specify virtual host properties", and "Step 3: Confirm new security enabled virtual host". The main area is titled "Specify key store properties" and contains a descriptive paragraph: "A key store file with a self signed certificate will be created in the WebSphere repository and propagated to target Web server machine upon completion of this wizard. Web server key store management and propagation to target Web server machine can be done through WebSphere console at a later time." Below this are five fields, each preceded by a yellow asterisk: "Key store file name" with value "webserver1", "Target key store directory" with value "\${WEB_INSTALL_ROOT}/conf", "Key store password" with masked characters "*****", "Verify key store password" with masked characters "*****", and "Certificate alias" with value "selfSigned". At the bottom are "Next" and "Cancel" buttons.

Figure 5-30 Enter SSL keystore properties

7. On the third page enter the IP address of the HTTP server in the IP Address field, leave the default SSL port as 443, and click **Next** (Figure 5-31).

The screenshot shows the same wizard window, now at "Step 2: Specify virtual host properties". The sidebar highlights this step with a yellow arrow. The main area is titled "Specify virtual host properties" and contains a descriptive paragraph: "Specify virtual host properties". Below this are two fields, each preceded by a yellow asterisk: "IP Address" with value "9.42.170.245" and "Port" with value "443". At the bottom are "Previous", "Next", and "Cancel" buttons.

Figure 5-31 Configure HTTP server IP address

8. On the last page review the summary information and click **Finish**.
9. Stop and start the HTTP server to activate the secured virtual host by clicking **Stop**, then **Start**.



Single Cluster topology

This chapter provides detailed instructions for creating the Single Cluster topology for IBM Business Process Manager V7.5. In this topology, all of the functional components run in the same cluster. This includes user applications, messaging infrastructure, Common Event Infrastructure (CEI), and support applications, all running in the same cluster.

This chapter contains the following sections:

- ▶ 6.1, “Topology summary” on page 144
- ▶ 6.2, “Configuring Deployment Environment Topology” on page 147
- ▶ 6.2, “Configuring Deployment Environment Topology” on page 147
- ▶ 6.3, “Post-creation configuration” on page 165
- ▶ 6.4, “Verification” on page 181

6.1 Topology summary

The Single Cluster topology is the simplest clustered deployment environment pattern. It is targeted at environments with limited hardware and is easy to set up with the Deployment Environment wizard tool.

Note: For further topology details, see the following website:

-http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/topic/com.ibm.wbpm.imuc.doc/topics/cpln_psvr_topologies.html

This topology applies to IBM Business Process Manager environments with and without Monitor profile augmentation. See Chapter 8, “Remote Messaging, Support, and Web topology with IBM Business Monitor” on page 277, for details. Also, the topology applies to clustered Process Center and clustered Process Server environments.

Figure 6-1 shows a diagram of the topology that we create in this chapter. It is a single clustered environment with two nodes using IBM Business Process Manager Advanced. In this topology, all of the functional components run in the same cluster. Thus, there is only one cluster member on each node with the messaging engines running on one cluster member at a time. In Figure 6-1, the passive messaging engines are shown shaded in grey.

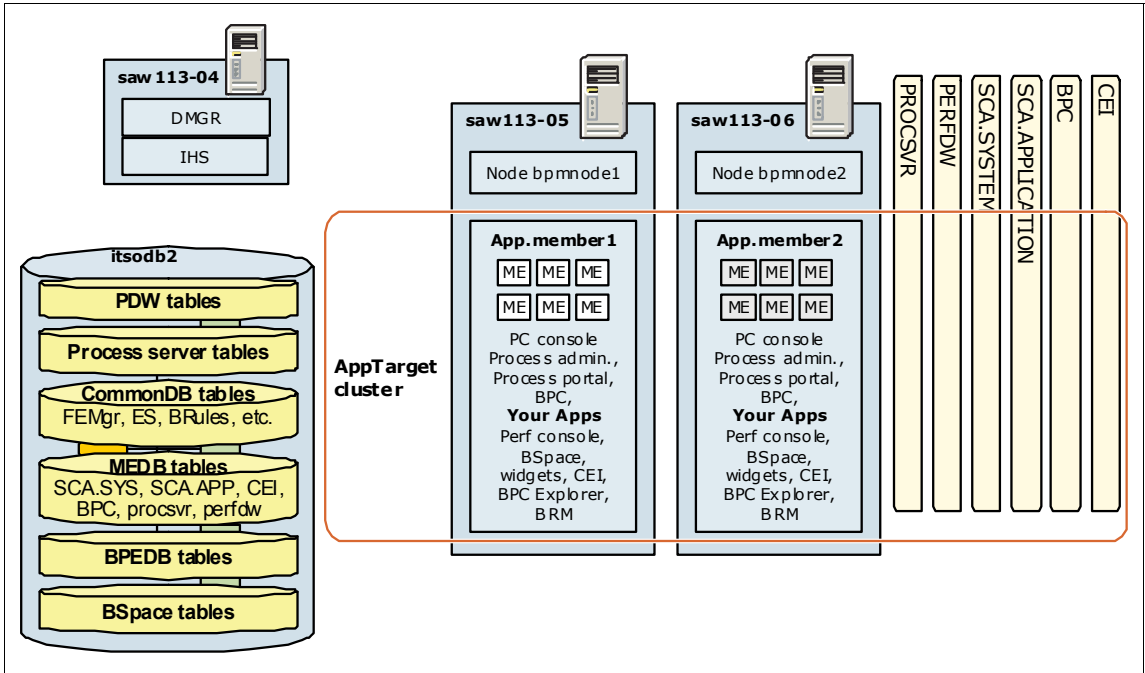


Figure 6-1 The Single Cluster topology

This topology has four machines, each hosting partial components of the system. One machine hosts the database installation, one hosts the deployment manager and the IBM HTTP Server, and the other two machines each host a node with a cluster member. Table 6-1 lists the details for this topology.

Table 6-1 Summary for the servers

Host names	Abbreviations	Software component names	Description
itsodb2	<Database_host_name>	Database	Database server
saw113-r04	<DMGR_Process_Center_host_name>	Deployment Manager	bpmdmgr node

Host names	Abbreviations	Software component names	Description
saw113-r04	<IHS_host_name>	IBM HTTP Server	Load balance web server
saw113-r05	<Node1_host_name>	Cluster Node 1	Node bpmnode1
saw113-r06	<Node2_host_name>	Cluster Node 2	Node bpmnode2

Prerequisites for creating this topology

Before you create this topology, you must complete the prerequisite steps (described Chapter 5, “Preparing your topology” on page 83):

1. Install DB2 (or an alternative database), as described in 5.3, “Installing the software” on page 88.
2. Install IBM HTTP Server (or an alternative HTTP server), as described in 5.7.1, “IBM HTTP Server” on page 136.
3. Install Tivoli Directory Server (or an alternative user registry), as described in 5.3, “Installing the software” on page 88.
4. Define the appropriate users in your user registry, as described in 5.2.6, “Defining the user registry” on page 87. In our example, we use bpmadin as the admin user ID, and the related password is bpmadin.
5. Install IBM Business Process Manager V7.5 Advanced, as described in 5.3.3, “Installing the products” on page 90.
6. Create the required databases and schemas, as described in 5.4, “Database tables and schema creation” on page 107. The following required databases in DB2 are created:
 - Common database (CMNDB)
 - Process Server Database (BPMDB)
 - Performance Data Warehouse Database (PDWDB)
 - Business Process Choreographer database (BPEDB)
 - Business process reporting schema (created under BPEDB)
 - Messaging engine database (MEDB)
 - Business Space schema (created under CMNDB)
7. Create a Deployment Manager profile, set up the user registry integration, add IBM HTTP Server to the cell, and modify certain configuration settings, as described in 5.5.4, “Creating a process server dmgr profile” on page 117.
8. Create and federate two custom nodes, as described in 5.5.5, “Creating process server custom profiles” on page 124.
9. Directory substitutions will use the details defined in Table 5-2 on page 89.

6.2 Configuring Deployment Environment Topology

This section provides instructions for configuring and deploying the Single Cluster deployment environment pattern. Use the hardware and software listed in “Prerequisites for creating this topology” on page 146. After completing these instructions, complete the steps detailed in 6.3, “Post-creation configuration” on page 165.

The topology includes a database server (DB2), two nodes to provide the clustering required, and an IBM HTTP Server to serve as a web server and provide load balancing.

Prior to running the Deployment Environment wizard or command-line tools, ensure that the environment Deployment Manager component (DMGR) and the custom nodes with their corresponding node agents are up and running. Check that there are no errors or exceptions in the corresponding profile log directories, for example:

- ▶ `<BPM_install_dir>/profiles/Dmgr01/logs`
- ▶ `<BPM_install_dir>/profiles/bpmNode01/logs`
- ▶ `<BPM_install_dir>/profiles/bpmNode02/logs`

The process is divided into two parts:

1. Define the deployment pattern topology. This is completed using the Integrated Solutions Console.
2. Apply the definition above by generating the deployment environment. This can be completed either using the Integrated Solutions Console or command-line tools.

It is possible to export the deployment pattern definitions from the Integrated Solutions Console administrative console. Section 6.2.2, “Using the command line” on page 164, details how to use the topology definitions to generate the deployment environment, using command-line tools, as an alternative silent option.

6.2.1 Using the Integrated Solutions Console

This section provides instructions for configuring and deploying the Single Cluster topology using the Integrated Solutions Console.

Creating a deployment environment

The following procedure creates the Single Cluster topology using the Integrated Solutions Console. Before you begin, ensure that the deployment manager and nodes are running and that there are no errors shown in the logs.

Note: For further details:

- About creating a Process Center environment using a deployment pattern, see:

http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/topic/com.ibm.wbpm.imuc.ebpm.doc/topics/tadm_create_top_pctr.html

- About creating a Process Server environment using a deployment pattern, see:

http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/topic/com.ibm.wbpm.imuc.ebpm.doc/topics/tadm_create_top.html

To create the Single Cluster deployment environment topology:

1. Log in to the Integrated Solutions Console as the primary administrative user that you defined when you created the profile. Here we use bpmadmin.
2. Navigate to **Servers** → **Deployment Environments**. Click **New**. The Integrated Solutions Console displays the first page of the Deployment Environment wizard with the “Create new deployment environment” option selected. Enter the name of your deployment environment (we use BPMSingleCluster in our example), (Figure 6-2). Then click **Next**.

Create a deployment environment that is based on a pattern or load an external deployment environment definition.

Enter the deployment environment name and select the path to take through the wizard (Fast path or Detailed). If you choose "Fast path: Show only needed steps", the wizard displays only those pages that do not have assigned default values.

At the end of the wizard, you can generate the deployment environment by clicking "Finish and Generate Environment", or you can click "Finish" to save the deployment environment definition. To generate the environment, you must properly configure all of the required parameters.

Create Deployment Environment

☒ Create a deployment environment based on a pattern

☐ Create a deployment environment based on an imported design

File path

* Deployment environment name

☐ Fast path: Show only needed steps

☒ Detailed: Show all steps

Figure 6-2 Create new deployment environment window: Name selection

3. Ensure that **BPMAPC** is selected as the deployment environment type on the Create new deployment environment wizard (Figure 6-3), then click **Next**.

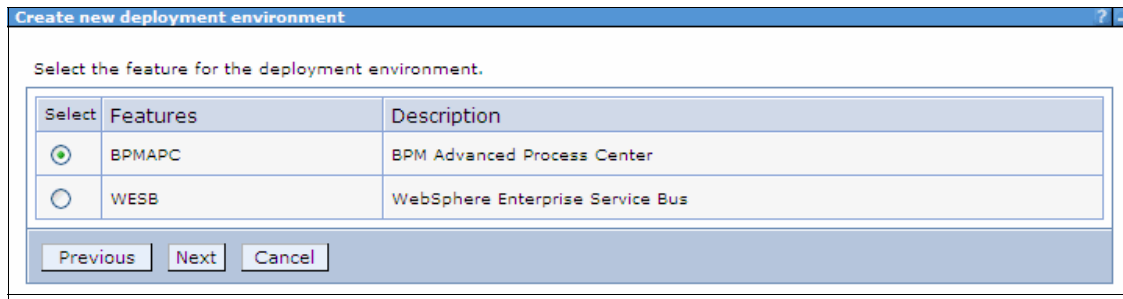


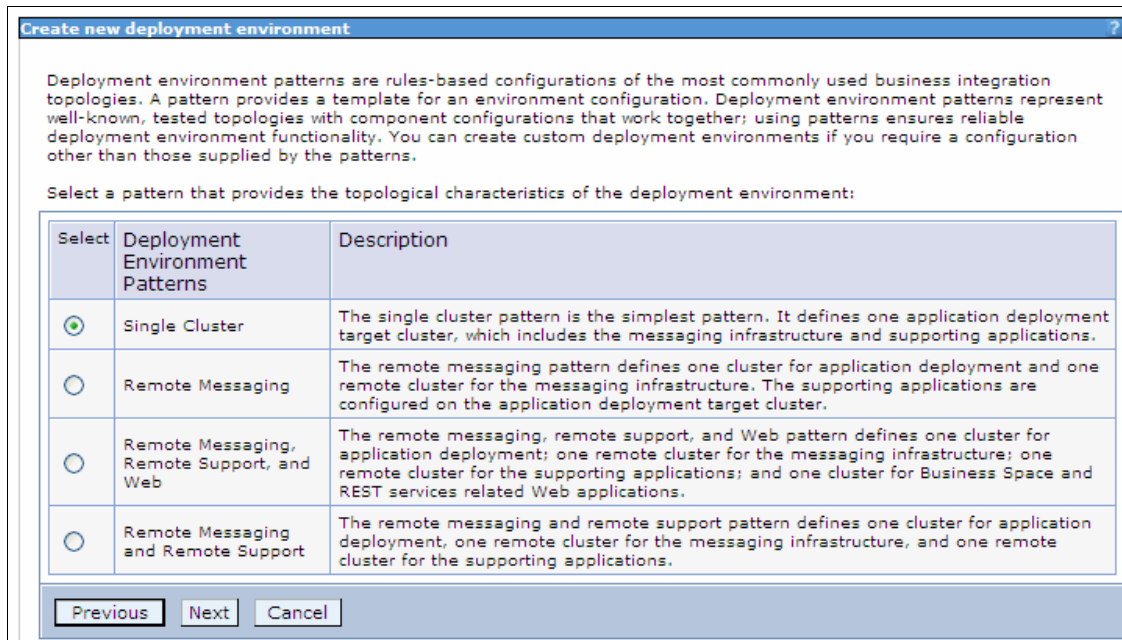
Figure 6-3 Create new deployment environment window: Type selection

Note: If you are creating a single cluster process server, the choice here should be BPMAPS, which is the IBM Business Process Manager Advanced Process Server.

WebSphere Enterprise Service Bus WESB is a subset of functionality included within the Business Process Manager Advanced feature and does not need to be additionally selected when creating a BPMAPS or BPMAPC deployment environment. For further information about the deployment environment feature choices including the WESB feature, see item 3 in the following references:

- For a Process Center environment using a deployment pattern, see:
http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/topic/com.ibm.wbpm.imuc.ebpm.doc/topics/tadm_create_top_pctr.html
- For a Process Center environment using a deployment pattern, see:
http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/index.jsp?topic=/com.ibm.wbpm.imuc.sbp.doc/topics/tadm_create_top.html

4. Select the **Single Cluster** deployment environment pattern (Figure 6-4), as this is the type of deployment environment that we are creating in this chapter, and then click **Next**.



Create new deployment environment ?

Deployment environment patterns are rules-based configurations of the most commonly used business integration topologies. A pattern provides a template for an environment configuration. Deployment environment patterns represent well-known, tested topologies with component configurations that work together; using patterns ensures reliable deployment environment functionality. You can create custom deployment environments if you require a configuration other than those supplied by the patterns.

Select a pattern that provides the topological characteristics of the deployment environment:

Select	Deployment Environment Patterns	Description
<input checked="" type="radio"/>	Single Cluster	The single cluster pattern is the simplest pattern. It defines one application deployment target cluster, which includes the messaging infrastructure and supporting applications.
<input type="radio"/>	Remote Messaging	The remote messaging pattern defines one cluster for application deployment and one remote cluster for the messaging infrastructure. The supporting applications are configured on the application deployment target cluster.
<input type="radio"/>	Remote Messaging, Remote Support, and Web	The remote messaging, remote support, and Web pattern defines one cluster for application deployment; one remote cluster for the messaging infrastructure; one remote cluster for the supporting applications; and one cluster for Business Space and REST services related Web applications.
<input type="radio"/>	Remote Messaging and Remote Support	The remote messaging and remote support pattern defines one cluster for application deployment, one remote cluster for the messaging infrastructure, and one remote cluster for the supporting applications.

Figure 6-4 Deployment environment pattern type window

5. You now run through a series of steps in the wizard, specifying how the deployment environment should be created. For step 1, you must specify which nodes are to be used to create the environment. Select both **bpmNode01** and **bpmNode02**, because these are the nodes that you created earlier (Figure 6-5). The single cluster spans the nodes selected.

Create new deployment environment ?

→ **Step 1: Select Nodes**

[Step 2: Clusters](#)

[Step 3: System REST Service Endpoints](#)

[Step 4: Import database configuration](#)

[Step 5: Database](#)

[Step 6: Security](#)

[Step 7: Business Process Choreographer](#)

[Step 8: Web Application Context Roots](#)

[Step 9: Summary](#)

Select Nodes

i Select the nodes to use for the deployment environment. The *Single Cluster* deployment environment *BPMSingleCluster* requires at least **1 node**. For high-availability and failover environments, select two nodes. For scalability, select more than two nodes.

Select	Node	Version	Host
<input checked="" type="checkbox"/>	bpmNode01	BPMPCC 7.5.0.0, BPMA 7.5.0.0, BPMAPC 7.5.0.0, WPS 7.5.0.0	saw113-05
<input checked="" type="checkbox"/>	bpmNode02	BPMPCC 7.5.0.0, BPMA 7.5.0.0, BPMAPC 7.5.0.0, WPS 7.5.0.0	saw113-06

Number of required nodes	1
Number of selected nodes	2

Next **Cancel**

Figure 6-5 Step 1: Select Nodes

6. In step 2, you can select how many cluster members to create on each node for each cluster that will be created. In this case, because we are creating a single-cluster topology, only one cluster (named Application Deployment Target) is listed. You can leave the values at the default to specify one cluster member per node (Figure 6-6).

Create new deployment environment

[Step 1: Select Nodes](#)

→ **[Step 2: Clusters](#)**

[Step 2.1: Application Deployment Target](#)

[Step 3: System REST Service Endpoints](#)

[Step 4: Import database configuration](#)

[Step 5: Database](#)

[Step 6: Security](#)

[Step 7: Business Process Choreographer](#)

[Step 8: Web Application Context Roots](#)

[Step 9: Summary](#)

Cluster Members

Map the clusters to the listed nodes by indicating the number of cluster members to configure.

Node	Version	Application Deployment Target
bpmNode01	BPMPC 7.5.0.0, BPMA 7.5.0.0, BPMAPC 7.5.0.0, WPS 7.5.0.0	1
bpmNode02	BPMPC 7.5.0.0, BPMA 7.5.0.0, BPMAPC 7.5.0.0, WPS 7.5.0.0	1

[Previous](#) [Next](#) [Cancel](#)

Figure 6-6 Step 2: Clusters

7. In step 2.1, you can set up the cluster name and each cluster member name. You can leave the values as the defaults (Figure 6-7).

Create new deployment environment

[Step 1: Select Nodes](#)
[Step 2: Clusters](#)
→ **[Step 2.1: Application Deployment Target](#)**
[Step 3: System REST Service Endpoints](#)
[Step 4: Import database configuration](#)
[Step 5: Database](#)
[Step 6: Security](#)
[Step 7: Business Process Choreographer](#)
[Step 8: Web Application Context Roots](#)
[Step 9: Summary](#)

Cluster Naming

Customize the name of a cluster and cluster member.

Cluster

Cluster
Application Deployment Target

* Cluster Name
BPMSingleCluster.AppTarget

Cluster Members

Node Name	Cluster Member Name
bpmNode01	BPMSingleCluster.AppTarget.
bpmNode02	BPMSingleCluster.AppTarget.

Previous Next Cancel

Figure 6-7 Step 2.1: Application Deployment Target

8. For step 3, enter the details for your REST endpoints. Because we are creating a production topology, we installed IBM HTTP Server to provide load balancing across our cluster. On this page, we enter the HTTP server host name and port (Figure 6-8).

The screenshot shows a web-based configuration wizard titled "Create new deployment environment". On the left, a vertical list of steps is shown: Step 1: Select Nodes, Step 2: Clusters, Step 3: System REST Service Endpoints (highlighted with a yellow arrow), Step 4: Import database configuration, Step 5: Database, Step 6: Security, Step 7: Business Process Choreographer, Step 8: Web Application Context Roots, and Step 9: Summary. The main content area is titled "System REST Service Endpoints" and contains a paragraph explaining the purpose of the page: "Use this page to configure service endpoints for Representational State Transfer (REST) system interfaces. If you want widgets to be available in Business Space, you must configure the REST service endpoints for those widgets. For each REST service endpoint, specify the host or virtual host and port that a client uses to communicate with your cluster. If you leave the host and port fields empty, the values default to those of a cluster member host and its HTTP port. For a load-balanced environment, you must later change the default values to the virtual host name and port of your environment." Below this text, under the heading "REST services", there are three input fields: "Protocol:" with a dropdown menu showing "http://", "Host name or virtual host in a load-balanced environment:" with a text box containing "saw113-04", and "Port:" with a text box containing "80". There is also a "Context root:" field with a text box containing "/rest". At the bottom of the wizard, there are three buttons: "Previous", "Next", and "Cancel".

Create new deployment environment

[Step 1: Select Nodes](#)
[Step 2: Clusters](#)
→ [Step 3: System REST Service Endpoints](#)
[Step 4: Import database configuration](#)
[Step 5: Database](#)
[Step 6: Security](#)
[Step 7: Business Process Choreographer](#)
[Step 8: Web Application Context Roots](#)
[Step 9: Summary](#)

System REST Service Endpoints

Use this page to configure service endpoints for Representational State Transfer (REST) system interfaces. If you want widgets to be available in Business Space, you must configure the REST service endpoints for those widgets. For each REST service endpoint, specify the host or virtual host and port that a client uses to communicate with your cluster. If you leave the host and port fields empty, the values default to those of a cluster member host and its HTTP port. For a load-balanced environment, you must later change the default values to the virtual host name and port of your environment.

REST services

Protocol:

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

Port:

Context root:

Figure 6-8 Step 3: System REST Service Endpoints

9. For step 4, there are two choices. The first option is to browse to and import the design file output by the Database Design Tool in the installation. In this case, the inputs in step 5 will be pre-populated based on that design file. The second option is to not import a design file, in which case the inputs in step 5 must be entered manually. In this example, we leave the Import field blank and manually enter our database settings in step 5 (Figure 6-9).

The screenshot shows a wizard window titled "Create new deployment environment" with a question mark icon. On the left is a vertical list of steps: Step 1: Select Nodes, Step 2: Clusters, Step 3: System REST Service Endpoints, Step 4: Import database configuration (highlighted with a yellow arrow), Step 5: Database, Step 6: Security, Step 7: Business Process Choreographer, Step 8: Web Application Context Roots, and Step 9: Summary. The main area is titled "Import database configuration" and contains the following text: "If you defined a database design document, enter the document name in the following field to import it into the new deployment environment. The database design document defines the database configuration for the selected deployment environment features. If you do not have a database design document, click **Next** to define the database parameters on the following page." Below this text is a label "Import database configuration file for features:" followed by a text input field, a "Browse..." button, and a "Clear" button. At the bottom of the wizard are three buttons: "Previous", "Next", and "Cancel".

Figure 6-9 Step 4: Import database configuration

10. For step 5, you might want to review the database settings that have been selected (Figure 6-10). For each line, check that the database name and schema match what you have planned in database creation. For each line, check that the Create Tables option is *not* selected, as you have already created the database tables. In the example shown in Figure 6-10, we uncheck all these Create Tables options.

Select	Name	Database Name	Schema	Create Tables	User Name	Password	Server	Provider
<input type="checkbox"/>	Business Process Choreographer data source	BPEDB	CMNBE00	<input type="checkbox"/>	db2admin	*****	itsodb2	DB2 Universal
<input type="checkbox"/>	Business Process Choreographer Messaging Engine data source	MEDEB	CMNBM00	<input type="checkbox"/>	db2admin	*****	itsodb2	DB2 Universal
<input type="checkbox"/>	Business Process Choreographer reporting function data source	BPEDB	CMNBC00	<input type="checkbox"/>	db2admin	*****	itsodb2	DB2 Universal
<input type="checkbox"/>	Business Space data source	CMNDB	CMNBS00	<input type="checkbox"/>	db2admin	*****	itsodb2	DB2 Universal
<input type="checkbox"/>	CEI Messaging Engine data source	MEDEB	CMNCM00	<input type="checkbox"/>	db2admin	*****	itsodb2	DB2 Universal
<input type="checkbox"/>	Performance Data Warehouse data source	PDWDB		<input type="checkbox"/>	db2admin	*****	itsodb2	DB2 Universal
<input type="checkbox"/>	Performance Data Warehouse Messaging Engine data source	MEDEB	CMNPE00	<input type="checkbox"/>	db2admin	*****	itsodb2	DB2 Universal
<input type="checkbox"/>	Process Server data source	BPMDB		<input type="checkbox"/>	db2admin	*****	itsodb2	DB2 Universal
<input type="checkbox"/>	Process Server Messaging Engine data source	MEDEB	CMNPS00	<input type="checkbox"/>	db2admin	*****	itsodb2	DB2 Universal
<input type="checkbox"/>	SCA System Bus Messaging Engine data source	MEDEB	CMNSS00	<input type="checkbox"/>	db2admin	*****	itsodb2	DB2 Universal
<input type="checkbox"/>	SCA Application Bus Messaging Engine data source	MEDEB	CMNSA00	<input type="checkbox"/>	db2admin	*****	itsodb2	DB2 Universal

Figure 6-10 Step 5: Database

Note: You can also use these create tables capabilities to simplify your Deployment Environment generation. In this case, you will not need the Database Design Tool to generate the SQL scripts and execute all the database scripts for all components. Only the databases need to be created in advance. Make sure that the Create Tables option is checked here, which is the default, and create all the necessary tables except Business Space. Finally, you can copy and execute the Business Space configuration scripts on the database machine after the Deployment Environment generated successfully.

11. In step 6, leave the default user names and passwords for the CEI JMS authentication, SCA, and Business Process Choreographer JMS authentication aliases (Figure 6-11).

Name	User name	Password	Confirm Password
CEI JMS authentication alias	bpmadmin	.....	.....
SCA authentication alias	bpmadmin	.....	.....
Business Process Choreographer JMS authentication alias	bpmadmin	.....	.....

Figure 6-11 Step 6: Security

- 12.If you are creating a Process Server cluster, there is a Process Server configuration page before the Business Process Choreographer settings page. On the Process Server configuration page (Figure 6-12), fill in the environment name, choose a proper environment type (we chose Production), and enter the process center connection information (we can chose the HTTP server address for the clustered Process Center).

The screenshot shows a web-based configuration wizard titled "Create new deployment environment". The left sidebar lists steps from Step 1 to Step 10. Step 7, "Process Server", is the current step and is highlighted with a yellow arrow. The main content area is titled "Process Server" and contains instructions: "Use this page to configure Process Server properties. For Process Center connection information, either select to use this Process Server as an offline server or specify the host or virtual host and port of a Process Center." Below the instructions are three sections: "Environment name" with a text input field containing "BPMPSCluster"; "Environment type" with a dropdown menu set to "Production"; and "Process Center Connection Information" which includes an unchecked checkbox for "Use server offline", a "Protocol:" dropdown set to "http://", a "Host name or virtual host in a load-balanced environment:" text input field containing "saw113-04", and a "Port:" text input field containing "80". At the bottom of the wizard are three buttons: "Previous", "Next", and "Cancel".

Figure 6-12 Process Server configuration

- 13.For Process Center step 7, set the password for the JMS API, escalation user, and administration job user authentication according to the definitions in the user registry (Figure 6-13 on page 160). Here we have not defined an email service for the human task manager, so uncheck the Enable e-mail service option.

[Step 1: Select Nodes](#)
[Step 2: Clusters](#)
[Step 3: System REST Service Endpoints](#)
[Step 4: Import database configuration](#)
[Step 5: Database](#)
[Step 6: Security](#)
[Step 7: Business Process Choreographer](#)
[Step 8: Web Application Context Roots](#)
[Step 9: Summary](#)

Business Process Choreographer

The business process choreographer components need to have the following parameters configured.

Security

Role	Use Default	Users	Groups	Description
Administrator	<input type="checkbox"/>	<input type="text" value="bpmadmin"/>	<input type="text"/>	User names, group names, or both, separated by the "|" symbol, for the business flow and human task administrator role. Users who are assigned to this role have all privileges.
Monitor	<input type="checkbox"/>	<input type="text" value="bpmadmin"/>	<input type="text"/>	User names, group names, or both, separated by the "|" symbol, for the business flow and human task monitor role. Users who are assigned to this role can view the properties of all of the business process and task objects.

Authentication	Users	Password	Confirm Password	Description
JMS API Authentication	<input type="text" value="bpmadmin"/>	<input type="password" value="....."/>	<input type="password" value="....."/>	Authentication for business flow manager message-driven bean to process asynchronous API calls
Escalation User Authentication	<input type="text" value="bpmadmin"/>	<input type="password" value="....."/>	<input type="password" value="....."/>	Authentication for human task manager message-driven bean to process asynchronous API calls
Administration job user authentication	<input type="text" value="bpmadmin"/>	<input type="password" value="....."/>	<input type="password" value="....."/>	Authentication for the business flow manager and human task manager administrative jobs. This user must be in the Administrator role.

Human Task Manager Mail Session

Figure 6-13 Step 7: Business Process Choreographer settings

Note: If you are creating a single cluster process server, that page is step 8, and the following page number is one bigger than the Process Center images.

14. In step 8, you can modify the context roots for various IBM Business Process Manager components. In the environment that we have created, we used the default values (Figure 6-14).

Create new deployment environment

[Step 1: Select Nodes](#)
[Step 2: Clusters](#)
[Step 3: System REST Service Endpoints](#)
[Step 4: Import database configuration](#)
[Step 5: Database](#)
[Step 6: Security](#)
[Step 7: Business Process Choreographer](#)
→ **[Step 8: Web Application Context Roots](#)**
[Step 9: Summary](#)

Web Application Context Roots

Modify the context roots for Web applications.

Context Root

Business Process Choreographer Explorer context root:

Business Process Rules Manager context root:

Business Space context root:

Figure 6-14 Step 8: Web Application Context Roots

15. For step 9, you can review a summary of the entire topology before it is created (Figure 6-15). Select **Finish and Generate Environment**.

Create new deployment environment

Step 1: Select Nodes

Step 2: Clusters

Step 3: System REST Service Endpoints

Step 4: Import database configuration

Step 5: Database

Step 6: Security

Step 7: Business Process Choreographer

Step 8: Web Application Context Roots

→ Step 9: Summary

Summary

This summary shows an overview of your new deployment environment. To save the deployment environment definition, click on "Finish". To save the definition and generate the deployment environment, click on "Finish and Generate Environment".

Overview

Parameter	Value
Deployment Environment Pattern	Single Cluster
Deployment environment name	BPMSingleCluster
Features	BPMAPC
Deployment Environment Status	Not configured

Deployment Targets

Cluster	Nodes
Application Deployment Target	bpmNode01 bpmNode02

Data Sources

Name	Database Name	Schema	Database Provider	Database Host
Performance Data Warehouse data source	PDWDB		DB2_UNIVERSAL	itsodb2
Performance Data Warehouse Messaging Engine data source	MEDB	CMNPE00	DB2_UNIVERSAL	itsodb2
Process Server data source	BPMDB		DB2_UNIVERSAL	itsodb2
Process Server Messaging Engine data source	MEDB	CMNPS00	DB2_UNIVERSAL	itsodb2
Business Process Choreographer data source	BPEDB	CMNBE00	DB2_UNIVERSAL	itsodb2
Business Process Choreographer reporting function data source	BPEDB	CMNBC00	DB2_UNIVERSAL	itsodb2
Business Process Choreographer Messaging Engine data source	MEDB	CMNBM00	DB2_UNIVERSAL	itsodb2
Business Space data source	CMNDB	CMNBS00	DB2_UNIVERSAL	itsodb2
CEI Messaging Engine data source	MEDB	CMNCM00	DB2_UNIVERSAL	itsodb2
SCA Application Bus Messaging Engine data source	MEDB	CMNSA00	DB2_UNIVERSAL	itsodb2
SCA System Bus Messaging Engine data source	MEDB	CMNSS00	DB2_UNIVERSAL	itsodb2

Security

Name	Authentication	User Name
------	----------------	-----------

Figure 6-15 Step 9: Summary

Note: If you want, you can select **Finish** here instead to save the deployment environment definition without generating it, giving you a chance to review and edit it first, or export a topology definition file for use in command-line generation (see 6.2.2, “Using the command line” on page 164, for more information about this).

16. Messages display as the environment is generated. When finished, click **Save changes**. The successful output should be similar to that shown in Figure 6-16. If any errors appear, review and correct them before you continue.













	2011-07-22 13:24:15	CWLDB9022I: Creating authentication alias BPCME_00_Auth_Alias_XA
	2011-07-22 13:24:17	CWLDB9021I: Datasource Business Process Choreographer ME data s Cluster=BPMSingleCluster.AppTarget
	2011-07-22 13:24:41	CWLDB9013I: Configuring component WBI_BPCEventCollector on dep
	2011-07-22 13:24:41	CWLDB9022I: Creating authentication alias OBSVRDB_BPMSingleClus WBI_BPCEventCollector.
	2011-07-22 13:24:41	CWLDB9022I: Creating authentication alias OBSVRDB_BPMSingleClus WBI_BPCEventCollector.
	2011-07-22 13:24:43	CWLDB9021I: Datasource BPCRFDDataSource is configured at scope C
	2011-07-22 13:24:48	CWLDB9013I: Configuring component WBI_BPCEXplorer on deployme
	2011-07-22 13:25:00	CWLDB9013I: Configuring component WBI_RECOVERY on deployment
	2011-07-22 13:25:02	CWLDB9013I: Configuring component WBI_BRM on deployment targe
	2011-07-22 13:25:03	CWLDB9013I: Configuring component WBI_Federated on deployment
	2011-07-22 13:25:03	CWLDB9013I: Configuring component WBI_BSPACE on deployment ta
	2011-07-22 13:25:03	CWLDB9051W: Deployment environment BPMSingleCluster is success

Figure 6-16 Environment generation information

Warning: Do not restart your deployment manager yet. You must ensure that the generation of the deployment environment has completed. Carry out the steps in 6.3.1, “Checking database connectivity” on page 165, to ensure that this is done successfully.

6.2.2 Using the command line

To configure a topology using the command line, you will need a topology definition file. The typical way to create this is to define a topology using the Integrated Solutions Console and then export it. To do this:

1. Define a topology as in 6.2.1, “Using the Integrated Solutions Console” on page 147, for example. Typically, you would only save the environment definition by selecting **Finish** at the end. You would not actually generate it.
2. Export the topology by opening the Integrated Solutions Console, navigating to **Servers** → **Deployment Environments**, selecting the relevant topology definition, and then clicking **Export**.

Note: You can generate a new topology definition from scratch using **wsadmin** commands. We do not cover that approach in this book. You can find more information at:

http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/topic/com.ibm.wbpm.imuc.ebpm.doc/topics/tcnfg_create_depenv_cmd.html

Whichever of these methods you choose, you can then generate the topology using two **wsadmin** commands, as shown in “Importing and generating a deployment environment topology” — one to import the topology definition file and another to generate it.

After you complete these instructions, you must complete the steps in 6.3, “Post-creation configuration” on page 165.

Importing and generating a deployment environment topology

After you have a file representing a deployment environment topology, you can import it and generate the environment using two **wsadmin** commands. Here we show how to do this interactively. You could also build this into a **wsadmin** script, with appropriate error checking.

First, import the deployment environment definition:

```
AdminTask.importDeploymentEnvDef ([ '-filePath', fileLocation,  
'-topologyName', topologyName])
```

Assuming that this task completes successfully, ensure that this configuration change is saved using the **AdminConfig.save()** command.

Then generate the deployment environment itself:

```
AdminTask.generateDeploymentEnv (['-topologyName', topologyName])
```

Again, assuming that this task completes successfully, save the change with **AdminConfig.save()**. Do not save the changes if they do not complete successfully, or you will most likely save an unusable deployment environment.

For more information about the topology generation with commands, refer to:

http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/index.jsp?topic=/com.ibm.wbpm.imuc.ebpm.doc/topics/tadm_cfgtopwithcmd.html

Warning: Do not restart your deployment manager yet. Ensure that the generation of the deployment environment is complete first. Carry out the steps in 6.3.1, “Checking database connectivity” on page 165, to ensure that this is done successfully.

6.3 Post-creation configuration

There are a few steps need after the Deployment Environment generation is completed successfully. These include:

- ▶ 6.3.1, “Checking database connectivity” on page 165
- ▶ 6.3.2, “Bootstrap data command execution” on page 166
- ▶ 6.3.3, “Configuring host aliases” on page 168
- ▶ 6.3.4, “Configuration for the web router” on page 169
- ▶ 6.3.5, “Configuring bus security” on page 174
- ▶ 6.3.6, “Sharing transaction and recovery logs” on page 175

6.3.1 Checking database connectivity

Before starting the clustered environment, check database connectivity to ensure that the deployment environment has been generated correctly:

1. Log in to the Integration Solutions Console and navigate to **Resources** → **JDBC** → **JDBC Providers** → **Data Sources**.
2. Make sure that **All scopes** is selected.
3. Select all of the data sources and click **Test connection** to ensure that they have connectivity.

A message displays confirming that the connection was successful for each datasource (Figure 6-17).

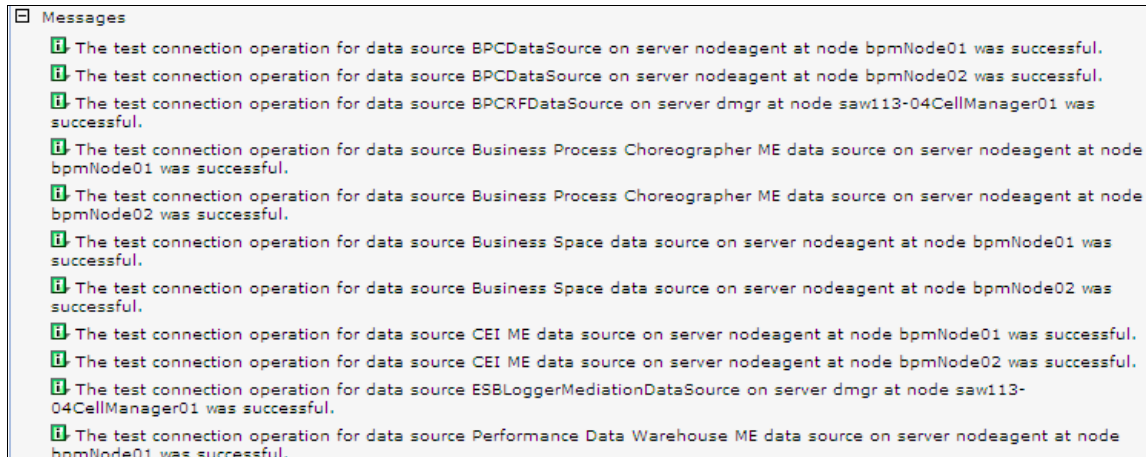


Figure 6-17 Data sources test connection output

6.3.2 Bootstrap data command execution

To complete the database configuration for IBM Process Manager V7.5, an additional manual step is currently required to load the repository in the BPMDB database.

Execute the following command on the DMGR machine:

```
/opt/IBM/WebSphere/AppServer/bin/bootstrapProcessServerData.sh  
-profilePath /opt/IBM/WebSphere/AppServer/profiles/Dmgr01 -dbType  
DB2_UNIVERSAL -dbJDBCClasspath  
/opt/IBM/WebSphere/AppServer/jdbcdrivers/DB2 -nodeName bpmNode01  
-serverName BPMSingleCluster.AppTarget.bpmNode01.0
```

As this command is used to set up and initialize the shared Process Server database, this script can be executed on any App Target cluster node. It only needs to be executed once for a Process Center or Process Server environment.

The output is similar to Example 6-1 if the bootstrap process server command executes successfully. Check the output for errors if any errors happen during command execution.

Example 6-1 Output of bootstrap process server command

```
[Activating .... ] Aug 2, 2011 10:53:24 AM null null
[Activating .... ] INFO: Client code attempting to load security
configuration
[Activating .... ] Aug 2, 2011 10:53:24 AM
com.lombardisoftware.utility.db.Quer
yUtil findDatabaseType
[Activating .... ] WARNING: Could not find database from JNDI lookup
in server.
Defaulting to configuration file
[Activating .... ] Aug 2, 2011 10:53:24 AM
com.lombardisoftware.core.cache.Loca
lCache initializeSettingsFile
[Activating .... ] INFO: CWLLG2155I: Cache settings read have been
from file f
ile:/opt/IBM/WebSphere/AppServer/BPM/Lombardi/process-server/twinit/lib
/basic_re
sources.jar!/LombardiTeamWorksCache.xml.

check.IMPORTFILE:

TWImportWrapper:

TWImportAndActivate:
[delete] Deleting:
/opt/IBM/WebSphere/AppServer/Dmgr01/config/cells/saw113-04Cell01/nodes/
bpmNode01/servers/BPMSingleCluster.AppTarget.bpmNode01.0/processserver/
config/100Bootstrap.xml
[delete] Deleting:
/opt/IBM/WebSphere/AppServer/Dmgr01/config/cells/saw113-04Cell01/nodes/
bpmNode01/servers/BPMSingleCluster.AppTarget.bpmNode01.0/processserver/
TeamWorksConfiguration.running.xml

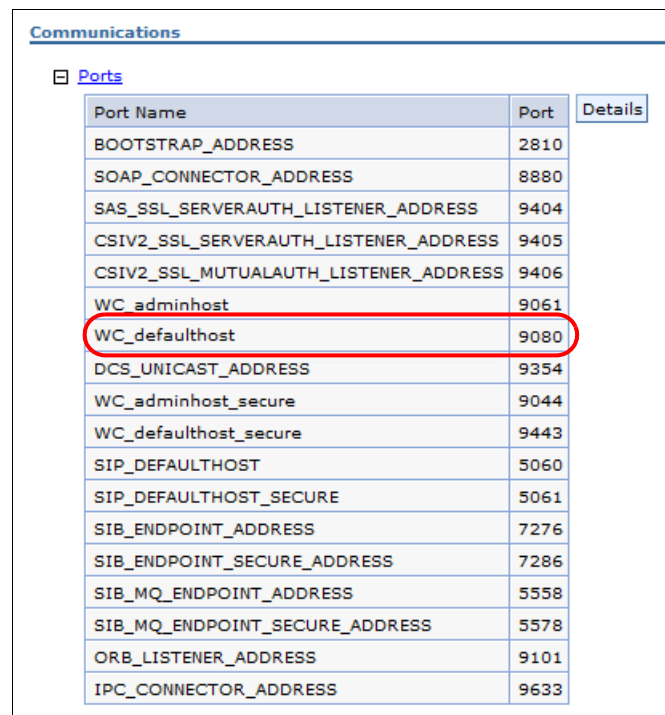
BUILD SUCCESSFUL
Total time: 8 minutes 3 seconds
```

6.3.3 Configuring host aliases

Ensure that each host alias contains the host and port information for each cluster member to be serviced. If you are using a web server or a proxy server, also include the corresponding host name and port number.

1. Determine the port numbers utilized by each cluster member. Log in to the Integrated Solutions Console as an administrative user.
2. Click **Servers** → **Server Types** → **WebSphere application servers**.
3. For every cluster member, click the name of the application server.
 - a. Under Communications, expand **Ports**.
 - b. For the port name *WC_defaulthost*, remember its port number.

The value for the port number can be 9080, 9081, or similar. The port is assigned to the *WC_defaulthost* portname (Figure 6-18). This example uses port 9080.



Ports		Details
Port Name	Port	
BOOTSTRAP_ADDRESS	2810	
SOAP_CONNECTOR_ADDRESS	8880	
SAS_SSL_SERVERAUTH_LISTENER_ADDRESS	9404	
CSIV2_SSL_SERVERAUTH_LISTENER_ADDRESS	9405	
CSIV2_SSL_MUTUALAUTH_LISTENER_ADDRESS	9406	
WC_adminhost	9061	
WC_defaulthost	9080	
DCS_UNICAST_ADDRESS	9354	
WC_adminhost_secure	9044	
WC_defaulthost_secure	9443	
SIP_DEFAULTHOST	5060	
SIP_DEFAULTHOST_SECURE	5061	
SIB_ENDPOINT_ADDRESS	7276	
SIB_ENDPOINT_SECURE_ADDRESS	7286	
SIB_MQ_ENDPOINT_ADDRESS	5558	
SIB_MQ_ENDPOINT_SECURE_ADDRESS	5578	
ORB_LISTENER_ADDRESS	9101	
IPC_CONNECTOR_ADDRESS	9633	

Figure 6-18 Ports value for *WC_defaulthost*

Note: Depending on your requirements, you might also need additional port values, such as *WC_defaulthost_secure*.

4. The host names and port numbers used by the cluster members must exist in the proper virtual hosts. From the left navigation area of the Integrated Solutions Console, click **Environment** → **Virtual hosts**.
5. Click the **default_host** name.
6. Under Additional Properties, click **Host Aliases**.
7. Check the list for the host name and port number used by each cluster member.

Note: An asterisk (*) is a wildcard character. It can be used to match to all host names. It might be a good practice to remove entries where the host name is an asterisk.

8. If the host name and port number for the cluster members is not displayed on the list, click **New** to add the missing entry to the list.
9. If you add a new entry, click **Save** → **Synchronize**.

Note: If you have a web server defined, any updates made to the virtual host list are important information to the web server. The plug-in file referenced by the web server will need to be generated and propagated:

1. After mapping virtual hosts, regenerate the plug-in configuration file. From the left navigation area, click **Servers** → **Server Types** → **Web servers**.
2. From the Web servers panel, select the check box next to the name of the web server for which you want to generate a plug-in. Click **Generate Plug-in**.

6.3.4 Configuration for the web router

In this example, the IBM HTTP Server is utilized to route HTTP requests to each member of the appropriate clusters. You might have alternatively chosen to utilize a WebSphere Proxy Server.

Adding IBM HTTP Server to cell

First, the IBM HTTP Server needs to be added to the cell, as described in 5.7.4, “Adding IBM HTTP Server to the cell” on page 136.

After the HTTP server is added to the cell, all the existing web modules should be mapped to the HTTP Server automatically. These mappings to the HTTP server are needed to map to enable the web plugin of the HTTP server to route the HTTP requests to the web modules running on the cluster.

To check the correct mapping, you can check it in the administrative console. The following example illustrates how to check the mapping for the BPCEXplorer application:

1. Log in to the administrative console and navigate to **Applications** → **Enterprise Applications** → **BPCEXplorer_BPMSingleCluster.AppTarget** → **Modules** → **Manage Modules**.
2. Check the mapping for web module BPCEXplorer. It should include the HTTP Server, which is the server entry containing server=webserver1 (Figure 6-19).

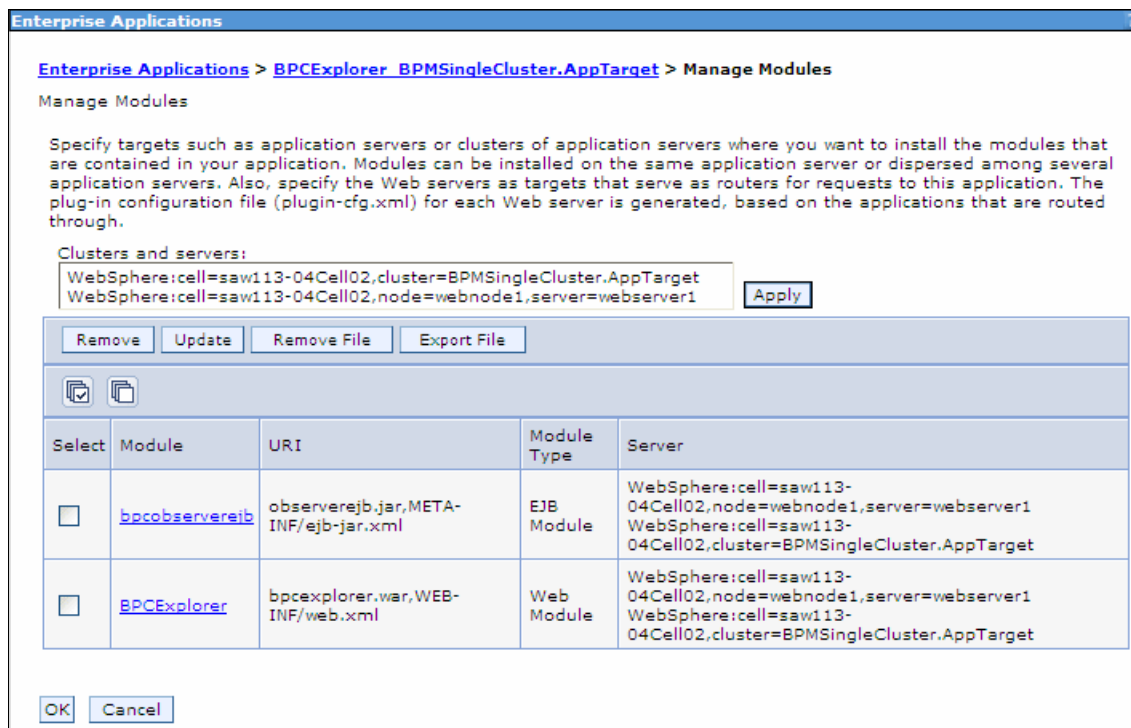


Figure 6-19 Mapping for web modules

Note: If accessing the web page with the HTTP Server does not work, but accessing each cluster member works well, the most likely cause of the problem is that the web module is not mapped to the HTTP Server correctly. You can check the mapping with the same approach here, adding the mapping to the HTTP server if it is missing. The applications containing web modules include the following applications:

- ▶ BPCEXplorer_BPMSingleCluster.AppTarget
- ▶ BPEContainer_BPMSingleCluster.AppTarget
- ▶ BPMAdministrationWidgets_BPMSingleCluster.AppTarget
- ▶ BSpaceEAR_BPMSingleCluster.AppTarget
- ▶ BSpaceForms_BPMSingleCluster.AppTarget
- ▶ BSpaceHelp_BPMSingleCluster.AppTarget
- ▶ BusinessRulesManager_BPMSingleCluster.AppTarget
- ▶ BusinessRules_BPMSingleCluster.AppTarget
- ▶ HumanTaskManagementWidgets_BPMSingleCluster.AppTarget
- ▶ IBM_BPM_Repository_BPMSingleCluster.AppTarget (none for Process Server)
- ▶ IBM_BPM_Teamworks_BPMSingleCluster.AppTarget
- ▶ REST Services Gateway
- ▶ REST Services Gateway Dmgr
- ▶ TaskContainer_BPMSingleCluster.AppTarget
- ▶ mm.was_BPMSingleCluster.AppTarget
- ▶ wesbWidget_BPMSingleCluster.AppTarget

Customizing Process Center cluster to work with HTTP Server

You should customize the environment to enable it to function properly as a cluster with the web server. The default configuration for each cluster member is for its generated URLs to point to itself as opposed to the load-balancing HTTP server. Therefore, the configuration must be changed so that URLs generated by all nodes in the system point to the common HTTP server URL.

Note: See the following reference for more details about customizing the Process Server/Process Center cluster to work with a web server:

http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/index.jsp?topic=/com.ibm.wbpm.imuc.ebpm.doc/topics/tconfig_custom_cluster_env.html

There are several configuration values to be replaced with the HTTP Server URL, including portal-prefix, teamworks-webapp-prefix, servlet-prefix, webapi-prefix, and so on. Such configuration settings are recorded in the 99Local.xml configuration file. However, the custom configuration override XML file, 100Custom.xml, is being used. This enables overriding the default installation configuration without directly editing the 99Local.xml configuration file containing the relevant configuration settings. For details about using the configuration overrides, see Appendix C, “Configuring IBM Business Process Manager V7.5 configuration settings” on page 377.

Example 6-2 is a sample 100Custom.xml for overriding existing configuration settings. Save it to the node-level configuration and the cluster-level configuration within the Dmgr configuration folder. In our environment, the configuration files are:

- ▶ /opt/IBM/WebSphere/AppServer/profiles/Dmgr01/config/cells/saw113-04Cell01/nodes/bpmNode03/servers/BPMSingleCluster.AppTarget.bpmNode01.0/process-center/config/100Custom.xml
- ▶ /opt/IBM/WebSphere/AppServer/profiles/Dmgr01/config/cells/saw113-04Cell01/nodes/bpmNode04/servers/BPMSingleCluster.AppTarget.bpmNode02.0/process-center/config/100Custom.xml
- ▶ /opt/IBM/WebSphere/AppServer/profiles/Dmgr01/config/cells/saw113-04Cell01/clusters/BPMSingleCluster.AppTarget/process-center/config/100Custom.xml

Note: 100Custom.xml is also replicated within each node folder, however, you do not need to modify these. Only the files within the Deployment Manager profile require modification because the Deployment Manager will synchronize the 100custom.xml configuration file from the Deployment Manager profile to the affected nodes.

Example 6-2 100Custom.xml for HTTP server

```
<properties>

<!--
To use [load balancer or proxy], insert the Fully Qualified Name (FQN)
for the Virtual IP or DNS name that load balances between http://[app
server node 1]:[port] and http://[app server node 2]:[port].
-->
    <authoring-environment merge="mergeChildren">
<!--
Used by the Process Designer debugger, if there is no direct HTTP
access to the nodes
```

```

-->
        <images-prefix
merge="replace">http://saw113-04:80/teamworks</images-prefix>
        <portal-prefix
merge="replace">http://saw113-04:80/portal</portal-prefix>
        <servlet-prefix
merge="replace">http://saw113-04:80/teamworks</servlet-prefix>
        <webapi-prefix
merge="replace">http://saw113-04:80/webapi</webapi-prefix>
<!--
The next 2 URLs should only ever load balance to one specific node, as
the Jamwiki database does not support clustered nodes and would
otherwise place the content in Jamwiki instances randomly.
-->
        <process-help-wiki-url-view
merge="replace">saw113-04:80/processhelp/en/%TITLE%?teamworksTitle=%TEA
MWORKS_TITLE%</process-help-wiki-url-view>
        <process-help-wiki-url-edit
merge="replace">saw113-04:80/processhelp/en/Special:Edit?topic=%TITLE%&
amp;teamworksTitle=%TEAMWORKS_TITLE%</process-help-wiki-url-edit>
        </authoring-environment>

        <common merge="mergeChildren">

<!--
The next 5 URLs should load balance or proxy to all nodes, using the
Virtual IP or DNS name with sticky sessions.
-->
        <webservices merge="mergeChildren">
                <base-url
merge="replace">http://saw113-04:80/teamworks/webservices</base-url>
                </webservices>
                <portal-prefix
merge="replace">http://saw113-04:80/portal</portal-prefix>
                <teamworks-webapp-prefix
merge="replace">http://saw113-04:80/teamworks</teamworks-webapp-prefix>
                <xml-serialization merge="mergeChildren">
                        <default-namespace-uri
merge="replace">http://saw113-04:80/schema/</default-namespace-uri>
                        </xml-serialization>
                <office merge="mergeChildren">
                        <sharepoint merge="mergeChildren">
                                <default-workspace-site-description
merge="replace">

```

```

<![CDATA[This site has been automatically
generated for managing collaborations and documents
for the Lombardi TeamWorks process instance: <#=  
tw.system.process.name #> <#=  
tw.system.process.instanceId #>  
TeamWorks Link:  
http://saw113-04:80/portal/jsp/getProcessDetails.do?bpdInstanceId=<#=  
tw.system.process.instanceId #>  
]]>  

</default-workspace-site-description>  

</sharepoint>  

</office>  

</common>  

<server merge="mergeChildren">  

  <email merge="mergeChildren">  

    <mail-template merge="mergeChildren">  

<!--  

The next URLs should loadbalance to all nodes, using the using the  

Virtual IP or DNS name with sticky sessions for task URLs in generated  

e-mails.  

-->  

    <client-link  

merge="replace">http://saw113-04:80/teamworks</client-link>  

    </mail-template>  

  </email>  

</server>  

</properties>

```

Note: For further details about customizing the Process Server/Process Center cluster to work with a web server see the following website:

http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/index.jsp?topic=/com.ibm.wbpm.imuc.ebpm.doc/topics/tconfig_custom_cluster_env.html

6.3.5 Configuring bus security

IBM Business Process Manager V7.5 introduces two additional buses leveraged by Process Server and Performance Data Warehouse. As a limitation of the current release, the deployment environment configuration establishes these two buses without security. The manual steps required to enable security for the two new buses are covered by the technote *Securing the messaging engines underlying the IBM Process Server and Performance Data Warehouse for IBM Business Process Manager*.

<http://www.ibm.com/support/docview.wss?uid=swg21499518>

6.3.6 Sharing transaction and recovery logs

To enable proper failover handling, the transaction and recovery log of each cluster member needs to be shared. Sharing means that the log files can be commonly accessed by each node/cluster member. From the multiple technologies available today to establish a shared filestore among systems, choose whatever fits your needs best.

Note: The high availability of the transaction service enables any server in a cluster to recover the transactional work for any other server in the same cluster. This is described in the WebSphere Application Server Information Center:

http://publib.boulder.ibm.com/infocenter/wasinfo/v7r0/index.jsp?topic=/com.ibm.websphere.nd.multiplatform.doc/info/ae/ae/cjta_trans_ha.html

The shared filestore technique leveraged for this example is NFS.

1. Enable each cluster:
 - a. Log in to the Integrated Solutions Console.
 - b. Click **Servers** → **Clusters** → **WebSphere application server clusters**.
 - c. In the WebSphere application server clusters panel, you will see the names of the clusters (Figure 6-20). Click the name of the cluster, **BPMSingleCluster.AppTarget**.

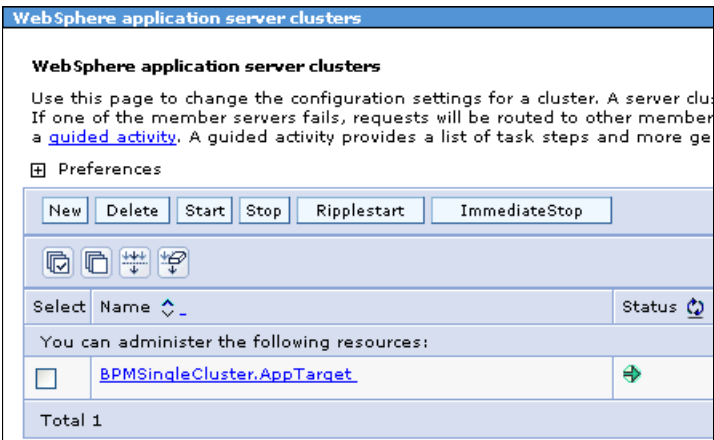


Figure 6-20 The single cluster utilized in this topology

- d. In the panel for the selected cluster, select the **Enable failover of transaction log recovery** check box (Figure 6-21). Then click **OK** and **Save** the change.

WebSphere application server clusters

WebSphere application server clusters > BPMSingleCluster.AppTarget

Use this page to change the configuration settings for a cluster. A server cluster consists of a group of application servers. If one of the application servers that is a member of the cluster fails, requests are routed to other members of the cluster.

Runtime Configuration **Local Topology**

General Properties

* Cluster name
BPMSingleCluster.AppTarget

Bounding node group name
DefaultNodeGroup

☒ Prefer local

☒ Enable failover of transaction log recovery

Apply OK Reset Cancel

Cluster messaging

■ [Messaging engines](#)

Business Integration

■ [Business Integration Configuration](#)

■ [Process Center](#)

■ [Performance Data Warehouse](#)

■ [Business Space Configuration](#)

■ [REST services](#)

■ [Service Component Architecture](#)

+ Common Event Infrastructure

+ Business Process Choreographer

+ Business Rules

+ Service Monitor

Additional Properties

+ [Cluster members](#)

■ [Backup cluster](#)

■ [Endpoint listeners](#)

■ [Security domain](#)

Figure 6-21 Select the Enable failover of transaction log recovery check box

2. On the shared file system and as a user with proper administrative authority, create translog and recoverylog directories. Example 6-3 assumes that the defined mount point on the file system is /BPMdata and that this mount point is available to every node of the cell.

Example 6-3 Create tranlog and recoverylog directories on a shared file system

```
cd /BPMdata
mkdir SharedLogs
cd SharedLogs
mkdir tranlogs
mkdir recoverylogs
```

```
cd tranlogs
mkdir BPMSingleCluster.AppTarget.bpmNode01.0
mkdir BPMSingleCluster.AppTarget.bpmNode02.0

cd ../recoverylogs
mkdir BPMSingleCluster.AppTarget.bpmNode01.0
mkdir BPMSingleCluster.AppTarget.bpmNode02.0
```

3. Now that the directories exist, configure each cluster member to its newly created shared transaction log folder:
 - a. Log in to the Integrated Solutions Console.
 - b. Navigate to **Servers** → **Server types** → **WebSphere application servers**.
 - c. In the WebSphere application servers panel, you will see the names of each of the servers (cluster members). Click the name of the cluster member **BPMRMSW.AppTarget.bpmNode01.0**.

- d. On the upper right, under Container Settings, expand **Container Services** and click **Transaction Service** (Figure 6-22).

Application servers

[Application servers](#) > **BPMSingleCluster.AppTarget.bpmNode01**

Use this page to configure an application server. An application server is a server that provides services required enterprise applications.

Runtime **Configuration**

General Properties

Name
BPMSingleCluster.AppTarget.bpmNode01

Node name
bpmNode01

☐ Run in development mode

☒ Parallel start

☐ Start components as needed

Access to internal server classes
Allow

Server-specific Application Settings

ClassLoader policy
Multiple

Class loading mode
Classes loaded with parent class loader first

Container Settings

- [Session management](#)
- ⊕ SIP Container Settings
- ⊕ Web Container Settings
- ⊕ Portlet Container Settings
- ⊕ EJB Container Settings
- ⊖ Container Services
 - [Application profiling service](#)
 - [Transaction Service](#)
 - [Dynamic cache service](#)
 - [Common Event Infrastructure Service](#)
 - [Compensation service](#)
 - [Internationalization Service](#)
 - [Default Java Persistence API settings](#)
 - [Object pool service](#)
 - [ORB service](#)
 - [Startup beans service](#)
- ⊕ Business Process Services

Figure 6-22 Under Container Settings, expand Container Services to find Transaction service

- e. In the Transaction service panel:
- Specify the tranlog directory that corresponds to this server, for example:
`/BPMdata/SharedLogs/tranlogs/BPMSingleCluster.AppTarget.node01.0`
 - Uncheck the **Enable file locking** check box (Figure 6-23).

The screenshot shows the 'Application servers' panel with the breadcrumb 'Application servers > BPMSingleCluster.AppTarget.bpmNode01 > Transaction service'. Below the breadcrumb is a description: 'Use this page to specify settings for the transaction service. The transaction service is a s coordinate updates to multiple resource managers to ensure atomic updates of data. Tra by applications or the container in which the applications are deployed.' There are two tabs: 'Runtime' and 'Configuration'. The 'Configuration' tab is active. Under the 'General Properties' section, there are several settings: 'Transaction log directory' with a text box containing '/BPMdata/SharedLogs/tranlo'; '* Total transaction lifetime timeout' with a text box containing '120' and 'seconds'; '* Async response timeout' with a text box containing '30' and 'seconds'; '* Client inactivity timeout' with a text box containing '60' and 'seconds'; '* Maximum transaction timeout' with a text box containing '14400' and 'seconds'; 'Heuristic retry limit' with a text box containing '0' and 'retries'; 'Heuristic retry wait' with a text box containing '0' and 'seconds'; an unchecked checkbox for 'Enable logging for heuristic reporting'; 'Heuristic completion direction' with a dropdown menu showing 'ROLLBACK'; an unchecked checkbox for 'Accept heuristic hazard'; an unchecked checkbox for 'Enable file locking'; and a checked checkbox for 'Enable transaction coordination authorization'.

Application servers

[Application servers](#) > [BPMSingleCluster.AppTarget.bpmNode01](#) > **Transaction service**

Use this page to specify settings for the transaction service. The transaction service is a s coordinate updates to multiple resource managers to ensure atomic updates of data. Tra by applications or the container in which the applications are deployed.

Runtime **Configuration**

General Properties

Transaction log directory

* Total transaction lifetime timeout
 seconds

* Async response timeout
 seconds

* Client inactivity timeout
 seconds

* Maximum transaction timeout
 seconds

Heuristic retry limit
 retries

Heuristic retry wait
 seconds

☐ Enable logging for heuristic reporting

Heuristic completion direction

☐ Accept heuristic hazard

☐ Enable file locking

☒ Enable transaction coordination authorization

Figure 6-23 Transaction service configuration

- iii. Click **OK** and **Save** the change.

Note: If Network File System Version 3 is used for storing transaction recovery logs and automated peer recovery is used, then file locking must be disabled:

http://publib.boulder.ibm.com/infocenter/wasinfo/v7r0/index.jsp?topic=/com.ibm.websphere.nd.doc/info/ae/ae/tjta_disable_lock.html

- f. Repeat steps 2a - 2e for the remaining cluster members to configure the tranlogs:
`BPMSingleCluster.AppTarget.bpmNode02.0`
4. Configure each member of the AppTarget cluster to its newly created shared recovery folder:
 - a. In the Integrated Solutions Console, navigate to **Servers** → **Server types** → **WebSphere application servers**.
 - b. Click **BPMSingleCluster.AppTarget.bpmNode01.0**.
 - c. On the upper right, under Container Settings, expand **Container Services** and click **Compensation Service**.
 - d. In the Compensation service panel:
 - Enter the recovery log directory:
`/BPMdata/SharedLogs/recoverylogs/BPMSingleCluster.bpmNode01.0`
 - Click **OK** and **Save** the change.
 - e. In the Integrated Solutions Console, navigate to **Servers** → **Server types** → **WebSphere application servers** and click the remaining application cluster member, **BPMSingleCluster.appTarget.bpmNode02.0**.
 - f. On the upper right, under Container Settings, expand **Container Services** and click **Compensation Service**.
 - g. In the Compensation service panel:
 - i. Enter the recovery log directory:
`/BPMdata/SharedLogs/recoverylogs/BPMSingleCluster.bpmNode02.0`
 - ii. Click **OK** and **Save** the change.

Note: In the future, when this cell is actively running in production, it is important to remember that the transaction log files must not be deleted from a production environment.

http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/index.jsp?topic=/com.ibm.wbpm.admin.doc/topics/ctro_tran_log_file.html

6.4 Verification

As the IBM Business Process Manager V7.5 consists of several components including Process Center, Business Space, Human Task Manager, Business Process Engine, and so on, you should verify each component's functionality:

- ▶ 6.4.1, "Restarting the deployment manager" on page 181
- ▶ 6.4.2, "Checking that CEI event persistence is disabled" on page 183
- ▶ 6.4.3, "Verification: Application Cluster can start successfully" on page 183
- ▶ 6.4.4, "Verification: Process Center function" on page 184
- ▶ 6.4.5, "Verification: Business Space" on page 191
- ▶ 6.4.6, "Verification: Human task manager" on page 192
- ▶ 6.4.7, "Verification: Business Process Choreographer engine" on page 196

6.4.1 Restarting the deployment manager

Restart the deployment manager. It is *essential* to ensure that the deployment environment generation has completed successfully or you might encounter problems. This is an asynchronous process, so a successful response from the Integrated Solutions Console or wsadmin stating that the deployment environment has been created is *not* sufficient confirmation.

To ensure that the process is complete, monitor the logs on each of your node agents (*not* the deployment manager). Toward the end of the deployment environment being created, you will see messages in the form of the following sample:

```
[8/1/11 16:35:41:481 EDT] 0000003a AppBinaryProc I   ADMA7021I:  
Distribution of application TaskContainer_BPMSingleCluster.AppTarget  
completed successfully.  
[8/1/11 16:35:41:575 EDT] 0000003a AppBinaryProc I   ADMA7021I:  
Distribution of application  
HTM_PredefinedTasks_V7500_BPMSingleCluster.AppTarget completed  
successfully.
```

There will be several sorts of these messages in the logs of both node agents as the standard applications are deployed to both nodes in the deployment environment. Wait for these messages to stop displaying and for the logs to quiesce, as this indicates that the deployment environment generation is complete.

Restart your deployment manager. Monitor the deployment manager startup logs to ensure that there are no errors or exceptions. If the deployment manager starts successfully, there will be a log entry similar to the sample below:

```
[8/2/11 11:57:44:640 EDT] 00000000 WsServerImpl A   WSVR0001I: Server  
dmgr open for e-business
```

Start all the node agents after the deployment manager has started, navigate to each node folder, and issue the **startNode** command. Monitor the node agent startup log for the node startup status.

Note: See the following website for more details about restarting deployment environments:

http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/topic/com.ibm.wbpm.admin.doc/topics/rref_recovering_servers.html

6.4.2 Checking that CEI event persistence is disabled

For a production system, it is best to disable persistence of CEI events to a database, as this can have a significant performance overhead. Now it is the default setting for the IBM Business Process Manager 7.5 release, compared with automatically enable for the 7.0 release. Check that it is disabled via the Integrated Solutions Console:

1. Open the Integrated Solutions Console and navigate to **Service Integration** → **Common Event Infrastructure** → **Event Service** → **Event Services**.

Note: If this menu item does not display, you might not have restarted your deployment manager since generating your deployment topology. In that case, restart it now.

2. Click **Default Common Event Infrastructure event server**. Ensure that the **Enable event data store** option is not selected.

6.4.3 Verification: Application Cluster can start successfully

After the deployment manager and both node agents have started successfully, you can start the cluster. To do this:

1. Open the Admin Console.
2. Navigate to **Servers** → **Clusters** → **WebSphere application server clusters**.
3. Select the single cluster.
4. Click **Start**.

Wait until the cluster has started completely, with the status icon becoming green when the entire cluster starts successfully. You will get the status shown in Figure 6-24.

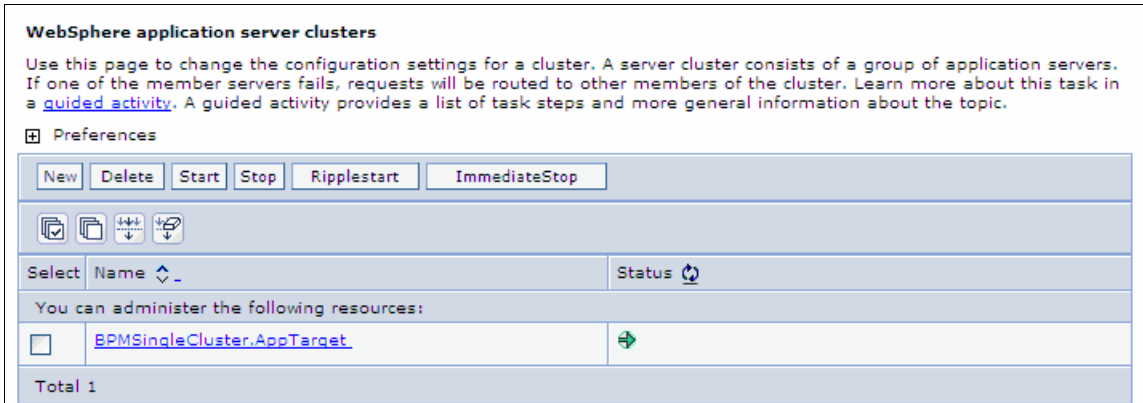


Figure 6-24 Application server clusters started successfully

Also, check the startup log of each cluster member for any errors or exceptions. If your cluster member starts successfully, you will see a log similar to the following message:

```
[8/2/11 12:08:57:605 EDT] 00000000 WsServerImpl A WSVR0002I: Server
BPMSingleCluster.AppTarget.bpmNode01.0 open for e-business
```

6.4.4 Verification: Process Center function

In this section, we verify the Process Center.

Verifying the Process Center web applications

There are a few process center web applications, including Process Center, Process Portal, and Process Admin, that you need to confirm are accessible, via the web server, without any issues:

- ▶ Process Server Admin Console (Figure 6-25):
 - <http://itsodb2/ProcessAdmin/>, using IHS for HTTP requests
 - <http://Node01.PC:9080/ProcessAdmin/>, direct HTTP requests to Node01

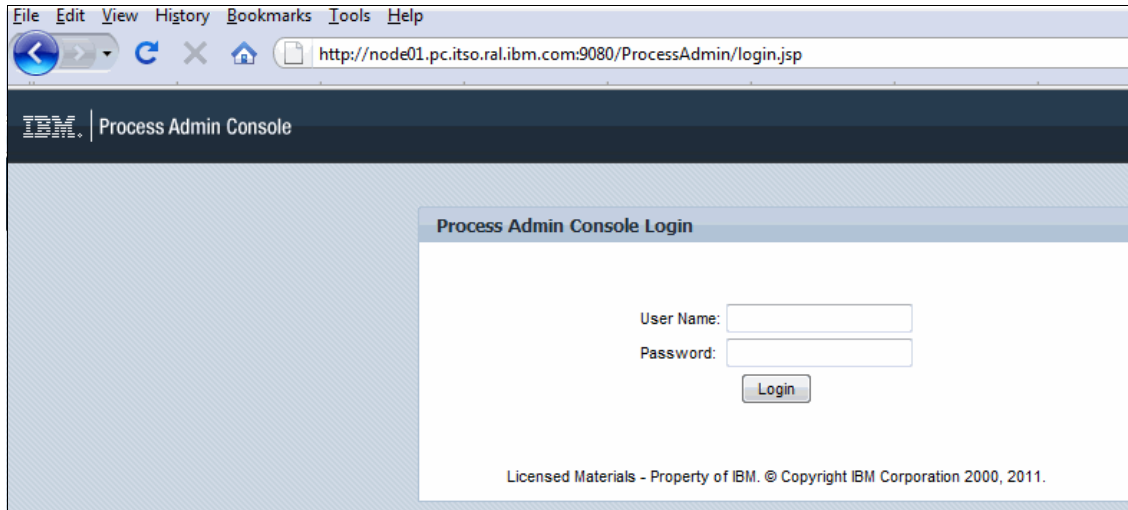


Figure 6-25 Process Admin Console Login panel

To do this:

- a. Log in as a valid user (in this case bpmadmin).
- b. Clear caches under the **IBM BPM Admin** → **Manage Caches** menu item (Figure 6-26).

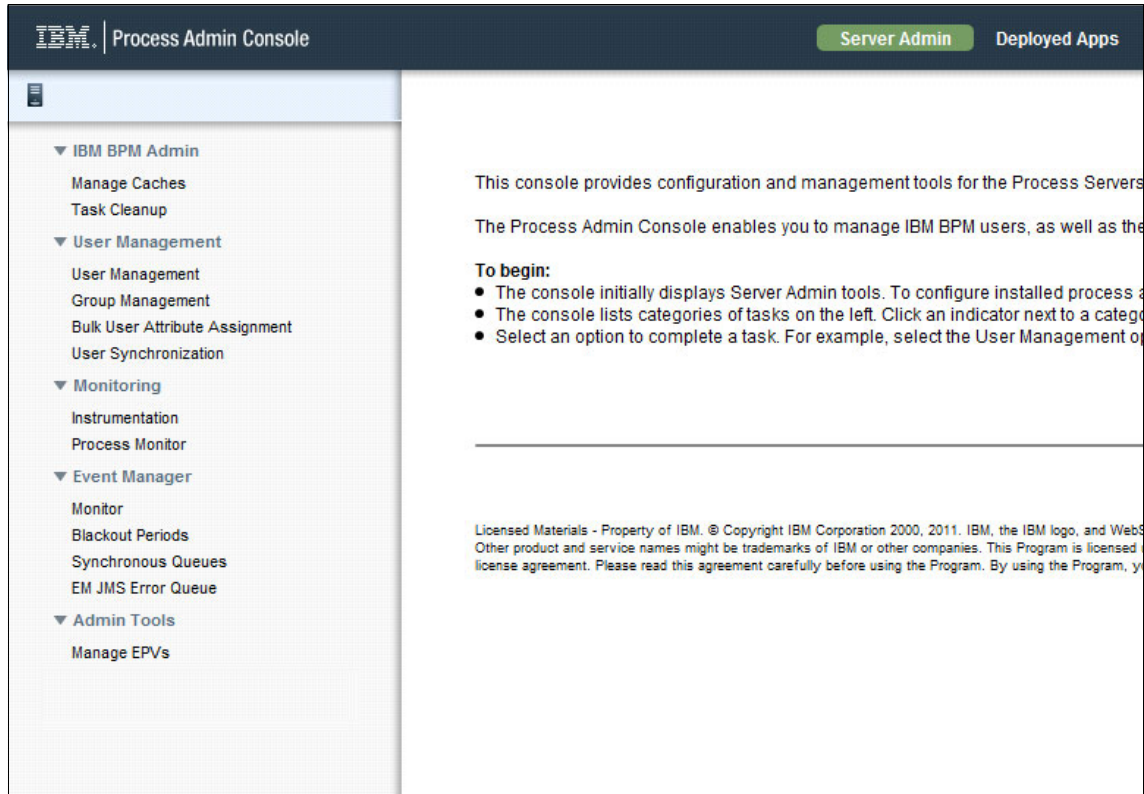


Figure 6-26 Process Admin Console with expanded menu

- c. Stop and start the Event Manager component under **Event Manager** → **Monitor**.

- Process Server Portal
 - <http://itsodb2/portal/>, using IHS for HTTP requests
 - <http://Node01.PC:9080/portal/>, direct HTTP requests to Node01 (Figure 6-27)

The screenshot shows the IBM Process Portal interface. The top header includes the IBM logo, 'Process Portal', and user information: 'Welcome, Administrator | Help | Admin | Preferences | Log Off'. On the left, there are two main navigation sections: 'My Tasks' with links to 'Inbox', 'History', 'Help Requests', and 'Alerts'; and 'My ScoreBoards' with links to 'My Performance', 'My Team Performance', 'Process Performance', 'SLA Overview', and 'Ad Hoc Reports'. The main area is titled 'Inbox' and contains a search bar with a 'Quick Search' button. Below the search bar is a table titled 'Instances' with the following columns: 'Instance Name', 'Process Definition', 'Instance Due Date', 'Task Subject', 'Task Priority', 'Task Due Date', and 'Run'. The table lists three instances, all with a priority of 'Normal' and a task subject of 'Task: Untitled1'.

Instance Name	Process Definition	Instance Due Date	Task Subject	Task Priority	Task Due Date	Run
<input type="checkbox"/> bpd6.204	bpd6	Aug 17, 2011 3:33:58 PM	Task: Untitled1	Normal	Aug 3, 2011 4:45:03 PM	
<input type="checkbox"/> bpd6.205	bpd6	Aug 17, 2011 3:52:08 PM	Task: Untitled	Normal	Aug 3, 2011 4:52:08 PM	
<input type="checkbox"/> bpd6.303	bpd6	Aug 17, 2011 5:01:30 PM	Task: Untitled1	Normal	Aug 3, 2011 6:01:42 PM	

Figure 6-27 Process Portal Inbox

To do this:

- Log in as a valid user (in this case bpmadmin).
- Make sure that the “Inbox” saved search renders without errors (Figure 6-27 on page 187).
- Select the **My Performance** scoreboard and ensure that it renders without errors (Figure 6-28).

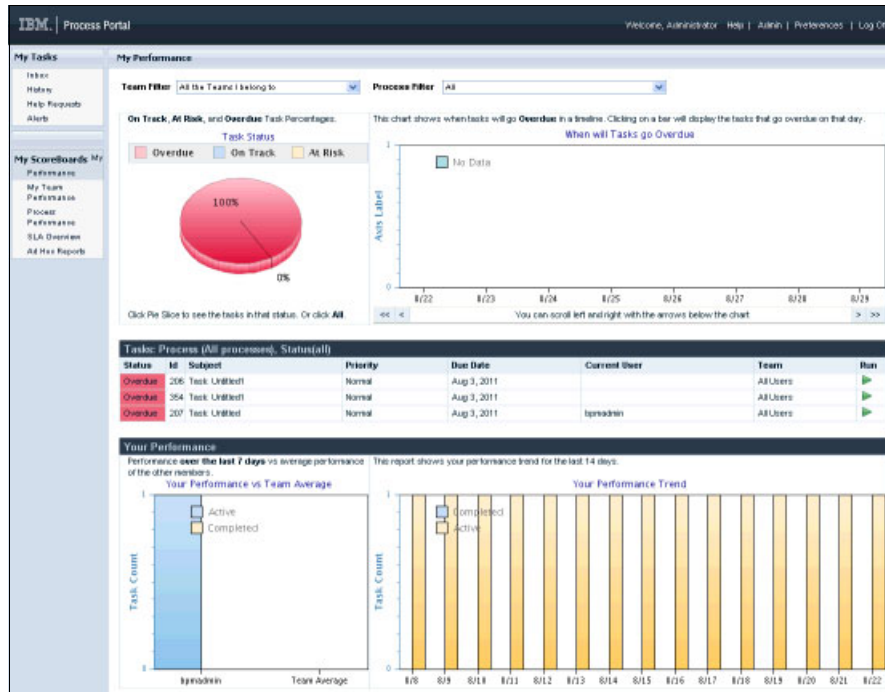


Figure 6-28 Process Portal My Performance scoreboard

- Performance Server Admin Console
 - <http://itsodb2/PerformanceAdmin/>, using IHS for HTTP requests
 - <http://Node01.PC:9081/PerformanceAdmin/>, direct HTTP requests to Node01 (Figure 6-29)

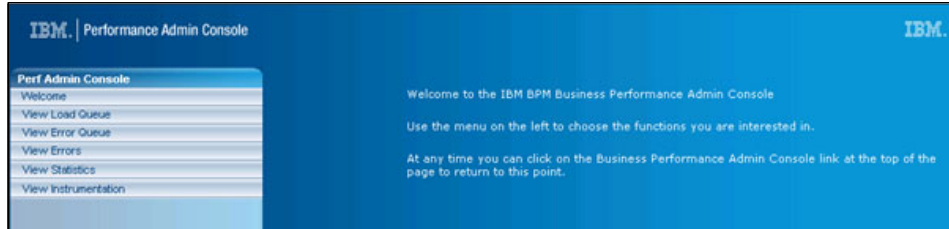


Figure 6-29

To do this:

- a. Log in as the `tw_admin` user.
- b. Inspect all menu items, ensuring that there are no errors or exceptions.

► WebService API

- <http://itsodb2/webapi/services/>, using IHS for HTTP requests
- <http://Node01.PC:9081/webapi/services/>, direct HTTP requests to Node01

To do this:

- a. Log in as a valid user (in this case `bpmadmin`).
- b. Check that the following WSDLs render without errors:
 - <http://yourwebserver/webapi/services/Version?wsdl>
 - <http://yourwebserver/webapi/services/AdminService?wsdl>
 - <http://yourwebserver/webapi/services/WebAPISoap?wsdl>
 - <http://yourwebserverwebapi/services/WebAPIService?wsdl>

Enter the Process Center URL `http://yourwebserver/ProcessCenter` and log in using bpmadmin. A Getting Started panel displays (Figure 6-30).



Figure 6-30 Getting Started with IBM Process Center panel

Downloading and installing the Process Designer

Download the process designer tool and install it to verify the functionality of Process Center. It only takes a few clicks to install:

1. Open a web browser and enter the Process Center URL:
`http://yourwebserver/ProcessCenter`
This displays the Getting Started panel (Figure 6-30).
2. Click **Download**, select a local folder in which to save the file, click **Save**, and the Process Designer download will start. Wait until the download is completed.
3. Find the downloaded file with the name IBM Process Designer.zip and extract to a folder.

4. Go to the extracted folder and double-click **installProcessDesigner_admin.bat** if you want to install Process Designer to default folder C:\IBM\ProcessDesigner\v7.5. Otherwise, open a command window and issue the command to specify another folder such as C:\IBMPD:

```
installProcessDesigner_admin.bat C:\IBMPD
```
5. Navigate to the install destination folder and double-click `eclipse.exe` to start the Process Designer.

Verifying with running sample BPD

The Process Center server has included a sample named Hiring Sample. It is executed by initiating the process using with Process Designer. Follow the Hiring Sample Tutorial for IBM Process Designer to open the sample and play back the process. It could also be used to verify the entire runtime environment. Ensure that you have given users access to the hiring sample process application as the tutorial indicated. It is required for the hiring sample tutorial.

The overview and steps to run the hiring sample can be found on the Hiring Sample Tutorial page in the IBM Business Process Manager V7.5 Info Center:

http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/index.jsp?topic=/com.ibm.wbpm.main.doc/tutorial/topic/cbpm_tutorial.html

6.4.5 Verification: Business Space

In this section we log into Business Space and navigate to the system health widget to ensure that the Business Space infrastructure is operating correctly.

Note: These instructions assume that you have set up your web server and that it is configured to accept HTTPS connections. We do not include instructions on that in this book. For more information about the IBM HTTP Server see *IBM HTTP Server (powered by Apache): An Integrated Solution for IBM eServer iSeries Servers*, SG24-6716.

1. Open a web browser, enter the Business Space URL
`http://yourwebserver/BusinessSpace`, and log in using `bpmadmin`.
2. Click **Go to Spaces**, click **Problem Determination**, and choose **System Health** tab.

3. You will see a page similar to Figure 6-31, showing the various deployment environments, clusters, and node agents that you have, and that they are running. Explore the other tabs and check other components in your environment if you want.

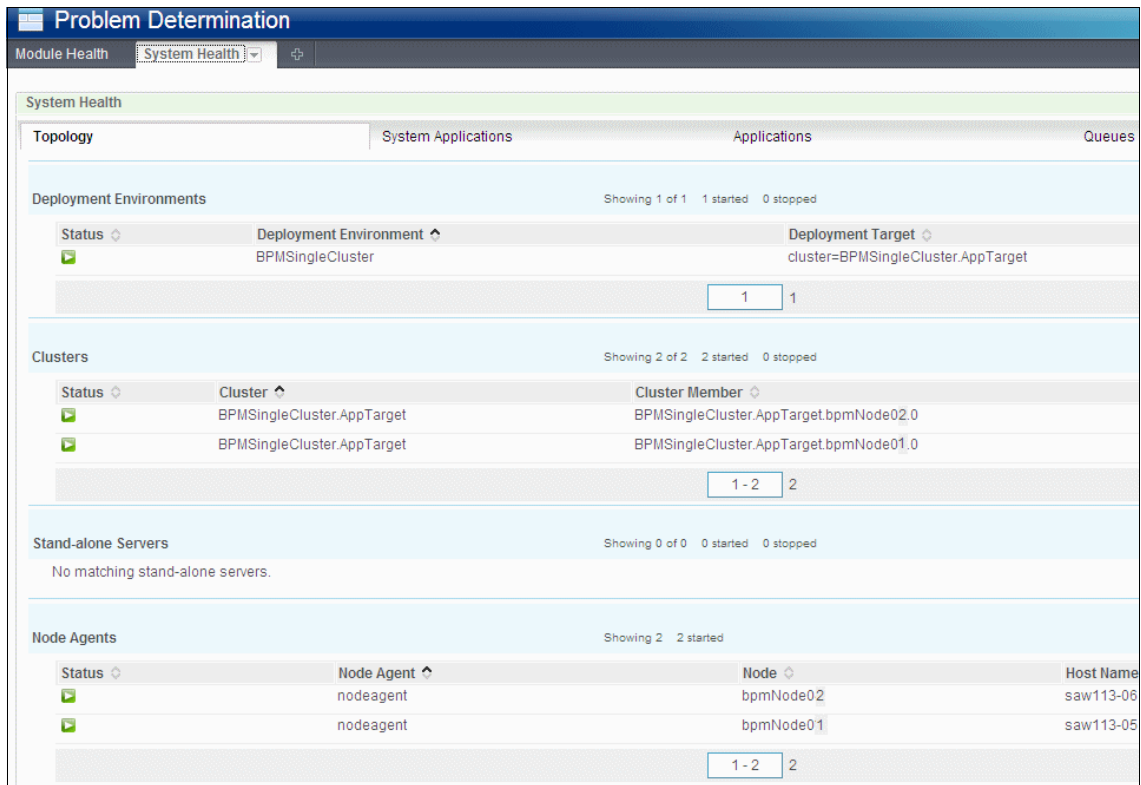


Figure 6-31 Business Space System Health widget

6.4.6 Verification: Human task manager

The following steps verify that the Human Task Manager component is working correctly:

1. Start your cluster if it is not yet started.
2. Open the Business Process Choreographer (BPC) Explorer on the web server for your topology (that is, <http://yourwebserver/bpc>). You might need to log in. Use the username and password that you configured previously.

3. Navigate to **Task Templates** → **My Task Templates**. You will see preconfigured sample human tasks. Click the box next to **Widget Message**, and click **Create Instance** (Figure 6-32).

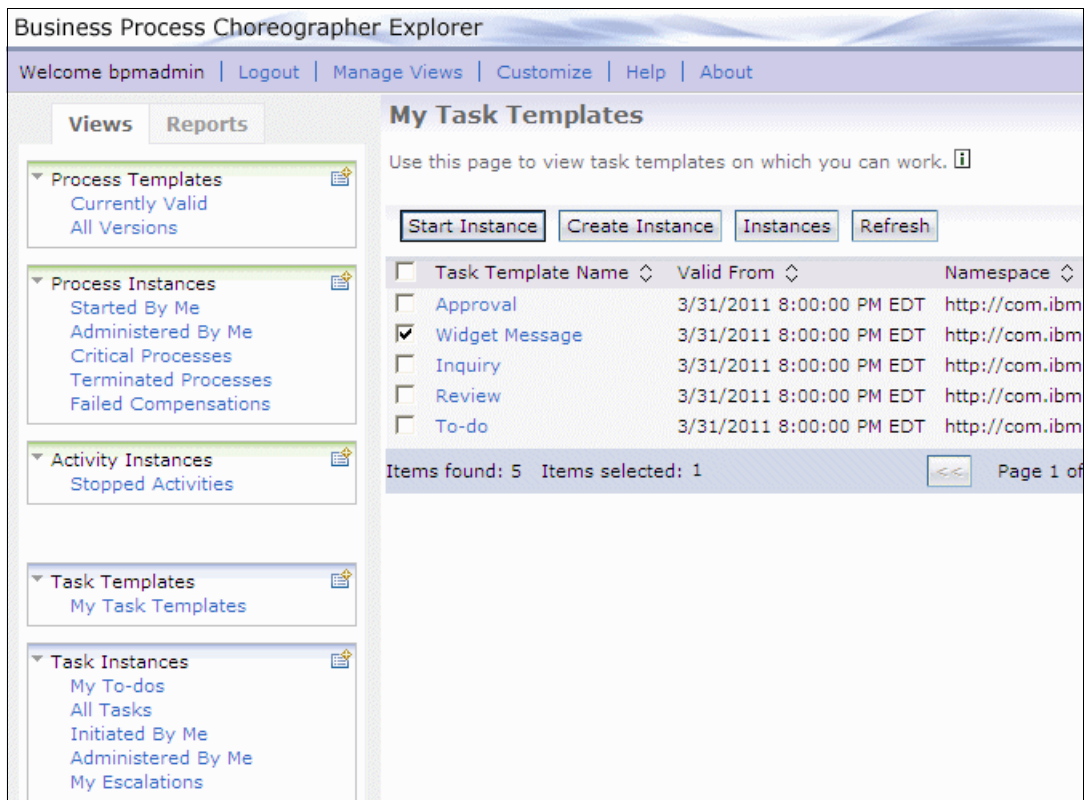


Figure 6-32 BPC Explorer: Creating a widget message, step 1

4. Enter values for the subject and message fields of the human task (Figure 6-33), then click **Submit**.

Business Process Choreographer Explorer

Welcome bpmadmin | Logout | Manage Views | Customize | Help | About

Views Reports

- Process Templates
 - Currently Valid
 - All Versions
- Process Instances
 - Started By Me
 - Administered By Me
 - Critical Processes
 - Terminated Processes
 - Failed Compensations
- Activity Instances
 - Stopped Activities
- Task Templates
 - My Task Templates
- Task Instances
 - My To-dos
 - All Tasks
 - Initiated By Me
 - Administered By Me
 - My Escalations

Task Input Message

Use this page to provide the input that is needed to start an instance of a human task process. [i](#)

Submit

Task Template Name: Widget Message
Task Description: "%htm:input.\request/subject%" message from %htm:task.originator%

Task Input Message

Form View

request	subject	HTM for BPC
	message	attempt to verify HTM function

Edit Source

Figure 6-33 BPC Explorer: Creating a widget message, step 2

5. Navigate to **Task Instances** → **Initiated By Me**. You should see an instance of the task that you just created. Click the task name itself, **Widget Message**.

6. Select the **Custom Properties** tab and click the empty space next to the htm_assigned_to field (this is an editable property, although it does not appear so at first). Enter a valid user to own the task (Figure 6-34). Click **Save**, then **Start**, then **Submit**. The task now has an owner.

Business Process Choreographer Explorer

Welcome bpmadmin | Logout | Manage Views | Customize | Help | About

Views | Reports

▼ Process Templates
Currently Valid
All Versions

▼ Process Instances
Started By Me
Administered By Me
Critical Processes
Terminated Processes
Failed Compensations

▼ Activity Instances
Stopped Activities

▼ Task Templates
My Task Templates

▼ Task Instances
My To-dos
All Tasks
Initiated By Me
Administered By Me
My Escalations

Task Instance

Use this page to display information about the task and, optionally, to work on the task. ⓘ

Delete Start Work Items Reschedule Change Priority Change Business Category

Task Description

Task Name Widget Message
Description "HTM for BPC" message from bpmadmin
Reason Originator

Details Template Details Task Input Message Task Output Message Custom Properties

Property Name	Property Value
htm_assigned_to	bpmadmin
htm_isHidden	true
htm_isPredefinedTask	true

Add Save

Figure 6-34 BPC Explorer: Creating a widget message, step 3

7. Click the check box next to the widget message task and click **Work on**. In the response comments field, enter text (Figure 6-35), then click **Complete**.

Business Process Choreographer Explorer

Welcome bpmadmin | Logout | Manage Views | Customize | Help | About

Views **Reports**

Process Templates
Currently Valid
All Versions

Process Instances
Started By Me
Administered By Me
Critical Processes
Terminated Processes
Failed Compensations

Activity Instances
Stopped Activities

Task Templates
My Task Templates

Task Instances
My To-dos
All Tasks
Initiated By Me
Administered By Me
My Escalations

Task Message

Use this page to provide the data required to complete the task. [i](#)

Complete **Save** **Release** **Cancel**

Task Name
Task Input Message

Widget Message

Form View

request	subject	HTM for BPC
	message	attempt to verify HTM function

View Source

Task Output Message

Form View

response	comments	verification complete and succeed
----------	----------	-----------------------------------

Edit Source

Figure 6-35 BPC Explorer: Creating a widget message, step 4

8. The human task is now finished and you have verified that the human task manager is working correctly. If you want to delete it, click **Task Instances** → **Administered By Me**, select the task, and select **Delete**.

6.4.7 Verification: Business Process Choreographer engine

Verify that the Business Process Choreographer is working correctly and can be aligned with the Process Designer and Integration Designer interaction verification. In the latest IBM Business Process Manager V7.5 sample page on the official IBM Business Process Manager Samples and Tutorials site, there are interaction samples to demonstrate the interaction capabilities:

<http://publib.boulder.ibm.com/bpcsamp/>

Among these samples, the procurement sample shows how to develop the interaction that is part of the workflow and executed by the BPEL process

engine. This sample can be used to verify the function of the business process engine.

Navigate to **Interaction Samples** → **Procurement sample: Calling a human task from a BPEL process** for instructions. Under the **Build it yourself** link you can find instructions about how to build the application and deploy it to IBM Business Process Manager Server. Under the **Run the Sample** link, you can find instructions about how to execute the sample using the BPC Explorer and Business Space. This verifies that the Business Process Choreographer is working correctly.



Remote Messaging, Remote Support, and Web topology

This chapter provides detailed instructions for creating the four-cluster Remote Messaging, Remote Support, and Web (RMSW) deployment environment pattern for IBM Business Process Manager Advanced V7.5 (Business Process Manager).

The RMSW topology pattern is a well-known deployment pattern provided by IBM. This topology pattern distributes deployment environment functionality across four separate clusters and is the suggested topology for Business Process Manager.

This topology can be used for creating either a Process Server or Process Center environment deployment environment.

This chapter contains the following sections:

- ▶ Topology summary
- ▶ Prerequisites for creating this topology
- ▶ Configuring Deployment Environment topology
- ▶ Post-creation configuration
- ▶ Verification

7.1 Topology summary

The RMSW deployment environment pattern for Business Process Manager is suitable for production environments that require performance and flexibility. The RMSW applies to a variety of use cases, including the possibility of starting small and scaling up as more resources are required to meet demand. This deployment environment pattern is the suggested topology for Business Process Manager.

Note: For further topology details, see the following website:

http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/topic/com.ibm.wbpm.imuc.doc/topics/cpln_psvr_topologies.html

The name *Remote Messaging, Support, and Web* reflects the relationship of the messaging engines, supporting functionality, and web-based user interfaces to the application deployment target.

The deployment environment pattern has the benefit of concentrating applications of similar functional behavior on a specific target cluster, balancing usage with resource requirements. This setup is targeted at environments with isolation performance and resilience requirements across distributed hardware.

Even though it is a complex deployment environment pattern, it is relatively straightforward to set up using the Deployment Environment wizard. The deployment environment pattern can be applied to both the Process Center and Process Server environments of Business Process Manager.

To use it with IBM Business Monitor 7.5, additional profile augmentation of the deployment environment is required. See Chapter 8, “Remote Messaging, Support, and Web topology with IBM Business Monitor” on page 277, for details.

In this chapter the RMSW topology is deployed across two nodes (Figure 7-1).

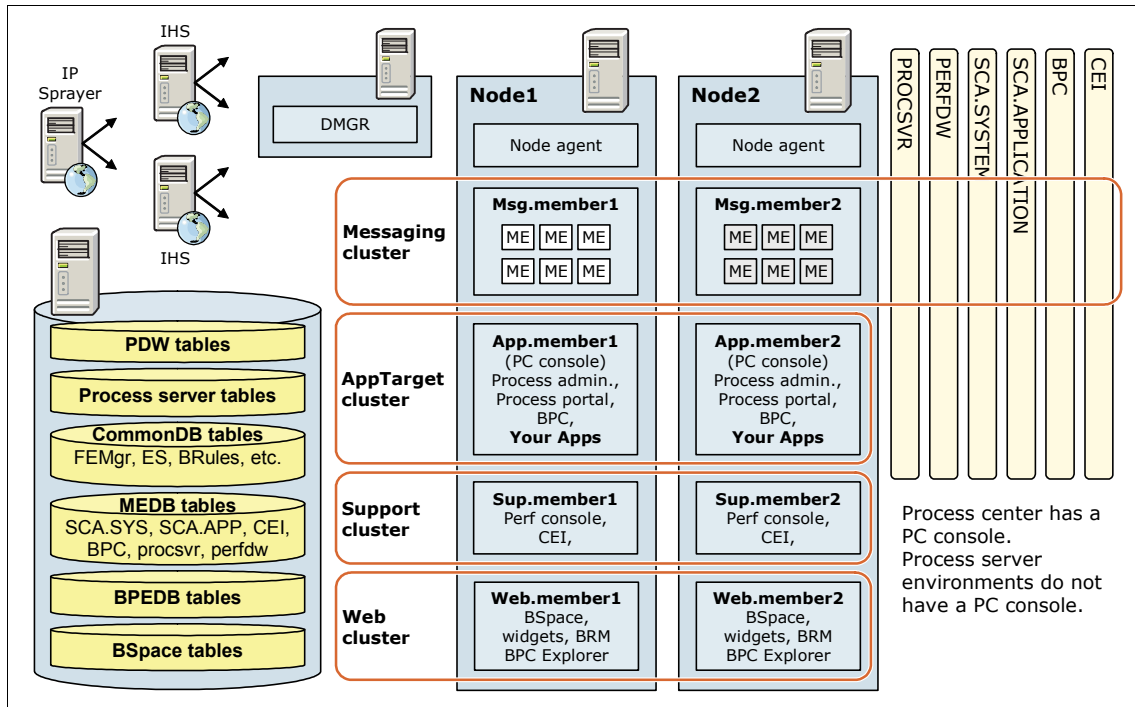


Figure 7-1 RMSW deployment environment pattern for IBM Business Process Manager Advanced V7.5

There are a number of physical servers used in the environment setup for this chapter. Each server hosts specific components of the system. One hosts the database installation, another the IBM HTTP Server, another the deployment manager, and finally two more each hosting an application server cluster node. See Table 7-1 on page 203 for server details used in this chapter.

Each of the six messaging engines is only actively running on one cluster node at any one time. The passive messaging engines, currently all on the second node, are depicted as grey shaded components in Figure 7-1.

Note: Figure 7-1 on page 201 depicts two IHS web servers, which each provide load balancing for HTTP requests to the cluster members. The illustration also depicts an IP sprayer for providing high availability of the web servers. Although Figure 7-1 on page 201 depicts the best practice, this chapter describes the utilization of only a single web server. It is assumed that in production environments in general, the network administrator will dictate and provide the routing and load balancing capabilities that meet the customer's requirements.

The functions used in this deployment environment pattern are distributed across four clusters based on usage and functional purpose. One cluster is used for messaging functionality, one cluster for support functionality, one cluster for applications, and one cluster for web-based functions. This gives the added advantage of precisely controlling the individual components in your environment. The functionality is distributed across clusters as follows:

- ▶ Messaging Infrastructure Cluster, which contains the messaging infrastructure
- ▶ Application Deployment Target Cluster, which contains
 - The repository for managing process model and integration process applications
 - The run time for executing process model and integration process applications
 - User applications for advanced integrations and IBM Business Monitor models
- ▶ Support Infrastructure Cluster, which contains
 - Process performance and monitoring applications
 - Common Event Infrastructure (CEI) applications
- ▶ Web Applications Cluster, which contains
 - Business Space application and widgets
 - Business Rules manager
 - Business Process Choreographer Explorer
 - REST API services

Note: The configuration activities for the deployment environment pattern are the same whether a Process Center or a Process Server component is being set up. However, within the deployment environment wizard, the names of the patterns reflect whether it is being applied to a Process Center or Process Server component.

Table 7-1 details the host names and usage of the servers in this deployment environment pattern.

Table 7-1 Servers used for installation

Host names	Abbreviation for host	Software component name	Description
itsodb2.itso.ral.ibm.com	<Database_host_name>	DB2 Database server	Database server
itsodb2.itso.ral.ibm.com	<LDAP_host_name>	ITDS server	LDAP server
webserver.itso.ral.ibm.com	<IHS_host_name>	IHS	Front-end web server load-balancing network traffic between the cluster nodes
Dmgr.PC.itso.ral.ibm.com	<DMGR_Process_Center_host_name>	bpmNodeDmgr	Deployment Manager for Process Center
Node01.PC.itso.ral.ibm.com	<Node1_Process_Center_host_name>	bpmNode01	Cluster node1 for Process Center
Node02.PC.itso.ral.ibm.com	<Node2_Process_Center_host_name>	bpmNode02	Cluster node2 for Process Center
Dmgr.PS.itso.ral.ibm.com	<DMGR_Process_Server_host_name>	NodeDmgrProc4Clusters	Deployment Manager for Process Server
Node01.PS.itso.ral.ibm.com	<Node1_Process_Server_host_name>	Node01Proc4Clusters	Cluster node1 for Process Server
Node02.PS.itso.ral.ibm.com	<Node2_Process_Server_host_name>	Node02Proc4Clusters	Cluster node2 for Process Server

Figure 7-2, “Remote Messaging, Remote Support, and Web Process Center environment” on page 204 and Figure 7-3 depict the details of a RMSW Process Center environment and a separate RMSW online runtime Process Server environment.

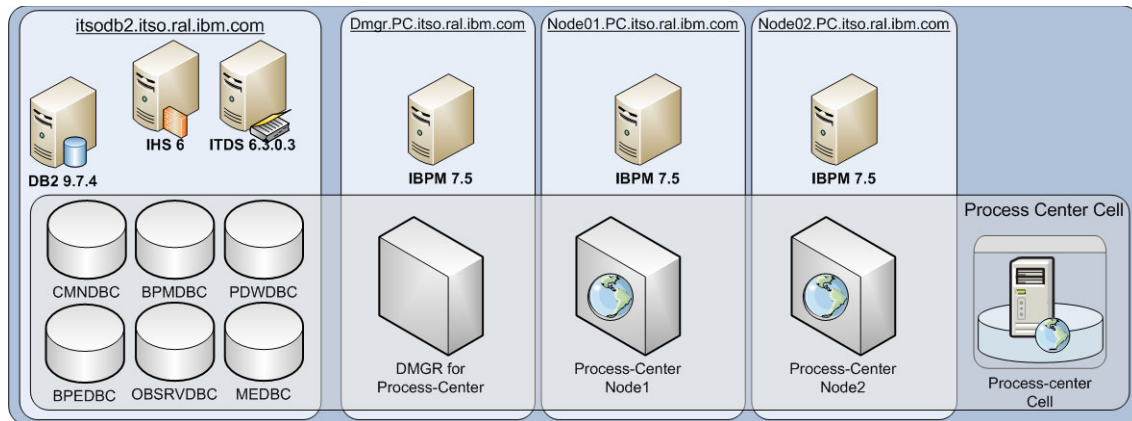


Figure 7-2 Remote Messaging, Remote Support, and Web Process Center environment

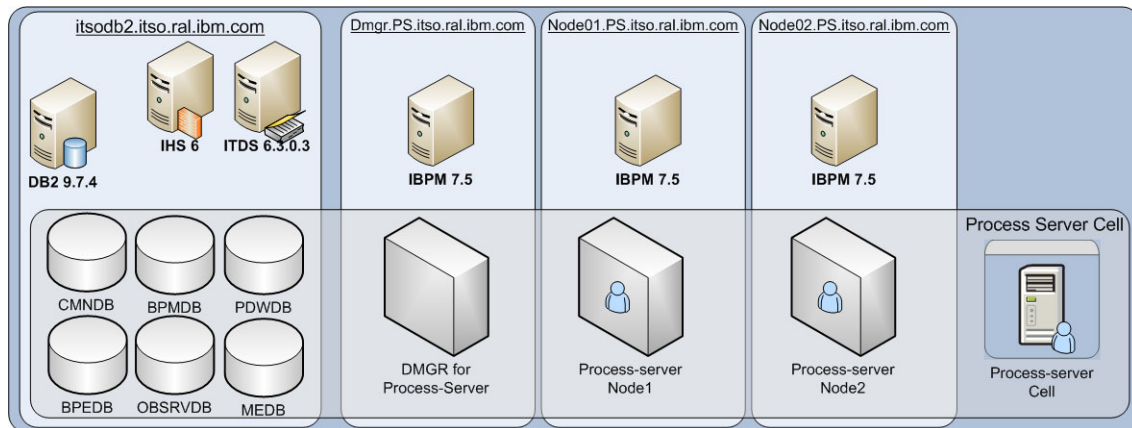


Figure 7-3 Remote Messaging, Remote Support, and Web Process Server environment

7.2 Prerequisites for creating this topology

Before you create this topology, you must complete the prerequisite steps described in Chapter 5, “Preparing your topology” on page 83, as follows:

1. Install DB2 (or an alternative database), as described in 5.3, “Installing the software” on page 88.
2. Install IBM HTTP Server (or an alternative HTTP server) to the cell, as described in 5.7.4, “Adding IBM HTTP Server to the cell” on page 136. Alternatively, a proxy server can be installed and configured.
3. Install Tivoli Directory Server (or an alternative user registry), as described in 5.7.3, “IBM Tivoli Directory Server” on page 136.
4. Define the appropriate users in your user registry, as described in 5.2.6, “Defining the user registry” on page 87. In our example, we use bpmadin as the admin user account, and the related password is its04you.
5. Install IBM Business Process Manager V7.5 Advanced, as described in 5.3, “Installing the software” on page 88.
6. Create the required databases and schemas, as described in 5.4, “Database tables and schema creation” on page 107. The following databases are created in DB2 for either a separate Process Center or a Process Server environment:
 - Common Database (CMNDB)
 - Process Server Database (BPMDB)
 - Performance Data Warehouse Database (PDWDB)
 - Messaging engine Database (MEDB)
 - Business Process Choreographer Database (BPEDB)
 - Business Process reporting schema (OBSVRDB)
 - Business Space schema (created in CMNDB)

Note: Only the common database tables are required to exist at the time that the deployment manager is started. The remaining databases and tables will not be used until the deployment environment is created. However, the runtime administrator and the database administrator have already planned for the database names, schemas, and users. As the runtime administrator has already generated the scripts via the Database Design Tool, then it is probably most expedient to supply all of the generated scripts to the database administrator immediately.

7. Create a Deployment Manager profile, set up the federated user registry integration, add IBM HTTP Server to the cell, and modify certain configuration settings, as described in 5.5.4, “Creating a process server dmgr profile” on page 117.

8. Create and federate two custom nodes, as described in 5.5.5, “Creating process server custom profiles” on page 124.
9. Directory substitutions will use the details defined in Table 5-2 on page 89, Table 7-1 on page 203, and Table 7-2.

Prior to running the Integrated Solutions Console Deployment Environment wizard or command-line tools detailed in 7.3.2, “Using the command line” on page 229, ensure that the Deployment Manager (DMGR) and the node agents for the custom nodes are operational. Check that there are no errors or exceptions in the corresponding profile log directories. For example:

- ▶ Deployment manager
`<BPM_install_dir>/profiles/<dmgr_profile_name>/logs/dmgr/SystemOut.log`
- ▶ bpmNode01 node agent
`<BPM_install_dir>/profiles/<custom_profile_name>/logs/nodeagent/SystemOut.log`
- ▶ bpmNode02 node agent
`<BPM_install_dir>/profiles/<custom_profile_name>/logs/nodeagent/SystemOut.log`

After completing the prerequisite steps, it is assumed that the deployment manager, empty custom nodes, and database tables exist. This empty cell is ready for creating and configuring the clusters.

This chapter utilizes the values described in Table 7-2. Some of these values were created during the prerequisite steps, while some values will be utilized for the first time during this chapter.

Table 7-2 Values utilized in this chapter

Description	Value	When created
cell name	bpmCell01	Chapter 5, “Preparing your topology” on page 83
Custom node 1 name	bpmNode01	Chapter 5, “Preparing your topology” on page 83
Custom node 2 name	bpmNode02	Chapter 5, “Preparing your topology” on page 83

Description	Value	When created
<DMGR_profile_dir>	<BPM_install_dir>/profiles/<dmgr_profile_name>	Chapter 5, "Preparing your topology" on page 83
<Custom_profile_dir>	<BPM_install_dir>/profiles/custom_profile_name>	Chapter 5, "Preparing your topology" on page 83
Deployment Environment name	BPMRMSWPC BPMRMSWPS	Chapter 7, "Remote Messaging, Remote Support, and Web topology" on page 199
AppTarget cluster name	BPMRMSWPC.AppTarget BPMRMSWPS.AppTarget	Chapter 7, "Remote Messaging, Remote Support, and Web topology" on page 199
Messaging cluster name	BPMRMSWPC.Messaging BPMRMSWPS.AppTarget	Chapter 7, "Remote Messaging, Remote Support, and Web topology" on page 199
Support cluster name	BPMRMSWPC.Support BPMRMSWPS.AppTarget	Chapter 7, "Remote Messaging, Remote Support, and Web topology" on page 199

Description	Value	When created
Web cluster name	BPMRMSWPC.WebApp BPMRMSWPS.WebApp	Chapter 7, “Remote Messaging, Remote Support, and Web topology” on page 199
Web server name	httpserver	Chapter 5, “Preparing your topology” on page 83

7.3 Configuring Deployment Environment topology

This section provides instructions for configuring and deploying a RMSW cluster topology using a deployment environment pattern for Business Process Manager. This section uses the hardware and software listed previously in 7.2, “Prerequisites for creating this topology” on page 205. After completing these instructions, complete the steps detailed in subsequent sections in the documented order. This topology includes a database server (DB2), two nodes to provide the horizontal clustering, and an IBM HTTP Server to serve as a web server and provide load balancing for the cluster nodes.

The process is divided into two parts:

1. Define the deployment pattern topology. In this example, it is completed using the Integrated Solutions Console.
2. Apply the definition above by generating the deployment environment. This can be completed either using the Integrated Solutions Console or command-line tools.

It is possible to export the deployment pattern definitions from the Integrated Solutions Console administrative console. Section 7.3.2, “Using the command line” on page 229, details how to use the topology definitions to generate the deployment environment using command-line tools as an alternative silent option.

7.3.1 Using the Integrated Solutions Console

This section provides instructions for configuring and deploying a RMSW cluster topology using the Integrated Solutions Console Deployment Environments wizard.

Note: For further details see the following resources:

- ▶ For creating a Process Center environment using deployment patterns, see:
http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/topic/com.ibm.wbpm.imuc.ebpm.doc/topics/tadm_create_top_pctr.html
- ▶ For creating a Process Server environment using deployment patterns, see:
http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/topic/com.ibm.wbpm.imuc.ebpm.doc/topics/tadm_create_top.html

To create the four-cluster RMSW deployment environment topology:

1. Log in to the Integrated Solutions Console using an administrative account (in this case, the bpmadmin user account).
2. Navigate to **Servers** → **Deployment Environments** (Figure 7-4).



Figure 7-4 Integrated Solutions Console Server menu

3. Select **New** (Figure 7-5).

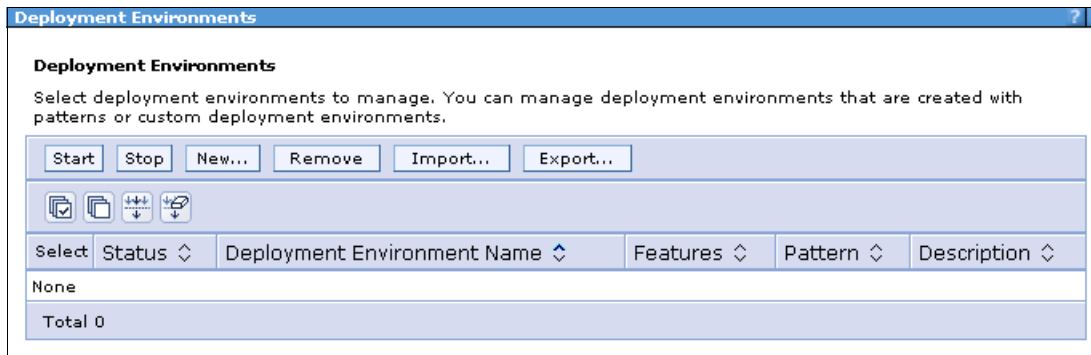


Figure 7-5 Deployment Environment wizard: Start panel

4. The initial page of the Deployment Environment wizard displays (Figure 7-6). The radio button for “Create a new deployment environment” option is pre-selected, as well as the “Detailed: Show all steps” option. In the “Deployment environment name” text box, enter the name of the environment. For example, for Process Center enter BPMRMSWPC and for Process Server enter BPMRMSWPS. Then select **Next**.

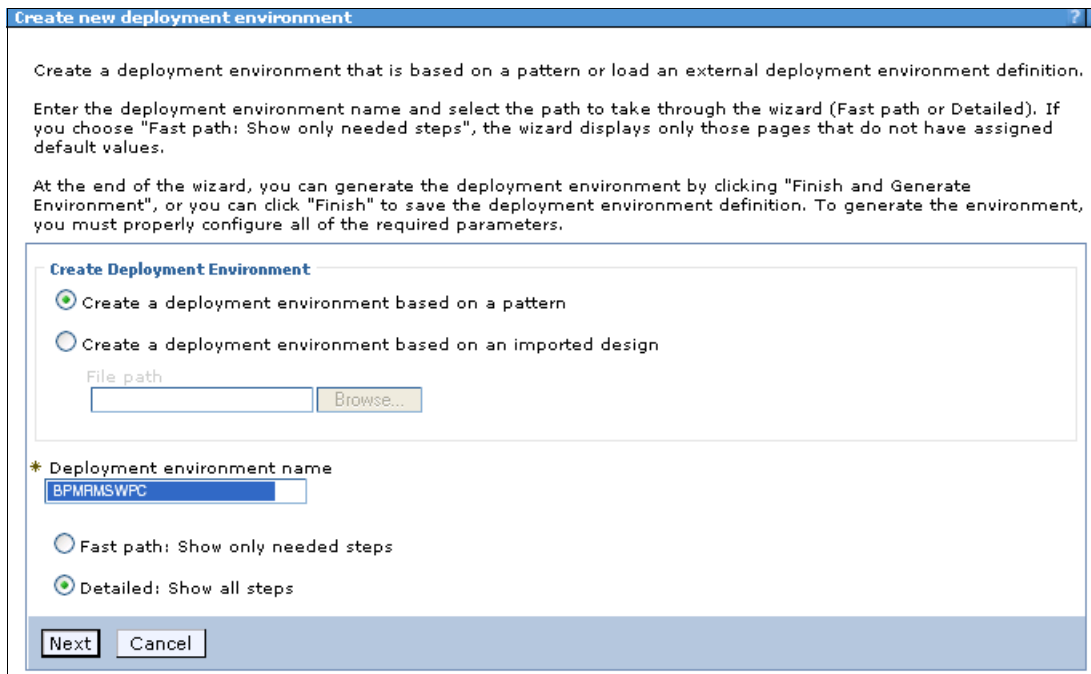


Figure 7-6 Deployment Environment wizard: Supply name and select type

5. Select either the **BPMAPC** option for Business Process Manager Advanced Process Center or the **BPMAPS** option for Business Process Manager Advanced Process Server for the deployment environment type (Figure 7-7 and Figure 7-8).

Create new deployment environment

Select the feature for the deployment environment.

Select	Features	Description
<input checked="" type="radio"/>	BPMAPC	BPM Advanced Process Center
<input type="radio"/>	WESB	WebSphere Enterprise Service Bus

Previous Next Cancel

Figure 7-7 Deployment Environment wizard: Select type for Process Center

Create new deployment environment

Select the feature for the deployment environment.

Select	Features	Description
<input checked="" type="radio"/>	BPMAPS	BPM Advanced Process Server
<input type="radio"/>	WESB	WebSphere Enterprise Service Bus

Previous Next Cancel

Figure 7-8 Deployment Environment wizard: Select type for Process Server

Note: WebSphere Enterprise Service Bus (WESB) is a subset of functionality included within the Business Process Manager Advanced feature and does not need to be additionally selected when creating a BPMAPS or BPMAPC deployment environment. For further information about the deployment environment feature choices, including the WESB feature, see item 3 in the following references:

- Process Center environment using deployment patterns
http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/topic/com.ibm.wbpm.imuc.ebpm.doc/topics/tadm_create_top_pctr.html
- Process Server environment using deployment patterns
http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/index.jsp?topic=/com.ibm.wbpm.imuc.sbp.doc/topics/tadm_create_top.html

6. Select the Remote Messaging, Remote Support, and Web deployment environment pattern (Figure 7-9) and select **Next** to proceed.

Create new deployment environment

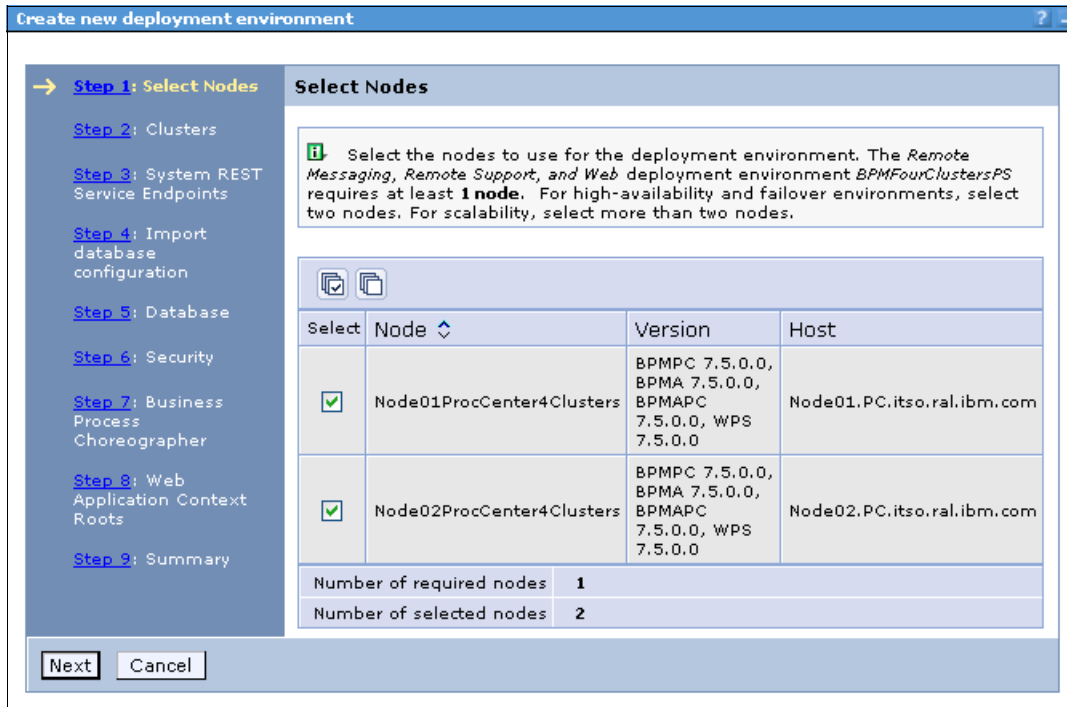
Deployment environment patterns are rules-based configurations of the most commonly used business integration topologies. A pattern provides a template for an environment configuration. Deployment environment patterns represent well-known, tested topologies with component configurations that work together; using patterns ensures reliable deployment environment functionality. You can create custom deployment environments if you require a configuration other than those supplied by the patterns.

Select a pattern that provides the topological characteristics of the deployment environment:

Select	Deployment Environment Patterns	Description
<input type="radio"/>	Single Cluster	The single cluster pattern is the simplest pattern. It defines one application deployment target cluster, which includes the messaging infrastructure and supporting applications.
<input type="radio"/>	Remote Messaging	The remote messaging pattern defines one cluster for application deployment and one remote cluster for the messaging infrastructure. The supporting applications are configured on the application deployment target cluster.
<input checked="" type="radio"/>	Remote Messaging, Remote Support, and Web	The remote messaging, remote support, and Web pattern defines one cluster for application deployment; one remote cluster for the messaging infrastructure; one remote cluster for the supporting applications; and one cluster for Business Space and REST services related Web applications.
<input type="radio"/>	Remote Messaging and Remote Support	The remote messaging and remote support pattern defines one cluster for application deployment, one remote cluster for the messaging infrastructure, and one remote cluster for the supporting applications.

Figure 7-9 Deployment Environment wizard: Select deployment pattern

7. Next comes a series of pages that specify the definition of the deployment environment.
 - a. Step 1: Select the nodes to be included in the environment (Figure 7-10 and Figure 7-11 on page 214). For Process Center select nodes **bpmNode01** and **bpmNode02**.



Create new deployment environment

→ **Step 1: Select Nodes**

[Step 2: Clusters](#)

[Step 3: System REST Service Endpoints](#)

[Step 4: Import database configuration](#)

[Step 5: Database](#)

[Step 6: Security](#)

[Step 7: Business Process Choreographer](#)

[Step 8: Web Application Context Roots](#)

[Step 9: Summary](#)

Select Nodes

i Select the nodes to use for the deployment environment. The *Remote Messaging, Remote Support, and Web* deployment environment *BPMFourClustersPS* requires at least **1 node**. For high-availability and failover environments, select two nodes. For scalability, select more than two nodes.

Select	Node	Version	Host
<input checked="" type="checkbox"/>	Node01ProcCenter4Clusters	BPMPD 7.5.0.0, BPMA 7.5.0.0, BPMAPC 7.5.0.0, WPS 7.5.0.0	Node01.PC.itso.ral.ibm.com
<input checked="" type="checkbox"/>	Node02ProcCenter4Clusters	BPMPD 7.5.0.0, BPMA 7.5.0.0, BPMAPC 7.5.0.0, WPS 7.5.0.0	Node02.PC.itso.ral.ibm.com

Number of required nodes: **1**

Number of selected nodes: **2**

Next **Cancel**

Figure 7-10 Deployment Environment wizard: Select Process Center nodes

- b. For Process Server select nodes **bpmNode01** and **bpmNode02** (Figure 7-11).

Create new deployment environment

→ **Step 1: Select Nodes**

[Step 2: Clusters](#)

[Step 3: System REST Service Endpoints](#)

[Step 4: Import database configuration](#)

[Step 5: Database](#)

[Step 6: Security](#)


[Step 7: Process Server](#)

[Step 8: Business Process Choreographer](#)

[Step 9: Web Application Context Roots](#)

[Step 10: Summary](#)

Select Nodes

 Select the nodes to use for the deployment environment. The *Remote Messaging, Remote Support, and Web* deployment environment *BPMFourClustersPS* requires at least **1 node**. For high-availability and failover environments, select two nodes. For scalability, select more than two nodes.

Select	Node	Version	Host
<input checked="" type="checkbox"/>	Node01Proc4Clusters	BPMP 7.5.0.0, BPMA 7.5.0.0, BPMAPC 7.5.0.0, WPS 7.5.0.0	Node01.PS.itso.ral.ibm.com
<input checked="" type="checkbox"/>	Node02Proc4Clusters	BPMP 7.5.0.0, BPMA 7.5.0.0, BPMAPC 7.5.0.0, WPS 7.5.0.0	Node02.PS.itso.ral.ibm.com

Number of required nodes	1
Number of selected nodes	2

Figure 7-11 Deployment Environment wizard: Select Process Server nodes

- c. Step 2: Enter how many cluster members or Java Virtual Machines (JVMs) to create on each node within the cluster. For this example, there will be one JVM per node per cluster (Figure 7-12 and Figure 7-13 on page 216).

Create new deployment environment

Step 1: Select Nodes

Step 2: Clusters

Step 2.1: Application Deployment Target

Step 2.2: Messaging Infrastructure

Step 2.3: Supporting Infrastructure

Step 2.4: Web Applications

Step 3: System REST Service Endpoints

Step 4: Import database configuration

Step 5: Database

Step 6: Security

Step 7: Business Process Choreographer

Step 8: Web Application Context Roots

Step 9: Summary

Cluster Members

Map the clusters to the listed nodes by indicating the number of cluster members to configure.

Node	Version	Application Deployment Target	Messaging Infrastructure	Supporting Infrastructure	Web Applications
Node01ProcCenter4Clusters	BPMP 7.5.0.0, BPMA 7.5.0.0, BPMA 7.5.0.0, WPS 7.5.0.0	1	1	1	1
Node02ProcCenter4Clusters	BPMP 7.5.0.0, BPMA 7.5.0.0, BPMA 7.5.0.0, WPS 7.5.0.0	1	1	1	1

Previous Next Cancel

Figure 7-12 Deployment Environment wizard: Enter total number of Process Center JVMs

Create new deployment environment

[Step 1: Select Nodes](#)

→ [Step 2: Clusters](#)

[Step 2.1: Application Deployment Target](#)

[Step 2.2: Messaging Infrastructure](#)

[Step 2.3: Supporting Infrastructure](#)

[Step 2.4: Web Applications](#)

[Step 3: System REST Service Endpoints](#)

[Step 4: Import database configuration](#)

[Step 5: Database](#)

Cluster Members

Map the clusters to the listed nodes by indicating the number of cluster members to configure.

Node	Version	Application Deployment Target	Messaging Infrastructure	Supporting Infrastructure	Web Applications
Node01Proc4Clusters	BPMP 7.5.0.0, BPMA 7.5.0.0, BPMA 7.5.0.0, WPS 7.5.0.0	1	1	1	1
Node02Proc4Clusters	BPMP 7.5.0.0, BPMA 7.5.0.0, BPMA 7.5.0.0, WPS 7.5.0.0	1	1	1	1

Figure 7-13 Deployment Environment wizard: Enter total number of Process Server JVMs

- d. Step 2.1: Further specify the names of the cluster and cluster members using the values shown in Figure 7-14 and Figure 7-15 on page 217. Full details are provided in Table 7-3 on page 217.

Create new deployment environment

[Step 1: Select Nodes](#)

[Step 2: Clusters](#)

→ [Step 2.1: Application Deployment Target](#)

[Step 2.2: Messaging Infrastructure](#)

[Step 2.3: Supporting Infrastructure](#)

[Step 2.4: Web Applications](#)

[Step 3: System REST Service Endpoints](#)

[Step 4: Import](#)

Cluster Naming

Customize the name of a cluster and cluster member.

Cluster

Cluster
Application Deployment Target

* Cluster Name
BPMRMSWPC.AppTarget

Cluster Members

Node Name	Cluster Member Name
Node02ProcCenter4Clusters	BPMRMSWPC.AppTarget
Node01ProcCenter4Clusters	BPMRMSWPC.AppTarget

Figure 7-14 Deployment Environment wizard: Enter names for Process Center AppTarget cluster and members

Step 1: Select Nodes

Step 2: Clusters

→ Step 2.1: Application Deployment Target

Step 2.2: Messaging Infrastructure

Step 2.3: Supporting Infrastructure

Step 2.4: Web Applications

Step 3: System REST Service Endpoints

Step 4: Import

Cluster Naming

Customize the name of a cluster and cluster member.

Cluster

Cluster

Application Deployment Target

* Cluster Name

BPMRMSWPC.AppTarget

Cluster Members

Node Name	Cluster Member Name
Node01Proc4Clusters	BPMRMSWPC.AppTarget
Node02Proc4Clusters	BPMRMSWPC.AppTarget

Figure 7-15 Deployment Environment wizard: Enter names for Process Server AppTarget cluster and members

Table 7-3 details the names used for both Process Center and Process Server clusters and their members.

Table 7-3 Names used for Process Center and Process Server clusters and members

Cluster type	Cluster name	Cluster member node names
Application deployment target (Process Center)	BPMRMSWPC.AppTarget	BPMRMSWPC.AppTarget .bpmNode01.0 BPMRMSWPC.AppTarget .bpmNode02.0
Application deployment target (Process Server)	BPMRMSWPS.AppTarget	BPMRMSWPS.AppTarget .Node01Proc4Clusters.0 BPMRMSWPS.AppTarget .Node02Proc4Clusters.0
Messaging infrastructure (Process Center)	BPMRMSWPC.Messaging	BPMRMSWPC.Messaging .bpmNode01.0 BPMRMSWPC.Messaging .bpmNode02.0
Messaging infrastructure (Process Server)	BPMRMSWPS.Messaging	BPMRMSWPS.Messaging .Node01Proc4Clusters.0 BPMRMSWPS.Messaging .Node02Proc4Clusters.0

Cluster type	Cluster name	Cluster member node names
Supporting infrastructure (Process Center)	BPMRMSWPC.Support	BPMRMSWPC.Support.b pmNode01.0 BPMRMSWPC.Support.b pmNode02.0
Supporting infrastructure (Process Server)	BPMRMSWPS.Support	BPMRMSWPS.Support.N ode01Proc4Clusters.0 BPMRMSWPS.Support.N ode02Proc4Clusters.0
Web applications (Process Center)	BPMRMSWPC.WebApp	BPMRMSWPC.WebApp.b pmNode01.0 BPMRMSWPC.WebApp.b pmNode02.0
Web applications (Process Server)	BPMRMSWPS.WebApp	BPMRMSWPS.WebApp.N ode01Proc4Clusters.0 BPMRMSWPS.WebApp.N ode02Proc4Clusters.0

- e. Step 3: This captures the details for the REST endpoints. As we are using IBM HTTP Server (IHS) as a front-end for load balancing HTTP requests for the clusters, this installation will use the IHS server details for this entry (Figure 7-16).

Create new deployment environment

[Step 1: Select Nodes](#)
[Step 2: Clusters](#)
→ [Step 3: System REST Service Endpoints](#)
[Step 4: Import database configuration](#)
[Step 5: Database](#)
[Step 6: Security](#)
[Step 7: Business Process Choreographer](#)
[Step 8: Web Application Context Roots](#)
[Step 9: Summary](#)

System REST Service Endpoints

Use this page to configure service endpoints for Representational State Transfer (REST) system interfaces. If you want widgets to be available in Business Space, you must configure the REST service endpoints for those widgets. For each REST service endpoint, specify the host or virtual host and port that a client uses to communicate with your cluster. If you leave the host and port fields empty, the values default to those of a cluster member host and its HTTP port. For a load-balanced environment, you must later change the default values to the virtual host name and port of your environment.

REST services

Protocol:

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

Port:

Context root:

Figure 7-16 Deployment Environment wizard: Enter REST endpoint details for Process Center

Note: It is assumed that the Process Server environment and the Process Center environment are using separate web servers or proxy servers, providing unique values for each configuration.

- f. Step 4: Either use a database design file generated as described in 5.4, “Database tables and schema creation” on page 107, or leave the text box blank. Leaving it blank will cause the Deployment Environment wizard to populate default values for the database names and corresponding schemas in the next step.

In this example, a previously generated database design file is uploaded and used to specify the database configuration (Figure 7-17).

The screenshot shows a web-based wizard titled "Create new deployment environment". On the left is a vertical sidebar with steps 1 through 9. Step 4, "Import database configuration", is highlighted with a yellow arrow. The main area is titled "Import database configuration" and contains instructional text about importing a database design document. Below the text is a text input field containing a file path, followed by "Browse..." and "Clear" buttons. At the bottom are "Previous", "Next", and "Cancel" buttons.

Create new deployment environment

Step 1: Select Nodes
Step 2: Clusters
Step 3: System REST Service Endpoints
→ **Step 4: Import database configuration**
Step 5: Database
Step 6: Security
Step 7: Business Process Choreographer
Step 8: Web Application Context Roots
Step 9: Summary

Import database configuration

If you defined a database design document, enter the document name in the following field to import it into the new deployment environment. The database design document defines the database configuration for the selected deployment environment features. If you do not have a database design document, click **Next** to define the database parameters on the following page.

Import database configuration file for features:

Figure 7-17 Deployment Environment wizard: Enter database design file for Process Center

Note: For a Process Server environment, a different database design file should be generated and used for this configuration. For an example of where reusing DB design files caused unexpected and inconsistent behavior see the following resource:

<http://www.ibm.com/developerworks/forums/message.jspa?messageID=14672915#14672915>

- g. Step 5: Review the values populated for the database settings. Confirm that the values are correct for the supplied database names and the corresponding schemas. For this example, all the Create Tables check boxes are not selected, as the database structure has been previously created, using SQL scripts generated from the Database Design Tool. See Appendix B, "Database design tool" on page 359, more details. Figure 7-18 on page 222 shows values used for databases and schemas.

Note: When using the create tables capabilities during Deployment Environment generation, it is not required to use the Database Design Tool to generate the SQL scripts and execute all the database scripts for all components separately. Using the Deployment Environment wizard only requires that the databases have already been created.

If the Deployment Environment wizard is being used, ensure that the Create Tables check boxes are selected, which is default behavior. All the necessary tables should be created in the target schemas and databases, except for Business Space. Copy and execute the Business Space database configuration scripts on the target database machine after successfully generating the deployment environment.

- iii. Step 6: Set up the usernames and passwords for CEI, SCA, and Business Process Choreographer JMS authentication aliases. The details are the same for both Process Center and Process Server using bpmadmin (Figure 7-19).

Create new deployment environment

Step 1: Select Nodes
Step 2: Clusters
Step 3: System REST Service Endpoints
Step 4: Import database configuration
Step 5: Database
→ Step 6: Security
Step 7: Business Process Choreographer
Step 8: Web Application Context Roots
Step 9: Summary

Security

Edit the user names and passwords for the authentication aliases that are needed by this deployment environment.

Name	User name	Password	Confirm Password
CEI JMS authentication alias	bpmadmin	*****	*****
SCA authentication alias	bpmadmin	*****	*****
Business Process Choreographer JMS authentication alias	bpmadmin	*****	*****

Previous Next Cancel

Figure 7-19 Deployment Environment wizard: Confirm authentication alias

- h. Step 7: This step is either Business Process Choreographer settings for a Process Center setup or an additional step for a Process Server environment cluster only.

The additional Process Server configuration page precedes the Business Process Choreographer settings page, collects the Process Server Environment name, and selects a relevant environment type and the Process Center Connection information for the HTTP server address used to connect to the Process Center.

The Process Server environment type selected is **Production**. There are other possible values (for example, Test and Staging) (Figure 7-20).

The screenshot shows the 'Create new deployment environment' wizard, specifically Step 7: Process Server. The left sidebar lists steps from Step 1 to Step 10, with Step 7 highlighted. The main panel is titled 'Process Server' and contains instructions: 'Use this page to configure Process Server properties. For Process Center connection information, either select to use this Process Server as an offline server or specify the host or virtual host and port of a Process Center.' Below this, the 'Process Server' section includes an 'Environment name' field with the value 'IBPMFourClustersPS', an 'Environment type' dropdown menu set to 'Production', and a 'Process Center Connection Information' section. This section has a checkbox for 'Use server offline' (unchecked), a 'Protocol' dropdown menu set to 'http://', a 'Host name or virtual host in a load-balanced environment' field with the value 'itsodb2', and a 'Port' field with the value '80'. At the bottom, there are 'Previous', 'Next', and 'Cancel' buttons.

Figure 7-20 Deployment Environment wizard: Process Server specific settings

- i. Step 7 (Process Center) or step 8 (Process Server): Specify the JMS API, escalation user, and administration user authentication details for Business Process Choreographer components. Uncheck the Enable e-mail service box (Figure 7-21 on page 225).

Business Process Choreographer

The business process choreographer components need to have the following parameters configured.

▼ Security

Role	Use Default	Users	Groups	Description
Administrator	<input type="checkbox"/>	<input type="text" value="bpadmin"/>	<input type="text"/>	User names, group names, or both, separated by the "|" symbol, for the business flow and human task administrator role. Users who are assigned to this role have all privileges.
Monitor	<input type="checkbox"/>	<input type="text" value="bpadmin"/>	<input type="text"/>	User names, group names, or both, separated by the "|" symbol, for the business flow and human task monitor role. Users who are assigned to this role can view the properties of all of the business process and task objects.

Authentication	Users	Password	Confirm Password	Description
JMS API Authentication	<input type="text" value="bpadmin"/>	<input type="text"/>	<input type="text"/>	Authentication for business flow manager message-driven bean to process asynchronous API calls
Escalation User Authentication	<input type="text" value="bpadmin"/>	<input type="text"/>	<input type="text"/>	Authentication for human task manager message-driven bean to process asynchronous API calls
Administration job user authentication	<input type="text" value="bpadmin"/>	<input type="text"/>	<input type="text"/>	Authentication for the business flow manager and human task manager administrative jobs. This user must be in the Administrator role.

▼ Human Task Manager Mail Session

☒ Enable e-mail service

Mail transport host

Mail transport user

Mail transport password

Figure 7-21 Deployment Environment wizard: Business Process Choreographer settings

Chapter 7. Remote Messaging, Remote Support, and Web topology 225

- j. Step 8 (Process Center) or Step 9 (Process Server): This allows the specification of the web application context root properties for Business Space, Business Process Rules Manager, and Business Process Choreographer Explorer. Figure 7-22 shows the default values being used.

The screenshot shows a wizard window titled "Create new deployment environment". On the left is a vertical sidebar with steps 1 through 9. Step 8, "Web Application Context Roots", is highlighted with a yellow arrow and bold text. The main area of the wizard is titled "Web Application Context Roots" and contains the instruction "Modify the context roots for Web applications." Below this is a section labeled "Context Root" with three text input fields: "Business Process Choreographer Explorer context root:" with the value "/bpc", "Business Process Rules Manager context root:" with the value "/br", and "Business Space context root:" with the value "/BusinessSpace". At the bottom of the wizard are three buttons: "Previous", "Next", and "Cancel".

Figure 7-22 Deployment Environment wizard: Set context root property for web applications

- k. Step 9 (Process Center) or Step 10 (Process Server) displays a summary of all previously entered settings (Figure 7-23 on page 227). Review the summary information. To accept and use it to generate the deployment environment, select **Finish and Generate Environment** (Figure 7-24 on page 228).

Note: If **Finish** is selected instead, the deployment environment definition is saved without generating it, allowing additional review activities or exporting a topology definition file for use in command-line generation. See 7.3.2, "Using the command line" on page 229, for further details.

[Step 1: Select Nodes](#)

[Step 2: Clusters](#)

[Step 3: System REST Service Endpoints](#)

[Step 4: Import database configuration](#)

[Step 5: Database](#)

[Step 6: Security](#)

[Step 7: Business Process Choreographer](#)

[Step 8: Web Application Context Roots](#)

→ [Step 9: Summary](#)

Summary

This summary shows an overview of your new deployment the deployment environment definition, click on "Finish". generate the deployment environment, click on "Finish and

Overview

Parameter	Value
Deployment Environment Pattern	Remote Messaging, Re
Deployment environment name	BPMFourClustersPC
Features	BPMAPC
Deployment Environment Status	Not configured

Deployment Targets

Cluster	Nodes
Application Deployment Target	Node01ProcC Node02ProcC
Messaging Infrastructure	Node01ProcC Node02ProcC
Supporting Infrastructure	Node01ProcC Node02ProcC
Web Applications	Node01ProcC Node02ProcC

Data Sources

Name	Database Name	Schema	Database Provider
Performance Data Warehouse data source	PDWDBC		DB2_UNIVERSAL
Performance Data Warehouse Messaging Engine data source	MEDBC	BPMPER00	DB2_UNIVERSAL
Process Server data source	BPMDBC		DB2_UNIVERSAL
Process Server Messaging Engine data source	MEDBC	BPMPRS00	DB2_UNIVERSAL

Figure 7-23 Deployment Environment wizard: Summary

Security		
Name	Authentication	User Name
Business Process Choreographer JMS authentication alias	BPC_Auth_Alias	bpmadmin
CEI JMS authentication alias	CommonEventInfrastructure.JMSAuthAlias	bpmadmin
SCA authentication alias	SCA_Auth_Alias	bpmadmin

Business Process Choreographer	
Parameter	Value
Business Process Choreographer Explorer context root	/bpc
Create a mail session to send e-mails	true
Mail session host	
Business Process Choreographer Explorer URL	
User for Administrator role	bpmadmin
Group for Administrator role	
User for Monitor role	bpmadmin
Group for Monitor role	

Business Process Rules Manager	
Parameter	Value
Business Process Rules Manager context root	/br

Figure 7-24 Deployment Environment wizard: Summary completion

- I. A confirmation of deployment environment is successfully created for the Process Center (Figure 7-25) and the Process Server (Figure 7-26 on page 229).

Deployment Environments					
Deployment Environments Select deployment environments to manage. You can manage deployment environments that are created with patterns or custom deployment environments.					
<input type="button" value="Start"/> <input type="button" value="Stop"/> <input type="button" value="New..."/> <input type="button" value="Remove"/> <input type="button" value="Import..."/> <input type="button" value="Export..."/>					
<div> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </div>					
Select	Status	Deployment Environment Name	Features	Pattern	Description
<input type="checkbox"/>		BPMRMSWPC	BPMAPC	Remote Messaging, Remote Support, and Web	
Total 1					

Figure 7-25 Deployment Environment wizard: Confirmation of success for Process Center

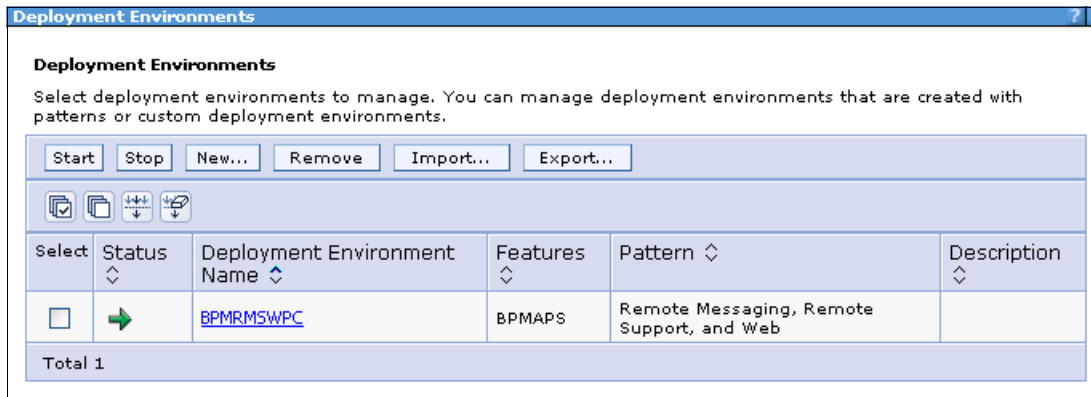


Figure 7-26 Deployment Environment wizard: Confirmation of success for Process Server

Warning: The deployment environment is not yet ready for use. You must first complete a number of additional configuration steps, including the bootstrapping step, to initialize the system. Perform these tasks as described in 7.4, “Post-creation configuration” on page 231.

7.3.2 Using the command line

To configure a topology using the command line, you will need to produce a topology definition file. This is typically created during the definition of a topology using the Integrated Solutions Console and then exporting the topology definition. The exported topology definition file is usually *not* applied to the WebSphere cell used to generate the topology definition in the first place.

The steps are:

1. Define a topology as in 7.3.1, “Using the Integrated Solutions Console” on page 209, for example. Save the topology environment definition by selecting **Finish** at the end of the process. The deployment environment will not be generated.
2. Export the topology by opening the Integrated Solutions Console, navigating to **Servers** → **Deployment Environments**, selecting the relevant topology definition, and then clicking **Export**.

Note: You can generate a brand new topology definition by using **wsadmin** commands. That approach is not covered in this document. See the following reference for more details:

http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/topic/com.ibm.wbpm.imuc.ebpm.doc/topics/tcnfg_create_depenv_cmd.html

Whichever of these methods used, it is possible to generate the topology using two specific **wsadmin** commands, as shown in the following section. There is one **wsadmin** command to import the topology definition file and another **wsadmin** command to generate it.

Importing and generating a deployment environment topology

After creating the file representing a deployment environment topology, it can be imported and used to generate the environment using the following **wsadmin** commands. In this example, this is done interactively. It is also possible to include this in a **wsadmin** script, with appropriate error checking.

First, import the deployment environment definition:

```
AdminTask.importDeploymentEnvDef ([ '-filePath', fileLocation,  
'-topologyName', topologyName])
```

Assuming that this task completes successfully, ensure that this configuration change is saved using the **AdminConfig.save()** command.

Then generate the deployment environment itself:

```
AdminTask.generateDeploymentEnv ([ '-topologyName', topologyName])
```

Again, assuming that this task completes successfully, save the change with **AdminConfig.save()**. Do not save the changes if they do not complete successfully, or you will most likely save an unusable deployment environment.

Note: For more information about the topology generation with commands, refer to:

http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/index.jsp?topic=/com.ibm.wbpm.imuc.ebpm.doc/topics/tadm_cfgtopwithcmd.html

Warning: The deployment environment is not yet ready for use. You must first complete a number of additional configuration steps, including the bootstrapping step to initialize the system. Perform these tasks as described in 7.4, “Post-creation configuration” on page 231.

7.4 Post-creation configuration

A final set of activities needs to be completed after the Deployment Environment has been successfully generated. These include:

- ▶ 7.4.1, “Checking database connectivity” on page 231
- ▶ 7.4.2, “Bootstrap data command execution” on page 234
- ▶ 7.4.3, “Restarting the deployment manager” on page 236
- ▶ 7.4.4, “Configuring for IBM HTTP Server” on page 237
- ▶ 7.4.5, “Changing the virtual host hostname” on page 245
- ▶ 7.4.6, “Checking that CEI event persistence is disabled” on page 247
- ▶ 7.4.7, “Securing the Process Server and Performance Data Warehouse service integration buses” on page 247
- ▶ 7.4.8, “Sharing transaction and recovery logs” on page 248

7.4.1 Checking database connectivity

Before starting the clustered environment, check database connectivity to ensure that the deployment environment has been generated correctly:

1. Log in to the administrative console and navigate to **Resources JDBC** → **JDBC Providers** → **Data Sources**.
2. Make sure that **All scopes** is selected.

3. Select all of the data sources and click **Test connection** to ensure that they have connectivity (Figure 7-27).





Preferences					
<input type="button" value="New"/> <input type="button" value="Delete"/> <input type="button" value="Test connection"/> <input type="button" value="Manage state..."/>					
   					
Select	Name ▾	JNDI name ▾	Scope ▾	Provider ▾	Description ▾ Category ▾
You can administer the following resources:					
<input checked="" type="checkbox"/>	BPCDataSource	jdbc/BPEDB	Cluster=BPMFourClusters.AppTarget	DB2 Universal JDBC Driver Provider (XA)	Business Process Choreographer data source
<input checked="" type="checkbox"/>	BPCRFDDataSource	jdbc/OBSVRDB_BPMFourClusters.Support	Cell=ProcCenter4Clusters	DB2 Universal JDBC Driver Provider (XA)	Business Process Choreographer reporting function data source
<input checked="" type="checkbox"/>	Business Process Choreographer ME data source	jdbc/com.ibm.ws.sib /BPMFourClusters.Messaging-CEI.ProcCenter4Clusters.Bus	Cluster=BPMFourClusters.Messaging	DB2 Universal JDBC Driver Provider (XA)	Business Process Choreographer Messaging Engine data source
<input checked="" type="checkbox"/>	Business Space data source	jdbc/mashupDS	Cluster=BPMFourClusters.WebApp	DB2 Universal JDBC Driver Provider (XA)	Business Space data source
<input checked="" type="checkbox"/>	CEI ME data source	jdbc/com.ibm.ws.sib /BPMFourClusters.Messaging-CEI.ProcCenter4Clusters.BUS	Cluster=BPMFourClusters.Messaging	DB2 Universal JDBC Driver Provider (XA)	CEI Messaging Engine data source
<input checked="" type="checkbox"/>	ESBLoggerMediationDataSource	jdbc/mediation/messageLog	Cell=ProcCenter4Clusters	DB2 Universal JDBC Driver Provider (XA)	Default data source for ESB Logger Mediation
<input checked="" type="checkbox"/>	Performance Data Warehouse ME data source	jdbc/com.ibm.ws.sib/twperfsvr_bus	Cluster=BPMFourClusters.Messaging	DB2 Universal JDBC Driver Provider (XA)	Performance Data Warehouse Messaging Engine data source
<input checked="" type="checkbox"/>	Performance Data Warehouse data source	jdbc/PerformanceDB	Cluster=BPMFourClusters.AppTarget	DB2 Universal JDBC Driver Provider (XA)	Performance Data Warehouse data source
<input checked="" type="checkbox"/>	Performance Data Warehouse data source	jdbc/TwqJDB	Cluster=BPMFourClusters.AppTarget	DB2 Universal JDBC Driver Provider (XA)	Performance Data Warehouse data source
<input checked="" type="checkbox"/>	Performance Data Warehouse data source	jdbc/PDOWDB	Cluster=BPMFourClusters.Support	DB2 Universal JDBC Driver Provider (XA)	Performance Data Warehouse data source
<input checked="" type="checkbox"/>	Process Server ME data source	jdbc/com.ibm.ws.sib/twprocsrv_bus	Cluster=BPMFourClusters.Messaging	DB2 Universal JDBC Driver Provider (XA)	Process Server Messaging Engine data source
<input checked="" type="checkbox"/>	Process Server data source	jdbc/TeamWorksDB	Cluster=BPMFourClusters.AppTarget	DB2 Universal JDBC Driver Provider (XA)	Process Server data source
<input checked="" type="checkbox"/>	Process Server data source	jdbc/ProcessDB	Cluster=BPMFourClusters.Support	DB2 Universal JDBC Driver Provider (XA)	Process Server data source
<input checked="" type="checkbox"/>	SCA Application Bus ME data source	jdbc/com.ibm.ws.sib /BPMFourClusters.Messaging-SCA.APPLICATION.ProcCenter4Clusters.Bus	Cluster=BPMFourClusters.Messaging	DB2 Universal JDBC Driver Provider (XA)	SCA Application Bus Messaging Engine data source
<input checked="" type="checkbox"/>	SCA System Bus ME data source	jdbc/com.ibm.ws.sib /BPMFourClusters.Messaging-SCA.SYSTEM.ProcCenter4Clusters.Bus	Cluster=BPMFourClusters.Messaging	DB2 Universal JDBC Driver Provider (XA)	SCA System Bus Messaging Engine data source
<input checked="" type="checkbox"/>	WBI DataSource	jdbc/WPSDB	Cell=ProcCenter4Clusters	DB2 Universal JDBC Driver Provider (XA)	WBI DataSource
Total 16					

Figure 7-27 JDBC datasources

A message confirming that the connection was successful for each datasource displays, similar to the output shown in Figure 7-28 on page 233.

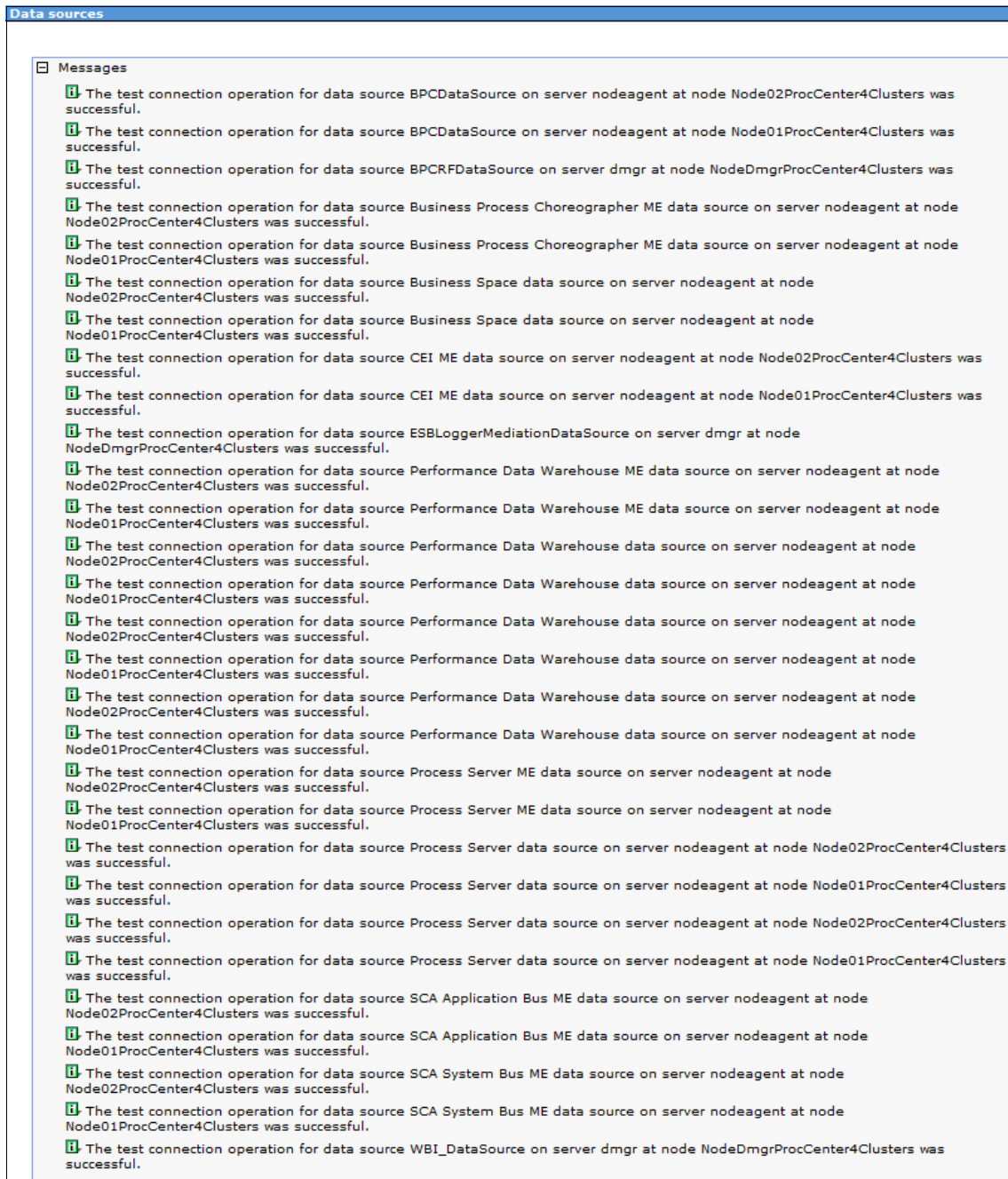


Figure 7-28 JDBC Data sources test connection output

7.4.2 Bootstrap data command execution

To complete the database configuration for IBM Business Process Manager Advanced V7.5, an additional manual step is currently required to load the repository in BPMDB database.

The **bootstrap** command is executed from the Deployment Manager profile bin directory. The **bootstrap** command requires the deployment manager's profile, because from that information the master configuration of the cell can be found. The **bootstrap** command will also need to know the target node name and server name of one of the AppTarget cluster members. With that information, the bootstrapping command will be able to determine and load the correct system initialization data.

Note: In IBM Business Process Manager v7.5.0.0, the bootstrapProcessServerData script requires a number of parameters, including the node name and server name of one of the AppTarget cluster members.

An enhancement exists in IBM Business Process Manager v7.5.0.1 where the scripting will recognize a parameter for specifying the cluster. In that case, the user can simply provide the cluster name and will no longer need to provide a node name and a server name.

Execute the **bootstrapProcessServerData** command on the DMGR machine (Example 7-1).

Example 7-1 Calling bootstrapProcessServerData initialization script

```
/opt/IBM/WebSphere/AppServer/profiles/DmgrProcCenter4Clusters/bin/boostrapProcessServerData.sh -profilePath
/opt/IBM/WebSphere/AppServer/profiles/DmgrProcCenter4Clusters -dbType
DB2_UNIVERSAL -dbJDBCClasspath
/opt/IBM/WebSphere/AppServer/jdbcdrivers/DB2 -nodeName bpmNode01
-serverName BPMRMSW.AppTarget.bpmNode01.0
```

As this command is used to set up and initialize the shared Process Server database, this script can be executed on any App Target cluster node. It only needs to be executed once for a Process Center or Process Server environment.

Example 7-2 shows a sample of a successful outcome for a bootstrapProcessServerData script execution. Check the output for any errors that might occur during the bootstrapProcessServerData script execution.

Example 7-2 Output of bootstrap Process Server command

```
[Activating .... ] Aug 4, 2011 10:22:24 AM null null
[Activating .... ] INFO: Client code attempting to load security
configuration
[Activating .... ] Aug 4, 2011 10:22:24 AM
com.lombardisoftware.utility.db.QueryUtil findDatabaseType
[Activating .... ] WARNING: Could not find database from JNDI lookup
in server.
Defaulting to configuration file
[Activating .... ] Aug 4, 2011 10:22:24 AM
com.lombardisoftware.core.cache.Loca
lCache initializeSettingsFile
[Activating .... ] INFO: CWLLG2155I: Cache settings read have been
from file
file:/opt/IBM/WebSphere/AppServer/BPM/Lombardi/process-server/twinit/li
b/basic_resources.jar!/LombardiTeamWorksCache.xml.

check.IMPORTFILE:

TWImportWrapper:

TWImportAndActivate:
[delete] Deleting:
/opt/IBM/WebSphere/AppServer/profiles/DmgrProcCenter4Clusters/config/ce
lls/ProcCenter4Clusters/nodes/bpmNode01/servers/BPMRMSW.AppTarget.bpmNo
de01.0/process-center/config/100Bootstrap.xml
[delete] Deleting:
/opt/IBM/WebSphere/AppServer/profiles/DmgrProcCenter4Clusters/config/ce
lls/ProcCenter4Clusters/nodes/bpmNode01/servers/BPMRMSW.AppTarget.bpmNo
de01.0/process-center/
TeamWorksConfiguration.running.xml

BUILD SUCCESSFUL
Total time: 8 minutes 3 seconds
```

Note: For further details of the bootstrapProcessData command, see the following reference:

http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/topic/com.ibm.wbpm.imuc.ebpm.doc/topics/tcnfg_bootstrap.html

7.4.3 Restarting the deployment manager

Restart the deployment manager. It is *essential* to ensure that the deployment environment generation has completed successfully, or you might encounter problems. As this is an asynchronous process, a successful response from the Integrated Solutions Console or wsadmin script stating that the deployment environment has been created is *not* sufficient confirmation.

To ensure that the process is complete, monitor the logs on each of your node agents (*not* the deployment manager). Toward the end of the deployment environment being created, you will see the following sort of messages:

```
[8/2/11 12:05:37:281 EDT] 0000003a AppBinaryProc I   ADMA7021I:
Distribution of application TaskContainer_BPMFourCluster.AppTarget
completed successfully.
[8/2/11 12:05:37:375 EDT] 0000003a AppBinaryProc I   ADMA7021I:
Distribution of application
HTM_PredefinedTasks_V7500_BPMFourCluster.AppTarget completed
successfully.
```

There will be several of these sorts of messages in the logs of both node agents as the standard applications are deployed to both nodes in the deployment environment. Wait for these messages to stop displaying and for the logs to quiesce, as this indicates that the deployment environment generation is complete.

Then restart your deployment manager. Monitor the deployment manager startup logs to ensure that there are no errors or exceptions. If the deployment manager starts successfully, there will be a log entry similar to the sample below:

```
[8/2/11 14:23:44:420 EDT] 00000000 WsServerImpl A   WSVR0001I: Server
dmgr open for e-business
```

Start all the node agents after the deployment manager has started, navigate to each node folder, and issue the **startNode** command. Monitor the node agent startup log for the node startup status.

Note: See the following reference for more details about restarting deployment environments and the implied order for starting clusters:

http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/topic/com.ibm.wbpm.admin.doc/topics/rref_recovering_servers.html

7.4.4 Configuring for IBM HTTP Server

This section describes how to configure IBM HTTP Server.

Adding IBM HTTP Server to cell

First, the IBM HTTP Server needs to be added to the cell, as described in 5.7.4, “Adding IBM HTTP Server to the cell” on page 136.

After the HTTP server is added to the cell, all the existing web modules should be mapped to the HTTP Server automatically. These mappings to the HTTP server are required to enable the web plug-in of the HTTP server to route the HTTP requests to the target web modules running in the cluster.

In this example, the IBM HTTP Server is utilized to route HTTP requests to each member of the appropriate clusters. You might have alternatively chosen to utilize a WebSphere proxy server.

Two sets of actions are necessary:

- ▶ Map web modules to the web server.
- ▶ Customize the clustered Process Center or Process Server to utilize the router.

Note: Only the second step is a required explicit step when utilizing a proxy server.

Map web modules to the web server

During the installation of the IBM HTTP Server Plug-in, a `configureWebserver` script is produced by the install process on the web server machine. The `configureWebserver` script automatically maps all web application modules to the web server. Therefore, if this script is run after the generation of the deployment environment, the web modules will automatically be mapped to the web server.

If you have already created the web server configuration (as assumed, as a prerequisite of this chapter), you must manually map these modules as follows:

1. Log in to the Integrated Solutions Console as an administrative user.
2. Click **Applications** → **Application Types** → **WebSphere enterprise applications**.
3. On the Enterprise Applications panel, click the name of the application.
4. On the Configuration tab, under Modules, click **Manage Modules**.

5. On the Manage Modules panel, perform the following steps:
 - a. Select the check box next to the name of the modules.
 - b. In the Clusters and servers section, select the application deployment target (where the application is already deployed) and the web server (if any). Use the Ctrl key to select multiple targets. For example, to have a web server serve your application, press the Ctrl key and then select the application server cluster and the web server together.

Figure 7-29 shows an example web module and mapping.

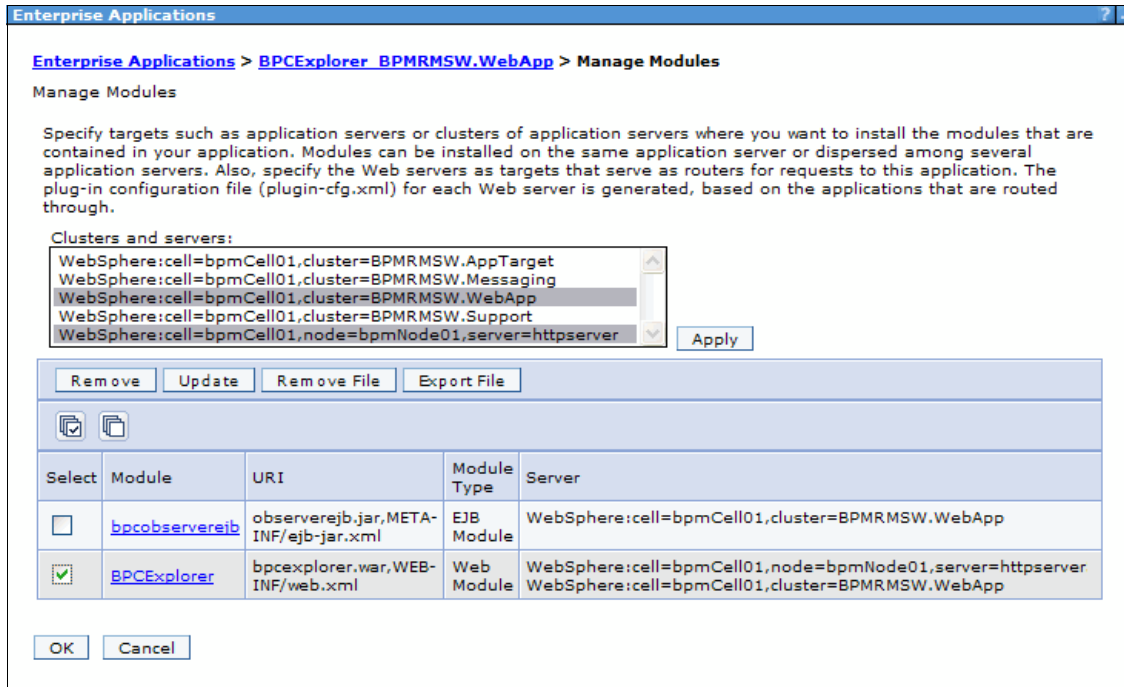


Figure 7-29 The web module is mapped to the web cluster and a web server

- c. Click **Apply**.
- d. Click **OK** and **Save** to save any changes.

For each enterprise application that you want the web server to serve, map all of its web modules. Table 7-4 contains a list of the enterprise applications that contain a web module. Each enterprise application can have one or more web modules.

Table 7-4 Components with web modules that might be mapped to a web server in addition to their deployment cluster

Components	Enterprise applications that contain web modules
Process Server	<ul style="list-style-type: none"> ▶ IBM_BPM_Portal (Process Portal) ▶ IBM_BPM_ProcessAdmin ▶ IBM_BPM_Repository ▶ IBM_BPM_Teamworks ▶ IBM_BPM_WebAPI
Performance Data Warehouse	<ul style="list-style-type: none"> ▶ IBM_BPM_PerformanceDW
Business Space	<ul style="list-style-type: none"> ▶ BSpaceEAR ▶ BSpaceForms ▶ BSpaceHelp ▶ PageBuilder2 ▶ mm.was
Widgets	<ul style="list-style-type: none"> ▶ BPMAAdministrationWidgets ▶ HumanTaskManagementWidgets ▶ BusinessRules ▶ wesbWidget ▶ CognosWidgets
REST services	<ul style="list-style-type: none"> ▶ REST Services Gateway
Business flow manager	<ul style="list-style-type: none"> ▶ BPEContainer ▶ BPCEplorer
Human task manager	<ul style="list-style-type: none"> ▶ TaskContainer ▶ HTM_PredefinedTaskMsg_V700 ▶ HTM_PredefinedTasks_V700
Business rules	<ul style="list-style-type: none"> ▶ BusinessRulesManager

Note: Later, if you see that accessing web pages with the HTTP server does not work, but that accessing each cluster member works as expected, most likely the cause is that the web module is not mapped to the HTTP server correctly. To validate, check the mapping of each module with the same approach as described above, and add the mapping to HTTP server if it is missing.

After a web module is mapped to the web server, generate and propagate the plug-in:

1. In the Integrated Solutions Console, expand **Servers** → **Server Types** and click **Web servers**.
2. Select your web server (Figure 7-30).

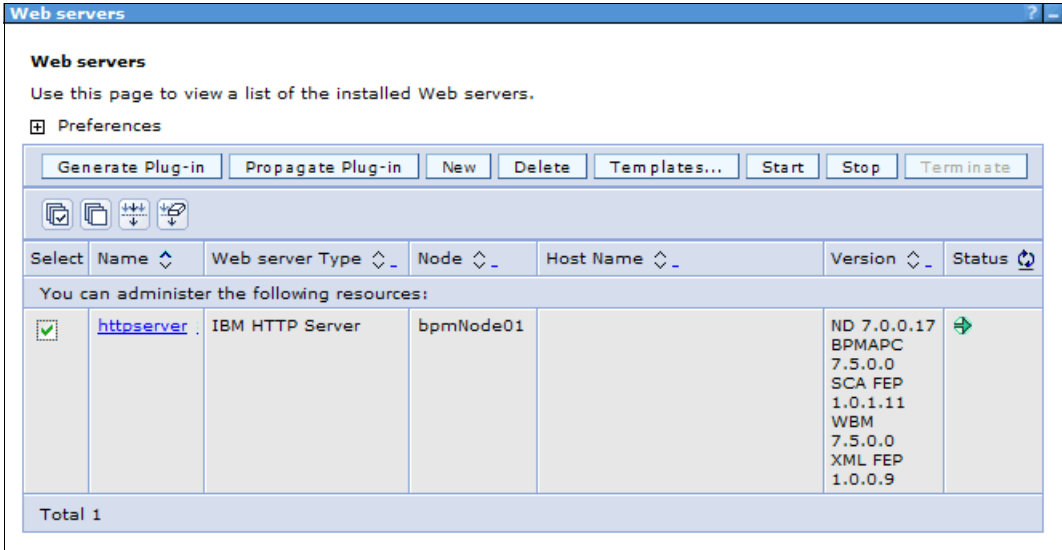


Figure 7-30 Generate and propagate Plug-in to selected web server

3. Click **Generate Plug-in**. Success or error messages will display (Figure 7-31).

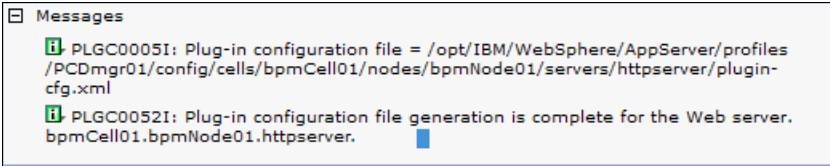


Figure 7-31 Feedback messages from a successful plug-in generation

4. Click **Propagate Plug-in**. Success or error messages will display (Figure 7-32).

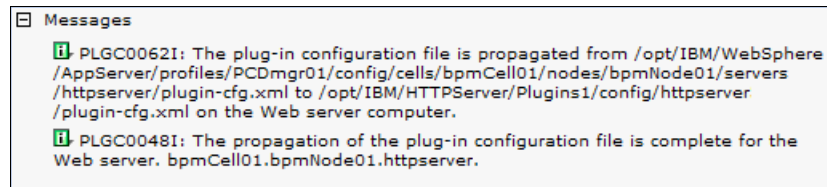


Figure 7-32 Feedback messages from a successful plug-in propagation

Customizing Process Center or Process Server to utilize router

For a Process Center or Process Server component, the default configuration of each cluster member references the node hostname where it has been installed. The node hostname is used in generated content and URLs produced by the Process Center or Process Server. To generate content and URLs that reference the relevant web server or proxy server, the Process Center or Process Server component configuration should be updated to reference the web server or proxy server hostname instead of the node host name.

If the HTTPS protocol is being used to route requests to the web server or proxy server, any relevant references to the HTTP protocol in the configuration should also be updated.

Example 7-3 on page 243 details the specific configuration settings to be updated for a Process Center or Process Server environment to use a web server or proxy server.

Note: See the following reference for more details about customizing the Process Server or Process Center cluster to work with a web server:

http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/index.jsp?topic=/com.ibm.wbpm.imuc.ebpm.doc/topics/tconfig_custom_cluster_env.html

There are several configuration values to be replaced with the HTTP Server URL. These include the portal-prefix, teamworks-webapp-prefix, servlet-prefix, webapi-prefix tags, and so on. Such configuration settings are recorded in the 99Local.xml configuration file. However, the custom configuration override XML file, 100Custom.xml, is being used. This enables overriding the default installation configuration without directly editing the 99Local.xml configuration file containing the out-of-the-box configuration settings. For general details about using the configuration overrides, see Appendix C, “Configuring IBM Business Process Manager V7.5 configuration settings” on page 377, for details.

Example 7-3 on page 243 is a sample 100Custom.xml for covering existing configuration settings. Save it to the node-level configuration, as well as the cluster-level configuration. In our environment, the configuration files are as follows, within the deployment manager profile (DMGR):

- ▶ /opt/IBM/WebSphere/AppServer/profiles/DmgrProcCenter4Clusters/config/cells/ProcCenter4Clusters/clusters/BPMRMSW.AppTarget/process-center/100Custom.xml
- ▶ /opt/IBM/WebSphere/AppServer/profiles/DmgrProcCenter4Clusters/config/cells/ProcCenter4Clusters/nodes/bpmNode01/servers/BPMRMSW.AppTarget.bpmNode01.0/process-center/config/100Custom.xml
- ▶ /opt/IBM/WebSphere/AppServer/profiles/DmgrProcCenter4Clusters/config/cells/ProcCenter4Clusters/nodes/bpmNode02/servers/BPMRMSW.AppTarget.bpmNode01.0/process-center/config/100custom.xml

Note: 100Custom.xml is also replicated within each node folder. However, you do not need to modify these. Only the files within the Deployment Manager profile require modification, because the Deployment Manager will synchronize the 100custom.xml configuration file from Deployment Manager profile to all managed nodes.

These should be synchronized to the managed cluster nodes using the **syncNode** command-line utility or the **Full Synchronise** option in the IBM WebSphere Application Server web-based administration console. In this example, for the two nodes being used, the locations of the synchronized custom configuration override files are as follows.

Within the Node1 profile:

- ▶ /opt/IBM/WebSphere/AppServer/profiles/DmgrProcCenter4Clusters/config/cells/ProcCenter4Clusters/nodes/bpmNode01/servers/BPMRMSW.AppTarget.bpmNode01.0/100custom.xml
- ▶ /opt/IBM/WebSphere/AppServer/profiles/DmgrProcCenter4Clusters/config/cells/ProcCenter4Clusters/clusters/BPMRMSW.AppTarget/process-center/100custom.xml

Within the Node2 profile:

- ▶ /opt/IBM/WebSphere/AppServer/profiles/DmgrProcCenter4Clusters/config/cells/ProcCenter4Clusters/nodes/bpmNode02/servers/BPMRMSW.AppTarget.bpmNode02.0/100custom.xml
- ▶ /opt/IBM/WebSphere/AppServer/profiles/DmgrProcCenter4Clusters/config/cells/ProcCenter4Clusters/clusters/BPMRMSW.AppTarget/process-center/100custom.

Example 7-3 shows the 100Custom.xml for the HTTP server.

Example 7-3 100Custom.xml for HTTP server

```
<properties>

<!--
To use [load balancer or proxy], insert the Fully Qualified Name (FQN)
for the Virtual IP or DNS name that load balances between http://[app
server node 1]:[port] and http://[app server node 2]:[port].
-->
    <authoring-environment merge="mergeChildren">
<!--
Used by the Process Designer debugger, if there is no direct HTTP
access to the nodes
-->
        <images-prefix
merge="replace">http://itsodb2:80/teamworks</images-prefix>
        <portal-prefix
merge="replace">http://itsodb2:80/portal</portal-prefix>
        <servlet-prefix
merge="replace">http://itsodb2:80/teamworks</servlet-prefix>
        <webapi-prefix
merge="replace">http://itsodb2:80/webapi</webapi-prefix>
<!--
The next 2 URLs should only ever load balance to one specific node, as
the Jamwiki database does not support clustered nodes and would
otherwise place the content in Jamwiki instances randomly.
-->
        <process-help-wiki-url-view
merge="replace">http://Node01.PC:9080/processhelp/en/%TITLE%?teamworksT
itle=%TEAMWORKS_TITLE%</process-help-wiki-url-view>
        <process-help-wiki-url-edit
merge="replace">http://Node01.PC:9080/processhelp/en/Special:Edit?topic
=%TITLE%&teamworksTitle=%TEAMWORKS_TITLE%</process-help-wiki-url-ed
it>
    </authoring-environment>

    <common merge="mergeChildren">

<!--
The next 5 URLs should load balance or proxy to all nodes, using the
Virtual IP or DNS name with sticky sessions.
-->
        <webservices merge="mergeChildren">
```

```

        <base-url
merge="replace">http://itsodb2:80/teamworks/webservices</base-url>
        </webservices>
        <portal-prefix
merge="replace">http://itsodb2:80/portal</portal-prefix>
        <teamworks-webapp-prefix
merge="replace">http://itsodb2:80/teamworks</teamworks-webapp-prefix>
        <xml-serialization merge="mergeChildren">
        <default-namespace-uri
merge="replace">http://itsodb2:80/schema/</default-namespace-uri>
        </xml-serialization>
        <office merge="mergeChildren">
        <sharepoint merge="mergeChildren">
        <default-workspace-site-description
merge="replace">
                <![CDATA[This site has been automatically
generated for managing collaborations and documents
        for the Lombardi TeamWorks process instance: <#=
tw.system.process.name #> <#= tw.system.process.instanceId #>
        TeamWorks Link:
http://itsodb2:80/portal/jsp/getProcessDetails.do?bpdInstanceId=<#=
tw.system.process.instanceId #>
        ]]>
                </default-workspace-site-description>
        </sharepoint>
        </office>
</common>
        <server merge="mergeChildren">
        <email merge="mergeChildren">
        <mail-template merge="mergeChildren">
<!--
The next URLs should loadbalance to all nodes, using the using the
Virtual IP or DNS name with sticky sessions for task URLs in generated
e-mails.
-->
                <client-link
merge="replace">http://itsodb2:80/teamworks</client-link>
        </mail-template>
        </email>
        </server>
</properties>

```

As an alternative, you could also edit `99Local.xml` directly, which is *not recommended* and requires backing up the default configuration files in advance before making any changes.

Note: For further details on customizing the Process Server/Process Center cluster to work with a web server, see the following resource:

http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/index.jsp?topic=/com.ibm.wbpm.imuc.ebpm.doc/topics/tconfig_custom_cluster_env.html

7.4.5 Changing the virtual host hostname

You might want to restrict the virtual host hostname used for port 9080 (the default HTTP port) for your four-cluster setup to only accept incoming HTTP requests from the configured IBM IHS Web server.

To learn the port number of the default HTTP port, within Integrated Solutions Console:

1. Navigate to **Servers** → **Server Types** → **WebSphere application servers**.
2. Select the application server to be checked. In this example, the application servers are `BPMRMSW.AppTarget.bpmNode01.0` and `BPMRMSW.AppTarget.bpmNode02.0`.

3. Navigate to **Communications** → **Ports** and select the plus button (+) to view the expanded port list. Confirm the port assigned to the WC_defaulthost portname (Figure 7-33). This example uses port 9080.

Communications		
Ports		
Port Name	Port	Details
BOOTSTRAP_ADDRESS	2810	
SOAP_CONNECTOR_ADDRESS	8880	
SAS_SSL_SERVERAUTH_LISTENER_ADDRESS	9404	
CSIV2_SSL_SERVERAUTH_LISTENER_ADDRESS	9405	
CSIV2_SSL_MUTUALAUTH_LISTENER_ADDRESS	9406	
WC_adminhost	9061	
WC_defaulthost	9080	
DCS_UNICAST_ADDRESS	9354	
WC_adminhost_secure	9044	
WC_defaulthost_secure	9443	
SIP_DEFAULTHOST	5060	
SIP_DEFAULTHOST_SECURE	5061	
SIB_ENDPOINT_ADDRESS	7276	
SIB_ENDPOINT_SECURE_ADDRESS	7286	
SIB_MQ_ENDPOINT_ADDRESS	5558	
SIB_MQ_ENDPOINT_SECURE_ADDRESS	5578	
ORB_LISTENER_ADDRESS	9101	
IPC_CONNECTOR_ADDRESS	9633	

Figure 7-33 WC_defaulthost port

To update the virtual host hostname:

1. Open the Integrated Solutions Console and log in.
2. Navigate to **Environment** → **Virtual hosts**.
3. Click **default_host**.
4. Under Additional Properties, click **Host Aliases**.
5. Add and delete entries as appropriate so that port 9080 is only associated with the hostname for the web server. There might be entries associated with the hostname *. These entries match any host, so remove them.
6. If the host name and port number for the cluster members are not displayed on the list, click **New** to add the missing entry to the list.
7. If you add a new entry, click **Save** and **Synchronize**.

Note: If you have a web server defined, any updates made to the virtual host list are important information to the web server. The plug-in file referenced by the web server will need to be generated and propagated.

1. After mapping virtual hosts, regenerate the plug-in configuration file. From the left navigation area, click **Servers** → **Server Types** → **Web servers**.
2. From the Web servers panel, select the check box next to the name of the web server for which you want to generate a plug-in. Click **Generate Plug-in**.

At this step, you can wait to perform the generation and propagation of the plug-in file.

7.4.6 Checking that CEI event persistence is disabled

For a production system, it is best to disable persistence of CEI events to a database, as this can have a significant performance impact on HTTP request response times. This is the default setting for the IBM Business Process Manager 7.5 release, compared with automatically enabling for the 7.0 release. Therefore, confirm that it is disabled via the Integrated Solutions Console:

1. Open the Integrated Solutions Console and navigate to **Service Integration** → **Common Event Infrastructure** → **Event Service** → **Event Services**.

Note: If this menu item does not appear, you might not have restarted your deployment manager since generating your deployment topology, in which case, restart it now.

2. Click **Default Common Event Infrastructure event server**. Ensure that the **Enable event data store** option is not selected.

7.4.7 Securing the Process Server and Performance Data Warehouse service integration buses

In Business Process Manager v7.5.0.0, the service integration buses used by the IBM Process Server and Performance Data Warehouse are shipped unsecured.

To secure these service integration buses, follow the instructions provided in the Technote available from IBM Support at:

<http://www-01.ibm.com/support/docview.wss?uid=swg21499518>

7.4.8 Sharing transaction and recovery logs

To enable proper failover handling, the transaction and recovery log of each cluster member needs to be shared. Sharing means that the log files can be commonly accessed by each node/cluster member. From the multiple technologies available today to establish a shared filestore among systems, choose whatever fits your needs best.

Note: The high availability of the transaction service enables any server in a cluster to recover the transactional work for any other server in the same cluster. This is described in the WebSphere Application Server Information Center:

http://publib.boulder.ibm.com/infocenter/wasinfo/v7r0/index.jsp?topic=/com.ibm.websphere.nd.multiplatform.doc/info/ae/ae/cjta_trans_ha.html

The shared filestore technique leveraged for this example is NFS.

1. Enable each cluster:
 - a. Log in to the Integrated Solutions Console.
 - b. Click **Servers** → **Clusters** → **WebSphere application server clusters**.

- c. In the WebSphere application server clusters panel, you will see the names of the clusters (Figure 7-34). Click the name of the cluster, **BPMRMSW.AppTarget**.



Figure 7-34 The four clusters utilized in this topology

- d. In the panel for the selected cluster, select the **Enable failover of transaction log recovery** check box (Figure 7-35). Then click **OK** and **Save** the change.

WebSphere application server clusters

WebSphere application server clusters > BPMRMSW.AppTarget

Use this page to change the configuration settings for a cluster. A server cluster consists of a group of application servers. If one of the application servers that is a member of the cluster fails, requests are routed to other members of the cluster.

Runtime Configuration Local Topology

General Properties

* Cluster name
BPMRMSW.AppTarget

Bounding node group name
DefaultNodeGroup

☒ Prefer local

☒ Enable failover of transaction log recovery

Apply OK Reset Cancel

Cluster messaging

- Messaging engines

Business Integration

- Business Integration Configuration
- Process Center
- Performance Data Warehouse
- Business Space Configuration
- REST services
- Service Component Architecture
- Common Event Infrastructure
- Business Process Choreographer
- Business Rules
- Service Monitor

Additional Properties

- Cluster members
 - Backup cluster
 - Endpoint listeners
 - Security domain

Figure 7-35 Select the Enable failover of transaction log recovery check box

- e. Repeat steps 1a - 1d for each of the remaining clusters:
- BPMRMSW.Messaging
 - BPMRMSW.Support
 - BPMRMSW.WebApp

2. On the shared file system and as a user with proper administrative authority, create tranlog and recoverylog directories. Example 7-4 assumes that the defined mount point on the file system is /BPMdata, and that this mount point is available to every node of the cell.

Example 7-4 Create tranlog and recoverylog directories on a shared file system

```
cd /BPMdata
mkdir SharedLogs
cd SharedLogs
mkdir tranlogs
mkdir recoverylogs

cd tranlogs
mkdir BPMRMSW.AppTarget.bpmNode01.0
mkdir BPMRMSW.AppTarget.bpmNode02.0
mkdir BPMRMSW.Messaging.bpmNode01.0
mkdir BPMRMSW.Messaging.bpmNode02.0
mkdir BPMRMSW.Support.bpmNode01.0
mkdir BPMRMSW.Support.bpmNode02.0
mkdir BPMRMSW.WebApp.bpmNode01.0
mkdir BPMRMSW.WebApp.bpmNode02.0

cd ../recoverylogs
mkdir BPMRMSW.AppTarget.bpmNode01.0
mkdir BPMRMSW.AppTarget.bpmNode02.0
```

3. Now that the directories exist, configure each cluster member to its newly created shared transaction log folder:
 - a. Log in to the Integrated Solutions Console.
 - b. Navigate to **Servers** → **Server types** → **WebSphere application servers**.
 - c. In the WebSphere application servers panel, you will see the names of each of the servers (cluster members). Click the name of the cluster member **BPMRMSW.AppTarget.bpmNode01.0**.

- d. On the upper right, under Container Settings, expand **Container Services** and click **Transaction Service** (Figure 7-36).

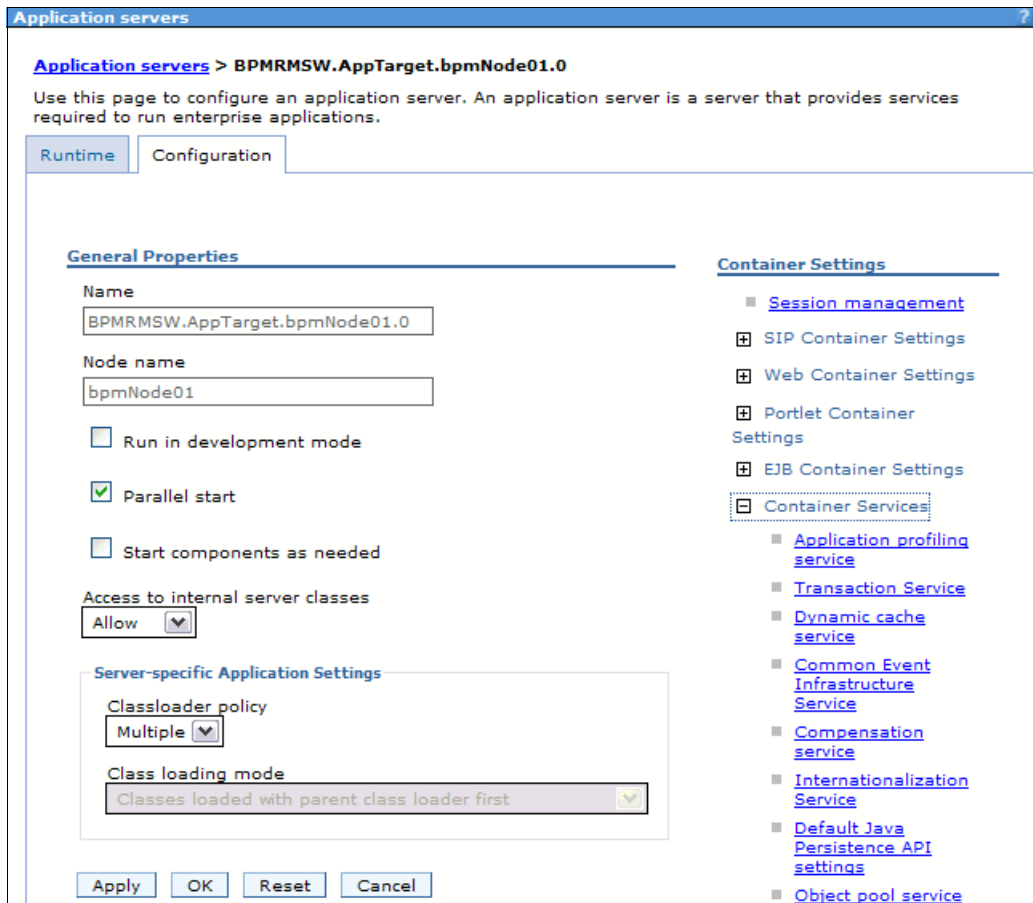


Figure 7-36 Under Container Settings, expand Container Services to find Transaction service

- e. On the Transaction service panel:
 - i. Specify the tranlog directory that corresponds to this server, for example:
 /BPMdata/SharedLogs/tranlogs/BPMRMSW.AppTarget.node01.0
 - ii. Uncheck the Enable file locking box.
 - iii. Click **OK** and **Save** the change.

Note: If Network File System Version 3 is used for storing transaction recovery logs and automated peer recovery is used, then file locking must be disabled:

http://publib.boulder.ibm.com/infocenter/wasinfo/v7r0/index.jsp?topic=/com.ibm.websphere.nd.doc/info/ae/ae/tjta_disable_lock.html

- f. Repeat steps 2a - 2e for each of the remaining cluster members to configure their tranlogs:
 - BPMRMSW.AppTarget.bpmNode02.0
 - BPMRMSW.Messaging.bpmNode01.0
 - BPMRMSW.Messaging.bpmNode02.0
 - BPMRMSW.Support.bpmNode01.0
 - BPMRMSW.Support.bpmNode02.0
 - BPMRMSW.WebApp.bpmNode01.0
 - BPMRMSW.WebApp.bpmNode02.0
4. Configure each member of the AppTarget cluster to its newly created shared recovery folder:
 - a. In the Integrated Solutions Console, navigate to **Servers** → **Server types** → **WebSphere application servers**.
 - b. Click **BPMRMSW.AppTarget.bpmNode01.0**.
 - c. On the upper right, under **Container Settings**, expand **Container Services** and click **Compensation Service**.
 - d. On the Compensation service panel:
 - i. Enter the recovery log directory:
/BPMdata/SharedLogs/recoverylogs/BPMRMSW.bpmNode01.0
 - ii. Click **OK** and **Save** the change.
 - e. In the Integrated Solutions Console, navigate to **Servers** → **Server types** → **WebSphere application servers** and click the remaining application cluster member, **BPMRMSW.appTarget.bpmNode02.0**.
 - f. On the upper right, under **Container Settings**, expand **Container Services** and click **Compensation Service**.
 - g. On the Compensation service panel:
 - i. Enter the recovery log directory:
/BPMdata/SharedLogs/recoverylogs/BPMRMSW.bpmNode02.0
 - ii. Click **OK** and **Save** the change.

Note: In the future, when this cell is actively running in production, it is important to remember that the transaction log files must not be deleted from a production environment.

http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/index.jsp?topic=/com.ibm.wbpm.admin.doc/topics/ctro_tran_log_file.html

7.5 Verification

As the IBM Business Process Manager v7.5 consists of several components, including Process Center, Business Space, Human Task Manager, Business Process Engine, and so on, verify each component's functionality:

- ▶ 7.5.1, “Verification: The application cluster can start successfully” on page 255
- ▶ 7.5.2, “Verification: Process Center functions” on page 260
- ▶ 7.5.3, “Verification: Business Space” on page 267
- ▶ 7.5.4, “Verification: Human Task manager” on page 268
- ▶ 7.5.5, “Verification: Business Process Choreographer” on page 276

The following section details activities that are used to validate and verify the four-cluster topology configuration.

7.5.1 Verification: The application cluster can start successfully

The four-cluster topology should resemble the structure depicted in Figure 7-37.

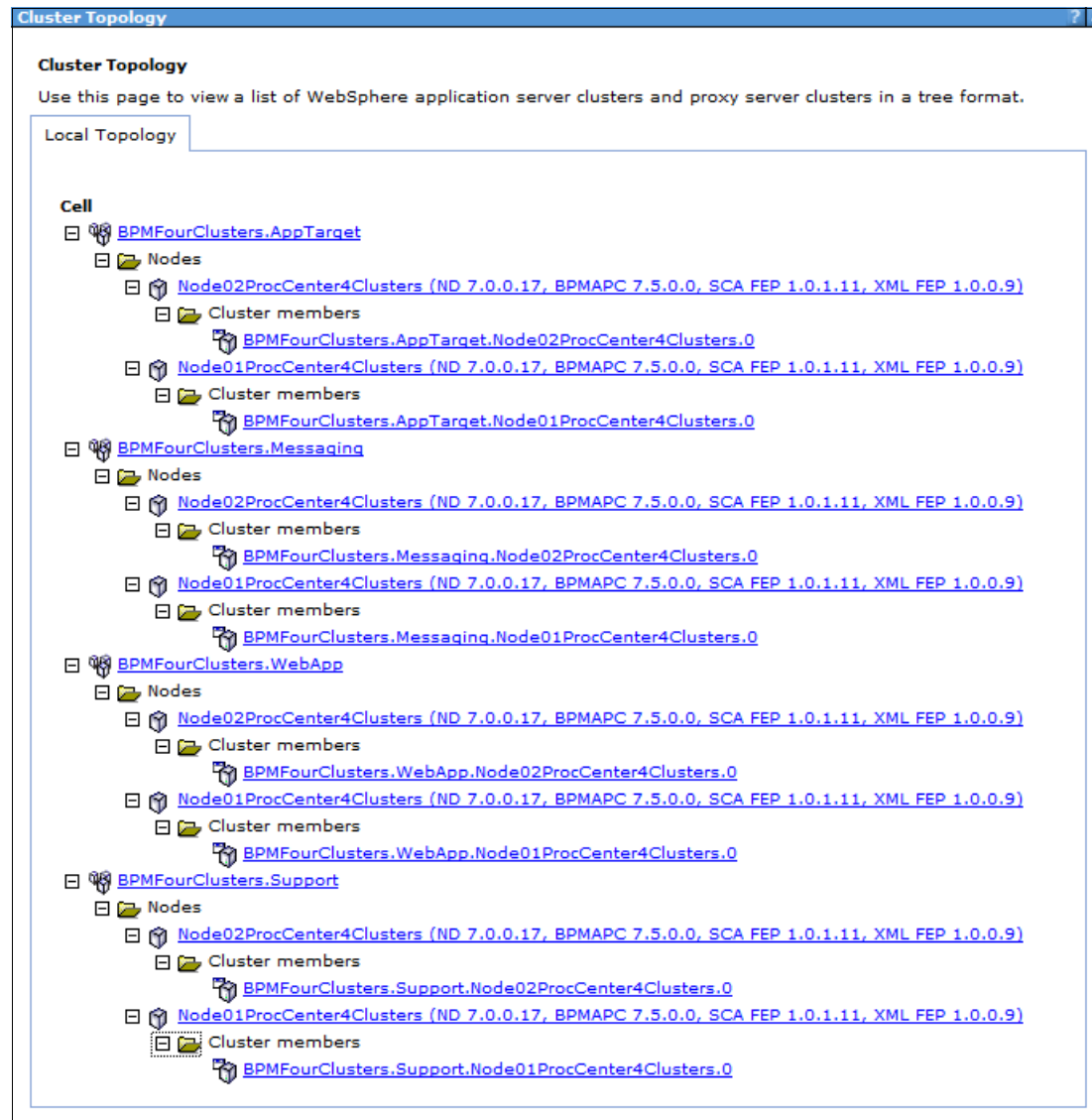


Figure 7-37 Four-cluster topology for Process Center

Note: A four-cluster topology for a Process Server would have an identical structure to Figure 7-37. However, the naming convention of the cluster components would be specific to the Process Server (for example, the node name would be Node01Proc4Clusters.0).

A second reason to restart the Deployment Manager is to load a plug-in used by the Integrated Solution Console. This allows you to see the Common Event Infrastructure panels under the Service Integration main menu item.

Note: It is important to frequently check the log files. In this case, verify that the deployment manager's `SystemOut.log` file and each node agent's `SystemOut.log` file do not contain any errors before stopping and after restarting.

Stop and then restart the deployment manager. Monitor the deployment manager startup logs to ensure that there are no errors or exceptions. If the deployment manager starts successfully, there should be no error messages, and a similar log entry as follows to confirm that it has started:

```
[8/2/11 14:23:44:420 EDT] 00000000 WsServerImpl A WSVR0001I: Server
dmgr open for e-business
```

If preferred, restart all the node agents after the deployment manager has started. Node agents can be stopped and restarted from their respective `PROFILE_HOME\bin` using the **stopNode.sh** and **startNode.sh** commands. Alternatively, it is possible to restart active node agents via the Integrated Solution Console under the **System Administration** → **Node agents** menu. Always monitor the node agent startup logs for the node startup status.

After the deployment manager and both node agents have started successfully, start the clusters. These should be started in a specific order:

1. Messaging cluster
2. Support cluster
3. App Target cluster
4. Web cluster

Verification: The messaging cluster starts cleanly

The first cluster to be started is the messaging cluster. In the Integrated Solutions Console, navigate to **Servers** → **Clusters** → **WebSphere application server clusters**. Select the Messaging cluster and click **Start**.

Wait until the cluster and all associated components have started completely. The status icon will become green when the entire cluster is started.

Review each messaging cluster member's SystemOut.log file, checking for the following information:

- ▶ Each cluster member is started. For example, you will see that each cluster member is open for e-business:


```
[8/15/11 0:27:37:601 CDT] 00000000 WsServerImpl A WSVR0001I:
Server BPMRMSW.Messaging.bpmNode01.0 open for e-business
```
- ▶ There are no error messages in the log files.
- ▶ Each messaging engine has achieved the STARTED state. Remember that each messaging engine is a singleton, and therefore in one cluster member's log you will see that the messaging engine is in state JOINED, while in the other cluster member's log you will see that the messaging engine is in state STARTED. For example, a similar message will be seen for each of the active messaging engines:


```
[8/15/11 0:27:34:913 CDT] 00000013 SibMessage I
[SCA.SYSTEM.bpmCell01.Bus:BPMRMSW.Messaging.000-SCA.SYSTEM.bpmCell01
.Bus] CWSID0016I: Messaging engine
BPMRMSW.Messaging.000-SCA.SYSTEM.bpmCell01.Bus is in state Started.
```
- ▶ The status of each messaging engine can also be viewed in the Integrated Solutions Console:
 - Navigate to **Service Integration** → **Buses** → and click the name of a bus.
 - Under Topology, click **Messaging Engines**. There you will see the status of the messaging engine (Figure 7-38).



Figure 7-38 A messaging engine in STARTED state

Note: The reason for starting the Messaging cluster first is because many resources used by other clusters are dependant on being able to connect to an active messaging engine.

Verification: The support cluster starts cleanly

Start the support cluster:

1. In the Integrated Solutions Console, navigate to **Servers** → **Clusters** → **WebSphere application server clusters**.
2. Select the support cluster and click **Start**.
3. Wait until the cluster and all associated components have started completely. The status icon will become green when the entire cluster is started.
4. Review each Support cluster member's SystemOut.log file.
 - Each cluster member is started. For example, you will see that each cluster member is open for e-business:

```
[8/15/11 0:45:16:366 CDT] 00000000 WsServerImpl A WSVR0001I:
Server BPMRMSW.Support.bpmNode02.0 open for e-business
```
 - There are no error messages in the log files.

Verification: The AppTarget cluster starts cleanly

Start the support cluster:

1. In the Integrated Solutions Console, navigate to **Servers** → **Clusters** → **WebSphere application server clusters**.
2. Select the AppTarget cluster and click **Start**.
3. Wait until the cluster and all associated components have started completely. The status icon will become green when the entire cluster is started.
4. Review each AppTarget cluster member's SystemOut.log file.
 - Each cluster member is started. For example, you will see that each cluster member is open for e-business:

```
[8/15/11 0:51:06:402 CDT] 00000000 WsServerImpl A WSVR0001I:
Server BPMRMSW.AppTarget.bpmNode02.0 open for e-business
```
 - There are no error messages in the log files.

Verification: The web cluster starts cleanly

Start the support cluster:

1. In the Integrated Solutions Console, navigate to **Servers** → **Clusters** → **WebSphere application server clusters**.
2. Select the web cluster and click **Start**.
3. Wait until the cluster and all associated components have started completely. The status icon will become green when the entire cluster is started.
4. Review each web cluster member's SystemOut.log file.
 - Each cluster member is started. For example, you will see that each cluster member is open for e-business:

```
[8/15/11 0:53:21:919 CDT] 00000000 WsServerImpl A WSVR0001I:  
Server BPMRMSW.WebApp.bpmNode02.0 open for e-business
```
 - There are no error messages in the log files.

Figure 7-39 shows the complete startup of four clusters and their members.

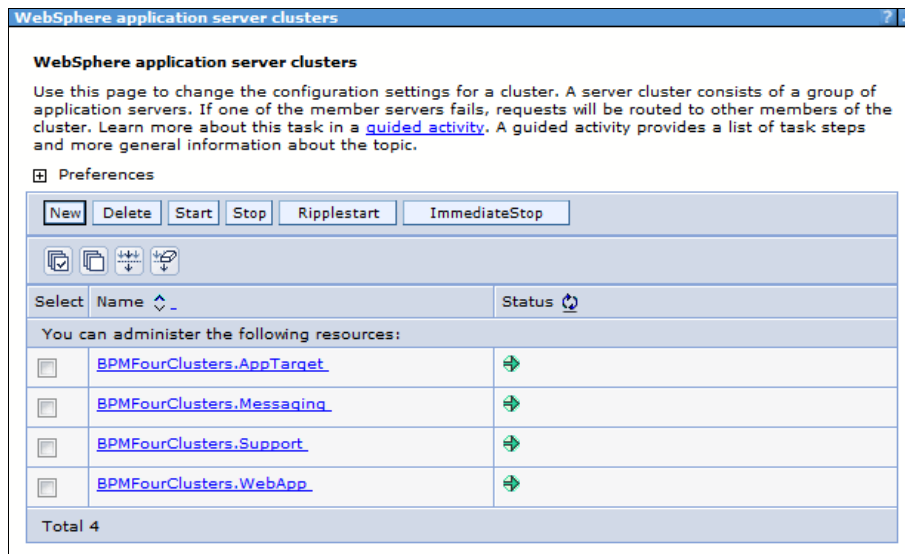


Figure 7-39 Complete startup of four clusters and their members

Also, check the startup log of each cluster member for any errors or exceptions. If your cluster member starts successfully, you will get log entries like those in Example 7-5.

Example 7-5 Log confirmation of successful server startup

```
[8/2/11 12:08:57:605 EDT] 00000000 WsServerImpl A WSVR0002I: Server  
BPMRMSW.AppTarget.bpmNode01.0 open for e-business
```

7.5.2 Verification: Process Center functions

In this section you will verify various Process Center functions.

Verifying the Process Center web applications

For HTTP requests, either use the front-end web server proxy `http://yourwebserver/` or direct requests to the `http://[Node host name]:[Node HTTP port]/node`.

You must confirm that a few web applications are accessible without any issues with the web server, such as Process Center, Process Portal, and Process Admin.

Confirm that the Process Center/Process Server functionality is fully operational by checking the relevant log files to ensure that the Process Server, Performance Server, and Event Manager components all start without errors or exceptions. The location of the log files should be:

`<BPM_install_dir>/AppServer/profiles/<Node_name>/logs/<Cluster_name>`

Confirm that the core functionality operates as expected across all aspects, including the Process Server/Event Manager.

Request and inspect the responses to the following URLs using a web browser:

- ▶ Process Server Admin Console (Figure 7-40)
 - <http://itsodb2/ProcessAdmin/>, using IHS for HTTP requests
 - <http://Node01.PC:9080/ProcessAdmin/>, direct HTTP requests to Node01

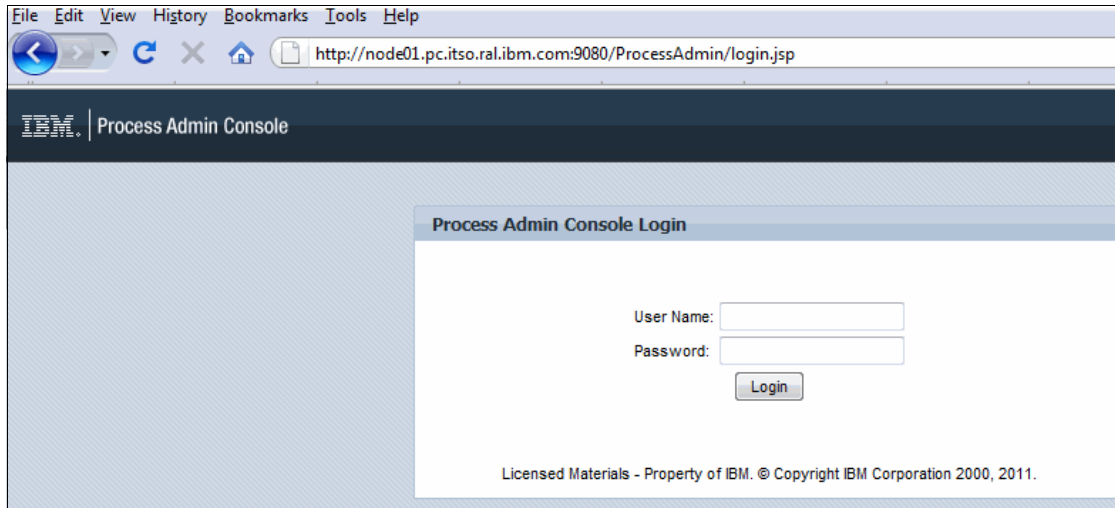


Figure 7-40 Process Admin Console Login panel

To request and inspect the responses:

- Log in as a valid user (in this case, bpmadmin).
- Clear the caches under the **IBM BPM Admin** → **Manage Caches** menu item (Figure 7-41).

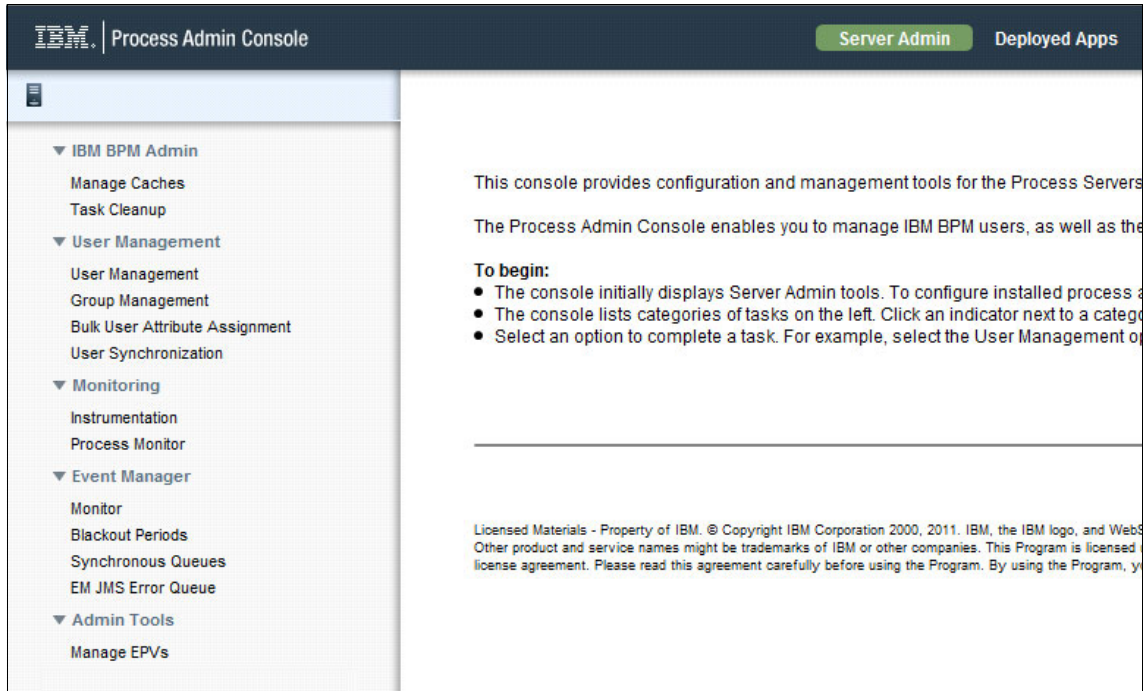


Figure 7-41 Process Admin Console with expanded menu

- Stop and start the Event Manager component under **Event Manager** → **Monitor** (Figure 7-42).

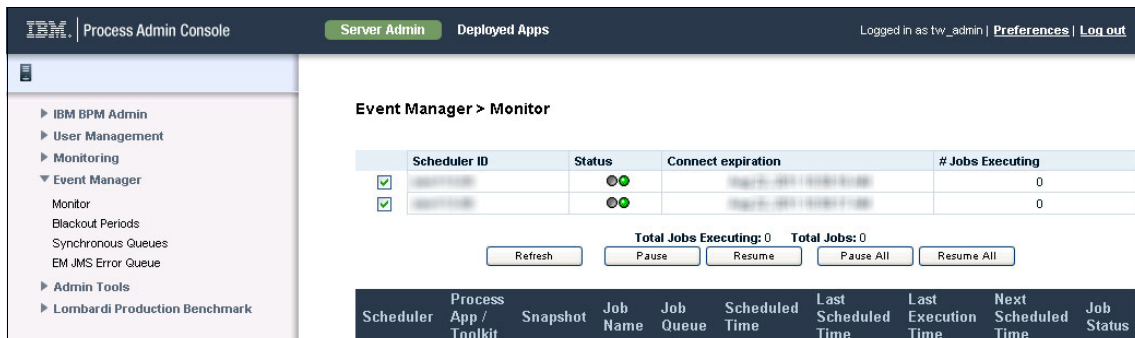


Figure 7-42 Event Manager components on each node

- d. Ensure that the status indicators are green.
 - e. Select **Pause all** → **Refresh**. The radio buttons should switch to the red indicators.
 - f. Select **Resume all** → **Refresh**. The radio buttons should switch back to the green indicators.
- **Process Server Portal:**
 - `http://itsodb2/portal/`, using IHS for HTTP requests
 - `http://Node01.PC:9080/portal/`, direct HTTP requests to Node01 (Figure 7-43)

The screenshot shows the IBM Process Portal interface. The top navigation bar includes the IBM logo, 'Process Portal', and user information: 'Welcome, Administrator | Help | Admin | Preferences | Log Off'. On the left, there are two main sections: 'My Tasks' with links to 'Inbox', 'History', 'Help Requests', and 'Alerts'; and 'My ScoreBoards' with links to 'My Performance', 'My Team Performance', 'Process Performance', 'SLA Overview', and 'Ad Hoc Reports'. The main area is titled 'Inbox' and contains a search bar, a 'Quick Search' button, and a table of task instances.

Instances							
	Instance Name	Process Definition	Instance Due Date	Task Subject	Task Priority	Task Due Date	Run
<input type="checkbox"/>	bpd6:204	bpd6	Aug 17, 2011 3:33:58 PM	Task: Untitled1	Normal	Aug 3, 2011 4:45:03 PM	
<input type="checkbox"/>	bpd6:205	bpd6	Aug 17, 2011 3:52:08 PM	Task: Untitled	Normal	Aug 3, 2011 4:52:08 PM	
<input type="checkbox"/>	bpd6:303	bpd6	Aug 17, 2011 5:01:30 PM	Task: Untitled1	Normal	Aug 3, 2011 6:01:42 PM	

Figure 7-43 Process Portal Inbox

Check the My Performance scoreboard:

- Log in as a valid user (in this case, bpmadmin).
- Make sure that the “Inbox” saved search renders without errors (Figure 7-43 on page 263).
- Select the **My Performance** scoreboard and ensure that it renders without errors (Figure 7-44).

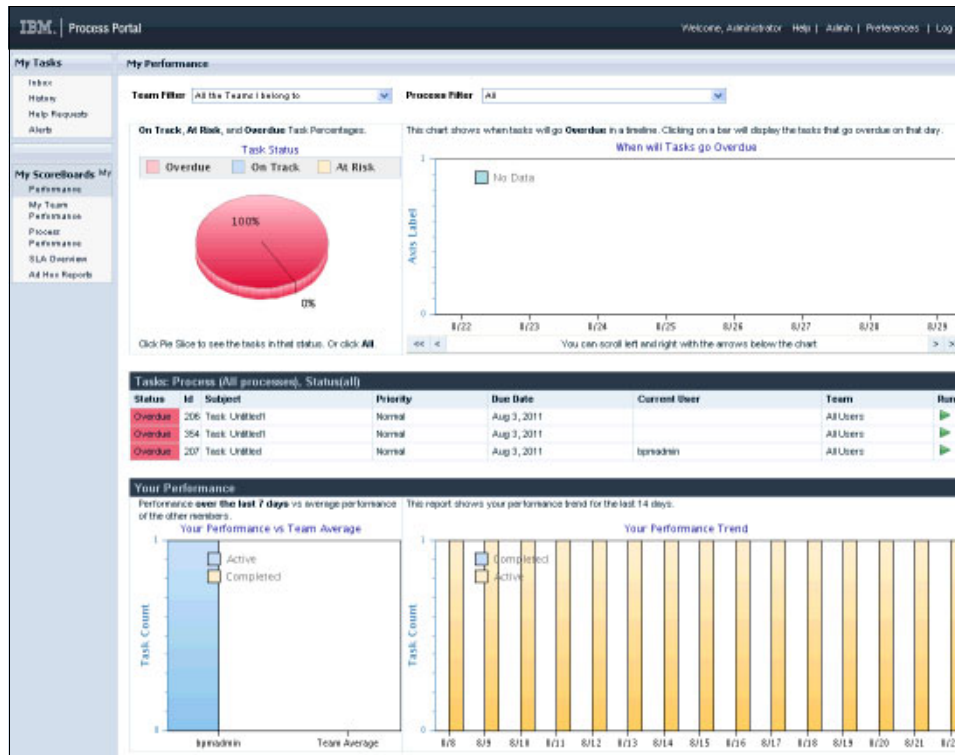


Figure 7-44 Process Portal My Performance scoreboard

- Performance Server Admin Console
 - <http://itsodb2/PerformanceAdmin/>, using IHS for HTTP requests
 - <http://Node01.PC:9081/PerformanceAdmin/>, direct HTTP requests to Node01

Check the Performance Admin Console:

- a. Log in as the tw_admin user.
- b. Inspect all menu items, ensuring that there are no errors or exceptions (Figure 7-45).

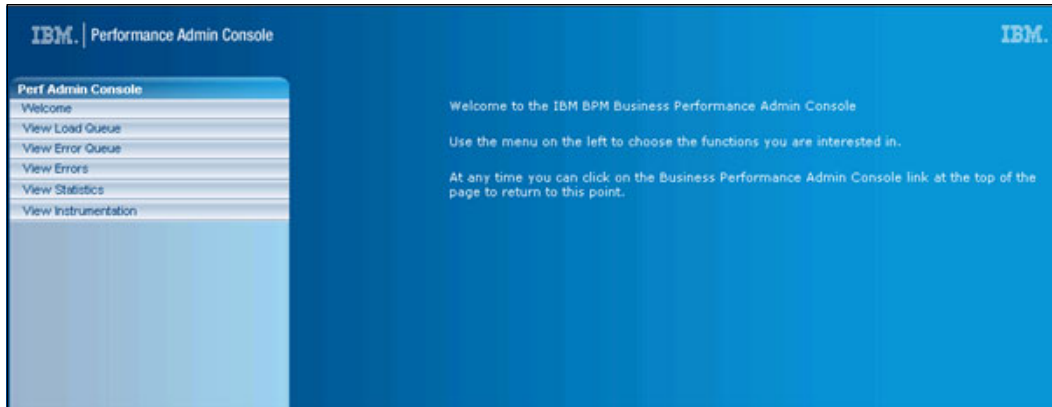


Figure 7-45 Performance Admin console

► WebService API

- <http://itsodb2/webapi/services/>, using IHS for HTTP requests
- <http://Node01.PC:9081/webapi/services/>, direct HTTP requests to Node01

Check the rendered WSDL files:

- a. Log in as a valid user (in this case, bpmadmin).
- b. Check that the following WSDLs render without errors:
 - <http://yourwebserver/webapi/services/Version?wsdl>
 - <http://yourwebserver/webapi/services/AdminService?wsdl>
 - <http://yourwebserver/webapi/services/WebAPISoap?wsdl>
 - <http://yourwebserver/webapi/services/WebAPIService?wsdl>

Enter the Process Center URL `http://yourwebserver/ProcessCenter` and log in using bpmadmin. A Getting Started panel displays (Figure 7-46).



Figure 7-46 Getting Started with IBM Process Center panel

Downloading and installing Process Designer

Download the process designer tool and install it to verify the functionality of Process Center. It only takes a few clicks to install:

1. Open a web browser and enter the Process Center URL `http://yourwebserver/ProcessCenter`, which displays the Getting Started panel (Figure 7-46).
2. Click **Download**, select a local folder in which to save the file, click **Save**, and the Process Designer download will start. Wait until the download is completed.
3. Find the downloaded file with the name is IBM Process Designer.zip and extract to a folder.

4. Go to the extracted folder and double-click **installProcessDesigner_admin.bat** if you want to install Process Designer to the default folder C:\IBM\ProcessDesigner\v7.5. Otherwise, open a command window and issue a command to specify another folder, such as C:\IBMPD:

installProcessDesigner_admin.bat C:\IBMPD
5. Navigate to the install destination folder and double-click **eclipse.exe** to start the Process Designer.

Verifying with running sample BPD

The Process Center Server has included a sample named *hiring sample*, which is executed by initiating the process using Process Designer. Follow the Hiring Sample Tutorial for IBM Process Designer to open the sample and play back the process. This can also be used to verify the entire runtime environment. Ensure that you have given users access to the hiring sample process application as the tutorial indicates. This is required for the Hiring Sample Tutorial.

An overview of and the steps to run the hiring sample can be found on the Hiring Sample Tutorial page on the IBM Business Process Manager v7.5 Info Center:

http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/index.jsp?topic=/com.ibm.wbpm.main.doc/tutorial/topic/cbpm_tutorial.html

7.5.3 Verification: Business Space

In this section we log into Business Space and navigate to the system health widget to ensure that the Business Space infrastructure is operating correctly.

Note: These instructions assume that you have set up your web server and that it is configured to accept HTTPS connections. We do not include instructions on that in this book. For more information about the IBM HTTP Server see *IBM HTTP Server (powered by Apache): An Integrated Solution for IBM eServer iSeries Servers*, SG24-6716.

1. Open a web browser, enter the Business Space URL <http://yourwebserver/BusinessSpace>, and log in using bpmadmin.
2. Click **Go to Spaces**, then click **Problem Determination** and choose the **System Health** tab.

3. You will see a page (similar to Figure 7-47) showing the various deployment environments, clusters, and node agents that you have, and that they are running. Explore the other tabs and check other components in your environment if you want.

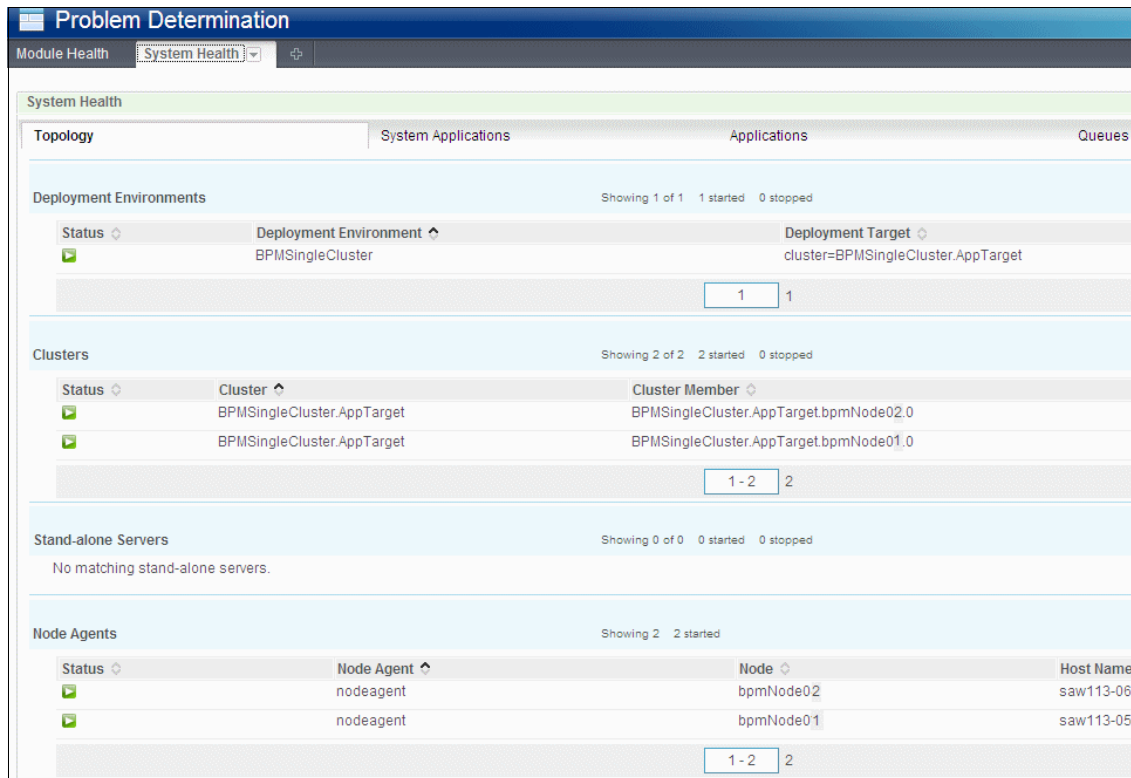


Figure 7-47 Business Space System Health widget

7.5.4 Verification: Human Task manager

The following steps verify that the Human Task Manager component is working correctly:

1. Start your cluster if it is not yet started.
2. Open the Business Process Choreographer (BPC) Explorer on the web server for your topology (that is, <http://yourwebserver/bpc>). You might need to log in. Use the username and password that you configured previously.

3. Navigate to **Task Templates** → **My Task Templates**. You will see preconfigured sample human tasks. Click the box next to **Widget Message**, and click **Create Instance** (Figure 7-48).

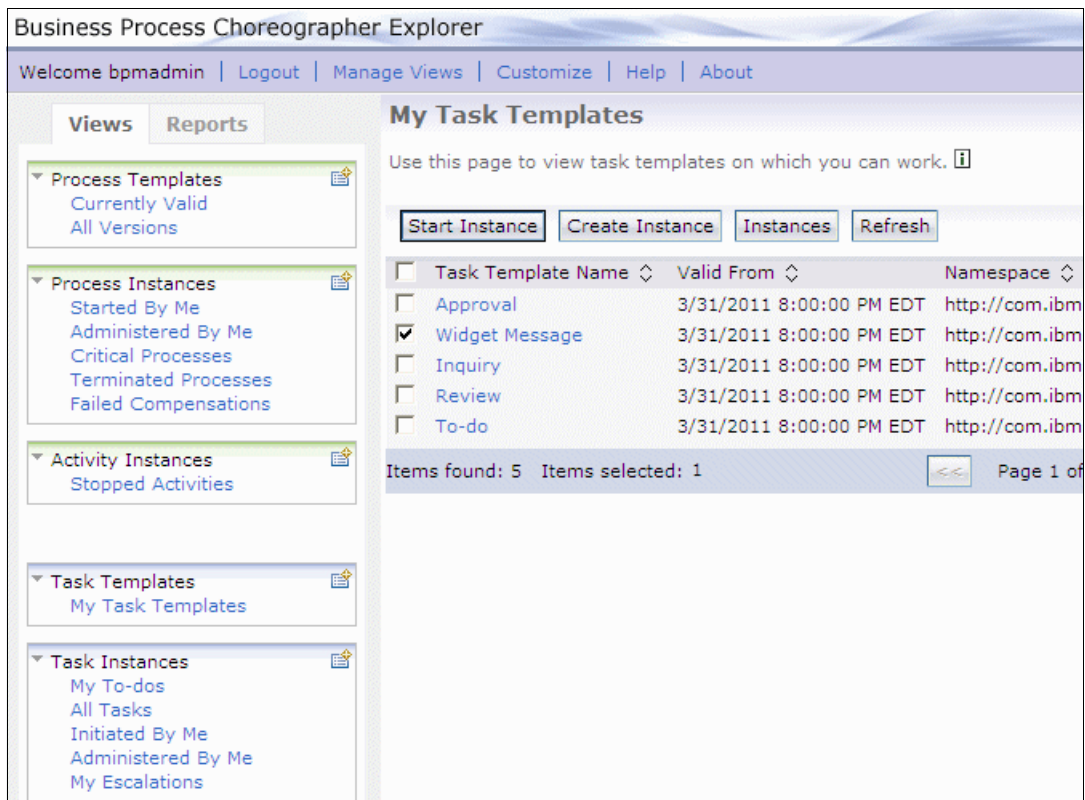


Figure 7-48 BPC Explorer: Creating a widget message, step 1

4. Enter values for the subject and message fields of the human task (Figure 7-49), and then click **Submit**.

Business Process Choreographer Explorer

Welcome bpmadmin | Logout | Manage Views | Customize | Help | About

Views Reports

- Process Templates
 - Currently Valid
 - All Versions
- Process Instances
 - Started By Me
 - Administered By Me
 - Critical Processes
 - Terminated Processes
 - Failed Compensations
- Activity Instances
 - Stopped Activities
- Task Templates
 - My Task Templates
- Task Instances
 - My To-dos
 - All Tasks
 - Initiated By Me
 - Administered By Me
 - My Escalations

Task Input Message

Use this page to provide the input that is needed to start an instance of a human task process. [i](#)

Submit

Task Template Name: Widget Message
Task Description: "%htm:input.\request/subject%" message from %htm:task.originator%

Task Input Message

Form View

request	subject	HTM for BPC
	message	attempt to verify HTM function

Edit Source

Figure 7-49 BPC Explorer: creating a Widget Message, step 2

5. Navigate to **Task Instances** → **Initiated By Me**. You should see an instance of the task that you just created. Click the task name itself, **Widget Message**.

6. Select the **Custom Properties** tab and click the empty space next to the `htm_assigned_to` field (this is an editable property, although it does not appear so at first). Enter a valid user to own the task (Figure 7-50). Click **Save** → **Start** → **Submit**. The task now has an owner.

Business Process Choreographer Explorer

Welcome bpmadmin | Logout | Manage Views | Customize | Help | About

Views | Reports

▼ Process Templates
Currently Valid
All Versions

▼ Process Instances
Started By Me
Administered By Me
Critical Processes
Terminated Processes
Failed Compensations

▼ Activity Instances
Stopped Activities

▼ Task Templates
My Task Templates

▼ Task Instances
My To-dos
All Tasks
Initiated By Me
Administered By Me
My Escalations

Task Instance

Use this page to display information about the task and, optionally, to work on the task. ⓘ

Delete Start Work Items Reschedule Change Priority Change Business Category

Task Description

Task Name: Widget Message
Description: "HTM for BPC" message from bpmadmin
Reason: Originator

Details | Template Details | Task Input Message | Task Output Message | **Custom Properties**

Property Name	Property Value
htm_assigned_to	<input type="text" value="bpmadmin"/>
htm_isHidden	true
htm_isPredefinedTask	true

Save

Add

Figure 7-50 BPC Explorer: Creating a widget message, step 3

- Click the check box next to the widget message task and click **Work on**. In the response comments field, enter text (Figure 7-51), then click **Complete**.

Business Process Choreographer Explorer

Welcome bpmadmin | Logout | Manage Views | Customize | Help | About

Views Reports

- Process Templates
 - Currently Valid
 - All Versions
- Process Instances
 - Started By Me
 - Administered By Me
 - Critical Processes
 - Terminated Processes
 - Failed Compensations
- Activity Instances
 - Stopped Activities
- Task Templates
 - My Task Templates
- Task Instances
 - My To-dos
 - All Tasks
 - Initiated By Me
 - Administered By Me
 - My Escalations

Task Message

Use this page to provide the data required to complete the task. ⓘ

Complete Save Release Cancel

Task Name
Task Input Message

Widget Message

Form View

request	subject	HTM for BPC
	message	attempt to verify HTM function

View Source

Task Output Message

Form View

response	comments	verification complete and succeed
----------	----------	-----------------------------------

Edit Source

Figure 7-51 BPC Explorer: Creating a widget message, step 4

- The human task is now finished and you have verified that the human task manager is working correctly. If you want to delete it, click **Task Instances** → **Administered By Me**, select the task, and select **Delete**.

Installing and running the classic BPC IVT application

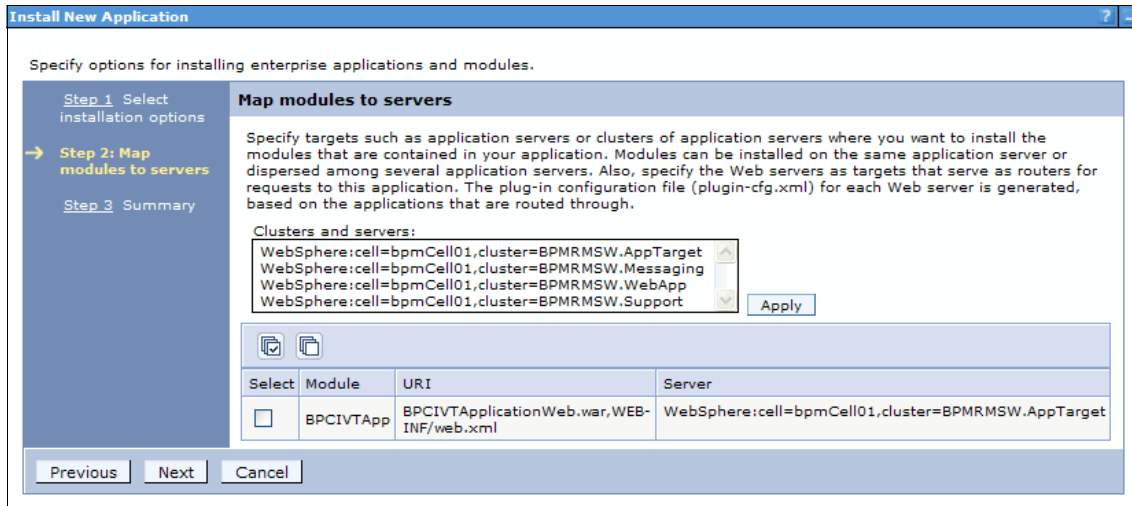
The Business Process Choreographer installation verification application is included in the product installation, and can be found at:

<BPM_install_dir>/installableApps/bpcivt.ear

Note: In a network deployment environment, you can only deploy one instance of the Business Process Choreographer installation verification application. For example, if you have two Business Process Choreographer clusters in the same network deployment cell, you can deploy the bpcivt.ear application only on one of the clusters. Later, if you want to deploy it on the second cluster, you must first undeploy it from the first cluster.

1. Ensure that at least one member of the AppTarget cluster is running.
2. Log in to the Integrated Solutions Console as an administrative user.
3. Click **Applications** → **New application** → **New enterprise application**.
4. For the path to the new application, browse to and select **bpcivt.ear** → **OK** → **Next**.
5. On the Preparing for the application installation panel, the radio button for **Fast Path - Prompt only when additional information is required** is selected. Click **Next**.
6. In Step 1: Select installation options, the default options are acceptable. Click **Next**.

7. In Step 2: Map modules to servers, verify that this module will be deployed to the BPMRMSW.AppTarget cluster (Figure 7-52). Click **Next**.



Install New Application

Specify options for installing enterprise applications and modules.

[Step 1 Select installation options](#)
→ Step 2: Map modules to servers
[Step 3 Summary](#)

Map modules to servers

Specify targets such as application servers or clusters of application servers where you want to install the modules that are contained in your application. Modules can be installed on the same application server or dispersed among several application servers. Also, specify the Web servers as targets that serve as routers for requests to this application. The plug-in configuration file (plugin-cfg.xml) for each Web server is generated, based on the applications that are routed through.

Clusters and servers:

WebSphere:cell=bpmCell01,cluster=BPMRMSW.AppTarget
WebSphere:cell=bpmCell01,cluster=BPMRMSW.Messaging
WebSphere:cell=bpmCell01,cluster=BPMRMSW.WebApp
WebSphere:cell=bpmCell01,cluster=BPMRMSW.Support

Apply

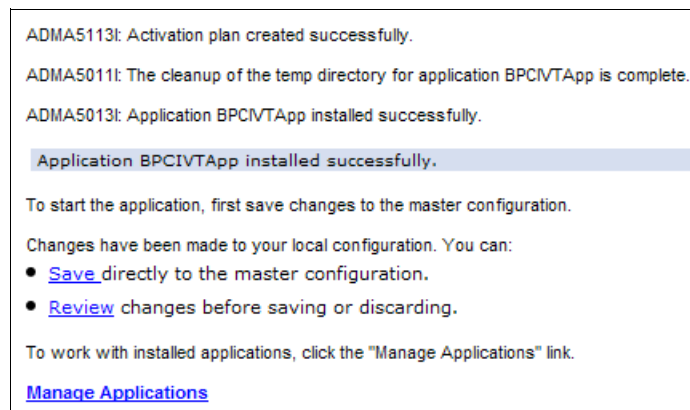
Select	Module	URI	Server
<input type="checkbox"/>	BPCIVTApp	BPCIVTApplicationWeb.war, WEB-INF/web.xml	WebSphere:cell=bpmCell01,cluster=BPMRMSW.AppTarget

Previous Next Cancel

Figure 7-52 The BPC IVT application must be deployed to the AppTarget cluster

Note: If you are also using an IHS web server, be sure to map the module to the AppTarget cluster and the web server.

8. Step 3: Summary is a summary of the application to be installed. Click **Finish**.
9. Verify that the BPC IVT application installs successfully (Figure 7-53). Click **Save**.



ADMA5113: Activation plan created successfully.

ADMA5011: The cleanup of the temp directory for application BPCIVTApp is complete.

ADMA5013: Application BPCIVTApp installed successfully.

Application BPCIVTApp installed successfully.

To start the application, first save changes to the master configuration.

Changes have been made to your local configuration. You can:

- [Save](#) directly to the master configuration.
- [Review](#) changes before saving or discarding.

To work with installed applications, click the "Manage Applications" link.

[Manage Applications](#)

Figure 7-53 Output shown when the BPC IVT application installation is successful

- 10.If you are using an IHS web server, remember to generate and propagate the plugin-cfg.xml.
- 11.Start the application. In the Integrated Solutions Console, navigate to **Applications → Application Types → WebSphere enterprise applications**.
- 12.Select **BPCIVTApp**, then click **Start**.
- 13.Verify that the application status switches from a red X to the green arrow, and that the feedback at the top of the panel indicates that the application has started (Figure 7-54).

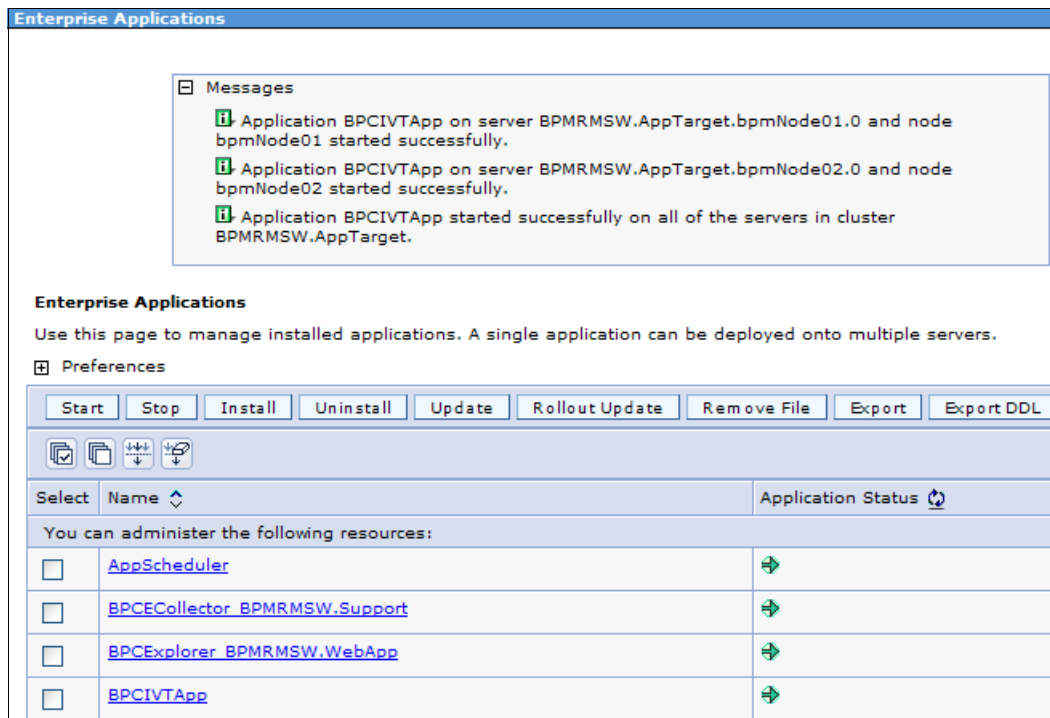


Figure 7-54 The BPC IVT application started successfully

- 14.Using a web browser, open to the BPC IVT's URL, either via the web server or proxy server, or by going directly to a cluster member's host and port:
 - http://<IHS_host>/bpcivt
 - http://<host_name>:<port>/bpcivt
- 15.You will see output in the browser. The last two lines should say Passed and Done.

Note: The BPC IVT application is described in the Business Process Manager v7.5 Information Center:

<http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/index.jsp?topic=/com.ibm.wbpm.bpc.doc/topics/t2cover.html>

Additional Business Process Choreographer samples

Additional Business Process Choreography samples are available on the web at:

<http://publib.boulder.ibm.com/bpcsamp/>

7.5.5 Verification: Business Process Choreographer

Verify that the Business Process Choreographer is working correctly and is aligned with the Process Designer and Integration Designer interaction verification. In the latest IBM Business Process Manager v7.5 sample page on the official Business Process Manager Samples and Tutorials site, there are interaction samples to demonstrate the interaction capabilities:

<http://publib.boulder.ibm.com/bpcsamp/>

Among these samples, the procurement sample shows how to develop the interaction that is part of the workflow and executed by the BPEL process engine. This sample could be used to verify the function of business process engine.

Navigate to **Interaction Samples** → **Procurement sample: Calling a human task from a BPEL process** for instructions. Under the **Build it yourself** link you can find instructions about how to build the application and deploy it to IBM Business Process Manager Server. Under the **Run the Sample** link, you can find instructions about how to execute the sample using the BPC Explorer and Business Space. This verifies that the Business Process Choreographer is working correctly.



Remote Messaging, Support, and Web topology with IBM Business Monitor

This chapter provides full instructions for creating a Remote Messaging, Support, and Web (RMSW) topology for IBM Business Process Manager with IBM Business Monitor V7.5.

This topology highlights a fundamental integration of the two products. Although this pattern can be created and configured piece by piece, this chapter describes how to create this pattern via the Deployment Environments wizard.

This topology can be utilized when you are creating either a Process Center cell or a Process Server cell. The majority of the steps are exactly the same for both cases.

This chapter contains the following sections:

- ▶ 8.1, “Topology summary” on page 278
- ▶ 8.2, “Prerequisites for creating this topology” on page 281
- ▶ 8.3, “Configuring the deployment environment topology” on page 284
- ▶ 8.4, “Post-creation configuration” on page 302
- ▶ 8.5, “Verification” on page 317

8.1 Topology summary

The Remote Messaging, Support, and Web topology is the most preferred topology for IBM Business Process Manager Advanced plus IBM Business Monitor.

Note: For additional details regarding topologies for IBM Business Monitor, see the following: website

http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/index.jsp?topic=/com.ibm.wbpm.mon.imuc.doc/plan/ha_intro.html

The name *Remote Messaging, Support, and Web* reflects the relationship of the messaging engines, supporting functionality, and web-based user interfaces to the application deployment target.

In this chapter the Remote Messaging, Remote Support, and Remote Web topology is deployed across two nodes (Figure 8-1).

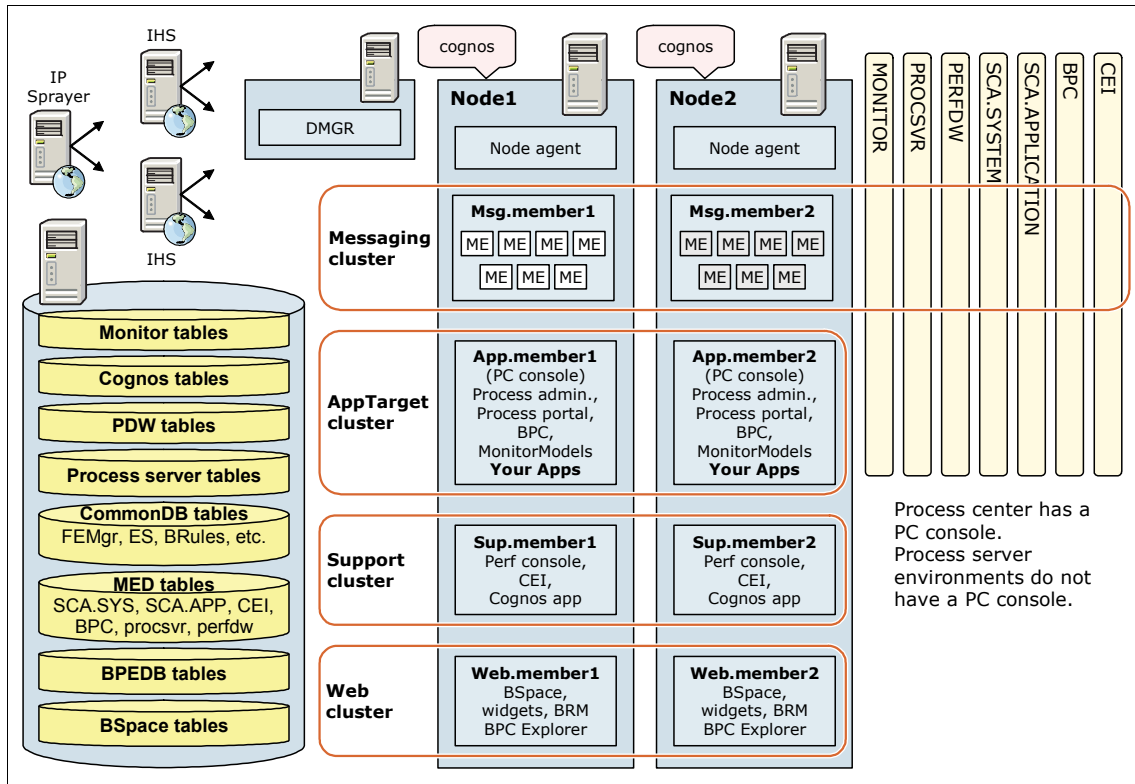


Figure 8-1 Remote Messaging, Support, and Web topology for IBM Business Process Manager Advanced plus IBM Business Monitor

The example of this topology created in this chapter utilizes multiple physical host systems. One system is hosting the database installation, one is hosting the deployment manager, and two systems each host a node containing cluster members.

Note: Figure 8-1 depicts two IHS Web servers, which each provide load balancing for HTTP requests to the cluster members. Figure 8-1 also depicts an IP sprayer for providing high availability of the web servers. Although Figure 8-1 depicts the best practice, this chapter describes the utilization of only a single web server. We assume that in production environments in general, the network administrator will dictate and provide the routing and load-balancing capabilities that meet the customer's requirements.

Table 8-1 provides a summary of the systems utilized in this chapter and how each will be referenced.

Table 8-1 Summary of the host systems and values utilized in this chapter

Component	Host system	Abbreviation for host	Notes
Database tables	itsodb2.itso.ra1.ibm.com	<DB2_host_name>	Database server
IBM HTTP Server	webserver.itso.ibm.ra1	<IHS_host_name>	Load balance web server
Deployment Manager	itsohost1.itso.ra1.ibm.com	<DMGR_host_name>	Deployment manager node
Node 1	itsohost2.itso.ra1.ibm.com	<bpmNode01_host_name>	Node bpmnode1
Node 2	itsohost3.itso.ra1.ibm.com	<bpmNode02_host_name>	Node bpmnode2

The functions utilized in this deployment environment pattern are spread across the four clusters based on usage and functional purpose. One cluster is used for messaging functionality, one cluster for support functionality, one cluster for applications, and one cluster for web-based functions. The functional purposes are distributed as follows:

- ▶ Messaging Infrastructure Cluster
 - Messaging engines
- ▶ Application Deployment Target Cluster
 - The repository for managing process model and integration process applications
 - The run time for executing process model and integration process applications
 - User applications for advanced integrations and monitor models
 - Business Process Choreographer containers

- ▶ Support Infrastructure Cluster
 - Process performance and monitoring applications
 - Cognos application
 - Common Event Infrastructure (CEI) application
- ▶ Web Applications Cluster
 - Business Space application and widgets
 - Business Rules manager
 - Business Process Choreographer Explorer
 - REST API services

8.2 Prerequisites for creating this topology

Before you create this topology, you must complete the prerequisite steps, described in Chapter 5, “Preparing your topology” on page 83, as follows:

1. Install DB2 (or an alternative database).
2. Install IBM HTTP Server (or an alternative HTTP server, or plan to utilize the WebSphere proxy server).
3. Install IBM Directory Server (or an alternative user registry).
4. Define the appropriate users in your user registry. In our example, we use bpmadmin/bpmadmin as the administrative user ID and password.
5. Install IBM Business Process Manager V7.5 Advanced.
6. Install IBM Business Monitor V7.5.
7. Create the required database scripts, and then create the required databases, tables, and schemas:
 - Common database tables (CMNDB)
 - Monitor database tables (MONITOR)
 - Cognos database tables (COGNOSCS)
 - Process Server database tables (BPMDB)
 - Performance Data Warehouse database tables (PDWDB)
 - Business Process Choreographer database tables (BPEDB)
 - Business process reporting schema (OBSRVDB)
 - Messaging engine database tables (MEDB)
 - Business Space schema (BSPACE)

Note: Only the Common database tables, Monitor database tables, and Cognos database are required to exist at the time that the deployment manager is started. The remaining databases and tables will not be used until the deployment environment is created. However, because the runtime administrator and the database administrator have already planned for the database names, schemas, and users, and because the runtime administrator has already generated the scripts via the Database Design Tool, then it is likely most expedient to give all of the generated scripts to the database administrator right away.

8. Create a deployment manager profile for IBM Business Process Manager, and then augment the deployment manager for IBM Business Monitor.
9. Create two custom nodes for IBM Business Process Manager, and then augment them for IBM Business Monitor. Finally, federate each custom profile to the deployment manager.

After completing the prerequisite steps, it is assumed that the deployment manager, empty nodes, and database tables exist. This empty cell is ready for you to create and configure the clusters in it.

This chapter utilizes the values described in Table 8-2. Some of these values were created during the prerequisite steps.

Table 8-2 Values utilized in this chapter

Description	Value	When created
cell name	bpmCell01	Chapter 5, "Preparing your topology" on page 83
Custom node 1 name	bpmNode01	Chapter 5, "Preparing your topology" on page 83
Custom node 2 name	bpmNode02	Chapter 5, "Preparing your topology" on page 83
<DMGR_profile_dir>	<BPM_install_dir>/profile s/<dmgr_profile_name>	Chapter 5, "Preparing your topology" on page 83

Description	Value	When created
<Custom_profile_dir>	<BPM_install_dir>/profiles/custom_profile_name>	Chapter 5, "Preparing your topology" on page 83
Deployment Environment name	BPMRMSW	Chapter 8, "Remote Messaging, Support, and Web topology with IBM Business Monitor" on page 277
AppTarget cluster name	BPMRMSW.AppTarget	Chapter 8, "Remote Messaging, Support, and Web topology with IBM Business Monitor" on page 277
Messaging cluster name	BPMRMSW.Messaging	Chapter 8, "Remote Messaging, Support, and Web topology with IBM Business Monitor" on page 277
Support cluster name	BPMRMSW.Support	Chapter 8, "Remote Messaging, Support, and Web topology with IBM Business Monitor" on page 277

Description	Value	When created
Web cluster name	BPMRMSW.WebApp	Chapter 8, “Remote Messaging, Support, and Web topology with IBM Business Monitor” on page 277
Web server name	httpserver	Chapter 5, “Preparing your topology” on page 83

8.3 Configuring the deployment environment topology

This section provides instructions for configuring and deploying a Remote Messaging, Remote Support, and Web cluster topology pattern for IBM Business Process Manager and IBM Business Monitor. After completing these activities, proceed to 8.4, “Post-creation configuration” on page 302, for full details of additional configuration.

Prior to running the ISC Deployment Environment Wizard or command-line tools, ensure that the deployment manager and node agents are up and running, and that there are no errors in each server’s log files, for example:

- ▶ Deployment manager:
`<BPM_install_dir>/profiles/<dmgr_profile_name>/logs/dmgr/SystemOut.log`
- ▶ bpmNode01 node agent:
`<BPM_install_dir>/profiles/<custom_profile_name>/logs/nodeagent/SystemOut.log`
- ▶ bpmNode02 node agent:
`<BPM_install_dir>/profiles/<custom_profile_name>/logs/nodeagent/SystemOut.log`

8.3.1 Using the Integrated Solutions Console

The procedure described in this section creates the deployment environment using the Integrated Solutions Console (ISC). Before you begin, ensure that the

deployment manager and nodes are running and there are no errors shown in the logs.

In the ISC, the Deployment Environments Wizard will help you define the Remote Messaging, Support, and Web topology. At the end of this wizard, you will have the opportunity to save your definition and to generate the topology. It is possible to generate the topology at a later time. In 8.3.2, “Using the command line” on page 301, we discuss how you can use these topology definitions to generate the deployment environment silently. However, the example in this section defines and generates the topology via the ISC.

1. Log in to the ISC as the primary administrative user that you defined when you created the deployment manager profile. Here we use bpmadmin.
2. Navigate to **Servers** → **Deployment Environments**. Click **New**. The system displays the first page of the Deployment Environment Configuration wizard with the “Create new deployment environment” option selected. Enter the name of our deployment environment (we use BPMRMSW in our example) (Figure 8-2). The option to Show all steps is selected by default. Click **Next**.

Create a deployment environment that is based on a pattern or load an external deployment environment definition.

Enter the deployment environment name and select the path to take through the wizard (Fast path or Detailed). If you choose "Fast path: Show only needed steps", the wizard displays only those pages that do not have assigned default values.

At the end of the wizard, you can generate the deployment environment by clicking "Finish and Generate Environment", or you can click "Finish" to save the deployment environment definition. To generate the environment, you must properly configure all of the required parameters.

Create Deployment Environment

☒ Create a deployment environment based on a pattern

☐ Create a deployment environment based on an imported design

File path

* Deployment environment name

☐ Fast path: Show only needed steps

☒ Detailed: Show all steps

Figure 8-2 Create new deployment environment window: Name selection

3. The Deployment Environment Features panel displays the options for the type of features to be included.

Note: The content of the Deployment Environment Features panel varies depending on the features that are available to the deployment manager that you have created. In a Process Center cell, you will see an option for BMAPC, which creates a Business Process Manager Advanced Process Center topology. In a Process Server cell, you will see an option for BMAPS, which creates a Business Process Manager Advanced Process Server topology. When IBM Business Monitor is included in the cell, you will see an option for Monitor. When multiple features are applicable, a secondary panel will allow for additional selections.

Note: WebSphere Enterprise Service Bus is included as a complete subset of the Business Process Manager Advanced feature. Therefore, it is not necessary to select WESB when creating a BMAPS or BMAPC deployment environment. For further information about the deployment environment feature choices, including the WESB feature, see item 3 in the following references:

http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/index.jsp?topic=/com.ibm.wbpm.imuc.ebpm.doc/topics/tadm_create_top_pctr.html

http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/index.jsp?topic=/com.ibm.wbpm.imuc.sbpn.doc/topics/tadm_create_top.html

If you are creating a Process Center cell, select **BMAPC** to create a Business Process Manager Advanced Process Center, then click **Next** (Figure 8-3).

If you are creating a Process Server cell, select **BMAPS** to create a Business Process Manager Advanced Process Server, then click **Next**.

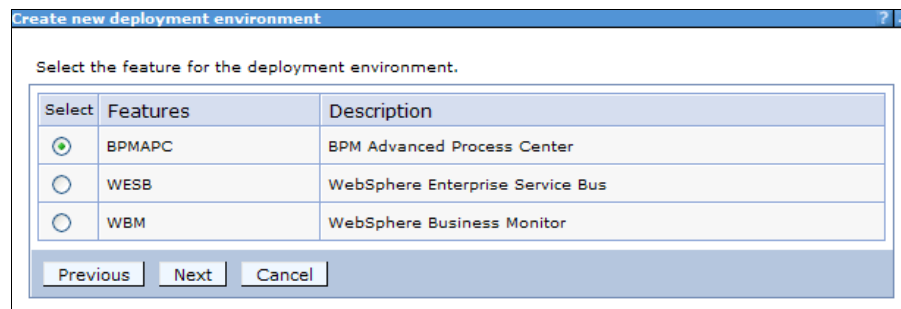


Figure 8-3 Select type for Process Server

4. Because multiple features are applicable to this deployment environment, a secondary panel will appear. Select **WBM** to include IBM Business Monitor in this deployment environment, then click **Next** (Figure 8-4).

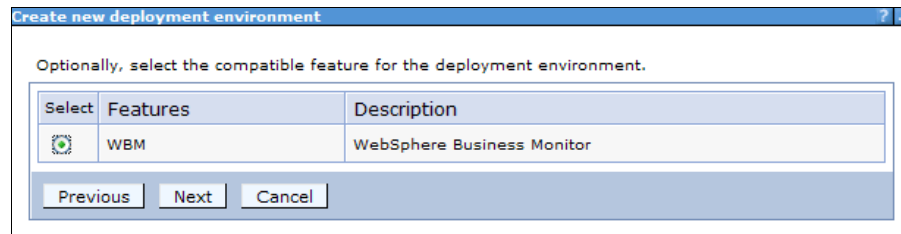


Figure 8-4 Select WBM as the additional feature to be included in this deployment environment

5. The Deployment Environment Patterns panel displays the two patterns that are available for IBM Business Monitor environments. Select **Remote Messaging, Remote Support, and Web** (Figure 8-5), then click **Next**.

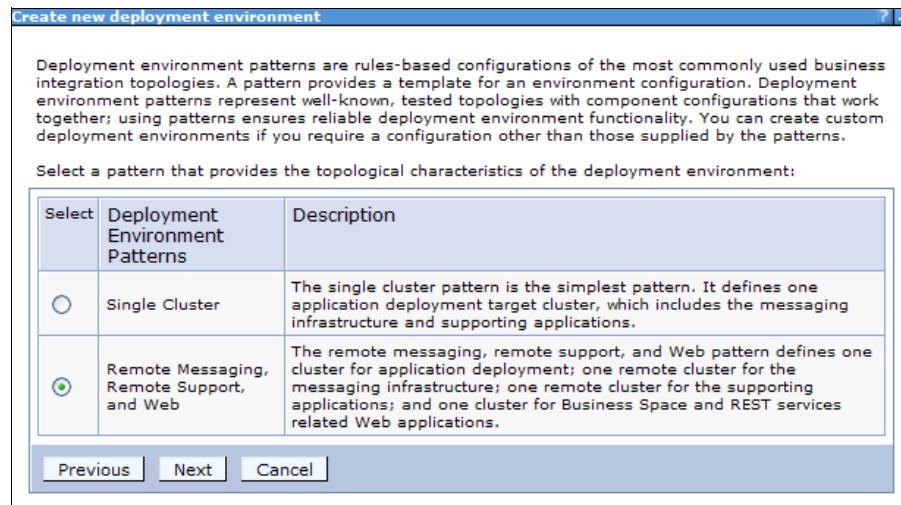


Figure 8-5 Two pattern choices for deployment environments that contain IBM Business Monitor

6. You now run through a series of steps in the wizard, specifying how the deployment environment should be created. For step 1, you must specify which nodes are to be used to create the environment. Select both **bpmNode01** and **bpmNode02**, because these are the nodes that you created earlier. The selected nodes are intended to host members of the clusters.

Create new deployment environment

Step 1: Select Nodes

Select Nodes

Select the nodes to use for the deployment environment. The Remote Messaging, Remote Support, and Web deployment environment BPMRMSW requires at least **1 node**. For high-availability and failover environments, select two nodes. For scalability, select more than two nodes.

Select	Node	Version	Host
<input type="checkbox"/>	IHSNode	WAS 7.0.0.17	webserver.itso.ral.ibm.com
<input checked="" type="checkbox"/>	bpmNode01	BPMP 7.5.0.0, WBM 7.5.0.0, BPMA 7.5.0.0, BPMAPC 7.5.0.0, WPS 7.5.0.0	itsohost2.ral.ibm.com
<input checked="" type="checkbox"/>	bpmNode02	BPMP 7.5.0.0, WBM 7.5.0.0, BPMA 7.5.0.0, BPMAPC 7.5.0.0, WPS 7.5.0.0	itsohost3.ral.ibm.com

Number of required nodes: **1**

Number of selected nodes: **2**

Next **Cancel**

Figure 8-6 Step 1: Select nodes

7. In step 2, you can select how many cluster members to create on each node for each cluster that will be created. You can use the default values to specify one cluster member per node (Figure 8-7).

Create new deployment environment

Step 1: Select Nodes

→ Step 2: Clusters

Step 2.1: Application Deployment Target

Step 2.2: Messaging Infrastructure

Step 2.3: Supporting Infrastructure

Step 2.4: Web Applications

Step 3: System REST Service Endpoints

Step 4: Import database configuration

Step 5: Database

Step 6: Security

Step 7: Business Process Choreographer

Step 8: Web Application Context Roots

Step 9: Summary

Cluster Members

Map the clusters to the listed nodes by indicating the number of cluster members to configure.

Node	Version	Application Deployment Target	Messaging Infrastructure	Supporting Infrastructure	Web Applications
bpmNode01	BPMP 7.5.0.0, WBM 7.5.0.0, BPMA 7.5.0.0, BPMA 7.5.0.0, WPS 7.5.0.0	1	1	1	1
bpmNode02	BPMP 7.5.0.0, WBM 7.5.0.0, BPMA 7.5.0.0, BPMA 7.5.0.0, WPS 7.5.0.0	1	1	1	1

Previous

Next

Cancel

Figure 8-7 Specify how many members of each cluster are to be created on each node

8. In Configure new deployment environment step 2.1, you can modify the cluster name and each cluster member name for the AppTarget cluster. You can use the default values (Figure 8-8).

Create new deployment environment

[Step 1: Select Nodes](#)
[Step 2: Clusters](#)
→ **[Step 2.1: Application Deployment Target](#)**
[Step 2.2: Messaging Infrastructure](#)
[Step 2.3: Supporting Infrastructure](#)
[Step 2.4: Web Applications](#)
[Step 3: System REST Service Endpoints](#)
[Step 4: Import database configuration](#)
[Step 5: Database](#)
[Step 6: Security](#)
[Step 7: Business Process Choreographer](#)
[Step 8: Web Application Context Roots](#)
[Step 9: Summary](#)

Cluster Naming

Customize the name of a cluster and cluster member.

Cluster

Cluster
Application Deployment Target

* Cluster Name
BPMRMSW.AppTarget

Cluster Members

Node Name	Cluster Member Name
bpmNode01	SW.AppTarget.bpmNode01.0
bpmNode02	SW.AppTarget.bpmNode02.0

[Previous](#) [Next](#) [Cancel](#)

Figure 8-8 The AppTarget cluster and members

9. In step 2.2, you can modify the cluster name and each cluster member name for the messaging cluster. You can use the default values (Figure 8-9).

Create new deployment environment

Step 1: Select Nodes

Step 2: Clusters

Step 2.1: Application Deployment Target

→ **Step 2.2: Messaging Infrastructure**

Step 2.3: Supporting Infrastructure

Step 2.4: Web Applications

Step 3: System REST Service Endpoints

Step 4: Import database configuration

Step 5: Database

Step 6: Security

Step 7: Business Process Choreographer

Step 8: Web Application Context Roots

Step 9: Summary

Cluster Naming

Customize the name of a cluster and cluster member.

Cluster

Cluster

Messaging Infrastructure

* Cluster Name

BPMRMSW.Messaging

Cluster Members

Node Name	Cluster Member Name
bpmNode01	BW.Messaging.bpmNode01.0
bpmNode02	BW.Messaging.bpmNode02.0

Previous Next Cancel

Figure 8-9 The Messaging cluster and members

10.1 In step 2.3, you can modify the cluster name and each cluster member name for the support cluster. You can use the default values (Figure 8-10).

Create new deployment environment

[Step 1: Select Nodes](#)

[Step 2: Clusters](#)

[Step 2.1: Application Deployment Target](#)

[Step 2.2: Messaging Infrastructure](#)

→ [Step 2.3: Supporting Infrastructure](#)

[Step 2.4: Web Applications](#)

[Step 3: System REST Service Endpoints](#)

[Step 4: Import database configuration](#)

[Step 5: Database](#)

[Step 6: Security](#)

[Step 7: Business Process Choreographer](#)

[Step 8: Web Application Context Roots](#)

[Step 9: Summary](#)

Cluster Naming

Customize the name of a cluster and cluster member.

Cluster

Cluster
Supporting Infrastructure

* Cluster Name
BPMRMSW.Support

Cluster Members

Node Name	Cluster Member Name
bpmNode01	RMSW.Support.bpmNode01.0
bpmNode02	RMSW.Support.bpmNode02.0

[Previous](#) [Next](#) [Cancel](#)

Figure 8-10 The Support cluster and members

11. In step 2.4, you can modify the cluster name and each cluster member name for the web cluster. You can use the default values (Figure 8-11).

Create new deployment environment

[Step 1: Select Nodes](#)

[Step 2: Clusters](#)

[Step 2.1: Application Deployment Target](#)

[Step 2.2: Messaging Infrastructure](#)

[Step 2.3: Supporting Infrastructure](#)

→ [Step 2.4: Web Applications](#)

[Step 3: System REST Service Endpoints](#)

[Step 4: Import database configuration](#)

[Step 5: Database](#)

[Step 6: Security](#)

[Step 7: Business Process Choreographer](#)

[Step 8: Web Application Context Roots](#)

[Step 9: Summary](#)

Cluster Naming

Customize the name of a cluster and cluster member.

Cluster

Cluster
Web Applications

* Cluster Name
BPMRMSW.WebApp

Cluster Members

Node Name	Cluster Member Name
bpmNode01	MSW.WebApp.bpmNode01.0
bpmNode02	MSW.WebApp.bpmNode02.0

Previous Next Cancel

Figure 8-11 The Web cluster and members

12. For step 3 of the wizard, enter the details for your REST endpoints. In this example topology, an IBM HTTP Web server is being utilized. On this page, we enter the host name and port of the web server (Figure 8-12).

Create new deployment environment

Step 1: Select Nodes
Step 2: Clusters
→ **Step 3: System REST Service Endpoints**
Step 4: Import database configuration
Step 5: Database
Step 6: Security
Step 7: Business Process Choreographer
Step 8: Web Application Context Roots
Step 9: Summary

System REST Service Endpoints

Use this page to configure service endpoints for Representational State Transfer (REST) system interfaces. If you want widgets to be available in Business Space, you must configure the REST service endpoints for those widgets. For each REST service endpoint, specify the host or virtual host and port that a client uses to communicate with your cluster. If you leave the host and port fields empty, the values default to those of a cluster member host and its HTTP port. For a load-balanced environment, you must later change the default values to the virtual host name and port of your environment.

REST services

Protocol:

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

Port:

Context root:

Figure 8-12 The host name and port value used by the web server

13. In Step 4, database design files can be specified (Figure 8-13). These files were output from the database design tool and were generated back in Chapter 5, “Preparing your topology” on page 83. The database design files used here will automatically populate the database parameters during the next step of the wizard.

Alternatively, these values can be left blank. In the subsequent wizard panel, it is possible to manually provide the database and schema information.

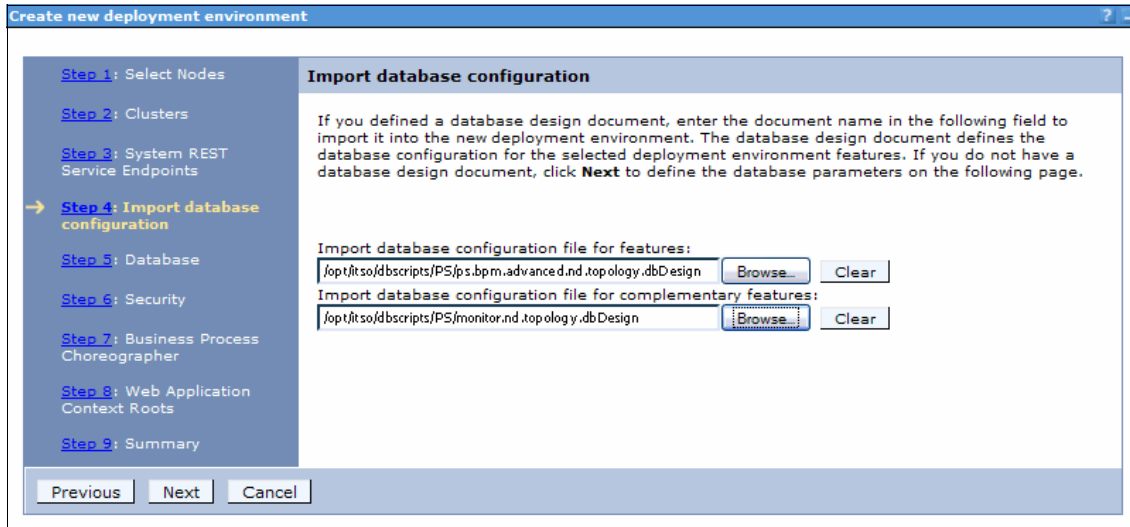


Figure 8-13 Import database configuration

14. Step 5 of the wizard displays the values that will be used to create the datasource resources needed to connect to the database tables. Because you have already created the databases and schemas, the values used here must match exactly with the database and schema values that have already been created.

For each line, check that the Create Tables option is *not* selected, because you have already created the database tables. In the example shown in Figure 8-14, we uncheck all these Create Tables options.

Create new deployment environment

Step 1: Select Nodes
Step 2: Clusters
Step 3: System REST Service Endpoints
Step 4: Import database configuration
→ Step 5: Database
Step 6: Security
Step 7: Business Process Choreographer
Step 8: Web Application Context Roots
Step 9: Summary

Database

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

Edit... Reset Edit Provider...

Select	Name	Database Name	Schema	Create Tables	User Name	Password	Server	Provider
<input type="checkbox"/>	Business Monitor messaging engine data source	PCMEDB	MONME00	<input type="checkbox"/>	db2inst1	*****	itscdb2.itso	DB2 Universal
<input type="checkbox"/>	Business Process Choreographer data source	PCBPEDB	BPE01	<input type="checkbox"/>	db2inst1	*****	itscdb2.itso	DB2 Universal
<input type="checkbox"/>	Business Process Choreographer Messaging Engine data source	PCMEDB	BPCME00	<input type="checkbox"/>	db2inst1	*****	itscdb2.itso	DB2 Universal
<input type="checkbox"/>	Business Process Choreographer reporting function data source	PCBPEDB	BPE00	<input type="checkbox"/>	db2inst1	*****	itscdb2.itso	DB2 Universal
<input type="checkbox"/>	Business Space data source	PCCMNDB	BSPACE	<input type="checkbox"/>	db2inst1	*****	itscdb2.itso	DB2 Universal
<input type="checkbox"/>	Cognos Content Store	PCCOGNOS		<input type="checkbox"/>	db2inst1	*****	itscdb2.itso	DB2 Universal
<input type="checkbox"/>	CEI Messaging Engine data source	PCMEDB	CEIME00	<input type="checkbox"/>	db2inst1	*****	itscdb2.itso	DB2 Universal
<input type="checkbox"/>	Performance Data Warehouse data source	PCPDWDB		<input type="checkbox"/>	db2inst1	*****	itscdb2.itso	DB2 Universal
<input type="checkbox"/>	Performance Data Warehouse Messaging Engine data source	PCMEDB	PDWME00	<input type="checkbox"/>	db2inst1	*****	itscdb2.itso	DB2 Universal
<input type="checkbox"/>	Process Server data source	PCBPMDB		<input type="checkbox"/>	db2inst1	*****	itscdb2.itso	DB2 Universal
<input type="checkbox"/>	Process Server Messaging Engine data source	PCMEDB	PSME00	<input type="checkbox"/>	db2inst1	*****	itscdb2.itso	DB2 Universal
<input type="checkbox"/>	SCA System Bus Messaging Engine data source	PCMEDB	SCASYS00	<input type="checkbox"/>	db2inst1	*****	itscdb2.itso	DB2 Universal
<input type="checkbox"/>	SCA Application Bus Messaging Engine data source	PCMEDB	SCAAP00	<input type="checkbox"/>	db2inst1	*****	itscdb2.itso	DB2 Universal

Previous Next Cancel

Figure 8-14 Remember to uncheck the Create Tables check box in each row of the Database panel

15. In step 6, leave the default user name and passwords for CEI JMS authentication, SCA and Business Process Choreographer JMS authentication alias, and Cognos Administration access (Figure 8-15).

Note: The default user name is the user ID with which you have logged into the ISC. In this example, the administrative user is bpmadmin.

Create new deployment environment

Step 1: Select Nodes
Step 2: Clusters
Step 3: System REST Service Endpoints
Step 4: Import database configuration
Step 5: Database
→ **Step 6: Security**
Step 7: Business Process Choreographer
Step 8: Web Application Context Roots
Step 9: Summary

Security

Edit the user names and passwords for the authentication aliases that are needed by this deployment environment.

Name	User name	Password	Confirm Password
CEI JMS authentication alias	bpmadmin	.....	.....
SCA authentication alias	bpmadmin	.....	.....
Business Process Choreographer JMS authentication alias	bpmadmin	.....	.....
Cognos Administration access authentication	bpmadmin	.....	.....

Previous Next Cancel

Figure 8-15 Step 6: Security

16. In a Process Server configuration only, step 7 is an additional step for identifying the Process Center to the Process Server. This panel collects the Process Server Environment name (the name by which the Process Center will identify this Process Server environment), and selects a relevant environment type and the Process Center Connection information for the HTTP server address used to connect to the Process Center. The Process Server environment type selected is **Production**. Other possible values are Test and Staging.

17. Step 8 (Process Server) or step 7 (Process Center) (Figure 8-16) gathers information needed for the configuration of Business Process Choreographer.

Create new deployment environment

Step 1: Select Nodes

Step 2: Clusters

Step 3: System REST Service Endpoints

Step 4: Import database configuration

Step 5: Database

Step 6: Security

→ Step 7: Business Process Choreographer

Step 8: Web Application Context Roots

Step 9: Summary

Business Process Choreographer

The business process choreographer components need to have the following parameters configured.

Security

Role	Use Default	Users	Groups	Description
Administrator	<input type="checkbox"/>	bpm admin		User names, group names, or both, separated by the "|" symbol, for the business flow and human task administrator role. Users who are assigned to this role have all privileges.
Monitor	<input type="checkbox"/>	bpm admin		User names, group names, or both, separated by the "|" symbol, for the business flow and human task monitor role. Users who are assigned to this role can view the properties of all of the business process and task objects.

Authentication	Users	Password	Confirm Password	Description
JMS API Authentication	bpm admin	.....	.....	Authentication for business flow manager message-driven bean to process asynchronous API calls
Escalation User Authentication	bpm admin	.....	.....	Authentication for human task manager message-driven bean to process asynchronous API calls
Administration job user authentication	bpm admin	.....	.....	Authentication for the business flow manager and human task manager administrative jobs. This user must be in the Administrator role.

Human Task Manager Mail Session

☐ Enable e-mail service

Mail transport host

Mail transport user

Mail transport password

Confirm mail transport password

Business Process Choreographer Explorer URL

Previous

Next

Cancel

Figure 8-16 Users and groups used by Business Process Choreographer

Set the password for the JMS API, Escalation User, and Administration job user authentication according to what is defined in the user registry.

Here we have not defined an email service for the human task manager. Clear the Enable e-mail service option.

18. In step 9 (Process Server) or step 8 (Process Center), you can modify the context roots for various IBM Business Process Management components. In the environment that we have created for this book, we used the default values (Figure 8-17).

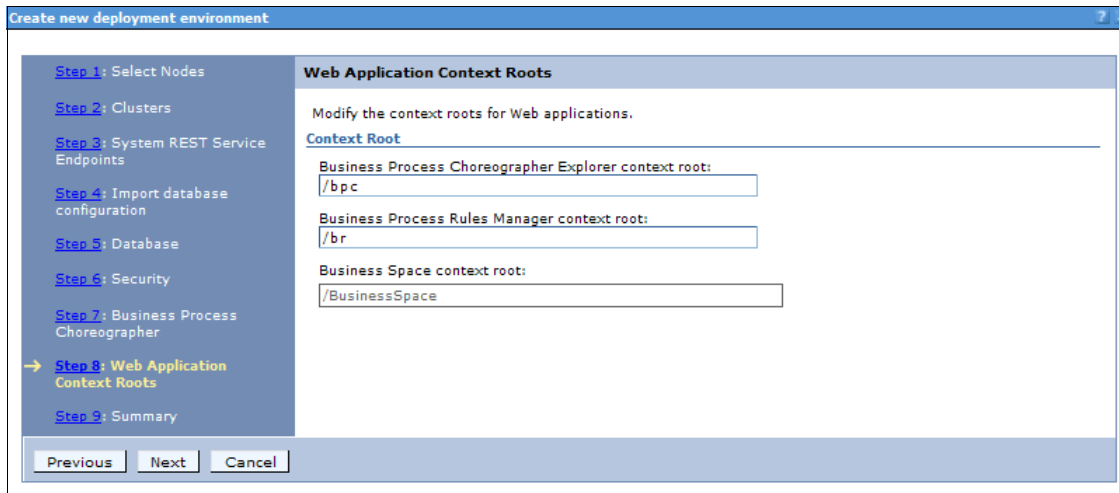


Figure 8-17 Web application context roots

19. In step 10 (Process Server) or step 9 (Process Center), you can review a summary of the entire topology before it is created.

Note: You can optionally select **Finish** here to save the deployment environment definition without generating it. This will give you a chance to review and edit the definition first, or export a topology definition file for use in command-line generation.

Select **Finish and Generate Environment**.

20. Messages display as the environment is generated. The successful output should be similar to Figure 8-18 on page 300. If any errors appear, do not save the generated environment, discard the changes, and address the problems before attempting to create the deployment environment again.

When finished, click **Save changes**.

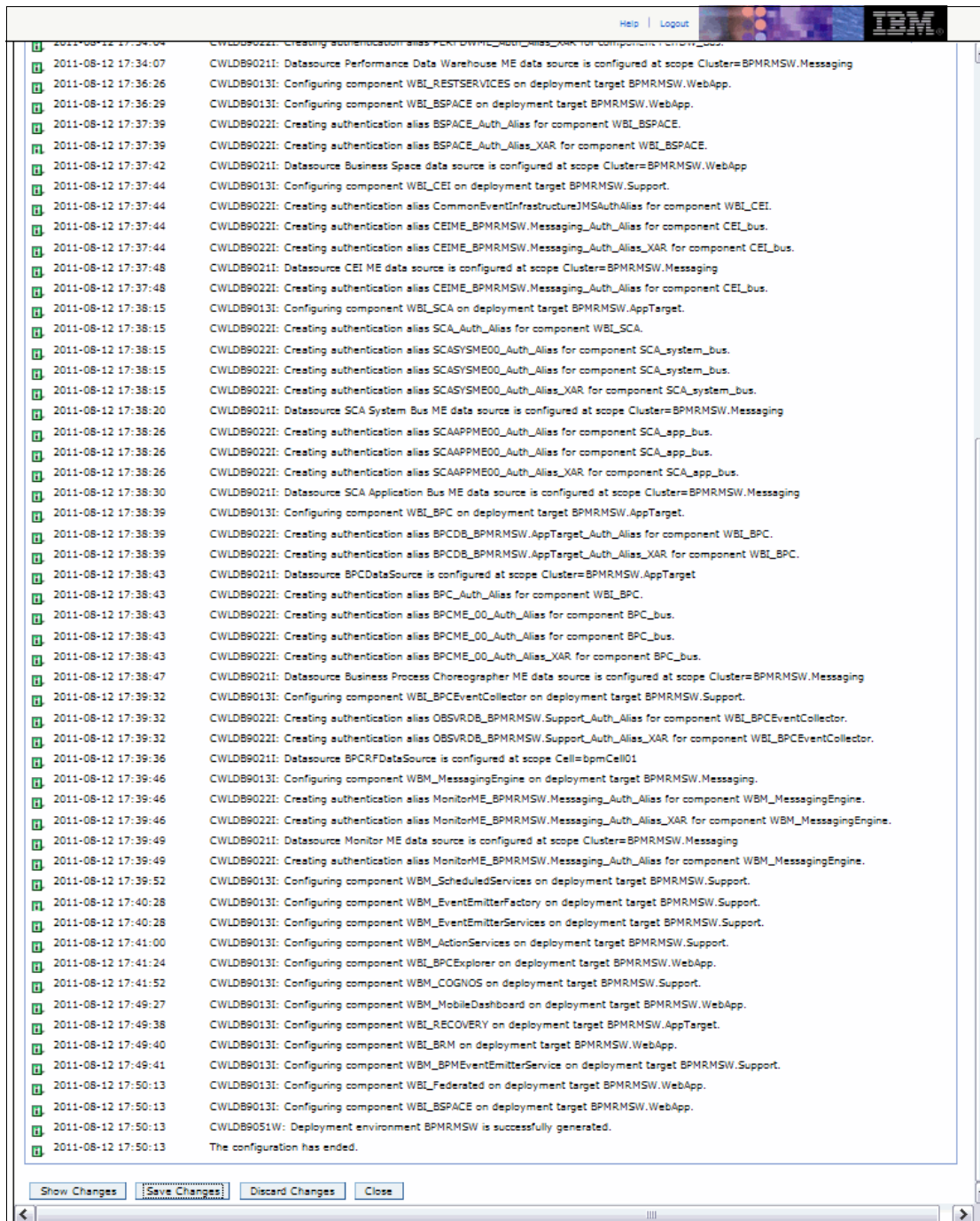


Figure 8-18 An example of output from a successful generation of a deployment environment

21. If there were no errors, then **Save** the configuration changes.

Warning: The deployment environment is not yet ready for use. You must first complete the bootstrapping step to prepare the data in some tables. Perform this task plus a few more tasks discussed in 8.4, “Post-creation configuration” on page 302.

8.3.2 Using the command line

To configure a topology using the command line, you will need to produce a topology definition file. This is typically created during the definition of a topology using the ISC and then exporting the topology definition. The exported topology definition file can be applied to a new WebSphere cell, and it is not required to be used only within the WebSphere cell used to generate the topology definition in the first place.

The steps to produce a topology definition file are:

1. Define a topology as in “Using the Integrated Solutions Console” on page 284. Save the topology environment definition by selecting **Finish** at the end of the process. The deployment environment will not be generated.
2. Export the topology by opening the ISC, navigating to **Servers** → **Deployment Environments**, selecting the relevant topology definition, and then clicking **Export**.

Note: You can generate a brand new topology definition by using **wsadmin** commands. That approach is not covered in this book. See the following reference for more details:

http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/topic/com.ibm.wbpm.imuc.ebpm.doc/topics/tcnfg_create_depenv_cmd.html

After you have created a topology definition file, you can import it and generate the environment using two **wsadmin** commands. Here we show how to do this interactively. You could also build this into a **wsadmin** script, with appropriate error checking.

1. First, import the deployment environment definition:

```
AdminTask.importDeploymentEnvDef ([ '-filePath', fileLocation,  
'-topologyName', topologyName])
```

Where *fileLocation* is the path and file name of the topology definition file, and *topologyName* is the name of the deployment environment.

2. Assuming that this task completes successfully, you must ensure that this configuration change is saved with **AdminConfig.save()**.
3. Generate the deployment environment itself:

```
AdminTask.generateDeploymentEnv ([ '-topologyName', topologyName])
```
4. Again, assuming that this task completes successfully, save the change with **AdminConfig.save()**. Do not save the changes if they do not complete successfully, or you will most likely save a broken deployment environment.

Note: For more information about the topology generation with commands, refer to:

http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/index.jsp?topic=/com.ibm.wbpm.imuc.ebpm.doc/topics/tadm_cfgtopwithcmd.html

8.4 Post-creation configuration

There are a few steps that need to be done after the Deployment Environment generation is completed successfully. These steps apply to both Process Center and Process Server cells, and include the following:

- ▶ 8.4.1, “Checking database connectivity” on page 303
- ▶ 8.4.2, “Bootstrap data command execution” on page 304
- ▶ 8.4.3, “Configuring host aliases” on page 305
- ▶ 8.4.4, “Configuration for the router” on page 307
- ▶ 8.4.5, “Securing the Process Server and Performance Data Warehouse service integration buses” on page 311
- ▶ 8.4.6, “Sharing transaction and recovery logs” on page 311

8.4.1 Checking database connectivity

Check database connectivity to ensure that the datasources used by the deployment environment have been generated correctly and that connectivity is possible:

1. Log in to the administrative console and navigate to **Resources** → **JDBC** → **JDBC Providers** → **Data Sources**.
2. Make sure that **All scopes** is selected (Figure 8-19).

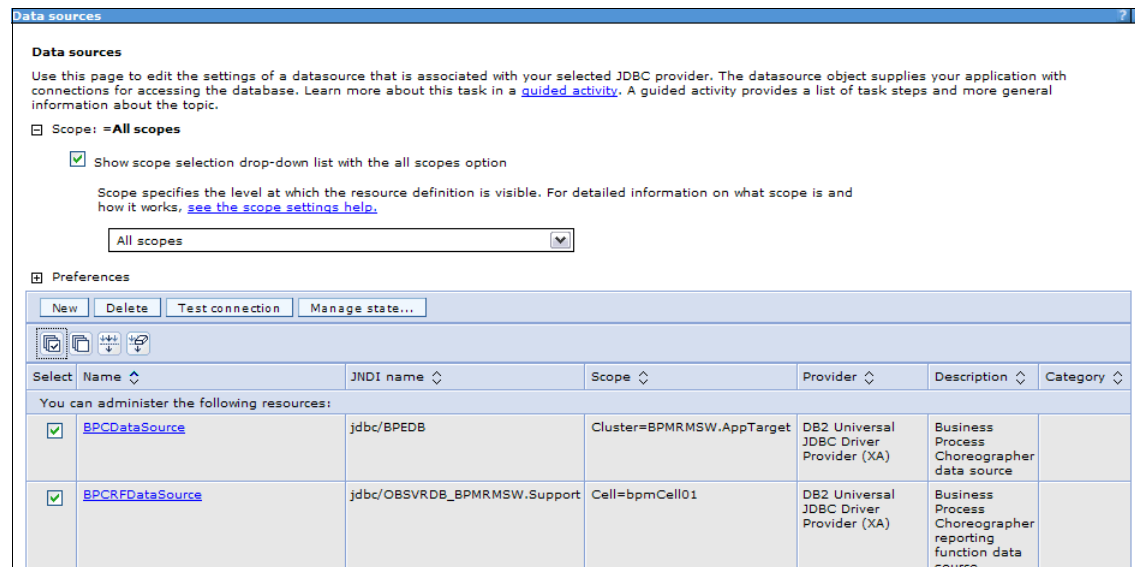


Figure 8-19 When looking at the Data sources panel, be sure that Scope:=All scopes is selected

3. Select all of the data sources and click **Test connection** to ensure that they have connectivity. You will see a message that the connection was successful for each (Figure 8-20).

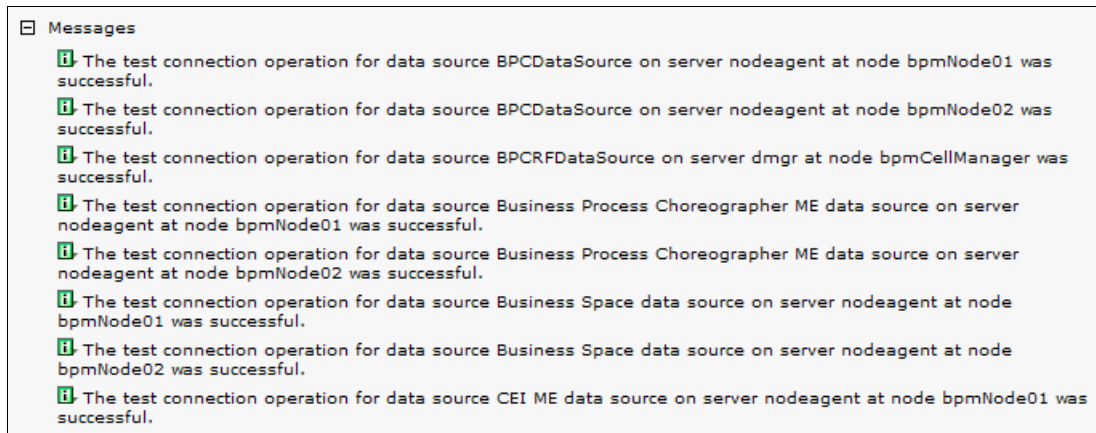


Figure 8-20 Data sources test connection output

8.4.2 Bootstrap data command execution

To complete the database configuration for IBM Business Process Manager Version 7.5, an additional manual step is currently required to load data into the repository in BPMDb database. The **bootstrap** command is executed from the product install root's bin directory (*WAS_HOME/bin*) of the deployment manager's installation. The **bootstrap** command will need to know the deployment manager's profile, because from that information the master configuration of the cell can be found. The **bootstrap** command will also need to know the node name and server name of one of the AppTarget cluster members. With that information, the bootstrapping command will be able to determine and load the correct data.

Note: In IBM Business Process Manager v7.5.0.0, the `bootstrapProcessServerData` script requires a number of parameters, including the node name and server name of one of the AppTarget cluster members. However, in v7.5.0.0, the script does not recognize a parameter for cluster.

An enhancement exists in IBM Business Process Manager v7.5.0.1 so that the scripting will recognize a parameter for specifying the cluster. In that case, the user can simply provide the cluster name and will no longer need to provide a node name and a server name.

The **bootstrap** command is mentioned in the Information Center:

http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/index.jsp?topic=%2Fcom.ibm.wbpm.imuc.ebpmcs.doc%2Ftopics%2Ftcnfg_bootstrap.html

Execute the command shown in Example 8-1 on the DMGR machine.

Example 8-1 Calling bootstrapProcessServerData initialization script

```
/opt/IBM/WebSphere/AppServer/profiles/Dmgr01/bin/bootstrapProcessServerData.sh -profilePath /opt/IBM/WebSphere/AppServer/profiles/Dmgr01 -dbType DB2_UNIVERSAL -dbJDBCClasspath /opt/IBM/WebSphere/AppServer/jdbcdrivers/DB2 -nodeName bpmNode01 -serverName BPMRMSW.AppTarget.bpmNode01.0
```

This command is used to load data into the database tables. It is not altering the configuration of the specified node or cluster member. Therefore, you can use either node and related cluster member server as the command-line parameter. It is not required to execute again for the other node.

Check the output for errors during the command execution.

8.4.3 Configuring host aliases

Ensure that each host alias contains the host and port information for each cluster member to be serviced. If you are using a web server or a proxy server, also include the corresponding host name and port number.

1. Determine the port numbers utilized by each of the cluster members. Log in to the Integrated Solutions Console as an administrative user.
2. Click **Servers** → **Server Types** → **WebSphere application servers**.

3. For every cluster member, click the name of the application server.
 - a. Under Communications, expand **Ports**.
 - b. For the port name, *WC_defaulthost*, remember its port number.

The value for the port number can be 9080, 9081, or something similar.

Note: Depending on your requirements, you might also need additional port values, such as *WC_defaulthost_secure*.

4. The host names and port numbers used by the cluster members must exist in the proper virtual hosts. From the left navigation area of the Integrated Solutions Console, click **Environment** → **Virtual hosts**.
5. Click the **default_host** name.
6. Under Additional Properties, click **Host Aliases**.
7. Check the list for the host name and port number used by each of the cluster members.

Note: An asterisk (*) is a wildcard character. It can be used to match to all host names. It can be a healthy practice to remove entries where the host name is an asterisk.

8. If the host name and port number for the cluster members are not displayed on the list, click **New** to add the missing entry to the list.
9. If you add a new entry, click **Save** and **Synchronize**.

Note: If you have a web server defined, any updates made to the virtual host list are important information to the web server. The plug-in file referenced by the web server will need to be generated and propagated.

1. After mapping virtual hosts, regenerate the plug-in configuration file. From the left navigation area, click **Servers** → **Server Types** → **Web servers**.
2. From the Web servers panel, select the check box next to the name of the web server for which you want to generate a plug-in. Click **Generate Plug-in**.

At this step, you can wait to perform the generation and propagation of the plug-in file, because these actions will be performed in 8.4.4, “Configuration for the router” on page 307.

8.4.4 Configuration for the router

In this example, the IBM HTTP Server is utilized to route HTTP requests to each member of the appropriate clusters. You might have alternatively chosen to utilize a WebSphere proxy server.

Two sets of actions are necessary:

- ▶ Map web modules to the web server.
- ▶ Customize the clustered Process Center or Process Server to utilize the router.

Note: Only the second step is a required explicit step when utilizing a proxy server.

Mapping web modules to the web server

During the installation of the IBM HTTP Server Plug-in, a `configureWebserver` script is produced by the install process on the web server machine. The `configureWebserver` script automatically maps all web application modules to the web server. Therefore, if this script is run after the generation of the deployment environment, the web modules will automatically be mapped to the web server.

If you have already created the web server configuration (as assumed as a prerequisite of this chapter), you must manually map these modules as follows:

1. Log in to the Integrated Solutions Console as an administrative user.
2. Click **Applications** → **Application Types** → **WebSphere enterprise applications**.
3. On the Enterprise Applications panel, click the name of the application.
4. On the Configuration tab, under Modules, click **Manage Modules**.
5. On the Manage Modules panel, perform the following steps:
 - a. Select the check boxes next to the name of the modules.
 - b. In the Clusters and servers section, select the application deployment target (where the application is already deployed) and the web server (if any). Use the Ctrl key to select multiple targets. For example, to have a web server serve your application, press the Ctrl key and then select the application server cluster and the web server together.

Figure 8-21 shows an example web module and mapping.

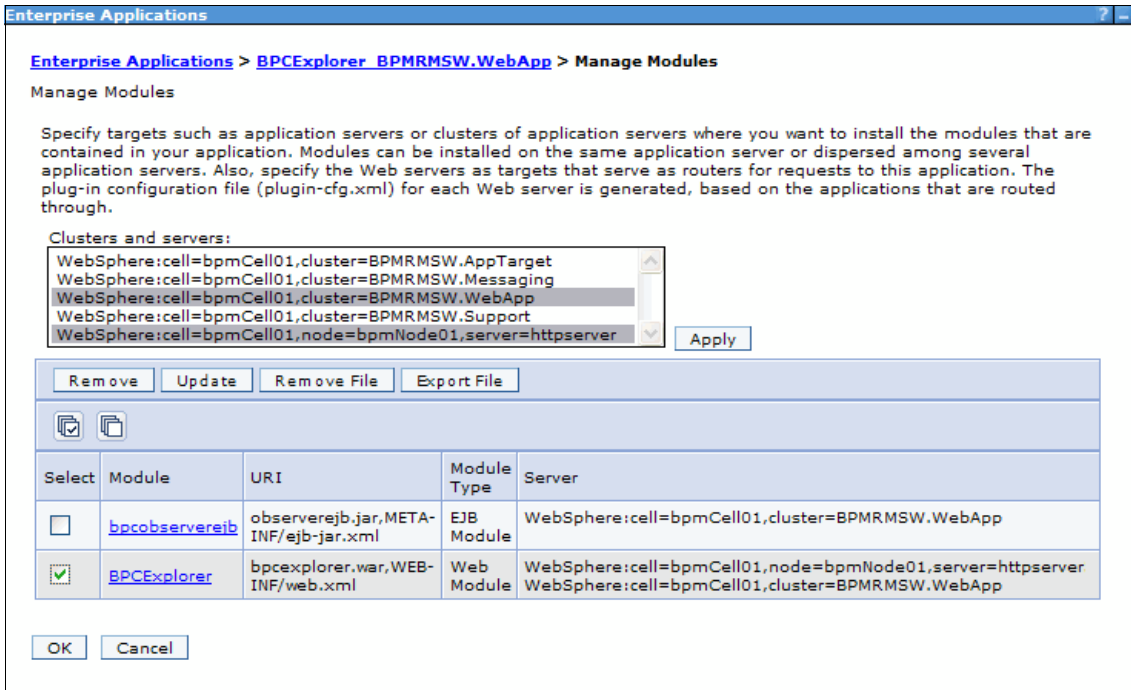


Figure 8-21 The web module is mapped to the web cluster and a web server

- c. Click **Apply**.
- d. Click **OK** and **Save** to save any changes.

For each enterprise application that you want the web server to serve, map all of its web modules. Table 8-3 contains a list of the enterprise applications that contain a web module. Each enterprise application can have one or more web modules.

Table 8-3 Components with web modules that can be mapped to a web server in addition to their deployment cluster

Components	Enterprise applications that contain web modules
Process Server	<ul style="list-style-type: none">▶ IBM_BPM_Portal (Process Portal)▶ IBM_BPM_ProcessAdmin▶ IBM_BPM_Repository▶ IBM_BPM_Teamworks▶ IBM_BPM_WebAPI

Components	Enterprise applications that contain web modules
Performance Data Warehouse	<ul style="list-style-type: none"> ▶ IBM_BPM_PerformanceDW
Business Space	<ul style="list-style-type: none"> ▶ BSpaceEAR ▶ BSpaceForms ▶ BSpaceHelp ▶ PageBuilder2 ▶ mm.was
Widgets	<ul style="list-style-type: none"> ▶ BPMAAdministrationWidgets ▶ HumanTaskManagementWidgets ▶ BusinessRules ▶ wesbWidget ▶ CognosWidgets
REST services	<ul style="list-style-type: none"> ▶ REST Services Gateway
Business flow manager	<ul style="list-style-type: none"> ▶ BPEContainer ▶ BPCEplorer
Human task manager	<ul style="list-style-type: none"> ▶ TaskContainer ▶ HTM_PredefinedTaskMsg_V700 ▶ HTM_PredefinedTasks_V700
Business rules	<ul style="list-style-type: none"> ▶ BusinessRulesManager
Remote Artifact Loader (RAL)	<ul style="list-style-type: none"> ▶ RemoteAL61
Monitor	<ul style="list-style-type: none"> ▶ IBM_WBM_EMITTER_SERVICES ▶ IBM_WBM_MOBILE_DASHBOARD ▶ WBMDashboard
Cognos	<ul style="list-style-type: none"> ▶ IBM Cognos

Note: Later, if accessing web pages with the HTTP server does not work, but accessing each cluster member works as expected, most likely the cause is that the web module is not mapped to the HTTP server correctly. To validate, check the mapping of each module with the same approach as described above, and add the mapping to the HTTP server if it is missing.

After a web module is mapped to the web server, generate and propagate the plug-in.

1. In the ISC, expand **Servers** → **Server Types** and click **Web servers**.
2. Select your web server (Figure 8-22).

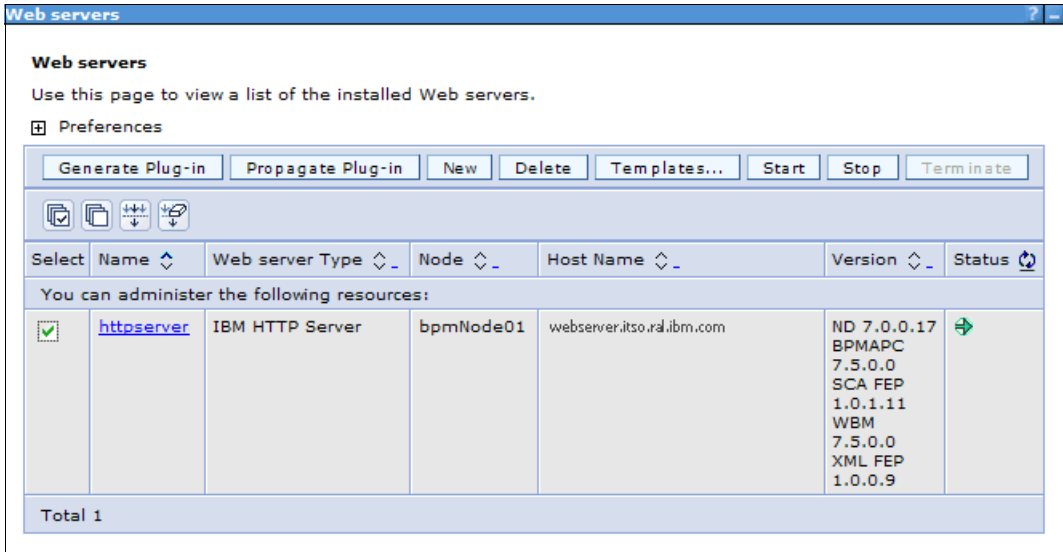


Figure 8-22 After selecting the Web server, the Plug-in may be generated and propagated

3. Click **Generate Plug-in**. Success or error messages will be displayed (Figure 8-23).

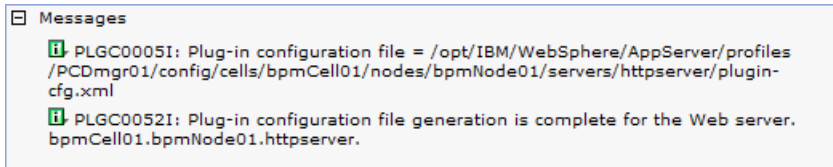


Figure 8-23 Feedback messages from a successful plug-in generation

4. Click **Propagate Plug-in**. Success or error messages will be displayed (Figure 8-24).

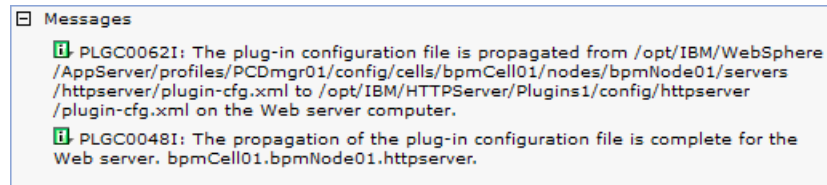


Figure 8-24 Feedback messages from a successful plug-in propagation

Customizing Process Center or Process Server to utilize a router

You must customize the Process Center or Process Server environment to enable it to function properly with the web server or proxy server. The default configurations for the process center component of each cluster member point to itself, instead of the router. Therefore, you need to replace it with the web server or proxy server URL.

Refer to Chapter 7, “Remote Messaging, Remote Support, and Web topology” on page 199, for the full details of this procedure.

8.4.5 Securing the Process Server and Performance Data Warehouse service integration buses

In Business Process Manager v7.5.0.0, the service integration buses used by the IBM Process Server and Performance Data Warehouse are shipped unsecured.

To secure these service integration buses, follow the instructions provided in the Technote available from IBM Support:

<http://www-01.ibm.com/support/docview.wss?uid=swg21499518>

8.4.6 Sharing transaction and recovery logs

To enable proper failover handling, the transaction and recovery log of each cluster member needs to be shared. Sharing means that the log files can be commonly accessed by each node/cluster member. From the multiple technologies available today, to establish a shared filestore among systems, choose whatever fits your needs best.

Note: The high availability of the transaction service enables any server in a cluster to recover the transactional work for any other server in the same cluster. This is described at the WebSphere Application Server Information Center:

http://publib.boulder.ibm.com/infocenter/wasinfo/v7r0/index.jsp?topic=/com.ibm.websphere.nd.multiplatform.doc/info/ae/ae/cjta_trans_ha.html

The shared filestore technique leveraged for this example is NFS.

- 1. Enable each cluster:
 - a. Log in to the Integrated Solutions Console.
 - b. Click **Servers** → **Clusters** → **WebSphere application server clusters**.
 - c. In the WebSphere Application Server clusters panel, you will see the names of the clusters (Figure 8-25). Click the name of the cluster, **BPMRMSW.AppTarget**.



Figure 8-25 The four clusters utilized in this topology

- d. In the panel for the selected cluster, select the **Enable failover of transaction log recovery** check box (Figure 8-26). Then click **OK** and **Save** the change.

The screenshot shows the 'WebSphere application server clusters' configuration window for the cluster 'BPMRMSW.AppTarget'. The 'Configuration' tab is active. In the 'General Properties' section, the 'Cluster name' is 'BPMRMSW.AppTarget' and the 'Bounding node group name' is 'DefaultNodeGroup'. The 'Enable failover of transaction log recovery' checkbox is checked. The 'Cluster messaging' section is expanded, showing 'Messaging engines'. The 'Business Integration' section is also expanded, showing various services like 'Business Integration Configuration', 'Process Center', 'Performance Data Warehouse', 'Business Space Configuration', 'REST services', and 'Service Component Architecture'. The 'Additional Properties' section is expanded, showing 'Cluster members', 'Backup cluster', 'Endpoint listeners', and 'Security domain'.

Figure 8-26 Select the Enable failover of transaction log recovery check box

- e. Repeat steps 1a- 1d for each of the remaining clusters:
- BPMRMSW.Messaging
 - BPMRMSW.Support
 - BPMRMSW.WebApp

2. On the shared file system and as a user with proper administrative authority, create tranlog and recoverylog directories. Example 8-2 assumes that the defined mount point on the file system is /BPMdata and that this mount point is available to every node of the cell.

Example 8-2 Create tranlog and recoverylog directories on a shared file system

```
cd /BPMdata
mkdir SharedLogs
cd SharedLogs
mkdir tranlogs
mkdir recoverylogs

cd tranlogs
mkdir BPMRMSW.AppTarget.bpmNode01.0
mkdir BPMRMSW.AppTarget.bpmNode02.0
mkdir BPMRMSW.Messaging.bpmNode01.0
mkdir BPMRMSW.Messaging.bpmNode02.0
mkdir BPMRMSW.Support.bpmNode01.0
mkdir BPMRMSW.Support.bpmNode02.0
mkdir BPMRMSW.WebApp.bpmNode01.0
mkdir BPMRMSW.WebApp.bpmNode02.0

cd ../recoverylogs
mkdir BPMRMSW.AppTarget.bpmNode01.0
mkdir BPMRMSW.AppTarget.bpmNode02.0
```

3. Now that the directories exist, configure each cluster member to its newly created shared transaction log folder:
 - a. Log in to the Integrated Solutions Console.
 - b. Navigate to **Servers** → **Server types** → **WebSphere application servers**.
 - c. In the WebSphere application servers panel, you will see the names of each of the servers (cluster members). Click the name of the cluster member **BPMRMSW.AppTarget.bpmNode01.0**.

- d. On the upper right, under Container Settings, expand **Container Services** and click **Transaction Service** (Figure 8-27).

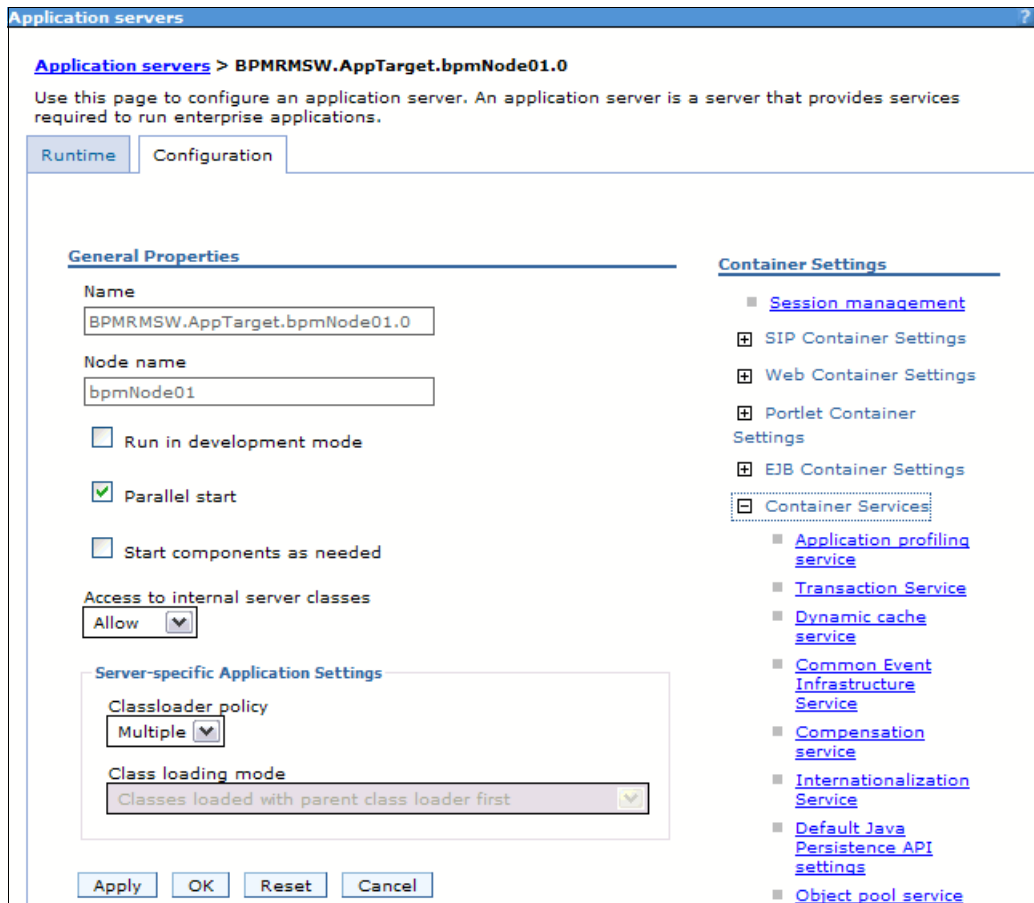


Figure 8-27 Under Container Settings, expand Container Services to find Transaction service

- e. On the Transaction service panel:
 - i. Specify the tranlog directory that corresponds to this server, for example:
`/BPMdata/SharedLogs/tranlogs/BPMRMSW.AppTarget.node01.0`
 - ii. Uncheck the Enable file locking box.
 - iii. Click **OK** and **Save** the change.

Note: If Network File System Version 3 is used for storing transaction recovery logs and automated peer recovery is used, then file locking must be disabled:

http://publib.boulder.ibm.com/infocenter/wasinfo/v7r0/index.jsp?topic=/com.ibm.websphere.nd.doc/info/ae/ae/tjta_disable_lock.html

- f. Repeat steps 2a - 2e for each of the remaining cluster members to configure their tranlogs:
 - BPMRMSW.AppTarget.bpmNode02.0
 - BPMRMSW.Messaging.bpmNode01.0
 - BPMRMSW.Messaging.bpmNode02.0
 - BPMRMSW.Support.bpmNode01.0
 - BPMRMSW.Support.bpmNode02.0
 - BPMRMSW.WebApp.bpmNode01.0
 - BPMRMSW.WebApp.bpmNode02.0
4. Configure each member of the AppTarget cluster to its newly created shared recovery folder:
 - a. In the ISC, navigate to **Servers** → **Server types** → **WebSphere application servers**.
 - b. Click **BPMRMSW.AppTarget.bpmNode01.0**.
 - c. On the upper right, under Container Settings, expand **Container Services** and click **Compensation Service**.
 - d. In the Compensation service panel:
 - i. Enter the recovery log directory:
/BPMdata/SharedLogs/recoverylogs/BPMRMSW.bpmNode01.0
 - ii. Click **OK** and **Save** the change.
 - e. In the ISC, navigate to **Servers** → **Server types** → **WebSphere application servers** and click the remaining application cluster member, **BPMRMSW.appTarget.bpmNode02.0**.
 - f. On the upper right, under Container Settings, expand **Container Services** and click **Compensation Service**.
 - g. On the Compensation service panel:
 - i. Enter the recovery log directory:
/BPMdata/SharedLogs/recoverylogs/BPMRMSW.bpmNode02.0
 - ii. Click **OK** and **Save** the change.

Note: In the future, when this cell is actively running in production, it is important to remember that the transaction log files must not be deleted from a production environment.

http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/index.jsp?topic=/com.ibm.wbpm.admin.doc/topics/ctro_tran_log_file.html

8.5 Verification

The following section details activities that are used to validate and verify the four-cluster topology configuration:

- ▶ 8.5.1, “Verification: Deployment manager and node agents start cleanly” on page 317
- ▶ 8.5.2, “Verification: Common Event Infrastructure persistence is disabled” on page 318
- ▶ 8.5.3, “Verification: The messaging cluster starting cleanly” on page 318
- ▶ 8.5.4, “Verification: The Support cluster starting cleanly” on page 320
- ▶ 8.5.5, “Verification: The AppTarget cluster starting cleanly” on page 320
- ▶ 8.5.6, “Verification: The Web cluster starting cleanly” on page 321
- ▶ 8.5.7, “Verification: Process Center and Process Server function” on page 321
- ▶ 8.5.8, “Verification: Business Space” on page 324
- ▶ 8.5.9, “Verification: Business Process Choreographer” on page 325

8.5.1 Verification: Deployment manager and node agents start cleanly

It is a suggested practice to ensure that the deployment manager and node agents restart without errors.

A second purpose of restarting the deployment manager is to load a plug-in used by the Integrated Solution Console. This allows you to see the Common Event Infrastructure panels under the Service Integration main menu item.

Note: It is important to frequently check the log files. In this case, verify that the deployment manager’s `SystemOut.log` file and each node agent’s `SystemOut.log` file do not contain errors before stopping and after restarting.

Stop then restart your deployment manager. Monitor the deployment manager startup logs to ensure that there are no errors or exceptions. If your deployment manager starts successfully, you will not see any error messages, and you will get a log similar to the following log:

```
[8/2/11 14:23:44:420 EDT] 00000000 WsServerImpl A WSVR0001I: Server
dmgr open for e-business
```

You can choose to restart all the node agents after deployment manager is started. Node agents can be stopped and restarted from their respective `PROFILE_HOME\bin` using the `stopNode.sh` and `startNode.sh` commands. Alternatively, you can restart active node agents via the Integrated Solution Console, under the **System Administration** → **Node agents** menu. Always monitor each node agent's log for the node startup status.

8.5.2 Verification: Common Event Infrastructure persistence is disabled

For a production system, it is best to disable persistence of CEI events to a database, as this can have a significant performance impact. In WebSphere Process Server v7.0 and earlier, this setting was automatically enabled, and you had to manually disable it. However, in IBM Business Process Manager v7.5, the default setting is automatically disabled. You can confirm that it is disabled via the Integrated Solutions Console:

1. Open the Integrated Solutions Console and navigate to **Service Integration** → **Common Event Infrastructure** → **Event Service** → **Event Services**.

Note: If this menu item does not appear, you might not have restarted your deployment manager since generating your deployment topology, in which case, restart it now.

2. Click **Default Common Event Infrastructure event server**. Ensure that the **Enable event data store** option is not selected.

8.5.3 Verification: The messaging cluster starting cleanly

The first cluster to be started is the messaging cluster. In the Integrated Solutions Console, navigate to **Servers** → **Clusters** → **WebSphere application server clusters**. Select the Messaging cluster and click **Start**.

Wait until the cluster and all associated components have started completely. The status icon will become green when the entire cluster is started.

Review each Messaging cluster member's SystemOut.log file.

- Each cluster member is started. For example, you will see that each cluster member is open for e-business:

```
[8/15/11 0:27:37:601 CDT] 00000000 WsServerImpl A WSVR0001I:
Server BPMRMSW.Messaging.bpmNode01.0 open for e-business
```

- There are no error messages in the log files.
- Each messaging engine has achieved the state STARTED. Remember that each messaging engine is a singleton, and therefore in one cluster member's log you will see that the messaging engine is in state JOINED, while in the other cluster member's log you will see that the messaging engine is in state STARTED. For example, a similar message will be seen for each of the active messaging engines:

```
[8/15/11 0:27:34:913 CDT] 00000013 SibMessage I
[SCA.SYSTEM.bpmCell01.Bus:BPMRMSW.Messaging.000-SCA.SYSTEM.bpmCell01
.Bus] CWSID0016I: Messaging engine
BPMRMSW.Messaging.000-SCA.SYSTEM.bpmCell01.Bus is in state Started.
```

- The status of each messaging engine can also be viewed in the ISC:
 - Navigate to **Service Integration** → **Buses** and click the name of a bus.
 - Under Topology, click **Messaging Engines**. There you will see the status of the messaging engine (Figure 8-28).



Figure 8-28 A messaging engine in state STARTED

Note: The reason for starting the Messaging cluster first is because many resources used by other clusters are dependant on being able to connect to an active messaging engine.

8.5.4 Verification: The Support cluster starting cleanly

Next, start the Support cluster. In the Integrated Solutions Console, navigate to **Servers → Clusters → WebSphere application server clusters**. Select the Support cluster and click **Start**.

Wait until the cluster and all associated components have started completely. The status icon will become green when the entire cluster is started.

Review each Support cluster member's `SystemOut.log` file.

- ▶ Each cluster member is started. For example, you will see that each cluster member is open for e-business:

```
[8/15/11 0:45:16:366 CDT] 00000000 WsServerImpl A WSVR0001I:  
Server BPMRMSW.Support.bpmNode02.0 open for e-business
```

- ▶ There are no error messages in the log files

8.5.5 Verification: The AppTarget cluster starting cleanly

Next, start the AppTarget cluster. In the Integrated Solutions Console, navigate to **Servers → Clusters → WebSphere application server clusters**. Select the AppTarget cluster and click **Start**.

Wait until the cluster and all associated components have started completely. The status icon will become green when the entire cluster is started.

Review each AppTarget cluster member's `SystemOut.log` file.

- ▶ Each cluster member is started. For example, you will see that each cluster member is open for e-business:

```
[8/15/11 0:51:06:402 CDT] 00000000 WsServerImpl A WSVR0001I:  
Server BPMRMSW.AppTarget.bpmNode02.0 open for e-business
```

- ▶ There are no error messages in the log files.

8.5.6 Verification: The Web cluster starting cleanly

Next, start the Web cluster. In the Integrated Solutions Console, navigate to **Servers** → **Clusters** → **WebSphere application server clusters**. Select the Web cluster and click **Start**.

Wait until the cluster and all associated components have started completely. The status icon will become green when the entire cluster is started.

Review each Web cluster member's `SystemOut.log` file.

- ▶ Each cluster member is started. For example, you will see that each cluster member is open for e-business:

```
[8/15/11 0:53:21:919 CDT] 00000000 WsServerImpl A WSVR0001I:  
Server BPMRMSW.WebApp.bpmNode02.0 open for e-business
```
- ▶ There are no error messages in the log files.

8.5.7 Verification: Process Center and Process Server function

There are several actions that can be performed for verification:

- ▶ Verify you are able to access web applications.
- ▶ Download and install the Process Designer from the Process Center.
- ▶ Execute a sample BPD in Hiring Sample.

Verifying that you are able to access web applications

This is a simple check to verify that the various web applications for the Process Center and Process Server function can be accessed via HTTP. There are several web applications by which to use the Process Center and Process Server function.

Note: For HTTP requests, either use the front-end web server or the proxy server host and port, or direct requests directly to each cluster member's host and port:

- ▶ `<IHS_host_name>`
This is the host name used by the web server or proxy server.
- ▶ `<host_name>:<port>`
This is the host name and default host port used by each cluster member.

As you access each of the web applications, confirm that there are no errors generated in the relevant log files:

1. Process Center Console

This applies to the Process Center environment only.

a. Access the web application:

- http://<IHS_host_name>/ProcessCenter/
- http://<host_name>:<port>/ProcessCenter/

b. Log in as a valid user: bpmadmin

c. Download Process Designer from the Process Center.

2. Process Server Admin Console

a. Access the web application:

- http://<IHS_host_name>/ProcessAdmin/
- http://<host_name>:<port>/ProcessAdmin/

b. Log in as a valid user: bpmadmin

c. Clear caches under the “manage cache” menu item.

3. Process Server Portal

a. Access the web application:

- http://<IHS_host_name>/portal/
- http://<host_name>:<port>/portal/

b. Log in as a valid user: bpmadmin

c. Make sure that the Inbox saved search renders without errors.

d. Select the **My Performance** scoreboard and ensure that it renders without errors.

4. Performance Server Admin Console

a. Access the web application:

- http://<IHS_host_name>/portal/PerformanceAdmin/
- http://<host_name>:<port>/PerformanceAdmin/

Note that the Performance Server Admin Console is running on the Support cluster, so use the appropriate <host_name>:<port>. The port can be 9081.

b. Log in as a valid user.

c. Inspect all menu items, ensuring that there are no errors or exceptions.

5. WebService API

- a. Access the web application:
 - `http://<IHS_host_name>/webapi/services/`
 - `http://<host_name>:<port>/webapi/services/`
- b. Log in as a valid user: bpmadmin
- c. Check that the following WSDLs render without errors:
 - `http://<host_name>:<port>/webapi/services/Version?wsdl`
 - `http://<host_name>:<port>/webapi/services/AdminService?wsdl`
 - `http://<host_name>:<port>/webapi/services/WebAPISoap?wsdl`
 - `http://<host_name>:<port>/webapi/services/WebAPIService?wsdl`

Installing the Process Designer

Download the Process Designer tool and install it to verify the function of Process Center:

1. Open a web browser and enter the Process Center URL:
`http://<IHS_host_name>/ProcessCenter`
2. On the getting started panel, click **Download**, select a local folder in which to save the files, click **Save**, and the Process Designer download will start. Wait until the download completes.
3. The name of the downloaded file is IBM Process Designer.zip. Extract this file to a folder.
4. If you want to install Process Designer to the default folder `C:\IBM\ProcessDesigner\v7.5`, then double-click the **installProcessDesigner_admin.bat** file. If you want to install Process Designer to a different location, then open a command window and issue the command to specify another folder, such as `C:\IBMPD`:
`installProcessDesigner_admin.bat C:\IBMPD`
5. Navigate to the install destination folder and double-click **eclipse.exe** to start the Process Designer.

Verifying by running sample BPD

The Process Center server has included a sample named Hiring Sample. This sample utilizes Process Designer. Follow the linked instructions for the Hiring Sample Tutorial for IBM Process Designer to open the sample and play back the process. This sample can also be used to verify the runtime environment. The tutorial indicates that the runtime users must have access to the Hiring Sample process application.

The overview and steps to run the Hiring Sample can be found at Hiring Sample Tutorial page on the IBM Business Process Manager v7.5 info center:

http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/index.jsp?topic=/com.ibm.wbpm.main.doc/tutorial/topic/cbpm_tutorial.html

8.5.8 Verification: Business Space

There are two actions that can be performed for verification:

- ▶ Verify that you are able to access the web application.
- ▶ Utilize a widget in the Business Space.

Verifying that you are able to access the web application

This is a simple check to verify that the Business Space Manager application can be accessed via HTTP:

1. Access the web application:

- `http://<IHS_host_name>/BusinessSpace/`
- `http://<host_name>:<port>/BusinessSpace/`

Note that the Business Space Manager is running on the WebApp cluster, so use the appropriate `<host_name>:<port>`. The port can be 9083.

2. Log in as a valid user: bpmadmin
3. Ensure that the web application renders without errors.

Utilizing a widget in the Business Space

In this section we log into Business Space and navigate to the system health widget to ensure that the Business Space infrastructure is working correctly.

Note: These instructions assume that you have set up your web server and that it is configured to accept HTTPS connections. We do not include instructions on that in this book. For more information about the IBM HTTP Server, see *IBM HTTP Server (powered by Apache): An Integrated Solution for IBM eServer iSeries Servers*, SG24-6716.

1. Open a web browser, enter the Business Space URL `http://<IHS_host_name>/BusinessSpace`, and log in using bpmadmin.
2. Click **Go to Spaces** → **Problem Determination** → **System Health** tab.

- You will see a page similar to that shown in Figure 8-29, showing the various deployment environments, clusters, and node agents that you have, and that they are running. You can also choose to explore the other tabs and check other components in your environment.

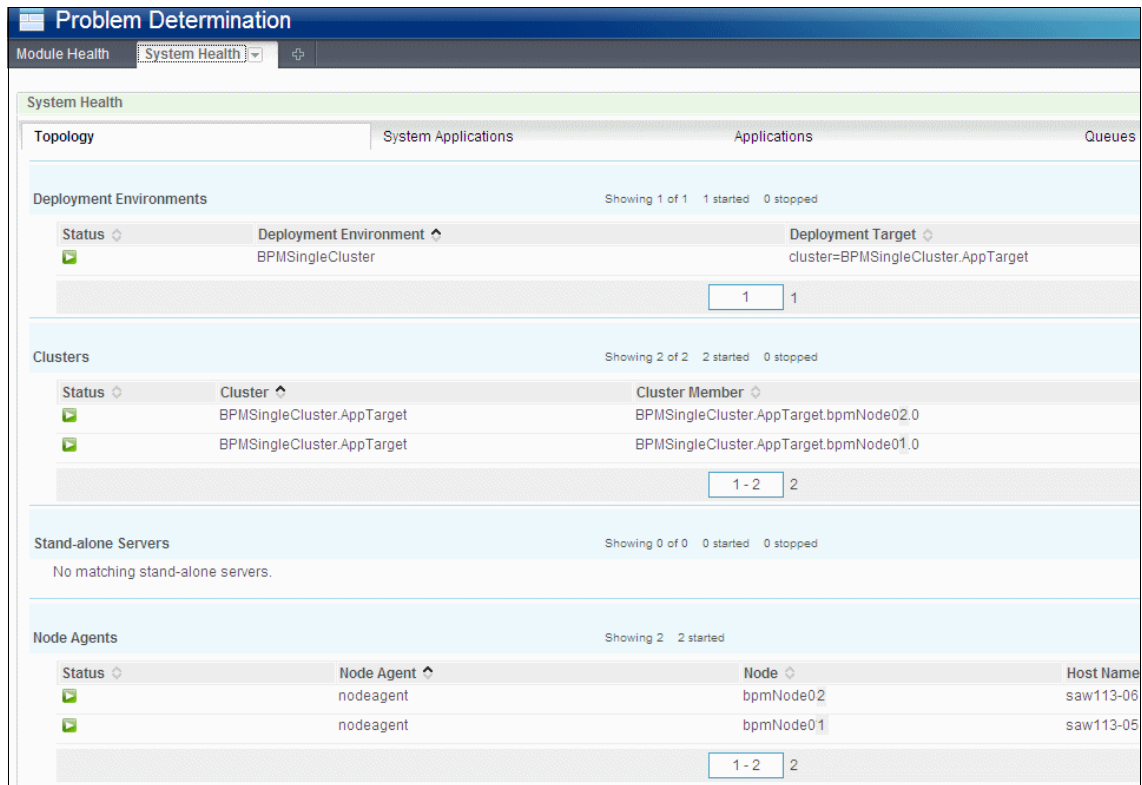


Figure 8-29 Business Space System Health widget

8.5.9 Verification: Business Process Choreographer

There are multiple actions that can be performed for verification:

- ▶ Verify that you are able to access the web application.
- ▶ Execute a sample task.
- ▶ Install and run the classic BPC IVT application.
- ▶ Additional samples.

Verifying that you are able to access the web application

This is a simple check to verify that the Business Process Choreographer Explorer application can be accessed via HTTP:

1. Access the web application:

- `http://<IHS_host_name>/bpc/`
- `http://<host_name>:<port>/bpc/`

Note that the Business Process Choreographer Explorer is running on the WebApp cluster, so use the appropriate `<host_name>:<port>`. The port can be 9083.

2. Log in as a valid user: `bpmadmin`
3. Ensure that the web application renders without errors.

Executing a sample task

To do this:

1. Open the Business Process Choreographer (BPC) Explorer. You might need to log in. Use the username and password that you configured for this.
2. Navigate to **Task Templates** → **My Task Templates**. You will see preconfigured sample human tasks. Click the **Widget Message** box, and then click **Create Instance** (Figure 8-30).

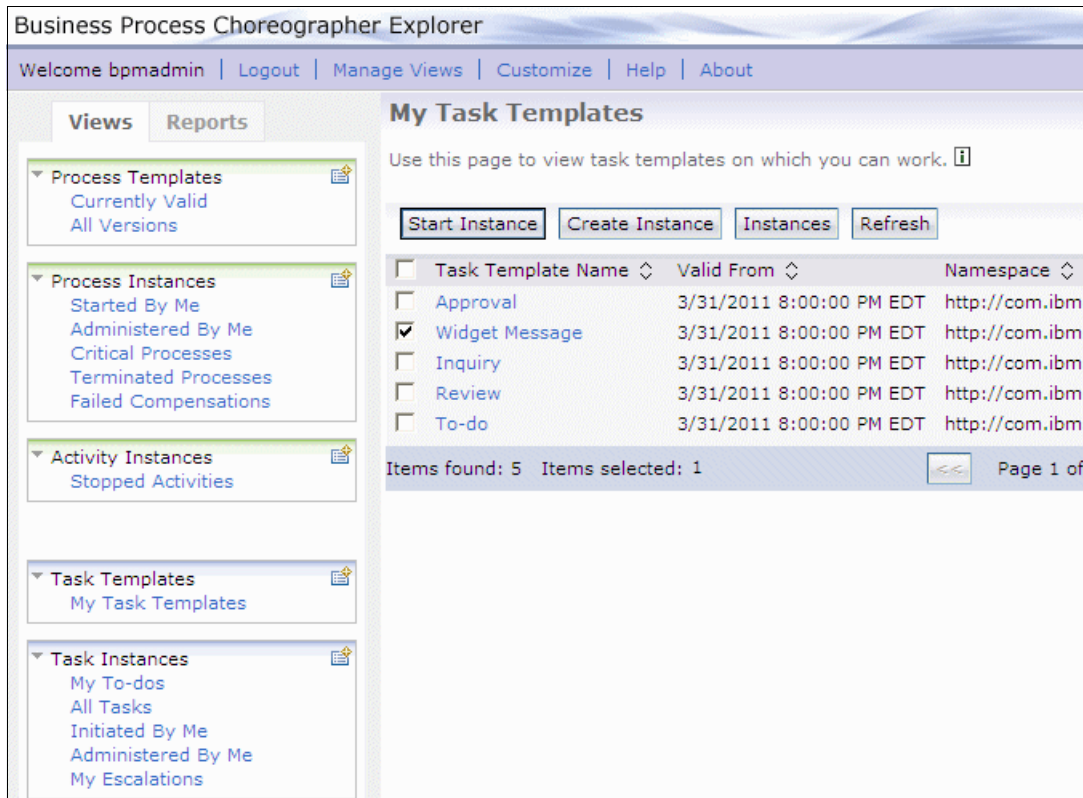


Figure 8-30 BPC Explorer: Creating a widget message, step 1

3. Enter values for the Subject and Message fields of the human task (Figure 8-31), then click **Submit**.

Business Process Choreographer Explorer

Welcome bpmadmin | Logout | Manage Views | Customize | Help | About

Views Reports

- Process Templates
 - Currently Valid
 - All Versions
- Process Instances
 - Started By Me
 - Administered By Me
 - Critical Processes
 - Terminated Processes
 - Failed Compensations
- Activity Instances
 - Stopped Activities
- Task Templates
 - My Task Templates
- Task Instances
 - My To-dos
 - All Tasks
 - Initiated By Me
 - Administered By Me
 - My Escalations

Task Input Message

Use this page to provide the input that is needed to start an instance of a human task process. [i](#)

Submit

Task Template Name: Widget Message
Task Description: "%htm:input.\request/subject%" message from %htm:task.originator%

Task Input Message

Form View

request	subject	HTM for BPC
	message	attempt to verify HTM function

Edit Source

Figure 8-31 BPC Explorer: Creating a widget message, step 2

4. Navigate to **Task Instances** → **Initiated By Me**. You should see the one instance of the task that you just created. Click the task name itself, **Widget Message**.

5. Select the **Custom Properties** tab and click the empty space next to the `htm_assigned_to` field (this is an editable property, although it does not appear so at first). Enter a valid user to own the task (Figure 8-32). Click **Save** → **Start** → **Submit**. The task now has an owner.

The screenshot shows the Business Process Choreographer Explorer interface. The left sidebar contains a tree view with categories: Process Templates, Process Instances, Activity Instances, Task Templates, and Task Instances. The main area is titled 'Task Instance' and contains a 'Task Description' section with fields for Task Name, Description, and Reason. Below this is a 'Custom Properties' tab with a table of properties. The 'htm_assigned_to' property is highlighted, and its value is being edited in a text box.

Property Name	Property Value
htm_assigned_to	<input type="text" value="bpmadmin"/>
htm_isHidden	true
htm_isPredefinedTask	true

Buttons: Delete, Start, Work Items, Reschedule, Change Priority, Change Business Category, Save, Add.

Figure 8-32 BPC Explorer: Creating a widget message, step 3

- Click the check box next to the widget message task and click **Work on**. In the response comments field, enter text (Figure 8-33), and then click **Complete**.

Business Process Choreographer Explorer

Welcome bpmadmin | Logout | Manage Views | Customize | Help | About

Views Reports

Process Templates
Currently Valid
All Versions

Process Instances
Started By Me
Administered By Me
Critical Processes
Terminated Processes
Failed Compensations

Activity Instances
Stopped Activities

Task Templates
My Task Templates

Task Instances
My To-dos
All Tasks
Initiated By Me
Administered By Me
My Escalations

Task Message

Use this page to provide the data required to complete the task. ⓘ

Complete Save Release Cancel

Task Name
Task Input Message

Widget Message

Form View

request	subject	HTM for BPC
	message	attempt to verify HTM function

View Source

Task Output Message

Form View

response	comments	verification complete and succeed
----------	----------	-----------------------------------

Edit Source

Figure 8-33 BPC Explorer: Creating a widget message, step 4

- The human task is now finished, and you have verified that the human task manager is working correctly. If you want to delete it, click **Task Instances** → **Administered By Me**, select the task, and select **Delete**.

Installing and running the classic BPC IVT application

The Business Process Choreographer installation verification application is included in the product installation and can be found at:

<BPM_install_dir>/installableApps/bpcivt.ear

Note: In a network deployment environment, you can only deploy one instance of the Business Process Choreographer installation verification application. For example, if you have two Business Process Choreographer clusters in the same network deployment cell, you can deploy the bpcivt.ear application only on one of the clusters. Later, if you want to deploy it on the second cluster, you must first undeploy it from the first cluster.

1. Ensure that at least one member of the AppTarget cluster is running.
2. Log in to the Integrated Solutions Console as an administrative user.
3. Click **Applications** → **New application** → **New enterprise application**.
4. For the path to the new application, browse to and select **bpcivt.ear**, then click **OK** → **Next**.
5. On the Preparing for the application installation panel, the radio button for **Fast Path - Prompt only when additional information is required** is selected. Click **Next**.
6. In Step 1: Select installation options, the default options are fine. Click **Next**.
7. In Step 2: Map modules to servers, verify that this module will be deployed to the BPMSRMSW.AppTarget cluster (Figure 8-34). Click **Next**.

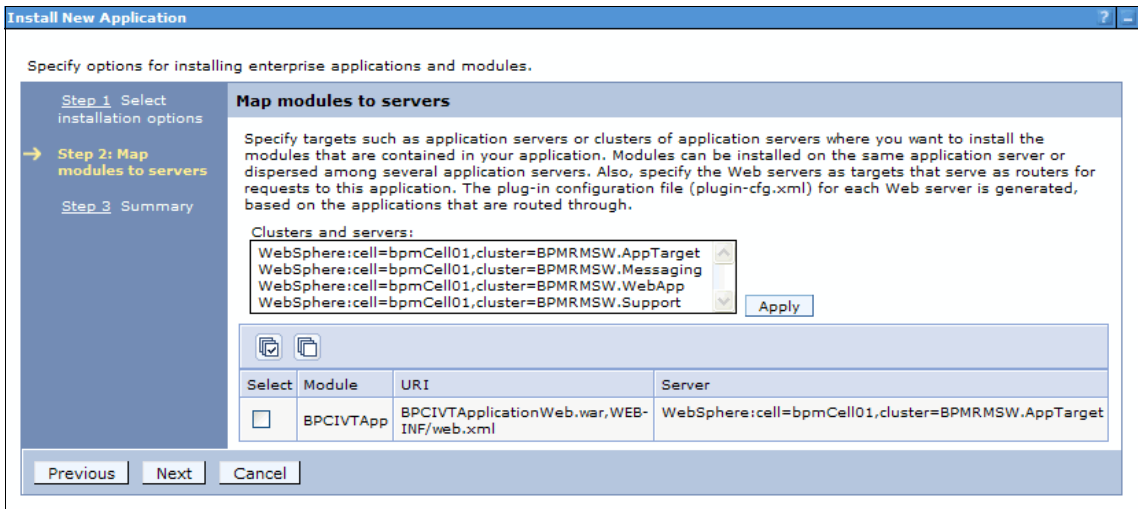
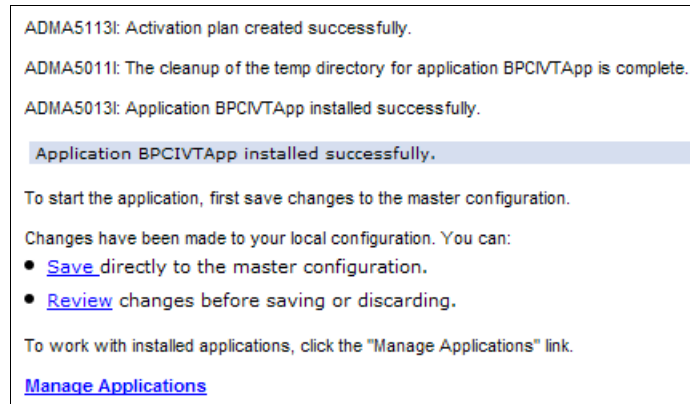


Figure 8-34 The BPC IVT application must be deployed to the AppTarget cluster

Note: If you are also using an IHS Web server, be sure to map the module to the AppTarget cluster and the web server.

8. Step 3: Summary is a summary of the application to be installed. Click **Finish**.
9. Verify that the BPC IVT application installs successfully (Figure 8-35), and then click **Save**.



ADMA5113: Activation plan created successfully.

ADMA5011: The cleanup of the temp directory for application BPCIVTApp is complete.

ADMA5013: Application BPCIVTApp installed successfully.

Application BPCIVTApp installed successfully.

To start the application, first save changes to the master configuration.

Changes have been made to your local configuration. You can:

- [Save](#) directly to the master configuration.
- [Review](#) changes before saving or discarding.

To work with installed applications, click the "Manage Applications" link.

[Manage Applications](#)

Figure 8-35 Output shown when the BPC IVT application installation is successful

10. If you are using an IHS Web server, remember to generate and propagate the `plugin-cfg.xml`.
11. The application needs to be started. In the ISC, navigate to **Applications** → **Application Types** → **WebSphere enterprise applications**.
12. Select **BPCIVTApp**, then click **Start**.

13. Verify that the application status will switch from a red X to the green arrow, and that the feedback at the top of the panel indicates that the application has started (Figure 8-36).

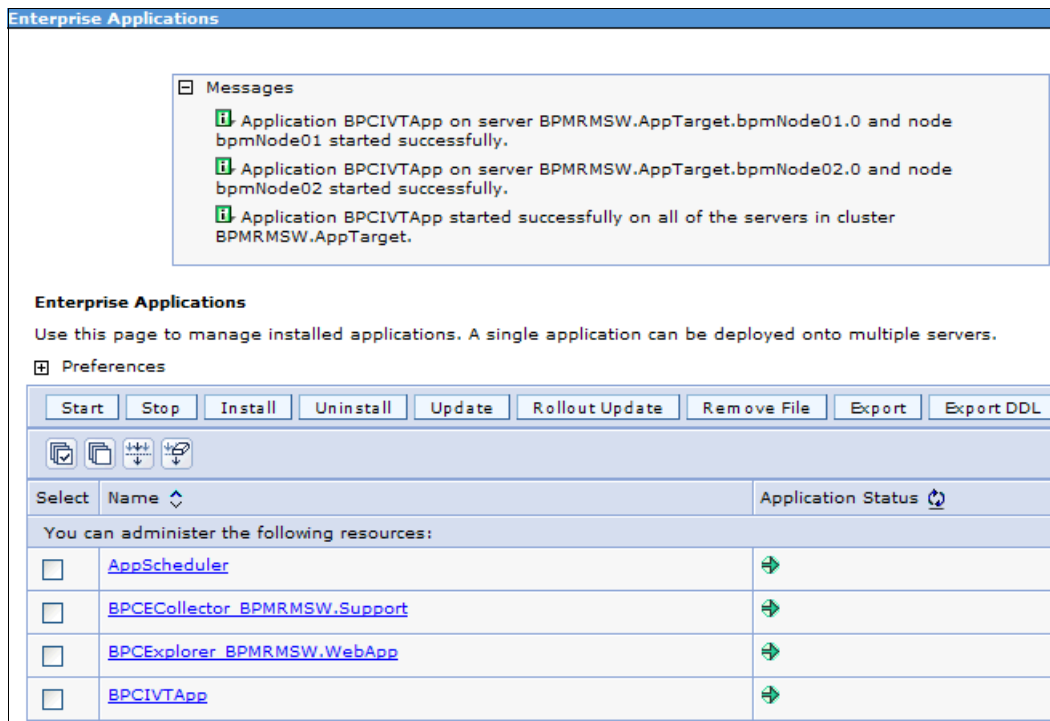


Figure 8-36 The BPC IVT application starts successfully

14. Using a web browser, open to the BPC IVT's URL, either via the web server or the proxy server, or by going directly to a cluster member's host and port:
 - `http://<IHS_host>/bpcivt`
 - `http://<host_name>:<port>/bpcivt`
15. You will see output in the browser. The last two lines should say Passed and Done.

Note: The BPC IVT application is described in the Business Process Manager v7.5 Information Center:

<http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/index.jsp?topic=/com.ibm.wbpm.bpc.doc/topics/t2cover.html>

Additional Business Process Choreographer samples

Additional Business Process Choreography samples are available on the web at:

<http://publib.boulder.ibm.com/bpcsamp/>



Cross-cell topology with IBM Business Monitor

This chapter describes how to set up IBM Business Monitor in its own cell based on the Remote Messaging, Support, and Web topology pattern. Process Server is deployed in a separate remote cell hosting the Common Event Infrastructure (CEI) service.

This chapter discusses the following topics:

- ▶ Topology overview
- ▶ Event Delivery
- ▶ Planning to install IBM Business Monitor
- ▶ Installing the topology
- ▶ Post-creation configuration

9.1 Topology overview

When installing IBM Business Monitor in a separate cell from Process Server, you have multiple choices of which topology to use in the Monitor cell, just as you had multiple choices of topologies in the Process Server cell. The primary choices are the Single Cluster or the Remote Messaging, Support, and Web (the Four-Cluster) topology. These topologies each have a deployment environment pattern. You can use the deployment environment wizard to configure the clusters, servers, and components.

In this chapter we use the Four-Cluster topology, which uses the Remote Messaging, Remote Support, and Web deployment environment pattern. This pattern groups the IBM Business Monitor applications into four clusters in a single cell. The components of IBM Business Monitor are distributed among the four clusters (Figure 9-1).

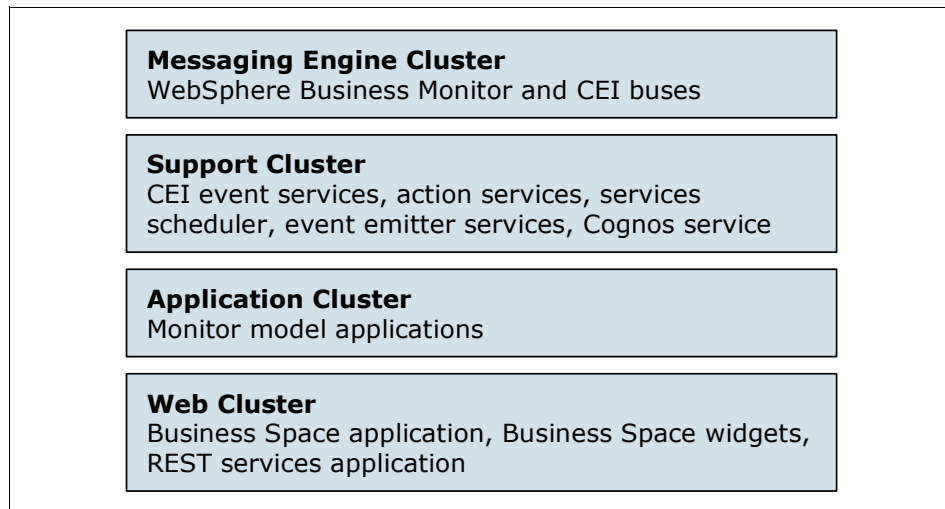


Figure 9-1 Four-Cluster topology component layout

Note: For best performance, the Event emitter services and CEI event service should be on the same cluster. Event emitter services include both the REST event emitter and the JMS event emitter.

9.2 Event Delivery

In a cross-cell topology, IBM Business Monitor is installed and configured as its own WebSphere Application Server plus IBM Business Monitor cell. Common Business Events (CBEs) issued in the IBM Business Process Manager cell by a Process Server instance need to be delivered to the monitor model applications in the IBM Business Monitor cell. There are two options for this cross-cell delivery:

- ▶ Table-based event delivery
- ▶ Queue-based event delivery

Note: The delivery option is chosen at application installation time for a monitor model. It is strongly suggested that you choose table-based event delivery (sometimes called *queue bypass*), both for reliability and for performance/scalability reasons.

9.2.1 Table-based event delivery

In table-based event delivery, the CBEs are delivered to IBM Business Monitor via the monitor database (Figure 9-2).

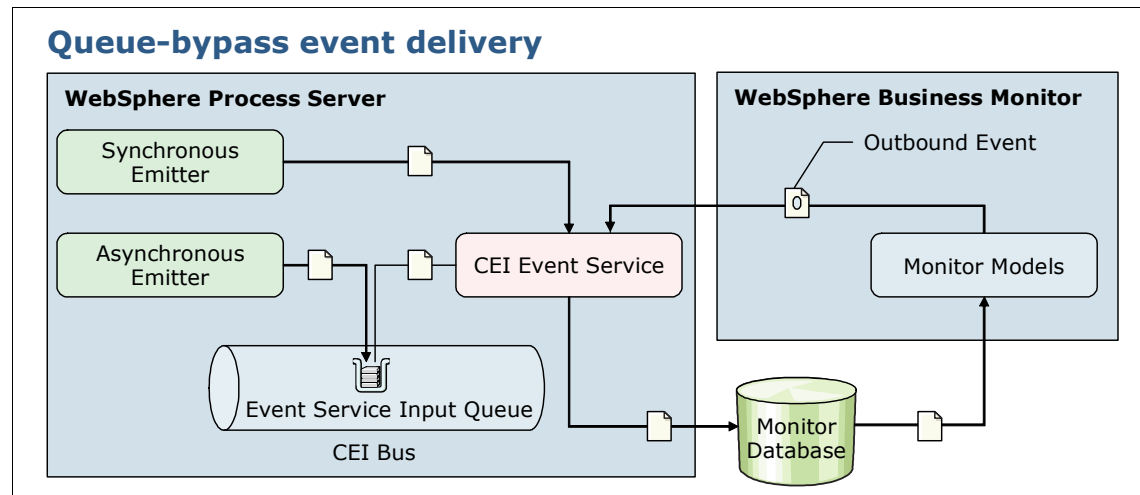


Figure 9-2 Table-based event delivery

9.2.2 Queue-based event delivery

An alternative option is to use a cross-cell bus link between the monitor bus in the Process Server cell and the monitor bus in IBM Business Monitor (Figure 9-3).

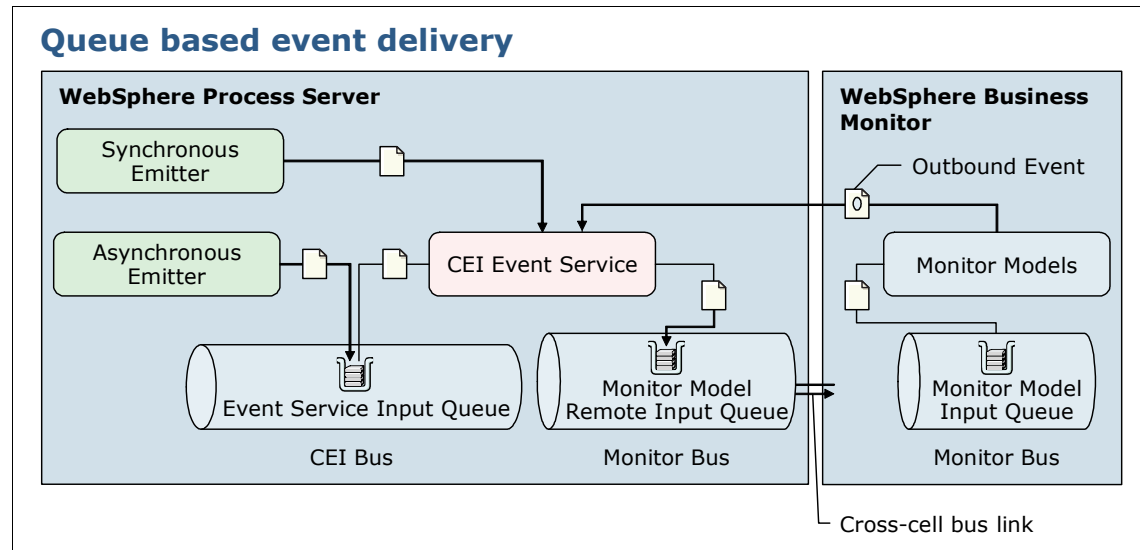


Figure 9-3 Queue-based event delivery

9.3 Planning to install IBM Business Monitor

IBM Business Monitor can be installed and configured its own cell. You are not required to install IBM Business Process Manager for this IBM Business Monitor cell.

The installation and configuration of this IBM Business Monitor cell requires considerations for several components:

► Profiles

The profiles needed for a cell that utilizes IBM Business Monitor include a deployment manager profile that has been created or augmented for IBM Business Monitor, and a number of custom profiles that have been created or augmented for IBM Business Monitor.

For the IBM Business Monitor cell built in this chapter, the types of profiles to be created are the IBM Business Monitor deployment manager profile and the IBM Business Monitor custom profile. For more information about each of these, see the following resources:

- Creating a Monitor deployment manager profile using the Profile Management Tool:
http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/index.jsp?topic=%2Fcom.ibm.wbpm.mon.imuc.doc%2Finst%2Fpmt_dm.html
- Creating a Monitor custom profile using the Profile Management Tool:
http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/index.jsp?topic=%2Fcom.ibm.wbpm.mon.imuc.doc%2Finst%2Fpmt_custom_adv.html
- Creating Monitor profiles using the **manageprofiles** command:
<http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/index.jsp?topic=%2Fcom.ibm.wbpm.mon.imuc.doc%2Finst%2Fmanageprofiles.html>

Note: The third type of profile is the standalone profile (also known as single server profile). Standalone profiles are fully functional single servers, and are generally utilized for test environments.

► Database considerations

The main monitor database, named MONITOR, stores the IBM Business Monitor configuration, monitor model metadata, and monitored data. The IBM Cognos Business Intelligence configuration is stored in a separate IBM Cognos BI content store database named COGNOSCS. Profile creation assumes that both the MONITOR and COGNOSCS database are created in the same database instance.

You can use the same database user name for the MONITOR database and for the COGNOSCS database. Remember that the IBM Cognos BI creates its own content store tables in the schema of the provided user name when IBM Cognos BI first starts.

The MONITOR database is also used to store schemas for the following components during stand-alone profile creation:

- Business Space
- CEI messaging engine message store
- IBM Business Monitor messaging engine message store

If you are not using a stand-alone profile, you can use the same database or different databases for these components. In addition, the EVENT data store used by the CEI to persist Common Base Events is not required, and therefore is not created or enabled by default.

Multiple types of data are stored in the MONITOR database. When you create the IBM Business Monitor profile or run the database scripts, you create database tables that contain configuration data for IBM Business Monitor. Later, when each monitor model is installed, additional tables are created to store data for that monitor model. When events are processed, monitor model instance data is stored in these tables. The dashboards then refer to these tables.

Tip: In a network deployment environment, create the MONITOR and COGNOSCS databases before starting the deployment manager and creating other custom profiles.

► User registry considerations

The user registry stores information that is used to authenticate users requesting access to IBM Business Monitor. You can configure multiple user registry types under federated repositories. Most production deployments use a Lightweight Directory Access Protocol (LDAP) server.

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

- Federated Repositories
- Local operating system
- Standalone LDAP registry
- Standalone custom registry

Note: For fine-grained security, the supported user registries are federated repositories (file-based), federated repositories (LDAP), and standalone LDAP registry.

9.4 Installing the topology

To install the IBM Business Monitor server and all required components using the four-cluster deployment environment, use the following high-level steps:

- ▶ Complete the pre-installation steps found in 5.2, “Prerequisite steps” on page 85.
- ▶ Install IBM Business Monitor, similar to the steps in 5.3, “Installing the software” on page 88.
- ▶ Create a deployment manager profile using either the Profile Management Tool or the **manageprofiles** command, following the steps in 5.5, “Creating the profiles” on page 113, and 5.5.4, “Creating a process server dmgr profile” on page 117.
- ▶ Unless you created the MONITOR database as part of creating the profile, run the scripts to create the database, following the instructions in 5.4, “Database tables and schema creation” on page 107.
- ▶ Start the deployment manager.
- ▶ Create custom nodes that are federated into the deployment manager cell, following the steps in 5.5.5, “Creating process server custom profiles” on page 124, and 5.5.6, “Federating the process server custom profiles” on page 127.
- ▶ Create the deployment environment, choosing the Remote Messaging, Remote Support, and Web (four-cluster) pattern. Follow the steps in 7.3, “Configuring Deployment Environment topology” on page 208.
- ▶ Configure additional components such as Business Space and IBM Cognos BI.

9.5 Post-creation configuration

Because your IBM Business Monitor is installed in a different cell from the CEI event service, you must complete additional configuration steps to enable the communication between the cells.

9.5.1 Event Service Configuration across multiple cells

For secure environments, before performing this task, ensure that the following tasks have been completed:

- ▶ If security is enabled in either the remote or local cell, it must be enabled in both.
- ▶ If security is enabled, you must enable server-to-server trust (SSL) between the remote CEI server and the local IBM Business Monitor server. See:
http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/index.jsp?topic=/com.ibm.wbpm.mon.admin.doc/sec/cfg_ssl.html
- ▶ LTPA keys must be shared across cells and the cells must have the same ID. See:
http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/index.jsp?topic=/com.ibm.wbpm.mon.admin.doc/sec/ltpa_cfg.html
- ▶ The Use identity assertion setting must be enabled in the local cell and the remote cell. See:
http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/index.jsp?topic=/com.ibm.wbpm.mon.admin.doc/sec/identity_assertion.html

In a multiple-cell environment, where IBM Business Monitor is not installed on the remote cell that is emitting events, you must configure the deployment manager and CEI servers in the remote cell so that they can emit events to the tables. Process Server Version 7.0 and later provide the files needed to support remote event emission. The following steps assume that the cell emitting events is a Process Server Version 7.0 or later. If not, see the following resource for more instructions:

http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/index.jsp?topic=/com.ibm.wbpm.mon.imuc.doc/inst/cfg_qb_cross_cell.html

9.5.2 Event delivery configuration across multiple cells

As discussed in 9.2, “Event Delivery” on page 337, there are two options to receive events from a remote CEI event service:

- ▶ Table-based event delivery
- ▶ Queue-based event delivery

Configuration of table-based event delivery

In a multiple-cell environment, where IBM Business Monitor is not installed on the remote cell that is emitting events, you must configure the deployment manager and CEI servers in the remote cell so that they can emit events to the

tables. Process Server Version 7.0 and later provides the files needed to support remote event emission. The following steps assume that the cell emitting events is a WebSphere Process Server Version 7.0 or IBM Business Process Manager Version 7.5 or later cell.

Note: If the cell from which the events are being emitted is earlier than WebSphere Process Server Version 7.0, refer to the following Information Center article for more instructions:

http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/index.jsp?topic=/com.ibm.wbpm.mon.imuc.doc/inst/cfg_qb_cross_cell.html

To enable IBM Business Monitor to bypass the JMS queue and use the table-based method to receive events in a cross-cell environment, you must create a data source in the remote cell.

After following the instructions in 9.5.1, “Event Service Configuration across multiple cells” on page 342, run the **wbmConfigureQueueBypassDataSource** command on the remote deployment manager to create the data source. The **wbmConfigureQueueBypassDataSource** command creates the data source that enables the remote CEI server to send information to the IBM Business Monitor database. You must run the command on the remote deployment manager.

The data source name is `Monitor_<cell_name>__Routing_Database`, where `<cell_name>` is the name of the cell where IBM Business Monitor is installed.

For full instructions for setting up table-based event delivery, including the usage and parameters for the **wbmConfigureQueueBypassDataSource** command, refer to:

http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/index.jsp?topic=/com.ibm.wbpm.mon.ref.doc/ref/wsadmin_queue_bypass.html

Running **wbmConfigureQueueBypassDataSource** is the final configuration step. After you run this command and save the configuration changes, you must restart the remote deployment manager.

Configuration of bus for queue-based event delivery

To receive events from a JMS queue in a cross-cell environment see “Configuration of bus for queue-based event delivery” on page 351.



Advanced topics

This chapter discusses advanced topology topics. It contains the following sections:

- ▶ Overview
- ▶ Extending a topology
- ▶ Monitor topics

10.1 Overview

This chapter discusses advanced topology topics, such as the reasons for and implications of extending an existing topology, disaster recovery, and other advanced topics.

10.2 Extending a topology

Extending a topology refers to modifying an existing topology in order to expand the topology in some way.

10.2.1 Reasons to extend a topology

There are many reasons to consider expanding an existing topology. For example:

- ▶ Isolation
- ▶ Multi-tenancy
- ▶ Growth
- ▶ Resource constraints and performance
- ▶ Simplicity
- ▶ Performance

Isolation

One reason to expand your topology is to satisfy isolation requirements. These requirements might be for business reasons, or they might be for technical or operational reasons. For example, the new application set might be on a unique schedule for maintenance and updates, and that schedule might not be acceptable to the original application running on the original environment.

Another reason for isolation is that the new application set might be identified as not being well behaved. It is important to eliminate any risk of errors caused by the new application set from having an impact on the execution of the existing application sets.

In addition to logical cluster-only isolation, the new clusters can be created on separate hardware, allowing for dedication of physical machine capacity. Therefore, hardware isolation can be achieved also.

Another reason for isolation stems from functional necessity. The applications might have different functional requirements. There might be different

requirements for qualities of service, or the two application sets might have different characteristics/requirements for performance.

For example, suppose that an application set is deployed and that it does not make use of human tasks. Operations might not configure the Human Task Manager (HTM) because it is not required. Later, a second application set is to be deployed, but this second application set uses human tasks. Before the second application set can be deployed, either the original deployment target must be configured to host HTM or a new deployment target must be created and configured.

Another example would be using the same situation above, where the first set of applications consists only of microflows, and the second set of applications uses human tasks, and therefore consists of some macroflows. If the existing topology had been configured with just microflows in mind for performance reasons. Then deploying the second application set would be detrimental to the performance of the second application set, and its runtime characteristics might degrade performance of the first set.

Multi-tenancy

Multi-tenancy refers to the capability of one set of applications to serve multiple clients organizations (tenants). Multi-tenancy is contrasted with a multi-instance configuration where separate instances of the set of applications are set up for different client organizations. With a multi-tenant configuration, a set of applications virtually partitions its data and configuration, and each client organization works with a customized virtual instance of the set of applications. Isolation is a must for a multi-tenant configuration.

Growth

Another reason for expanding a topology is growth. Ultimately, there will be limits to the capacity of a single cluster, whether it is an application target cluster, a messaging engine cluster, or even a support or web cluster. If there are many applications deployed and they are running high volumes with many different large objects in memory, then the application target cluster might become resource constrained.

There might be some growth based on versioning of applications. If the old versions of the application remain while the new versions of the application are deployed, then the number of applications and destinations is increasing. This eventually leads to an overburdened situation. Overburdened situations bring us to another growth-related reason for using additional clusters to avoid a performance bottleneck.

Resource constraints and performance

Potential resource constraints might be a reason for expanding a topology. There are many resources that are being used by a system, such as runtime memory, native memory, CPU, databases, disks, and backend systems. Overburdened situations such as these create a performance bottleneck.

Runtime memory can become constrained if there are many applications deployed, running high volumes, with many large objects in memory, or even a combination of these. For example, a constraint might be caused by having too much static XSD type information. Or the underlying JVMs might spend too much time doing garbage collection because the heap is constrained or even fragmented (because of large objects).

Another resource constraint that should be avoided is overuse of a single set of database tables. For example, if there are many deployed Business Process Execution Language (BPEL) applications, and there are many process instances being started and tasks being claimed, then there is heavy utilization of the BPEDB tables. This heavy utilization could lead to a resource constraint on those database tables where access times to the tables increase.

Having many applications deployed might introduce contention on shared thread pools, database connection pools, or any other shared resource.

Simplicity

Another reason for expanding a topology is simplicity. Growing a topology by creating additional application deployment target and messaging target pairs is a repeatable and proven process:

1. Create the new clusters.
2. Configure each cluster.
3. Include settings for SIBus connectivity.

So as you implement additional application sets, each one receives a new application deployment target and messaging target pair. It is much easier to plan for messaging engine capacity and SIBus connectivity than it is to retrofit an existing topology.

10.2.2 Implications of extending a topology

Growing a topology by creating additional application deployment target and messaging target pairs is a simple choice. This path always provides a broadly capable level of functionality. Conversely, it is possible to grow the topology by creating only a new application deployment target and reusing an existing messaging target. Be aware that this alternate path is limited in the number of times that it can be repeated. Eventually there is a danger of overburdening the

single messaging target. Considering this, the decision to maintain a 1:1 ratio or to allow multiple application deployment targets to share a single messaging target is impacted by the amount of, and the level of isolation desired for, the messaging target.

10.2.3 Extending a topology with vertical or horizontal clustering

A common technique for improving performance is to clone the application target server. The theory is that if one server is good, two must be better.

IBM BPM 7.5 clustering comes in two flavors:

- ▶ Horizontal clustering
- ▶ Vertical clustering

Horizontal clustering

The first is the horizontal type that you are probably more familiar with. In this arrangement, a clone of the application target server is created on another node. The resulting set of equivalent servers (one on each node) is a traditional cluster. Horizontal capacity offers fault tolerance as a benefit. Because the cluster members are running on separate nodes, they are running on separate machines (at least logical machines and perhaps physical machines). In the case of a logical machine, this might still increase processor capacity. In the case of a physical machine, it definitely does.

Costs of horizontal clustering

There is extra overhead with any calls that must pass between the JVMs on two separate machines. Remember that there is a single Messaging Engine server that is active, so one of the servers will incur this extra overhead.

Often the benefit of increased hardware capacity and fault tolerance of horizontal clustering will outweigh the costs.

Vertical clustering

Similarly, you can create cluster members vertically, which means that multiple application target servers are created on the same node. Each cluster member can serve the same content just as in the horizontal cluster member case.

The ultimate goal of vertical clustering is to distribute the processing of the original cluster across two clusters, increasing performance or removing a resource constraint. This assumes that the node has the resource capacity to handle the additional servers. In addition, vertical clustering carries a cost. Vertical clustering is a good idea when the benefits outweigh the costs, and you have excess capacity at the node level.

Costs of vertical clustering

Vertical clustering means that there are more JVMs sharing the same resources and there will be more contention for processor resources. There is extra overhead with any calls that must pass between the JVMs. However, that would be incurred with either clustering method.

10.2.4 Extending the topology by adding new clusters

This section discusses extending the topology by adding new clusters.

Adding a WebSphere Enterprise Server Bus cluster

Sometimes you want to extend your topology to provide additional functionality. In this case, you want to extend an existing topology that does not have WebSphere Enterprise Server Bus (WESB) functionality, to include that functionality. One way to achieve this is to extend your current topology by adding a new cluster that is configured to use WESB.

Adding an additional WebSphere Application Server cluster

A common extension of topology is to extend it by adding new cluster members to handle pure WebSphere Application Server type applications, such as static or dynamic HTML web applications, or pure J2EE applications. To do this, add a new cluster that is configured as a basic WAS cluster.

10.2.5 Multi-cell and double Remote Messaging, Support, and Web topologies

For a number of reasons you might consider having more than one Remote Messaging, Support, and Web topology. In this situation you have two options to expand:

- ▶ A double Remote Messaging, Support, and Web topology: Two Remote Messaging, Support, and Web topologies within a single cell
- ▶ A multi-cell topology: Two distinct cells, each cell containing a Remote Messaging, Support, and Web topology

Multi-cell topology

A multi-cell topology is a topology that has two distinct cells each hosting a set of applications.

Double remote messaging, support, and web topology

Implementing a double Remote Messaging, Support, and Web topology will introduce some constraints, which need to be carefully evaluated. Doing this might require changes to your application, and translates not only into more administration effort, but also application code changes.

10.3 Monitor topics

This section discusses an advanced topic for monitor topologies, using queue-based event delivery.

Configuration of bus for queue-based event delivery

In a multiple-cell environment, where IBM Business Monitor is not installed on the remote cell that is emitting events, you must configure the deployment manager and CEI servers in the remote cell so that they can emit events to the IBM Business Monitor cell. IBM WebSphere Process Server Version 7.0 and later provides the files needed to support remote event emission. The following steps assume that the cell emitting events is IBM WebSphere Process Server Version 7.0 or later. If it is not, see the following website for more instructions:

http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/index.jsp?topic=/com.ibm.wbpm.mon.imuc.doc/inst/cfg_jms_cross_cell.html

To enable IBM Business Monitor to use the queue-based method of event delivery, you must install the cross-cell files, create the remote service integration bus, and create the link between the local and remote buses. Then follow the instructions in 9.5.1, “Event Service Configuration across multiple cells” on page 342.

From the `app_server_root/scripts.wbm/crossCell` directory of the IBM Business Monitor server installation, choose one of the methods below to run the service integration bus cross-cell configuration utility. For more information about this utility, see the related links above.

- ▶ Run the command interactively.
- ▶ Run the command using a properties file.

Interactively

To run the command interactively, use the `configRemoteMonitorBus.sh` or `configRemoteMonitorBus.bat` scripts.

Properties file

To run the command using a properties file, review the configRemoteMonitorBus.props file and change any necessary properties. The configRemoteMonitorBus.props file is an example properties file that is located in the app_server_root/scripts.wbm/crossCell directory, but you can create your own properties file for your configuration. Then execute the configRemoteMonitorBus.sh or configRemoteMonitorBus.bat scripts with the following properties:

```
configRemoteMonitorBus.sh -props properties_file_name
```

Where *properties_file_name* is the fully qualified name of the properties file that contains the required values for the configuration. The path to the properties file must be fully specified for the script to find the properties file.

The cross-cell configuration utility creates a service integration bus in the remote cell. The name of the bus is MONITOR.<remote_cell_name>.bus, where <remote_cell_name> is the name of the remote cell.

When the script completes, restart both the local IBM Business Monitor server and the remote server.

Following the steps in “Verification” on page 352 to verify that the remote service integration bus exists and that the link between the local and remote buses was created successfully.

Verification

After you have configured the IBM Business Monitor server to use the CEI server on a remote Process Server, you must verify that you successfully created the remote bus and service integration link.

To verify that the remote bus and the service integration bus link exist and are active, complete the following steps:

1. From the administrative console on the remote WebSphere Application Server or Process Server, click **Service Integration** → **Buses**.
2. Click the MONITOR.<cell_name>.bus bus that you are verifying, where <cell_name> is the name of the cell where the remote CEI server is installed.
3. Under Topology, click **Messaging Engines**. One messaging engine is defined. The Status field displays a green arrow if the messaging engine is active.

4. Click the messaging engine, and then click **Additional Properties** → **Service integration bus links**. If you are connecting the remote cell to a single monitor installation and a monitor installation to a single remote cell, one link is defined. You can, however, have more than one link. The Status field displays a green arrow if the link is active.
5. (Optional) To verify using the System.out log, look for a message similar to the following message:

CWSIP0382I: Messaging engine FADB84EB685E209F responded to
subscription request, Publish Subscribe topology now consistent

The messaging engine name is different for each machine.



Part 3

Appendixes



Additional material

This book refers to additional material that can be downloaded from the Internet as described in the following sections.

Locating the web material

The web material associated with this book is available in softcopy on the Internet from the IBM Redbooks web server. Point your web browser at:

<ftp://www.redbooks.ibm.com/redbooks/SG247976>

Alternatively, you can go to the IBM Redbooks website at:

ibm.com/redbooks

Select the **Additional materials** and open the directory that corresponds with the IBM Redbooks form number, SG247976.

Using the Web material

Create a subdirectory (folder) on your workstation, and extract the contents of the Web material .zip file into this folder.



B

Database design tool

This appendix describes the database design tool (DDT) and the database design file that it generates. This appendix also shows how you use DDT and presents examples.

Overview of database design tool

The database design tool is a command-line tool that generates or edits a database design file iteratively. The database design file is the main output of DDT. Therefore, the database design tool also generates the database script files. These files are created based on the properties of a database design file.

DDT can run iteratively or using command-line options.

When you create a database design file, you run DDT iteratively. DDT prompts you for the information necessary to create the database design file. For most inputs, DDT shows a default value. After you have entered all data, you can choose to exit and generate the database design file.

You can run DDT with the command-line options when you want to generate the database script files.

Overview of database design file

The database design file is generated by DDT and contains the definition of the database objects necessary to configure and run IBM Business Process Manager or IBM Business Monitor.

The database design file is a configuration file that can be used to:

- ▶ Provide database information during profile creation.
- ▶ Specify database configuration properties during deployment environment creation.
- ▶ Generate database script files that are used to create databases, tables, indexes, tablespaces, and other database objects.

The database design file is a text file with the configuration that you chose during the iterative execution of the DDT.

When creating a deployment environment, you use only one database design file for the entire process. This file is the only source for the either profile management tool (pmt), for the manageprofile command-line tool (manageprofile), and for the deployment environment wizard in the admin console. It is also used to generate the database script files. The use of this unique file simplifies configuration of the deployment environment, no matter the topology that you choose.

Using the database design tool

This section provides examples of using DDT. After it is created, the database design file can be changed manually by editing it or by using the DDT. To change the database design file using DDT, choose option 3 on the first option menu. You can also run DDT with the `-e` command-line option to automatically open a database design file and change it.

Note: The DDT does not perform the following tasks:

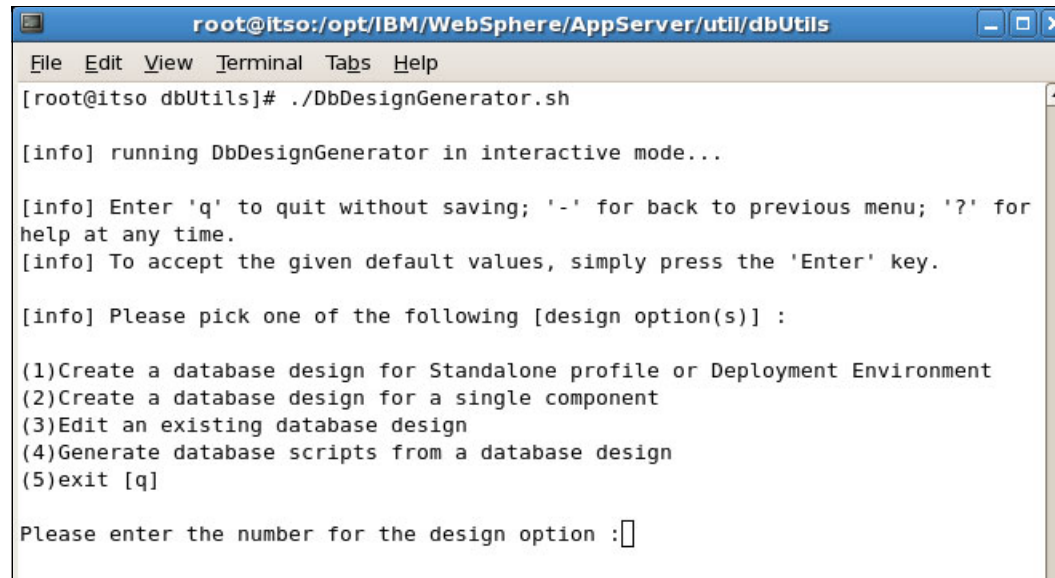
- ▶ It does not generate database scripts for the Common Event Infrastructure. The Common Event Infrastructure database scripts are created *after* the generation of the deployment environment.
- ▶ It does not generate a **create database** command for all database components (for example, the messaging engine database).

It does not generate a master script to execute all database scripts.

Creating a database design file

This section provides an example of how to create a database design file for a Process Server or Process Center dmgr profile.

1. Run the DDT, entering `<install_dir>/util/dbUtils/DbDesignGenerator.sh`.
Figure B-1 shows the initial options that you have when entering the DDT.



```
root@itso:/opt/IBM/WebSphere/AppServer/util/dbUtils
File Edit View Terminal Tabs Help
[root@itso dbUtils]# ./DbDesignGenerator.sh

[info] running DbDesignGenerator in interactive mode...

[info] Enter 'q' to quit without saving; '-' for back to previous menu; '?' for
help at any time.
[info] To accept the given default values, simply press the 'Enter' key.

[info] Please pick one of the following [design option(s)] :

(1)Create a database design for Standalone profile or Deployment Environment
(2)Create a database design for a single component
(3)Edit an existing database design
(4)Generate database scripts from a database design
(5)exit [q]

Please enter the number for the design option : 
```

Figure B-1 Starting DDT

2. We will create a new database design file for a deployment environment.
Choose option 1.

3. In Figure B-2 you can see the pattern options available. Choose option 1 to create the database config file for a network deployment topology for Process Server or Process Center.

```
Please enter the number for the design option :1

[info] Please pick one of the following [database pattern(s)] :

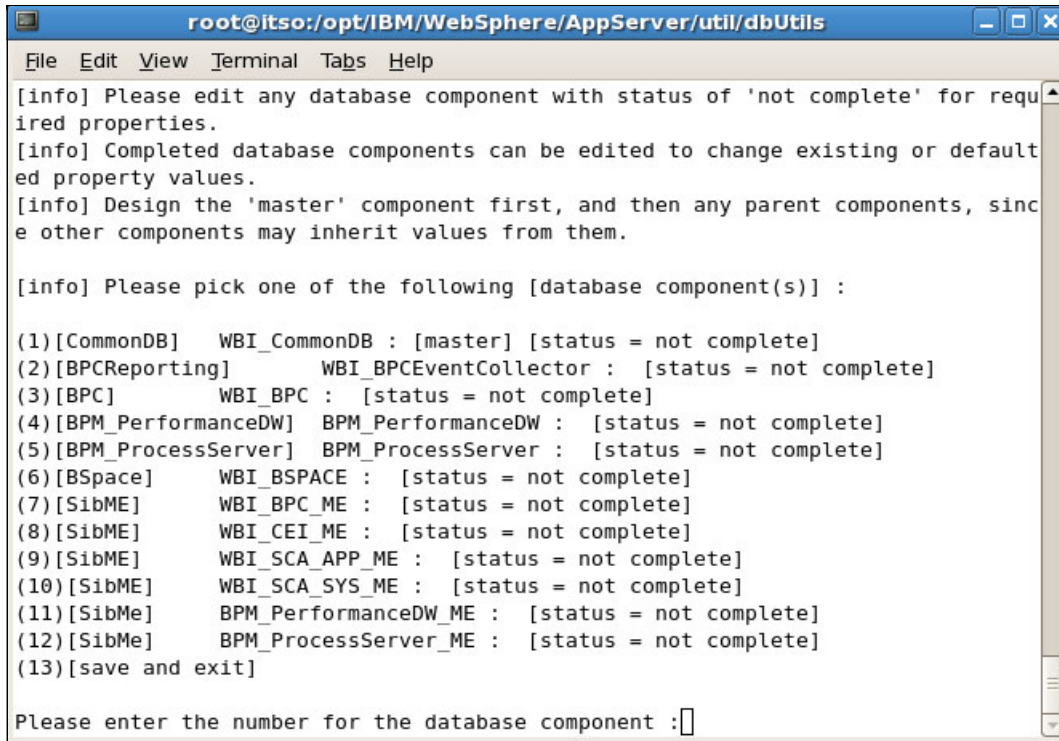
(1)bpm.advanced.nd.topology
(2)bpm.advanced.standalone
(3)bpm.standard.nd
(4)bpm.standard.standalone
(5)monitor.nd.topology
(6)monitor.standalone
(7)wesb.nd.topology
(8)wesb.standalone

Please enter the number for the database pattern :
```

Figure B-2 Database pattern options

4. The DDT shows all the database components for a deployment environment. Note that each database component has status information about whether it is completed. At this moment, all components have the status not complete.

Note also that the CommonDB component is listed as the master component (Figure B-3). This means that all other components inherit the configuration defined for the CommonDB. When you configure CommonDB, most properties will be defined for the other components.

A terminal window titled 'root@itso:/opt/IBM/WebSphere/AppServer/util/dbUtils' with a menu bar (File, Edit, View, Terminal, Tabs, Help). The window displays a series of informational messages and a list of database components. The messages state: '[info] Please edit any database component with status of 'not complete' for required properties.', '[info] Completed database components can be edited to change existing or default property values.', and '[info] Design the 'master' component first, and then any parent components, since other components may inherit values from them.' The list of components is as follows:
[info] Please pick one of the following [database component(s)] :
(1)[CommonDB] WBI_CommonDB : [master] [status = not complete]
(2)[BPCReporting] WBI_BPCEventCollector : [status = not complete]
(3)[BPC] WBI_BPC : [status = not complete]
(4)[BPM_PerformanceDW] BPM_PerformanceDW : [status = not complete]
(5)[BPM_ProcessServer] BPM_ProcessServer : [status = not complete]
(6)[Bspace] WBI_BSPACE : [status = not complete]
(7)[SibME] WBI_BPC_ME : [status = not complete]
(8)[SibME] WBI_CEI_ME : [status = not complete]
(9)[SibME] WBI_SCA_APP_ME : [status = not complete]
(10)[SibME] WBI_SCA_SYS_ME : [status = not complete]
(11)[SibMe] BPM_PerformanceDW_ME : [status = not complete]
(12)[SibMe] BPM_ProcessServer_ME : [status = not complete]
(13)[save and exit]
The prompt 'Please enter the number for the database component :' is followed by a cursor.

```
root@itso:/opt/IBM/WebSphere/AppServer/util/dbUtils
File Edit View Terminal Tabs Help
[info] Please edit any database component with status of 'not complete' for required properties.
[info] Completed database components can be edited to change existing or default property values.
[info] Design the 'master' component first, and then any parent components, since other components may inherit values from them.

[info] Please pick one of the following [database component(s)] :

(1)[CommonDB] WBI_CommonDB : [master] [status = not complete]
(2)[BPCReporting] WBI_BPCEventCollector : [status = not complete]
(3)[BPC] WBI_BPC : [status = not complete]
(4)[BPM_PerformanceDW] BPM_PerformanceDW : [status = not complete]
(5)[BPM_ProcessServer] BPM_ProcessServer : [status = not complete]
(6)[Bspace] WBI_BSPACE : [status = not complete]
(7)[SibME] WBI_BPC_ME : [status = not complete]
(8)[SibME] WBI_CEI_ME : [status = not complete]
(9)[SibME] WBI_SCA_APP_ME : [status = not complete]
(10)[SibME] WBI_SCA_SYS_ME : [status = not complete]
(11)[SibMe] BPM_PerformanceDW_ME : [status = not complete]
(12)[SibMe] BPM_ProcessServer_ME : [status = not complete]
(13)[save and exit]

Please enter the number for the database component : 
```

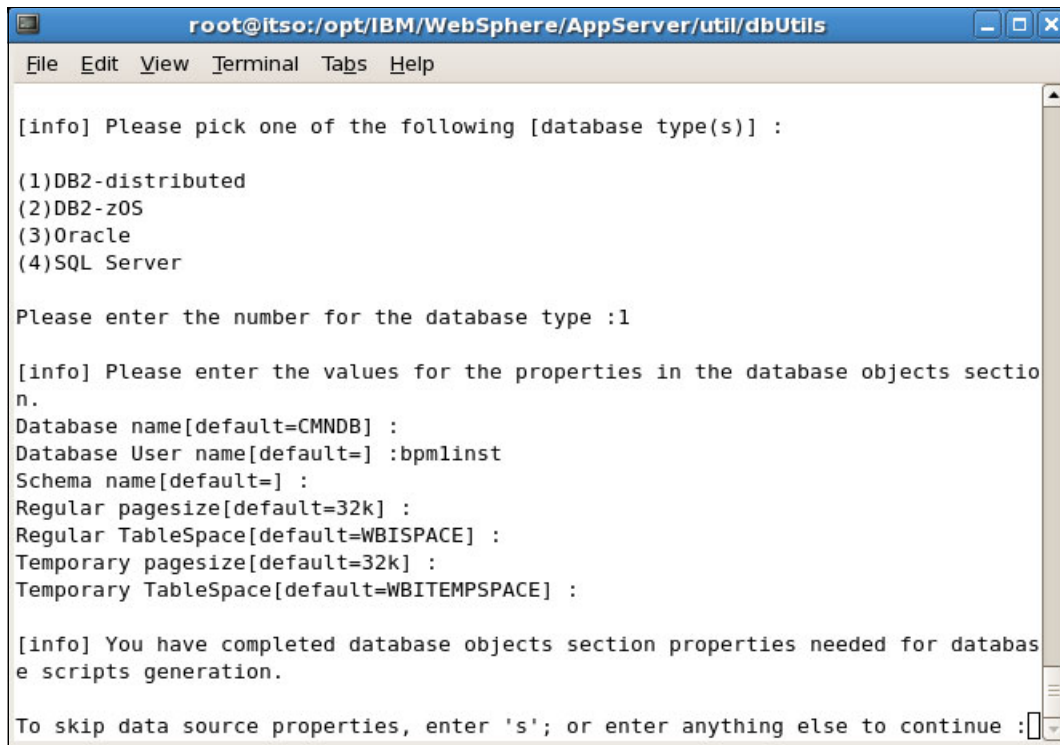
Figure B-3 Database components

5. After choosing the database component that you want to configure, you are presented with the databases types available (Figure B-4). In our example we choose DB2-distributed.

```
[status] WBI_CommonDB is not complete with 1 remaining item(s):  
[ 1 ] CommonDB.WBI_CommonDB : : DbType key is not set.  
  
Edit this database component? (y/n) [default=y] :y  
  
[info] Please pick one of the following [database type(s)] :  
  
(1)DB2-distributed  
(2)DB2-z05  
(3)Oracle  
(4)SQL Server  
  
Please enter the number for the database type :
```

Figure B-4 Database types

6. The next step is to define properties for the component and database type that you have chosen. You might have to provide a database name, user name, tablespace configuration, and so on. For the CommonDB in DB2 you must enter the properties shown in Figure B-5.



```
root@itso:/opt/IBM/WebSphere/AppServer/util/dbUtils
File Edit View Terminal Tabs Help

[info] Please pick one of the following [database type(s)] :

(1)DB2-distributed
(2)DB2-zOS
(3)Oracle
(4)SQL Server

Please enter the number for the database type :1

[info] Please enter the values for the properties in the database objects section.
Database name[default=CMNDB] :
Database User name[default=] :bpmlinst
Schema name[default=] :
Regular pagesize[default=32k] :
Regular TableSpace[default=WBI SPACE] :
Temporary pagesize[default=32k] :
Temporary TableSpace[default=WBITEMPSPACE] :

[info] You have completed database objects section properties needed for database scripts generation.

To skip data source properties, enter 's'; or enter anything else to continue : 
```

Figure B-5 Properties for CommonDB in a DB2 database

7. The last configuration that DDT prompts you for are the data source values.
Figure B-6 shows the configuration that we used for our lab.

```
[info] You have completed database objects section properties needed for database scripts generation.

To skip data source properties, enter 's'; or enter anything else to continue :

[info] Please pick one of the following [database provider(s)] :

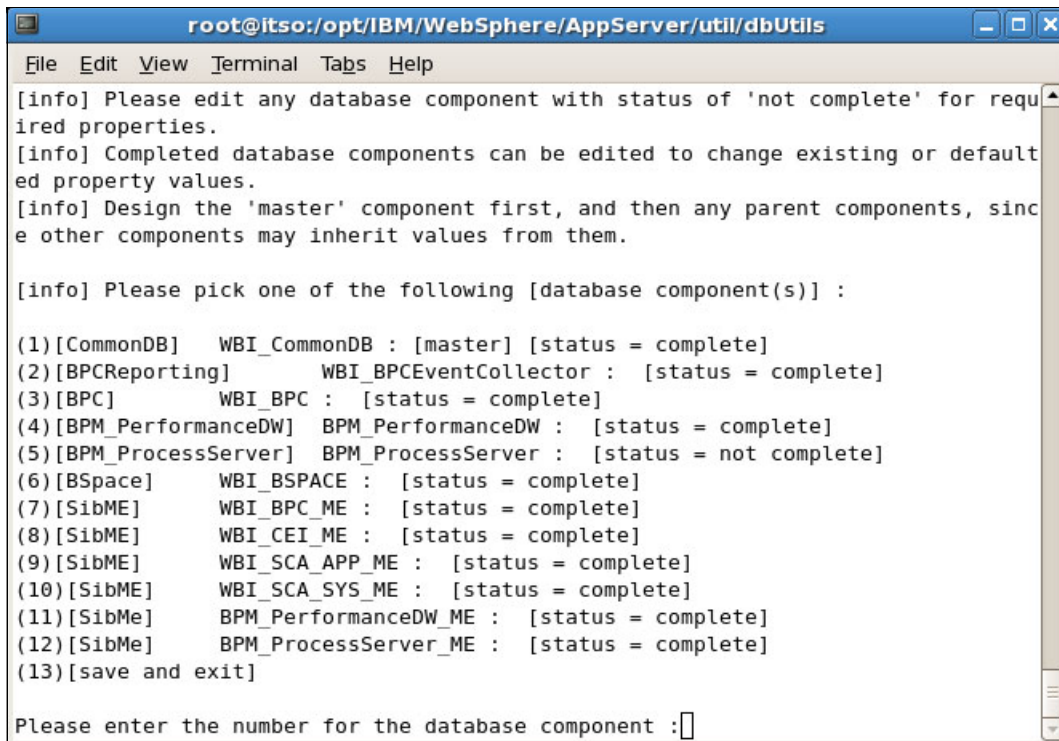
(1)DB2 Universal JDBC Driver Provider # XA data source # DB2 Universal JDBC Driver Provider (XA)
(2)DB2 Using IBM JCC Driver # XA data source # DB2 Using IBM JCC Driver (XA)

Please enter the number for the database provider :1

[info] Please enter the values for the properties in the data source properties section.
Database server host[default=] :db2itso.itso.ral.ibm.com
Database server port[default=50000] :
Data source user name[default=bpmlinst] :
Data source password[default=] :itso4you
DB2 Universal JDBC driver path[default=${WAS_INSTALL_ROOT}/jdbcdrivers/DB2] :
Universal JDBC driver path[default=${WAS_INSTALL_ROOT}/jdbcdrivers/DB2] :
```

Figure B-6 Datasource configuration

8. DDT presents you with the main menu after you have gone through all steps to configure the CommonDB component. As this component is the master one, the other components inherit its properties. So, as you see in Figure B-7, almost all components are marked with the status complete.



```
root@itso:/opt/IBM/WebSphere/AppServer/util/dbUtils
File Edit View Terminal Tabs Help
[info] Please edit any database component with status of 'not complete' for required properties.
[info] Completed database components can be edited to change existing or default property values.
[info] Design the 'master' component first, and then any parent components, since other components may inherit values from them.

[info] Please pick one of the following [database component(s)] :

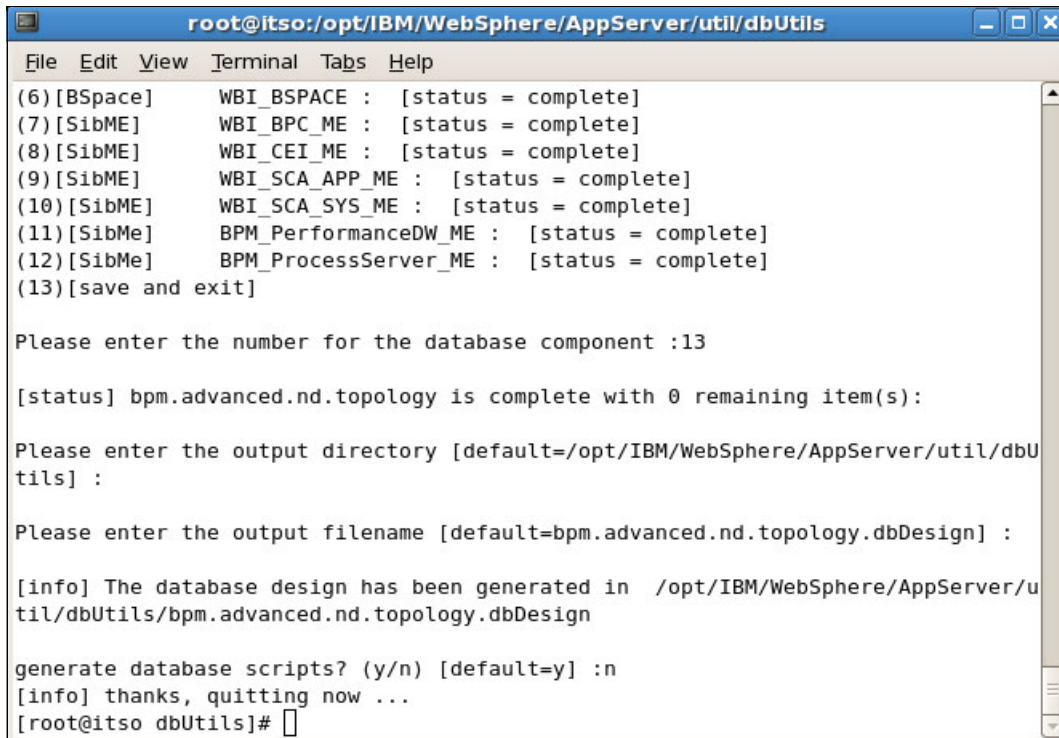
(1)[CommonDB]    WBI_CommonDB : [master] [status = complete]
(2)[BPCReporting] WBI_BPCEventCollector : [status = complete]
(3)[BPC]         WBI_BPC : [status = complete]
(4)[BPM_PerformanceDW] BPM_PerformanceDW : [status = complete]
(5)[BPM_ProcessServer] BPM_ProcessServer : [status = not complete]
(6)[BSpace]      WBI_BSPACE : [status = complete]
(7)[SibME]       WBI_BPC_ME : [status = complete]
(8)[SibME]       WBI_CEI_ME : [status = complete]
(9)[SibME]       WBI_SCA_APP_ME : [status = complete]
(10)[SibME]      WBI_SCA_SYS_ME : [status = complete]
(11)[SibMe]      BPM_PerformanceDW_ME : [status = complete]
(12)[SibMe]      BPM_ProcessServer_ME : [status = complete]
(13)[save and exit]

Please enter the number for the database component : 
```

Figure B-7 Main menu

9. You must configure all the components until they show the status complete. To do this, choose each component showing a status of not complete and complete its configuration.
10. If you need to change any property of a component that is completed or not, choose it from the menu and go through the configuration steps again. The default properties shown this time are those that you entered in the previous step.

11. After you configured all components, create the database design file. Choose the **Save and exit** option. You are prompted with the path and name for the database design file.



```
root@itso:/opt/IBM/WebSphere/AppServer/util/dbUtils
File Edit View Terminal Tabs Help
(6)[Bspace]      WBI_BSPACE : [status = complete]
(7)[SibME]       WBI_BPC_ME  : [status = complete]
(8)[SibME]       WBI_CEI_ME  : [status = complete]
(9)[SibME]       WBI_SCA_APP_ME : [status = complete]
(10)[SibME]      WBI_SCA_SYS_ME : [status = complete]
(11)[SibMe]      BPM_PerformanceDW_ME : [status = complete]
(12)[SibMe]      BPM_ProcessServer_ME : [status = complete]
(13)[save and exit]

Please enter the number for the database component :13

[status] bpm.advanced.nd.topology is complete with 0 remaining item(s):

Please enter the output directory [default=/opt/IBM/WebSphere/AppServer/util/dbUtils] :

Please enter the output filename [default=bpm.advanced.nd.topology.dbDesign] :

[info] The database design has been generated in /opt/IBM/WebSphere/AppServer/util/dbUtils/bpm.advanced.nd.topology.dbDesign

generate database scripts? (y/n) [default=y] :n
[info] thanks, quitting now ...
[root@itso dbUtils]#
```

Figure B-8 Saving and exiting DDT

12. You can generate the database scripts file at this point by entering y. We choose not to explicitly generate the database scripts in the following sections.

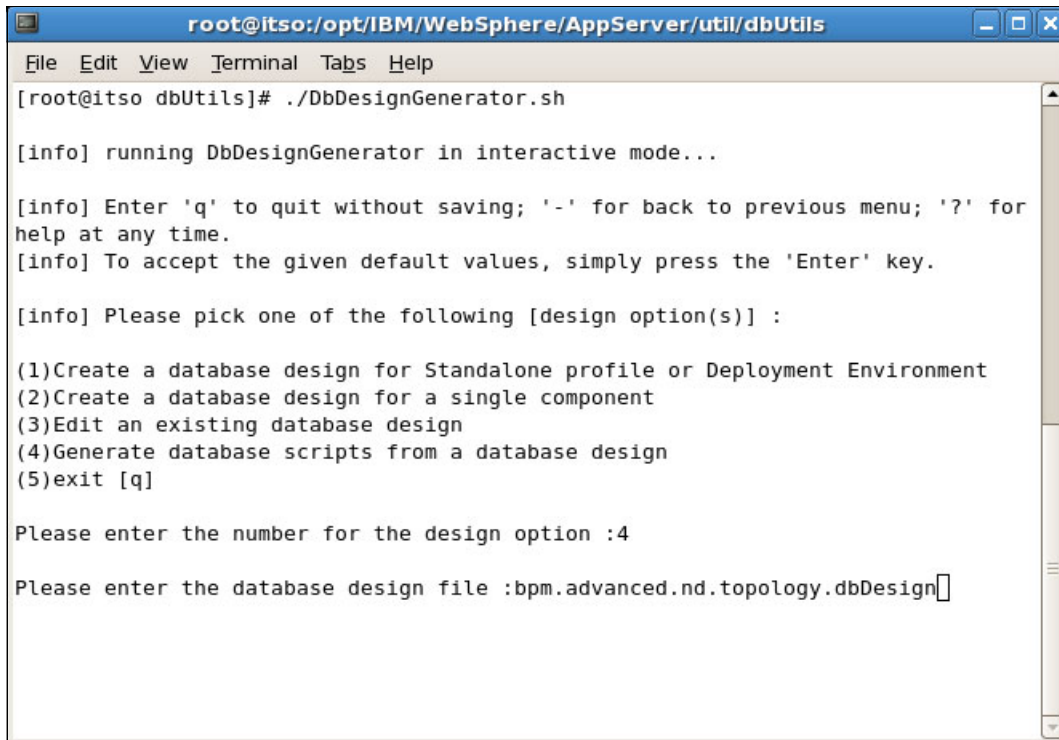
Generating the database scripts

There are two ways to generate the database scripts after you have created the database design file. We can create them iteratively or directly using the command line with options.

Generating the database scripts iteratively

This section shows how to generate the database scripts files iteratively.

1. Run the DDT, entering `<install_dir>/util/dbUtils/DbDesignGenerator.sh`.
2. Choose option 4 to generate the database scripts from a database design file and then enter the database design file name (Figure B-9).



```
root@itso:/opt/IBM/WebSphere/AppServer/util/dbUtils
File Edit View Terminal Tabs Help
[root@itso dbUtils]# ./DbDesignGenerator.sh

[info] running DbDesignGenerator in interactive mode...

[info] Enter 'q' to quit without saving; '-' for back to previous menu; '?' for
help at any time.
[info] To accept the given default values, simply press the 'Enter' key.

[info] Please pick one of the following [design option(s)] :

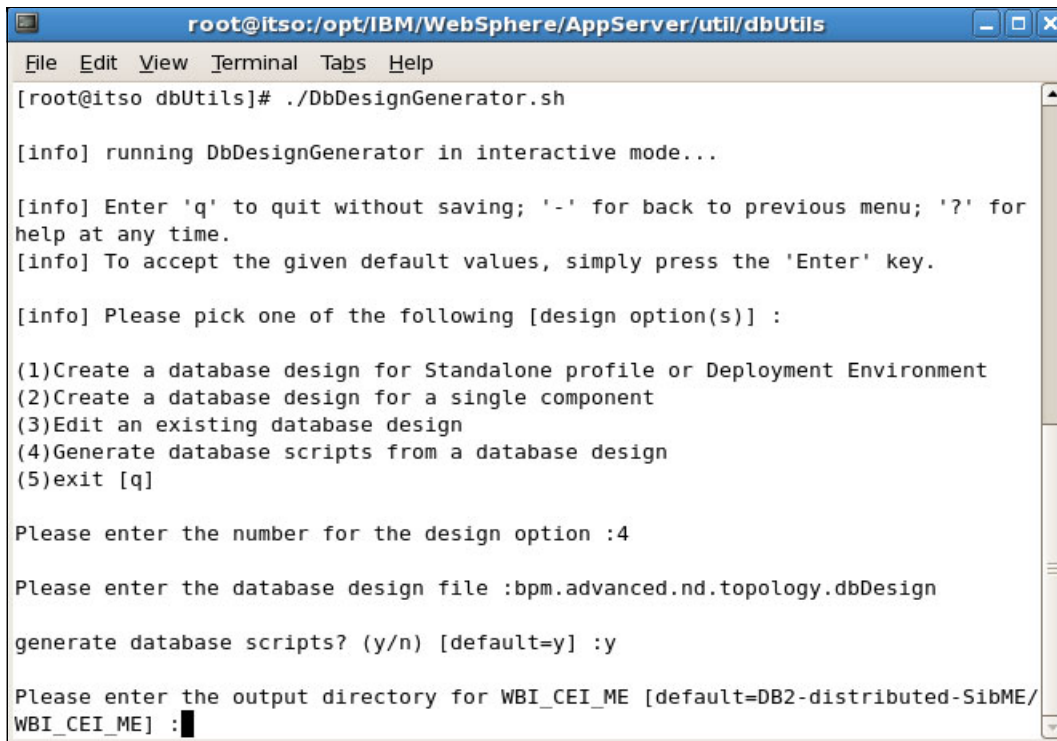
(1)Create a database design for Standalone profile or Deployment Environment
(2)Create a database design for a single component
(3)Edit an existing database design
(4)Generate database scripts from a database design
(5)exit [q]

Please enter the number for the design option :4

Please enter the database design file :bpm.advanced.nd.topology.dbDesign
```

Figure B-9 Generating script files iteratively

3. DDT opens the database design file and validates its content. If it is okay, DDT prompts you to create the database scripts (Figure B-10).



```
root@itso:/opt/IBM/WebSphere/AppServer/util/dbUtils
File Edit View Terminal Tabs Help
[root@itso dbUtils]# ./DbDesignGenerator.sh

[info] running DbDesignGenerator in interactive mode...

[info] Enter 'q' to quit without saving; '-' for back to previous menu; '?' for
help at any time.
[info] To accept the given default values, simply press the 'Enter' key.

[info] Please pick one of the following [design option(s)] :

(1)Create a database design for Standalone profile or Deployment Environment
(2)Create a database design for a single component
(3)Edit an existing database design
(4)Generate database scripts from a database design
(5)exit [q]

Please enter the number for the design option :4

Please enter the database design file :bpm.advanced.nd.topology.dbDesign

generate database scripts? (y/n) [default=y] :y

Please enter the output directory for WBI_CEI_ME [default=DB2-distributed-SibME/
WBI_CEI_ME] :
```

Figure B-10 Generating the database scripts

4. For each component, DDT prompts for the output directory. The directory that you choose will contain one or more database script files.
5. After the files of the last component are generated, DDT quits.

Generating the database scripts using a command line

You can generate the database script files running DDT with the -g option. When using the -g option, you must specify the name of the database design file. The DDT syntax with the -g option is:

```
./DbDesignGenerator.sh -g <dbDesign_file> [-d <generate_dir>]
```

The -d option defines the directory to generate the database script files (Example B-1). If you omit the -d option, DDT uses the current directory.

Example B-1 Generating database script files with the -g option

```
./DbDesignGenerator.sh -g bpm.advanced.nd.topology.dbDesign
[info] running DbDesignGenerator in generating mode...
[info] The script(s) have been generated in
/opt/IBM/WebSphere/AppServer/util/dbUtils/DB2-distributed-SibME/WBI_CEI
_ME
[info] The script(s) have been generated in
/opt/IBM/WebSphere/AppServer/util/dbUtils/DB2-distributed-BPM_ProcessSe
rver

. . .

[info] The script(s) have been generated in
/opt/IBM/WebSphere/AppServer/util/dbUtils/DB2-distributed-CommonDB
[info] thanks, quitting now ...
```

Using the database design file

The database design file is used to create the database scripts file running DDT. It can also be used to create a dmgr profile and deployment environment.

The following examples show how to use the database design file.

Creating a profile with PMT

When using the profile management tool (pmt) to create a dmgr profile, you can use a database design file. During the wizard's steps, you can use a database design file generated with DDT. Figure B-11 shows the pmt step where you select the database design file generated by DDT.

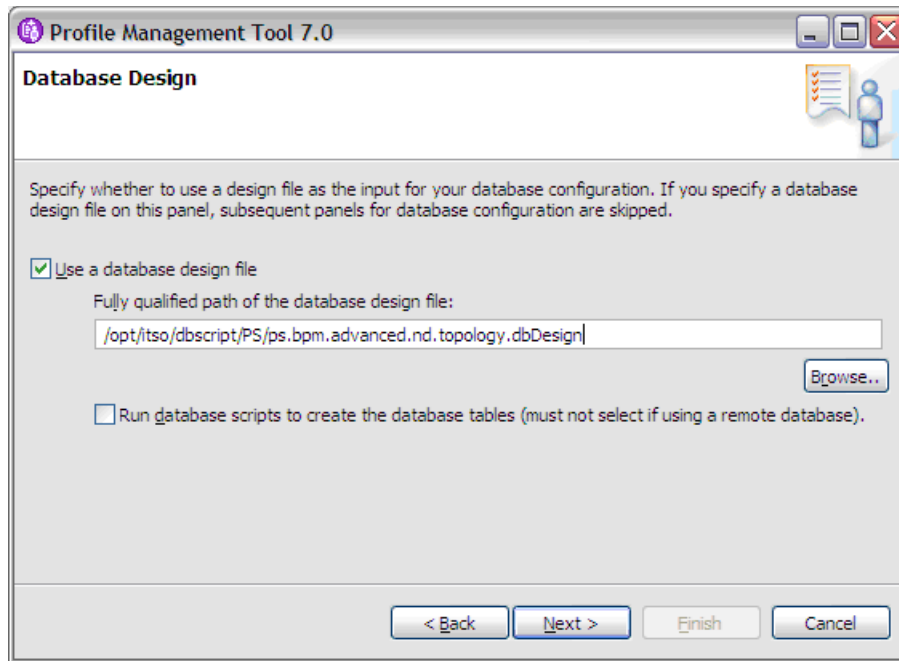


Figure B-11 Selecting the database design file in PMT

Creating a profile with manageprofile

The database design file can be used to create a dmgr profile using the manageprofile tool:

```
./manageprofiles.sh -create -templatePath <TemplateLocation>  
-wbidbDesign pc.bpm.advanced.nd.topology.dbDesign
```

Creating a deployment environment with the admin console

The same database design file is used during the deployment environment wizard to define the database properties (Figure B-12).

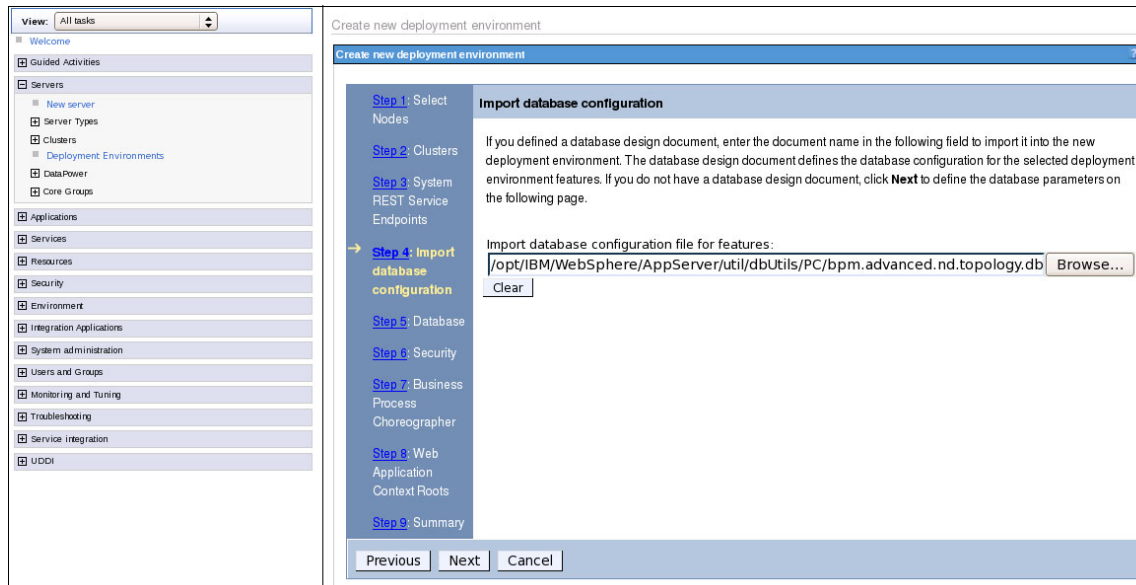


Figure B-12 Using the database design file during deployment environment creation

Quick reference

This section provides a quick reference for the database design tool:

- ▶ DDT location and command:
`<install_dir>/util/dbUtils/DbDesignGenerator.sh`
- ▶ DDT options are:
 - e `<db_design_file>`
to edit a previous created database design file
 - g `<db_design_file> [-d <output_directory>]`
to generate the database design scripts using the
`<db_design_file>` information
 - v `<db_design_file>`
to validate the `<db_design_file>`

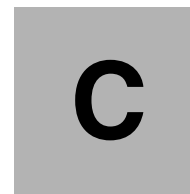
-?

to show the DDT options

- Database design file name created by DDT:

<file_name>.dbDesign

- The database design file is used to:
 - Generate the database scripts files using DDT.
 - Create a DMGR profile using `pmt.sh(bat)` or `manageprofile.sh(bat)`.
 - Create a deployment environment using the admin console.



Configuring IBM Business Process Manager V7.5 configuration settings

This appendix describes and includes samples for the IBM Business Process Manager V7.5 server configuration files that determine the settings applied to a IBM Business Process Manager V7.5 Environment. It includes the following topics:

- ▶ Configuration file overview and explanation
- ▶ Scope of configuration settings and dependencies
- ▶ Configuration file details
- ▶ Overriding configuration settings
- ▶ Examples

The configuration files contain a specific variant or dialect of eXtensible Markup Language (XML) used to parameterize, set, and expose configuration settings for the Business Process Modelling Notation (BPMN) components of all IBM Business Process Manager V7.5 editions. These Business Process Modelling Notation configuration settings are managed by configuration, usually by manually creating and editing custom override configuration XML files, for example, 100Custom.xml, 101CustomSMTP.xml, and so on. They are not managed from within the Business Process Manager web-based administration console or

the IBM WebSphere Application Server Version 7.0 web-based administration console.

For more information, refer to the following resources:

- ▶ Managing IBM Process Servers
http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/topic/com.ibm.wbpm.admin.doc/adminguide/topic/managing_process_servers.html
- ▶ Teamworks Config File Overview and Explanation technote
<http://www-01.ibm.com/support/docview.wss?uid=swg21439614>
- ▶ Enhance your 100Custom.xml
<http://wiki.lombardi.com/display/commwiki/Enhance+your+100Custom.xml>
- ▶ Search IBM documentation for 100Custom.xml
<http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/advanced/searchView.jsp?searchWord=100custom.xml&maxHits=500&group=None>

Configuration file overview and explanation

There are a number of areas in which the IBM Business Process Manager V7.5 product configuration settings are managed. Usually, the tool used to manage the relevant configuration settings has a direct relationship to where the configuration settings are applied (Figure C-1).

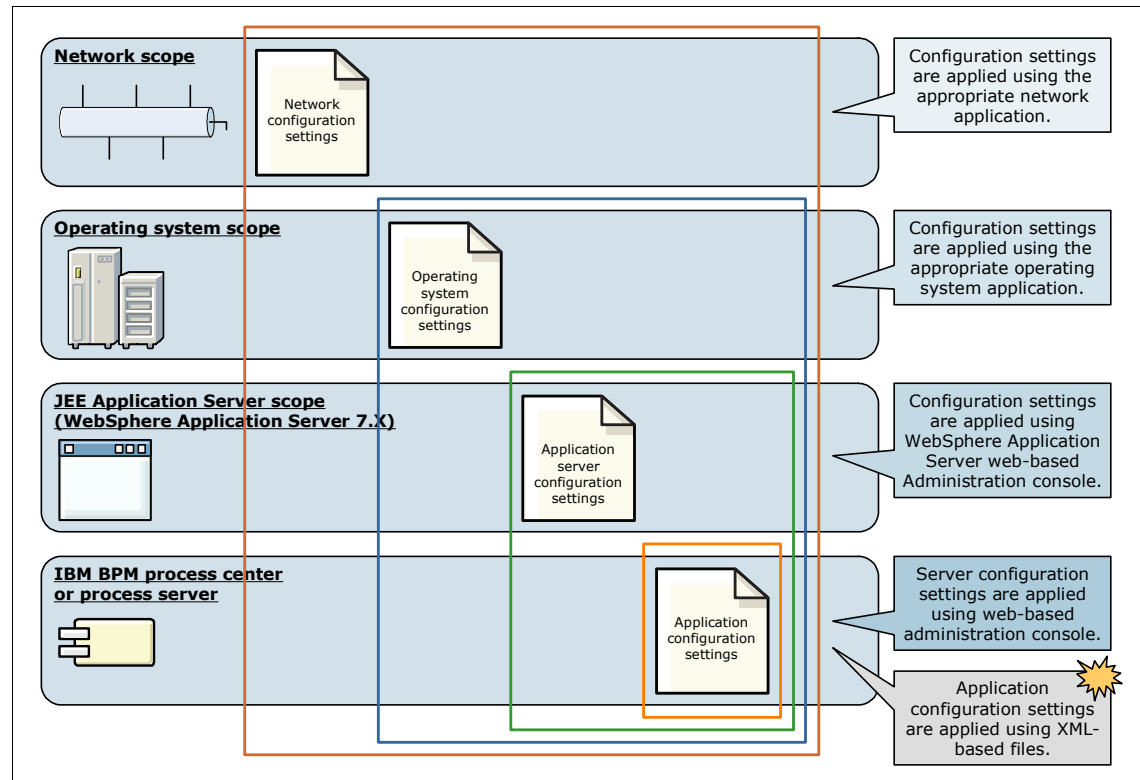


Figure C-1 Configuration settings scope

Scope of configuration settings and dependencies

This section describes the scope of various configuration settings and where they are managed to put the configuration override XML file into context.

Network-specific configuration dependencies and settings

The network configuration dependencies are set up using the appropriate network management tools. The settings that can affect the installation and management of the IBM Business Process Manager V7.5 product include:

- ▶ Load balancer settings
- ▶ Virtual IP (VIP) address settings
- ▶ Domain Name System (DNS) settings

The relevant IBM Business Process Manager V7.5 configuration settings are managed using the configuration override XML file, 100 Custom.xml. See “Overriding configuration settings” on page 386 for more details.

Operating system specific configuration dependencies and settings

For the target operating system (that is, Windows, Linux, AIX®, and so on), the configuration dependencies are set up using the appropriate operating system management tools. The settings that can affect the installation and management of the IBM Business Process Manager V7.5 product include:

- ▶ Creating, stopping, and starting Windows Services
- ▶ User account environment variable used for the temporary directory

The relevant IBM Business Process Manager V7.5 configuration settings are managed using the configuration override XML file, 100 Custom.xml. See “Overriding configuration settings” on page 386 for more details.

Java Platform, Enterprise Edition Application Server specific configuration dependencies and settings

The Java Platform, Enterprise Edition (JEE) application server being used is IBM WebSphere Application Server Version 7.0 and usually provides a number of enterprise Java services, also known as container-based services. See the following references for details of the Java Platform, Enterprise Edition Application Server specification and WebSphere Application Server 7.0 in particular:

- ▶ JSR 316: Java Platform, Enterprise Edition 6 (Java EE 6) Specification
<http://www.jcp.org/en/jsr/detail?id=316>
- ▶ IBM WebSphere Application Server Version 7.0 online documentation
<http://publib.boulder.ibm.com/infocenter/wasinfo/v7r0/index.jsp>

JEE application server configuration settings for IBM WebSphere Application Server Version 7.0 are primarily accomplished by using the product-supplied web-based administration console. The enterprise services that are provided and that can affect the installation and management of IBM WebSphere Application Server Version 7.0 include:

- ▶ Java Database Connectivity (JDBC) datasources and connection pooling
- ▶ Java Messaging Service (JMS) queues and connection factories
- ▶ Java Transaction API (JTA)
- ▶ Java API for XML (JAX)

Business Process Modelling Notation engine specific configuration settings

The Business Process Modelling Notation engine can also use Java-based services provided directly by the IBM Business Process Manager V7.5 product by applying configuration settings defined using XML files. That is, the 100Custom.xml configuration overrides the XML file used to configure the following items:

- ▶ Business Process Modelling Notation engine temporary directory.
- ▶ Simple Mail Transfer Protocol (SMTP) server to use for sending or relaying generated email for user task notification.
- ▶ For the Process portal, generate target load balancer Uniform Resource Locators correctly for Business Process Diagram (BPD) coaches, Process Portal Uniform Resource Locators (URLs), Process Task Uniform Resource Locators (URLs), task e-mails, XML namespaces, and so on.

For Business Process Manager, the default XML configuration files located in the <Business Process ManagerInstallation Directory>/<Process Center or Process Server profile configuration directory>/config directory are created during installation of the product and are loaded in numerical name order.

The directory path location of the configuration XML files depends on whether you have installed a stand-alone server environment, a clustered network deployment environment, or a single server network deployment environment, as shown below:

- For a stand-alone server configuration:

```
<stand-alone-profile-root>\config\cells\<cell-name>\nodes\<stand-alone-node-name>\servers\<server-name>\process-server\config
```

- For a network deployment cluster configuration:

- In the network deployment Process Server cluster:

```
<DMGR-profile-root>\config\cells\<cell-name>\clusters\<cluster-name>\process-server\config
```

- Each Process Server cluster member at:

```
<DMGR-profile-root>\config\cells\<cell-name>\nodes\<custome-node-name>\servers\<cluster-member-name>\process-server\config
```

- For a network deployment single server configuration:

```
<DMGR-profile-root>\config\cells\<cell-name>\nodes\<custome-node-name>\servers\<server-name>\process-server\config
```

The standard files are loaded in the following order:

1. ./config/system/00Static.xml
2. ./config/system/50AppServer.xml
3. ./config/system/60Database.xml
4. ./config/system/80EventManager.xml
5. ./config/system/98Database.xml
6. ./config/system/99Local.xml
7. ./config/system/99Sharepoint.xml
8. ./config/100Custom.xml

These files are merged to produce the overall configuration used by either a Process Center or a Process Server. See Chapter 4, “Process Center and Process Server concepts” on page 59, for full details of Process Center and Process Server components of Business Process Manager.

The full and final configuration space is written to the TeamWorksConfiguration.running.xml file after it is merged and loaded from the various individual configuration files at startup time. The TeamWorksConfiguration.running.xml file shows the actual configuration values

applied from merging all of the xml config files present in the `./config/` directory on the target running Process Center or Process Server. See Figure C-2 for a high-level breakdown of server components.

Note: Currently, the contents and XML configuration settings within `TeamWorksConfiguration.running.xml` do not have fully documented references. Information is spread across technotes, wiki pages, and so on. Changes to the configuration can be requested by IBM support or services, and this section should facilitate those sort of configuration update activities.

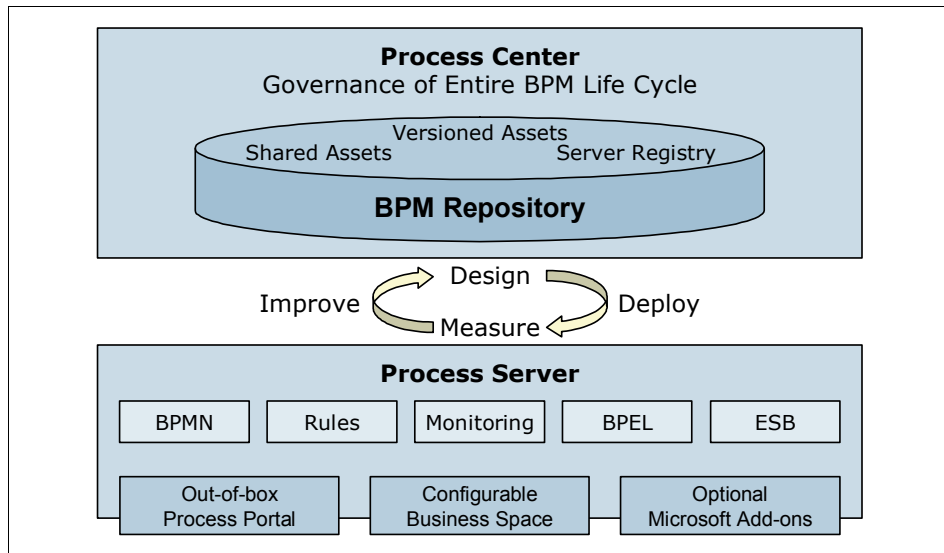


Figure C-2 Business Process Manager server components

The rest of this appendix focuses on details regarding the use, editing, and settings configured in the `100Custom.xml` configuration override file and examples.

Configuration file details

By default, the first time that a configuration element is loaded from a Business Process Manager configuration XML file, it will be present in the final generated configuration. For example, if both `99Local.xml` and `100Custom.xml` contain the configuration XML tag `<environment-name>`, then the configuration XML tag in `99Local.xml` will be the final version, unless the merge attribute is set to replace it in `100Custom.xml`. The actual mechanics for overriding previously set configuration settings are detailed later in this section.

Custom configuration override XML files are designed to hold the configuration customizations, overrides, and changes that are made to any part of the IBM Business Process Manager V7.5 configuration space (for example, `100Custom.xml`). These are merged from the individual configuration files into the final `TeamWorksConfiguration.running.xml` configuration file that details the configuration settings used.

It is suggested that you use custom configuration override XML files (for example, `100custom.xml`) for configuration overrides, as opposed to directly editing the XML onfiguration files generating during the product installation.

Note: See “Managing IBM Business Process Manager configuration settings” for more details:

http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/index.jsp?topic=/com.ibm.wbpm.admin.doc/adminguide/topic/managing_twks_config_settings.html

If a brand new install of IBM Business Process Manager V7.5 is performed, simply apply a corresponding, existing `100Custom.xml` for that version and all the changes that have been made will be applied and used, overriding the current configuration values.

This is the suggested approach to use for overriding the default installation configuration. If for any reason a reinstall is required or any existing configuration settings in the individual default configuration files need to be updated, these configuration changes should be applied using the `100Custom.xml` configuration override file, as this is self-documenting, and also ensures consistent application of the required changes.

For example, any additional columns or views for your Process Portal task manager should be placed in the `100Custom.xml` configuration override file. Any changes to default values, such as your system lane user, should also be made in the `100Custom.xml` file.

It is possible to have separate custom configuration override XML files for a set of configuration settings that are related to a specific function, for example, 101CustomSMTP.xml to override relevant SMTP configuration settings and 102CustomLoadbalancer.xml to override relevant Load balancer configuration settings. Ensure that the filename used for the custom configuration override XML file is unique and preceded by a numerical increment, one higher than the lowest custom configuration file. For example, because 100Custom.xml already exists, the next file could be 101CustomSMTP.xml, then 102CustomLoadbalancer.xml, and so on.

Tip: When moving to a new version of the software, always review the configuration changes applied using the current custom configuration override files. This review check point ensures that the current configuration overrides being applied are still relevant for the new version. For example, some of the default settings or database queries that you use to customize the Process Portal task manager might change between releases or even fix pack. Other configuration override settings might no longer apply.

Backing up existing config files

It is always a good practice to use an XML file editor that validates XML documents and make a backup copy of any files you are editing. But these configuration XML files are one area in which some caution must be exercised when making backup copies. Specifically, always change the extension from .xml when backing up these files.

All of the files in the [IBM Business Process Manager V7.5 Installation Directory]/[IBM Business Process Manager V7.5 Component Server Directory]/config directory that have the .xml file extension are loaded by IBM Business Process Manager V7.5 upon startup. These configuration XML files are loaded in the following order:

1. Files starting with letters are loaded first.
2. Files starting with numbers in numerical order are loaded next. For example, if you have the following configuration of XML files in the [IBM Business Process Manager V7.5 Installation Directory]/[IBM Business Process Manager V7.5 Component Server Directory]/config directory, they will be loaded in the order shown below:
 - a. ./config/system/Copy of 99Local.xml
 - b. ./config/system/00Static.xml
 - c. ./config/system/50AppServer.xml
 - d. ./config/system/60Database.xml
 - e. ./config/system/80EventManager.xml

- f. `./config/system/98Database.xml`
- g. `./config/system/99Local.xml`
- h. `./config/100Cusom.xml`

This means that any settings in the Copy of `99Local.xml` will take effect and any settings in the `99Local.xml` will be ignored (except for elements including the `merge=replace` attribute, as noted above).

Tip: Ensure that a different extension, like `.bak`, is used when backing up configuration XML files.

Overriding configuration settings

For Business Process Manager, there are two types of server components:

- ▶ Process Center (PCS) or Process Server (PSS)
- ▶ Performance Data Warehouse (PDW)

There are four types of Business Process Manager environments that can be set up:

- ▶ Development Process Center
- ▶ Test Runtime Process Server
- ▶ Stage Runtime Process Server
- ▶ Production Runtime Process Server

For the Business Process Manager, there are configuration overrides that apply based on the following scope:

- ▶ Server component type (that is, either a Process Center or a Process Server)
- ▶ System Environment (that is, development, test, staging, or production)
- ▶ Business Process Manager environment

See Chapter 4, “Process Center and Process Server concepts” on page 59, for details.

The following section describes the configuration overrides, and applies and provides examples.

For a Process Center or Process Server component, the configuration XML file has the high-level structure shown in Figure C-3.

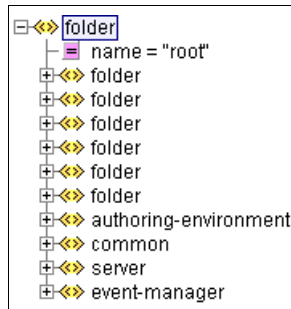


Figure C-3 Process Center or Process Server configuration XML file structure

For a Performance Data Warehouse (PDW) component, the configuration XML file has the high-level structure shown in Figure C-4.



Figure C-4 Performance Data Warehouse (PDW) configuration XML file structure

The 100Custom.xml configuration XML override file is used to replace existing, extend existing, or add new configuration settings. The 100Custom.xml configuration XML has the high-level structure shown in Figure C-5.

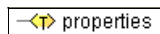


Figure C-5

Figure C-5 just shows an empty <properties> configuration XML tag. All other configuration XML tags to be contained within the <properties> tag should be valid XML tags that will override or extend existing configuration XML tags, achieved by using the merge attribute.

Using the merge attribute

When loading or replacing values via the 100Custom.xml configuration override file, careful consideration needs to be taken when selecting the appropriate merge setting to use for each configuration XML tag element. For each defined configuration XML tag element, the merge attribute supports the following values:

- ▶ **append**

This appends the newly defined configuration XML tag element.

- ▶ **mergeChildren**

This merges the new newly defined configuration XML tag element with the first of any existing ones. This is the default behavior. The mergeChildren attribute is supposed to combine a child onfiguration XML tag element with a parent configuration XML tag element. Note that the mergeChildren attribute will not combine a child configuration XML tag element with a parent child configuration XML tag element if the parent does not have any attributes and the child only has text values.

- ▶ **replace**

This replaces all existing configuration XML tag elements with the override configuration XML tag elements defined.

There are examples of the use of the append, replace, and merge attributes in 50AppServer.xml and 60DataBase.xml which overrides items in 00Static.xml depending on database/application server. Using an example from the sample 100Custom.xml file, if you want to change the <environment-name>, in the 99Local.xml file you have something like Example C-1.

Example C-1 Extract from 99Local.xml

```
<properties>
...
    <common merge="mergeChildren">
...
        <environment-name>Environment_from_99Local</environment-name>
...
    </common>
...
</properties>
```

To change the environment name in an override file called 104CustomEnvironmentNameOverride.xml, you would create something like Example C-2.

Example C-2 Custom configuration XML override file - 101CustomEnvironmentNameOverride.xml

```
<properties>
<!-- 104CustomEnvironmentNameOverride.xml -->
  <common merge="mergeChildren">
    <environment-name
merge="replace">Environment_from_101Custom</environment-name>
  </common>
</properties>
```

Note: For details see “Changing IBM Process Server properties” at:

http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/index.jsp?topic=/com.ibm.wbpm.admin.doc/adminguide/topic/changing_server_props.html

Troubleshooting custom settings

Use an XML text editor to create and modify custom configuration override XML files to avoid common issues (for example, close XML tags, validate the file to ensure that it is a proper XML document, and so on). Do not use the Windows default text editor, Notepad, to edit XML files, as it could introduce hidden control characters that create an invalid XML file.

Inspect the current TeamWorksConfiguration.running.xml file to confirm the correct structure of the XML document and the tags to override.

Examples

This section details typical configuration override sample XML files. Each sample shows the details for a complete individual 100Custom.xml file. To use more than one sample, aggregate the relevant entries.

The directory path location of 100Custom.xml depends on whether you have installed a stand-alone server environment, a clustered network deployment environment, or a single server network deployment environment, as shown below:

- ▶ For a stand-alone server configuration:


```
<stand-alone-profile-root>\config\cells\<cell-name>\nodes\<stand-alone-node-name>\servers\<server-name>\process-server\config\100Custom.xml
```
- ▶ For a network deployment cluster configuration:
 - In the network deployment Process Server cluster:


```
<DMGR-profile-root>\config\cells\<cell-name>\clusters\<cluster-name>\process-server\config\100Custom.xml
```
 - Each Process Server cluster member at:


```
<DMGR-profile-root>\config\cells\<cell-name>\nodes\<custome-node-name>\servers\<cluster-memeber-name>\process-server\config\100Custom.xml
```
- ▶ For a network deployment single server configuration:


```
<DMGR-profile-root>\config\cells\<cell-name>\nodes\<custome-node-name>\servers\<server-name>\process-server\config\100Custom.xml
```

Typical Process Server environment configuration overrides

For each Process Server registered with a specific Process Center, the configuration overrides discussed in this section can be applied, wherever relevant.

Altering the Process Server repository heartbeat

This configuration setting alters the time interval used by the Process Server to send a heartbeat message to the Process Center.

Override the connection values defined in ./system/99Local.xml using 100Custom.xml.

Example C-3 Configuration override for Process Server heartbeat interval

```
<properties>
  <server merge="mergeChildren">
<!-- Positive values ( in secs) dictate the communication interval
between the process-server and process-center.
    "-1" disables the communication.
-->
```



```
<repository-server-interval  
merge="replace">600</repository-server-interval>  
</server>  
</properties>
```

See the following reference for details:

http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/index.jsp?topic=/com.ibm.wbpm.imuc.ebpm.doc/topics/tconnect_to_pctr.html

Altering the Process Server installation permissions

This configuration setting alters the time interval used by the Process Server to send a heartbeat message to the Process Center.

To deploy process applications to online runtime servers, you must have the following access permissions to the process application to be deployed:

- ▶ Write access to deploy to any non-production Process Server
- ▶ Read access to deploy to Process Servers in Development environments

Example C-4 Configuration override for Process Server installation permissions

```
<properties>  
  <server merge="mergeChildren">  
<!-- [group_name] = Name of the Process Server group members that are  
allowed to deploy process applications.  
-->  
    <process-center-install-group merge="replace">[insert  
group_name]</process-center-install-group>  
  </server>  
</properties>
```

See the following reference for details:

http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/index.jsp?topic=/com.ibm.wbpm.admin.doc/adminguide/topic/managing_users_G.html

Typical IBM Business Process Manager Version 7.5 zone configuration overrides

These configuration overrides apply to both the Process Center and to every registered Process Server. These configuration override changes need to be applied using the 100Custom.xml configuration override file on each node.

SMTP server

Alter the configuration to use a specified SMTP server and corresponding email address for sending emails for BPMN process emails. Replace the values `smtp.yourdomain.com` and `bpmadmin@yourdomain.com` with those corresponding to the target Process Center or Process Server environment.

Example C-5 Configuration override for configuring SMTP server

```
<propeties>
  <server merge="mergeChildren">
    <email merge="mergeChildren">
      <!-- SMTP server that mail should be sent to -->
      <smtp-server merge="replace">smtp.yourdomain.com</smtp-server>
      <!-- If this is set to true then the from address set on external
email will -->
      <!-- include a valid email address, which is either the user's
contact email -->
      <!-- address or the default address below if no contact address
is found. -->
      <valid-from-required merge="replace">true</valid-from-required>
      <!-- Used when sending external email if the sender has no email
contact info set -->
      <default-from-address
merge="replace">bpmadmin@yourdomain.com</default-from-address>
      <send-external-email merge="replace">true</send-external-email>
    </email>
  </server>
</propeties>
```

Altering generated Uniform Resource Locators

Alter generated Uniform Resource Locators to use load balancer, front-end proxy or web server, Virtual IP address or Domain Name System (DNS) host name instead (Example C-6).

Example C-6 Configuration override for generating Uniform Resource Locators

```
<properties>
<!--
  Instructions:
    Replace "<load balancer or proxy host name>" with the appropriate
Fully qualified name (FQN) for load balancer or proxy.
    Replace "<load balancer or proxy host port>" with the appropriate
port number for load balancer or proxy.
-->
<!--
```

To use [load balancer or proxy], insert the Fully Qualified Name (FQN) for the Virtual IP or DNS name that load balances between http://[app server node 1]:[port] and http://[app server node 2]:[port].

-->

```
<authoring-environment merge="mergeChildren">
```

<!--

Used by the Process Designer debugger, if there is no direct HTTP access to the nodes

-->

```
<images-prefix merge="replace">http://<load balancer or
proxy host name>:<load balancer or proxy host
port>/teamworks</images-prefix>
```

```
<portal-prefix merge="replace">http://<load balancer or
proxy host name>:<load balancer or proxy host
port>/portal</portal-prefix>
```

```
<servlet-prefix merge="replace">http://<load balancer or
proxy host name>:<load balancer or proxy host
port>/teamworks</servlet-prefix>
```

```
<webapi-prefix merge="replace">http://<load balancer or
proxy host name>:<load balancer or proxy host
port>/webapi</webapi-prefix>
```

<!--

The next 2 URLs should only ever load balance to one specific node, as the Jamwiki database does not support clustered nodes and would otherwise place the content in Jamwiki instances randomly.

-->

```
<process-help-wiki-url-view merge="replace">http://<WLE
node1 host name>:<WLE node1 host
port>/processhelp/en/%TITLE%?teamworksTitle=%TEAMWORKS_TITLE%</process-
help-wiki-url-view>
```

```
<process-help-wiki-url-edit merge="replace">http://<WLE
node1 host name>:<WLE node1 host
port>/processhelp/en/Special:Edit?topic=%TITLE%&teamworksTitle=%TEA
MWORKS_TITLE%</process-help-wiki-url-edit>
```

```
</authoring-environment>
```

```
<common merge="mergeChildren">
```

<!--

The next 5 URLs should load balance or proxy to all nodes, using the Virtual IP or DNS name with sticky sessions.

-->

```
<webservices merge="mergeChildren">
```

```

        <base-url merge="replace">http://<load balancer or
proxy host name>:<load balancer or proxy host
port>/teamworks/webservices</base-url>
    </webservices>
    <portal-prefix merge="replace">http://<load balancer or
proxy host name>:<load balancer or proxy host
port>/portal</portal-prefix>
    <teamworks-webapp-prefix merge="replace">http://<load
balancer or proxy host name>:<load balancer or proxy host
port>/teamworks</teamworks-webapp-prefix>
    <xml-serialization merge="mergeChildren">
        <default-namespace-uri merge="replace">http://<load
balancer or proxy host name>:<load balancer or proxy host
port>/schema/</default-namespace-uri>
    </xml-serialization>
    <office merge="mergeChildren">
        <sharepoint merge="mergeChildren">
            <default-workspace-site-description
merge="replace">
                <![CDATA[This site has been automatically
generated for managing collaborations and documents
for the Lombardi TeamWorks process instance: <#=
tw.system.process.name #> <#= tw.system.process.instanceId #>
TeamWorks Link: http://<load balancer or proxy host name>:<load
balancer or proxy host
port>/portal/jsp/getProcessDetails.do?bpdInstanceId=<#=
tw.system.process.instanceId #>
]]>
                    </default-workspace-site-description>
                </sharepoint>
            </office>
        </common>
        <server merge="mergeChildren">
            <email merge="mergeChildren">
                <mail-template merge="mergeChildren">
<!--
The next URLs should loadbalance to all nodes, using the using the
Virtual IP or DNS name with sticky sessions for task URLs in generated
e-mails.
-->
                    <client-link merge="replace">http://<load balancer or
proxy host name>:<load balancer or proxy host
port>/teamworks</client-link>
                </mail-template>
            </email>

```

```
</server>  
</properties>
```

Note: For further samples using the 100Custom.xml configuration override file, search the following IBM documentation for 100Custom.xml:

<http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/advanced/searchView.jsp?searchWord=100custom.xml&maxHits=500&group=None>

Abbreviations and acronyms

BAM	Business Activity Monitoring	LDAP	Lightweight Directory Access Protocol
BPC	Business Process Choreographer	MEDB	Messaging Engine Database
BPD	business Process Sefinition	PDWDB	Performance Data Warehouse Database
BPEDB	Business Process Choreographer Database	PMT	Profile Management Tool
BPEL	Business Process Execution Language	RAL	Remote Artifact Loader
BPM	Business Process Management	REST	Representational State Transfer
BPMN	Business Process Modelling Notation	SCA	Service Component Architecture
BSPACE	Business Space schema	SMTP	Simple Mail Transfer Protocol
CBEs	Common Base Events	SOA	Service-Oriented Architecture
CEI	Common Event Infrastructure	URLs	Uniform Resource Locators
CMNDB	Common Database		
DB2	Database Server		
DDT	Database Design Tool		
DMGR	Deployment Manager		
DNS	Domain Name System		
FQN	Fully Qualified Name		
HTM	Human Task Manager		
IBM	International Business Machines Corporation		
ITSO	International Technical Support Organization		
JAX	Java API for XML		
JDBC	Java Database Connectivity		
JEE	Java Platform, Enterprise Edition		
JMS	Java Message Service		
JTA	Java Transaction API		
JVM	Java Virtual Machine		
KPI	Key Performance Indicator		

Related publications

The publications listed in this section are considered particularly suitable for a more detailed discussion of the topics covered in this book.

IBM Redbooks

The following IBM Redbooks publications provide additional information about the topic in this document. Note that some publications referenced in this list might be available in softcopy only.

- ▶ *Scaling BPM Adoption from Project to Program with IBM Business Process Manager*, SG24-7973
- ▶ *WebSphere Business Process Management V7 Production Topologies*, SG24-7854

Help from IBM

IBM Support and downloads

ibm.com/support

IBM Global Services

ibm.com/services



IBM Business Process Manager V7.5 Production Topologies



IBM Business Process Manager V7.5 Production Topologies

Build and extend IBM Business Process Manager Advanced topologies

Integrate IBM Business Monitor

Learn by example with practical scenarios

This IBM Redbooks publication describes how to build production topologies for IBM Business Process Manager Advanced V7.5. It is aimed at IT architects and IT specialists who want to understand and implement these topologies. Use this book to select the appropriate production topologies for a given environment, then follow the step-by-step instructions included in this book to build these topologies.

Part one introduces IBM Business Process Manager and provides an overview of basic topology components and Process Server and Process Center. This part also provides an overview of the production topologies that we describe in this book, including a selection criteria for when to select a given topology.

Part two provides a series of step-by-step instructions for creating production topology environments using deployment environment patterns. This includes topologies that incorporate IBM Business Monitor. This part also discusses advanced topology topics.

INTERNATIONAL TECHNICAL SUPPORT ORGANIZATION

BUILDING TECHNICAL INFORMATION BASED ON PRACTICAL EXPERIENCE

IBM Redbooks are developed by the IBM International Technical Support Organization. Experts from IBM, Customers and Partners from around the world create timely technical information based on realistic scenarios. Specific recommendations are provided to help you implement IT solutions more effectively in your environment.

For more information:
ibm.com/redbooks