WebSphere® Application Server V4.0.1 for z/OS and OS/390

Installation and Customization

GA22-7834-07

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Note

Before using this information and the product it supports, be sure to read the general information under Appendix G, “Notices,” on page 413.

Eighth Edition (July 2003)

This is a revision of GA22–7834–06.

This edition applies to WebSphere Application Server V4.0.1 for z/OS and OS/390 (5655-F31), and to all subsequent releases and modifications until otherwise indicated in new editions.

The most current versions of the WebSphere Application Server V4.0.1 for z/OS and OS/390 publications are at this Web site: `http://www.ibm.com/software/webservers/appserv/zos_os390/library/`

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About this book

WebSphere Application Server V4.0.1 for z/OS and OS/390: Installation and Customization describes how to

- Plan for, install, and customize the WebSphere for z/OS run-time environment
- Upgrade code levels from one release or service level of the product to another.

  Note: The primary source for migration information for WebSphere for z/OS is *WebSphere Application Server V4.0.1 for z/OS and OS/390: Migration*, GA22-7860. You should begin your migration planning with that manual.
- Set up WebSphere for z/OS in advanced system configurations, such as a sysplex.

Included are instructions for setting up requisite z/OS or OS/390 functions, such as eNetwork Communication Server (TCP/IP), the Security Server (RACF), and workload management (WLM), for use by WebSphere for z/OS.

Note: The full product name is "WebSphere Application Server V4.0.1 for z/OS and OS/390," referred to in this text as "WebSphere for z/OS."

Who should read this book

This book is intended for system programmers, security administrators, network administrators, or database administrators who configure z/OS or OS/390 subsystems and install WebSphere for z/OS.

How this book is organized

Planning for and installing WebSphere for z/OS includes those tasks you must perform prior to installing business applications. It includes such tasks as planning your system configuration and installing the WebSphere for z/OS run-time environment. Chapter 1, "Overview of installation and customization," on page 1 provides a quick introduction to the installation process.

To install the run-time environment, you must perform tasks in two general areas:

1. The base z/OS or OS/390 system. You must prepare various z/OS or OS/390 subsystems and your network prior to setting up WebSphere for z/OS. For instance, you must perform such tasks as setting up security controls, defining workload management (WLM) workloads, and setting up DB2. See Chapter 2, "Preparing the base z/OS or OS/390 environment," on page 9 for details.
2. The WebSphere for z/OS run-time environment itself. This includes loading the code, changing PARMLIB members, creating environment files, and running configuration jobs (also known as bootstrap jobs). See Chapter 3, "Installing and customizing your first run time," on page 51 for details.

Chapter 4, "Performing post-installation tasks," on page 183 covers tasks, such as backing up your system, that you may want to do immediately after installation and customization.

You can get started with WebSphere for z/OS on a monoplex system, then implement advanced security, workload management, database, and sysplex operations later. For these advanced tasks, see Chapter 5, "Performing advanced tasks," on page 191.

Chapter 6, "Installing new releases and maintenance levels of WebSphere for z/OS," on page 305 provides general information and procedures for migrating WebSphere for z/OS from one release or service level to another.

Note: You should begin your migration planning with *WebSphere for z/OS: Migration*.

Following the last chapter are these appendixes:

- Appendix A, "Environment files," on page 321 describes the WebSphere for z/OS environment variables.
- Appendix B, "Sample instructions from the customization dialog," on page 363 provides a sample set of initial installation and customization instructions and a sample set of migration instructions from the customization dialog that you can use for pre-installation planning.
- Appendix C, "Migrating from WebSphere for z/OS V4.0 to V4.0.1 without the customization dialog," on page 389 has procedures for migrating to WebSphere for z/OS V4.0.1 without using the customization dialog.
- Appendix D, "Using an alternate HFS structure for product upgrades," on page 397 introduces an alternate HFS structure and appropriate procedures for performing WebSphere for z/OS code upgrades.
- Appendix E, "Configuring the name space," on page 403 describes how to configure the WebSphere for z/OS naming space.
- Appendix F, "Setting up DCE," on page 409 describes how to set up DCE security.
- Appendix G, "Notices," on page 413 contains various legal notices.

"Glossary" on page 417 tells you where to find information on terms used in this manual.

"Index" on page 419 provides a topic page reference.

Where to find related information, tools, and supplements

This is a list of books that are in the WebSphere for z/OS library. They can be found by accessing the following Web site:

`http://www.ibm.com/software/webservers/appserv/zos_os390/library/`

- *WebSphere Application Server V4.0.1 for z/OS and OS/390: Program Directory*, GI10-0680, describes the elements of and the installation instructions for WebSphere for z/OS.
- *WebSphere Application Server V4.0.1 for z/OS and OS/390: License Information*, LA22-7855, describes the license information for WebSphere for z/OS.
- *WebSphere Application Server V4.0.1 for z/OS and OS/390: Installation and Customization*, GA22-7834, describes the planning, installation, and customization tasks and guidelines for WebSphere for z/OS.
- *WebSphere Application Server V4.0.1 for z/OS and OS/390: Messages and Diagnosis*, GA22-7837, provides diagnosis information and describes messages and codes associated with WebSphere for z/OS.

- *WebSphere Application Server V4.0.1 for z/OS and OS/390: Operations and Administration*, SA22-7835, describes system operations and administration tasks.
- *WebSphere Application Server V4.0.1 for z/OS and OS/390: Assembling J2EE Applications*, SA22-7836, describes how to develop, assemble, and install J2EE applications in a WebSphere for z/OS J2EE server.
- *WebSphere Application Server V4.0.1 for z/OS and OS/390: Assembling CORBA Applications*, SA22-7848, describes how to develop, assemble, and deploy CORBA applications in a WebSphere for z/OS (MOFW) server.
- *WebSphere Application Server V4.0.1 for z/OS and OS/390: System Management User Interface*, SA22-7838, describes the system administration and operations tasks as provided in the Systems Management User Interface.
- *WebSphere Application Server V4.0.1 for z/OS and OS/390: System Management Scripting API*, SA22-7839, describes the functionality of the WebSphere for z/OS Systems Management Scripting API product.
- *WebSphere Application Server V4.0.1 for z/OS and OS/390: Migration*, GA22-7860, describes migration procedures for WebSphere for z/OS.

Here are some other WebSphere Application Server books on that Web site that you might find particularly helpful:

- *WebSphere Application Server for OS/390 V3.5 Standard Edition Planning, Installing, and Using*, GC34-4835, provides information about running the Version 3.5 runtime shipped with the V4.0.1 product within the HTTP Server address space. You can use this configuration if you want to continue running non-J2EE-compliant Web applications in the V3.5 runtime within the HTTP Server address space while migrating to the full WebSphere for z/OS run time.
- *Building Business Solutions with WebSphere*, SC09-4432

The integrated WebSphere Application Server Advanced Edition and WebSphere Application Server Enterprise Edition InfoCenter includes CORBA (MOFW) information you need to code CORBA (MOFW) components. Go to:

```
http://www.ibm.com/software/webservers/appserv/infocenter.html
```

For additional WebSphere for z/OS tools and supplements, go to the following Web site and select the download link:

```
http://www.ibm.com/software/webservers/appserv/zos_os390/
```

You might also need to refer to information about other z/OS or OS/390 elements and products. All of this information is available through links at the following Internet locations:

```
http://www.ibm.com/servers/eserver/zseries/zos/
http://www.ibm.com/servers/s390/os390/
```

How to send your comments

Your feedback is important in helping to provide the most accurate and highest quality information. You can e-mail your comments to:

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wasdoc@us.ibm.com
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or fax them to 919-254-0206.

Be sure to include the document name and number, the WebSphere Application Server version, and, if applicable, the specific page, table, or figure number on which you are commenting.

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Summary of changes

Summary of changes
for GA22–7834–07
WebSphere for z/OS V4.0.1
as updated, July 2003
service level W401508

This edition contains information previously presented in GA22–7834–06, which supports WebSphere for z/OS. The following is a summary of changes to this information:

- The following APARs were incorporated into this edition:
  - PQ61266, resulting in:

    Updates to environment variable BBOC_HTTP_OUTPUT_TIMEOUT added to Appendix A, “Environment files,” on page 321.
  - PQ67719, resulting in:

    New step added to “Steps for adding the BBOASR1 MOFW server” on page 135..
  - PQ67872, resulting in:

    New UMASK example added to “Setting permission for files created by applications” on page 30.
  - PQ69792, resulting in:

    Environment variable IBM_JVM_ST_VERBOSEGC_LOG added to Appendix A, “Environment files,” on page 321.
  - PQ72180, resulting in:

    New rules for User IDs added to “2 Define variables” on page 62.
  - PQ73174, resulting in:

    Clarification between the ldapcp and ldapsearch commands added to “Steps for updating the access control list for LDAP” on page 184.
  - PQ73360, resulting in:

    Updates for when using a non-default TCPIP stack added to “Multiple TCP/IP stacks” on page 211.
  - PQ73853, resulting in:

    Updates to environment variable BEAN_DELETE_SLEEP_TIME added to Appendix A, “Environment files,” on page 321.
  - PQ74029, resulting in:

    New environment variables BBOC_HTTP_BACKLOG=*n*, BBOC_HTTPS_BACKLOG=*n*, BBOC_IIOP_BACKLOG=*n*, and BBOC_IIOPSSL_BACKLOG=*n* added to Appendix A, “Environment files,” on page 321.
  - PQ74381, resulting in:

    Changes for ACL entries when backend is RDBM vs. TDBM added to “Steps for updating the access control list for LDAP” on page 184.
  - PQ74792, resulting in:

    New environment variables BBOC_HTTP_OUTPUT_TIMEOUT_RECOVERY and BBOC_HTTP_SSL_OUTPUT_TIMEOUT_RECOVERY added to Appendix A, “Environment files,” on page 321.

- Other changes:
  - New PTF requirement for Client certificates with system SSL added to chart in “z/OS or OS/390 software requirements for WebSphere for z/OS” on page 10..
  - Environment variable name error corrected in “Steps for defining the second WebSphere for z/OS system” on page 202.
  - SGSKLOAD location information updated in “Setting up SSL security for WebSphere for z/OS” on page 217.
  - Procedure for downloading a CA certificate modified in “Steps for setting up secure HTTPS Transport Handler connections using client certificates signed by an internal CA” on page 235.
  - Steps modified in “Steps for configuring a test node through the customization dialog” on page 301.
  - Cold start procedure modified in “The cold start process” on page 308.
  - Various other environment variables added, modified or deleted in Appendix A, “Environment files,” on page 321.
- Minor technical and editorial changes have also been made.

Technical changes or additions to the text and illustrations are indicated by a vertical line to the left of the change.

Summary of changes
for GA22–7834–06
WebSphere for z/OS V4.0.1
as updated, September 2002
PTFs UQ90051, UQ90052, and UQ70037
APARs PQ65206, PQ65207, and PQ66463
service level W401400

This edition contains information previously presented in GA22–7834–05, which supports WebSphere for z/OS. The following is a summary of changes to this information:

- The new WebSphere Studio Application Developer Integration Edition support for z/OS Connectors introduces these changes:
  - Bullet changed to include required skills in “Determining your skill needs” on page 9.
  - Two bullets changed to accomodate new function in “Software requirements for developing WebSphere for z/OS applications” on page 14.
  - Bullet changed to accomodate new function in “Overview of setting up the CICS Transaction Gateway ECI connector for J2EE applications” on page 265.
  - Bullet changed to accomodate new function in “Overview of setting up the IMS Connector for Java for J2EE applications” on page 272.
  - Bullet changed to accomodate new function in “Overview of setting up the IMS JDBC Connector for J2EE applications” on page 279.
- The new Direct Deployment Tool/390fy support introduces these changes:
  - Changes to software requirements for Java 2 Enterprise Edition application components made to “Software requirements for developing WebSphere for z/OS applications” on page 14.
  - Three bullets changed (all three match) to accomodate new function in:
    - “Overview of setting up the CICS Transaction Gateway ECI connector for J2EE applications” on page 265

    - “Overview of setting up the IMS Connector for Java for J2EE applications” on page 272
    - “Overview of setting up the IMS JDBC Connector for J2EE applications” on page 279.
- The new SQLID for managed datasources support introduces these changes:
  - New section called ″Preparing DB2 to support SQLIDs on WebSphere for z/OS managed datasources,″ which outlines the steps to follow to properly prepare DB2 to support SQLIDs on WebSphere for z/OS managed datasources, added to Chapter 4, “Performing post-installation tasks,” on page 183..
- The new Peer restart and recovery 2 support introduces these changes:
  - A list of products that individually support peer restart and recovery added to “Peer restart and recovery” on page 206.
- The new HTTP Transport Handler Client certificate support introduces these changes:
  - Description of function added to “Setting up SSL security for WebSphere for z/OS” on page 217.
  - New environment variables and JVM properties added to Appendix A, “Environment files,” on page 321:
    - APP_EXT_DIR=
    - BBOC_HTTP_MODE=
    - BBOC_HTTP_SSL_CBIND =
    - BBOC_HTTP_SSL_MODE=
    - BBOC_HTTPALL_NETWORK_QOS=
    - BBOC_HTTPALL_TCLASS_FILE =
    - CLONEID=
    - com.ibm.websphere.preconfiguredCustomServices=
    - com.ibm.websphere.sendredirect.compliance=
    - com.ibm.ws390.wc.config.dynxmlfilename=
    - com.ibm.ws390.wc.config.dynsrvxmlfilename=
- The new Operator Commands Rollback support introduces these changes:
  - New environment variable, TRACESPECIFIC, added to Appendix A, “Environment files,” on page 321.
- The new Classloader diagnostics support introduces these changes:
  - Environment variables APP_EXT_DIR and WS_EXT_DIRS changed in Appendix A, “Environment files,” on page 321.
- The following APARs were also incorporated into this edition:
  - PQ60472, resulting in:

    New guideline offering guidance on LDAP maxConnections/maxThreads added to “Guidelines, rules, and recommendations for DB2 and LDAP” on page 41.
  - PQ60880, resulting in:

    New step that describes how important it is to have JDBC MULTICONTEXT enabled added to “Steps for running the BBOIVPE (J2EE) installation verification program” on page 167.
  - PQ62048, resulting in:

List of environment variables required to configure all ports for a firewall added to a firewall list item in “Tips on TCP/IP and WebSphere for z/OS” on page 17.

– PQ62127, resulting in:

  New section ″“Setting permission for files created by applications” on page 30,,″ which describes how to change the default umask for the server region, added to Chapter 2, “Preparing the base z/OS or OS/390 environment,” on page 9.

– PQ62464, resulting in:

  New environment variable IIOP_SERVER_SESSION_KEEPALIVE=*n* added to Appendix A, “Environment files,” on page 321.

– PQ63711, resulting in:

  New environment variables BBOO_ACCEPT_HTTP_WORK_AFTER_N_SECS=*n* and BBOO_ACCEPT_HTTP_WORK_AFTER_N_SRS=*n* added to Appendix A, “Environment files,” on page 321.

- Other changes:
  – Reference to MQSeries book added to “z/OS or OS/390 software requirements for WebSphere for z/OS” on page 10.
  – The entry for ″Enterprise beans that access transactions and data under CICS or IMS″ removed from the table in “z/OS or OS/390 software requirements for WebSphere for z/OS” on page 10.
  – A note about APAR PQ65982 added to ″WebSphere for z/OS-supported connectors — For the IMS Connector for Java″ in the table in “z/OS or OS/390 software requirements for WebSphere for z/OS” on page 10.
  – More added to the description for ″SGLDLNK″ in “Steps for defining variables” on page 61.
  – Recommendation about logging in if your installation has multiple administrators added to “Steps for starting the Administration application” on page 105.
  – Steps about modifying environment variables removed from “Steps for adding the BBOASR2 J2EE server” on page 108 and “Steps for adding the BBOASR1 MOFW server” on page 135.
  – Statements about high-level qualifiers clarified in the following sections:
    - “Steps for creating the database for the installation verification programs (IVPs)” on page 166
    - “Steps for running the BBOIVPE (J2EE) installation verification program” on page 167
    - “Steps for running the BBOIVP (MOFW) installation verification program (IVP)” on page 175
  – Bullet about editing the httpd.conf file changed in “Steps for setting up the Web application IVPs” on page 169.
  – New steps added to “Steps for cold-starting RRS” on page 177.
  – FTP Web addresses clarified in “Defining SSL security for clients and servers” on page 225.
  – Warning added to MAX_SRS environment variable in Appendix A, “Environment files,” on page 321.
- Minor technical and editorial changes have also been made.

Summary of changes for GA22–7834–05 WebSphere for z/OS V4.0.1 as updated, July 2002 service level W401082

This edition contains information previously presented in GA22–7834–04, which supports WebSphere for z/OS. The following is a summary of changes to this information:

- The new Peer Restart and Recovery support (APAR PQ57396, PTF UQ99332, Service Level W401042) introduces these changes:
  - A new section, "Restarting WebSphere for z/OS" on page 206, which describes various methods for restarting your system when you are running in a sysplex environment.
  - New and changed environment variables.
- The new HTTP Transport Handler Phase III support (APAR PQ59911, PTF UQ90049, Service Level 11) introduces these changes:
  - An addition to the section "The WebSphere for z/OS environment for Web applications" on page 4 to describe HTTP handlers and execution environments.
  - A new section, "Selecting a Web container security collaborator level" on page 250 to describe how the security functions provided by the Web container are determined.
  - New and changed environment variables.
- The following APARs were also incorporated into this edition:
  - PQ59440, resulting in:
    - A note in "Steps for starting a new conversation" on page 107 that provides a reference to the other related information.
    - New section "Steps for changing any item in the active conversation" on page 179 with instructions on how to change any item in the active conversation.
    - New section "Managing DB2 space occupied by SM tables" on page 180 to help you determine the DB2 space currently occupied by the SM tables and manage DB2 tables that are either large or already at their maximum.
  - PQ61720, resulting in:

    Deletion of ″Enable SETROPTS GRPLIST″ from "Security Customization" on page 88.
- Various updates made to section "Steps for configuring the IMS JDBC Connector" on page 280.
- Various updates made to section "Steps for defining the IMS JDBC Connector as a J2EE server resource" on page 281.
- Section "Overview of BBOMCFG" on page 98 is updated with some rules.
- Minor technical and editorial changes have also been made.

Summary of changes for GA22–7834–04 WebSphere for z/OS V4.0.1 as updated, March 2002 service level W4010038

This edition contains information previously presented in GA22–7834–03, which supports WebSphere for z/OS. The following is a summary of changes to this information:

- The new LDAP TDBM support (APAR PQ58298, PTF UQ90048, Service Level W401038) introduces these changes:
  - The initial panels in the customization dialog have changed, which affects "Steps for running the customization dialog" on page 56 and "Steps for performing a warm start from WebSphere for z/OS V4.0 to V4.0.1" on page 313..
  - The LDAP customization variables and panels have changed, which affects "LDAP Customization" on page 84.
  - A new procedure was added.
- Support for WebSphere for z/OS-supported (APAR PQ55873, PTF UQ99329, Service Level W401030) connectors introduces:
  - Changes to software requirements (see "z/OS or OS/390 software requirements for WebSphere for z/OS" on page 10)
  - Instructions for configuring the CICS and IMS subsystems and connectors for use with WebSphere for z/OS (see "Configuring the WebSphere for z/OS-supported connectors" on page 262)
- Due to concurrency control management support (APAR PQ55873, PTF UQ99329, Service Level W401030), a new section was added to provide guidelines for related DB2 settings (see "Guidelines for DB2 settings for WebSphere concurrency control management" on page 45).
- Minor technical and editorial changes have also been made.

Summary of changes for GA22–7834–03 WebSphere for z/OS V4.0.1 as updated, January 2002 service level W401017

This edition contains information previously presented in GA22–7834–02, which supports WebSphere for z/OS. The following is a summary of changes to this information:

- A new requirement for Cryptographic Services System SSL is documented in "z/OS or OS/390 software requirements for WebSphere for z/OS" on page 10.
- A new guideline for DB2 data definition control was added to "Guidelines, rules, and recommendations for DB2 and LDAP" on page 41.
- A new step was added to "Steps for preparing your security system" on page 197..
- A change was made to the recommendation for use of COMMNDxx in "Steps for customizing base z/OS or OS/390 functions on the other systems in the sysplex" on page 198.
- Changes were made to the description of environment variables required for setting up a sysplex in "Defining new WebSphere for z/OS clustered host instances in the sysplex" on page 202.
- A new section, "Configuring your systems for test and production" on page 294, was added (APAR PQ55866, PTF UQ99328, Service Level W401014).
- Changes were made to the warm start procedures in Appendix C, "Migrating from WebSphere for z/OS V4.0 to V4.0.1 without the customization dialog," on page 389 and Appendix D, "Using an alternate HFS structure for product upgrades," on page 397.

- New environment variables are documented in Appendix A, “Environment files,” on page 321.
- Appendix B, “Sample instructions from the customization dialog,” on page 363 was added.
- Minor technical and editorial changes have also been made.

Summary of changes for GA22–7834–02 WebSphere for z/OS V4.0.1 as updated, October 2001

This book contains information previously presented in GA22–7834–01, which supports WebSphere for z/OS. The following is a summary of changes to this information:

- Additional overview information about EJBROLE support was added.
- Information about the customization dialog has changed.
- Information about release migrations (in Chapter 4 of the previous edition) has moved to *WebSphere for z/OS: Migration*.
- Information about setting up WebSphere for z/OS in a sysplex now includes recommendations for HFS structures. This information is in Chapter 5, “Performing advanced tasks,” on page 191, Chapter 6, “Installing new releases and maintenance levels of WebSphere for z/OS,” on page 305, and Appendix D, “Using an alternate HFS structure for product upgrades,” on page 397.
- Minor technical and editorial changes have also been made.

Summary of changes for GA22–7834–01 WebSphere for z/OS as updated, June 2001, service level W400017

This book contains information previously presented in GA22–7834–00, which supports WebSphere for z/OS. The following is a summary of changes to this information:

- Information about the customization dialog and the changed installation verification programs has been added in this edition, introduced through APAR PQ48858 (PTF UQ900028, service level W400017) and APAR PQ49216 (PTF UQ90029, service level W400017).
- The information about classes specified on the CLASSPATH statement has changed, introduced through APAR PQ48859 (PTF UQ54362, service level W400012).
- The information about environment variables has changed, introduced through APAR PQ47185 (PTF UQ53185, service level W400007).
- Minor technical and editorial changes have also been made.

Chapter 1. Overview of installation and customization

WebSphere Application Server V4.0.1 for z/OS and OS/390, hereafter referred to as WebSphere for z/OS, brings together the functions of WebSphere Application Server for OS/390 Version 3 Standard Edition and Enterprise Edition into a single product.

This manual covers planning, installing, and customizing tasks for WebSphere for z/OS.

Planning for, installing, and customizing WebSphere for z/OS includes those tasks you must perform prior to installing business applications. The tasks include planning your system configuration and installing the WebSphere for z/OS run-time environment. This chapter:

- Gives a general overview of the tasks you must do to install and customize WebSphere for z/OS initially.
- Provides a picture and description of your run-time environment after the initial installation and customization. The initial installation and customization is performed on a monoplex or a single system in a sysplex.
- Provides a checklist of things you should consider for your initial installation of WebSphere for z/OS, your application development and client systems, and advanced system configurations, such as WebSphere for z/OS in a sysplex

To install the run-time environment initially, you must perform tasks in two general areas:

1. The base z/OS or OS/390 system. You must prepare various z/OS or OS/390 elements, products, and your network prior to setting up WebSphere for z/OS. For instance, you must perform such tasks as updating your TCP/IP network, setting up security controls, and defining workload management (WLM) workloads. See Chapter 2, "Preparing the base z/OS or OS/390 environment," on page 9 for details.
2. The WebSphere for z/OS run-time environment itself. This includes loading the code, changing parmlib members, creating environment files, and running configuration jobs (also known as bootstrap jobs). See Chapter 3, "Installing and customizing your first run time," on page 51 for details.

If you already have a release of WebSphere installed and customized, you can migrate the release to WebSphere for z/OS. See *WebSphere Application Server V4.0.1 for z/OS and OS/390: Migration*, GA22-7860.

After installation and customization, you can install application development environments for your application developers and client environments for your business applications. More information about this, see *WebSphere Application Server V4.0.1 for z/OS and OS/390: Assembling J2EE Applications*, SA22-7836.

When you have stabilized WebSphere for z/OS on the first system, you can enable WebSphere for z/OS in a sysplex. You may also implement other advanced system configurations, such as connecting your business applications to an IMS or CICS database. These and other topics are in Chapter 5, "Performing advanced tasks," on page 191.

Diagram of a WebSphere for z/OS run-time configuration

Figure 1 on page 3 depicts the WebSphere for z/OS run-time configuration after you install the product initially on a monoplex system or a single system in a sysplex.

Before we continue, let us explain some terminology, especially the use of the word *server*. In WebSphere for z/OS, the functional component on which applications run is called a *server instance*. Server instances comprise address spaces that actually run code.

A *server*, on the other hand, is a *logical grouping* of replicated server instances. Why is that? Servers allow you to partition workloads into separate server instances, but still refer to them as a single unit. This is particularly important in sysplex environments, where each system in the sysplex might be running a replicated server instance, but clients outside the sysplex address them as a single server. The client does not know which server instance is actually doing work on its behalf; in fact, a subsequent work request from the client may, due to workload balancing, be served by a different server instance in the sysplex.

Within each server instance are two kinds of address spaces: control regions and server regions. A *control region* runs system authorized programs and manages things such as communication for the server instance. Each server instance has one control region. A *server region* runs unauthorized programs, such as business applications. Depending on the workload, a server instance has one or more server regions running at a time (except for the Daemon, which is a specialized server instance and which has no server regions). When work builds up, additional server regions are dynamically started to meet the demand.

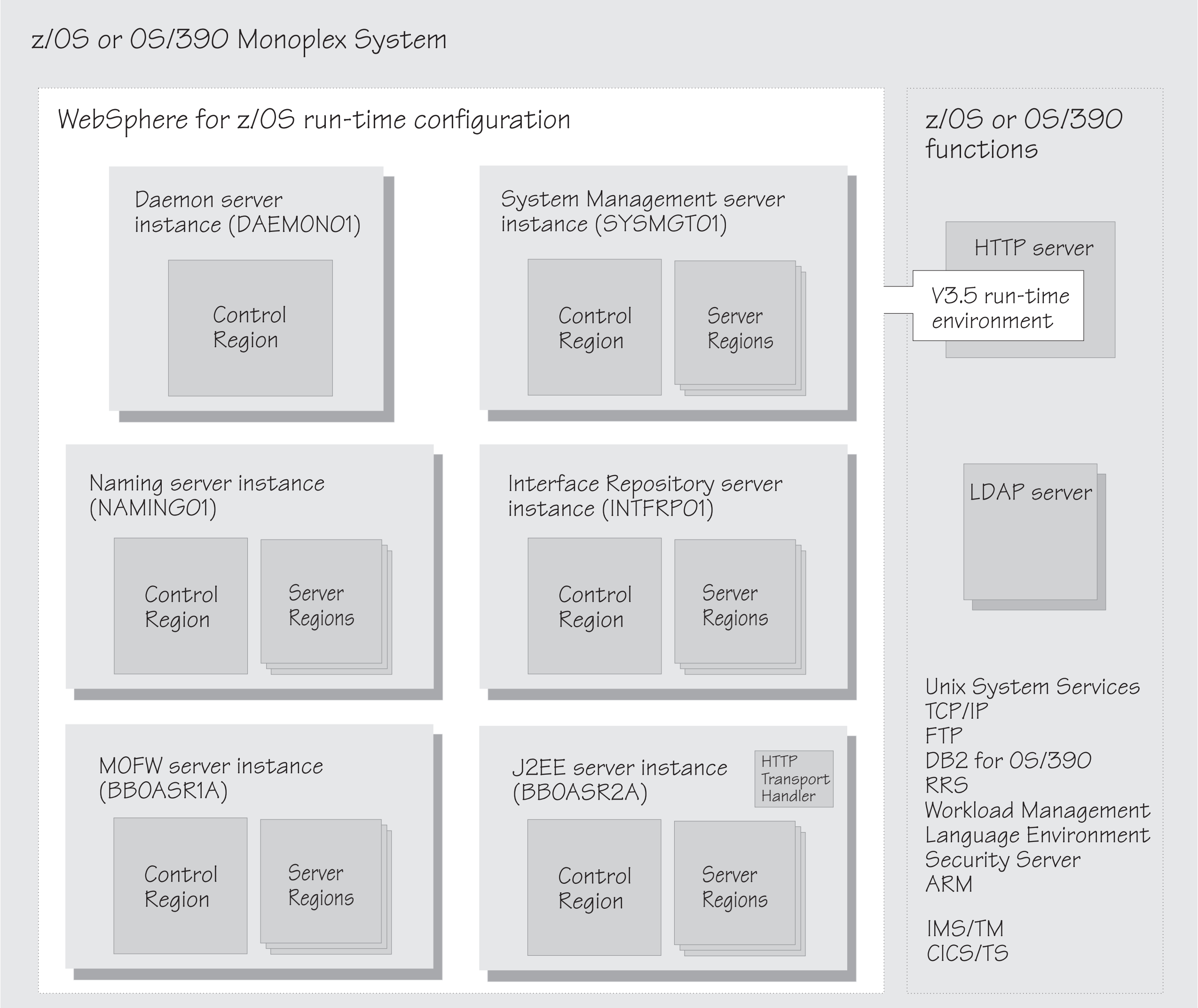

Figure 1. WebSphere for z/OS run time on a monoplex system

As Figure 1 shows, a full WebSphere for z/OS run time includes the Daemon, System Management, Naming, and Interface Repository server instances. Though not directly part of WebSphere for z/OS, the run time requires a Lightweight Directory Access Protocol (LDAP) server. We also include two general-purpose application server instances:

- A J2EE server instance (BBOASR2A), used by the J2EE installation verification programs (IVPs) to test J2EE component support. You can use this server instance as a pattern for your servlet, Java server pages, or enterprise (EJB) bean server instances.
- A MOFW server instance (BBOASR1A), used by the MOFW portion of our installation verification program to test MOFW component support. MOFW (Managed Object Framework) is WebSphere for z/OS's implementation of CORBA-compliant components. You can use this server instance as a pattern for your MOFW components.

The run-time server instances use other z/OS or OS/390 functions, as indicated in Figure 1, such as z/OS UNIX, and TCP/IP. Part of installing WebSphere for z/OS includes configuring these functions for use by the run time (more about that in Chapter 2, "Preparing the base z/OS or OS/390 environment," on page 9).

J2EE servers contain at least one Web container and one EJB container. The Web container manages Web applications (servlets and JavaServer Pages), while the EJB container manages enterprise beans. The WebSphere for z/OS run time includes two functional components that act as HTTP protocol catchers for Web applications:

- The HTTP transport handler, which is part of the J2EE server (the HTTP transport handler is depicted in the BBOASR2A J2EE server instance in Figure 1 on page 3)
- A WebSphere Application Server Standard Edition for OS/390 V3.5 run-time environment routine (pictured in the HTTP server in Figure 1 on page 3) that runs in the HTTP server address space and routes HTTP requests to Web applications running in a Web container.

For more on the environment for Web applications, see "The WebSphere for z/OS environment for Web applications."

The server instances you see in Figure 1 on page 3 are automatically created during the installation on the first z/OS or OS/390 image. Table 1 lists the default servers and their corresponding server instance and server names.

Table 1. Server instance and server names

Server	Server instance name	Server name
Daemon	DAEMON01	CBDAEMON
System Management	SYSMGT01	CBSYSMGT
Naming	NAMING01	CBNAMING
Interface Repository	INTFRP01	CBINTFRP

During installation and customization, you will set up an LDAP server. You will also create either the MOFW server instance, BBOASR1A, and its corresponding application server, BBOASR1, or the J2EE server instance, BBOASR2A, and its corresponding server, BBOASR2, or both, depending on which IVPs you want to run.

The WebSphere for z/OS environment for Web applications

Web components, which are known as Web applications, may consist of any combination of the following parts:

- One or more Java servlets
- Any other Java classes that act as utility classes in support of the servlets
- Static files such as HTML pages and GIF or JPEG images
- JavaServer Pages (JSPs) that format dynamic output

To enable Web applications for use, your Web-serving environment requires an HTTP handler, to receives HTTP requests from a network of browsers using the HTTP access protocol, and an execution environment, which interprets the inbound request and runs the appropriate servlet, based on the contents of the inbound request. The WebSphere for z/OS J2EE server includes a choice of two HTTP handlers and execution environments:

1. The HTTP and/or HTTPS Transport Handlers in combination with the Web container in the J2EE server, or
2. The IBM HTTP Server for z/OS in combination with the WebSphere for z/OS Local Redirector plug-in shipped with the WebSphere for z/OS product, and/or Web container in the J2EE server.

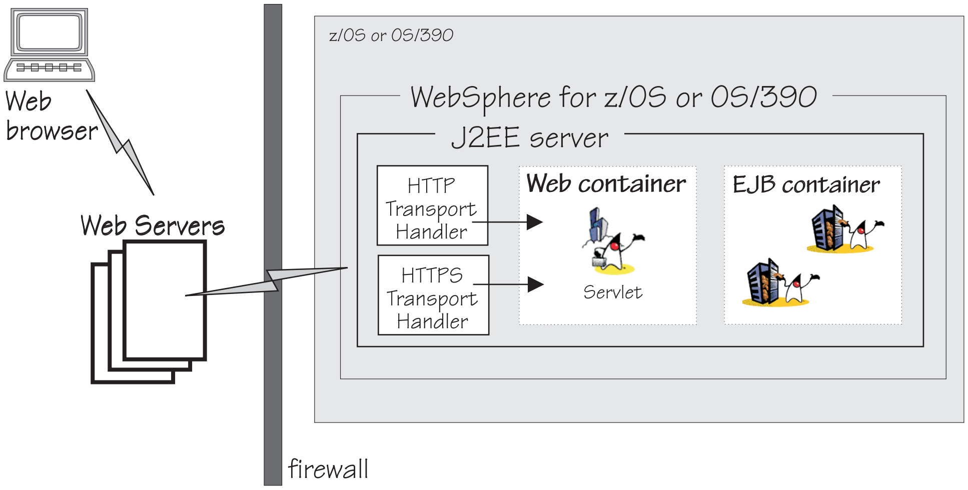

Figure 2. Possible configuration of the Web-serving environment on z/OS or OS/390

Web applications running in the Web container have direct access to resources on z/OS or OS/390, or can access them through Enterprise beans running in any WebSphere for z/OS J2EE server. Web applications use the RMI/IIOP protocol to access Enterprise beans running in J2EE servers on the same or different z/OS or OS/390 images.

For more information about deploying Web applications, see *WebSphere Application Server V4.0.1 for z/OS and OS/390: Assembling J2EE Applications*, SA22-7836.

Creating a plan to implement WebSphere for z/OS

Successful deployment of WebSphere for z/OS requires that you plan for changes to your z/OS or OS/390 system and plan for the WebSphere for z/OS installation and customization. This section provides a checklist for tasks you should consider.

Steps for creating your implementation plan

To get started, plan to build all WebSphere for z/OS run-time server instances on one system, then replicate them on other systems as you expand into a sysplex. This procedure guides you through initial planning and implementation of WebSphere for z/OS on a monoplex. Then it guides you through setting up your application development and client environments. Finally, the procedure guides you through planning for optional advanced system configurations.

Before you begin: We assume you have a z/OS or OS/390 system on which you will implement WebSphere for z/OS.

Perform the following steps to implement your plan:

1. Plan WebSphere for z/OS on a monoplex or a single system in a multi-system sysplex. Check off each item as you complete it:

Check off	Item	For more information, see . . .
	Determine the skills you need.	"Determining your skill needs" on page 9

Check off	Item	For more information, see . . .
	Determine WebSphere for z/OS system requirements.	"Determining WebSphere for z/OS system requirements" on page 10
	Understand and plan for customization changes you will need to do for your TCP/IP network.	"Updating your TCP/IP network" on page 16
	Understand security options and prepare for securing your system.	"Setting up security" on page 19
	Set up workload management environments for WebSphere for z/OS run-time servers.	"Setting up workload management (WLM)" on page 33
	Customize resource recovery services for use by WebSphere for z/OS.	"Recommendations for resource recovery services" on page 38
	Plan for your performance and monitoring systems.	"Guideline for RMF and other monitoring systems" on page 39
	Plan for DB2 and LDAP changes.	"DB2 database and LDAP" on page 39
	Follow recommendations for memory utilization.	"Recommendations for using memory" on page 46
	Plan and define your problem diagnosis procedures.	"Planning for problem diagnosis" on page 47
	Consider automatic restart management before you install WebSphere for z/OS.	"Tip on automatic restart management (ARM)" on page 50

2. Install and customize WebSphere for z/OS.

Check off	Item	For more information, see . . .
	Install and customize WebSphere for z/OS for the first time.	Chapter 3, "Installing and customizing your first run time," on page 51
-or-		
	Upgrade code levels to a new release or service level of WebSphere for z/OS.	*WebSphere Application Server V4.0.1 for z/OS and OS/390: Migration*, GA22-7860, and Chapter 6, "Installing new releases and maintenance levels of WebSphere for z/OS," on page 305

3. Perform various post-installation tasks.

Check off	Item	For more information, see . . .
	Plan and define your system backup procedures.	"Guidelines for backup of the WebSphere for z/OS system" on page 183
	Update the LDAP access control list, if necessary.	"Adding a new administrator for the Administration application" on page 184
	Plan and define your software service procedures.	"Overview of product service" on page 187

Check off	Item	For more information, see . . .
	Set up RACF protection for DB2, if desired.	"Setting up RACF protection for DB2" on page 187
	Implement automation controls and set up automatic restart management for WebSphere for z/OS, if desired.	"Setting up automation and automatic restart management" on page 189

4. Plan for your application development and client environments.

Check off	Item	For more information, see . . .
	Review WebSphere for z/OS requirements for application development and client environments.	*WebSphere Application Server V4.0.1 for z/OS and OS/390: Assembling J2EE Applications*, SA22-7836, and *WebSphere Application Server V4.0.1 for z/OS and OS/390: Assembling CORBA Applications*, SA22-7848

5. (Optional) Plan and implement advanced system configurations.

Check off	Item	For more information, see . . .
	Plan to deploy WebSphere for z/OS in a sysplex.	"Enabling WebSphere for z/OS on a sysplex" on page 191
	Plan to have multiple TCP/IP stacks, use connection optimization, use an IBM Network Dispatcher, or use bind-specific support.	"Implementing an advanced TCP/IP network" on page 211
	Implement advanced security controls such as SSL and Kerberos	"Implementing advanced security" on page 215
	Tune system performance.	"Implementing advanced performance controls" on page 256
	Access IMS resources. You have several options: • For J2EE applications: 1. Use the IMS Connector for Java. 2. Use the IMS JDBC Connector. 3. Use the "beta" IMSAPPC connector. • For CORBA applications: 1. Use the OTMA interface. 2. Use APPC.	• For J2EE applications, see "Deciding which connector to use" on page 264 to determine which IMS connector to use. • For CORBA applications: – "Guidelines for the IMS-OTMA Procedural Application Adapter (CORBA applications)" on page 285 – "Setting up the IMS-APPC Procedural Application Adapter" on page 286

Check off	Item	For more information, see . . .
	Access CICS resources. You have two options: • For J2EE applications, use the CICS Transaction Gateway ECI connector. • For CORBA applications, use the EXCI interface.	• "Overview of setting up the CICS Transaction Gateway ECI connector for J2EE applications" on page 265 • "Setting up the CICS-EXCI Procedural Application Adapter for CORBA applications" on page 284
	Plan for testing and production systems	"Configuring your systems for test and production" on page 294

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6. Plan and implement release and maintenance upgrades.

Check off	Item	For more information, see . . .
	Review code upgrade methods.	"Overview of code upgrading methods" on page 305
	Perform release and maintenance upgrades.	"Procedures for upgrading WebSphere for z/OS code" on page 313

You are done when you have checked all the applicable items.

Chapter 2. Preparing the base z/OS or OS/390 environment

Some z/OS or OS/390 function customization steps you need to do for WebSphere for z/OS can be done before you install and customize WebSphere for z/OS itself. We have put those tasks into this chapter, allowing you to segment your work.

Other z/OS or OS/390 function customization steps must occur along with customizing WebSphere for z/OS itself. You will find those steps in Chapter 3, "Installing and customizing your first run time," on page 51.

In either case, this chapter gives you background information about WebSphere for z/OS's use of z/OS or OS/390 functions and provides planning guidelines and tips for implementing WebSphere for z/OS.

Determining your skill needs

In assembling your project team, you should consider the skills you need to implement WebSphere for z/OS. Below are the function skill areas you need.

You can get started with WebSphere for z/OS by assembling a team with the following system skills:

- z/OS UNIX System Services and the hierarchical file system (HFS)
- eNetwork Communications Server (TCP/IP) or equivalent
- Lightweight Directory Access Protocol (LDAP)
- DB2
- Workload management (WLM)
- System logger and resource recovery services (RRS)
- SMP/E and JCL
- Security Server (RACF), or the security product you use

As you move your system toward a production environment, you need to have the following system skills available:

- Automatic restart management (ARM)
- System Automation, if you have it installed, or the automation you use
- Sysplex, if you plan to use WebSphere for z/OS in a sysplex
- Secure Sockets Layer (SSL), Kerberos, or Distributed Computing Environment (DCE), if you plan to have security in a distributed network
- RMF or other performance measurement systems
- Webserver, if you plan to support HTTP clients
- C++ or Java

For the application development environment, you need the following skills:

- Object-oriented application programming skills
- If you plan to use Java-based components, knowledge of the Java 2 Platform, Enterprise Edition (J2EE) and the Enterprise JavaBeans (EJB) component architecture
- If you plan to use CORBA components, knowledge of Common Object Request Broker Architecture (CORBA)
- Knowledge of the application development tool you use, such as WebSphere Studio Application Developer Integration Edition or VisualAge for Java.
- Windows skills
- Network File System (NFS) or File Transfer Protocol (FTP) skills

Determining WebSphere for z/OS system requirements

The following are system requirements for WebSphere for z/OS.

z/OS or OS/390 hardware requirements

The hardware requirements for this product are any hardware that supports OS/390 Version 2 Release 8 or z/OS and later releases of those products. However, there are significant performance advantages for those applications doing floating point arithmetic if the machine has binary floating point hardware, such as S/390 Parallel Enterprise Server-Generation 5 and later systems.

The LPAR in which the WebSphere for z/OS run-time and initial application servers run requires a minimum of 512 MB of real storage. You many need to increase the real storage size depending on the size and number of application servers you deploy.

z/OS or OS/390 software requirements for WebSphere for z/OS

The following z/OS or OS/390 elements, features, and components must be installed, enabled, and configured. Consult the Program Directory or PSP bucket for the required corrective service.

- OS/390 Version 2 Release 8 (or later) or z/OS configured as a sysplex (at minimum, you need a monoplex). For details, see *z/OS MVS Setting Up a Sysplex*, SA22-7625.
- z/OS or OS/390 UNIX System Services (z/OS UNIX) with a hierarchical file system (HFS). For details, see *z/OS UNIX System Services Planning*, GA22-7800.

  Note: The WebSphere for z/OS System Management Server requires a read/write HFS. If you plan to deploy WebSphere for z/OS in a sysplex, you must establish some means of sharing the HFS in read/write mode across the sysplex. For OS/390 Version 2 Release 8, you must use the Network File System. For OS/390 Version 2 Release 9 or later and z/OS, you can choose either the Network File System or use the shared HFS function.
- eNetwork Communications Server (TCP/IP) or equivalent. In this manual, we refer to eNetwork Communications Server, but you may substitute an equivalent product. For details, see *z/OS Communications Server: IP Migration*, GC31-8773.
- An FTP server.
- DB2 Version 7.1.

  Notes:

  1. If you run WebSphere for z/OS on more than one system in the sysplex and share workloads, you must configure DB2 in data sharing mode, which requires the Coupling Facility. For details, see *DB2 Data Sharing: Planning and Administration*, SC26-9935.
  2. If you run DB2 in a monoplex, you do not need to run in data sharing mode.
- Workload management (WLM) set up in goal mode. For details, see *z/OS MVS Planning: Workload Management*, SA22-7602.
- z/OS or OS/390 system logger. For details, see *z/OS MVS Setting Up a Sysplex*, SA22-7625.
- Resource recovery services (RRS). For details, see *z/OS MVS Programming: Resource Recovery*, SA22-7616.

- A security product such as SecureWay Security Server (RACF). In this manual we refer to Security Server in examples, but you may substitute an equivalent security product. For details, see *z/OS Security Server RACF Migration*, GA22-7690.
- Cryptographic Services System SSL, a component of Cryptographic Services Base, an element of z/OS or OS/390. For details, see *z/OS System Secure Sockets Layer Programming*, SC24-5901.
- LDAP, a component in z/OS or OS/390 Security Server. For details, see *z/OS Security Server LDAP Server Administration and Use*, SC24-5923.

  Recommendation: Use the TDBM backend for your LDAP server. The TDBM backend improves performance of your LDAP server and IBM has announced that RDBM will not be supported after z/OS V1R3.

  Requirement: To use TDBM, you must have OS/390 V2R10 or z/OS V1R1 (or later).

  – If you have OS/390 V2R10 or z/OS V1R1, you need the following service:
    - APAR OW47125, PTF UW76457
    - APAR OW47330, PTF UW79934
    - APAR OW51996, PTF UW84685
    - APAR OW53596, PTF UW87092

  – If you have z/OS V1R2 or V1R3, you need the following service:
    - APAR OW50714, PTF UW82076
    - APAR OW51996, PTF UW84686
    - APAR OW53596, PTF UW87093
- IBM Developer Kit for OS/390 Java 2 Technology Edition Version 1.1, an element of WebSphere for z/OS, but also available separately. The SDK level supported by this product is 1.3.0.

  Note: Later releases of the IBM Developer Kit for OS/390 Java 2 Technology Edition are not supported.

Regarding optional functions, consult the following table:

Table 2. Software requirements for optional functions

If you plan to use . . .	Then you need . . .	Notes . . .
Kerberos security	OS/390 SecureWay Security Server Network Authentication and Privacy Service for OS/390	For OS/390 V2R8 and V2R9, this support is available through the following Web site: `http://www.software.ibm.com` For OS/390 V2R10 and z/OS, this support is part of SecureWay Security Server.
DCE security	DCE component of the Security Server, an optional element of z/OS or OS/390	See *z/OS DCE Administration Guide*, SC24-5904.
Client certificates with system SSL	HIPER APAR OA02637 (PTF UA01920)	This applies to z/OS 1.4 only. If you are running a release of z/OS or OS/390 earlier than z/OS 1.4, obtain this PTF before installing 1.4.

Table 2. Software requirements for optional functions (continued)

If you plan to use . . .	Then you need . . .	Notes . . .
EJB roles to secure Web components or enterprise beans	z/OS V1R2 Security Server (RACF) or equivalent	For releases of z/OS or OS/390 earlier than z/OS V1R2, install the appropriate APAR for this support.
Java Message Service (JMS)	• MQSeries for OS/390 Version 5 Release 2, with PTFs UQ67401 and UQ59338 • JMS Support Pack MA88	MQSeries for OS/390 does not provide a message broker that supports the publish/subscribe domain. You must install a message broker on another platform and point the Queue Manager to that message broker. For example, you could install a message broker such as MQseries Integrator for the MQSeries Support pack MA0C and point the Queue Manager there. For details on MQSeries, see *MQSeries Using Java*, SC34-5456 or *MQSeries for OS/390 System Setup Guide Version 5 Release 2*, SC34-5651.
WebSphere for z/OS IMS-OTMA or IMS-APPC Procedural Application Adapter support	IMS/TM 6.1.0	See "Guidelines for the IMS-OTMA Procedural Application Adapter (CORBA applications)" on page 285
WebSphere for z/OS CICS-EXCI Procedural Application Adapter support	CICS/TS 1.3	See "Setting up the CICS-EXCI Procedural Application Adapter for CORBA applications" on page 284
The IBM Distributed Debugger and Object Level Trace	C/C++ with the Debug Tool feature of z/OS or OS/390	See *z/OS and z/OS.e Planning for Installation*, GA22-7504, and *Debug Tool User's Guide and Reference*, SC09-2137
DB2 SQLJ in J2EE application components	DB2 V7.1 PTF UQ59527	

Table 2. Software requirements for optional functions (continued)

If you plan to use . . .	Then you need . . .	Notes . . .
WebSphere for z/OS-supported connectors	For the CICS Transaction Gateway ECI connector: • CICS Transaction Gateway for OS/390 V4.0.2, and • CICS Transaction Server V1 R3 • WebSphere for z/OS Administration application Version 4.01.011	For configuration details, see "Overview of setting up the CICS Transaction Gateway ECI connector for J2EE applications" on page 265.
	For the IMS Connector for Java: • IMS Connect for z/OS V1 R2.0 with APARs PQ57191 and PQ57192 • IMS V7 R1 with APAR PQ57868 • WebSphere for z/OS Administration application Version 4.01.011	To run IMS Connector for Java applications developed with WebSphere Studio Application Developer Integration Edition, you will also need IMS Connect for z/OS V1 R2.0 with APAR PQ65982. For configuration details, see "Overview of setting up the IMS Connector for Java for J2EE applications" on page 272.
	For the IMS JDBC Connector: • IMS V7 R1 with APAR PQ57320 • WebSphere for z/OS Administration application Version 4.01.011	For configuration details, see "Overview of setting up the IMS JDBC Connector for J2EE applications" on page 279.
WebSphere for z/OS-supplied "beta" connectors	CICSEXCI and IMSAPPC connectors on the WebSphere Application Server Web page: `http://www.ibm.com/software/webservers/appserv/`	The download package includes instructions, runtime code, and other materials that enable you to develop J2EE applications that use the connector support. For more information about the connector support, see the readme file.

Workstation requirements

The Administration and Operations applications are shipped with WebSphere for z/OS. They require the following:

Processor
400 MHz (minimum)

Memory
256 MB (minimum)

Disk 20 MB of available hard disk space (minimum configuration)

50 MB of available hard disk space (with all configuration options)

Temporary disk space
50 MB (deleted after installation)

Display
800x600 capable display (minimum)

Operating system
Microsoft Windows NT 4.0 (with service pack 3), Microsoft Windows 95 (with service pack 1 or 2), Windows 98 or Windows 2000

Communications
TCP/IP (provided by the operating system)

Web browser
HTML 3.2 capable (such as Netscape Navigator 4.0 or Microsoft Internet Explorer 4.0)

Java Virtual Machine
IBM Java Runtime Environment 1.3 or higher (included with installation package)

Increasing processor speed and memory may improve your workstation performance.

Software requirements for developing WebSphere for z/OS applications

The required products for your application development environment depend on whether you are developing J2EE components or CORBA (MOFW) components. MOFW is the Managed Object Framework, IBM's implementation of the CORBA standard.

Requirements for J2EE components: If you are developing J2EE components, you need the following on your workstation:

Table 3. Software requirements for Java 2 Enterprise Edition application components

J2EE application component	Software to use
Enterprise beans	**For development:** One of the following: • WebSphere Studio Application Developer and 390fy, which is the preferred method of deploying applications. • The WebSphere for z/OS Application Assembly tool (read the recommendations following this table for further information about using the Application Assembly tool). • The IBM WebSphere Studio Application Developer V4.0x • WebSphere Studio Application Developer Integration Edition • Non-IBM tools, such as JBuilder or Visual Cafe, for application development. Use the documentation for those products to determine hardware and software requirements.
	For testing: One of the following: • IBM WebSphere Studio Application Developer V4.0x • WebSphere Studio Application Developer Integration Edition environment • This combination of products: – IBM or Sun Microsystems Java 2 Standard Edition (J2SE) Software Development Kit (SDK) V1.3 – WebSphere Application Server Advanced Edition, V3.5, or Advanced Single Server Edition, V4.0 (Optional) DB2 Universal Database Version 7.1, required only for testing beans that require the use of a persistent datastore.
	For assembly: One of the following: • The WebSphere for z/OS Application Assembly tool (read the recommendations following this table for further information about using the Application Assembly tool) • The IBM WebSphere Studio Application Developer V4.0x
	For installation in a J2EE server: • The WebSphere for z/OS Administration application
Servlets and JavaServer Pages (JSPs)	**For development and testing:** One of the following: • WebSphere Studio Application Developer and 390fy, which is the preferred method of deploying applications. • The WebSphere for z/OS Application Assembly tool (read the recommendations following this table for further information about using the Application Assembly tool). • The IBM WebSphere Studio Application Developer V4.0x • IBM or Sun Microsystems Java 2 Standard Edition (J2SE) Software Development Kit (SDK) V1.3
	For assembly: One of the following: • The WebSphere for z/OS Application Assembly tool (read the recommendations following this table for further information about using the Application Assembly tool) • The IBM WebSphere Studio Application Developer V4.0x
	For installation in a J2EE server: The WebSphere for z/OS Administration application

Recommendations:

- The preferred method of deploying applications is to use WebSphere Studio Application Developer and 390fy. If you are using the following two IBM extensions, however, you still need to use the Application Assembly tool:
  - **SyncToOSThread:** See the section, "Using security roles and RunAs identities with Enterprise beans" in *WebSphere Application Server V4.0.1 for z/OS and OS/390: Assembling J2EE Applications*, SA22-7836 for more information on this extension.
  - **Connection Management Policy:** See the following for more information on the Connection Management Policy extension:
    - *WebSphere Application Server V4.0.1 for z/OS and OS/390: Assembling J2EE Applications*, SA22-7836
    - The Application Assembly tool's built-in Help
    - The Beta Connector Guide located at:

      `http://www.ibm.com/software/webservers/appserv/download_v4z.html`
- Use the IBM WebSphere Studio Application Developer to develop and test beans, servlets, and JSPs. This product enables developers to fully test entity and session beans, including JNDI lookups, remote method calls, and method calls on the home interface. It also has a servlet engine, so that servlets and JSPs can be served up to a Web browser as if they were going through an HTTP and Application Server.

  Additionally, WebSphere Studio Application Developer enables you to automatically package servlets or JSPs into Web application archive (WAR) files. (If you use other tools, you might have to create the WAR files manually.)
- If you are using the WebSphere for z/OS Application Assembly tool, download the latest copy from the WebSphere Application Server web site (go to

  ```
  http://www.ibm.com/software/webservers/appserv/
  zos_os390/support.html
  ```

  and click `Download` on the left frame).

For J2EE components, you need the following on z/OS or OS/390:

- An FTP server that can write to the Hierarchical File System (HFS)

Requirements for CORBA (MOFW) components: If you are developing CORBA (MOFW) components, you need the following on your workstation:

- Component Broker for Windows NT 3.5
- VisualAge C++
- If developing for procedural application adaptors, VisualAge for Java Enterprise Edition 3.5

For CORBA (MOFW) components, you need the following on z/OS or OS/390:

- C/C++ IBM Open Class Library (an optional feature of z/OS or OS/390. Required for compiling code but not at run time). See *z/OS Language Environment Customization*, SA22-7564, and *z/OS and z/OS.e Planning for Installation*, GA22-7504.

Updating your TCP/IP network

WebSphere for z/OS follows the CORBA standard, Internet Inter-ORB Protocol (IIOP), for communications. Accordingly, you must consider changes to your TCP/IP network and modify the TCP/IP configuration.

This section provides background information about changes you will need to make to your Domain Name Server (DNS) and TCP/IP. The actual steps to perform are in the customized instructions provided by the customization dialog (see “Running the customization dialog” on page 56).

Tips on TCP/IP and WebSphere for z/OS

Consider the following for your TCP/IP network.

On z/OS or OS/390:

- You can get started with a simple Domain Name Service (DNS) name server and a single z/OS or OS/390 image, but you should design your initial configuration with growth in mind. You may, for instance, intend to expand your business applications beyond the monoplex to a full sysplex configuration for performance reasons or to prevent a single point of failure. Several considerations come to bear here.

  Several DNS implementations and network router implementations allow the use of a generic Daemon IP Name, while dynamically routing network traffic to replicated server instances. If you intend to expand your system beyond a monoplex, it might be worthwhile to use one of these implementations from the start. Non round-robin DNS name servers limit your ability to expand without retrofitting a name server that allows dynamic network traffic routing.

  You have your choice of DNS and router implementations on or off z/OS or OS/390:

  - Non round-robin DNS name servers.
  - Round robin DNS name servers.
  - Connection optimization, a technique used by z/OS or OS/390 that uses DNS and workload management (WLM). WebSphere for z/OS uses connection optimization to prevent a single point of failure. To use connection optimization, you must run the DNS name server on z/OS or OS/390. For more information, see “Connection optimization” on page 212.
  - Network routers, such as the IBM Network Dispatcher. For more information, see “IBM Network Dispatcher” on page 213.
- **Select the Daemon IP name for the Daemon Server carefully.** You can choose any name you want, but, once chosen, it is difficult to change. Also, you cannot change the Daemon IP name in the middle of installation and customization.

  You must define the DAEMON_IPNAME environment variable at installation time, before you start the Daemon bootstrap process. For the value, use the Daemon IP name you chose. See Appendix A, “Environment files,” on page 321.

  The bootstrap process sets, among other things, the Daemon IP name in the system management database. After bootstrap, WebSphere for z/OS uses the value in the system management database and ignores the value in the environment file. It is possible that, after bootstrap, the value of the DAEMON_IPNAME environment variable could change to a value other than what is in the system management database. If this happens, an error message is issued, but the Daemon initializes with the value from the system management database.
- Select the port for the Daemon Server and do not change it. Object references also include the port—if you change the port, existing objects will no longer be accessible. WebSphere for z/OS uses port 5555 as a default.
- In WebSphere for z/OS, the System Management Server handles the Resolve Port. Because clients are configured with a Resolve IP Name and the server

returns such items as the Naming Server root, or an Interface Repository reference, the server is more resilient to change.

Recommendation: CORBA and IBM recommend a default port 900 for the Resolve Port. If you use another port for the Resolve Port, you must change it everywhere in your distributed network.

You may configure the bootstrap server locally on z/OS or OS/390 (it is actually the System Management Server in WebSphere for z/OS) or on another system. You can configure ports other than 900 to facilitate multiple ORBs on z/OS or OS/390.

- You can set fixed port numbers for all connections to enable you to configure your servers behind a firewall. If you need to use the Internet Inter-ORB Protocol (IIOP) through a firewall, ensure that your firewall supports IIOP.

  To configure all ports for a firewall, set up the following environment variables on a server instance basis:

  – DAEMON_PORT for the Daemon (default value is 5555)
  – DAEMON_SSL_PORT for Daemon SSL (default value is 5556)
  – com.ibm.ws.naming.ldap.masterurl port for LDAP (default value is 1389)
  – RESOLVE_PORT for Systems Management (default value is 900)
  – BBOC_HTTP_PORT for J2EE server listening for HTTP requests
  – BBOC_HTTPS_PORT for HTTP SSL

  Use unique ports on every system in the sysplex for recovery in case a server instance gets restarted on a different system than the one on which it was initially running.

  Note: See Appendix A, “Environment files,” on page 321 for more information on the environment variables and how to set their values.

- All other ports are dynamically obtained.
- Establish a TCP/IP host address for the root naming context.
- Other TCP/IP-related activities include setting up NFS, LDAP, WebServer (optional), Kerberos (optional) and DCE (optional).

  For LDAP, we recommend you set up an LDAP server exclusively for WebSphere for z/OS even if you already have an LDAP server on your system. This exclusive LDAP server needs its own port (we suggest it be 1389).

- If you use the DNS on z/OS or OS/390, you may wish to change the refresh timer interval (-t value) associated with the named daemon. The -t value specifies the time (nn, in seconds) between refreshes of sysplex names and addresses and of the weights associated with those names and addresses. The default is sixty seconds. Reducing the -t value will shorten the lapse time required to register the DAEMON_IPNAME and RESOLVE_IPNAME with the DNS, but will also increase DNS processing overhead. In our testing, we used an interval of 10 seconds. For details, see *z/OS Communications Server: IP Configuration Reference*, SC31-8776.

On the workstation that runs the Administration and Operations applications:

The Administration and Operations applications, clients of the System Management Server that run on Windows NT, need TCP/IP setup. You must define the bootstrap server IP name and the naming server IP name in your domain name server (DNS) or your workstation HOSTS file.

- The bootstrap server IP name is the name associated with the initial connection to the host. It is defined by the RESOLVE_IPNAME parameter of the WebSphere for z/OS environment file.
- The naming server IP name is a generic name associated with your naming server and is defined by the DAEMON_IPNAME parameter of the WebSphere for z/OS environment file. If you have more than one name server (federated name space) you must ensure that all the name servers' host names needed by the workstation can be resolved.

Your workstation may have a HOSTS file, which is used to associate TCP/IP host names with TCP/IP addresses. Ordinarily, TCP/IP addresses are associated with host names by the domain name server (DNS) for your system. Your workstation uses the HOSTS file when a host name cannot be resolved using your domain name server. "Steps for updating the workstation Hosts file" on page 103 gives you instructions about how to update your HOSTS file.

Setting up security

WebSphere for z/OS supports access to resources by clients and servers in a distributed network, so part of your security strategy should be to determine how to control access to these resources and prevent inadvertant or malicious destruction of the system or data.

These are the pieces in the distributed network that you must consider:

- You must authorize servers to the base operating system services in z/OS or OS/390. These services include RACF security, database management, and transaction management.
  - For the servers, you must distinguish between control regions and server regions. Control regions run authorized system code, so they are trusted. Server regions run application code and are given access to resources, so you should carefully consider the authorizations you give server regions.
  - You must also distinguish between the level of authority run-time servers and your own application servers have. For example, the System Management server needs the authority to start other servers, while your own application servers do not need this authority.
- You must authorize clients (users) to servers and objects within servers. The characteristics of each client requires special consideration:
  - Is the client on the local system or is it remote? The security of the network becomes a consideration for remote clients.
  - Will you allow unidentified (unauthenticated) clients to access the system? Some resources on your system may be intended for public access, while others need to be protected. In order to access protected resources, clients must establish their identities and have authorization to use those resources.
  - What kind of objects will the client access? Enterprise beans and CORBA objects have differing authorization mechanisms.

If you need to protect resources, identifying who accesses those resources is critical. Thus, any security system requires client (user) identification, also known as authentication. In a distributed network supported by WebSphere for z/OS, clients can be accessing resources from:

- Within the same system as a server
- Within the same sysplex as the server
- Remote z/OS or OS/390 systems

- Heterogeneous systems, such as WebSphere on distributed platforms, CICS, or other CORBA-compliant systems.

Additionally, clients may request a service that requires a server to forward the request to another server. In such cases, the system must handle delegation, the availability of the client identity for use by intermediate servers and target servers.

Finally, in a distributed network, how do you ensure that messages being passed are confidential and have not been tampered? How do you ensure that clients are who they claim to be? How do you map network identities to z/OS or OS/390 identities? These issues are addressed by the following support in WebSphere for z/OS:

- The use of SSL and digital certificates
- Kerberos
- Distributed Computing Environment (DCE)

Because network security is not required for your initial installation and customization of WebSphere for z/OS, details on these topics are reserved for the topic Chapter 5, “Performing advanced tasks,” on page 191. This current topic is designed to introduce you to WebSphere for z/OS security and allow you to make early planning decisions about system security. In Chapter 3, “Installing and customizing your first run time,” on page 51, there are specific instructions for setting up initial RACF security controls through the use the customization dialog IBM provides with the product.

The following topics describe how WebSphere for z/OS supports security. The descriptions are organized under the following subtopics:

- Authorization checking
- User identification, authentication, and network security issues

Note: We use Security Server (RACF) as an example, but you can use an equivalent product.

Included are notes on support for security auditing and security administration.

Authorization checking

Each control region, server region, and client must have its own MVS user ID (more about user identification and authentication later). When a request flows from a client to the server or from a server to a server, WebSphere for z/OS passes the user identity (client or server) with the request. Thus each request is performed on behalf of the user identity and the system checks to see if the user identity has the authority to make such a request.

Summary of controls

Table 4 is a summary of the controls used to grant authorizations to resources. By understanding and using these controls, you can control all resource accesses in WebSphere for z/OS.

Table 4. Summary of controls and authorizations

Control	Authorization
CBIND class	Access to a server
DATASET class	Access to data sets
DCEUUIDS and FACILITY classes	Mapping DCE credentials to RACF user IDs

Table 4. Summary of controls and authorizations (continued)

Control	Authorization
DSNR class	Access to DB2
EJBROLE or GEJBROLE class	Access to methods in enterprise beans
FACILITY class (IRR.DIGTCERT.LIST and IRR.DIGTCERT.LISTRING)	SSL key rings, certificates, and mappings
FACILITY class (IMSXCF.OTMACI)	Access to OTMA for IMS access
FACILITY Class (IRR.RUSERMAP)	Kerberos credentials
GRANTs (DB2)	DB2 access to plans and database
HFS file permissions	Access to HFS files
LDAP access control lists	LDAP-controlled access to WebSphere for z/OS naming and interface repository data
LOGSTRM class	Access to log streams
OPERCMDS class	Start and stop servers by Daemon
PTKTDATA class	Passticket enabling in the sysplex
SERVER class	Access to control region by a server region
Set OS Thread Identity to RunAs Identity	J2EE server property used to change the execution identity for non-J2EE resources
SOMDOBJS class	Access to methods in CORBA objects
STARTED class	Associate user ID (and optionally group ID) to start procedure
SURROGAT class (*.DFHEXCI)	Access to EXCI for CICS access

Server authorizations

Figure 3 on page 22 shows the kinds of authorization checking WebSphere for z/OS does for servers.

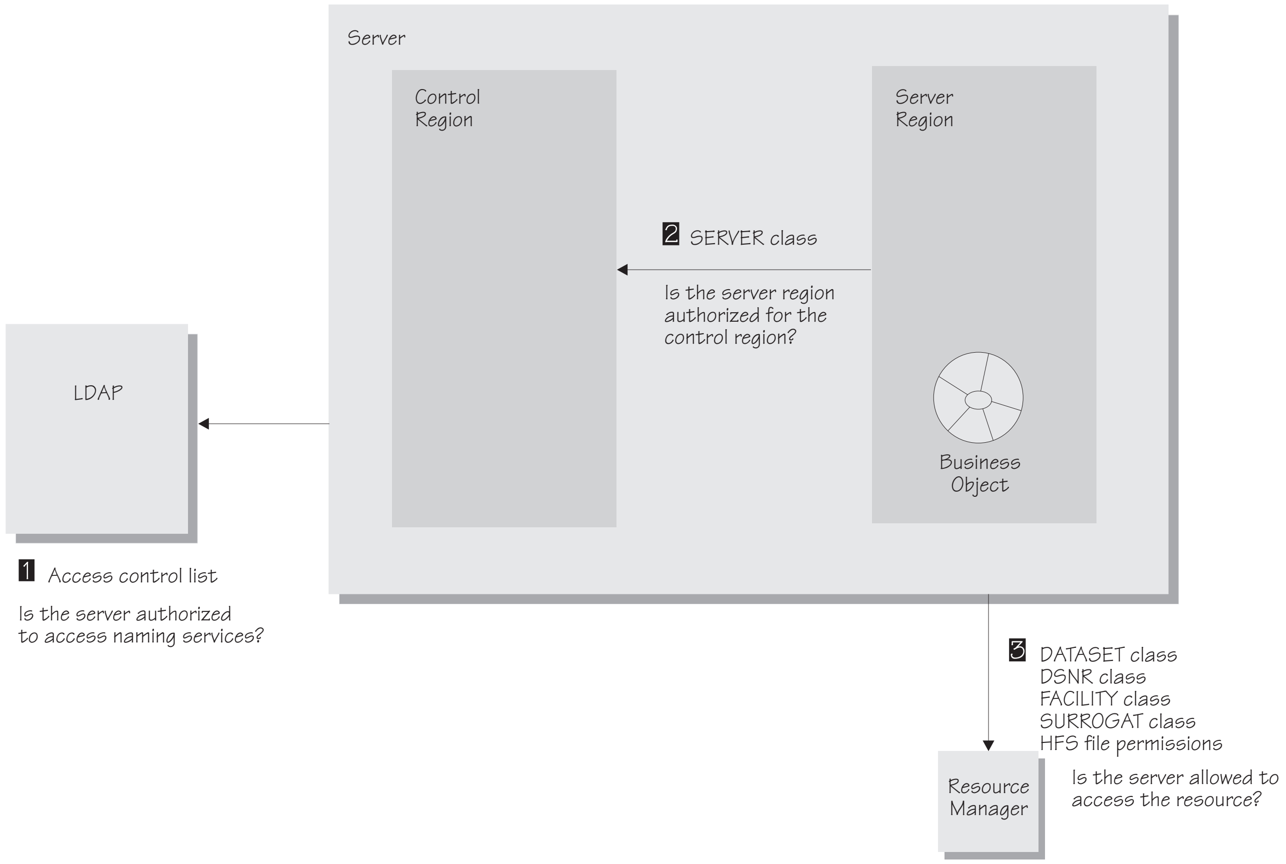


Figure 3. Server authorization checking

The following explains the numbered items in Figure 3.

1. LDAP can be set up to use access control lists (ACLs) for its objects, in which case your Naming Server and System Management Server need to be authorized to update these objects. For more information, see *z/OS Security Server LDAP Server Administration and Use*, SC24-5923.
2. Server regions must have access to profiles in the RACF SERVER class. This controls whether a server region can call authorized routines in the control region.

   Control regions do not require such access control. Only authorized programs, loaded from Authorized Program Facility (APF) libraries, run in control regions.
3. Resource managers such as DB2, IMS, and CICS have implemented their own resource controls, which control the ability of servers to access resources.

   When resource controls are used by DB2, all control regions and server regions need to be granted access to the relevant resources. You can do this by using the DSNR RACF class (if you have RACF support) or by issuing the relevant DB2 GRANT statements.

   Access to OTMA for IMS access is through the FACILITY Class (IMSXCF.OTMACI). Access to EXCI for CICS is through the SURROGAT class (*.DFHEXCI).

   You can control access to data sets through the DATASET class and HFS files through file permissions.

Specifics about server authorization checking: To control access to WebSphere for z/OS resources:

- As a rule of thumb, give greater authority to control regions and less authority to server regions.

Table 5. Level of trust and authority for regions

Region	Level of trust and access authority
Control region	Contains WebSphere for z/OS system code. Trusted, deals with multiple users. Greater authorization. Runs APF-authorized.
Server region	Contains application code. Untrusted. Other than having authorization to get work and to attach to data stores, should run unauthorized.

- Regarding the WebSphere for z/OS run-time servers, the rule of thumb is to give less authority to the Daemon and Naming Server, and greater authority to the System Management Server, as explained in the table below:

Table 6. Assigning authorities to WebSphere for z/OS run-time server control and server regions

Run-time Server	Region	Required Authorities
Daemon Server	Control	STARTED class, access to WLM services, access to DNS, OPERCMDS access to START, STOP, CANCEL, FORCE and MODIFY other servers
Naming Server	Control	STARTED class, access to WLM services
	Server	STARTED class, READ authority to the SERVER class, DBADM for the LDAP database
System Management Server	Control	STARTED class
	Server	STARTED class, READ authority to the SERVER class, OPERCMDS access to START, STOP, CANCEL, FORCE and MODIFY other servers
Interface Repository Server	Control	STARTED class
	Server	STARTED class, READ authority to the SERVER class, DBADM for the LDAP database

- Remember to protect the RRS log streams. By default, UACC is READ.
- Protect the WebSphere for z/OS environment files, especially if they contain passwords. For more information about the environment files, see Appendix A, “Environment files,” on page 321.

Client authorizations

Figure 4 on page 24 shows the kinds of authorization checking WebSphere for z/OS does for clients.

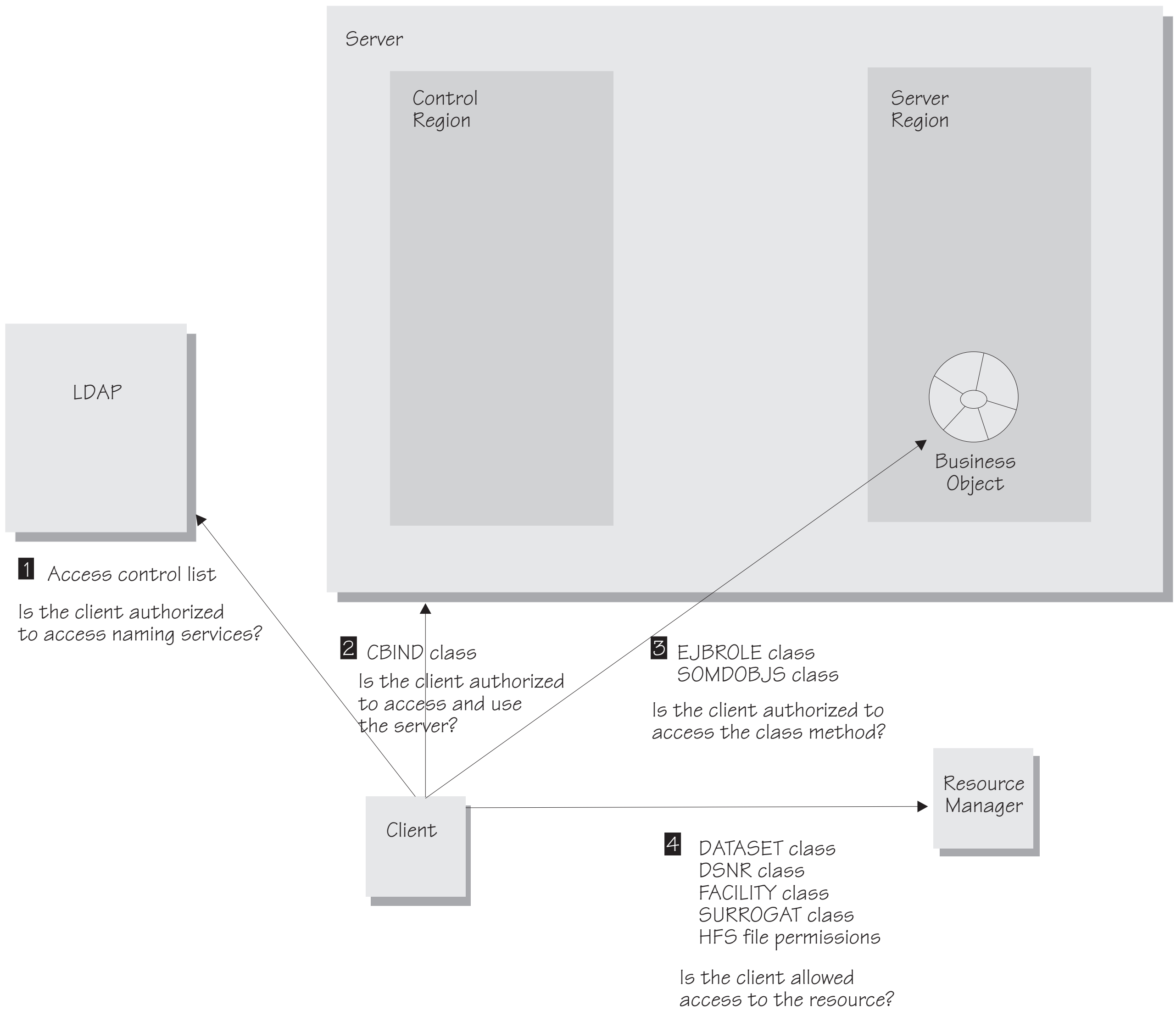


Figure 4. Client authorization checking

The following explains the numbered items in Figure 4.

1. LDAP uses access control lists to control client access to naming services. Usually, you set up a general ANYBODY user identity with read access to the LDAP name space, allowing any client to access naming services.
2. You can use the CBIND class in RACF (optional) to restrict a client's ability to access servers, or you can deactivate the class if you do not require this kind of access control. There are two types of profiles WebSphere for z/OS uses in the CBIND class:
   - One that controls whether a local or remote client can access servers. The name of the profile has this form:

     `CB.BIND.`**`server_name`**

     where *server_name* is the name of the server.
   - One that controls whether a client can use components in a server. The name of the profile has this form:

     `CB.`**`server_name`**

where *server_name* is the name of the server.

Note: When you add a new server, you must authorize all systems management user IDs (for example, CBADMIN) to have read access to the CB.**server_name** and CB.BIND.**server_name** RACF profiles.

Example: CBADMIN needs read authority to the CB.BBOASR1 and CB.BIND.BBOASR1 profiles:

```
PERMIT CB.BBOASR1      CLASS(CBIND) ID(CBADMIN) ACCESS(READ)
PERMIT CB.BIND.BBOASR1 CLASS(CBIND) ID(CBADMIN) ACCESS(READ)
```

3. EJBROLE and SOMDOBJS classes:
   - Use the EJBROLE (or GEJBROLE) class in RACF to control a client's access to enterprise beans. There are two distinct sets of tasks that are required to protect an application using EJB roles.
     a. The security administrator must define the roles and set up access rights in RACF.
        – Define a profile name using the EJBROLE (or GEJBROLE) class.

          Example:
          ```
          RDEF EJBROLE role_name UACC(NONE)
          ```

          where *role_name* matches the security role attribute specified either in the jar file or for the application. A role name cannot contain blanks, and cannot exceed 245 characters. Role names, however, may be in mixed case.
        – Create membership in the role by granting MVS userids or groups permission to the defined EJBROLE profile.

          Example:
          ```
          PERMIT role_name CLASS(EJBROLE)  ID(mvsid_gp) ACCESS(READ)
          ```
        – Activate and RACLIST the EJBROLE class.

          Example:
          ```
          SETROPTS CLASSACT(EJBROLE)
          SETROPTS RACLIST(EJBROLE) GENERIC(EJBROLE)
          ```
     b. The application assembler must assign method permissions to the bean or method using the Application Assembly Tool.
        – Define the roles relevant to the application. These role names must match the profile names assigned to RACF.
        – Once defined, the role can be assigned to access an application (as a method permission).
        – After the application assembly is complete, the application must be reinstalled using the Administration application.

        For details about assigning method permissions, see *WebSphere Application Server V4.0.1 for z/OS and OS/390: Assembling J2EE Applications*, SA22-7836.
   - Use the SOMDOBJS class in RACF to control a client's access to CORBA objects. Profile names in SOMDOBJS have the form:

     ```
     server_name.home.method
     ```

     where

     server_name
     Is the server name. It must be 8 characters or less.

home
Is the home name. It must be 192 characters or less.

method
Is the method name. It can be up to the length of the remainder of 244 minus the sum of the server and home name lengths.

Example: If the server name is 8 characters, and the home name is 128 characters, the method name can be 108 (244 − (8 + 128)).

If a method is protected by SOMDOBJS and:

– A client program is using the method to update an attribute of an object, give the client UPDATE authorization for the method.

– A client program is using the method to read an attribute of an object, give the client READ authorization for the method.

All names are folded into uppercase characters, regardless of how you enter them. Thus, there is no difference between MY_server.MY_home.MY_method and MY_SERVER.MY_HOME.MY_METHOD.

In addition to the RACF SOMDOBJS definitions, you must specify method-level access checking through the WebSphere for z/OS Administration application. Check the box for method-level access checking when you define your application's container.

4. Resource managers such as DB2, IMS, and CICS have implemented their own resource controls, which control the ability of clients to access resources.

   When resource controls are used by DB2, use the DSNR RACF class (if you have RACF support) or by issuing the relevant DB2 GRANT statements.

   Access to OTMA for IMS access is through the FACILITY Class (IMSXCF.OTMACI). Access to EXCI for CICS is through the SURROGAT class (*.DFHEXCI).

   You can control access to data sets through the DATASET class and HFS files through file permissions.

User identification, authentication, and network security issues

Proper security for any system requires that users or programs identify themselves and prove they are who they claim to be (authenticate themselves). Figure 5 on page 27 shows the kinds of user identification and authentication WebSphere for z/OS uses within and across systems.

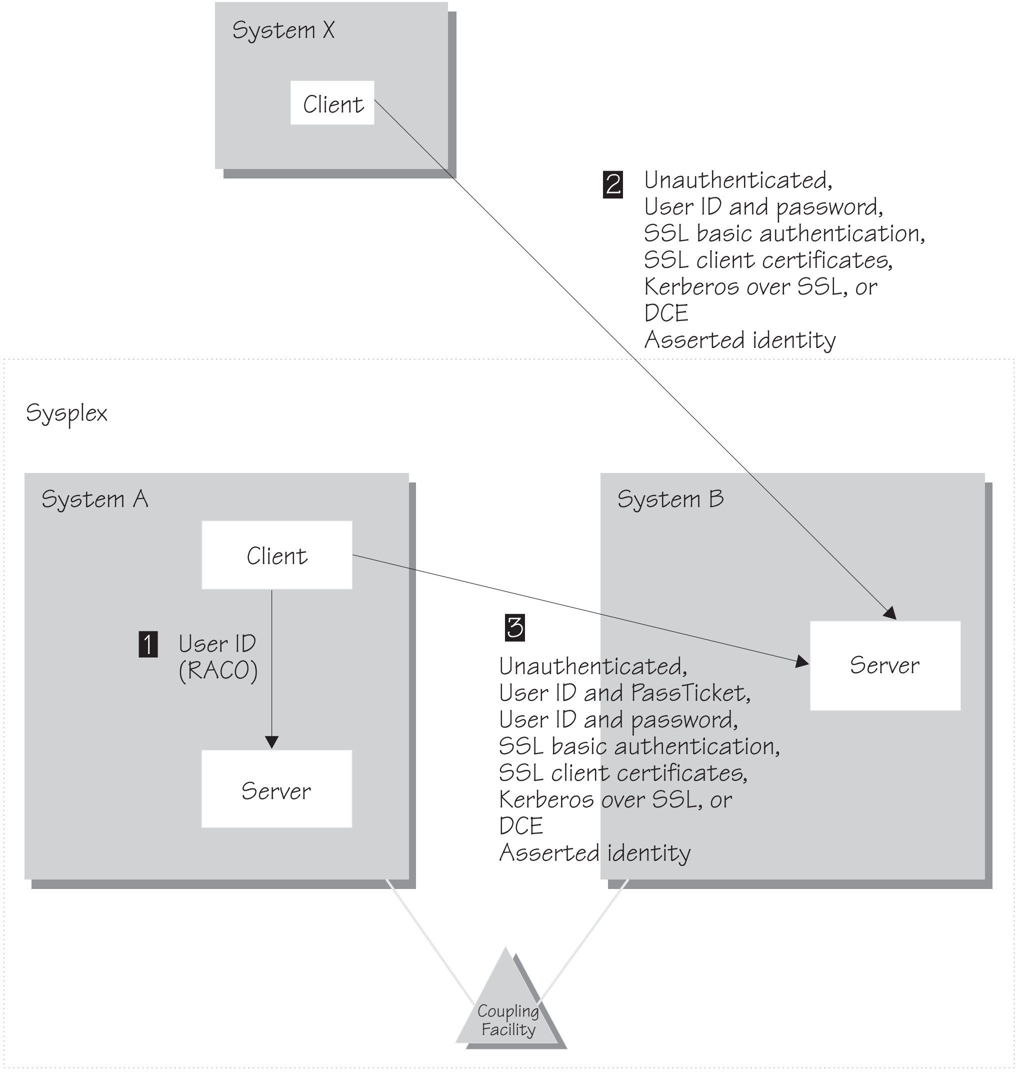


Figure 5. Identification and authentication

The following explains the numbered items in Figure 5.

1. Local clients and servers use their user IDs to identify themselves when requesting a service. WebSphere for z/OS uses a transportable form of the user's Accessor Environment Element (ACEE), called a RACO, for local clients and servers running in the same sysplex. The RACO is used throughout the WebSphere for z/OS system and ensures that any task is performed under the requestor's identity. No authentication is required because the user's identity is already established by the operating system. Just like other OS/390 applications, WebSphere for z/OS uses the operating system to keep track of the user identities and makes calls to the security service during the execution of a piece of work.
2. Unless you can be sure all messages exchanged flow exclusively within a trusted network, authenticity of clients and servers, message confidentiality, and message integrity become important issues. A client may want to be sure that it is receiving a service from a legitimate server and a server may want to be sure who the client is. Each party also wants to be sure that messages exchanged are protected from tampering or snooping by a malicious third party, so security in the transportation medium (message protection) is a concern. WebSphere for z/OS provides several authentication mechanisms,

some of which involve message protection. You need to decide, based on the nature of your network, which authentication mechanism you need:

- You can create a network with no security by configuring your server to accept unauthenticated clients. When you configure the server this way, every request without an identity is run under a default identity established by the server.
- From a WebSphere for z/OS client, you can use user ID/password security, which validates the client but which offers no message protection and no guarantee that a server is authentic. User ID/Password security should never be used in an untrusted network because user IDs and passwords can easily be intercepted and reused to gain entry into the system.
- If you want the added security of protected communications and user authentication in a network, you can use Secure Sockets Layer (SSL) security. SSL provides security over the communications link through encryption technology, ensuring the integrity of messages in a network. Because communications are encrypted between two parties, a third party cannot tamper with messages.

  SSL also provides methods to prove the identities of the parties communicating. Through SSL support on WebSphere for z/OS, there are these ways to prove the identities of servers and clients:

  - Basic authentication (also known as SSL Type 1 authentication), in which a server proves its identity by passing a digital certificate to the client, much like a person presents a passport to enter another country. A client proves its identity to the server by passing a user identity and password known by the target server.
  - Client certificate support, in which both the server and client supply digital certificates to prove their identities to each other.
  - Kerberos over SSL is another authentication mechanism you can use. In WebSphere for z/OS, Kerberos client authentication is used in conjunction with SSL to provide a complete authentication mechanism, in which SSL provides message security and authenticates the server to the client. Kerberos itself provides the ability for a server to authenticate the client.
  - Asserted identity, in which an intermediate server can send the identities of its clients to a target server in a secure yet efficient manner. This function requires client certificate support to establish the intermediate server as the owner of the SSL session. Through RACF, the system can check that the intermediate server can be trusted (to confer this level of trust, CBIND authorization is granted by administrators to RACF IDs that run secure system code exclusively). Once trust in this intermediate server is established, client identities (MVS user IDs) need not be separately verified by the target server; those client identities are simply asserted without requiring authentication.

  SSL and Kerberos support is optional: running WebSphere for z/OS without them affects the encryption and authentication functions only. You can still use other authentication mechanisms.

  For details on SSL, see “Setting up SSL security for WebSphere for z/OS” on page 217. For details on Kerberos, see “Setting up Kerberos security for WebSphere for z/OS” on page 252.
- Distributed Computing Environment (DCE) security is another option you can use for clients and servers on different systems in an untrusted network. DCE uses a third-party verification technique that verifies that clients are

communicating with the correct servers and servers are communicating with the correct clients. DCE also allows you to encrypt messages and check for message tampering.

DCE support is optional: running WebSphere for z/OS without installing DCE affects the DCE encryption and authentication functions only. If you do not install and activate DCE, WebSphere for z/OS cannot use DCE to authenticate remote clients.

For details on the use of DCE and its requirements, see Appendix F, “Setting up DCE,” on page 409.

3. Within the sysplex, all security protocols (except for RACO) are supported between clients and servers within the sysplex. Additionally, PassTickets are supported, in which the client’s user ID is used for identification and a PassTicket for authentication. A PassTicket is a one-time-use password that is dynamically generated.

   Because communications within a sysplex flow directly over a protected network, WebSphere for z/OS avoids the overhead of message encryption for these communications. In other words, when systems in a sysplex are directly connected, WebSphere for z/OS determines that the communication is guaranteed to be secure, and does not use encryption.

When a client connects to a server, part of the connection includes a negotiation between the client and server about what security protocol is to be used. This is an advance topic. Details about security protocol negotiation are in the topic “How clients and servers negotiate security protocols” on page 215.

Specifics about identification and authentication

For identification, each control region and server region start procedure must have its own user ID and you must define it in the STARTED class. Control regions are trusted, while server regions are not—we explain that in “Authorization checking” on page 20. Because you should give differing resource authorizations to each, you should give differing user IDs to control regions and server regions.

Additional user IDs are required for installation. We provide the definitions for these user IDs in our RACF sample. See the customized instructions produced when you run the customization dialog.

- User IDs for control regions and server regions.
- A user ID for the installation verification program and its application server. Our RACF sample uses CBIVP.
- A user ID called CBADMIN used by the Administration application.
- A default local and remote user ID associated with each server through the Administration application. We use CBGUEST.

Necessary user IDs and RACF definitions for the WebSphere for z/OS run time are provided by our RACF sample.

Regarding authentication, an operator starts a server by using the START command and the control region start procedure. Authentication of the start procedure’s user ID is made by virtue of the fact that an operator started the start procedure—that is, no password is required. If you want to restrict an operator’s ability to start servers, do so through the OPERCMDS class in RACF.

Setting permission for files created by applications

Files created by applications running in the server region will have permission bits set according to the default umask. To change the default umask for the server region, specify the _EDC_UMASK_DFLT environment variable in the JCL procedure for the server region.

On the JCL EXEC statement, specify:

```
PARM='ENVAR("_EDC_UMASK_DFLT=00x")
```

where `00x` is the umask value to use. The default value is 002.

Recommendation: IBM recommends that you use a umask value of 002, which means that files created by applications running in the server region will have permission bits set to 775.

Examples:

- EXEC statement with multiple parameters specified on the PARMkeyword:

```
//BBSxxxxS EXEC PGM=BBOSR,REGION=0M,TIME=NOLIMIT,
// PARM='ENVAR("_EDC_UMASK_DFLT=002")/ &PARMS &IWMSSNM'
```

- PARM keyword with multiple values specified on the ENVAR parameter:

```
// PARM='TRAP(ON,NOSPIE),ENVAR("_CEE_ENVFILE=DD:BBOENV","_EDC_UMASK_DFLx
// T=002")/ -ORBsrvname &IWMSSNM &PARMS'
```

Note: Because the entire UMASK parameter value in the example above does not fit on the same line, a continuation character splits the value into two parts: ″_EDC_UMASK_DFLx and T=002″. To correctly code the JCL in this situation:

- The continuation character (x in ″_EDC_UMASK_DFLx) must appear in column 72.
- The remainder of the UMASK parameter value (T=002″) must begin in column 16 on the following line.

Note: See the following documents for more information:

- *z/OS Language Environment Programming Reference*, SA22-7562, for more information on ENVAR.
- *z/OS C/C++ Programming Guide*, SC09-4765, for more information on how to change the UMASK defaults.
- *z/OS UNIX System Services Command Reference*, SA22-7802.

Security auditing

Security auditing is handled in the usual way by the security product. WebSphere for z/OS uses the System Authorization Facility (SAF), which provides an auditing mechanism consistent with other functions in z/OS or OS/390.

Security administration

Security administration should be handled in the usual way by the security product.

Choosing the system security you need

Determine the security you need and the components you must install and customize. You need to determine your security based on your application, the interaction between servers, and network topology before you decide which security mechanisms best fit your needs.

Steps for choosing the system security you need

Before you begin: You need to know how WebSphere for z/OS uses the underlying security systems during run time. "Setting up security" on page 19 provides an overview of WebSphere for z/OS security.

Follow these steps to choose the security you need:

1. Decide whether or not your applications require protection.

   If your applications do not exchange confidential data and the identities of participants are not required, then you can avoid most security controls and ignore the rest of this topic.

   Note: You must enable servers to allow unauthenticated requests through the Administration application and set up a z/OS or OS/390 user ID that will be used to process unauthenticated requests through RACF.

2. If your applications operate in an untrusted network and they deal with confidential or mission-critical data, then you should choose one of the security mechanisms that support message integrity and/or confidentiality (Table 7).

Table 7. Recommended security mechanisms based on your trust in the network

	Non-SSL Security				SSL-based Security[2a]			
Type of network	**local**	**Pass Ticket**	**User ID/ Pass–word**	**DCE**	**Basic Auth–tication**	**Kerb–eros**	**Client certifi–cates**	**Aserted identity**
Trusted	X	X	X	X	X	X	X	X[2b]
Untrusted		[2c]	[2d]	X	X	X	X	

   Notes:

   a. While SSL generally causes encryption to be done, the level of encryption is negotiated by server and client, and integrity of the messages without confidentiality is a possible outcome. If you want to ensure the confidentiality of messages, specify this while setting up the server. See "Setting up SSL security for WebSphere for z/OS" on page 217.

   b. The management of asserted identities requires trust to be conferred administratively on intermediate servers.

   c. Generally, communication within a sysplex is protected through an XCF connection. Because PassTicket security is used only among members of a sysplex, the configuration of the rest of the network is not relevant.

   d. **Never** send user IDs and passwords over an untrusted network. Note that the Administration application connects from the workstation to WebSphere for z/OS through user ID and password.

3. If your application has a server component (enterprise beans or CORBA components) that issue requests to remote servers, consider a security mechanism that provides for an authenticated identity to be transmitted to the

remote servers. Some mechanisms enable the client identity to be propagated (delegated) to a remote server and some mechanisms transmit the intermediate server's identity (Table 8).

Table 8. Recommended security mechanisms based on the need to propagate a user identity

	Non-SSL Security				**SSL-based Security**			
Type of propagation	**local**	**Pass Ticket**	**User ID/ Pass–word**	**DCE**	**Basic Auth–tication**	**Kerb–eros**	**Client certifi–cates**	**Asserted identity**
Server can forward client identity	X	X		X		X		X

4. Finally, determine the type of security mechanism to use according to the software configuration you have and the type of client that is interacting with your servers (Table 9).

Table 9. Recommended security mechanisms based on the software configuration and client characteristics

	Non-SSL Security				**SSL-based Security**			
Client characteristics	**local**	**Pass Ticket**	**User ID/ Pass–word**	**DCE**	**Basic Auth–tication**	**Kerb–eros**	**Client certifi–cates**	**Asserted identity**
On the same z/OS or OS/390 system	X							
In the same sysplex		X	X	X	X	X	X	X
Registered in a remote shared RACF database			X	X	X	X	X	X
Registered in a remote RACF database that is not shared				X		X	X	
WebSphere Application Server Advanced Edition V4.0					X[4a]			
WebSphere Application Server Enterprise Edition (distributed) C++				X			X	
WebSphere Application Server Enterprise Edition (distributed) Java				X	X			
CICS							X	
OEM ORBs							X	

Note:

a. Using SSL basic authentication with WebSphere Application Server Advanced Edition is limited to the interaction between a client (or server) and a WebSphere for z/OS server. A WebSphere for z/OS client (or server) cannot use SSL basic authentication in its interaction with a WebSphere Application Server Advanced Edition server.

You can now implement the security controls for the components you chose.

Example of choosing system security

Example: This is an example of how you would consider selecting security mechanisms for a system.

In this example, you deploy two J2EE servers (CBSRV1 and CBSRV2) in a sysplex. Clients communicate with the system through CBSRV1 and CBSRV1 propagates client identities to CBSRV2 across the sysplex, which is secure. Clients run on WebSphere Application Server Enterprise Edition (distributed) and their interaction with the sysplex is on a network that is not trusted. The data the application uses must be protected and kept confidential.

1. Since you must protect the confidentiality of the data and know the client identities, your first decision is clear: since your network is untrusted, you must use a security mechanism that supports message integrity and confidentiality (see Table 7 on page 31).
2. Your application requires that the client identity be propagated to other servers. You may use PassTicket, asserted identities, Kerberos, or DCE (see Table 8 on page 32).
   - PassTicket security is generally the simplest mechanism to set up within a sysplex, but is restricted in that an address space can only have one PassTicket per second.
   - Asserted identity security requires the client’s MVS identity be defined on both MVS systems. You must define SSL certificates and key rings for CBSRV1 and CBSRV2 through RACF. Also, you must define a trust relationship between CBSRV1 and CBSRV2 by giving CBSRV1 RACF CONTROL authority for the CB.BIND.CBSRV2.* profile.
   - Kerberos security is the most robust of the security mechanisms in WebSphere for z/OS. Kerberos is scalable and delegates Kerberos network identities securely. However, you must install and configure Kerberos and SSL, which is a significant task.
   - DCE security is an option if you already have DCE security implemented.

   You choose PassTicket security because you know your application will have a low volume of transactions and you want to minimize security tasks and administration.
3. Finally, you choose SSL basic authentication for network interactions because WebSphere Application Server Enterprise Edition (distributed) supports that security mechanism.

In this example, you would define PassTicket and SSL Type 1 (basic authentication) for CBSRV1 and PassTicket security for CBSRV2.

Setting up workload management (WLM)

WebSphere for z/OS uses the workload management (WLM) function in z/OS or OS/390 to manage workloads. This section helps you get started and is sufficient to get a functioning WebSphere for z/OS system. Advanced workload management topics are in Chapter 5, “Performing advanced tasks,” on page 191.

Setting up workload management (WLM) in goal mode

WebSphere for z/OS requires that z/OS or OS/390 run workload management in goal mode. If your system runs in compatibility mode, you must implement goal mode. For details on workload management, see *z/OS MVS Planning: Workload Management*, SA22-7602.

Setting up workload management for run-time servers

In addition to setting up workload management in goal mode, you need to define workload management policies for WebSphere for z/OS servers and your business application servers. This section discusses specifics for the run-time servers. For details on workload management and business applications, see *WebSphere Application Server V4.0.1 for z/OS and OS/390: Assembling J2EE Applications*, SA22-7836.

Overview of workload management and servers

You need to define application environments for the System Management Server, Naming Server, and Interface Repository Server (you do not define an application environment for the Daemon Server). Without these definitions, WebSphere for z/OS will not start.

Note: To get started, you do not need to define special classification rules and work qualifiers, but you may want to do this for your production system. For more information, see “Implementing advanced performance controls” on page 256.

Because the installation verification programs need servers, you must also define an application environment for the MOFW application server, the J2EE application server, or both (depending on whether you plan to use MOFW or J2EE components). We include those servers in the tables below.

Just like servers for your business applications, the WebSphere for z/OS run-time servers (with the exception of the Daemon) have a control region and one or more server regions. The regions are started by the start procedures shown in Table 10.

Table 10. Default start procedures for run-time control and server regions

Server	Default server name	Default control region start procedure	Default server region start procedure
Naming Server	CBNAMING	BBONM	BBONMS
System Management Server	CBSYSMGT	BBOSMS	BBOSMSS
Interface Repository Server	CBINTFRP	BBOIR	BBOIRS
MOFW application server	BBOASR1	BBOASR1	BBOASR1S
J2EE application server	BBOASR2	BBOASR2	BBOASR2S

For business application servers, you have to start the control regions yourself. For the WebSphere for z/OS run-time servers, however, you need only start the Daemon, which in turn starts the control regions for the System Management Server, Naming Server, and Interface Repository Server. Workload manager dynamically starts the server regions as work requests arrive. Thus, you must create WLM application environments that name **server** region start procedures to start, as shown in Table 11. For example, specify BBOASR1S as the start procedure name that workload management starts for the BBOASR1 server.

Each new server that you create for a business application also needs to be defined to workload management. See *WebSphere Application Server V4.0.1 for z/OS and OS/390: Assembling J2EE Applications*, SA22-7836.

Step for defining workload management policies for the run-time servers

Before you begin: You must have access to the IWMARIN0 application and be able to update the workload management policies.

Perform the following step to define the workload management policies:

- Use the ISPF application IWMARIN0 to define WLM application environments according to the following table.

  Tip: Table 11 uses IBM default names for the servers and procedures as examples. The customization dialog allows you to change server and procedure names, which means you would need to use the values you supply through the customization dialog. The dialog also tailors the workload management definition task to include the names you supply, so you may prefer to follow the customized instructions from the dialog. For more on the customization dialog, see Chapter 3, "Installing and customizing your first run time," on page 51.

Table 11. Application environment specifications for run-time servers

Run-time server	Application environment (same as server name)	Subsystem type	Procedure name for the run-time server region	Start parameter	Limit on starting server address space for a subsystem instance[1]
Naming Server	CBNAMING	CB	BBONMS	IWMSSNM=&IWMSSNM	No limit
System Management Server	CBSYSMGT	CB	BBOSMSS	IWMSSNM=&IWMSSNM	No limit
Interface Repository Server	CBINTFRP	CB	BBOIRS	IWMSSNM=&IWMSSNM	No limit
MOFW application server	BBOASR1	CB	BBOASR1S	IWMSSNM=&IWMSSNM	Single address space per system[2]
J2EE application server	BBOASR2	CB	BBOASR2S	IWMSSNM=&IWMSSNM	No limit

Table 11. Application environment specifications for run-time servers (continued)

Run-time server	Application environment (same as server name)	Subsystem type	Procedure name for the run-time server region	Start parameter	Limit on starting server address space for a subsystem instance[1]

Notes:

1. You can specify “No limit”, or “Single address space per system.” You cannot specify “Single address space per sysplex.”
2. The MOFW installation verification program runs in BBOASR1 and is an example of a program that makes the state of transient objects available to other transactions, which requires that all transactions run in the same address space (server region). If all transactions do not run in the same server region, one transaction may process in one server region and a second transaction that depends on the state of a transient object may process in a different server region. However, the state of the transient object would not be available to the second transaction. To set up a server like BBOASR1, you must do the following:
   a. Set up only one server instance for the server. You cannot replicate server instances because that would result in more than one server region (address space).
   b. Set the workload management “Limit on starting server address space for a subsystem instance” to “Single address space per system.” You cannot use “No limit” because that could result in more than one server region (address space).
   c. Using the Administration application, set the following server attributes for your application server:
      - Check the Production check box
      - Set the Isolation policy to multiple transactions per server region.

For details on defining the application environments to workload manager, see *z/OS MVS Planning: Workload Management*, SA22-7602.

You are done when you activate the service policy and exit IWMARIN0.

The following example shows how to create an application environment for BBOASR1. You must perform the steps in the example for each server in Table 11 on page 35.

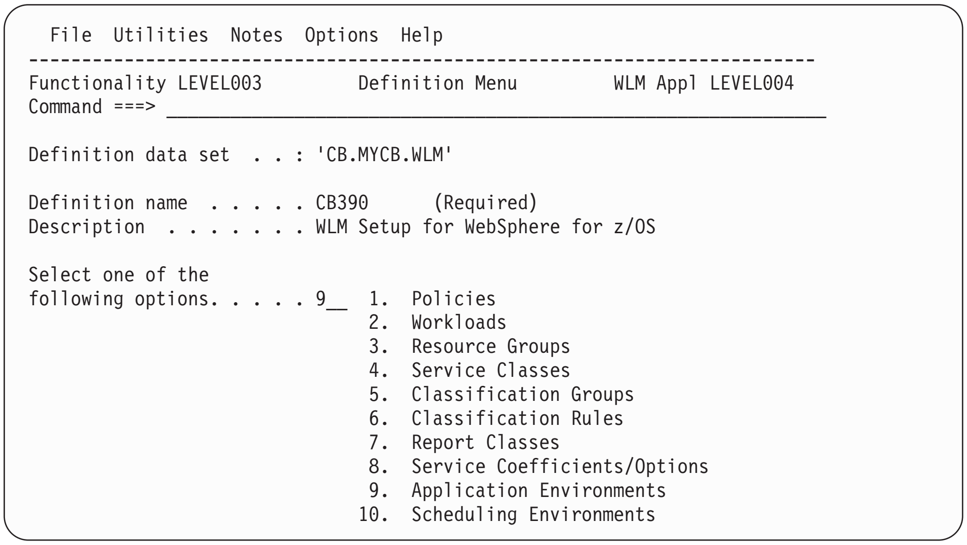
Example of using IWMARIN0: The following shows the panels you use in IWMARIN0 to define an application environment.

Before you begin: Workload management must be running in goal mode, and you must have access to a WLM definition, either saved in a WLM definition data set, or active in the WLM couple data set.

The user of IWMARIN0 must have update access to the RACF FACILITY class profile MVSADMIN.WLM.POLICY.

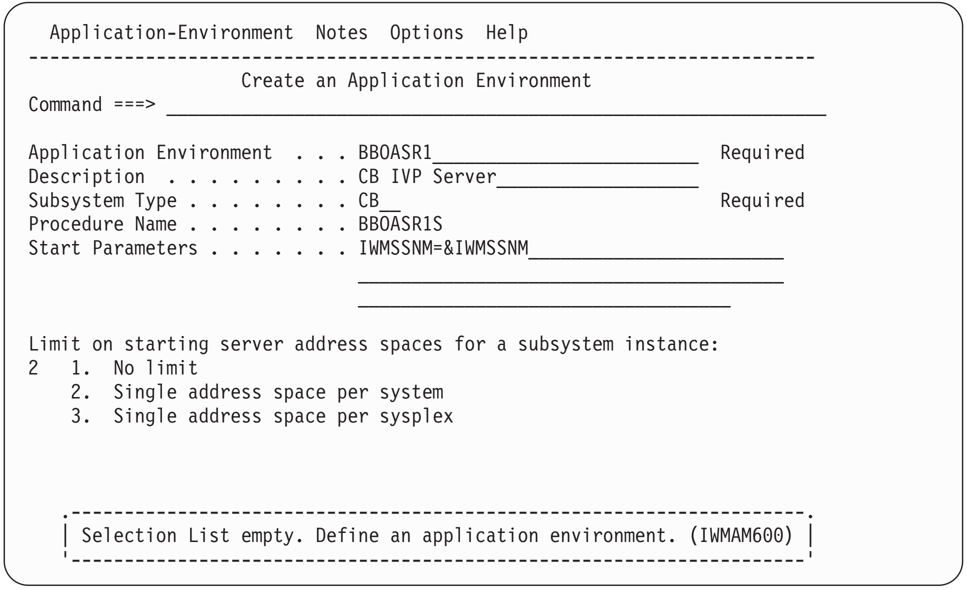
Perform the following steps to create the BBOASR1 application environment:

1. Open the main panel by issuing IWMARIN0. Either load a WLM goal mode definition from a WLM definition data set, or extract a working goal mode definition from the WLM couple data set. Then choose option 9:



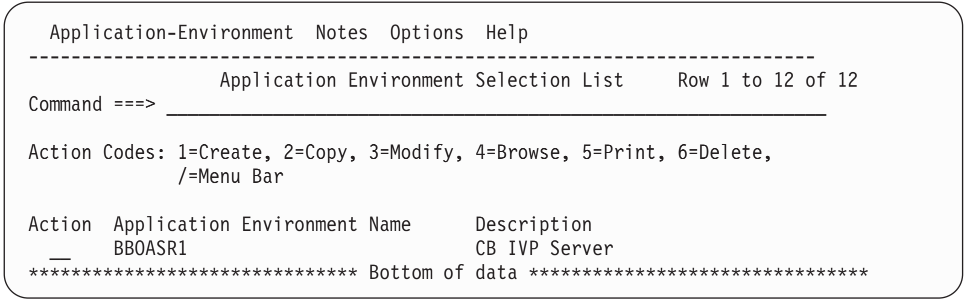
```
  File  Utilities  Notes  Options  Help
--------------------------------------------------------------------------
Functionality LEVEL003         Definition Menu         WLM Appl LEVEL004
Command ===> ______________________________________________________________

Definition data set  . . : 'CB.MYCB.WLM'

Definition name  . . . . . CB390      (Required)
Description  . . . . . . . WLM Setup for WebSphere for z/OS

Select one of the
following options. . . . . 9__  1.  Policies
                                2.  Workloads
                                3.  Resource Groups
                                4.  Service Classes
                                5.  Classification Groups
                                6.  Classification Rules
                                7.  Report Classes
                                8.  Service Coefficients/Options
                                9.  Application Environments
                               10.  Scheduling Environments
```

2. Fill in the field on the next panel as shown:



```
  Application-Environment  Notes  Options  Help
--------------------------------------------------------------------------
                    Create an Application Environment
Command ===> ______________________________________________________________

Application Environment  . . . BBOASR1_________________________  Required
Description  . . . . . . . . . CB IVP Server___________________
Subsystem Type . . . . . . . . CB__                              Required
Procedure Name . . . . . . . . BBOASR1S
Start Parameters . . . . . . . IWMSSNM=&IWMSSNM________________________
                               ________________________________________
                               ___________________________________

Limit on starting server address spaces for a subsystem instance:
2   1.  No limit
    2.  Single address space per system
    3.  Single address space per sysplex



     .----------------------------------------------------------------------.
     | Selection List empty. Define an application environment. (IWMAM600) |
     '----------------------------------------------------------------------'
```

3. Save the application environment. The following panel appears:



```
  Application-Environment  Notes  Options  Help
--------------------------------------------------------------------------
                  Application Environment Selection List     Row 1 to 12 of 12
Command ===> ______________________________________________________________

Action Codes: 1=Create, 2=Copy, 3=Modify, 4=Browse, 5=Print, 6=Delete,
              /=Menu Bar

Action  Application Environment Name      Description
  __    BBOASR1                           CB IVP Server
******************************* Bottom of data ********************************
```

4. From the Utilities menu, select Install definition.

5. From the Utilities menu, select Activate service policy.

6. From the File menu, select exit.

Recommendations for resource recovery services

WebSphere for z/OS requires the use of the RRS Attach Facility (RRSAF) of DB2, which in turn requires that resource recovery services (RRS) be set up. If you do not have RRS set up, the customization dialog helps you do this. See Chapter 3, “Installing and customizing your first run time,” on page 51.

When setting up RRS, consider the following:

1. You may already have configured RRS for z/OS or OS/390 to exploit WLM-managed DB2 Stored Procedures address spaces. However, if DB2 is the only RRS-compliant resource manager participating in transactional commits, optimizations will cause the system to bypass RRS usage of the system logger. This means that, while your installation may have configured RRS, your log streams might have just minimal activity. WebSphere for z/OS is an RRS-compliant resource manager and will participate in transactional commits with DB2. Thus, WebSphere for z/OS will require RRS to start writing data to its system logger log streams. You might need to adjust the size of your log streams.
   - WebSphere for z/OS has no significant impact on the RM.DATA log.
   - Depending on the transaction policies of both the client and container, you may not see any activity in the MAIN.UR log. This lack of activity is not a problem.
   - Depending on the transactional policy defined for your containers, you may see much more activity in your DELAYED.UR log stream than in the MAIN.UR log stream. In general, WebSphere for z/OS performs a modified distributed commit even for those protected resources that are accessed or modified in a single server region, and you may observe these global transactions in the in-doubt state. In-doubt is a very short-lived state when the transaction is local to a given application server. However, because the transaction does enter the in-doubt state, RRS logs hardened data in the DELAYED.UR log.

     All RRS transaction logging for WebSphere for z/OS will occur solely in the DELAYED.UR log stream. Such logging may change in future releases of WebSphere for z/OS, so you still may want to configure your MAIN.UR log stream so that it can handle a production workload, in case you deploy a new container or the WebSphere for z/OS infrastructure changes.
   - WebSphere for z/OS has no significant impact on the RESTART log.
   - There is no reason to change your policy about the ARCHIVE log. Though optional, we suggest you use the ARCHIVE log. It has a small negative effect on performance. Set the retention period for the log as you would normally.
2. The Object Transaction Service in WebSphere for z/OS cannot detect when it has been restarted in a different logging group, which affects transaction recovery. We recommend you use automatic restart management (ARM) to control restart locations.
3. For structure sizes, we recommend the following for initial setup values. Through experience, you may need to adjust these:

Table 12. Recommended size of log streams

Log stream	Initial size	Size
RM.DATA	1 MB	1 MB
MAIN.UR	5 MB	50 MB
DELAYED.UR	5 MB	50 MB
RESTART	1 MB	5 MB
ARCHIVE	5 MB	50 MB

Check the MAXBUFSIZE on your log streams. If the size is too small, you may encounter DB2 failures.

Details about resource recovery are in *z/OS MVS Programming: Resource Recovery*, SA22-7616. Details about the RRS Attach Facility are in *DB2 for OS/390 Application Programming and SQL Guide*, SC26-8958.

Guideline for RMF and other monitoring systems

You can use any performance and monitoring system you choose.

DB2 database and LDAP

This section explains how WebSphere for z/OS uses DB2 and LDAP (Lightweight Directory Access Protocol), provides guidelines for these two functions, describes DB2 operational considerations, and discusses rules about LDAP security.

After installation and customization is complete, you may wish to use RACF to protect DB2 resources. For more information, see “Setting up RACF protection for DB2” on page 187.

Overview

This section describes the relationships between WebSphere for z/OS, DB2, and LDAP.

For WebSphere for z/OS, the LDAP component of the z/OS or OS/390 Security Server provides the directory services for the Java Naming and Directory Interface (JNDI) and CORBA (MOFW) naming and interface repository services. The contents of the directory are stored in DB2 tables.

At run time, your J2EE components require an LDAP server to be running for the JNDI name services. We recommend that you use the LDAP server you create during installation and customization for this purpose. CORBA (MOFW) components do not require an LDAP server to be running because they rely on the Naming Server, which runs the LDAP DLLs in its own address space. In both cases, you need an LDAP server for administrative purposes, such as adding users to the LDAP access control list.

Recommendation: Even if you already have an LDAP server on your system, create a new LDAP server and database for WebSphere for z/OS. The reasons are:

- The data you put in the database is of interest only to WebSphere for z/OS and accessible through WebSphere for z/OS services.
- An exclusive LDAP server and database helps you keep the WebSphere for z/OS databases synchronized.

Note: If you have an existing WebSphere Application Server Enterprise Edition for OS/390 V3.02 LDAP database, schema changes require that you migrate that database using an unload/reload operation.

For in-depth instructions about setting up LDAP, refer to *z/OS Security Server LDAP Server Administration and Use*, SC24-5923.

During installation and customization, you must create an LDAP server (or use an existing LDAP server), create the LDAP database, run bind jobs, set DB2 grants, and initialize the LDAP directories. You will find these instructions in the customized instructions produced by the customization dialog (for more information about the customization dialog, see "Running the customization dialog" on page 56).

Structure of the LDAP configuration files

The main LDAP configuration file, *system*.bboslapd.conf, uses include statements to include the other configuration files. Typical LDAP configuration files also include a dsnaoini statement, which points to the DSNAOINI data set, the DB2 initialization file. However, in order to place our version of DSNAOINI into the HFS, the start procedures for LDAP, the Naming server region, and the Interface Repository server region must point to DSNAOINI through a DD statement (our samples do that for you). When you use such a DD statement in the start procedures, you do not need to use the dsnaoini statement in the LDAP configuration file. Thus, we comment out the dsnaoini statement in bboslapd.conf.

The structure looks like this:

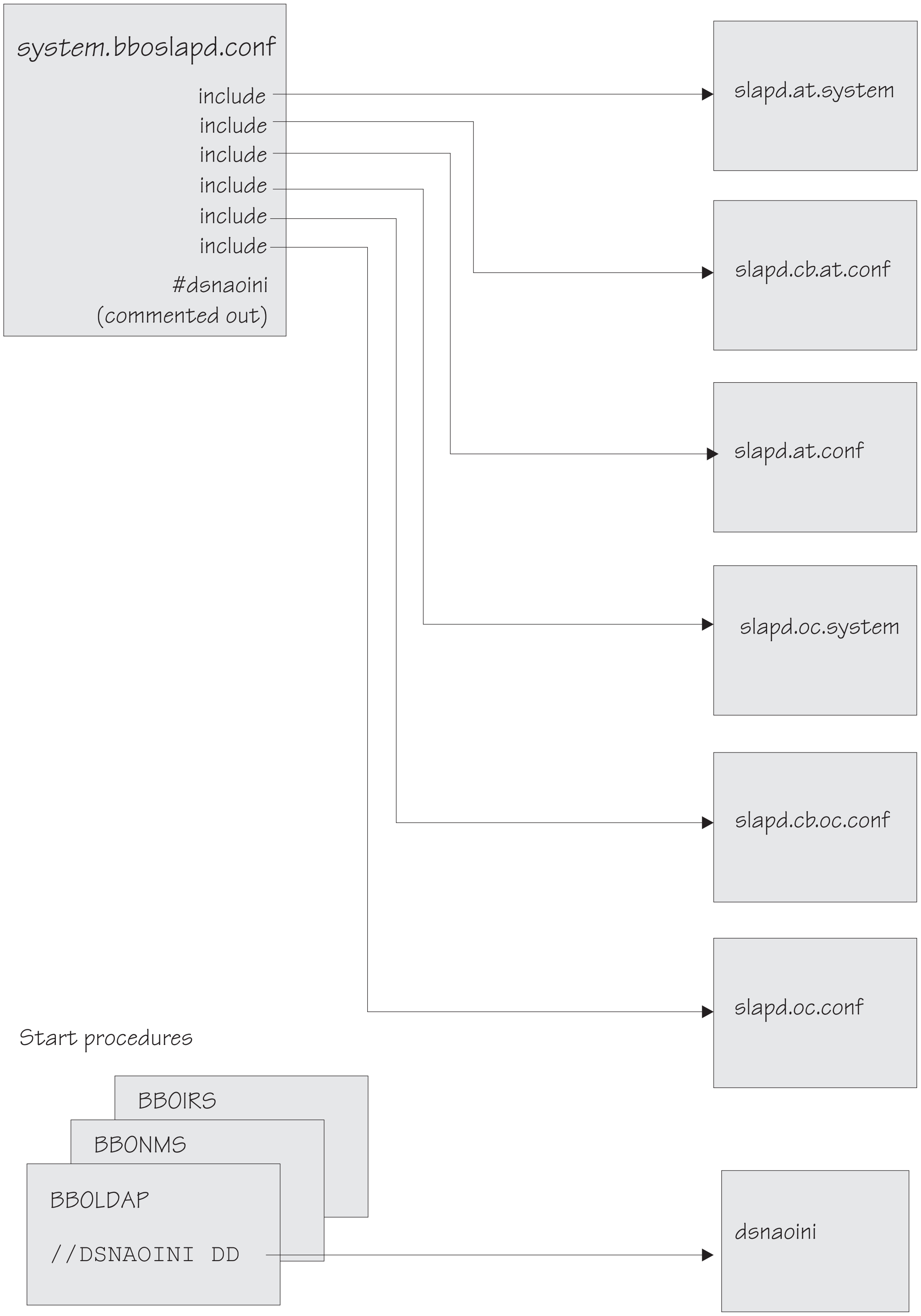


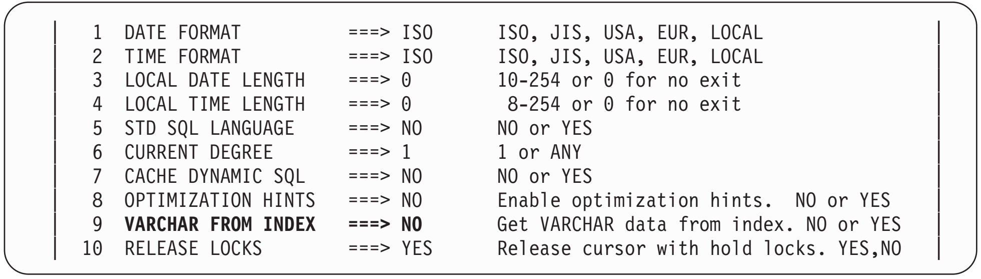
Figure 6. LDAP configuration file structure

Guidelines, rules, and recommendations for DB2 and LDAP

Follow these guidelines, rules, and recommendations to set up DB2 and LDAP:

- Use the TDBM backend for your LDAP server. The TDBM backend improves the performance of your LDAP server and IBM has announced that RDBM will not be supported after z/OS V1R3. For release and service requirements for TDBM, see “z/OS or OS/390 software requirements for WebSphere for z/OS” on page 10..

- The VARCHAR FROM INDEX option must be set to NO. This option is set through the DB2 installation panels (see the bold print in the figure).



```
|   1  DATE FORMAT          ===> ISO      ISO, JIS, USA, EUR, LOCAL             |
|   2  TIME FORMAT          ===> ISO      ISO, JIS, USA, EUR, LOCAL             |
|   3  LOCAL DATE LENGTH    ===> 0        10-254 or 0 for no exit               |
|   4  LOCAL TIME LENGTH    ===> 0         8-254 or 0 for no exit               |
|   5  STD SQL LANGUAGE     ===> NO       NO or YES                             |
|   6  CURRENT DEGREE       ===> 1        1 or ANY                              |
|   7  CACHE DYNAMIC SQL    ===> NO       NO or YES                             |
|   8  OPTIMIZATION HINTS   ===> NO       Enable optimization hints.  NO or YES |
|   9  VARCHAR FROM INDEX   ===> NO       Get VARCHAR data from index. NO or YES |
|  10  RELEASE LOCKS        ===> YES      Release cursor with hold locks. YES,NO |
```

- Review the need for additional resources to support DB2 large objects (LOBs) when you install WebSphere for z/OS and when you deploy an application on WebSphere for z/OS. The following is an indication that you may not have sufficient storage for large objects:

  ```
  -904, ERROR:  UNSUCCESSFUL EXECUTION CAUSED BY AN UNAVAILABLE TYPE OF RESOURCE 00000907,
  AND RESOURCE NAME DSNT418I SQLSTATE = 57011 SQLSTATE RETURN CODE DSNT415I ...
  ```

  Adjust the amount of storage needed for large objects through the USER LOB VALUE STORAGE (LOBVALA) and SYSTEM LOB VALUE STORAGE (LOBVALS) fields on the DSNTIP7 DB2 installation panel. For more information, see *DB2 Installation Guide*, GC26-9936.
- The CORBA (MOFW) support in WebSphere for z/OS does not support DBCS. You must configure DB2 with the DSNHDECP parameter MIXED=NO.
- LDAP RDBM support in WebSphere for z/OS requires you configure DB2 with DSNHDECP parameter MIXED=NO.
- If you are configuring a J2EE server and you would like to support DBCS data, you should configure DB2 with the DSNHDECP parameter MIXED=YES and you must use the LDAP TDBM backend. The RDBM backend does not support MIXED=YES.
- Check the size of your DB2 logs. They might need to be larger because of the number of transactions WebSphere for z/OS generates.
- Increase the BP32K buffer pools to at least 100.
- Check the size of your DSNDB07 database.
- Check the 32K temporary work space for DB2. Your installation may not have had use for this work space before, but WebSphere for z/OS uses it. You must run a DB2 job called DSNTIJTM (in *hlq*.SDSNSAMP) during DB2 installation to allocate the work space. If this allocation is not large enough, you may get an SQL -904 return code when bringing up the LDAP server, the System Management Server, or the Naming Server.
- Take note of the fact that WebSphere for z/OS uses row-level locking and Type 2 indexes.
- If possible, keep the WebSphere for z/OS LDAP tables separate from other LDAP tables. The reason for keeping the sets of LDAP tables separate is that you need to back up the WebSphere for z/OS LDAP tables with the WebSphere for z/OS system management database as a unit. Performing such a coordinated backup is easier if the WebSphere for z/OS LDAP tables are separate from other LDAP tables. Additionally, if you need to restore the WebSphere for z/OS environment, restoring the WebSphere for z/OS LDAP tables will not interfere with LDAP tables used by other applications.

- Access to naming services is controlled and managed by LDAP access control lists. The sample LDIF file we provide (bboldif.cb) provides two LDAP access IDs with write access to the name space: CBAdmin and WASAdmin. Because they have write access, you may want to change the administrative password in the LDIF file.

  If you change the password for CBAdmin (you can do this through the customization dialog at installation and customization time), you must update the LDAPBINDPW environment variable for the Naming server and the LDAPIRBINDPW environment variable for the Interface Repository server. Update the environment variable in the current.env file for each server. For more information, see Appendix A, "Environment files," on page 321.

  Note: General run-time name lookup requires read access to the name space. The sample LDIF file provides an access ID with read access called ANYBODY, which allows any user to access name services.
- DB2 counts RRSAF threads in the Batch thread bucket. IBM recommends you increase the MAX USERS and MAX BATCH CONNECT settings as follows. In DSN710.SDSNSAMP(DSNTIJUZ):
  - Increase the CTHREAD parameter, used to increase MAX USERS
  - Increase the IDBACK parameter, used to increase MAX BATCH CONNECT

  Example:

  ```
  DSN6SYSP AUDITST=NO,
           BACKODUR=5,
           CHKFREQ=50000,
           CONDBAT=64,
           CTHREAD=700,
           DBPROTCL=DRDA,
           DLDFREQ=5,
           DSSTIME=5,
           EXTRAREQ=100,
           EXTRASRV=100,
           EXTSEC=NO,
           IDBACK=500,
           IDFORE=40,
           IDXBPOOL=BP0,
           LBACKOUT=AUTO,
  ```

  For more information, see *DB2 Installation Guide*, GC26-9936.
- **Attention:** During installation and customization, you are instructed to run a job called BBO1JCL. **If you have already run this job, or if the DSNACLI plan already exists on your system, do not run it again because this will destroy all GRANT privileges established for DB2.**

  If you are not a DB2 expert, contact one to determine if BBO1JCL has already been run or if DSNACLI already exists. To determine this, run the following SPUFI query, which tests to see whether the DSNACLI plan has already been bound:

  ```
  select * from sysibm.sysplan where name='DSNACLI';
  ```

  If you get SQLCODE=100, DSNACLI has not been bound. You may safely run BBO1JCL.

  If BBO1JCL has already been run or DSNACLI already exists, you have some alternatives:
  - Bind the plan again specifying RETAIN so that existing privileges are not lost.

- Find out who has execute privileges on the plan, run BBO1JCL again, then re-grant the privileges. To find out who has execute privileges on the plan, run the following SPUFI query:

  ```
  select  * from sysibm.sysplanauth where name='DSNACLI';
  ```
- Create a new plan name (for example, BBOACLI), update the dsnaoini file used by BBOLDAP and WebSphere for z/OS with the new plan name, then bind the new plan using the same package names and DBRMs as in BBO1JCL. Then update the execute permissions appropriately for BBOLDAP, BBOIRS, and BBONMS, or PUBLIC (depending on your installations policies).

- If you use data definition control as an additional DB2 security measure, you must register the following plans:
  - DSNJDBC
  - DSNACLI

  For more information about data definition control, see *DB2 Administration Guide*, SC26-9931.
- There are two settings in the slap.conf file: maxConnections and maxThreads. The customization dialogs set both to a default of 10. However, this value may be too small for your system—a situation that can cause LDAP connection failures. You can determine the correct value to use based on the release and/or APAR level you are running for the LDAP server on your system.

  Beginning with z/OS V1R2 (or after applying APAR OW50971 to OS/390 V2R10 or z/OS V1R1), you should use the configuration parameter ″commThreads″ and specify to run with approximately two times the number of CPUs dedicated to the LPAR in which the LDAP server is running. ″maxConnections″ can be set independently and represents the maximum number of concurrently connected clients that you want the server to allow. It now has a minimum of 30 and a maximum that depends on MAXFILEPROC from BPXPRMxx.

  Note: See *z/OS Security Server LDAP Server Administration and Use*, SC24-5923, for more information on how to configure LDAP.

Guidelines for Java Database Connectivity and static SQL

Java Database Connectivity (JDBC) provides an interface for Java application programs to access relational data in a database by using dynamic SQL. Static SQL (SQLJ) provides support for embedded static SQL in Java applications and applets. DB2 supports these application programming interfaces. For complete information about JDBC, SQLJ, and DB2, see *DB2 for OS/390 Application Programming Guide and Reference for Java*. This topic covers guidelines related to WebSphere for z/OS’s use of JDBC and SQLJ.

- You may use JDBC (dynamic SQL) and SQLJ (static SQL) in your server applications.
- Record the location of the run-time properties file, db2sqljjdbc.properties. You will use the location during the WebSphere for z/OS customization process. If you customize this file, you may want to keep the customized version in a separate directory such as `/etc` and record its location.
- All J2EE servers and the System Management server must be granted EXECUTE authority on the DSNJDBC plan. If your installation allows public access to the DSNJDBC plan, all you need to do is issue:

  ```
  GRANT EXECUTE ON PLAN DSNJDBC TO PUBLIC
  ```

If your installation does not allow public access to the DSNJDBC plan, then you must grant EXECUTE authority to all J2EE servers and the System Management server. If you use DB2 secondary authorization IDs, then you can grant the authority to the groups to which the server IDs belong.

Note: During installation and customization, you use the BBOCBGRT job (produced by the customization dialog) to grant various user IDs authority to access DB2. This GRANT job issues:

```
GRANT EXECUTE ON PLAN DSNJDBC TO PUBLIC
```

You may want to alter or remove the statement.

- You must use the RRSAF attachment interface (not CAF).

For more information about setting up JDBC and SQLJ and the implications for application programs, see *DB2 for OS/390 Application Programming Guide and Reference for Java*.

Guidelines for DB2 settings for WebSphere concurrency control management

If your installation uses typical DB2 defaults for U-lock management and lock size, certain WebSphere applications that use container-managed Enterprise beans (CMP beans) may encounter deadlocks. The likelihood of encountering deadlocks is entirely dependent on the design and execution pattern of the application. The potential for deadlocks increases with the number and frequency of applications driving concurrent transactions that update the same areas of the DB2 database. If, given your installation's application workload, the potential for deadlocks is high, consider using the following DB2 settings:

- RRULOCK(YES)
- LOCKSIZE(ROW)

For additional details, see the information about settings for the internal resource lock manager (IRLM) in *DB2 Installation Guide*, GC26-9936.

Alternative: Your applications may be candidates for the optimistic approach to concurrency control management. To determine whether your applications can use optimistic concurrency control, see the topic about controlling concurrent access to persistent data in *WebSphere Application Server V4.0.1 for z/OS and OS/390: Assembling J2EE Applications*, SA22-7836.

Notes on planning for DB2 operations

When planning for operations, note the following:

- WebSphere for z/OS uses DB2 for its control information. Thus, DB2 must be running for the WebSphere for z/OS run-time servers to run. If you plan to stop DB2 in order to do maintenance, you must also stop WebSphere for z/OS. Also, you must stop LDAP before DB2 will shut down.
- When displaying DB2 threads with the `-dis thd(*)` command, the correlation ID is `CB390`. The Authid column contains the user id of the active/last request.

  Example:

```
NAME     ST A   REQ   ID        AUTHID   PLAN     ASID TOKEN
RRSAF    T      9     CB390     DINGES   ?RRSAF   0045 436
RRSAF    T      841   CB390     CBNAMSR1 ?RRSAF   0044 435
RRSAF    T      1457  CB390     CBNAMSR1 ?RRSAF   0031 434
RRSAF    T      83    CB390     CBINTSR1 ?RRSAF   001E 433
RRSAF    T      221   CB390     CBIVP    ?RRSAF   0015 432
RRSAF    T      3709  CB390     CBNAMSR1 ?RRSAF   0038 431
RRSAF    T      1923  CB390     CBSYMCR1 ?RRSAF   0040 12
RRSAF    T      2078  CB390     CBSYMCR1 ?RRSAF   0040 13
RRSAF    DI     2300  CB390     CBSYMCR1 ?RRSAF   0040 14
RRSAF    T      1285  CB390     CBSYMCR1 ?RRSAF   0040 350
RRSAF    T      452   CB390     CBDMNCR1 ?RRSAF   003F 10
RRSAF    T      31    CB390     CBDMNCR1 ?RRSAF   003F 11
```

For JDBC connections the correlation id is the name of the job.

Example:

```
NAME     ST A   REQ   ID        AUTHID   PLAN     ASID TOKEN
RRSAF    T  *   3     BBOASR1S  CBASRU1  DSNJDBC  0039 438
```

Rules for LDAP security

You can control access to LDAP directories, subdirectories, or entries by means of access control lists (ACLs). ACLs specify which users are allowed access to each LDAP entry and which types of operations those users may perform. For details, see *z/OS Security Server LDAP Server Administration and Use*, SC24-5923. Follow these rules regarding LDAP security:

- For CORBA (MOFW) components, IBM has configured the LDAP DLLs to run within the Naming and Interface Repository server instances, thus eliminating the need to have a separate LDAP server running with the WebSphere for z/OS run time.

  If you do not follow the standard configuration of running the LDAP DLLs in the Naming and Interface Repository server instances and rely on an LDAP server running with WebSphere for z/OS run time, do not implement ACL-based access control to WebSphere for z/OS data. If you do implement ACL-based access control with such a configuration, WebSphere for z/OS will not be able to access its data.
- You can use RACF user IDs in LDAP Access Control Lists.

  Example: If USER1 is a RACF user id, use the following ACL statement. It gives USER1 the maximum access rights to the specified LDAP entry.

  ```
  aclSource: cn=DEPT_A, o=IBM, c=US
  aclEntry: access-id:USER1:object:ad:normal:rwsc
  ```

  You cannot, however, use RACF group names in this way. For more information about this and how LDAP can access the RACF database, see *z/OS Security Server LDAP Server Administration and Use*, SC24-5923. If you use group names, your installation must place WebSphere for z/OS libraries, DB2 libraries, and SYS1.LINKLIB under program control.
  Recommendation: For your initial LDAP configuration, we recommend you do not set up LDAP with RACF group names.

Recommendations for using memory

WebSphere for z/OS differs from previous application servers in its use of memory. WebSphere for z/OS's implementation takes advantage of z/OS or OS/390's efficient memory management, but, like many of today's newer application servers and languages, it is a large consumer of memory. You may experience some changes from your existing memory usage patterns. This section outlines changes you might need to make. Follow these recommendations:

1. For real storage requirements, see "z/OS or OS/390 hardware requirements" on page 10.

2. We recommend you dynamically load the run time in the link pack area (LPA) because the size of the load modules is large, and many address spaces need to refer to those load modules. The load modules for the run time comprise about 200 MB in size.

   Because you are using dynamic LPA, you may run out of ECSA after an IPL if you do not increase CSA at IPL time. Add 200 MB to ECSA in support of WebSphere for z/OS. You should monitor ECSA after dynamically loading the run time into LPA. Remember to increase the size of your CSA page data set accordingly.
3. If you choose to place the load modules in steplib or in the link list, you must allow for the additional 200 MB as part of each address space's region. A typical WebSphere for z/OS basic installation consists of 9 address spaces, each of which reference most of the 200 MB of load modules.
4. In addition to placing the load modules in the link pack area, give each address space a dynamic area of at least 128 MB.
5. Check to see whether your installation limits region sizes through the IEFUSI exit, JES exits, or TSO segment defaults. All of the WebSphere for z/OS JCL procedures are shipped with a default REGION=0M, which means you should give them as large a region as possible. If you choose to run from the link pack area, you will need a minimum of 128 MB for the dynamic area. If you choose to run from the link list you will need a minimum of 328 MB (200 MB for load modules and 128 MB for the dynamic area).

   If your IEFUSI exit routine limits the maximum region to a size smaller than what you need (128 MB minimum when you run from the link pack area or 328 MB minimum when you run from the link list), you will get an abend. To fix the problem, either change the IEFUSI exit routine to allow a larger default region, or change the JCL REGION= parameter to the size needed.

   Your installation may limit (control) the specification of REGION=, usually through the JES2 EXIT06 exit or the JES3 IATUX03 exit. If so, relax this restriction for the WebSphere for z/OS JCL procedures.

   Finally, check your TSO segment default region size and change, if necessary.

Additional information about tuning your application's memory usage is in "Implementing advanced performance controls" on page 256.

Planning for problem diagnosis

This section describes:
- WebSphere for z/OS's use of Component Trace
- The WebSphere for z/OS error log stream
- Dump data sets

Overview of problem diagnosis

WebSphere for z/OS uses component trace (CTRACE) to capture and to display trace data in trace data sets. WebSphere for z/OS identifies itself to CTRACE with the component name "SYSBBOSS". CTRACE allows you to:
- Merge multiple traces through the browse tool, including other components such as TCP/IP and z/OS UNIX.
- Write trace data to a data set rather than sysprint, keeping spool space free.
- Allow trace data to wrap or not wrap, allowing better management of system resources.

- Use CTRACE to funnel trace data from multiple address spaces to one data set, or have CTRACE send the trace data from each address space to separate data sets.
- Start and stop tracing without stopping and restarting WebSphere for z/OS address spaces.
- Use one or more data sets for capturing trace data, thus allowing you to manage I/O more effectively.

WebSphere for z/OS also has an error log stream that records error information when WebSphere for z/OS detects an unexpected condition or failure within its own code, such as:

- Assertion failures
- Unrecoverable error conditions
- Vital resource failures, such as memory
- Operating system exceptions
- Programming defects in WebSphere for z/OS code

Use the error log stream in conjunction with other facilities available to capture error or status information, such as an activity log, trace data, system logrec, and job log.

The WebSphere for z/OS error log stream is a system logger application. Because the error log stream uses the system logger, you can:

- Have error information written to a coupling facility log stream, which provides sysplex-wide error logging, or to a DASD-only log stream, which provides single system-only error logging.

  Note: There is a significant performance penalty when using DASD-only error logging.
- Set up either a common log stream for all of WebSphere for z/OS or individual log streams for servers and server instances. Local z/OS or OS/390 client ORBs can also log data in log streams. Because the system logger APIs are unauthorized, any application can use them. You should control access to the log streams through a security product such as RACF.

WebSphere for z/OS provides a REXX EXEC (BBORBLOG) that allows you to browse the error log stream. By default, the EXEC formats the error records to fit a 3270 display.

This manual describes the error log stream and how to set it up. Information about using the error log stream to diagnose problems is in *WebSphere Application Server V4.0.1 for z/OS and OS/390: Messages and Diagnosis*, GA22-7837. General information and guidance about the system logger is in *z/OS MVS Setting Up a Sysplex*, SA22-7625. Table 13 shows where to find information pertinent to the error log stream:

Table 13. Finding WebSphere for z/OS Error Log Stream Information

What is your goal?	You should read:
Learn about the system logger and understand its requirements	*z/OS MVS Setting Up a Sysplex*, SA22-7625
Learn about the WebSphere for z/OS error log stream	"Overview of problem diagnosis" on page 47

Table 13. Finding WebSphere for z/OS Error Log Stream Information (continued)

What is your goal?	You should read:
Plan for and set up the WebSphere for z/OS error log stream	*z/OS MVS Setting Up a Sysplex*, SA22-7625 Table 19 on page 71
Size the coupling facility structure space needed for the WebSphere for z/OS error log stream	*z/OS MVS Setting Up a Sysplex*, SA22-7625
Define access authorization to system logger resources for the WebSphere for z/OS error log stream	Table 19 on page 71
Define the WebSphere for z/OS error log stream	Table 19 on page 71
View the WebSphere for z/OS error log stream	*WebSphere Application Server V4.0.1 for z/OS and OS/390: Messages and Diagnosis*, GA22-7837
Learn about how Java applications can log messages and trace data in the error log stream	*WebSphere Application Server V4.0.1 for z/OS and OS/390: Assembling J2EE Applications*, SA22-7836

For details about problem diagnosis, see *WebSphere Application Server V4.0.1 for z/OS and OS/390: Messages and Diagnosis*, GA22-7837.

Post-installation notes on the error log

After the installation bootstrap is complete, use the Administration application to change the log stream name or create new log stream names for servers or server instances.

Notes:

1. A server error log stream setting overrides the general WebSphere for z/OS setting, and a server instance setting overrides a server setting. Thus, you can set up general error logging, but direct error logging for servers or server instances to specific log streams.
2. If you create a new log stream name through the Administration application, you must configure a new log stream on z/OS or OS/390 and, if using the coupling facility, define a corresponding new coupling facility log stream.
3. If you changed an existing log stream, or created a new one, you probably need to restart WebSphere for z/OS. When the name of a log stream is changed through the Administration application, in most cases a restart of WebSphere for z/OS is required before the change becomes effective. The only case when the change takes effect automatically is when the log stream name is changed for a server along with other changes that cause the server to be restarted.

If you want WebSphere for z/OS messages that occur during execution of a z/OS or OS/390 client to be recorded in an error log stream, code the CLIENTLOGSTREAMNAME environment variable in its environment file, then initialize the client. For more information about CLIENTLOGSTREAMNAME, see Appendix A, “Environment files,” on page 321.

Our RACF sample BBOCBRAK gives UPDATE authority to the run-time control and server region user IDs for the log stream you created (it requires that you supply a log stream name). After installation and customization, if you want to grant access to the log stream:

- For each server identity that writes to the log stream (or client identity, if you allow clients to write to the error log stream), assign UPDATE access to the log stream.
- For each user who browses the error log stream, assign READ access.

Follow the sample RACF commands in BBOCBRAK.

Planning for Component Trace

To use CTRACE, you:

- Specify trace options for identifying trace data sets and connecting WebSphere for z/OS address spaces to the data sets in parmlib members.
- Update WebSphere for z/OS environment variables to allow for initial trace parameters.
- Use IPCS-CTRACE to view the trace data because you cannot read the trace data in an ordinary editor.

For more information about setting up CTRACE for WebSphere for z/OS, see *WebSphere Application Server V4.0.1 for z/OS and OS/390: Messages and Diagnosis*, GA22-7837.

Recommendation for dumps

Plan as you would normally for system dumps. Due to the sized of WebSphere for z/OS address spaces, you may need to re-size your system dump data sets.

Tip on automatic restart management (ARM)

If you have automatic restart management (ARM) enabled on your system, you may wish to disable ARM for the WebSphere for z/OS address spaces before you install and customize WebSphere for z/OS. During customization, job errors may cause unnecessary restarts of the WebSphere for z/OS address spaces. After installation and customization, consider enabling ARM. For more information, see “Setting up automation and automatic restart management” on page 189.

Chapter 3. Installing and customizing your first run time

You should follow this chapter in the order in which it is presented.

1. "Preparing for installation and customization" on page 52 tells you about things you must complete before you start customizing WebSphere for z/OS and configuring the run-time servers.
2. "Installing the code through SMP/E" on page 54 tells you where to find information about installing the product code.
3. "Running the customization dialog" on page 56 explains how to run the customization dialog.
4. "Following the customized instructions" on page 97 explains how to follow the instructions generated by the customization dialog to complete the system setup and run the bootstrap jobs.
5. "Installing the Administration and Operations applications" on page 102 provides information about installing the Administration and Operations applications, which are workstation programs used to define and operate servers.
6. "Defining application servers for the installation verification programs" on page 104 gives you instructions on how to run the Administration application to create the BBOASR2 and BBOASR1 servers used for the installation verification programs.
7. "Running the WebSphere for z/OS installation verification programs (IVPs)" on page 167 gives you instructions on how to run the installation verification programs.

If you encounter problems during installation and customization, refer to *WebSphere Application Server V4.0.1 for z/OS and OS/390: Messages and Diagnosis*, GA22-7837, for trouble-shooting information.

Overview of installing and customizing WebSphere for z/OS

This topic explains the installation and customization process at a high level.

Installing and customizing WebSphere for z/OS requires that you prepare the operating system and subsystems, install the product code through SMP/E, run the customization dialog, install the Administration and Operations applications, define application servers for the installation verification programs, and run the installation verification programs.

You can find background information about preparing z/OS or OS/390 subsystems in Chapter 2, "Preparing the base z/OS or OS/390 environment," on page 9.

For information about installing the product code through SMP/E, see *WebSphere Application Server V4.0.1 for z/OS and OS/390: Program Directory*, GI10-0680.

The customization dialog is an ISPF dialog that eliminates the need to hand-tailor sample jobs supplied with the product. You define the customization options once in the dialog panels, then the dialog generates the jobs with your options, eliminating the need to define them in several places. The benefit to you is reduced typos and inconsistencies, and a quicker customization.

The Administration and Operations applications are workstation-based applications that allow you to define and operate servers. During the installation and customization process, you will install these applications, then use them to define servers that run the installation verification programs.

IBM provides installation verification programs that test Web applications and server components, such as enterprise beans. At the end of installation and customization, you will run one or more of these programs.

The following table outlines the installation and customization process:

Stage	Description
1	Install prerequisite products, such as DB2 Version 7. Configure z/OS subsystems, such as resource recovery services (RRS) and workload management.
2	Install WebSphere for z/OS using SMP/E according to the *WebSphere Application Server V4.0.1 for z/OS and OS/390: Program Directory* (if you use CBPDO) or *ServerPac: Installing Your Order* (if you use ServerPac).
3	Run the customization dialog. Through a series of panels, you choose options and define variables. Using your values, the dialog tailors the WebSphere for z/OS customization jobs but does not execute them. Rather, the dialog provides a custom set of instructions for you to follow. When you finish the dialog, you have a set of instructions and tailored jobs ready to complete the product customization.
4	Follow the instructions created by the customization dialog. The instructions take you through a process we call the bootstrap. When you finish, you have a complete WebSphere for z/OS run-time configuration. **Note:** For pre-installation planning, we provide a **sample** set of instructions in "Sample customized instructions for initial installation and customization" on page 363. Be sure to follow the instructions you generate for your system, since they will differ from the sample.
5	Install the workstation-based Administration and Operations applications (also called the System Management User Interface).
6	With the Administration application, create the J2EE or CORBA (MOFW) server definitions. These servers are used by the installation verification programs and are examples of application servers you will create for your own applications.
7	Run the installation verification programs to verify your WebSphere for z/OS system is working properly.

When you finish the entire installation and customization process, you have WebSphere for z/OS running in a monoplex system. As you gain experience, you can roll out WebSphere for z/OS across your sysplex to gain the advantages of z/OS sysplex operations.

Preparing for installation and customization

You must prepare z/OS or OS/390 subsystems and do other tasks in this section before you start installation and customization. Additionally, you must determine important information about WebSphere for z/OS and z/OS or OS/390 subsystems before you start customization.

Steps for preparing your z/OS or OS/390 subsystems

Before you begin: Read Chapter 1, "Overview of installation and customization," on page 1.

Follow these steps:

1. Prepare your z/OS or OS/390 subsystems (see Chapter 2, "Preparing the base z/OS or OS/390 environment," on page 9). In particular, be sure you have followed instructions and tips for the following:
   - System requirements. See "Determining WebSphere for z/OS system requirements" on page 10.
   - TCP/IP. See background information and tips in "Updating your TCP/IP network" on page 16.
   - Security Server (RACF). See "Setting up security" on page 19.
   - Workload manager (WLM). See "Setting up workload management (WLM)" on page 33.
   - Resource Recovery Services. See "Recommendations for resource recovery services" on page 38.
   - DB2. For background, guidelines, and rules about DB2 and LDAP (which you will install in this chapter, should you not have one installed), see "DB2 database and LDAP" on page 39.

   ____

2. If you do not already have one, set up a RACF user ID and authorize it to have read/write access to the WebSphere for z/OS files (BBO.* data sets and HFS files). The user ID must have the ability to create DB2 tables.

   Note: In this book we cite product data set names without high-level qualifiers, unless a full data set name is required for clarity, in which case we use `BBO` as the qualifier.

   ____

You are done when you have successfully finished these preparations.

Installing the code through SMP/E

Follow the *WebSphere Application Server V4.0.1 for z/OS and OS/390: Program Directory*, GI10-0680 (if you use CBPDO) or *ServerPac: Installing Your Order* (if you use ServerPac), to install the code through SMP/E.

Notes:

1. You can change the high-level qualifier of the installed data sets (not recommended) or the middle-level qualifier. In this book we use data set names without high-level qualifiers, unless a full data set name is required for clarity, in which case we use `BBO` as the qualifier.
2. If you are installing from a driving system, make sure the maintenance level of the target system meets requirements for WebSphere for z/OS.
3. Make sure the product code HFSes are mounted at `/usr/lpp/java` and `/usr/lpp/WebSphere`, or at similar mount points of your choice.

Steps for collecting information for customization

This procedure prepares you for the WebSphere for z/OS customization dialog. By recording important information in the worksheets later in this chapter, you will make important decisions about the information you will enter into the dialog.

Before you begin: You must know or be able to find the system characteristics for the system on which WebSphere for z/OS will run.

Perform these steps:

1. Read through the section "Running the customization dialog" on page 56 (through "L Load Customization Variables" on page 96) to get acquainted with the customization dialog and the information you need to supply to it.

2. Fill in the worksheets in "Running the customization dialog" on page 56 (through "L Load Customization Variables" on page 96) with the customization values you will use.

   Note: The worksheets follow the order of the customization dialog panels. Titles in the worksheet match panel titles in the dialog.

You are done when you have completed filling in the worksheets.

Running the customization dialog

The customization dialog is intended for the system programmer or administrator responsible for installing and customizing WebSphere for z/OS. The dialog is intended to be used only once, for the first time you customize the product.

The dialog covers a portion of WebSphere for z/OS customization. Specifically, it creates tailored jobs to:

- Copy the generated jobs into your system libraries.
- Create the system management HFS structure and the initial environment file
- Create and customize the LDAP server
- Set up WebSphere for z/OS security controls (RACF)
- Define the WebSphere for z/OS run-time configuration (systems management server, naming server, interface repository server, daemon server)
- Run the installation verification programs (IVPs)

Steps for running the customization dialog

Before you begin: You must have the product code installed and have access to the product data sets.

Rules: Regarding your display:

- Your logon display must support a minimum of 32 rows by 80 columns (32 x 80) in order for the ISPF customization dialog to run.
- If you have a 32-row display and use the ISPF split screen function, deselect "Always show split line" on the ISPF Settings panel and split the screen at the extreme top or bottom of the display. This prevents the split screen line from displaying and lines in the customization dialog from being obscured. Other uses of split screen will obscure lines in the customization dialog.
- If you have a 32-row display, you cannot display the PF key settings. Displaying the PF key settings will obscure lines at the bottom of the dialog panels. Issue `PFSHOW OFF`.

You should complete the worksheets in this section.

Perform the following steps to run the customization dialog:

1. From the ISPF command line, enter the following:

   ```
   ex 'hlq.sbboclib(bbowstrt)' 'options'
   ```

   where

   hlq
   Is the high-level qualifier for the SBBOCLIB data set.

   options
   Are command options. Enclose any and all options in a single set of quotes.

   hlq(*value*)
   Specifies the data set qualifier(s) for the WebSphere for z/OS product data sets. The default value is the same as what you specify as the high-level qualifier for BBOWSTRT. If you do not specify a high-level qualifier for BBOWSTRT, the default is `BBO`.

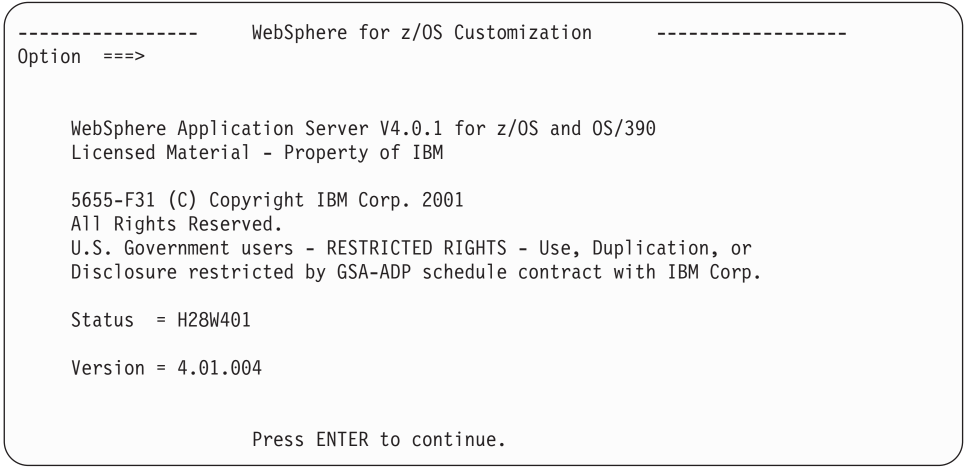
   appl(*value*)
   Specifies the ISPF application name. The default value is `BBO`.

lang(*value*)
Specifies the national language. Values can be either ENUS (English) or JAPN (Japanese). The default is ENUS.

Example:

```
ex 'bbo.sbboclib(bbowstrt)' 'hlq(bbo) appl(bbo) lang(enus)'
```

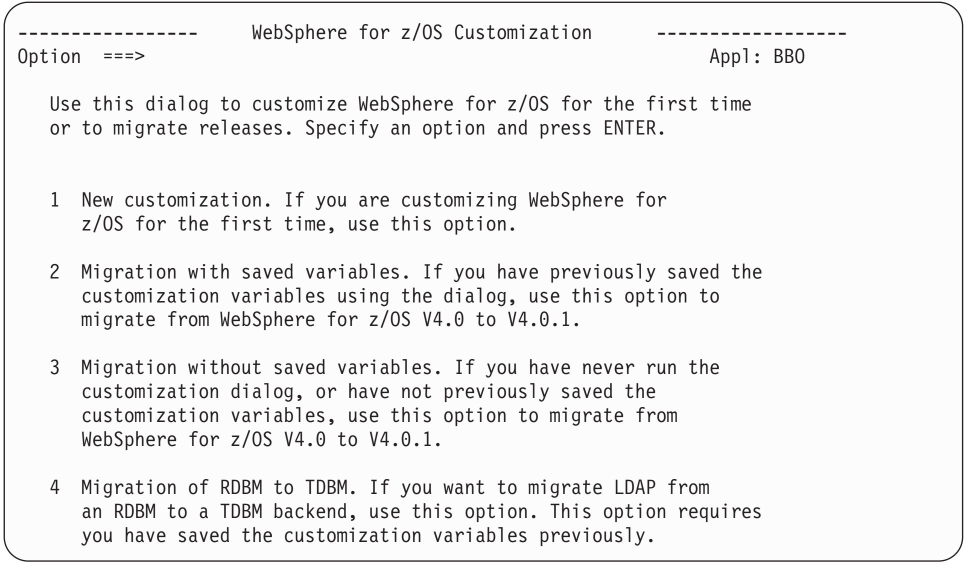
Result: You see the splash screen:



```
-----------------     WebSphere for z/OS Customization      ------------------
Option  ===>


     WebSphere Application Server V4.0.1 for z/OS and OS/390
     Licensed Material - Property of IBM

     5655-F31 (C) Copyright IBM Corp. 2001
     All Rights Reserved.
     U.S. Government users - RESTRICTED RIGHTS - Use, Duplication, or
     Disclosure restricted by GSA-ADP schedule contract with IBM Corp.

     Status  = H28W401

     Version = 4.01.004


                     Press ENTER to continue.
```

2. Press Enter.

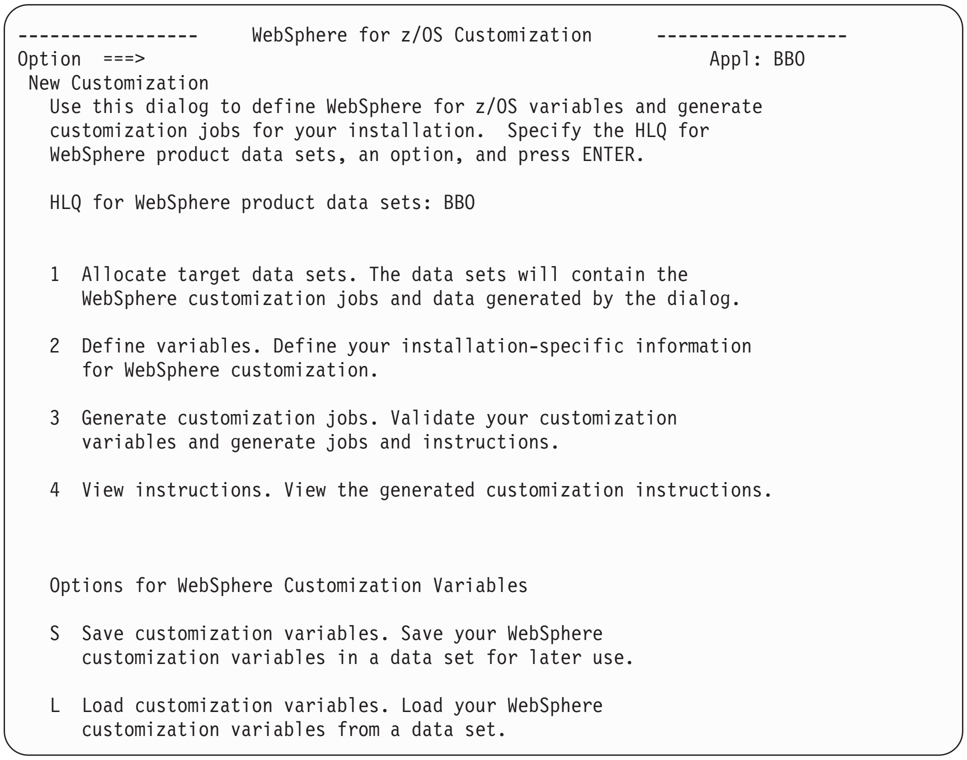
   Result: You see the following panel:



```
-----------------     WebSphere for z/OS Customization      ------------------
Option  ===>                                                     Appl: BBO

   Use this dialog to customize WebSphere for z/OS for the first time
   or to migrate releases. Specify an option and press ENTER.


   1  New customization. If you are customizing WebSphere for
      z/OS for the first time, use this option.

   2  Migration with saved variables. If you have previously saved the
      customization variables using the dialog, use this option to
      migrate from WebSphere for z/OS V4.0 to V4.0.1.

   3  Migration without saved variables. If you have never run the
      customization dialog, or have not previously saved the
      customization variables, use this option to migrate from
      WebSphere for z/OS V4.0 to V4.0.1.

   4  Migration of RDBM to TDBM. If you want to migrate LDAP from
      an RDBM to a TDBM backend, use this option. This option requires
      you have saved the customization variables previously.
```

3. Choose option 1 and press Enter.

   Result: You see the main dialog panel:



```
-----------------     WebSphere for z/OS Customization      ------------------
Option  ===>                                                    Appl: BBO
 New Customization
   Use this dialog to define WebSphere for z/OS variables and generate
   customization jobs for your installation.  Specify the HLQ for
   WebSphere product data sets, an option, and press ENTER.

   HLQ for WebSphere product data sets: BBO


   1  Allocate target data sets. The data sets will contain the
      WebSphere customization jobs and data generated by the dialog.

   2  Define variables. Define your installation-specific information
      for WebSphere customization.

   3  Generate customization jobs. Validate your customization
      variables and generate jobs and instructions.

   4  View instructions. View the generated customization instructions.



   Options for WebSphere Customization Variables

   S  Save customization variables. Save your WebSphere
      customization variables in a data set for later use.

   L  Load customization variables. Load your WebSphere
      customization variables from a data set.
```

You have finished starting the customization dialog.

Steps for allocating the target data sets

Before you begin: You need to start the customization dialog.

Perform the following steps to allocate the target data sets:

1. On the main dialog panel, type 1 in the `Option` field.

   ____

2. If you did not specify a high-level qualifier when you started the customization dialog, type one in the `HLQ for WebSphere product data sets` field.

   ____

3. Press Enter.

   ____

4. On the Allocate Target Data Sets panel, type in the information from "1 Allocate Target Data Sets" on page 60, then press Enter.

   ____

You are done when the data set allocation succeeds.

1 Allocate Target Data Sets

Table 14. Allocate target data sets

Item	Value in the dialog after you load IBM defaults	Your value (Fill in the blanks)
High Level Qualifier	(null)	

This panel asks you to specify the high-level qualifiers (hlq) for the target data sets. Target data sets are those into which the customization dialog places the customized jobs and other data. The data sets are:

hlq.CNTL
A partitioned data set of fixed block, 80-byte records, that contains WebSphere for z/OS customization jobs.

hlq.DATA
A partitioned data set of variable length records that contains other data produced by the customization dialog.

Steps for defining variables

Before you begin: You must start the customization dialog.

Perform the following steps to define variables:

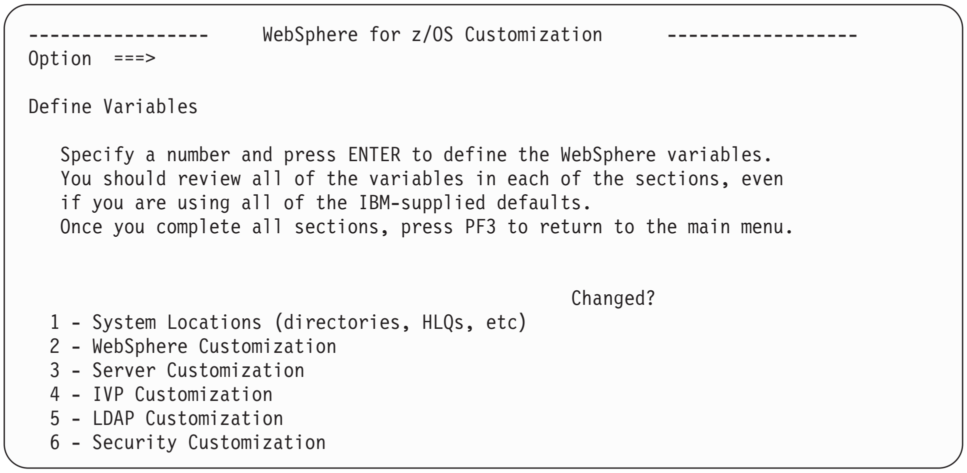
1. On the main dialog panel, type 2 in the `Option` field.

   ---

2. Press Enter.

   Note: If this is the first time through the dialog, you see the Load Customization Variables panel. Press enter to load the default WebSphere for z/OS variable settings from the product data sets and continue.

   Result: You see:



```
-----------------     WebSphere for z/OS Customization      ------------------
Option  ===>

Define Variables

   Specify a number and press ENTER to define the WebSphere variables.
   You should review all of the variables in each of the sections, even
   if you are using all of the IBM-supplied defaults.
   Once you complete all sections, press PF3 to return to the main menu.



                                                   Changed?
  1 - System Locations (directories, HLQs, etc)
  2 - WebSphere Customization
  3 - Server Customization
  4 - IVP Customization
  5 - LDAP Customization
  6 - Security Customization
```

   ---

3. Follow the options in order and enter information from “2 Define variables” on page 62.

You are done when you finish all the Define Variables panels.

2 Define variables

System locations (directories, HLQs, etc):

Table 15. System Locations (1 of 3)

Item	Value in the dialog after you load IBM defaults	Your value (Fill in the blanks)
System name	(system on which the customization dialog is running)	
Sysplex name	(sysplex on which the cutsomization dialog is running)	
PROCLIB	SYS1.PROCLIB	
PARMLIB	SYS1.PARMLIB	
SYSEXEC	(blank)	
SGLDLNK	GLD.SGLDLNK	
		In link list or LPA?
SCEERUN	CEE.SCEERUN	
		In link list or LPA?
SBBOLOAD	BBO.SBBOLOAD	
		In link list or LPA?
SBBOLD2	BBO.SBBOLD2	
		In link list or LPA?
SBBOMIG	BBO.SBBOMIG	
		In link list or LPA?
SDSNLOAD	DSN710.SDSNLOAD	
		In link list or LPA?
SDSNLOD2	DSN710.SDSNLOD2	
		In link list or LPA?
SDSNEXIT	DSN710.SDSNEXIT	
		In link list or LPA?
SDSNDBRM	DSN710.SDSNDBRM	
RUNLIB.LOAD	DSN710.RUNLIB.LOAD	
SBBOLPA	BBO.SBBOLPA	
SBBOULIB	BBO.SBBOULIB	
SBBODBRM	BBO.SBBODBRM	
SBBOEXEC	BBO.SBBOEXEC	
SBBOMSG	BBO.SBBOMSG	

This panel asks you for information about your base operating system, HFS-resident components, and DB2 subsystem.

System name
: The system name for the target z/OS or OS/390 system on which WebSphere for z/OS is installed.

Sysplex name

The sysplex name for the target z/OS or OS/390 system on which WebSphere for z/OS is installed.

Tip: If you are not sure what the system name (&SYSNAME) and sysplex name (&SYSPLEX) are, use the console command `D SYMBOLS` on the target z/OS or OS/390 system to display them.

For the following, specify the fully-qualified data set names without quotes.

PROCLIB

An existing procedure library where the WebSphere for z/OS cataloged procedures are to be added.

PARMLIB

An existing parameter library for system definitions to support WebSphere for z/OS. This data set must be in the parmlib concatenation for the target z/OS or OS/390 system.

SYSEXEC

A variable-block (RECFM=VB, LRECL=255) data set into which the customization process places REXX EXECs to be called from TSO, such as the WebSphere for z/OS error log browser, BBORBLOG. You must allocate this data set and concatenate it as part of the SYSEXEC DD allocation in your installation–wide TSO logon PROC or allocation exec.

If your existing SYSEXEC DD data set concatenation consists of fixed-blocked (RECFM=FB) data sets, you must make a **copy** of the *hlq*.DATA data set (produced by the customization dialog) after the customization process is complete, and place the copy in the SYSEXEC concatenation.

If you do not specify a data set name, the customization process does not place any REXX EXECs in any data set.

Specify the following LDAP, Language Environment, DB2, and WebSphere for z/OS data sets and whether they are (“Y”) or are not (“N”) in the link list or the link pack area (LPA). “N” indicates the generated JCL will contain STEPLIB statements for these data sets. Refer to your SMP/E installation for the location of these data sets listed by their DD Name.

SGLDLNK

Your existing LDAP run-time load module library.

Attention: Do not go into your BBONMS or BBOIRS proc and remove the STEPLIB to SGLDLNK.

LDAP ships two pre-linked versions of module GLDCLDAP (the LDAP client DLL):

- The regular version of GLDCLDAP is linkedited into the LPA and HFS.
- A special WebSphere for z/OS version of GLDCLDAP is linkedited into SGLDLNK, which is typically added to the LINKLIST.

The special version for WebSphere for z/OS exists because the CORBA naming code talks directly to the LDAP database instead of sending requests to the LDAP server to do the work. The STEPLIB is necessary because, while the correct DLL is in LINKLIST, the ″non-WebSphere for z/OS″ one is in the LPA. The LPA is searched first in MVS, so the regular version of GLDCLDAP would normally (incorrectly) be used. By putting SGLDLNK in the STEPLIB, it is put ahead of LPA in the search order, and the correct DLL is therefore used.

Non-WebSphere for z/OS customers can run with either version (J2EE servers use the LDAP server and can therefore use the DLL in LPA), but WebSphere for z/OS customers **must** run with the special copy that is in SGLDLNK. There is a link in /usr/lib (or whichever location you specify) for GLDCLDAP to point to /usr/lpp/ldapclient/. This is where the DLL lives in the HFS (non-WebSphere for z/OS copy).

SCEERUN
Your existing Language Environment run-time load module library.

SBBOLOAD
WebSphere for z/OS load module library that you installed through SMP/E. It has members that should go into the link list or LPA.

SBBOLD2
WebSphere for z/OS load module library that you installed through SMP/E. It has members that should go into the link list. Do not place them in LPA.

SBBOMIG
WebSphere for z/OS IPCS data set that you installed through SMP/E.

SDSNLOAD
Your existing DB2 run-time load module library PDS.

SDSNLOD2
Your existing DB2 run-time load module library PDSE.

SDSNEXIT
Your existing DB2 installation exits load module library.

Specify the following DB2 and WebSphere for z/OS libraries so they can be accessed by the customized job streams the dialog produces. These data sets must be cataloged.

SDSNDBRM
Your existing DB2 DBRM library.

RUNLIB.LOAD
Your existing DB2 sample application load module library.

SBBOLPA
WebSphere for z/OS data set you installed through SMP/E. Its members must go into the LPA.

SBBOULIB
WebSphere for z/OS unauthorized load module library you installed through SMP/E.

SBBODBRM
WebSphere for z/OS DBRM library you installed through SMP/E.

SBBOEXEC
WebSphere for z/OS variable length file distribution PDS you installed through SMP/E.

SBBOMSG
WebSphere for z/OS message skeletons for language translation you installed through SMP/E.

Table 16. System Locations (2 of 3)

Item	Value in the dialog after you load IBM defaults	Your value (Fill in the blanks)
Locations of HFS resident components		
Java home directory	/usr/lpp/java/IBM/J1.3	
LDAP home directory	/usr/lpp/ldap	
DB2 home directory	/usr/lpp/db2/db2710	
WebSphere home directory	/usr/lpp/WebSphere	
NLS Path	/usr/lib/nls/msg/En_US.IBM-1047/%N	

Locations of HFS resident components:

Java home directory
Your existing Java SDK library path.

LDAP home directory
Your existing LDAP library path.

DB2 home directory
Your existing DB2 library path.

WebSphere home directory
The name of the directory where WebSphere for z/OS files reside after SMP/E installation.

NLS Path
NLS library path used in the NLSPATH environment variable. The directory must either be /usr/lib/nls/msg/En_US.IBM-1047/%N or /usr/lib/nls/msg/C/%N.

Table 17. System Locations (3 of 3)

Item	Value in the dialog after you load IBM defaults	Your value (Fill in the blanks)
DB2 information		
DB2 version number	7	
DB2 subsystem name	DB2	
DB2 location name	LOC1	
Tablespace buffer pool	BP0	
Index buffer pool	BP0	
32K tablespace buffer pool	BP32K	
DB2 jdbc properties file	/usr/lpp/db2/db2710/classes /db2sqljjdbc.properties	
System Management Database		
Database name	BBOMDB01	
First STOGROUP for database	BBOMG01	
Volume for first STOGROUP	*	
Second STOGROUP for database	BBOMG02	
Volume for second STOGROUP	*	
Stateful Session Bean Database		
Database name	BBOJDB01	
First STOGROUP for database	BBOJG01	
Volume for first STOGROUP	*	
Second STOGROUP for database	BBOJG02	
Volume for second STOGROUP	*	

DB2 Information

DB2 version number
The version of DB2 you use for WebSphere for z/OS. Currently, this version must be version 7.

DB2 subsystem name
The name of your DB2 subsystem.

DB2 location name
Your DB2 data source location name. This is set in the DB2 installation job DSNTIJUZ.

Tablespace buffer pool
Name of your DB2 tablespace buffer pool.

Note: If your installation does not allow user data to be placed in BP0, specify an appropriate buffer pool. Ask your DB2 administrator for the correct value.

Index buffer pool
Name of your DB2 index buffer pool.

Note: If your installation does not allow user data to be placed in BP0, specify an appropriate buffer pool. Ask your DB2 administrator for the correct value.

32K tablespace buffer pool
Name of your DB2 virtual 32K buffer pool.

DB2 jdbc properties file
Specify the path and name of your SQLJ/JBDC run-time properties file. If you customized this file, you may want to keep the customized version in a separate directory, such as `/etc`. If so, override the default setting.

Example:

```
/usr/lpp/db2/db2710/classes/db2sqljjdbc.properties
```

This file is shipped as part of the DB2 JDBC feature, and must be modified during JDBC customization. See *DB2 for OS/390 Application Programming Guide and Reference for Java*.

System Management Database

Database name
Specifies the database name for the WebSphere for z/OS system management database.

First STOGROUP for database
Specifies the first storage group for the database.

Volume for first STOGROUP
Specifies either the DASD volume serial number that will contain the above data set or "*" to let SMS select a volume. Using "*" requires that SMS automatic class selection (ACS) routines be in place to select the volume. If you do not have SMS set up to handle data set allocation automatically, list the volume explicitly.

Second STOGROUP for database
Specifies the second storage group for the database.

Volume for second STOGROUP
Specifies either the DASD volume serial number that will contain the above data set or "*" to let SMS select a volume. Using "*" requires that SMS automatic class selection (ACS) routines be in place to select the volume. If you do not have SMS set up to handle data set allocation automatically, list the volume explicitly.

Stateful Session Bean Database

Database name
The database name for the database that supports stateful session beans.

First STOGROUP for database
Specifies the first storage group for the database.

Volume for first STOGROUP
Specifies either the DASD volume serial number that will contain the above data set or "*" to let SMS select a volume. Using "*" requires that SMS automatic class selection (ACS) routines be in place to select the volume. If you do not have SMS set up to handle data set allocation automatically, list the volume explicitly.

Second STOGROUP for database
Specifies the second storage group for the database.

Volume for second STOGROUP
Specifies either the DASD volume serial number that will contain the above data set or "*" to let SMS select a volume. Using "*" requires that SMS

automatic class selection (ACS) routines be in place to select the volume. If you do not have SMS set up to handle data set allocation automatically, list the volume explicitly.

WebSphere customization:

Table 18. WebSphere Customization (1 of 4)

Item	Value in the dialog after you load IBM defaults	Your value (Fill in the blanks)
WebSphere configuration HFS information		
Mount point	/WebSphere390/CB390	
Name	OMVS.WAS.CONFIG.HFS	
Volume, or ’*’ for SMS	*	
Primary allocation in cylinders	40	
Secondary allocation in cylinders	20	
WebSphere DB2 information		
VCAT value	DSN710	
Data volume, or ’*’ for SMS	*	
Index volume, or * for SMS	*	
WebSphere Namespace Information		
CORBA name space root	o=BOSS,c=US	
JNDI name space root	o=WASNaming,c=US	

WebSphere configuration HFS Information

Mount point
: Read/write HFS directory mount point where application data and environment files will be written. The customization process creates this mount point.

Name
: Hierarchical File System data set to be mounted at the above mount point.

Volume, or ’*’ for SMS
: Specifies either the DASD volume serial number that will contain the above data set or “*” to let SMS select a volume. Using “*” requires that SMS automatic class selection (ACS) routines be in place to select the volume. If you do not have SMS set up to handle data set allocation automatically, list the volume explicitly.

Primary allocation in cylinders
: Initial size allocation in cylinders for the above data set.

Recommendation: The minimum suggested size is 40 cylinders (3390).

Secondary allocation in cylinders
: Size of each secondary extent in cylinders.

WebSphere DB2 information

VCAT value
: High-level qualifier for DB2 table spaces. This existing VCAT value is used to create storage groups.

Data volume, or ’*’ for SMS
: Specify either the DASD volume serial number for the WebSphere for z/OS DB2 tables storage group or “*” to let SMS select a volume. Using “*” requires that SMS automatic class selection (ACS) routines be in place

to select the volume. If you do not have SMS set up to handle data set allocation automatically, list the volume explicitly.

Index volume, or '*' for SMS
: Specify either the DASD volume serial number for the WebSphere for z/OS DB2 tables storage group or “*” to let SMS select a volume. Using “*” requires that SMS automatic class selection (ACS) routines be in place to select the volume. If you do not have SMS set up to handle data set allocation automatically, list the volume explicitly.

WebSphere Namespace Information

Rules:

- For the following name space roots, you must specify at least the “o=...” parameter.
- Values can be mixed case. Use lowercase characters for the parameter names.

CORBA name space root
: Root naming context that will be created for CORBA (MOFW) components.

JNDI name space root
: Starting point of the WsnName tree context that will be created for J2EE components.

Table 19. WebSphere Customization (2 of 4)

Item	Value in the dialog after you load IBM defaults	Your value (Fill in the blanks)
WebSphere error log stream information		
Name	WAS.ERROR.LOG	
Data class	STANDARD	
Storage class	(null)	
HLQ for data sets	LOGGER	
Is logstream CF resident (Y|N)	Y	
If yes, structure name	WAS_STRUCT	
If no, specify:		
logstream size	3000	
staging size	3000	
RRS log stream information		
Group name	(sysplex on which the customization dialog is running)	
Data class	STANDARD	
Storage class	(null)	
HLQ for data sets	LOGGER	
Is logstream CF resident (Y|N)	Y	
Create RRS PROC (Y|N)	Y	

WebSphere Error Logstream Information

Name
Name of your WebSphere for z/OS error log stream that will be created.

Rules:

- The name must be 26 characters or less.
- Do NOT put quotes around it.

Data class
An existing DFSMS data class for the log stream data set allocation.

Storage class
An existing DFSMS storage class for allocation of the DASD staging data set for this log stream.

HLQ for data sets
The high-level qualifier for your log stream data set name and staging data set name that will be created.

Is logstream CF resident (Y|N)
If you want the log stream to be created on a coupling facility, specify “Y”. If on DASD, specify “N”.

If yes, specify structure name
If using the coupling facility, specify the coupling facility structure to be used for the log stream.

Rule: The name can be 1 to 16 characters, including alphanumeric characters, national characters, and an underscore, where the first character is uppercase alphabetic.

If no, specify: logstream size
: Specifies the size, in 4K blocks, of the log stream DASD data sets for the log stream being defined.

If no, specify: staging size
: Specifies the size, in 4K blocks, of the DASD staging data set for the log stream being defined.

RRS Logstream Information

If you do not have the RRS log streams set up, the customization dialog will create the jobs you can use to set up the log streams.

Group name
: Specify the XCF group name.

  Recommendation: Use your sysplex name.

Data class
: Specify an existing DFSMS Data Class for the log stream data set allocation.

Storage class
: An existing DFSMS storage class for allocation of the DASD staging data set for this log stream.

HLQ for data sets
: The high-level qualifier for your log stream data set name and staging data set name.

Is logstream CF resident (Y|N)
: If the log stream is to be created on a coupling facility, specify "Y". If on DASD, specify "N".

Create RRS PROC (Y|N)
: If you answer "Y", the dialog copies the ATRRRS cataloged procedure into SYS1.PROCLIB so that RRS can be started.

  If you already have RRS set up, specify "N".

Table 20. WebSphere for z/OS Customization (3 of 4)

Item	Value in the dialog after you load IBM defaults	Your value (Fill in the blanks)
WebSphere for z/OS Common Groups and User IDs		
Control region group for ALL servers	CBCTL1	
Control region GID for ALL servers	2211	
Server region group for base servers	CBSR1	
Server region GID for base servers	2201	
Unauthenticated User Definitions for Base Servers		
User ID	CBGUEST	
UID	2102	
Group	CBCLGP	
GID	2202	
WebSphere for z/OS Application Installer Group Information		
Group	CBCFG1	
GID	2300	
WebSphere for z/OS Administrator Information		
User ID	CBADMIN	
UID	2103	
Password	CBADMIN	
Group	CBADMGP	
GID	2203	

This panel asks you to supply some RACF groups and user IDs that are common throughout WebSphere for z/OS. The dialog creates the RACF commands to define these new user IDs and groups for your security system.

To minimize the number of RACF definitions, RACF authorizations will be at the group level rather than the user ID level. In a later panel, the dialog asks for user IDs for the run-time server instances. These user IDs will be connected to their proper RACF groups.

For control regions, which run system authorized code, you can create a single group. Thus, the dialog creates a single RACF group for all control regions.

On the other hand, server regions may have differing authorizations because they run application code and need access to differing resources. This dialog creates a RACF group for the WebSphere for z/OS run-time servers only. (You will have to create these RACF definitions for your own application server regions.)

Rules:

- | User IDs must be unique names (one to seven alphabetic or numeric characters) and begin with an alphabetic character. |
- Groups must be unique names (one to seven characters).
- UIDs (user identifiers) must be unique numbers within the system between 1 and 2,147,483,647.
- Do not assign a UID of 0 (Superuser) to any of these users.

- GIDs (group identifiers) should be unique numbers between 1 and 2,147,483,647.

WebSphere Common Groups and User IDs

Control region group for ALL servers
A group name that the dialog uses for all control regions.

Control region GID for ALL servers
A group identifier that the dialog uses for all control regions.

Server region group for base servers
A group name that the dialog uses for the WebSphere for z/OS run-time server regions.

Server region GID for base servers
A group identifier that the dialog uses for the WebSphere for z/OS run-time server regions.

Unauthenticated User Definitions for Base Servers

Userid If you allow unauthenticated client requests, this is the default user ID under which those requests run.

UID The user identifier for the unauthenticated user.

Group The group for unauthenticated users.

GID The group identifier for unauthenticated users.

WebSphere Application Installer Group Information

Group The group name for all users that install applications. This group allows you to manage application installers' authorities more easily.

GID The group identifier for application installers.

WebSphere Administrator Information

Userid The user ID for your initial administrator. This administrator uses the Administration and Operations applications.

UID The user identifier for the initial administrator.

Password
The password that the initial administrator uses to log onto the Administration and Operations applications.

Group The group name for all your administrators.

GID The group identifier for all your administrators.

Table 21. WebSphere for z/OS Customization (4 of 4)

Item	Value in the dialog after you load IBM defaults	Your value (Fill in the blanks)
CTRACE Writer Definitions		
Procedure name	BBOWTR	
User ID	STCRACF	
Group	SYS1	
Trace Data Set Information		
Name	SYS1.*system*.WAS390.CTRACE	
Volume, or "*"for SMS	*	
Primary space in cylinders	20	
Secondary space in cylinders	0	

WebSphere for z/OS uses component trace (CTRACE) to capture and to display trace data in trace data sets. WebSphere for z/OS identifies itself to CTRACE with the with the component name ″SYSBBOSS″.

CTRACE Writer Definitions

Procedure name
: This is the CTrace external writer start procedure to be created. It is identified in the WebSphere for z/OS CTrace member (CTIBBOxx) in PROCLIB.

Userid
: RACF user ID to be created and associated with the CTrace external writer start procedure.

Group
: RACF group name to be created and associated with this user.

Trace Data Set information

Name
: Specify a fully-qualified data set name, such as WAS390.CTRACE1, for the data set to be created. The default includes the system name of the system on which the customization dialog is running.

Rule: Do not use quotes.

Volume, or ″*″ for SMS
: Specify either the DASD volume serial number containing the above data set or "*" to let DFSMShsm select a volume. Using "*" requires SMS. Using "*" requires that SMS automatic class selection (ACS) routines be in place to select the volume. If you do not have SMS set up to handle data set allocation automatically, list the volume explicitly.

Primary space in cylinders
: The primary space for the trace data set.

Secondary space in cylinders
: The secondary space for the trace data set.

Server Customization: The WebSphere for z/OS run time requires four base system servers and their server instances: Daemon, System Management, Naming, and Interface Repository. The panels corresponding to Table 22 through Table 25 on page 79 set up the names, start procedures, and user IDs for the base servers.

Recommendation: Use the IBM default names the first time you install WebSphere for z/OS to make the installation instructions easier to follow.

For identification, the start procedure for each base server control region and server region must have a user ID and will be defined in the STARTED class. For more information, see “Server authorizations” on page 21.

Table 22. Server Customization (1 of 4)

Item	Value in the dialog after you load IBM defaults	Your value (Fill in the blanks)
Daemon definitions		
Server name	CBDAEMON	
Server instance	DAEMON01	
Procedure name	BBODMN	
Userid	CBDMNCR1	
UID	2111	
Port	5555	
IP name	(null)	
SSL Port	5556	

The Daemon is the initial point of contact in WebSphere for z/OS for clients and the server contains the location service agent to place sessions in a sysplex.

The **Server name** is the generic server name used for all Daemon instances in the sysplex. The server name is used in security profiles to control a client’s access to this server.

The **Server instance** name is the specific server instance name for the Daemon on your target z/OS or OS/390 system. The server instance is associated with a single control region, which in turn has a **Procedure name** and a control region **Userid** and **UID**.

Specify the TCP/IP **Port** and **IP name** at which the Daemon listens for incoming connections. The port and IP name are sometimes called the *Daemon port* and *Daemon IP name*. For advice on appropriate settings for the port and IP name, see “Updating your TCP/IP network” on page 16. Also specify an additional **SSL port** at which the Daemon listens for incoming SSL connections.

Note: Select the IP name and port number for the Daemon Server carefully. You can choose any name you want, but once chosen, it is difficult to change, even in the middle of customization.

Table 23. Server Customization (2 of 4)

Item	Value in the dialog after you load IBM defaults	Your value (Fill in the blanks)
System Management server definitions		
Server name	CBSYSMGT	
Server instance	SYSMGT01	
Control region information		
Procedure name	BBOSMS	
Userid	CBSYMCR1	
UID	2112	
Server region information		
Procedure name	BBOSMSS	
Userid	CBSYMSR1	
UID	2104	
Resolve IP port	900	
Resolve IP name	(same as Daemon)	

The System Managment server manages configuration data for all servers and interacts with the Administration and Operations applications (SM GUI) on Windows to install and configure application servers.

The **Server name** is the generic server name used for all system management instances in the sysplex. The **Server instance** name is the specific server instance name for the system management server on your target z/OS or OS/390 system.

The server instance consists of a single control region and one or more server regions. The control region is asssociated with a **Procedure name** and a control region **Userid** and **UID**. The server regions share a common **Procedure name**, server region **Userid** and **UID**.

Specify a TCP/IP port for the **Resolve IP port** and an IP name for the **Resolve IP name** at which the system management server listens for incoming connections. For advice on appropriate settings for the Resolve port and IP name, see "Updating your TCP/IP network" on page 16. By default, the customization dialog sets the Resolve IP name to be the same as the Daemon IP name.

Note: Select the IP name and port number for the SM server carefully. You can choose any name you want, but once chosen, it is difficult to change, even in the middle of customization.

Worksheet

Table 24. Server Customization (3 of 4)

Item	Value in the dialog after you load IBM defaults	Your value (Fill in the blanks)
Interface Repository server definitions		
Server name	CBINTFRP	
Server instance	INTFRP01	
Control region information		
Procedure name	BBOIR	
Userid	CBINTCR1	
UID	2114	
Server region information		
Procedure name	BBOIRS	
Userid	CBINTSR1	
UID	2106	

The Interface Repository server manages the inventory of CORBA business object interfaces for predicate evaluation queries.

The **Server name** is the generic server name used for all interface respository instances in the sysplex. The **Server instance** name is the specific server instance name for the interface respository server on your target z/OS or OS/390 system.

The server instance consists of a single control region and one or more server regions. The control region is asssociated with a **Procedure name** and a control region **Userid** and **UID**. The server regions share a common **Procedure name**, server region **Userid** and **UID**.

Table 25. Server Customization (4 of 4)

Item	Value in the dialog after you load IBM defaults	Your value (Fill in the blanks)
Naming server definitions		
Server name	CBNAMING	
Server instance	NAMING01	
Control region information		
Procedure name	BBONM	
Userid	CBNAMCR1	
UID	2113	
Server region information		
Procedure name	BBONMS	
Userid	CBNAMSR1	
UID	2105	
Keyring	CBKeyring	

The Naming server provides applications with the capability to register and to find names for object references. Services are implemented through LDAP tables and JNDI services.

The **Server name** is the generic server name used for all naming instances in the sysplex. The **Server instance** name is the specific server instance name for the naming server on your target z/OS or OS/390 system.

The server instance consists of a single control region and one or more server regions. The control region is asssociated with a **Procedure name** and a control region **Userid** and **UID**. The server regions share a common **Procedure name**, server region **Userid** and **UID**.

Specify the name of the *client's* **Keyring** used in SSL processing. This key ring must reside in RACF. For more information, see "Setting up SSL security for WebSphere for z/OS" on page 217.

IVP Customization: This part of the dialog (corresponding to Table 26 and Table 27 on page 82) asks you for information about the application servers used for the installation verification programs (IVPs). Though the dialog asks you for information for both the CORBA and J2EE application servers, you can choose later to run either IVP or both, depending on which server type you plan to have.

Table 26. IVP Customization (1 of 2) - CORBA Server

Item	Value in the dialog after you load IBM defaults	Your value (Fill in the blanks)
Server name	BBOASR1	
Server instance	BBOASR1A	
Control region information		
Procedure name	BBOASR1	
Userid	CBACRU1	
UID	2107	
Server region information		
Procedure name	BBOASR1S	
Userid	CBASRU1	
UID	2110	
Group	CBASR1	
GID	2205	
Unauthenticated user information		
Local userid	CBIVP	
UID	2109	
Remote userid	CBIVP	
UID	2109	
Group	CBIVPGP	
GID	2209	
User ID to run the IVP		
Userid	CBIVP	
UID	2109	
Password	CPIVP	
Server key ring	CBKeyring	
Client key ring	CBKeyring	
Location of script	/tmp	

The installation verification program for the CORBA (MOFW) run-time application server consists of a simple business object called Policy that uses the following server definitions.

The **Server name** is the generic server name used for all instances of the CORBA IVP application server in the sysplex. The **Server instance** name is the specific server instance name for the CORBA IVP server on your target z/OS or OS/390 system.

The server instance consists of a single control region and one or more server regions. The control region is asssociated with a **Procedure name** and a control region **Userid** and **UID**. The server regions share a common **Procedure name**, server region **Userid** and **UID**, and server region **Group** and **GID**.

Unauthenticated clients on the same z/OS or OS/390 system as WebSphere for z/OS run under the **Local userid**, with its associated **UID**. Unauthenticated clients running on remote systems run under the **Remote userid** and associated **UID**. Both user IDs are associated with a **Group** and **GID**.

The CORBA (MOFW) IVP runs as a batch job. For the user ID that runs the IVP, specify the **Userid**, **UID** and **Password** to be used for running this job.

Specify a **Server Keyring** and **Client Keyring** to be used for SSL processing. Both key rings must reside in the RACF database. For more information on SSL, see "Setting up SSL security for WebSphere for z/OS" on page 217.

Specify a read/write HFS directory where the dialog will place the IVP shell script. You may want to specify a different directory, such as /tmp/CBIVP, to segregate the files for the CORBA IVP. If you do specify a different directory, you must create this directory before running the WebSphere for z/OS customization batch jobs. Make sure the directory is owned by the user ID used to run the IVP and give the directory file permissions of 755.

Worksheet

Table 27. IVP Customization (2 of 2) - J2EE Server

Item	Value in the dialog after you load IBM defaults	Your value (Fill in the blanks)
Server name	BBOASR2	
Server instance	BBOASR2A	
Control region information		
Procedure name	BBOASR2	
User ID	CBACRU2	
UID	2115	
Server region information		
Procedure name	BBOASR2S	
User ID	CBASRU2	
UID	2116	
Group	CBASR2	
GID	2216	
Unauthenticated user information		
Local user ID	CBIVP2	
UID	2117	
Remote user ID	CBIVP2	
UID	2117	
Group	CBIVPGP2	
GID	2217	
User ID to run the IVP		
User ID	CBIVP2	
UID	2117	
Password	CPIVP2	
Server key ring	CBKeyring	
Client key ring	CBKeyring	
Location of script	/tmp	

The installation verification program for the J2EE run-time application server consists of a simple business object called Policy that uses the following server definitions.

The **Server name** is the generic server name used for all instances of the J2EE IVP application server in the sysplex. The **Server instance** name is the specific server instance name for the J2EE IVP server on your target z/OS or OS/390 system.

The server instance consists of a single control region and one or more server regions. The control region is asssociated with a **Procedure name** and a control region **Userid** and **UID**. The server regions share a common **Procedure name**, server region **Userid** and **UID**, and server region **Group** and **GID**.

Unauthenticated clients on the same z/OS or OS/390 system as WebSphere for z/OS run under the **Local userid**, with its associated **UID**. Unauthenticated clients running on remote systems run under the **Remote userid** and associated **UID**. Both user IDs are associated with a **Group** and **GID**.

One of the J2EE IVPs runs as a batch job. For the user ID that runs the IVP, specify the **Userid**, **UID** and **Password** to be used for running this job.

Specify a **Server Keyring** and **Client Keyring** to be used for SSL processing. Both key rings must reside in the RACF database. For more information on SSL, see "Setting up SSL security for WebSphere for z/OS" on page 217.

Specify a read/write HFS directory where the dialog will place the IVP shell script. You may want to specify a different directory, such as /tmp/CBIVP2, to segregate the files for the J2EE IVP. If you do specify a different directory, you must create this directory before running the WebSphere for z/OS customization batch jobs. Make sure the directory is owned by the user ID used to run the IVP and give the directory file permissions of 755.

LDAP Customization: LDAP (Lightweight Directory Access Protocol) provides the directory services for the Java Naming and Directory Interface (JNDI) and CORBA naming and interface repository services. For the WebSphere for z/OS implementation, LDAP stores its naming data in a DB2 database.

The dialog provides most of the LDAP configuration data, but you must specify the LDAP server definitions and some configuration information on this panel.

Table 28. LDAP Customization (1 of 2)

Item	**Value in the dialog after you load IBM defaults**	**Your value (Fill in the blanks)**
LDAP Server Definitions		
Procedure name	BBOLDAP	
User ID	CBLDAP	
UID	2119	
Group	CBLDAPGP	
GID	2219	
LDAP Configuration Information		
IP name	(same as Daemon)	
IP port	1389	
Administrator user DN	cn=CBAdmin	
Administrator user pw	secret	
DB2 STOGROUP value	BBOLDSTO	
DB2 database name	BBOLDAP	
Authid for DB2 tables	BBOLDAP	
LDAP Database Type		
Database Type	TDBM	

Rules:

- In the following, names must be 7 characters or less.
- User IDs must be unique names (one to seven alphabetic or numeric characters) and begin with an alphabetic character.
- UIDs (user identifiers) must be unique numbers within the system between 1 and 2,147,483,647.

LDAP Server Definitions

Procedure name
: The name of the procedure to be created in your procedure library that starts the LDAP server.

Userid The SAF-defined user ID to be created and associated with the LDAP start procedure.

UID The user identifier associated with this user ID.

Group The SAF-defined group name for the LDAP server.

GID The group identifier associated with this group.

LDAP Configuration Information

IP Name
: The fully-qualified IP host name of the system on which the LDAP server will run.

IP Port
: An existing IP port to be used by the LDAP server.

Administrator user DN
: The distinguished name of the LDAP administrator to be created.

Administrator user pw
: The password to be created for this user.

DB2 STOGROUP value
: The name of the default storage group to be created for the LDAP database.

DB2 database name
: The name of the LDAP database to be created in DB2.

Authid for DB2 tables
: The user ID to be created and granted access to the LDAP tables.

LDAP Database Type

Database Type
: Specifies which LDAP backend your LDAP server will use. Choices are TDBM or RDBM.

Recommendation: Use the TDBM backend for your LDAP server. The TDBM backend improves the performance of your LDAP server and IBM has announced that RDBM will not be supported after z/OS V1R3.

For software requirements for TDBM, see “z/OS or OS/390 software requirements for WebSphere for z/OS” on page 10.

If you choose TDBM for the database type, you see the following:

Table 29. LDAP Customization (2 of 2)

Item	Value in the dialog after you load IBM defaults	Your value (Fill in the blanks)
LDAP TDBM Tablespace Information		
Tablespace for LDAP entry	BBOENT	
Tablespace for LDAP long entry	BBOLENT	
Tablespace for LDAP long attribute	BBOLATTR	
Tablespace for LDAP miscellaneous	BBOMISC	
Tablespace for LDAP search	BBOSRCH	
Tablespace for LDAP replica	BBOREPL	
Tablespace for LDAP descendants	BBODESC	
Working directory for LDAP schema files		
Directory name	/tmp	

LDAP TDBM Tablespace Information

All table spaces and tables are set up by default, whether or not you actually use them. For more information about LDAP table spaces, see *z/OS Security Server LDAP Server Administration and Use*, SC24-5923.

Tablespace for LDAP entry
: Specifies the partitioned table space name which is to be used when creating the LDAP entry table.

Tablespace for LDAP long entry
: Specifies the long entry table space, which holds “spill over” rows for entry data that does not fit into the entry table table space.

Tablespace for LDAP long attribute
: Specifies the long attribute table space, which holds “spill over” rows for attribute data that does not fit into the entry table table space.

Tablespace for LDAP miscellaneous
: Specifies the miscellaneous table space.

Tablespace for LDAP search
: Specifies the table space used by the LDAP search function.

Tablespace for LDAP replica
: Specifies the LDAP replica table space. This table space can be used later if you implement replication.

Option for creating DB2 Indexes

Working directory for LDAP schema files

Directory name
: Specify an existing temporary directory that will hold the LDAP schema files for later processing. If the directory does not exist, you must create it before running the WebSphere for z/OS customization batch jobs.

If you choose RDBM for the database type, you see the following:

Table 30. LDAP Customization (2 of 2)

Item	Value in the dialog after you load IBM defaults	Your value (Fill in the blanks)
LDAP Tablespace Information		
Tablespace for LDAP entry table	BBOENT	
Tablespace for 32K tables	BBO32K	
Tablespace for 4K tables	BBO4K	
Tablespace for 4K mutex table	BBOMUTX	

LDAP Tablespace Information

Tablespace for LDAP entry table
: Specifies the partitioned table space name which is to be used when creating the LDAP entry table.

Tablespace for 32K tables
: Specifies the segmented table space name that is to be used when creating 32K tables.

Tablespace for 4K tables
: Specifies the segmented table space name that is to be used when creating 4K tables.

Tablespace for 4K mutex table
: Specifies the nonsegmented table space name that is to be used when creating the LDAP 4K mutex table.

Security Customization: This panel allows you to specify authentication and authorization options for your run-time resources. For more information about security and WebSphere for z/OS, see "Setting up security" on page 19.

Table 31. Security Customization (1 of 1)

Item	Value in the dialog after you load IBM defaults	Your value (Fill in the blanks)
Use DSNR class to control DB2 access	N	
Use SOMDOBJS class to control CORBA method access	N	
Use EJBROLE class to control EJB method access	N	
Use OPERCMDS to control commands	N	
Use DCE for authentication and encryption	N	
Use Kerberos over SSL	N	
Use SSL basic authentication	N	
Use SSL client certificates	N	
Test certificate authority label	WAS TestCertAuth	
PassTicket profile name	CBS390	(cannot change)
PassTicket KEYMASK value	0123456789ABCDEF	

In the following, specifying "Y" (yes) tells the dialog to define the profile or control in RACF. Specifying "N" (no) tells the dialog not to define the profile or control.

Use DSNR class to control DB2 access
: Specify "Y" to create the RACF DSNR class. The class helps you centralize DB2 security management through RACF.

Use SOMDOBJS class to control CORBA method access
: Specify "Y" to create the RACF SOMDOBJS class. The class controls method accesses for CORBA objects.

Use EJBROLES class to control EJB method access
: Specify "Y" to create the RACF EJBROLES class. EJBROLES controls method access for enterprise beans.

Use OPERCMDS to control commands
: Specify "Y" to create the RACF OPERCMDS class. OPERCMDS controls the ability of an operator to start servers.

Use DCE for authentication and encryption
: Specify "Y" to create DCE (Distributed Computing Environment) security. You can use DCE to create secure communications in a network.

Use Kerberos over SSL
: Specify "Y" to create Kerberos security. With this option, SSL provides message security and authenticates the server to the client. Kerberos provides the ability for the server to authenticate the client.

Use SSL basic authorization
: Specify "Y" to create SSL basic authorization security. With this option, the

server proves its identity by passing a digital certificate to the client. The client proves its identity by passing a user identity and password known by the target server.

Use SSL client certificates

Specify “Y” to create SSL client certificate security. With this option, both the server and client pass digital certificates to prove their identities to each other.

Test certificate authority label

The dialog uses this label to create a test certificate authority certificate.

Recommendation: Use this certificate for testing purposes only.

Passticket Profile name

Is the profile name used for the PassTicket profile. You cannot change it.

PassTicket KEYMASK value

Specify any string of 16 hexadecimal characters as a mask for PassTickets.

Steps for generating customization jobs

Before you begin: You must complete Option 2, Define variables.

Recommendation: When you have finished entering all your customization data, before you generate the customization jobs, use the S option to save your customization variables for future reference. See "Steps for saving the customization variables" on page 93.

Perform the following steps to generate the customization jobs:

1. On the main dialog panel, type 3 in the `Option` field.

   ____

2. Press Enter.

   Result: If all variables are defined correctly, you see the Specify Job Cards panel.

   ____

3. Fill in the job card information according to "3 Generate customization jobs" on page 91, then press Enter.

   ____

You are done when all the jobs are generated.

3 Generate customization jobs

Table 32. Generate customization jobs

Item	**Value in the dialog after you load IBM defaults**	**Your value (Fill in the blanks)**
Job card information	//jobname JOB (ACCTNO,ROOM),'*userid*',CLASS=A,REGION=0M //* //* //*	

Specify the job card according to your installation requirements.

Note: The dialog generates a job name and the "JOB" keyword for each job.

Steps for viewing the generated customization instructions

Before you begin: You must complete Option 3, Generate customization jobs.

Perform the following steps to view the generated customization instructions:

1. On the main dialog panel, type 4 in the `Option` field.

   ___

2. Press Enter.

   ___

3. View the instructions. You may print the instructions according to your local print procedures.

   ___

You are done when you view or print the instructions.

Steps for saving the customization variables

Before you begin: You must complete Option 2, Define variables.

Perform the following steps to save the customization variables:

1. On the main dialog panel, type S in the `Option` field.

   ____

2. Press Enter.

   Result: You see the Save Customization Variables panel.

   ____

3. Type in the information from "S Save Customization Variables" on page 94, then press Enter.

   ____

You are done when you successfully save the variables.

S Save Customization Variables

Table 33. Save customization variables

Item	Value in the dialog after you load IBM defaults	Your value (Fill in the blanks)
Dsname	(null)	

Specify the name of the data set into which you want to save the customization variables.

Rules:

- The data set must be a sequential data set. Do not specify a member name.
- Place quotes around the data set name.

Steps for loading customization variables

When you first run the customization dialog, you must load the customization variables. IBM provides member BBOWVARS in the SBBOEXEC data set, which allows you to prime the dialog with default values.

You may also follow these instructions to re-load variables you have saved.

Before you begin: You must start the customization dialog.

Perform the following steps to load customization variables:

1. On the main dialog panel, type L in the `Option` field.

   ____

2. Press Enter.

   Result: You see the Load Customization Variables panel.

   ____

3. Type in the information from "L Load Customization Variables" on page 96, then press Enter.

   ____

You are done when you successfully load the variables.

L Load Customization Variables

Table 34. Load customization variables

Item	Value in the dialog after you load IBM defaults	Your value (Fill in the blanks)
Dsname	(null)	

Specify the data set from which you will prime the variables.

Following the customized instructions

The customization dialog generates instructions tailored for your system. The procedure in this section explains how to follow those instructions to customize your system and run the bootstraps.

Rules:

1. If you created the target data sets (*.CNTL and *.DATA) on another (driving) system, you must copy them to the **target system** and give them the same data set names.
2. **You must perform the instructions on your target system.**

The major steps of the customization process are:

Stage	Description
1	Make a variety of configuration changes to your z/OS or OS/390 system configuration (PARMLIB, TCP/IP, workload management, and so forth.). The customized instructions provide details and pointers to relevant documentation.
2	Define log streams used by WebSphere for z/OS and RRS through jobs BBOERRLG and BBORRSLS. You do not need to run BBORRSLS if RRS is already running on your target MVS system.
3	Create a customized set of RACF commands for initial WebSphere for z/OS security setup through job BBOCBRAJ. The RACF commands are saved in member BBOWBRAK of the *hlq*.DATA data set. Job BBOCBRAK executes these RACF commands. Later, you can use the RACF commands saved in BBOWBRAK to help in defining security for additional servers or users.
4	Create a customized set of RACF commands for the LDAP server security setup using job BBOLDRAJ. The RACF commands are saved in member BBOLDRAK of the *hlq*.DATA data set. Job BBOLDRAK executes these RACF commands.
5	Allocate and mount the WebSphere for z/OS system management HFS through job BBOWCHFS. If your root HFS is mounted read-only, you may need to define one or more mount points manually. See the instructions for details. Job BBOMCFG creates subdirectories and files in the WebSphere for z/OS system management HFS. For more information about the resulting HFS structure, see “Overview of BBOMCFG” on page 98.
6	Copy customized PARMLIB and PROCLIB members, as well as customized HFS files, into their proper locations using job BBOWCPY1.
7	Define the DB2 tables and objects used by the WebSphere for z/OS system management server through job BBOMCRDB. DB2 and RRS must be running before you run BBOMCRDB. Job BBOBIND creates package bindings for this database.
8	Define the DB2 tables needed by the WebSphere for z/OS LDAP server through job BBOLDTBC. Jobs BBO1JCL and BBO2JCL bind packages and plans for this database. In certain cases, job BBO1JCL should NOT be run. For details, see the discussion about BBO1JCL page 43. If you need to recreate the LDAP tables with BBOLDTBC, run job BBODTBD first to delete the old ones. Running BBOLDTBD requires you to redo the entire customization process again.
9	Set up DB2 authorizations for the WebSphere for z/OS system management and LDAP databases through jobs BBOCBGRT and BBOLDGRT.

Stage	Description
10	Prime the LDAP tables with the initial entries needed for WebSphere for z/OS setup using job BBOLD2DB.
11	Run the bootstrap process. This process consists of bringing up the WebSphere for z/OS run–time servers for the first time, restarting them, running two configuration jobs (BBONMC and BBOIRC), and restarting the run time once more. Each phase of this bootstrap causes additional information to be stored in the WebSphere for z/OS databases and HFS. Once the bootstrap process is complete, you have a working WebSphere for z/OS run time that you will use to run the installation verification programs (IVPs) and your own applications.

Overview of BBOMCFG

The BBOMCFG job creates the system management HFS structure on a mount point for a WebSphere for z/OS file system. The mount point is specified by a variable called -TARGETDIR. The default -TARGETDIR is `/WebSphere390/CB390`.

Rules:

1. TARGETDIR must be a read/write directory. If you plan to set up WebSphere for z/OS in a sysplex, this directory must be shared, so you must establish some means of sharing the HFS in read/write mode across the sysplex. For OS/390 Version 2 Release 8, you must use the Network File System. For OS/390 Version 2 Release 9 or later and z/OS, you can choose either the Network File System or use the shared HFS function.
2. The System Management group (default CBCFG1) and user ID (default CBSYMSR1) must own each directory and subdirectory in TARGETDIR. If the System Management group and user ID do not own TARGETDIR, use the chown command to make them the owner of each directory and subdirectory in TARGETDIR. Thus, if you use the default TARGETDIR, you must use the chown command to give the System Management group and user ID ownership of /WebSphere390 and /WebSphere390/CB390.

   Example:

   ```
   chown -R CBSYMSR1:CBCFG1 /WebSphere390
   ```
3. If you want to do an initial installation of WebSphere for z/OS and reuse the same mount point (TARGETDIR) as an existing system management HFS structure, you must delete all directories and files under the existing mount point before running BBOMCFG.

   Example: Previously, you installed WebSphere for z/OS for the first time and used `/WebSphere390/CB390` as your TARGETDIR. Now you want to do an initial installation again using the same TARGETDIR. You must delete all directories and files under `/WebSphere390/CB390` before you run BBOMCFG.

The entire subdirectory structure looks like this:

```
/TARGETDIR
   /controlinfo
      /envfile
         /SYSPLEX
           /DAEMON01
              current.env -> /TARGETDIR/SYSPLEX/initial/configuration.env
           /INTFRP01
              current.env -> /TARGETDIR/SYSPLEX/initial/configuration.env
           /NAMING01
              current.env -> /TARGETDIR/SYSPLEX/initial/configuration.env
           /SYSMGT01
              current.env -> /TARGETDIR/SYSPLEX/initial/configuration.env
   /SYSPLEX
```

```
   /conversations
      /cb302
      /current
        configuration.xml -> /TARGETDIR/SYSPLEX/initial/configuration.xml
   /etc
      /ldap
           SYS1.bboldif.cb
           SYS1.bboslapd.conf
           SYS1.dsnaoini
   /initial
      configuration.env
      configuration.xml
      WebContainerDB2.xml
   /resources
      /templates
        CICS_ECIConnectionFactory.properties
        CICS_ECIConnectionFactory.xml
        DB2datasource.properties
        DB2datasource.xml
        DB2datasource_ja_JP.properties
        IMSConnectionFactory.properties
        IMSConnectionFactory.xml
        IMSJdbcDataSource.properties
        IMSJdbcDataSource.xml
        JavaMailSession.properties
        JavaMailSession.xml
        JavaMailSession_ja_JP.properties
        JavaNetURLResource.properties
        JavaNetURLResource.xml
        JavaNetURLResource_ja_JP.properties
        MQQueue.xml
        MQQueueConnectionFactory.xml
        MQRRSQueueConnectionFactory.xml
        MQRRSTopicConnectionFactory.xml
        MQTopic.xml
        MQTopicConnectionFactory.xml
   /temp
/apps
   /SYSPLEX
```

where

TARGETDIR
Is the mount point you specify using a job variable called -TARGETDIR in BBOMCFG.

SYSPLEX
Is the name of the sysplex on which your WebSphere for z/OS system runs. You specify the sysplex name in a job variable called -SYSPLEX.

The directories that are important for installation and customization are:

- *TARGETDIR*/*SYSPLEX*/initial. Environment files for the run-time servers are placed in this directory.
- *TARGETDIR*/*SYSPLEX*/etc/ldap. Custom LDAP configuration files are in this directory.

The following are variables in BBOMCFG. The customization dialog supplies values for these variables using values you supply in the dialog.

Table 35. Variables in job BBOMCFG

Variable	Explanation
-INSTALLDIR	The name of the directory where WebSphere for z/OS files reside after SMP/E installation
-TARGETDIR	The name of the WebSphere for z/OS mount point. -TARGETDIR is used as the base directory under which BBOMCFG sets up a directory structure that will hold all HFS-related configuration and application data. The value of -TARGETDIR must be the same as the value of the CBCONFIG environment variable specified in environment files and the CBCONFIG JCL variable used in the start procedures to startup WebSphere for z/OS servers. The value of -TARGETDIR should **not** be the same as -INSTALLDIR.
-SYSPLEX	The name of the monoplex or sysplex on which WebSphere for z/OS runs. You can obtain this value by entering the command `D SYMBOLS` on the system console.
-SYSNAME	The name of the z/OS or OS/390 system on which WebSphere for z/OS runs. You can obtain this value by entering the command `D SYMBOLS` on the system console.
-DM_NAME	The name of your initial Daemon server instance that will be used for the bootstrap
-IR_NAME	The name of your initial Interface Repository server instance that will be used for the bootstrap
-NM_NAME	The name of your initial Naming server instance that will be used for the bootstrap
-SM_NAME	The name of your initial System Management server instance that will be used for the bootstrap
-OWNER	The user ID associated with the System Management server. It will be the owner of the HFS files.
-GROUP	The RACF group name for the HFS files. BBOCBRAK creates this group (the default is CBCFG1). The purpose of the group is to allow application installers to manage these HFS files without needing to be in the same RACF groups as the run-time server user IDs, particularly the system management server region user ID (CBSYMSR1), which owns the HFS directories.

Steps for following the customized instructions

Before you begin: You must run the customization job and generate the customized jobs.

Note: For pre-installation planning, we provide a **sample** set of instructions in “Sample customized instructions for initial installation and customization” on page 363. Be sure to follow the instructions you generate for your system, since they will differ from the sample.

Perform the following steps to follow the customized instructions.

1. Within the customization dialog, enter option 4 (View the generated customization instructions).

2. View or print the instructions.

3. Follow the instructions in the order they are presented.

You know you are done when you have finished the WebSphere for z/OS bootstrap process. The customized instructions will tell you to return to this manual to continue.

Installing the Administration and Operations applications

The procedures in this section tell you how to install the Administration and Operations applications and, if your workstation does not use a domain name server (DNS), how to update the workstation Hosts file.

Steps for installing the Administration and Operations applications

In these steps, you download and install the Administration and Operations applications package to your Windows workstation. The program package is a self-extracting exe file.

Before you begin: Check the workstation requirements in “Determining WebSphere for z/OS system requirements” on page 10.

Perform the following steps to install the Administration and Operations applications:

1. Open a command prompt and change directories to a directory into which you will download the program package.

   Example:

   ```
   C:\>cd temp

   C:\TEMP>
   ```

2. Issue the ftp command to the system on which WebSphere for z/OS runs. Log onto the system. You can log on with any user ID with an OMVS segment defined. Our example uses CBGUEST, but we suggest you use your own user ID.

   Example:

   ```
   C:\TEMP>ftp boss.my.com
   Connected to boss.my.com.
   220-FTPD1 IBM FTP CS V2R8 at OS390CBSERIES, 15:18:44 on 2000-04-18.
   220 Connection will close if idle for more than 5 minutes.
   User (boss.my.com:(none)): cbguest
   331 Send password please.
   Password:
   230 CBGUEST is logged on.  Working directory is "CBGUEST.".
   ```

3. Change directories to the directory where the program package resides (default is `/usr/lpp/WebSphere/bin`).

   Example:

   ```
   ftp> cd /usr/lpp/WebSphere/bin
   250 HFS directory /usr/lpp/WebSphere/bin is the current working directory
   ```

4. Issue the bin command and get the program package.

   Example:

   ```
   ftp> bin
   200 Representation type is Image
   ftp> get bboninst.exe
   200 Port request OK.
   125 Sending data set /usr/lpp/WebSphere/bin/bboninst.exe
   250 Transfer completed successfully.
   16725648 bytes received in 35.16 seconds (475.70 Kbytes/sec)
   ```

5. Quit ftp.

Example:

```
ftp> quit
221 Quit command received. Goodbye.
```

6. From the Start menu, click Run, then use Browse to find the program package. Click OK.

7. Follow the InstallShield wizard to complete the installation.

You know you are done when the InstallShield wizard completes successfully.

Steps for updating the workstation Hosts file

If the workstation on which the Administration and Operations applications run is not connected to a Domain Name Server (DNS) or is not in the same domain as WebSphere for z/OS, you must update the workstation Hosts file. Through the Hosts file, your workstation can find the system on which WebSphere for z/OS runs. If your workstation is connected to a DNS, you can skip this procedure.

Before you begin: You must be on a running Windows system.

Perform the following steps to update the Hosts file on Windows:

1. Find the Hosts file. On Windows NT, it is usually in `c:\winnt\system32\drivers\etc`. On Windows 95, it is usually in `c:\windows`.

   Tip: If you do not have a Hosts file, you can create one using any text editor and placing it in the appropriate directory. You may have a sample Hosts file, Lmhosts.sam, that you can use to model your new Hosts file.

2. Make an association between a TCP/IP host name and an address by adding an entry to the file. Each entry in the Hosts file consists of an IP address, followed by a fully-qualified IP name and, optionally, one or more aliases. The fully-qualified name should be first after the IP address to assure proper address resolution. Each entry must be surrounded by blanks and on a single line.

   Example:

```
#
#  The following entries allow the workstation to access CB on OS390 without
#  the workstation being in the same domain.
#
9.82.93.2 boss0082.washington.ibm.com  boss0082  #CB Daemon_IPname and alias
#
#  The CB Resolve_IPname is the same for this installation or it, too, must
#  be added.
#
```

3. Save your Hosts file and test it. You can test your changes by opening a command window and issuing the ping command with the name you just added.

   Example:

```
ping wsccb
```

You know you are done when you get a response from the ping command.

Defining application servers for the installation verification programs

Use the Administration application to define the BBOASR2 server, the BBOASR1 server, or both. The BBOASR2 server is a J2EE server. Three of the installation verification programs (IVPs) use BBPASR2 to test J2EE component support. The BBOASR1 server is a MOFW server. One IVP uses BBOASR1 to test MOFW component support. Besides allowing you to run the IVPs, these servers provide examples of how to set up your own business application servers.

Each of the following two main sections of this topic describe how to start the Administration application and a add new conversation. A *conversation* is a system management object that allows you to display and modify a WebSphere for z/OS configuration. (For information about conversations and the Administration application, see *WebSphere Application Server V4.0.1 for z/OS and OS/390: System Management User Interface*, SA22-7838.) Then each section describes how to define an application server, install the IVP application, then activate the conversation. Activating a conversation means that your server configuration has been updated for use by the system management function in WebSphere for z/OS.

You may define either server or both, depending on the component types you plan to use. Base your choice on which component type server you want:

If you want to set up:	Then define the server according to instructions in:
J2EE servers	"Defining the BBOASR2 J2EE server" on page 105
MOFW servers	"Defining the BBOASR1 MOFW server" on page 132
J2EE servers and MOFW servers	"Defining the BBOASR2 J2EE server" on page 105 followed by "Defining the BBOASR1 MOFW server" on page 132 (use two distinct conversations)

When a new conversation is created, all objects in the currently-active conversation are automatically added to the new conversation. Therefore, creating a J2EE server conversation first, followed by a MOFW conversation, results in the second conversation containing definitions for both J2EE and MOFW servers.

You can now perform the steps for the decision you have made.

The Administration application interacts with the System Management Server to do its work. You may find these interactions take some time to complete.

Defining the BBOASR2 J2EE server

If you plan to use J2EE components, do the steps in this section to set up BBOASR2, the J2EE server that the IVPs use to test J2EE component support.

Steps for starting the Administration application

Before you begin: You must initialize the WebSphere for z/OS run-time server instances and have the Administration application installed.

Perform these steps to start the Administration application:

1. On your workstation, click Start, then Programs, then IBM WebSphere for z/OS Administration.

   ____

2. Fill in the dialog with the Bootstrap server IP name, port 900, the user ID cbadmin, and password (for the password, see our RACF sample BBOCBRAK). Click OK.

   Recommendations:

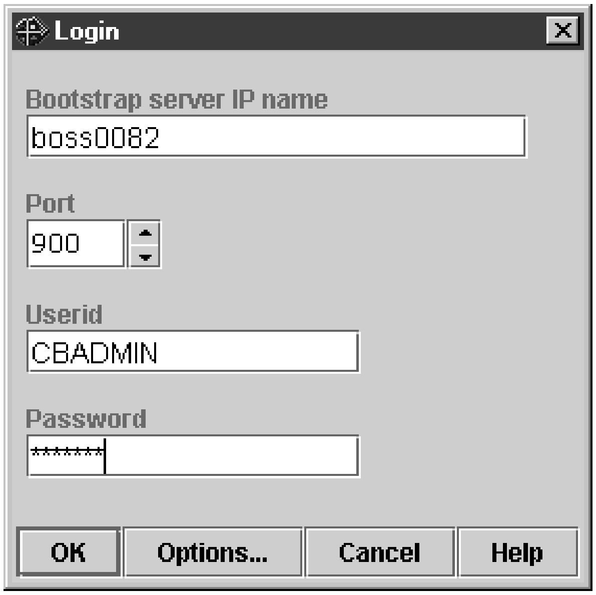
   a. We strongly recommend that you **not** use the same administrator ID to log on to multiple concurrent sessions of the application, from either a single workstation or from more than one workstation. For example, if you start the Administration application on your workstation using CBADMIN as the user ID, you should not start another session using CBADMIN from either your own or a different workstation.

   b. If you define several administrator user IDs, they all may be logged on simultaneously, but only **one** should update and activate a conversation at a time.

      If more than one administrator attempts to activate a conversation, unexpected results will occur. When an administrator starts a new conversation, a copy of the currently active conversation is used as the base level. If more than one administrator creates a new conversation based on the same currently active conversation, the first administrator to activate will be successful. All others who try to activate will fail, since their changes are not based on the currently active conversation (the currently active conversation has changed out from under them). The second and subsequent administrators will have to start over again using the new current conversation. Depending on the amount of change, this can be very disruptive. Thus, while one administrator is updating and activating a conversation, the others should use the administration application only for read or display functions.

   c. When you login to the WebSphere for z/OS Administration application, you will be able to view only your own conversations and the current active conversation, even if you have the same security authorities of other administrator user IDs.

      If your installation has multiple administrators, they are able to login to the Administration application using the same user ID, but should not login simultaneously.



Bootstrap server IP name
boss0082

Port
900

Userid
CBADMIN

Password
****

You know you are done when the main window appears showing the bootstrap conversation. If you have trouble connecting, check the Help system or *WebSphere Application Server V4.0.1 for z/OS and OS/390: System Management User Interface*, SA22-7838, for more information.

Steps for starting a new conversation

Before you begin: You must start the Administration application by logging in.

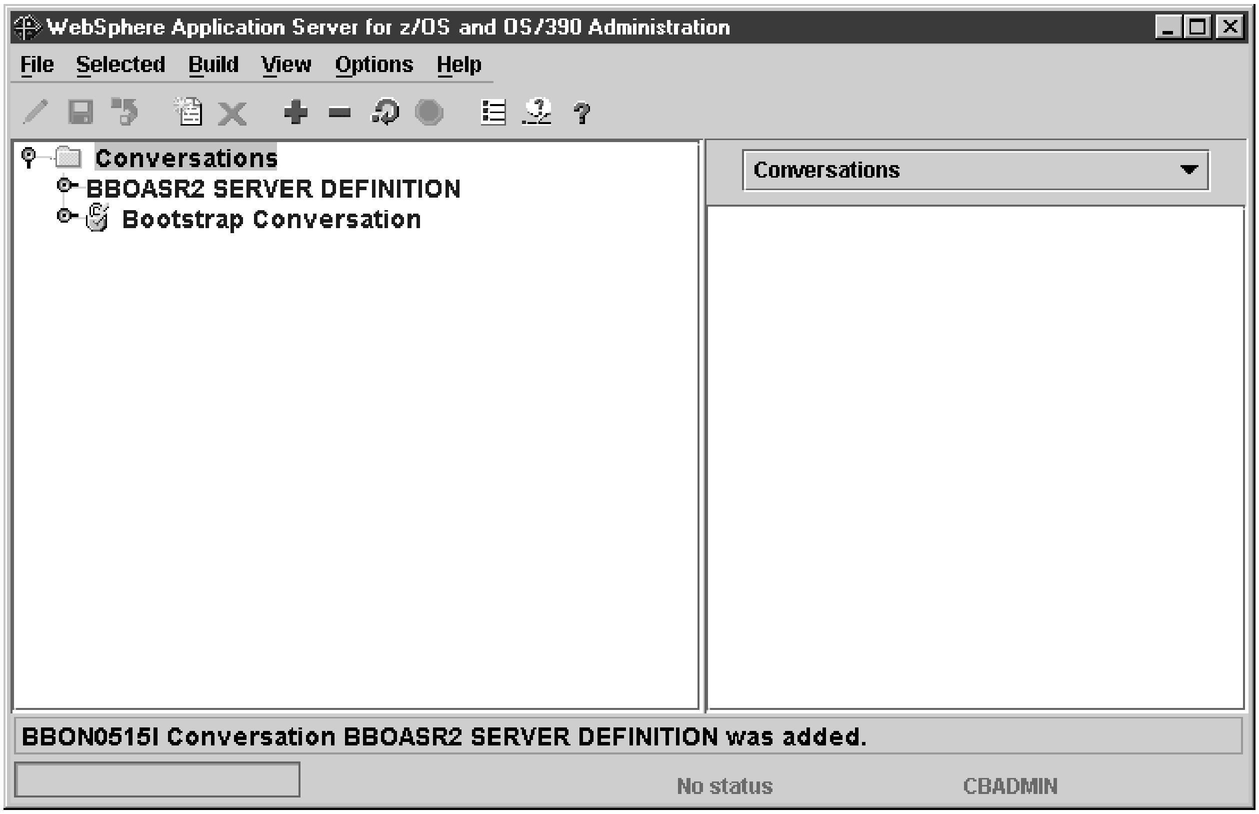
Perform these steps to start a new conversation:

1. Select the Conversations folder with the left mouse button. Then, using the right mouse button, click the Conversations folder, then select Add.
2. In the properties form (right panel), name your new conversation. For example, we named the conversation “BBOASR2 SERVER DEFINITION.” Add a description (optional).
3. Click the save (diskette) icon. The words “Adding... Conversations” appear in the tree.

You know you are done when the following message appears in the status bar:

```
BBON0515I Conversation BBOASR2 SERVER DEFINITION was added.
```

The screen looks like this:



BBON0515I Conversation BBOASR2 SERVER DEFINITION was added.

Note: There are DB2 space issues with continually adding new conversations and not cleaning up the old ones. Please see “Steps for changing any item in the active conversation” on page 179 for more information.

Steps for adding the BBOASR2 J2EE server

Before you begin: You must be working on the current conversation.

Perform these steps to add the new server:

1. Expand your new conversation tree by clicking the node to the left of the conversation name.

   ____

2. Expand Sysplexes, then your sysplex.

   ____

3. Select the J2EE server folder with the left mouse button. Then, using the right mouse button, Click the J2EE server folder, then select Add.

   ____

4. In the properties form, enter values or make selections as appropriate for your installation.

Server name	BBOASR2
Server description	Optional server description
Control region identity	The user ID under which the control region runs. This must match an entry in the RACF STARTED class and have appropriate RACF authorizations for a control region. The default value in BBOCBRAK is CBACRU2.
Server region identity	The user ID under which the server region runs. This must match an entry in the RACF STARTED class and have appropriate RACF authorizations for a server region. The default value in BBOCBRAK is CBASRU2.
Server region stack size (in bytes)	0
Production J2EE server	Select the check box
Debugger allowed	Leave unchecked
Object Level Trace hostname	Leave blank
Object Level Trace port	Leave the default
Isolation policy	One transaction per server region
Replication policy	One per server
Local identity	The user ID you chose as the local unauthenticated user ID on the IVP customization panel in the customization dialog. By default, the customization dialog uses CBIVP2.
Remote identity	The user ID you chose as the remote unauthenticated user ID on the IVP customization panel in the customization dialog. By default, the customization dialog uses CBIVP2.
Register transaction factory	Clear the check box*

* A server that registers as a transaction factory must be available at all times. Because BBOASR2 is available only during installation verification, this server should not register as a transaction factory.

The Naming Server is defined as a transaction factory. If you remove the Naming Server from the configuration, you need to make another server into a transaction factory. You can have more than one transaction factory, but remember that such servers must be available at all times.

Allow server region recycling	Select the check box
Server recycling interval	50000

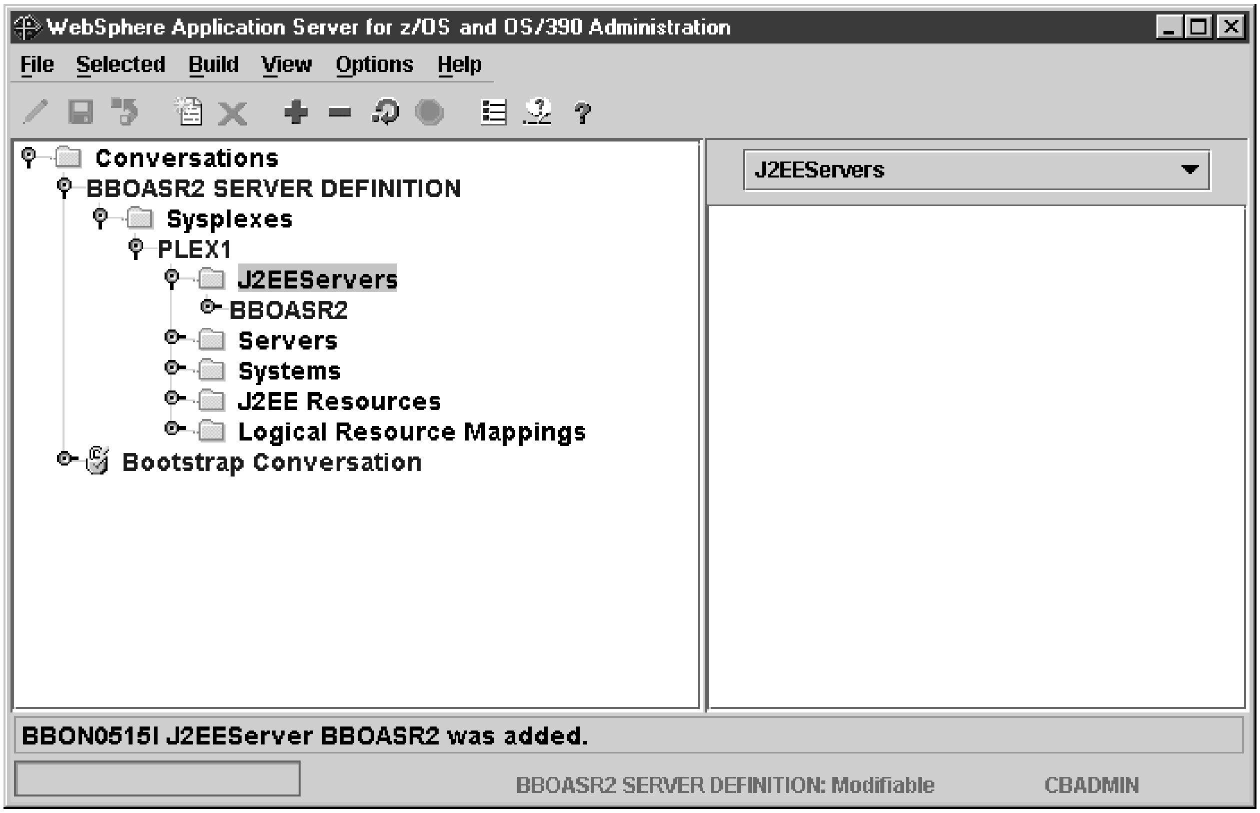
Logstream name	The name of the log stream you set up for capturing error information. See Table 19 on page 71. You may leave this blank, in which case the system uses the Daemon's log stream.
Control region proc name	BBOASR2 (default)
Enable Setting OS Thread Identity to RunAs	Clear the check box
Allow non-authenticated clients	Select the check box
Userid password allowed	Select the check box
Userid passticket allowed	Clear the check box
DCE allowed	Clear the check box
DCE quality of protection	No protection
DCE keytab file	Leave blank
SSL Type 1 allowed	Clear the check box
SSL Client Certificates allowed	Clear the check box
Kerberos allowed	Clear the check box
Send Asserted Identities allowed	Clear the check box
Accept Asserted Idenitites allowed	Clear the check box
SSL Use Confidentiality only	Clear the check box
SSL RACF keyring	CBKeyring
SSL V2 timeout	100
SSL V3 timeout	600
Security preference list	Set Password to priority 1
Write Server Activity Records	If you want to gather server activity records, select the check box.
Write Container Activity SMF Records	If you want to gather container activity records, select the check box.
Write Server Interval SMF Records	If you want to gather server interval records, select the check box.
Write Container Interval SMF Records	If you want to gather container interval records, select the check box.
Interval length	0
Environment variable list	Leave unchanged.

5. Click the save (diskette) icon. The words ″Adding... J2EE servers″ appear in the tree.

You know you are done when the following appears in the status bar:

```
BBON0515I J2EEServer BBOASR2 was added.
```

The screen looks like this:



BBON0515I J2EEServer BBOASR2 was added.

BBOASR2 SERVER DEFINITION: Modifiable CBADMIN

Steps for adding the BBOASR2A server instance

Before you begin: You must have the BBOASR2 server defined.

Perform these steps to add the server instance:

1. If necessary, expand the tree by clicking the node to the left of J2EEServers and BBOASR2.

   ____

2. Select Server Instances with the left mouse button. Then, using the right mouse button, click Server Instances, then select Add.

   ____

3. In the properties form, enter BBOASR2A as the server instance name.

   ____

4. Optional: enter a server instance description.

   ____

5. Optional: supply a log stream name. If you do not supply one, the default is the log stream name you chose for the BBOASR2 server.

   ____

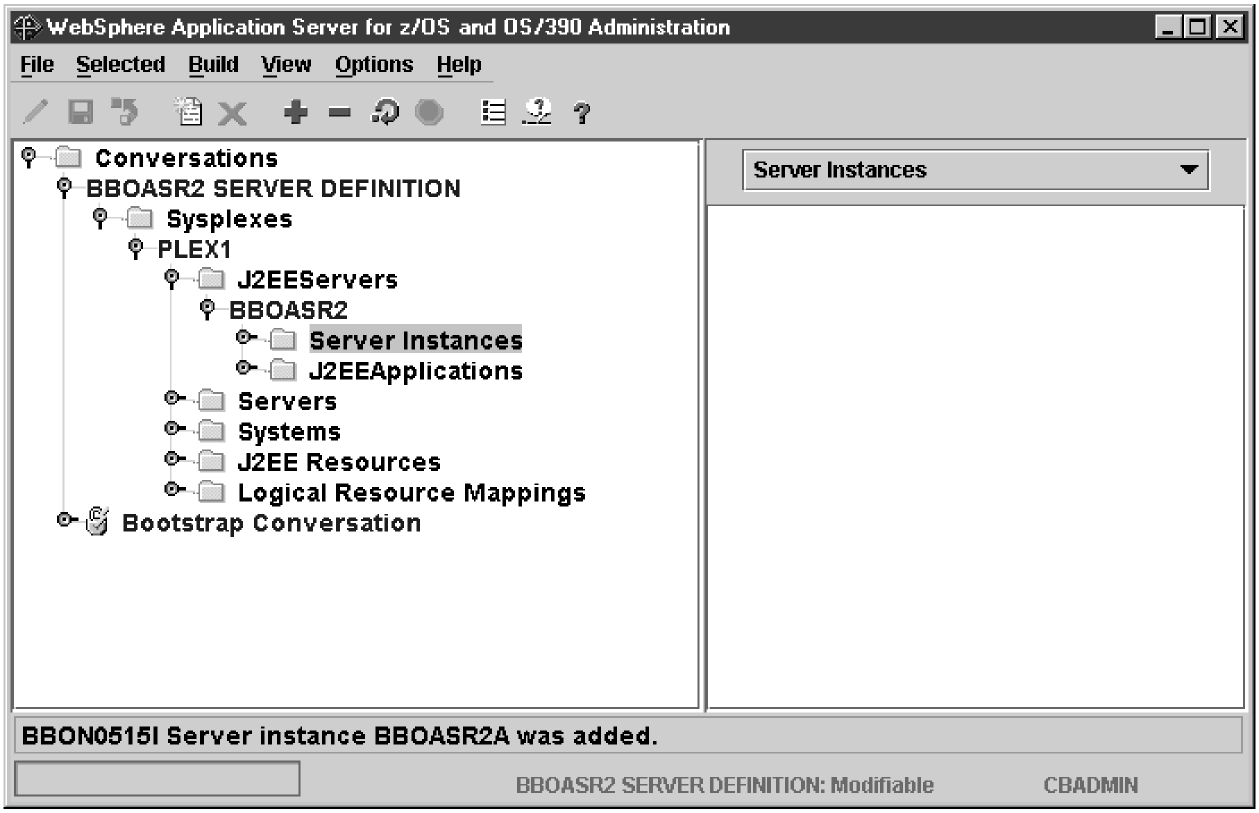
6. Click the save (diskette) icon. The words ″Adding... Server Instances″ appear in the tree.

   ____

You know you are done when the following message appears in the status bar:

```
BBON0515I Server instance BBOASR2A was added.
```

The screen looks like this:



WebSphere Application Server for z/OS and OS/390 Administration
File Selected Build View Options Help
Conversations
BBOASR2 SERVER DEFINITION
Sysplexes
PLEX1
J2EEServers
BBOASR2
Server Instances
J2EEApplications
Servers
Systems
J2EE Resources
Logical Resource Mappings
Bootstrap Conversation
Server Instances

BBON0515I Server instance BBOASR2A was added.

BBOASR2 SERVER DEFINITION: Modifiable CBADMIN

Steps for adding a J2EE resource

Before you begin: You must be working on the current conversation.

Perform these steps to add a J2EE resource:

1. Select J2EE resources with the left mouse button. Then, using the right mouse button, click J2EE resources, then select Add.

   ____

2. In the properties form, enter a name for the J2EE resource. For example, we used "BBOASR2_EJB_IVP_RESOURCE."

   ____

3. Optional: enter a description of the J2EE resource.

   ____

4. Find the property labelled `J2EE resource type`, and select `DB2datasource`.

   The Administration application fills in the fields above with the information that is appropriate for a DB2 data source.

   ____

5. Click the save (diskette) icon. The words ″Adding... J2EE resources″ appear in the tree.

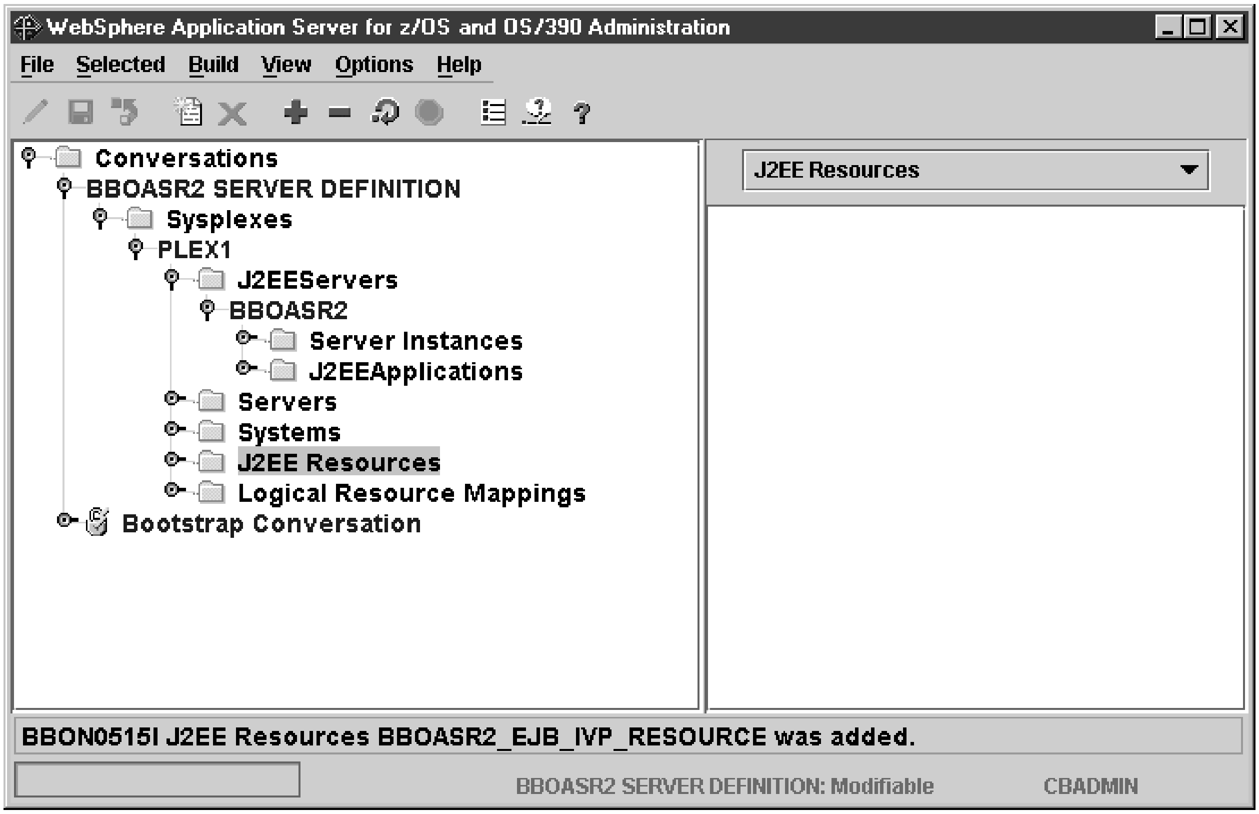
   ____

You know you are done when the following message appears in the status bar:

```
BBON0515I J2EE Resources name was added.
```

where *name* is the name you chose for the J2EE resource.

The screen looks like this:



BBON0515I J2EE Resources BBOASR2_EJB_IVP_RESOURCE was added.

BBOASR2 SERVER DEFINITION: Modifiable CBADMIN

Steps for adding the J2EE resource instance

Before you begin: You must define a J2EE resource.

Perform these steps to add the J2EE resource instance:

1. If necessary, expand the tree for the newly created J2EE resource by clicking the node to the left of the J2EE resource name.

   ____

2. Select J2EE Resource Instances with the left mouse button. Then, using the right mouse button, Click J2EE Resource Instances, then select Add.

   ____

3. In the properties form, enter the appropriate values:
   - J2EE resource instance name.

     Example: `BBOASR2_EJB_IVP_RESOURCE_`*`system`*, where *system* is your system name.
   - J2EE resource instance description (optional).
   - Location Name: supply the the DB2 location name.

   ____

4. Click the save (diskette) icon. The words ″Adding... J2EE resource instances″ appear in the tree.

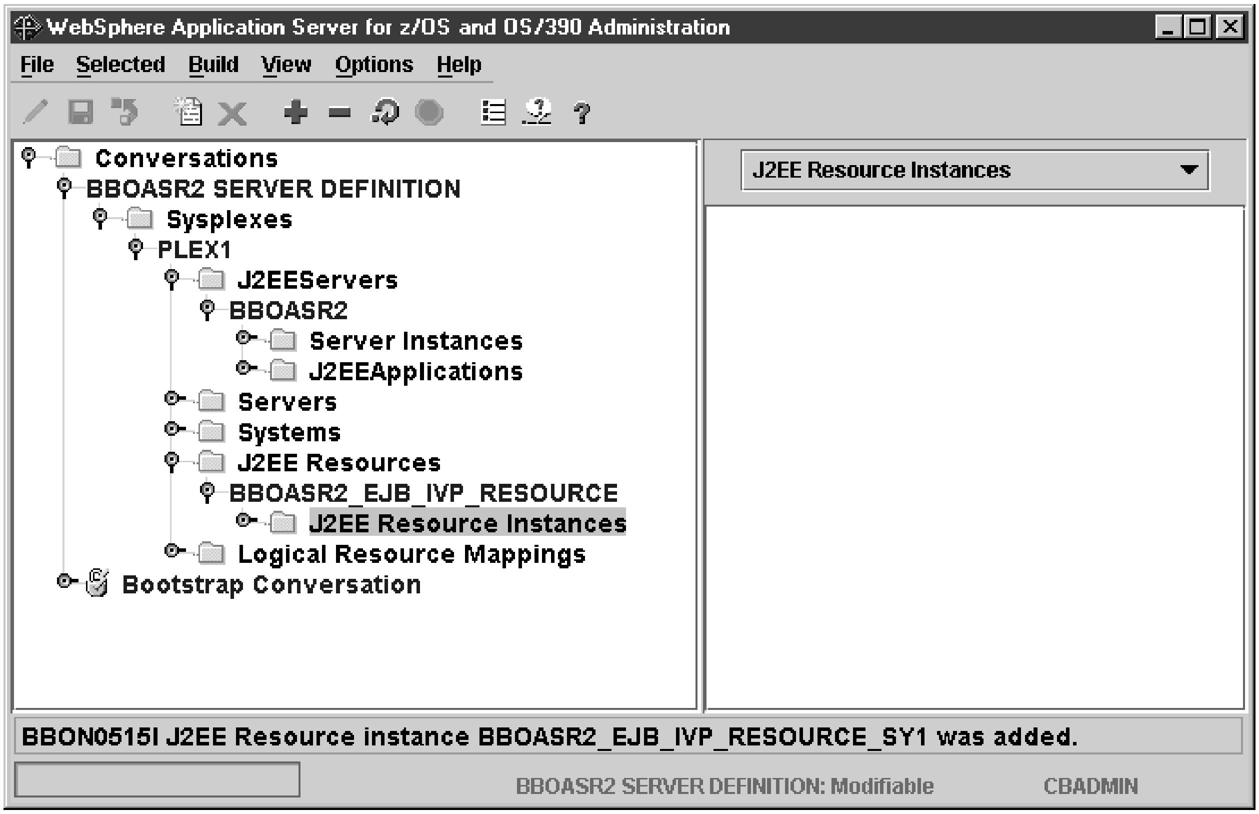
   ____

You know you are done when the following message appears in the status bar:

```
BBON0515I J2EE resource Instance name was added.
```

where *name* is the name you chose for the J2EE resource instance.

The screen looks like this:



BBON0515I J2EE Resource instance BBOASR2_EJB_IVP_RESOURCE_SY1 was added.

BBOASR2 SERVER DEFINITION: Modifiable CBADMIN

Steps for installing WebSphereSampleApp.ear into the Web container

Before you begin:

- Make sure that the FTP server on z/OS or OS/390 is running.
- Download in binary the WebSphereSampleApp.ear file from the WebSphere for z/OS samples directory. The default location for this file is:

  ```
  /usr/lpp/WebSphere/samples
  ```

Perform the following steps to installing WebSphereSampleApp.ear into the Web container:

1. In the tree, right-click the BBOASR2 server.

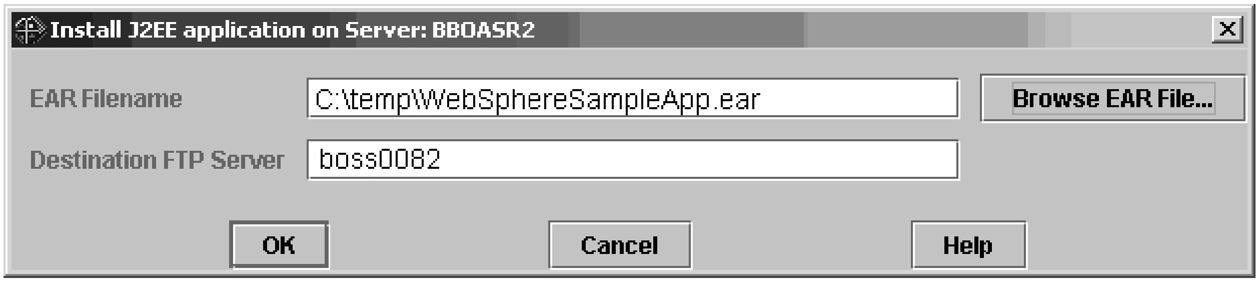
   ____

2. Choose Install J2EE Application... from the Selected menu bar. The Install J2EE Application dialog box appears.

   ____

3. In the dialog box, enter the following values:
   - The name of the EAR file that contains your J2EE application. Use the Browse button to navigate to the WebSphereSampleApp.ear file in your workstation file system.
   - The name of the FTP server for the sysplex in which you want to install your application. Usually, this is the IP name of the system you logged onto (it is displayed as the default).

   Example:



Install J2EE application on Server: BBOASR2

EAR Filename: C:\temp\WebSphereSampleApp.ear

Destination FTP Server: boss0082

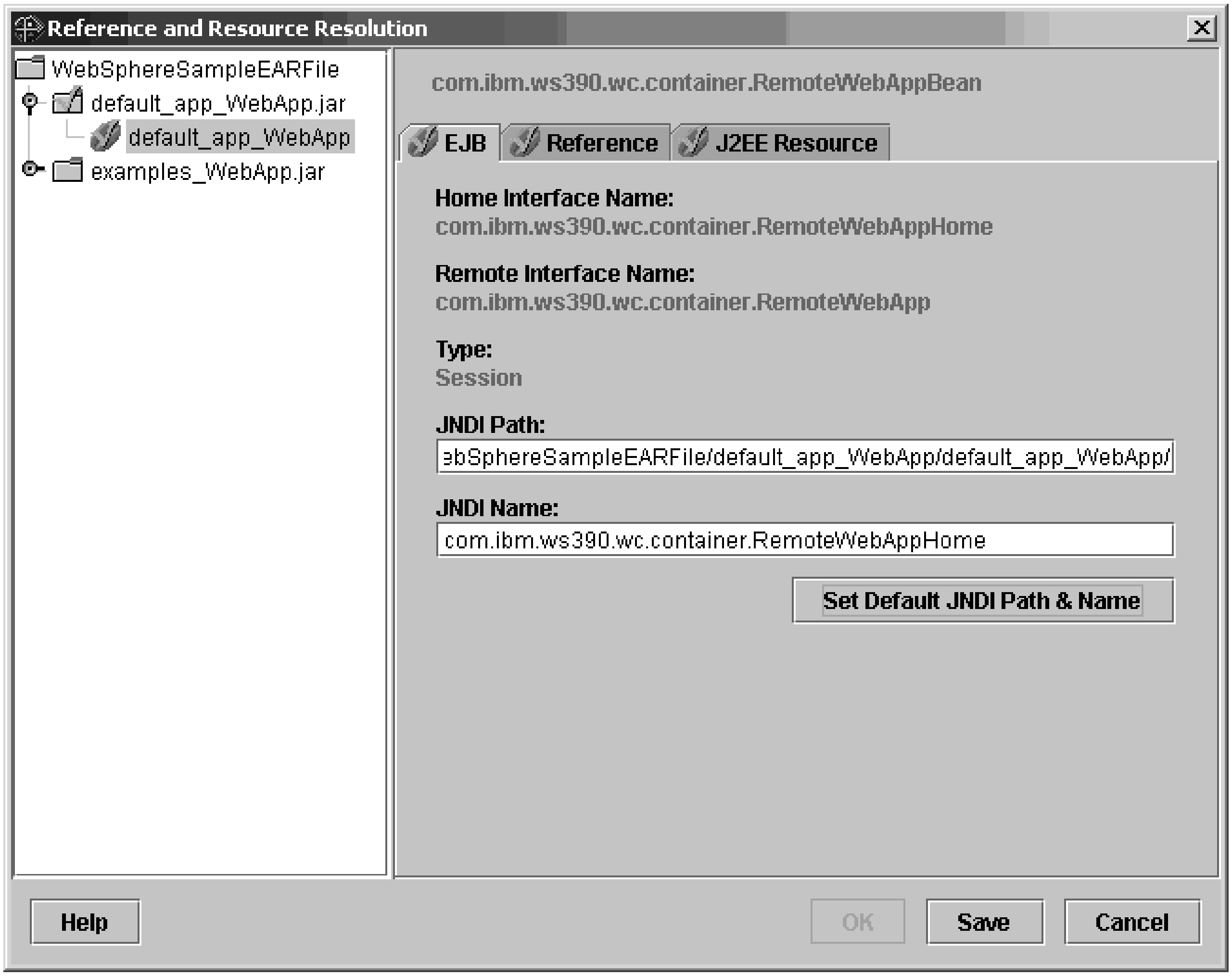
   Click OK.

   Result: A pop-up appears with the words “Loading ear file,” then the Reference and Resource Resolution window appears and displays the application content in the ear file.

   ____

4. In the Reference and Resource Resolution window:
   a. Expand default_app_WebApp.jar by clicking the node to the left of the folder.
   b. Click the default_app_WebApp bean, then click the button labelled “Set Default JNDI Path & Name.”

      Result: You will know you have finished this process when the bean symbol to the left of the bean name has a checkmark over it.



com.ibm.ws390.wc.container.RemoteWebAppBean

Home Interface Name:
com.ibm.ws390.wc.container.RemoteWebAppHome

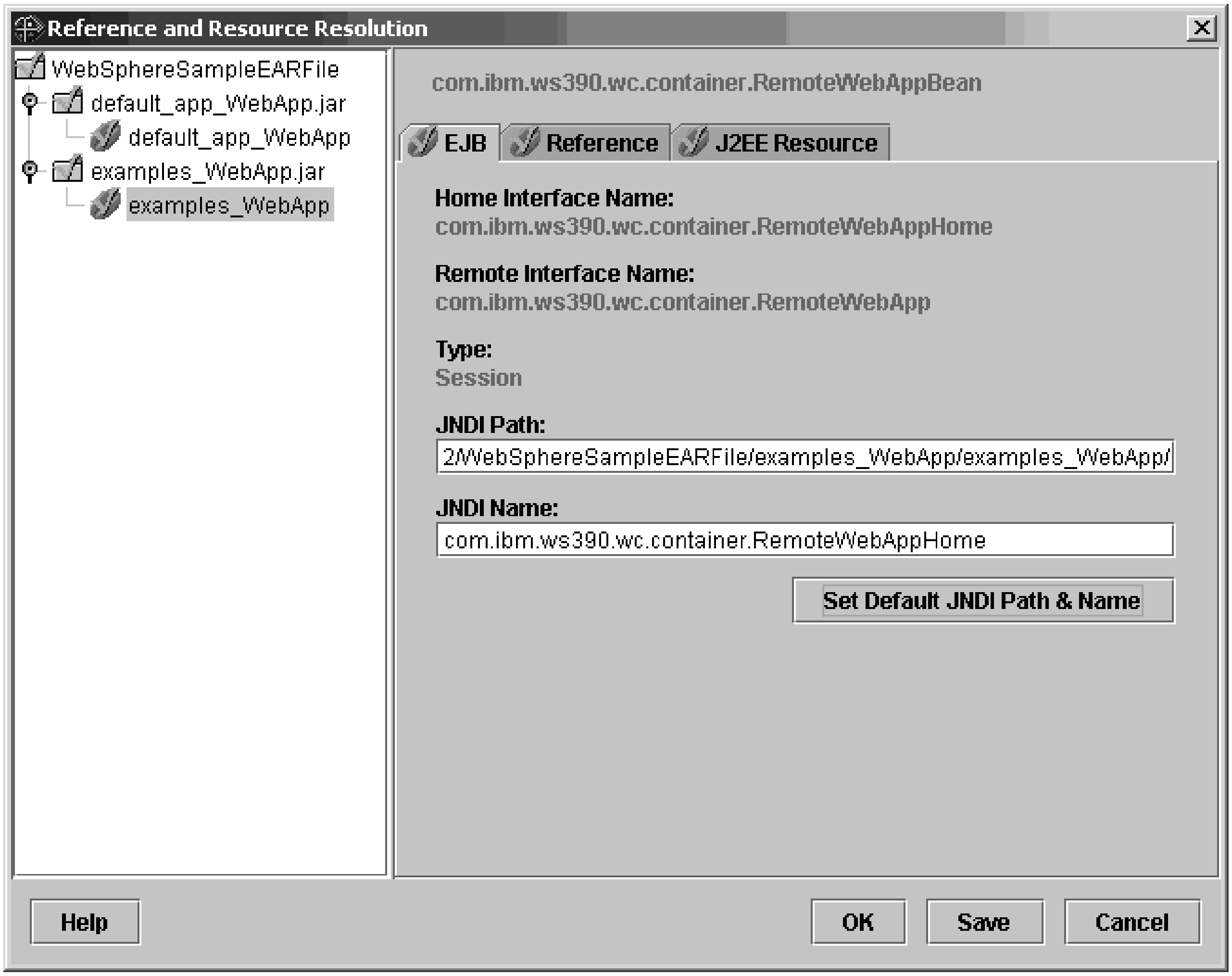
Remote Interface Name:
com.ibm.ws390.wc.container.RemoteWebApp

Type:
Session

JNDI Path:
ebSphereSampleEARFile/default_app_WebApp/default_app_WebApp/

JNDI Name:
com.ibm.ws390.wc.container.RemoteWebAppHome

5. Repeat these steps for examples_WebApp and the examples_WebApp bean.
   Result:



Reference and Resource Resolution

- WebSphereSampleEARFile
  - default_app_WebApp.jar
    - default_app_WebApp
  - examples_WebApp.jar
    - examples_WebApp

com.ibm.ws390.wc.container.RemoteWebAppBean

Home Interface Name:
com.ibm.ws390.wc.container.RemoteWebAppHome

Remote Interface Name:
com.ibm.ws390.wc.container.RemoteWebApp

Type:
Session

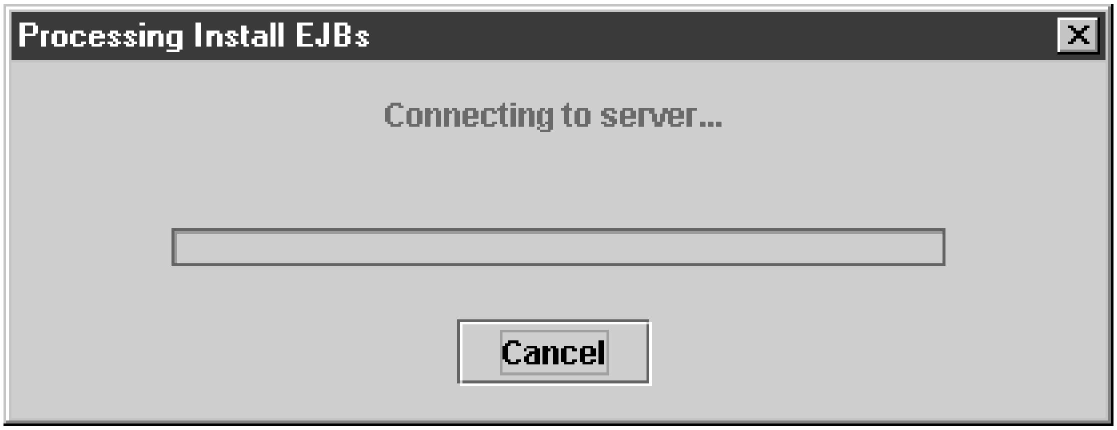
JNDI Path:
2/WebSphereSampleEARFile/examples_WebApp/examples_WebApp/

JNDI Name:
com.ibm.ws390.wc.container.RemoteWebAppHome

6. Click OK.

   Result: This action starts the automatic FTP transfer of your EAR file contents from your workstation to z/OS or OS/390. A pop-up appears with messages describing the stage in the FTP transfer.

   Example:



Processing Install EJBs

Connecting to server...

Then the words `Deploying... BBOASR2` appear in the tree.

The FTP transfer follows these stages:

Stage	Description
1	When the ear file is imported, the system FTPs it to `targetdir/sysplex/temp/administrator_ID/WebSphereSampleApp_resolved.ear` *targetdir* is the mount point, *sysplex* is the name of the sysplex, and *administrator_ID* is the user ID of the administrator (usually CBADMIN).
2	The ear file is processed. During ear file processing, the ear file is exploded into directory `targetdir/apps/BBOASR2/Ln/app_name/` *app_name* is the name of the application (not necessarily equal to the ear file name).
3	A scaffolding directory `targetdir/apps/BBOASR2/Ln/A/` is created under which all the deployment information is stored.

Note: Upon activation of the conversation, everything beneath

```
targetdir/apps/BBOASR2/Ln/
```

is moved one level up to

```
targetdir/apps/BBOASR2/
```

You know you are done when the following message appears in the status bar:

```
BBON0470I EAR file WebSphereSampleApp_resolved.ear has been successfully
          installed on server BBOASR2.
```

Steps for installing PolicyIVP.ear in the EJB container

Before you begin:

- Make sure that the FTP server on z/OS or OS/390 is running.
- Download in binary the PolicyIVP.ear file from the WebSphere for z/OS samples directory to your workstation. The default location for the file on z/OS or OS/390 is:

  ```
  /usr/lpp/WebSphere/samples/PolicyIVP/ejb
  ```

Perform the following steps to install the EAR file for your application, using the WebSphere for z/OS Administration application:

1. In the tree, select the BBOASR2 server.

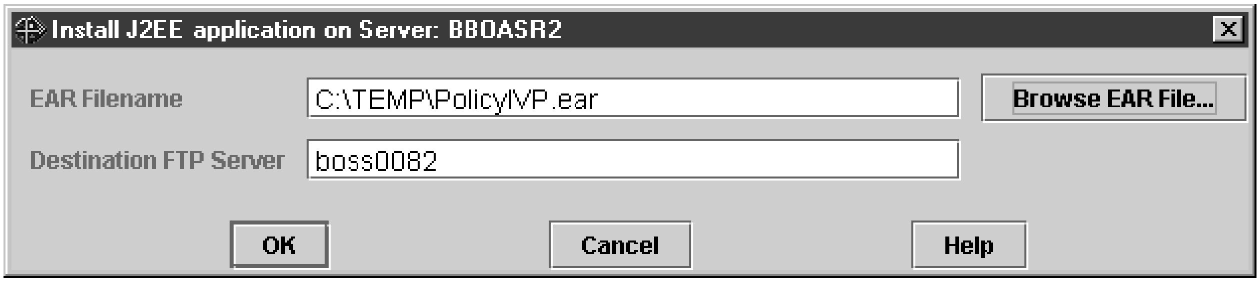
   ---

2. Choose Install J2EE Application... from the Selected menu bar. The Install J2EE Application dialog box appears.

   ---

3. In the dialog box, enter the following values:
   - The name of the EAR file that contains your J2EE application. Use the Browse button to navigate to the PolicyIVP.ear file in your workstation file system.
   - The name of the FTP server for the sysplex in which you want to install your application. Usually, this is the IP name of the system you logged onto (it is displayed as the default).

   Example:



Install J2EE application on Server: BBOASR2

EAR Filename: C:\TEMP\PolicyIVP.ear

Destination FTP Server: boss0082

   Click OK.

   Result: A pop-up appears with the words “Loading ear file,” then the Reference and Resource Resolution window appears and displays the application content in the ear file.

   ---

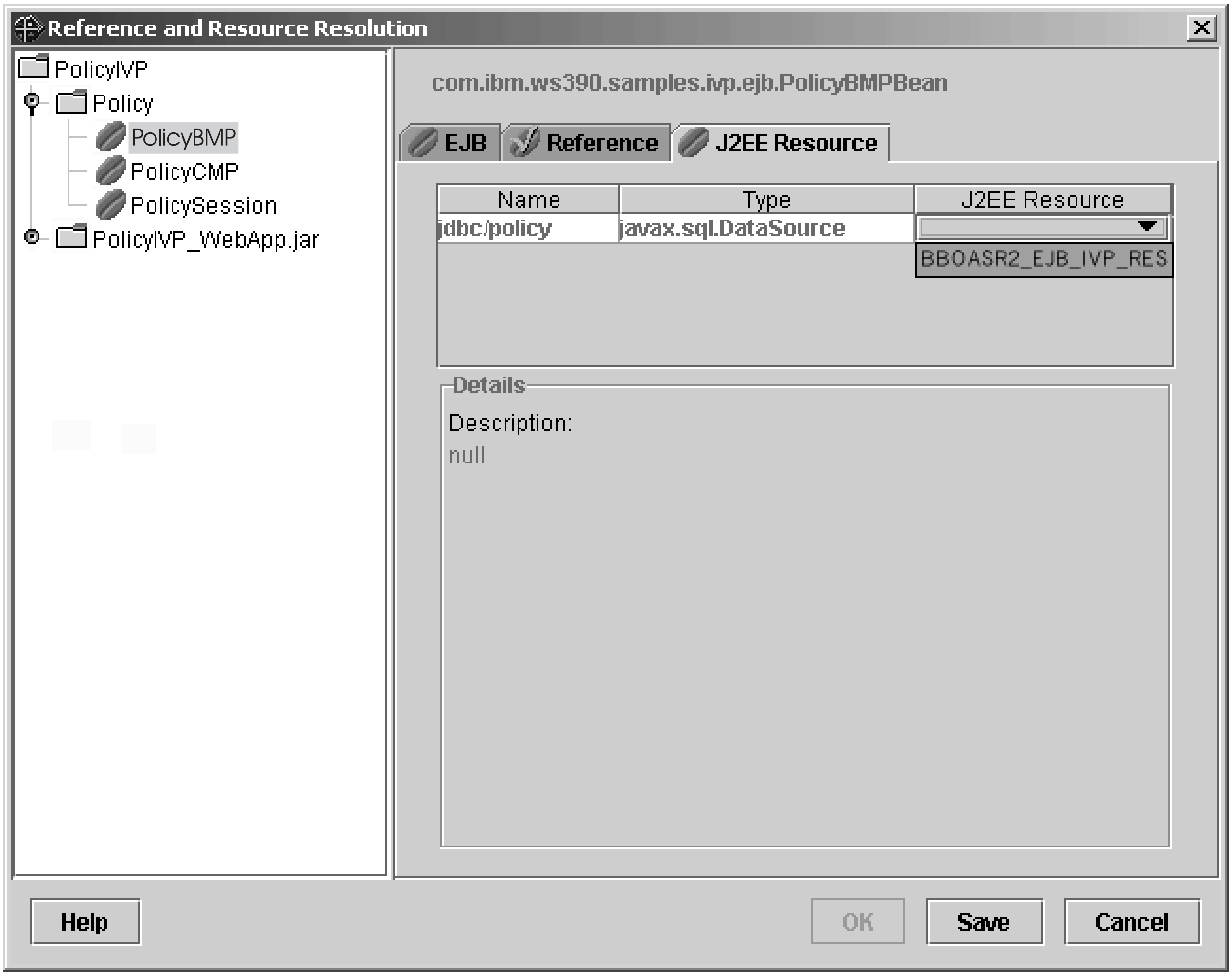
4. Expand each folder listed in the Reference and Resource Resolution window by clicking the node to the left of the folder. Set the JNDI Path and JNDI Name for each bean in turn by clicking the bean, then clicking the button labelled “Set Default JNDI Path & Name.”

   ---

5. Select each bean by clicking the bean symbol.
   a. If the “J2EE Resource” tab has a green check mark, select the next bean.
   b. If the “J2EE Resource” does not have a green check mark:
      - Click “J2EE Resource” tab.

- Click on the blank space in the table in the “J2EE Resource” column, which brings up a list of J2EE resources.
- Click on the name of the J2EE resource you created earlier in “Steps for adding a J2EE resource” on page 112.

Example:

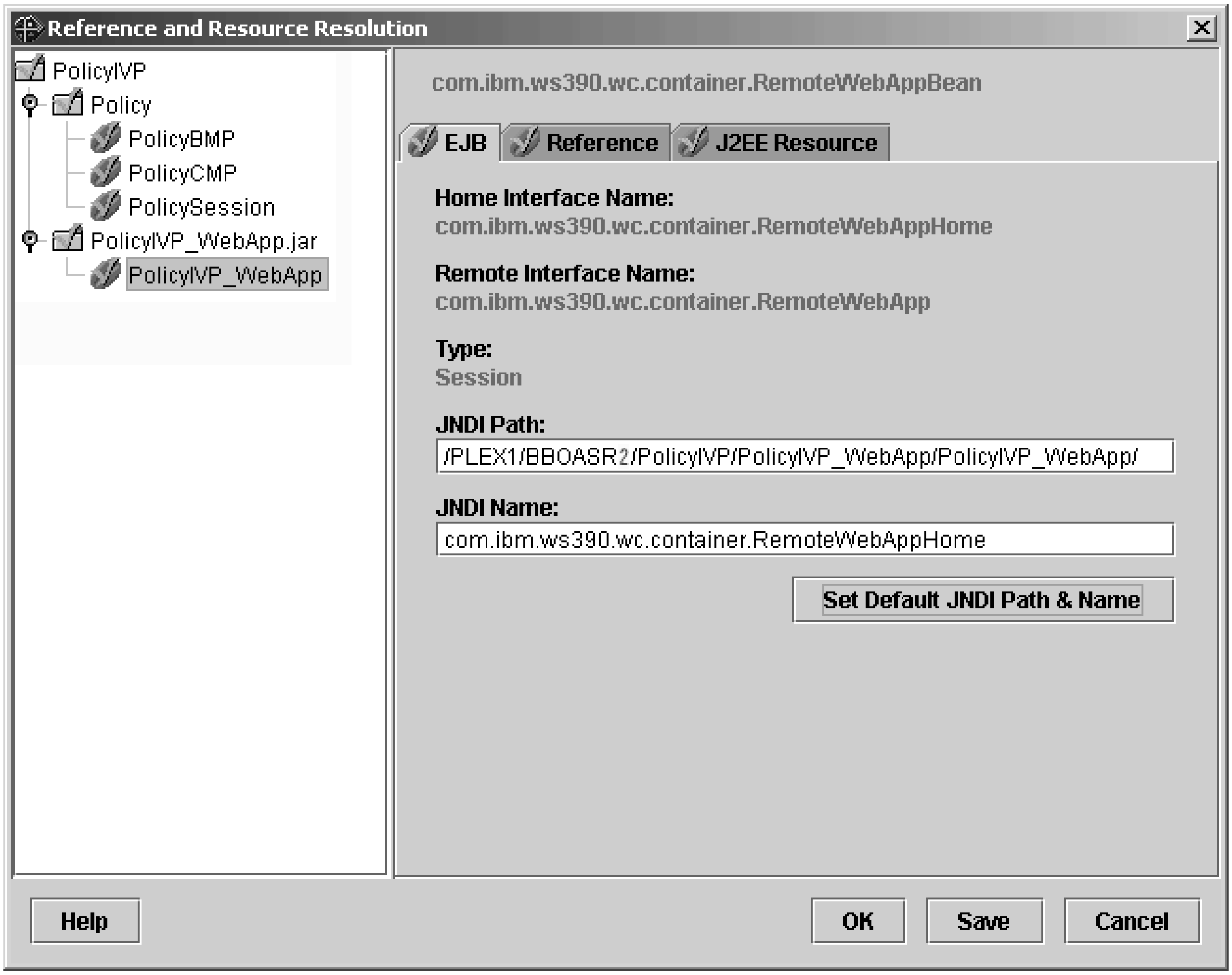


Name	Type	J2EE Resource
jdbc/policy	javax.sql.DataSource	BBOASR2_EJB_IVP_RES

Description:
null

Result: A check-mark appears on the bean symbol.

6. When all beans have checkmarks to the left, click OK.



Home Interface Name: com.ibm.ws390.wc.container.RemoteWebAppHome

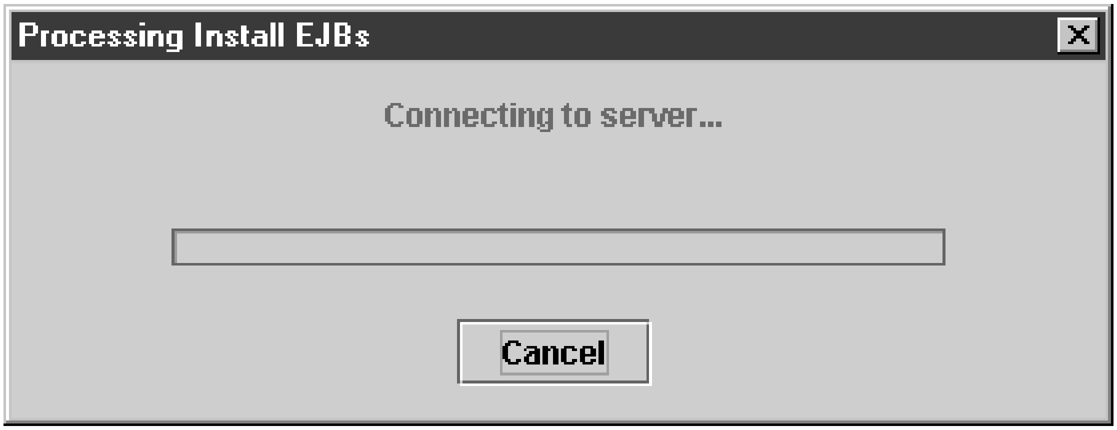
Remote Interface Name: com.ibm.ws390.wc.container.RemoteWebApp

Type: Session

JNDI Path: /PLEX1/BBOASR2/PolicyIVP/PolicyIVP_WebApp/PolicyIVP_WebApp/

JNDI Name: com.ibm.ws390.wc.container.RemoteWebAppHome

Result: This action starts the automatic FTP transfer of your EAR file contents from your workstation to z/OS or OS/390. A pop-up appears with messages describing the stage in the FTP transfer.



Connecting to server...

Then the words `Deploying... BBOASR2` appear in the tree.

Tip: Data from the Reference and Resource Resolution window is saved in a new copy of the ear file named *application_name*_resolved.ear before it is transferred to the server for deployment. If you reopen that copy of the file later, you do not have to re-enter the information a second time.

The FTP transfer follows these stages:

Stage	Description
1	When the ear file is imported, the system FTPs it to *targetdir*/*sysplex*/temp/*administrator_ID*/PolicyIVP_resolved.ear *targetdir* is the mount point, *sysplex* is the name of the sysplex, and *administrator_ID* is the user ID of the administrator (usually CBADMIN).
2	The ear file is processed. During ear file processing, the ear file is exploded into directory *targetdir*/apps/BBOASR2/L*n*/*app_name*/ *app_name* is the name of the application (not necessarily equal to the ear file name).
3	A scaffolding directory *targetdir*/apps/BBOASR2/L*n*/A/ is created under which all the deployment information is stored.

Note: Upon activation of the conversation, everything beneath

targetdir/apps/BBOASR2/L*n*/

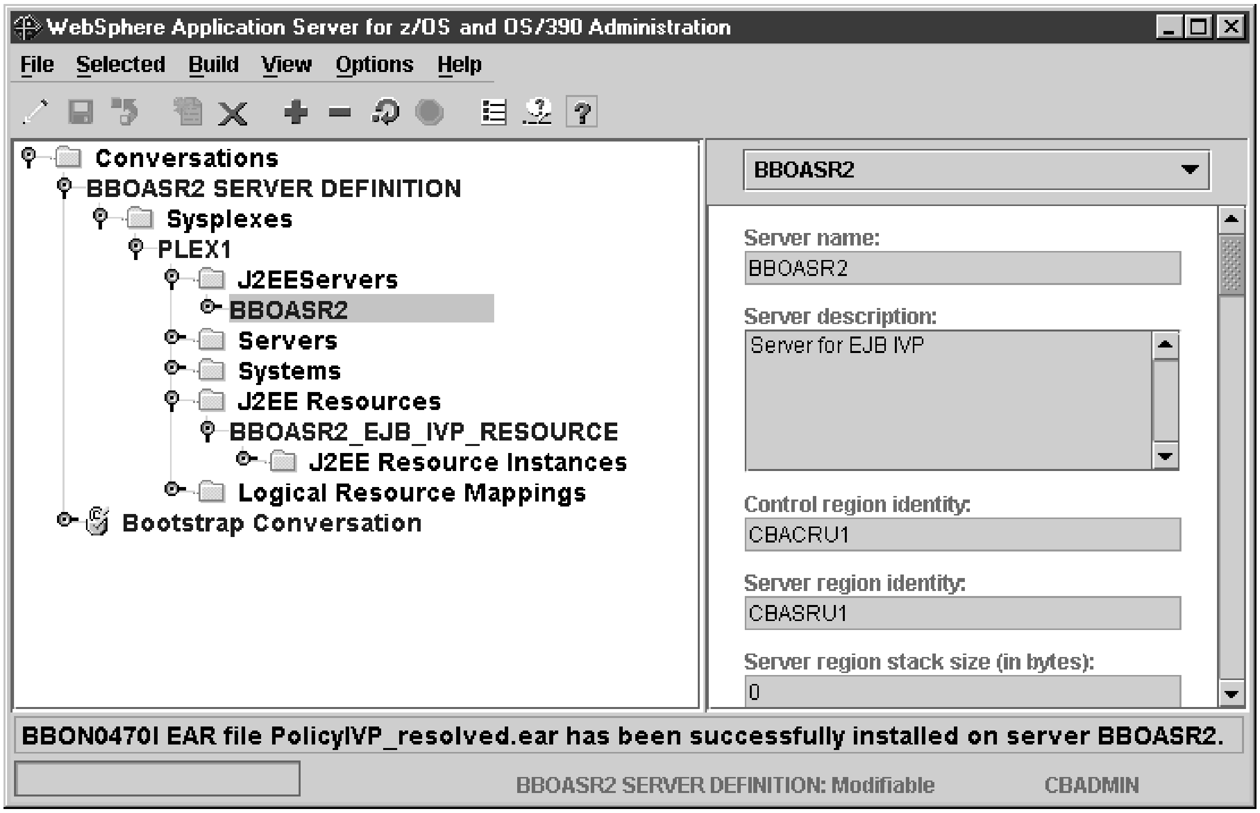
is moved one level up to

targetdir/apps/BBOASR2/

You know you are done when the following message appears in the status bar:

```
BBON0470I EAR file PolicyIVP_resolved.ear has been successfully installed on server BBOASR2.
```

Here is what the screen looks like when you have successfully installed the IVP:



Server name: BBOASR2

Server description: Server for EJB IVP

Control region identity: CBACRU1

Server region identity: CBASRU1

Server region stack size (in bytes): 0

BBON0470I EAR file PolicyIVP_resolved.ear has been successfully installed on server BBOASR2.

BBOASR2 SERVER DEFINITION: Modifiable CBADMIN

Steps for validating the conversation

Before you begin: You must complete all the previous steps in the current conversation.

Perform the following steps to validate the conversation:

1. If necessary, scroll up the tree to the BBOASR2 SERVER DEFINITION conversation name.

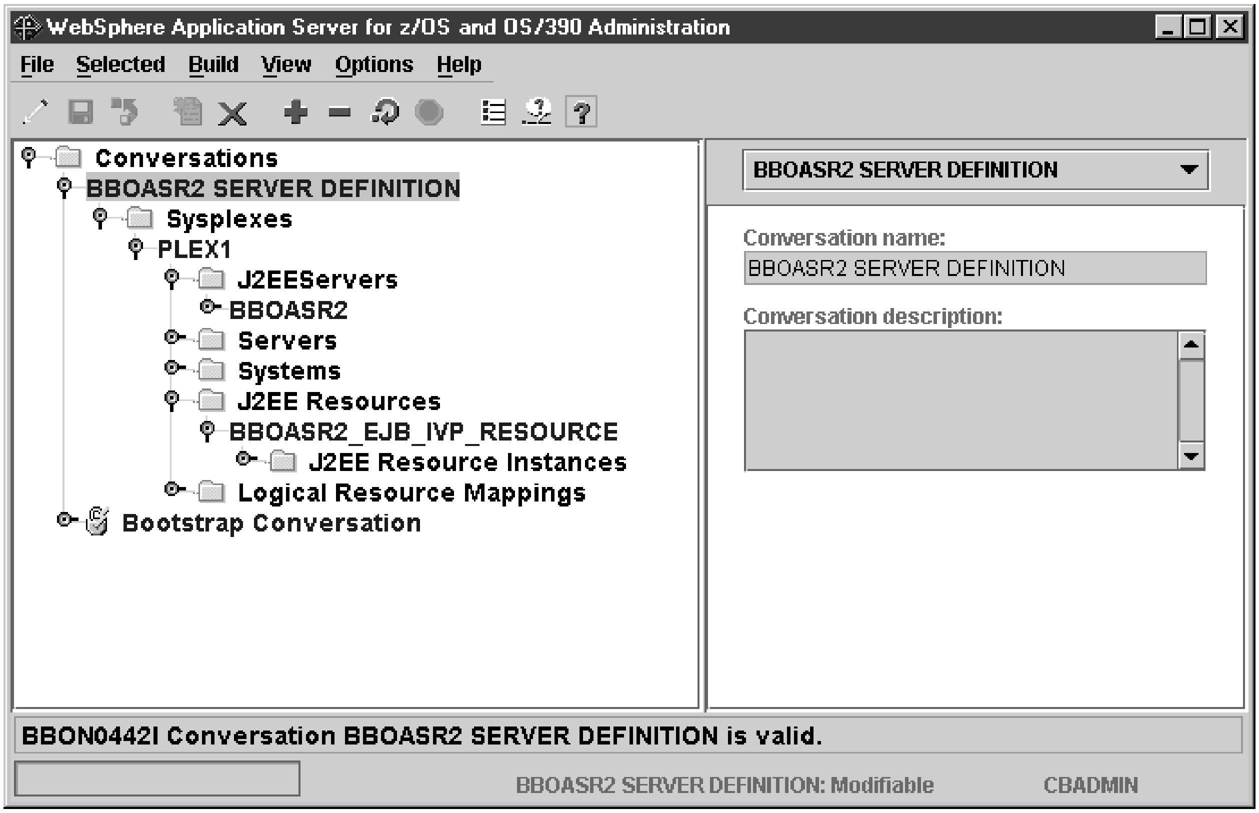
   ____

2. Select the conversation with the left mouse button. Then, using the right mouse button, click the conversation, then select Validate.

   ____

You know you are done when the following message appears in the status bar:

```
BBON0442I Conversation BBOASR2 SERVER DEFINITION is valid.
```



Conversation name: BBOASR2 SERVER DEFINITION

Conversation description:

BBON0442I Conversation BBOASR2 SERVER DEFINITION is valid.

BBOASR2 SERVER DEFINITION: Modifiable CBADMIN

Step for committing the conversation

Before you begin: You must validate the current conversation.

⇔ Select the conversation with the left mouse button. Then, using the right mouse button, click the conversation, then select Commit. Answer Yes to the question:

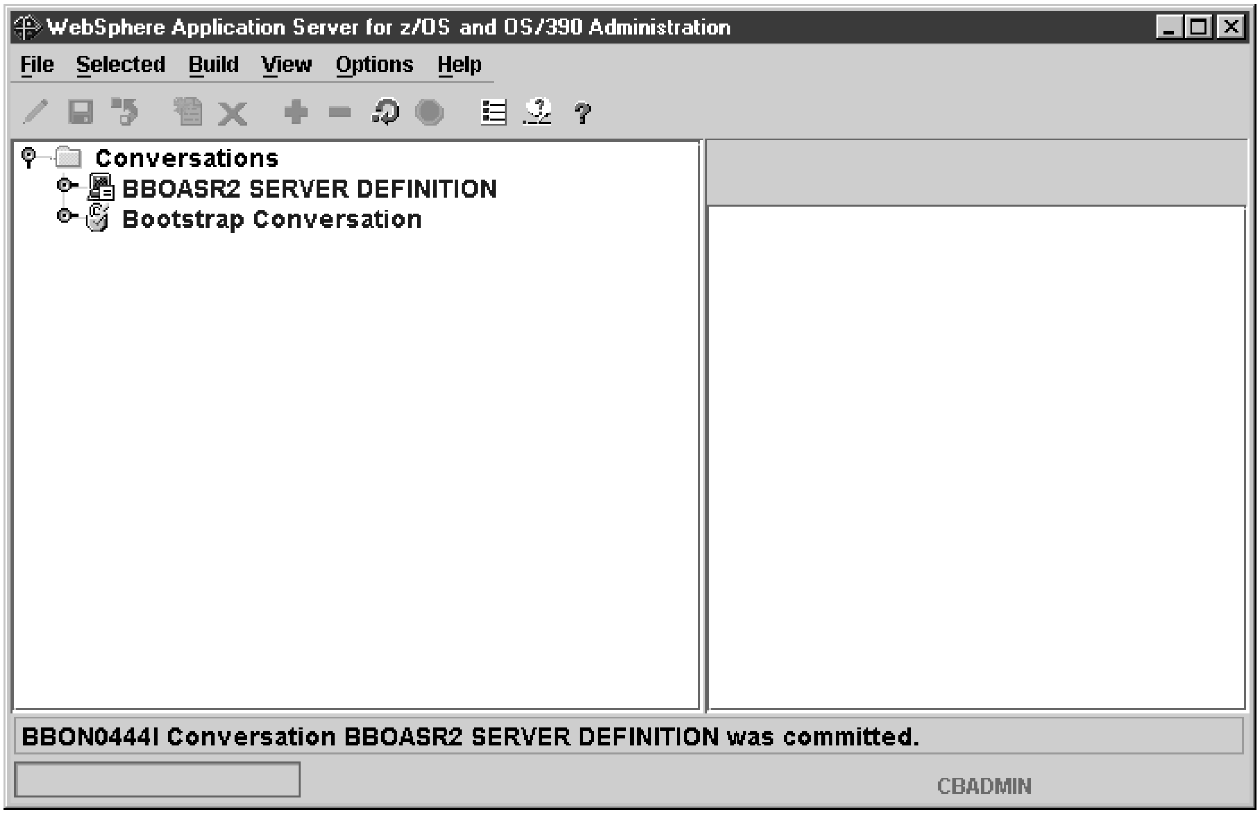
```
BBON0534I You cannot undo Commit.  Do you still want to commit?
```

The words "Committing... BBOASR2 SERVER DEFINITION" appear in the tree.

You know you are done when the following message appears in the status bar:

```
BBON0444I Conversation BBOASR2 SERVER DEFINITION was committed.
```

The screen looks like this:


WebSphere Application Server for z/OS and OS/390 Administration
File
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Conversations
BBOASR2 SERVER DEFINITION
Bootstrap Conversation
CBADMIN

BBON0444I Conversation BBOASR2 SERVER DEFINITION was committed.

Step for viewing the WebSphere for z/OS Host Instructions

Before you begin: You must validate and commit the current conversation.

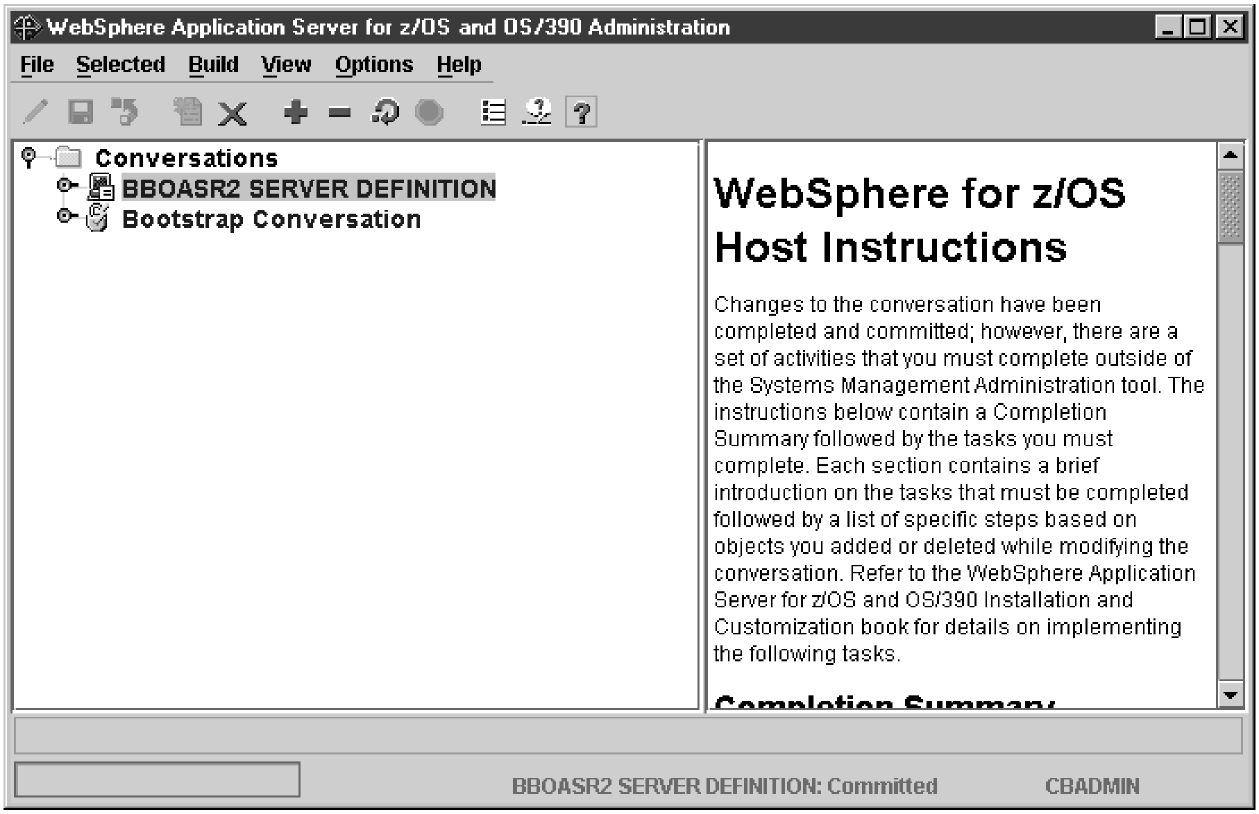
Perform the following step to view the instructions:

- Select the BBOASR2 SERVER DEFINITION conversation with the left mouse button. Then, using the right mouse button, click the conversation, then select Instructions.

You are done when you see the WebSphere for z/OS Host Instructions.

Note: Normally when defining servers, you would need to follow these instructions. However, the jobs from the customization dialog already accomplished all tasks prescribed by the host instructions. You may, for your information, read these instructions, but you do not have to perform the tasks for this server definition.

The screen looks like this:



WebSphere Application Server for z/OS and OS/390 Administration
File Selected Build View Options Help
Conversations
BBOASR2 SERVER DEFINITION
Bootstrap Conversation

WebSphere for z/OS Host Instructions

Changes to the conversation have been completed and committed; however, there are a set of activities that you must complete outside of the Systems Management Administration tool. The instructions below contain a Completion Summary followed by the tasks you must complete. Each section contains a brief introduction on the tasks that must be completed followed by a list of specific steps based on objects you added or deleted while modifying the conversation. Refer to the WebSphere Application Server for z/OS and OS/390 Installation and Customization book for details on implementing the following tasks.

Completion Summary

BBOASR2 SERVER DEFINITION: Committed CBADMIN

Steps for marking all tasks complete

Before you begin: You must complete all required z/OS or OS/390 tasks.

Perform these steps to mark all tasks complete:

1. Select the BBOASR2 SERVER DEFINITION conversation with the left mouse button. Then, with the right mouse button, click the conversation, select Complete, then All tasks.

   ____

2. Answer Yes to the question:

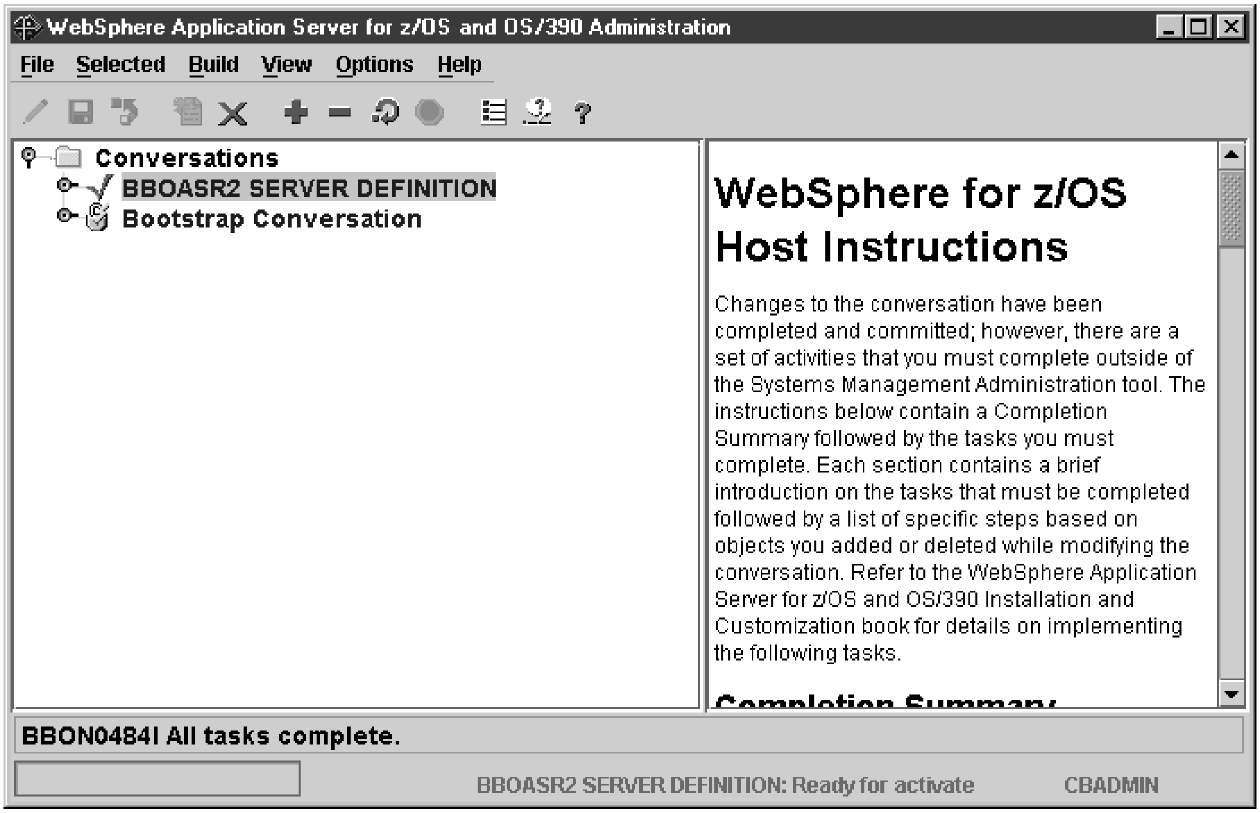
   ```
   BBON0550I  Are you sure that all tasks have been completed?
   ```

   ____

You know you are done when the following message appears in the status bar:

```
BBON0484I All tasks complete.
```

The screen looks like this:



WebSphere Application Server for z/OS and OS/390 Administration
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BBOASR2 SERVER DEFINITION
Bootstrap Conversation

WebSphere for z/OS Host Instructions

Changes to the conversation have been completed and committed; however, there are a set of activities that you must complete outside of the Systems Management Administration tool. The instructions below contain a Completion Summary followed by the tasks you must complete. Each section contains a brief introduction on the tasks that must be completed followed by a list of specific steps based on objects you added or deleted while modifying the conversation. Refer to the WebSphere Application Server for z/OS and OS/390 Installation and Customization book for details on implementing the following tasks.

Completion Summary

BBON0484I All tasks complete.

BBOASR2 SERVER DEFINITION: Ready for activate   CBADMIN

Steps for activating your new conversation

Before you begin: You must complete all previous instructions in this section.

Perform these steps to activate your new conversation:

1. Select the BBOASR2 SERVER DEFINITION conversation with the left mouse button. Then, with the right mouse button, click the conversation, then select Activate.

   ____

2. Answer Yes to the question:

   ```
   BBON0539I  Activate cannot be undone.  Do you want to activate conversation
              BBOASR2 SERVER DEFINITION?
   ```

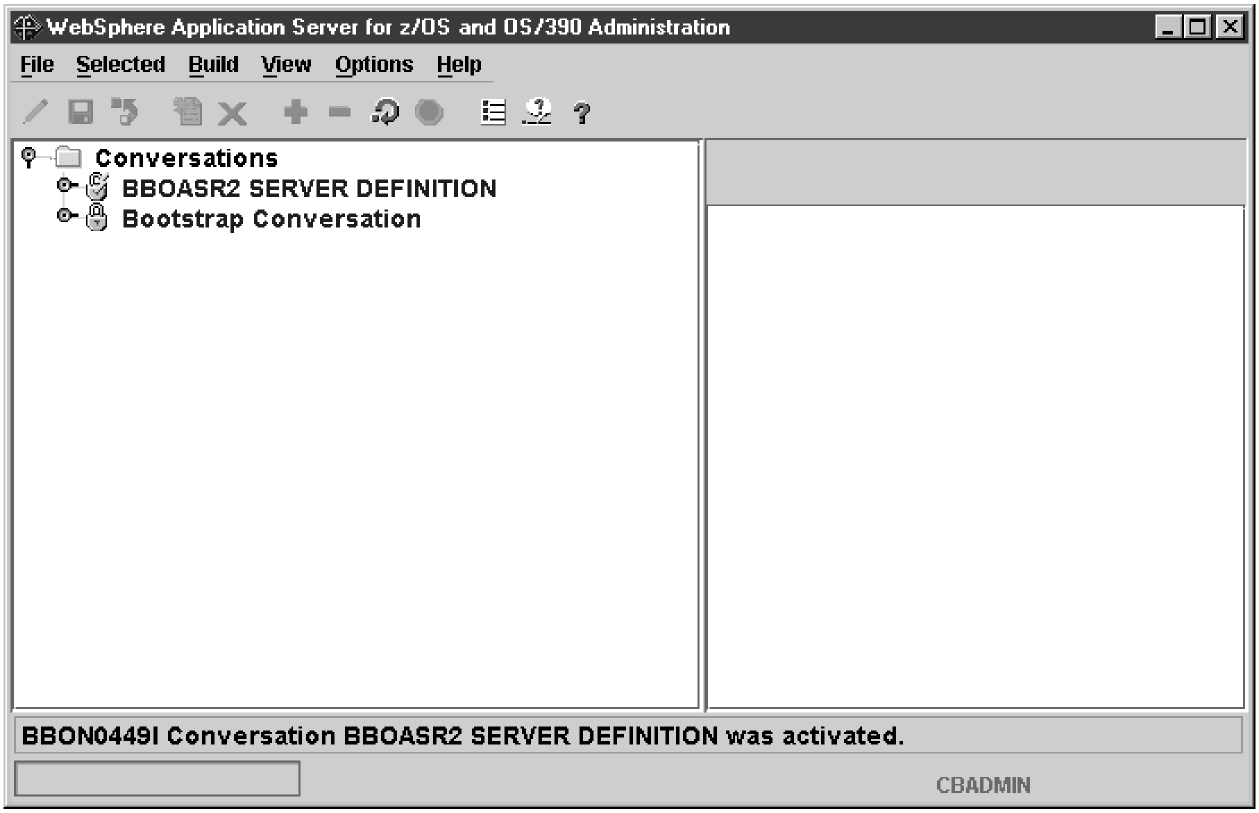
   Result: The words "Activating... BBOASR2 SERVER DEFINITION" appear in the tree.

   ____

You know you are done when the following message appears in the status bar:

```
BBON0449I Conversation BBOASR2 SERVER DEFINITION was activated.
```

The screen looks like this:



WebSphere Application Server for z/OS and OS/390 Administration
File
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BBOASR2 SERVER DEFINITION
Bootstrap Conversation
CBADMIN

BBON0449I Conversation BBOASR2 SERVER DEFINITION was activated.

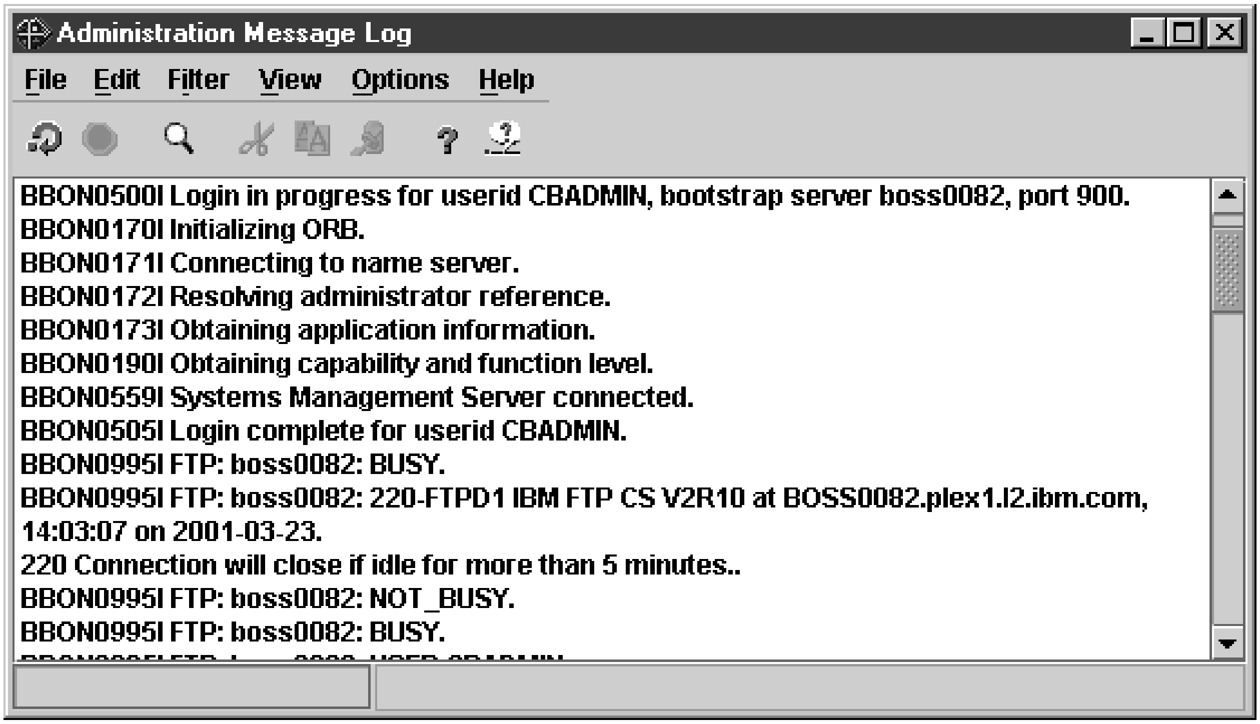
Steps for printing the Administration Message Log

Before you begin: You must activate your conversation.

Follow these steps to print the Administration Message Log:

1. Click File, then Message log...

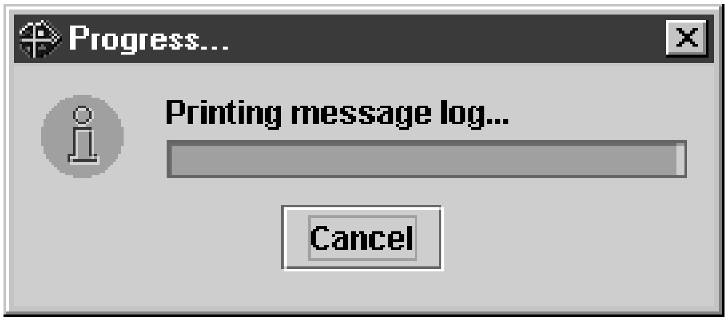
   Result: The screen looks like this:



```
BBON0500I Login in progress for userid CBADMIN, bootstrap server boss0082, port 900.
BBON0170I Initializing ORB.
BBON0171I Connecting to name server.
BBON0172I Resolving administrator reference.
BBON0173I Obtaining application information.
BBON0190I Obtaining capability and function level.
BBON0559I Systems Management Server connected.
BBON0505I Login complete for userid CBADMIN.
BBON0995I FTP: boss0082: BUSY.
BBON0995I FTP: boss0082: 220-FTPD1 IBM FTP CS V2R10 at BOSS0082.plex1.l2.ibm.com,
14:03:07 on 2001-03-23.
220 Connection will close if idle for more than 5 minutes..
BBON0995I FTP: boss0082: NOT_BUSY.
BBON0995I FTP: boss0082: BUSY.
```

2. From the Administration Message Log window, click File, then Print...

Result: You see the Windows print dialog. Select a printer and click ok. You see the folowing pop-up:



Printing message log...

You know you are done when you get a printout of the Administration Message Log. You may exit the program.

You have finished defining the BBOASR2 server

If you want to run the MOFW IVP, continue with “Defining the BBOASR1 MOFW server” on page 132. Otherwise, go to “Steps for creating the database for the installation verification programs (IVPs)” on page 166.

Defining the BBOASR1 MOFW server

If you plan to use MOFW components, do the steps in this section to set up BBOASR1, the MOFW server that the IVP uses to test MOFW component support.

Steps for starting the Administration application

Before you begin: You must initialize the WebSphere for z/OS run-time server instances and have the Administration application installed.

Perform these steps to start the Administration application:

1. On your workstation, click Start, then Programs, then IBM WebSphere for z/OS Administration.

   ____

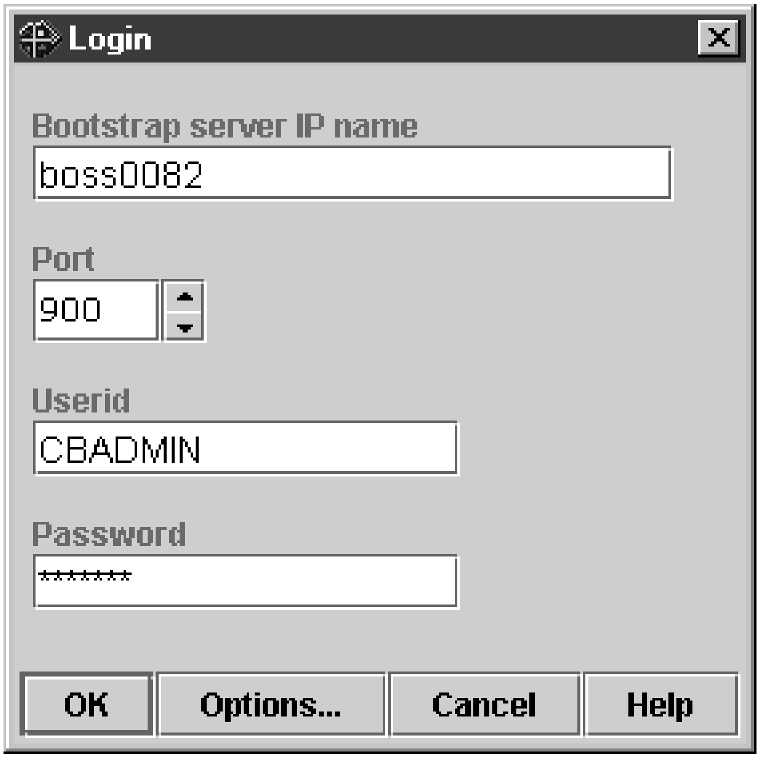
2. Fill in the dialog with the Bootstrap server IP name, port 900, the user ID cbadmin, and password (for the password, see our RACF sample BBOCBRAK). Click OK.

   Recommendations:

   a. We strongly recommend that you **not** use the same administrator ID to log on to multiple concurrent sessions of the application, from either a single workstation or from more than one workstation. For example, if you start the Administration application on your workstation using CBADMIN as the user ID, you should not start another session using CBADMIN from either your own or a different workstation.

   b. If you define several administrator user IDs, they all may be logged on simultaneously, but only **one** should update and activate a conversation at a time.

      If more than one administrator attempts to activate a conversation, unexpected results will occur. When an administrator starts a new conversation, a copy of the currently active conversation is used as the base level. If more than one administrator creates a new conversation based on the same currently active conversation, the first administrator to activate will be successful. All others who try to activate will fail, since their changes are not based on the currently active conversation (the currently active conversation has changed out from under them). The second and subsequent administrators will have to start over again using the new current conversation. Depending on the amount of change, this can be very disruptive. Thus, while one administrator is updating and activating a conversation, the others should use the administration application only for read or display functions.



Bootstrap server IP name
boss0082

Port
900

Userid
CBADMIN

Password
****

You know you are done when the main window appears showing the bootstrap conversation. If you have trouble connecting, check the Help system or *WebSphere Application Server V4.0.1 for z/OS and OS/390: System Management User Interface*, SA22-7838, for more information.

Steps for starting a new conversation

Before you begin: You must start the Administration application by logging in.

Perform these steps to start a new conversation:

1. Select the Conversations folder with the left mouse button. Then, using the right mouse button, click the Conversations folder, then select Add.

   ____

2. In the properties form (right panel), name your new conversation. For example, we named the conversation "BBOASR1 Server Definition." Add a description (optional).

   ____

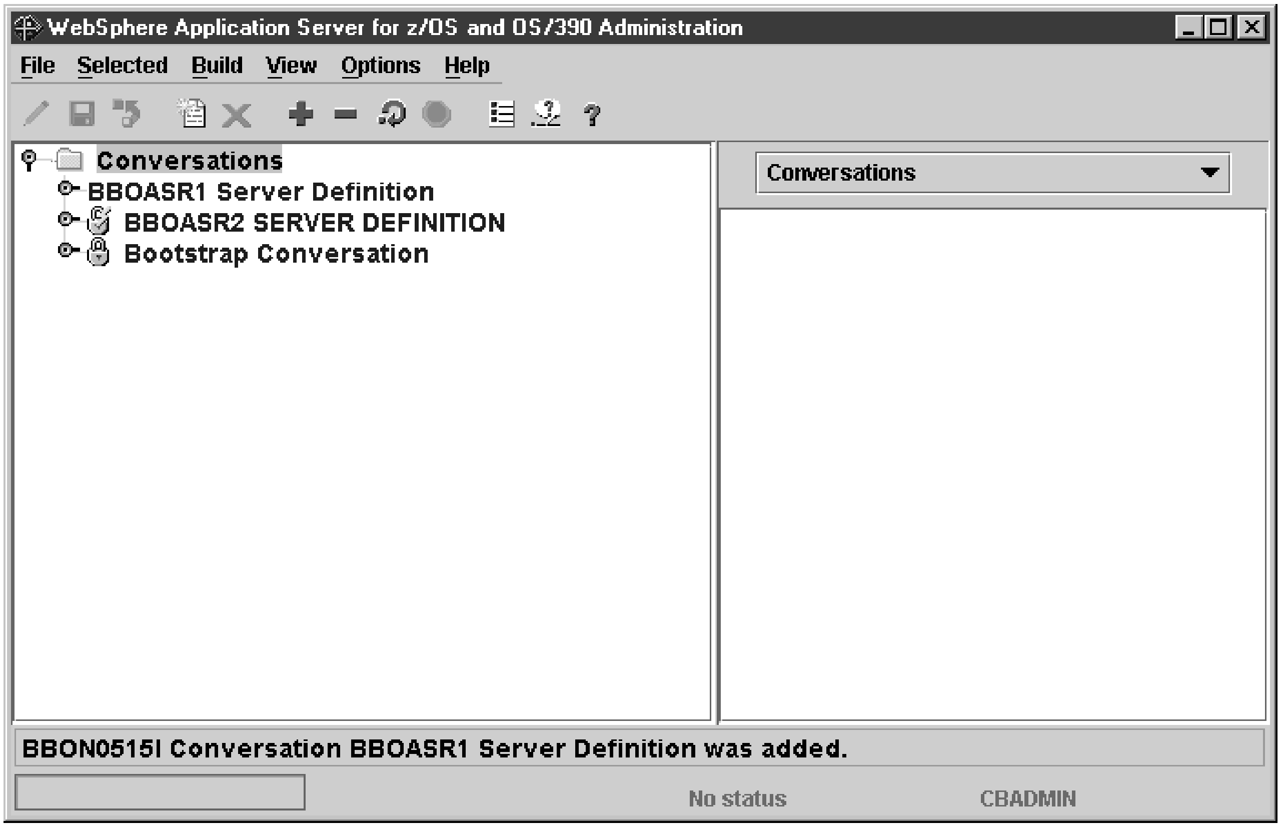
3. Click the save (diskette) icon. The words "Adding... Conversations" appear in the tree.

   ____

You know you are done when the following message appears in the status bar:

```
BBON0515I Conversation BBOASR1 Server Definition was added.
```

The screen looks like this:



WebSphere Application Server for z/OS and OS/390 Administration

BBON0515I Conversation BBOASR1 Server Definition was added.

No status

CBADMIN

Steps for adding the BBOASR1 MOFW server

Before you begin: You must be working on the current conversation.

Perform these steps to add the BBOASR1 server.

1. If necessary, expand your new conversation tree by clicking the node to the left of the conversation name.

2. Expand Sysplexes, then your sysplex.

3. Select the Servers folder with the left mouse. Then, using the right mouse button, click the Servers folder, then select Add.

4. In the properties form, enter values or make selections as follows.

Server name	BBOASR1
Server description	Optional server description
Control region identity	The user ID under which the control region runs. This must match an entry in the RACF STARTED class and have appropriate RACF authorizations for a control region. The default value in BBOCBRAK is CBACRU1.
Server region identity	The user ID under which the server region runs. This must match an entry in the RACF STARTED class and have appropriate RACF authorizations for a server region. The default value in BBOCBRAK is CBASRU1.
Server region stack size (in bytes)	0
Production server	Select the check box
Debugger allowed	Leave unchecked
Object Level Trace hostname	Leave blank
Object Level Trace port	Leave the default
Isolation policy	Multiple transactions per server region
Replication policy	One per server
Local identity	The user ID you chose as the local unauthenticated user ID on the IVP customization panel in the customization dialog. By default, the customization dialog uses CBIVP.
Remote identity	The user ID you chose as the remote unauthenticated user ID on the IVP customization panel in the customization dialog. By default, the customization dialog uses CBIVP.
Register transaction factory	Clear the check box*

* A server that registers as a transaction factory must be available at all times. Because BBOASR1 is available only during installation verification, this server should not register as a transaction factory.

The Naming Server is defined as a transaction factory. If you remove the Naming Server from the configuration, you need to make another server into a transaction factory. You can have more than one transaction factory, but remember that such servers must be available at all times.

Allow server region recycling	Select the check box
Server recycling collection interval	50000

Logstream name	The name of the log stream you set up for capturing error information. See Table 19 on page 71. You may leave this blank, in which case the system uses the Daemon's log stream.
Control region proc name	BBOASR1 (default)
Allow non-authenticated clients	Select the check box
Userid password allowed	Select the check box
Userid passticket allowed	Clear the check box
DCE allowed	Clear the check box
DCE quality of protection	No protection
DCE keytab file	Leave blank
SSL Type 1 (Basic Authentication) allowed	Clear the check box
SSL Client Certificates allowed	Clear the check box
Kerberos allowed	Clear the check box
Send Asserted Identities allowed	Clear the check box
Accept Asserted Identities allowed	Clear the check box
SSL Use Confidentiality Only	Clear the check box
SSL RACF Keyring	Leave blank
SSL V2 timeout	Leave blank
SSL V3 timeout	Leave blank
Security preference list	Set Password to priority 1
Write Server Activity SMF Records	If you want to gather server activity records, select the check box.
Write Container Activity SMF Records	If you want to gather container activity records, select the check box.
Write Server Interval SMF Records	If you want to gather server interval records, select the check box.
Write Container Interval SMF Records	If you want to gather container interval records, select the check box.
SMF Interval Length	Set the length of recording intervals for SMF recording. Valid when you specify Write Server Interval SMF Records or Write Container Interval SMF Records. The default interval is one hour. You can set the interval from 15 to 86400 seconds (24 hours). If you set this value to 0, the system uses the value from the INTERVAL statement in the SMFPRMxx parmlib member. If there is no INTERVAL statement in SMFPRMxx, the default interval is 30 minutes.
Environment variable list	Leave unchanged.

---

5. Set the CLASSPATH environment variable for BBOASR1 as follows. The Environment variable list contains three columns:

Type
The Type field tells you at which level this variable is defined: SY (Sysplex), SV (Server), or SI (Server instance).

Name
The name of the environment variable.

Value
The value of the environment variable as it is defined at the level which is specified by its Type.

For more information about how to add or modify environment variables, use the help system in the Administration application or see WebSphere Application Server V4.0.1 for z/OS and OS/390: System Management User Interface, SA22-7838.

The following is the CLASSPATH environment variable to set:

CLASSPATH
Should include the following files:

- path/bboplsj.jar
- path/bboplc.jar

Notes:

a. The default path for bboplsj.jar and bboplc.jar is /usr/lpp/WebSphere/samples/PolicyIVP/PRODUCTION.
b. After activation of this conversation, System Management automatically prepends ws390srt.jar, waswebc.jar, and xerces.jar to the application server CLASSPATH for you.

If you plan to use procedural application adapters, add the following to CLASSPATH:

- :/usr/lpp/WebSphere/lib/bboadptr.jar
- :/usr/lpp/WebSphere/lib/bbokeart.jar
- :/usr/lpp/WebSphere/lib/bbokpart.jar

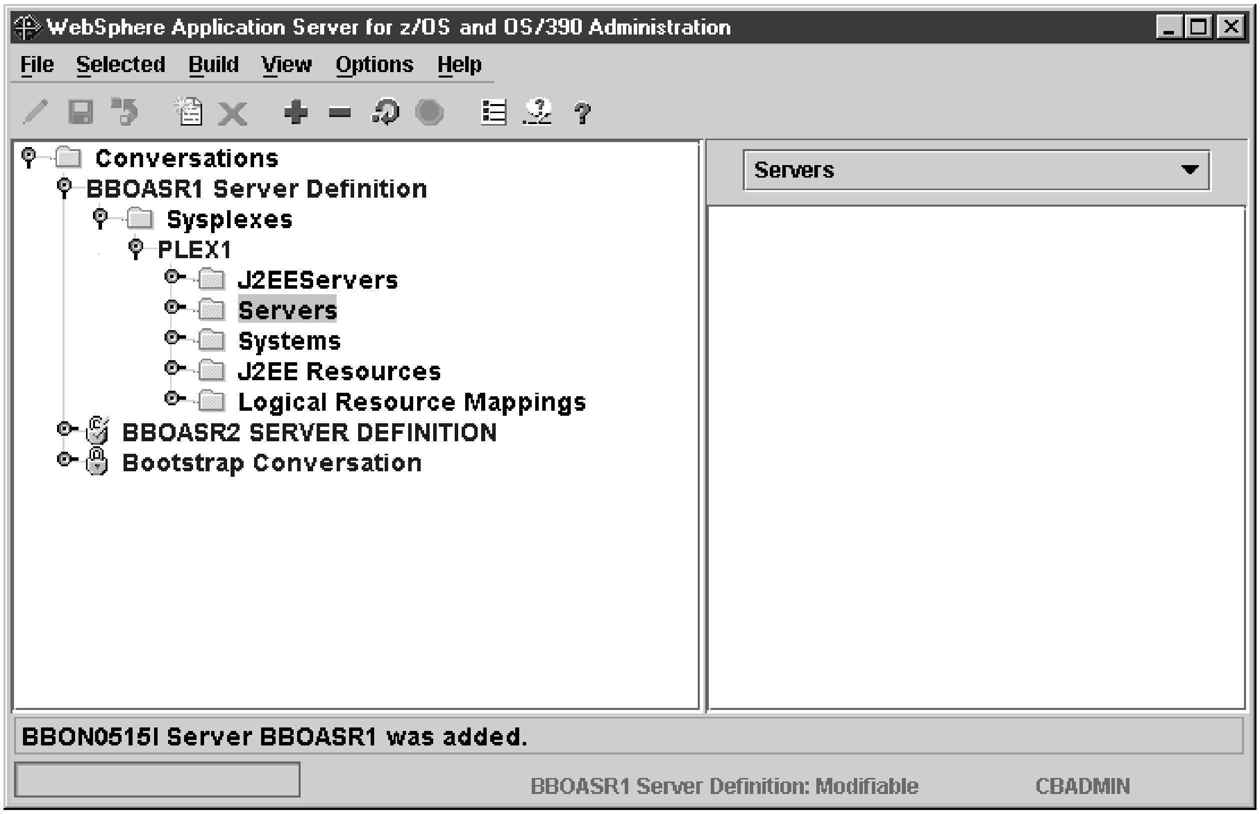
Note: The ″:″ delimiters were added to the above example because it is assumed you will add the path to an existing CLASSPATH. The ″:″ delimiter is required between all paths you specify.

6. Click the save (diskette) icon. The words “Adding... Servers” appear in the tree.

You know you are done when the following message appears in the status bar:

```
BBON0515I Server BBOASR1 was added.
```

The screen looks like this:


WebSphere Application Server for z/OS and OS/390 Administration
File Selected Build View Options Help
Conversations
BBOASR1 Server Definition
Sysplexes
PLEX1
J2EEServers
Servers
Systems
J2EE Resources
Logical Resource Mappings
BBOASR2 SERVER DEFINITION
Bootstrap Conversation
Servers

BBON0515I Server BBOASR1 was added.

BBOASR1 Server Definition: Modifiable CBADMIN

Steps for adding the BBOASR1A server instance

Before you begin: You must have the BBOASR1 server defined.

Perform these steps to add the BBOASR1A server instance:

1. Expand the Servers and BBOASR1 folders by clicking the node to the left of the folder icons.

   ____

2. Select Server Instances with the left mouse button. Then, using the right mouse button, click Server Instances, then select Add.

   ____

3. In the properties form, enter BBOASR1A as the server instance name.

   ____

4. Optional: enter a server instance description.

   ____

5. Optional: supply a log stream name and update the LOGSTREAMNAME environment variable. If you do not, the default is the log stream name you chose for the BBOASR1 server.

   ____

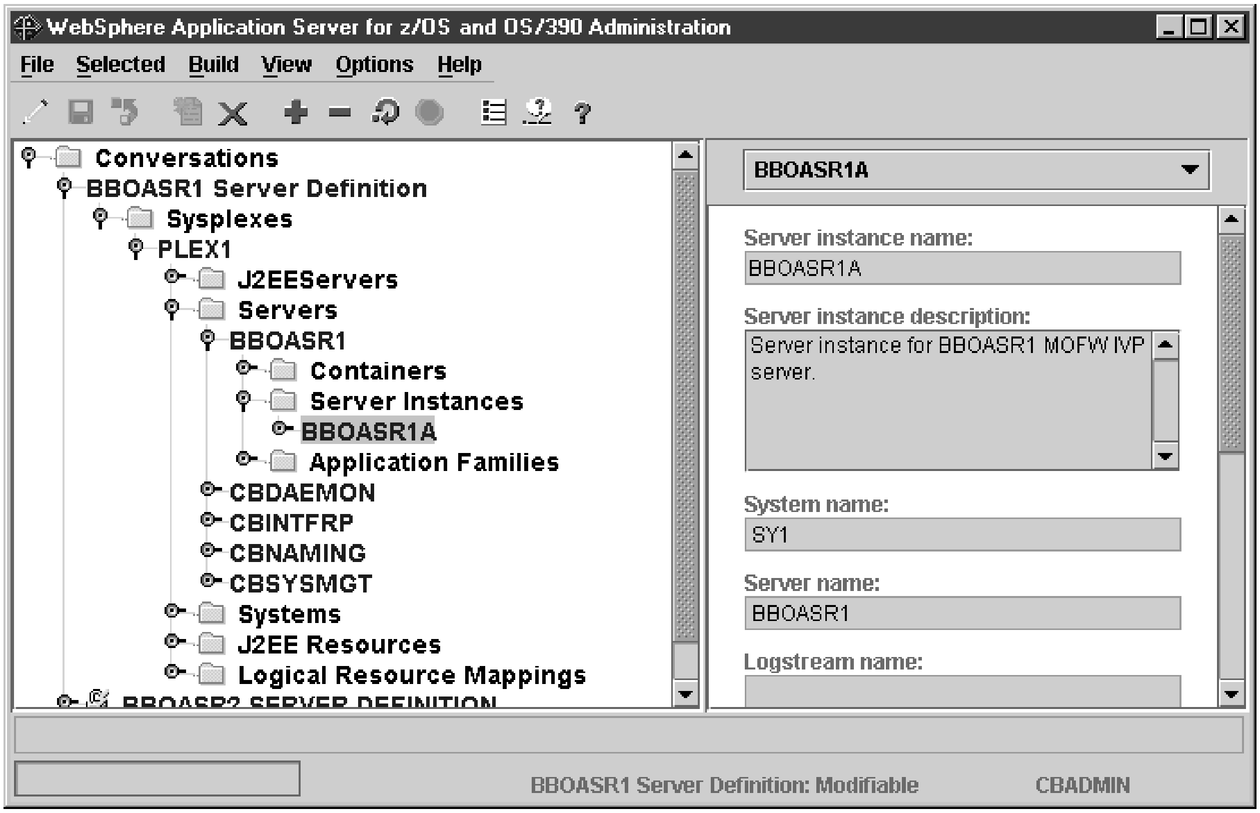
6. Click the save (diskette) icon. The words "Adding... Server Instance" appear in the tree.

   ____

You know you are done when the following message appears in the status bar:

```
BBON0515I Server instance BBOASR1A was added.
```

At the end of this procedure, this is how the screen appears after you expand Server Instances in the tree and select BBOASR1A:



BBOASR1A

Server instance name:
BBOASR1A

Server instance description:
Server instance for BBOASR1 MOFW IVP server.

System name:
SY1

Server name:
BBOASR1

Logstream name:

BBOASR1 Server Definition: Modifiable CBADMIN

Steps for adding a logical resource mapping

Before you begin: You must be working on the current conversation.

Perform these steps to add a logical resource mapping.

1. Select Logical Resource Mappings with the left mouse button. Then, using the right mouse button, click Logical Resource Mappings, then select Add.

   ____

2. In the properties form, enter CB_OS/390_IVP_DB2 as the Logical Resource Mapping name.

   ____

3. Optional: enter a Logical Resource Mapping description.

   ____

4. Scroll the properties form to LRM subsystem type and select DB2.

   ____

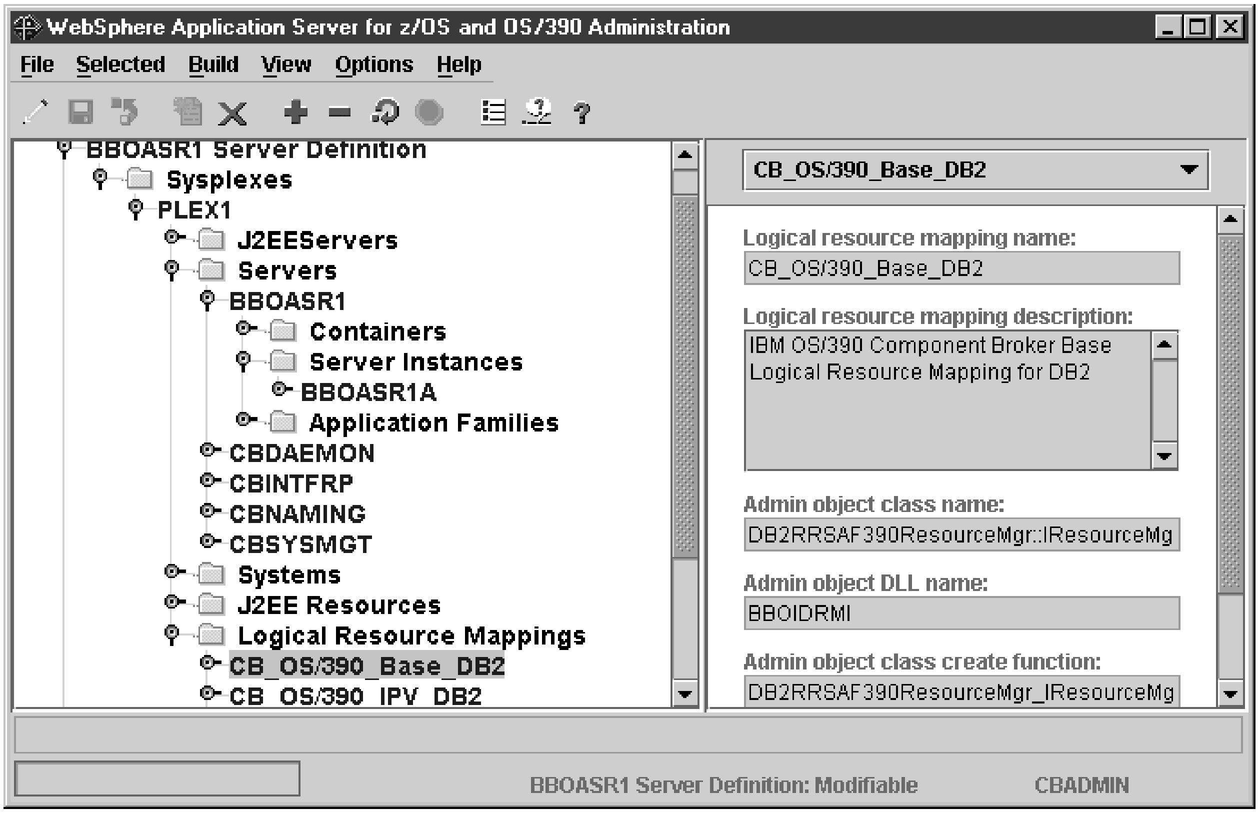
5. Click the save (diskette) icon. The words "Adding... Logical Resource Mappings" appear in the tree.

   ____

You know you are done when the following message appears in the status bar:

```
BBON0515I Logical resource mapping CB_OS/390_IVP_DB2  was added.
```

The screen looks like this:



Logical resource mapping name: CB_OS/390_Base_DB2

Logical resource mapping description: IBM OS/390 Component Broker Base Logical Resource Mapping for DB2

Admin object class name: DB2RRSAF390ResourceMgr::IResourceMg

Admin object DLL name: BBOIDRMI

Admin object class create function: DB2RRSAF390ResourceMgr_IResourceMg

BBOASR1 Server Definition: Modifiable   CBADMIN

Steps for adding a logical resource mapping instance

Before you begin: You must define the CB_OS/390_IVP_DB2 logical resource mapping.

Perform these steps to add a logical resource mapping instance:

1. If necessary, expand the Logical Resource Mappings folder by clicking the node to the left of the folder icon.

   ____

2. Expand CB_OS/390_IVP_DB2 by clicking the node to the left of the folder icon.

   ____

3. Select LRM Instances with the left mouse button. Then, using the right mouse button, click LRM Instances, then select Add.

   ____

4. In the properties form, enter CB_OS/390_IVP_DB2_*system_name* as the LRM Instance name. The value you supply for *system_name* is, by convention, the system name of the system on which BBOASR1A runs.

   Example: If the system name is SY1, the LRM Instance name would be `CB_OS/390_IVP_DB2_SY1`.

   ____

5. Optional: enter a LRM Instance description.

   ____

6. Select the system this LRM Instance is for.

   ____

7. In the Connection data table, locate "DB2 Subsystem Name" in the Name column. Enter the DB2 subsystem name or group attachment name in the associated Value column. If "CollectionId" appears in the Name column, enter "CBIVP_PKG" in the associated Value column.

   ____

8. Click the save (diskette) icon. The words "Adding... LRM Instances" appear in the tree.

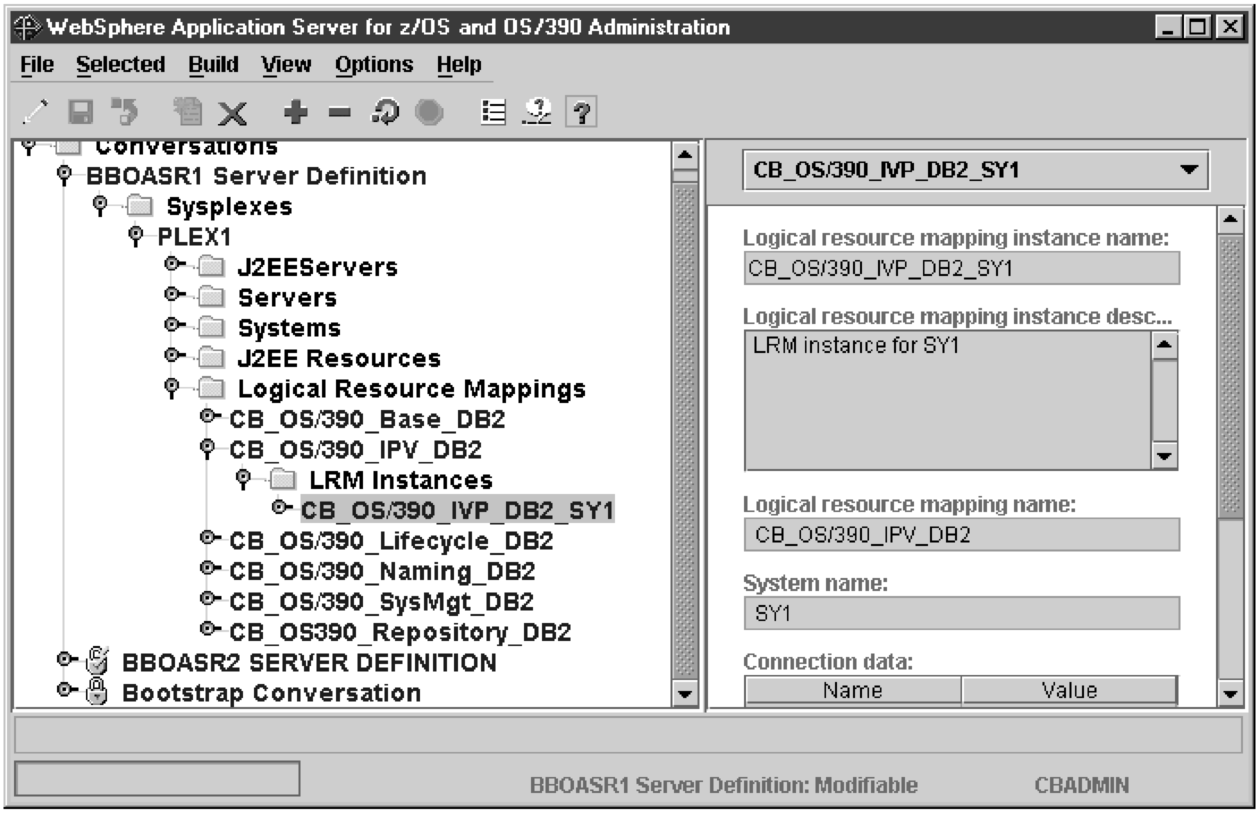
   ____

You know you are done when the following message appears in the status bar:

```
BBON0515I LRM instance CB_OS/390_IVP_DB2_system_name was added.
```

where *system_name* is the system name you chose.

At the end of this procedure, this is how the screen appears after you expand LRM Instances and select CB_OS/390_IVP_DB2_SY1:



Logical resource mapping instance name: CB_OS/390_IVP_DB2_SY1

Logical resource mapping instance desc...: LRM instance for SY1

Logical resource mapping name: CB_OS/390_IPV_DB2

System name: SY1

Connection data:

Name	Value

BBOASR1 Server Definition: Modifiable CBADMIN

Steps for adding the PolicyHomeObjects container

Before you begin: You must be working on the current conversation.

Perform the following steps to add the PolicyHomeObjects container:

1. If necessary, expand the BBOASR1 folder by clicking the node to the left of the folder icon.

   ____

2. Select Containers with the left mouse button. Then, using the right mouse button, click Containers, then select Add.

   ____

3. In the properties form, enter the container name exactly as shown. The name is case sensitive:

   ```
   PolicyHomeObjects
   ```

   ____

4. Optional: enter a container description.

   ____

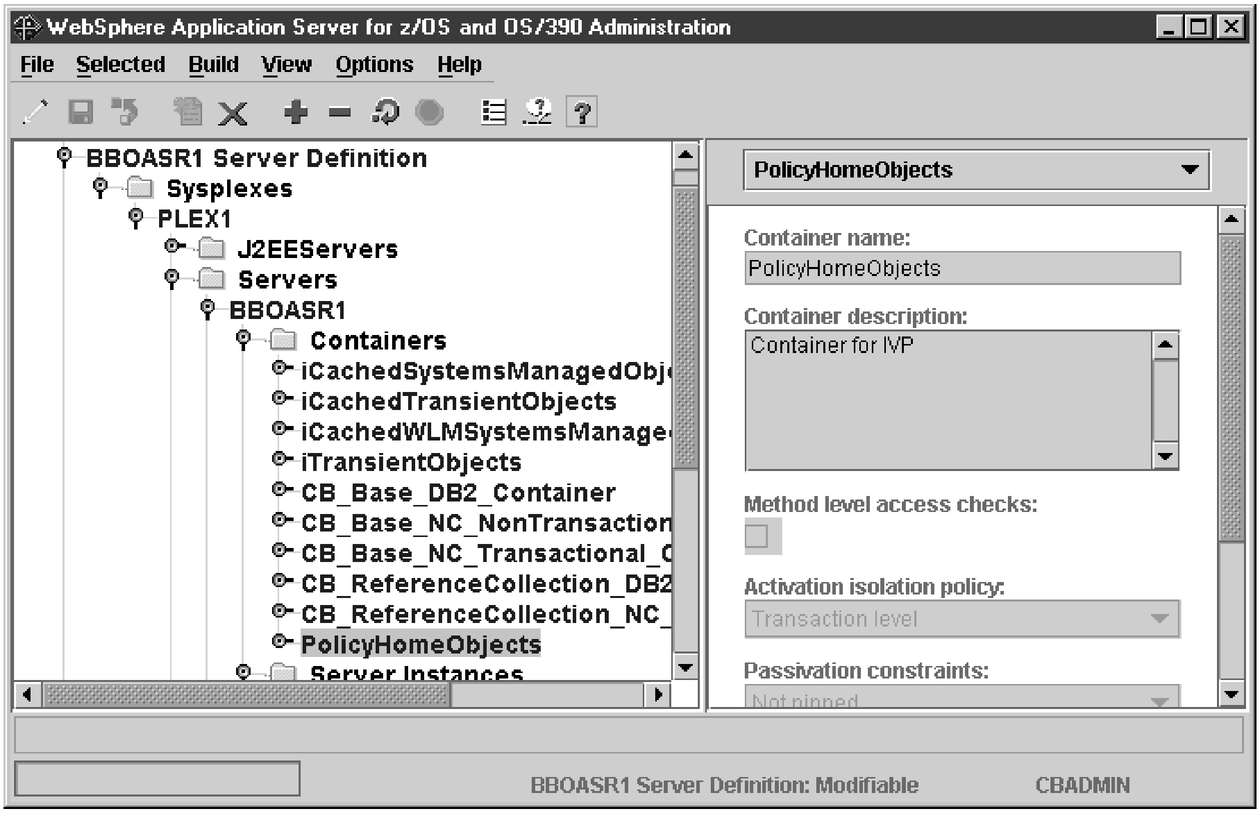
5. Click the save (diskette) icon. The words “Adding... Containers” appear in the tree.

   ____

You know you are done when following message appears in the status bar:

```
BBON0515I Container PolicyHomeObjects was added.
```

At the end of this procedure, this is how the screen appears after you expand Containers in the tree and select PolicyHomeObjects:



Container name: PolicyHomeObjects

Container description: Container for IVP

Method level access checks: □

Activation isolation policy: Transaction level

Passivation constraints: Not pinned

BBOASR1 Server Definition: Modifiable CBADMIN

Steps for adding a logical resource manager (LRM) connection for the PolicyHomeObjects container

Before you begin: You must add the PolicyHomeObjects container.

Perform these steps to add a logical resource manager connection for the PolicyHomeObjects container.

1. If necessary, expand the Containers folder under the BBOASR1 server by clicking the node to the left of the folder icon.

   ____

2. Click the node to the left of PolicyHomeObjects.

   ____

3. Select LRM Connections with the left mouse button. Then, using the right mouse button, click LRM Connections, then select Add.

   ____

4. Choose the following as the logical resource mapping name:

   ```
   CB_OS/390_IVP_DB2
   ```

   ____

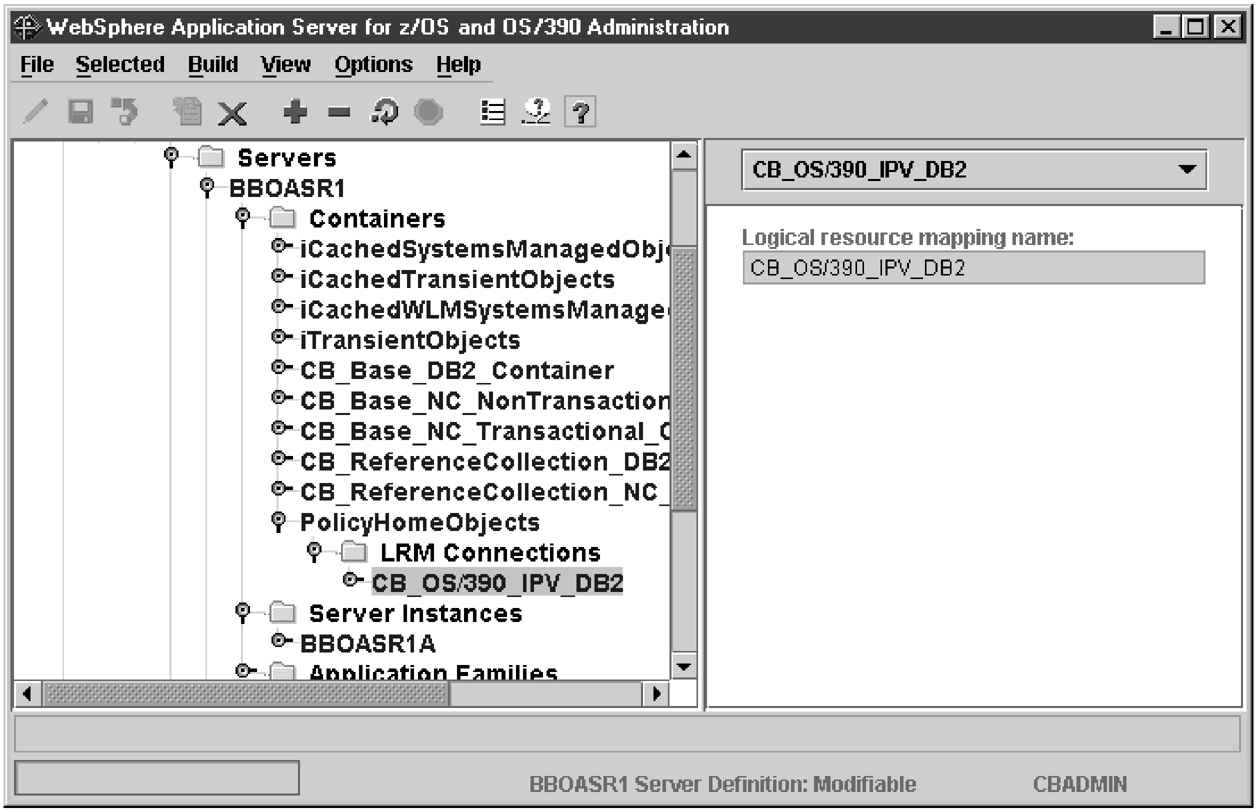
5. Click the save (diskette) icon. The words “Adding... LRM Connections” appear in the tree.

   ____

You know you are done when the following message appears in the status bar:

```
BBON0547I LRM connection CB_OS/390_IVP_DB2 was added.
```

At the end of this procedure, this is how the screen appears after you expand LRM Connections in the tree and select CB_OS/390_IVP_DB2:



Logical resource mapping name: CB_OS/390_IPV_DB2

BBOASR1 Server Definition: Modifiable CBADMIN

Steps for adding the PolicySQLObjects container

Before you begin: You must be working on the current conversation.

Perform the following steps to add the PolicySQLObjects container:

1. Select Containers with the left mouse button. Then, using the right mouse button, click Containers, then select Add.

   ____

2. In the properties form, enter the container name exactly as shown. The name is case sensitive:

   ```
   PolicySQLObjects
   ```

   ____

3. Optional: enter a container description.

   ____

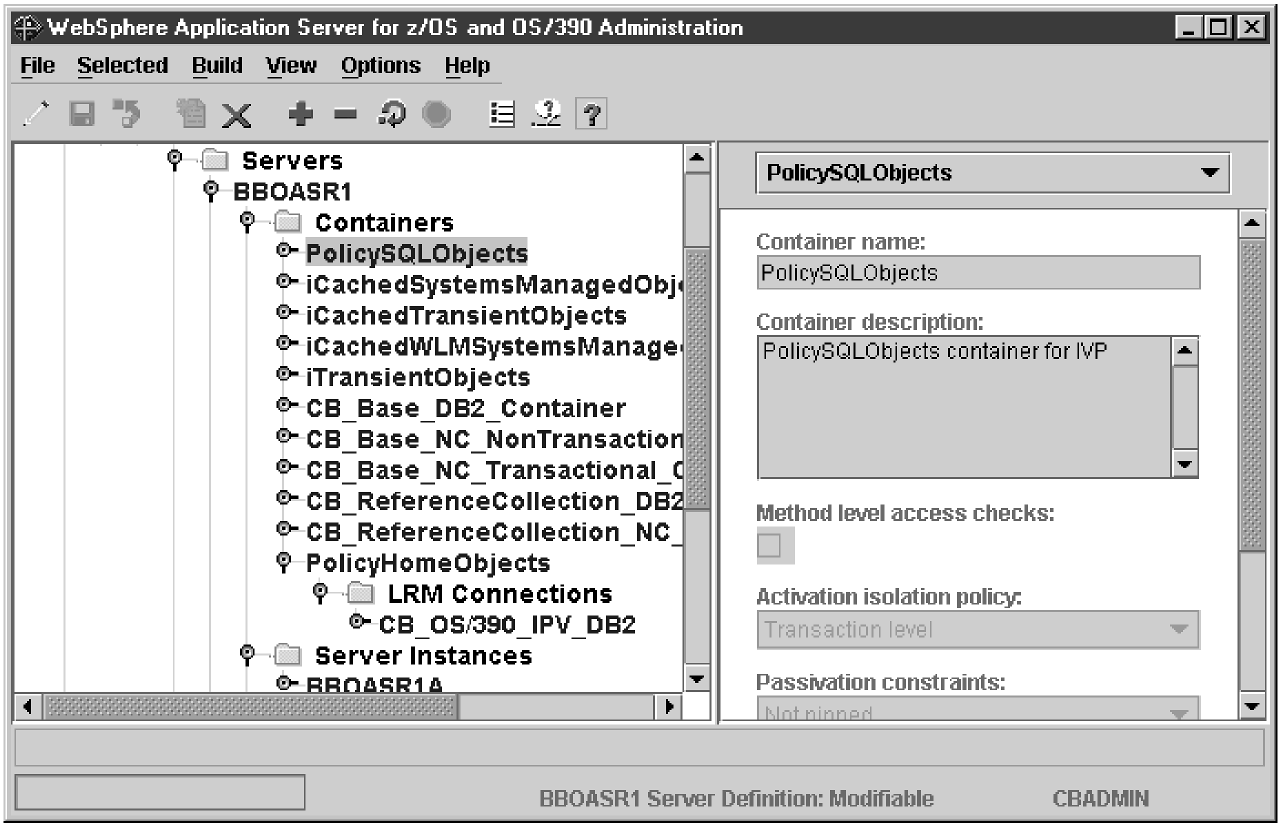
4. Click the save (diskette) icon. The words “Adding... Containers” appear in the tree.

   ____

You know you are done when the following message appears in the status bar:

```
BBON0515I Container PolicySQLObjects was added.
```

At the end of this procedure, this is how the screen appears after you expand Containers in the tree and select PolicySQLObjects:



Container name: PolicySQLObjects

Container description: PolicySQLObjects container for IVP

Method level access checks: □

Activation isolation policy: Transaction level

Passivation constraints: Not pinned

BBOASR1 Server Definition: Modifiable CBADMIN

Steps for adding a logical resource manager (LRM) connection for the PolicySQLObjects container

Before you begin: You must add the PolicySQLObjects container.

Perform these steps to add a logical resource manager for the PolicySQLObjects container:

1. If necessary, expand the Containers folder under the BBOASR1 server by clicking the node to the left of the folder icon.

   ____

2. Expand PolicySQLObjects by clicking the node to the left of the folder icon.

   ____

3. Select LRM Connections with the left mouse button. Then, using the right mouse button, click LRM Connections, then select Add.

   ____

4. Choose the following as the logical resource mapping name:

   ```
   CB_OS/390_IVP_DB2
   ```

   ____

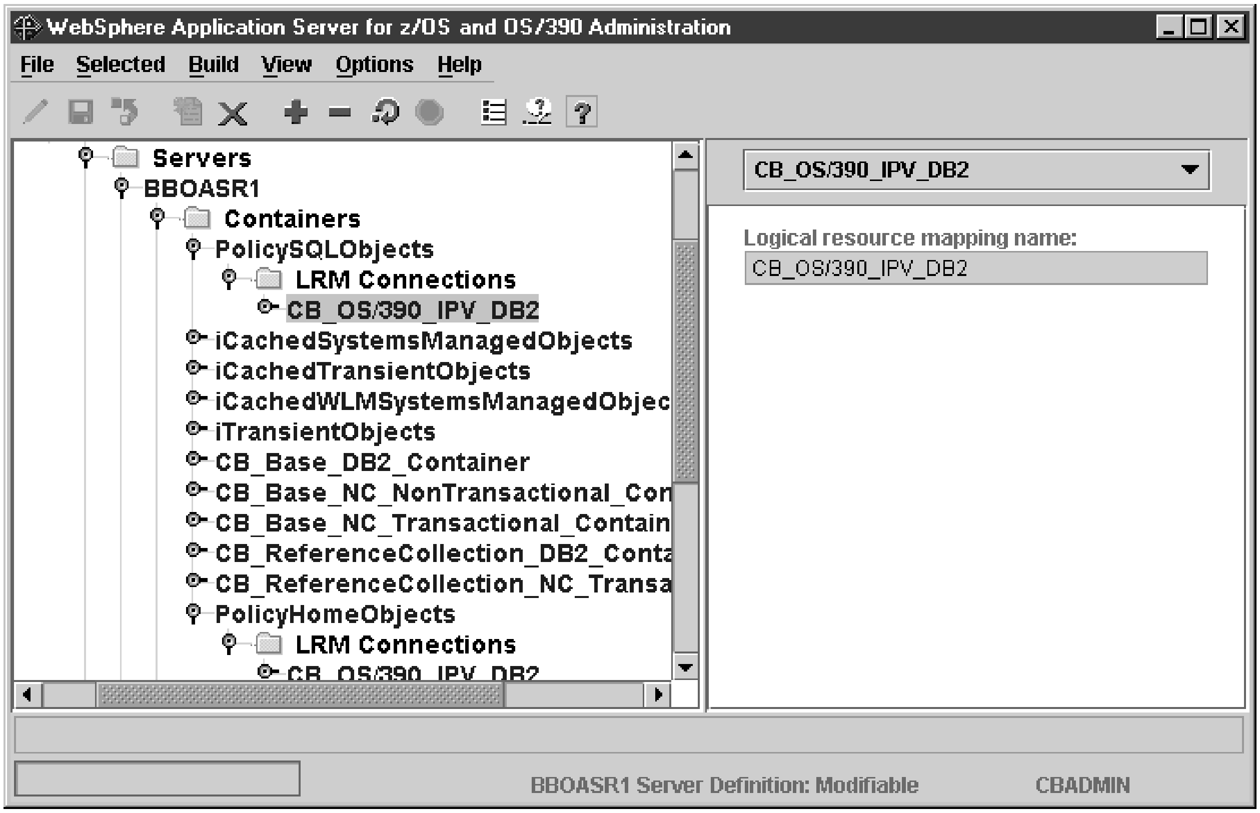
5. Click the save (diskette) icon. The words “Adding... LRM Connections” appear in the tree.

   ____

You know you are done when the following message appears in the status bar:

```
BBON0547I LRM connection CB_OS/390_IVP_DB2 was added.
```

At the end of this procedure, this is how the screen appears after you expand LRM Connections in the tree and select CB_OS/390_IVP_DB2:


WebSphere Application Server for z/OS and OS/390 Administration
File
Selected
Build
View
Options
Help
Servers
BBOASR1
Containers
PolicySQLObjects
LRM Connections
CB_OS/390_IPV_DB2
iCachedSystemsManagedObjects
iCachedTransientObjects
iCachedWLMSystemsManagedObjec
iTransientObjects
CB_Base_DB2_Container
CB_Base_NC_NonTransactional_Con
CB_Base_NC_Transactional_Contain
CB_ReferenceCollection_DB2_Conta
CB_ReferenceCollection_NC_Transa
PolicyHomeObjects
LRM Connections
CB_OS/390_IPV_DB2
CB_OS/390_IPV_DB2

Logical resource mapping name: CB_OS/390_IPV_DB2

BBOASR1 Server Definition: Modifiable CBADMIN

Steps for adding the PolicyTransientObjects container

Before you begin: You must be working on the current conversation.

Perform the following steps to add the PolicyTransientObjects container:

1. Select Containers with the left mouse button. Then, using the right mouse button, click Containers, then select Add.

2. In the properties form, enter the container name exactly as shown. The name is case sensitive:
   ```
   PolicyTransientObjects
   ```

3. Optional: enter a container description.

4. In the properties form, for Activation isolation policy, select **Container level**.

   > **Important!**
   > Choose **Container level**. This is not the default.

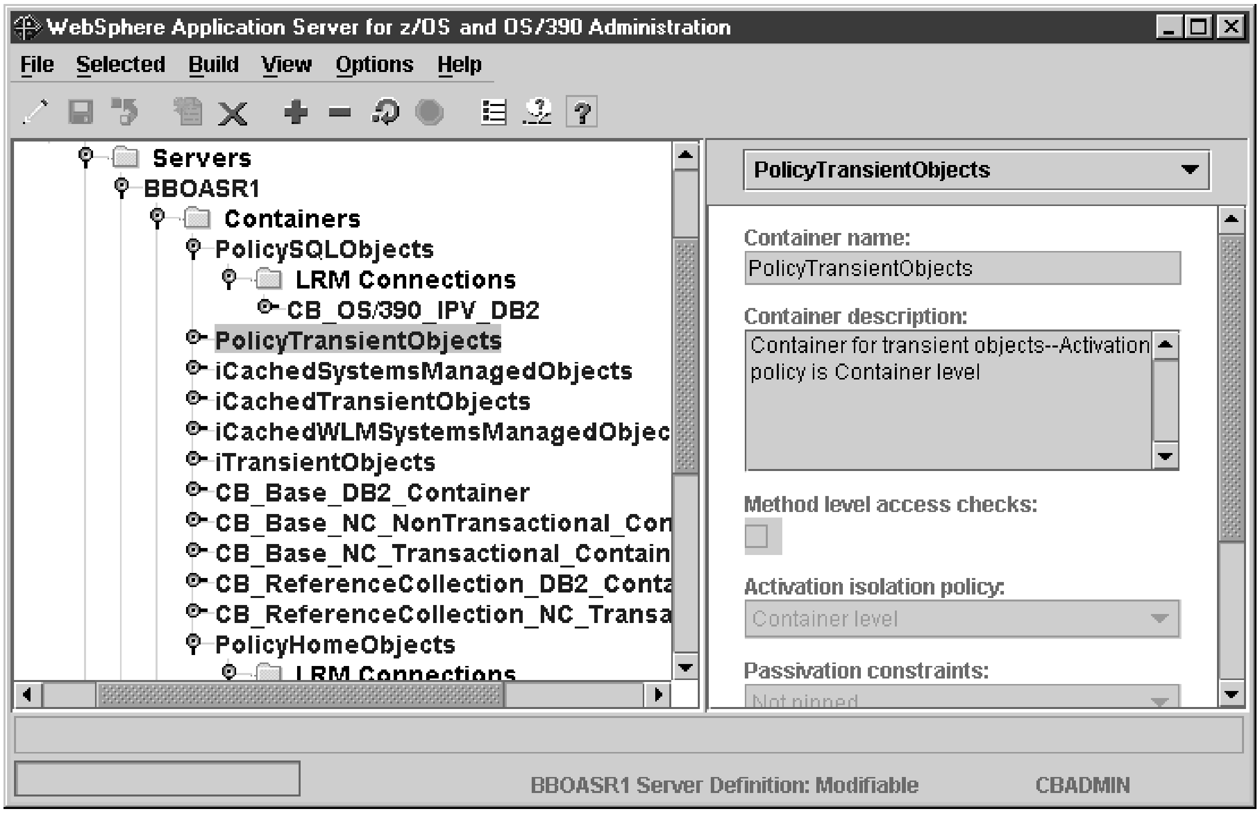
5. Click the save (diskette) icon. The words “Adding... Containers” appear in the tree.

You know you are done when the following message appears in the status bar:

```
BBON0515I Container PolicyTransientObjects was added.
```

Note: An LRM Connection is not required for this container.

At the end of this procedure, this is how the screen appears after you expand Containers in the tree and select PolicyTransientObjects:


WebSphere Application Server for z/OS and OS/390 Administration
File
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Options
Help
Servers
BBOASR1
Containers
PolicySQLObjects
LRM Connections
CB_OS/390_IPV_DB2
PolicyTransientObjects
iCachedSystemsManagedObjects
iCachedTransientObjects
iCachedWLMSystemsManagedObjec
iTransientObjects
CB_Base_DB2_Container
CB_Base_NC_NonTransactional_Con
CB_Base_NC_Transactional_Contain
CB_ReferenceCollection_DB2_Conta
CB_ReferenceCollection_NC_Transa
PolicyHomeObjects
LRM Connections
PolicyTransientObjects
BBOASR1 Server Definition: Modifiable
CBADMIN

Container name: PolicyTransientObjects

Container description: Container for transient objects--Activation policy is Container level

Method level access checks: □

Activation isolation policy: Container level

Passivation constraints: Not pinned

Steps for adding the PolicySQLLocalObjects container

Before you begin: You must be working on the current conversation.

Perform the following steps to add the PolicySQLLocalObjects container:

1. Select Containers with the left mouse button. Then, using the right mouse button, click Containers, then select Add.

   ---

2. In the properties form, enter the container name exactly as shown. The name is case sensitive:

   ```
   PolicySQLLocalObjects
   ```

   ---

3. Optional: enter a container description.

   ---

4. Under Transaction policy, choose **Supports Same-Server Hybrid Global**.

   > **Important!**
   > Choose **Supports Same-Server Hybrid Global**.

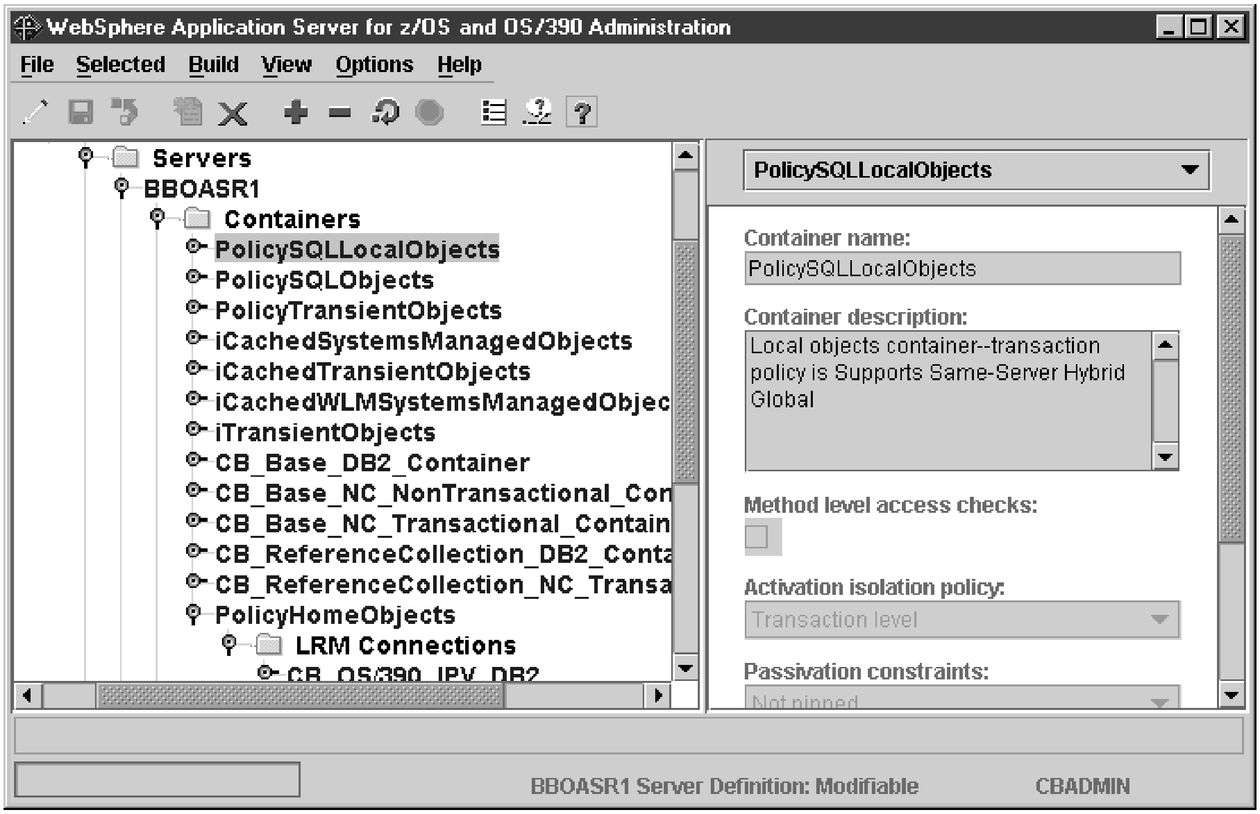
   ---

5. Click the save (diskette) icon. The words "Adding... Containers" appear in the tree.

You know you are done when the following message appears in the status bar:

```
BBON0515I Container PolicySQLLocalObjects was added.
```

The screen looks like this:


WebSphere Application Server for z/OS and OS/390 Administration
File
Selected
Build
View
Options
Help

Servers
BBOASR1
Containers
PolicySQLLocalObjects
PolicySQLObjects
PolicyTransientObjects
iCachedSystemsManagedObjects
iCachedTransientObjects
iCachedWLMSystemsManagedObjec
iTransientObjects
CB_Base_DB2_Container
CB_Base_NC_NonTransactional_Con
CB_Base_NC_Transactional_Contain
CB_ReferenceCollection_DB2_Conta
CB_ReferenceCollection_NC_Transa
PolicyHomeObjects
LRM Connections
CB_OS/390_IPV_DB2

PolicySQLLocalObjects

Container name: PolicySQLLocalObjects

Container description: Local objects container--transaction policy is Supports Same-Server Hybrid Global

Method level access checks: □

Activation isolation policy: Transaction level

Passivation constraints: Not pinned

BBOASR1 Server Definition: Modifiable CBADMIN

Steps for adding a logical resource manager (LRM) connection for the PolicySQLLocalObjects container

Before you begin: You must add the PolicySQLLocalObjects container.

Perform these steps to add a logical resource manager for the PolicySQLLocalObjects container:

1. If necessary, expand the Containers folder under the BBOASR1 server by clicking the node to the left of the folder icon.

   ____

2. Expand PolicySQLLocalObjects by clicking the node to the left of the folder icon.

   ____

3. Select LRM Connections with the left mouse button. Then, using the right mouse button, click LRM Connections, then select Add.

   ____

4. Choose the following as the logical resource mapping name:

   ```
   CB_OS/390_IVP_DB2
   ```

   ____

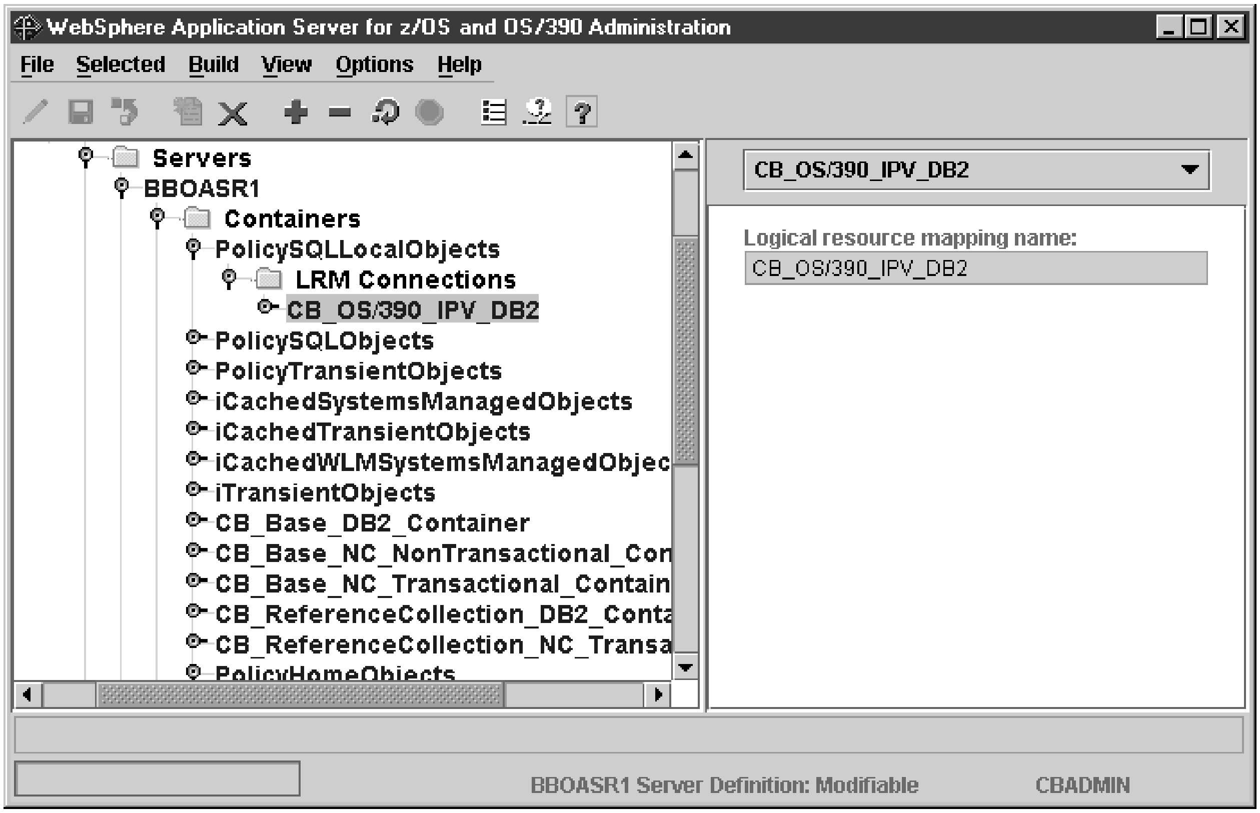
5. Click the save (diskette) icon. The words “Adding... LRM Connections” appear in the tree.

   ____

You know you are done when the following message appears in the status bar:

```
BBON0547I LRM connection CB_OS/390_IVP_DB2 was added.
```

At the end of this procedure, this is how the screen appears after you expand LRM Connections and select CB_OS/390_IVP_DB2:


WebSphere Application Server for z/OS and OS/390 Administration
File
Selected
Build
View
Options
Help
Servers
BBOASR1
Containers
PolicySQLLocalObjects
LRM Connections
CB_OS/390_IPV_DB2
PolicySQLObjects
PolicyTransientObjects
iCachedSystemsManagedObjects
iCachedTransientObjects
iCachedWLMSystemsManagedObjec
iTransientObjects
CB_Base_DB2_Container
CB_Base_NC_NonTransactional_Con
CB_Base_NC_Transactional_Contain
CB_ReferenceCollection_DB2_Conta
CB_ReferenceCollection_NC_Transa
PolicyHomeObjects
CB_OS/390_IPV_DB2

Logical resource mapping name: CB_OS/390_IPV_DB2

BBOASR1 Server Definition: Modifiable CBADMIN

Steps for adding the PolicyTransientLocalObjects container

Before you begin: You must be working on the current conversation.

Perform the following steps to add the PolicyTransientLocalObjects container:

1. Select Containers with the left mouse button. Then, using the right mouse button, click Containers, then select Add.

2. In the properties form, enter the container name exactly as shown. The name is case sensitive:

   ```
   PolicyTransientLocalObjects
   ```

3. Optional: enter a container description.

4. In the properties form, for Activation isolation policy, select **Container level**.

   > **Important!**
   >
   > Choose **Container level**. This is not the default.

5. Under Transaction policy, choose **Supports Same-Server Hybrid Global**.

   > **Important!**
   >
   > Choose **Supports Same-Server Hybrid Global**.

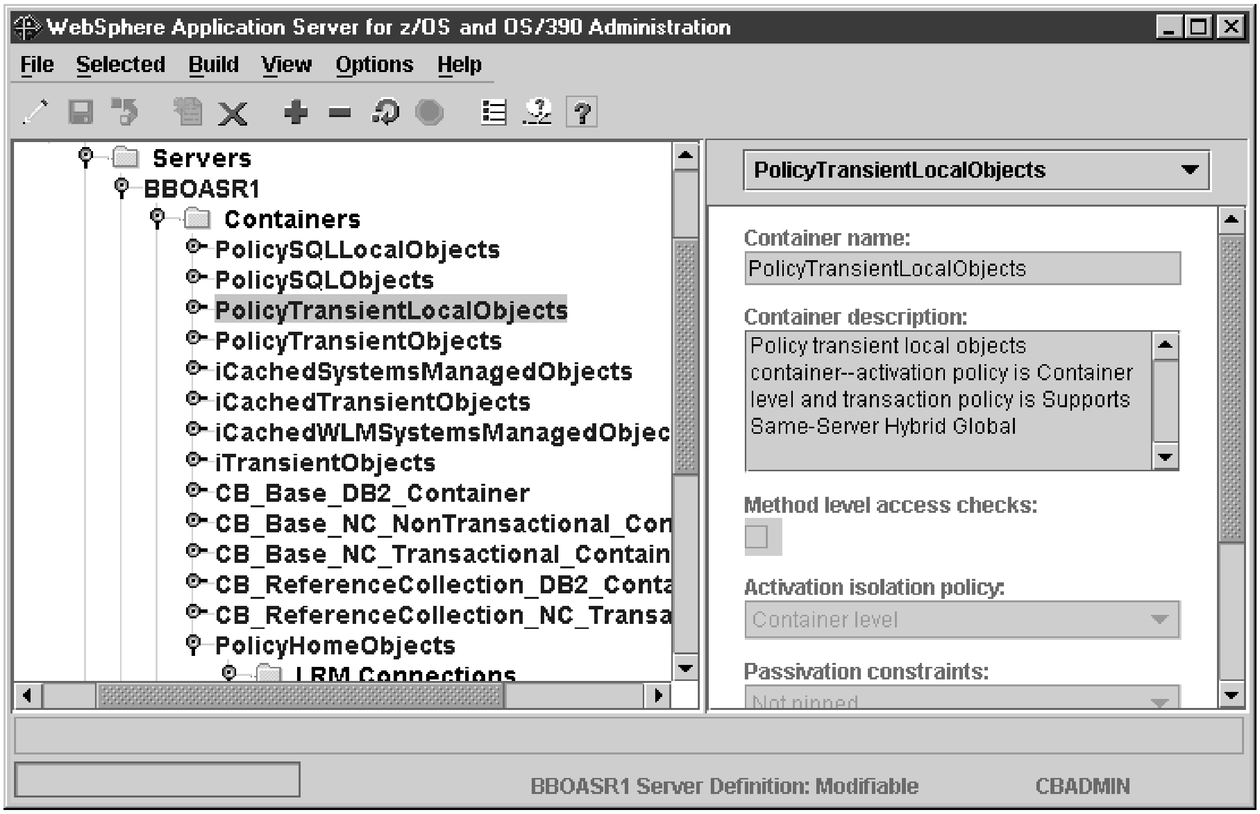
6. Click the save (diskette) icon. The words “Adding... Containers” appear in the tree.

You know you are done when the following message appears in the status bar:

```
BBON0515I Container PolicyTransientLocalObjects was added.
```

Note: An LRM Connection is not required for this container.

At the end of this procedure, this is how the screen appears after you expand Containers and select PolicyTransientLocalObjects:


WebSphere Application Server for z/OS and OS/390 Administration
File Selected Build View Options Help
Servers
BBOASR1
Containers
PolicySQLLocalObjects
PolicySQLObjects
PolicyTransientLocalObjects
PolicyTransientObjects
iCachedSystemsManagedObjects
iCachedTransientObjects
iCachedWLMSystemsManagedObjec
iTransientObjects
CB_Base_DB2_Container
CB_Base_NC_NonTransactional_Con
CB_Base_NC_Transactional_Contain
CB_ReferenceCollection_DB2_Conta
CB_ReferenceCollection_NC_Transa
PolicyHomeObjects
LRM Connections
PolicyTransientLocalObjects

Container name: PolicyTransientLocalObjects

Container description: Policy transient local objects container--activation policy is Container level and transaction policy is Supports Same-Server Hybrid Global

Method level access checks: □

Activation isolation policy: Container level

Passivation constraints: Not pinned

BBOASR1 Server Definition: Modifiable CBADMIN

Steps for importing the PolicyFamily application

Before you begin: You must define the BBOASR1 server.

Perform these steps to import the PolicyFamily application:

1. On z/OS or OS/390, mount the WebSphere for z/OS HFS at mount point /usr/lpp/WebSphere.

   ____

2. If necessary, scroll up the conversation tree to the BBOASR1 server. Select BBOASR1 with the left mouse button. Then, using the right mouse button, click BBOASR1, then select Import application.

   ____

3. In the Import dialog, enter the input and output files for the PolicyFamily application. The input file is

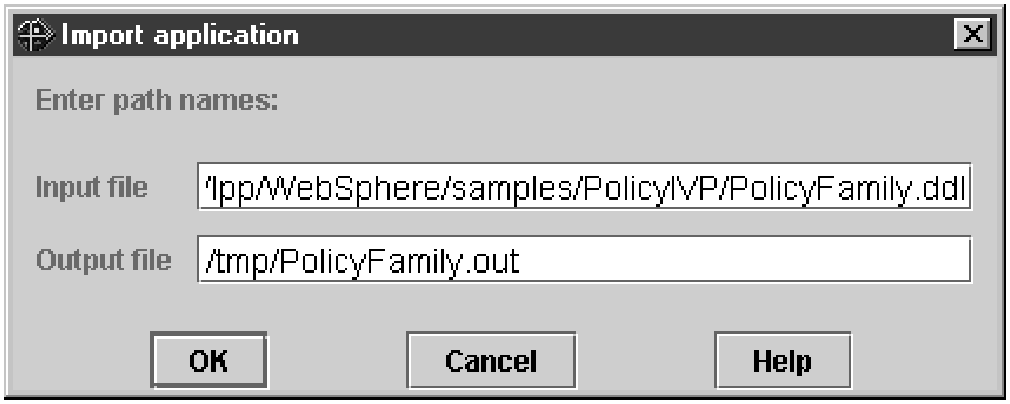
   ```
   /usr/lpp/WebSphere/samples/PolicyIVP/PolicyFamily.ddl
   ```

   Rules:

   a. The import and output data sets are associated with the BBOSMSS address space user ID (CBSYMSR1 in our BBOCBRAK sample):

      - If you use data sets, this user ID must have read access to the input data set and alter access to the output data set.
      - If you use HFS files, this user ID must have the ability to search the directories to find the input file, the ability to read the input file, and the ability to write the output file.

   b. Another process cannot be using the import or output data sets used during the import process. For example, you cannot use ISPF to edit or browse the data set or data set member at the same time you start the import.



Input file: 'lpp/WebSphere/samples/PolicyIVP/PolicyFamily.ddl

Output file: /tmp/PolicyFamily.out

   ____

4. Click OK. The words “Importing... BBOASR1” appear in the tree. Wait for the following message:

   ```
   BBON0467I Package file '/usr/lpp/WebSphere/samples/PolicyIVP/PolicyFamily.ddl'
             was imported.
   ```

   ____

5. Click File, then Message log... Check the message log for more detailed error messages by searching for the word “Error” and reading the messages that follow it.

   ____

You know you are done when the import succeeds with no errors.

Steps for validating the conversation

Before you begin: You must complete all the previous steps in the current conversation.

Perform the following steps to validate the conversation:

1. If necessary, scroll up the tree to the BBOASR1 Server Definition conversation name.

   ____

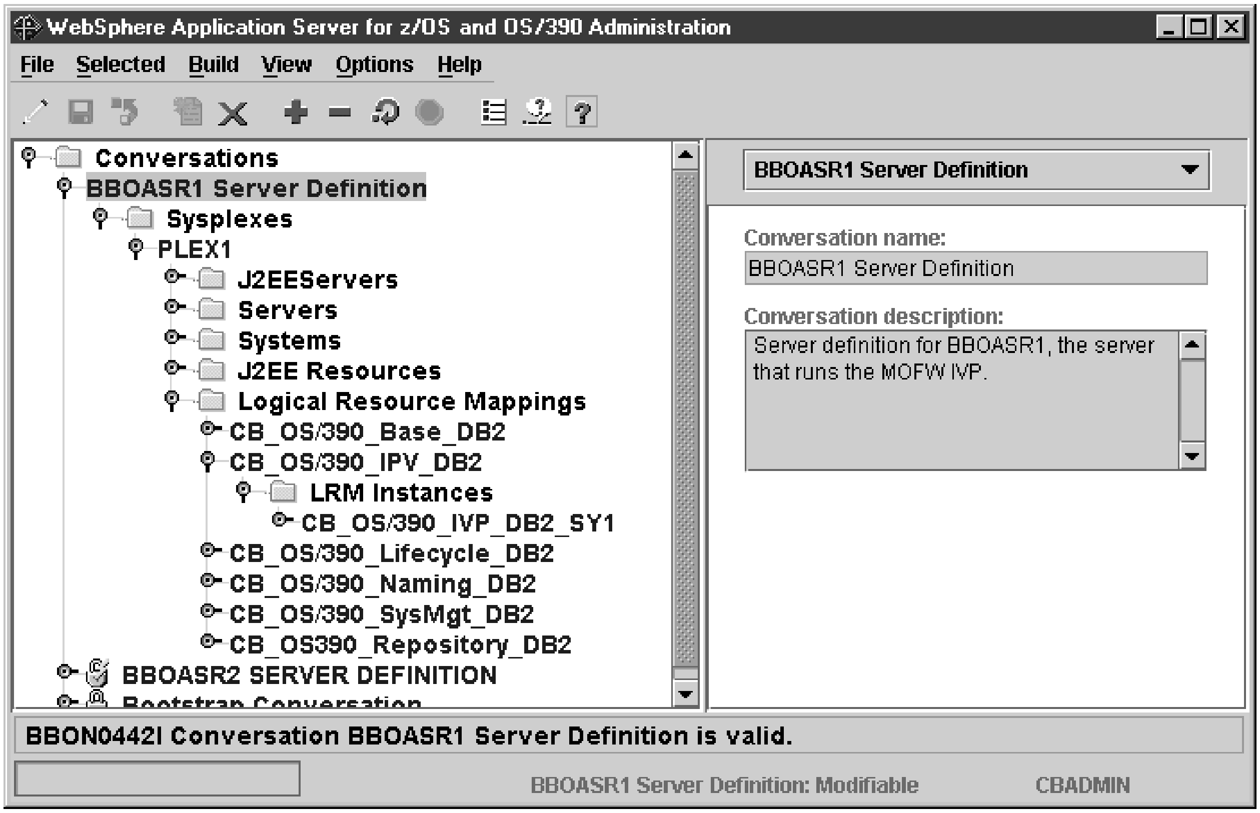
2. Select the conversation with the left mouse button. Then, using the right mouse button, click the conversation, then select Validate.

   Result: The words "Validating... BBOASR1 Server Definition" appear in the tree.

   ____

You know you are done when the following message appears in the status bar:

```
BBON0442I Conversation BBOASR1 Server Definition is valid.
```



Conversation name: BBOASR1 Server Definition

Conversation description: Server definition for BBOASR1, the server that runs the MOFW IVP.

BBON0442I Conversation BBOASR1 Server Definition is valid.

BBOASR1 Server Definition: Modifiable CBADMIN

Step for committing the conversation

Before you begin: You must validate the current conversation.

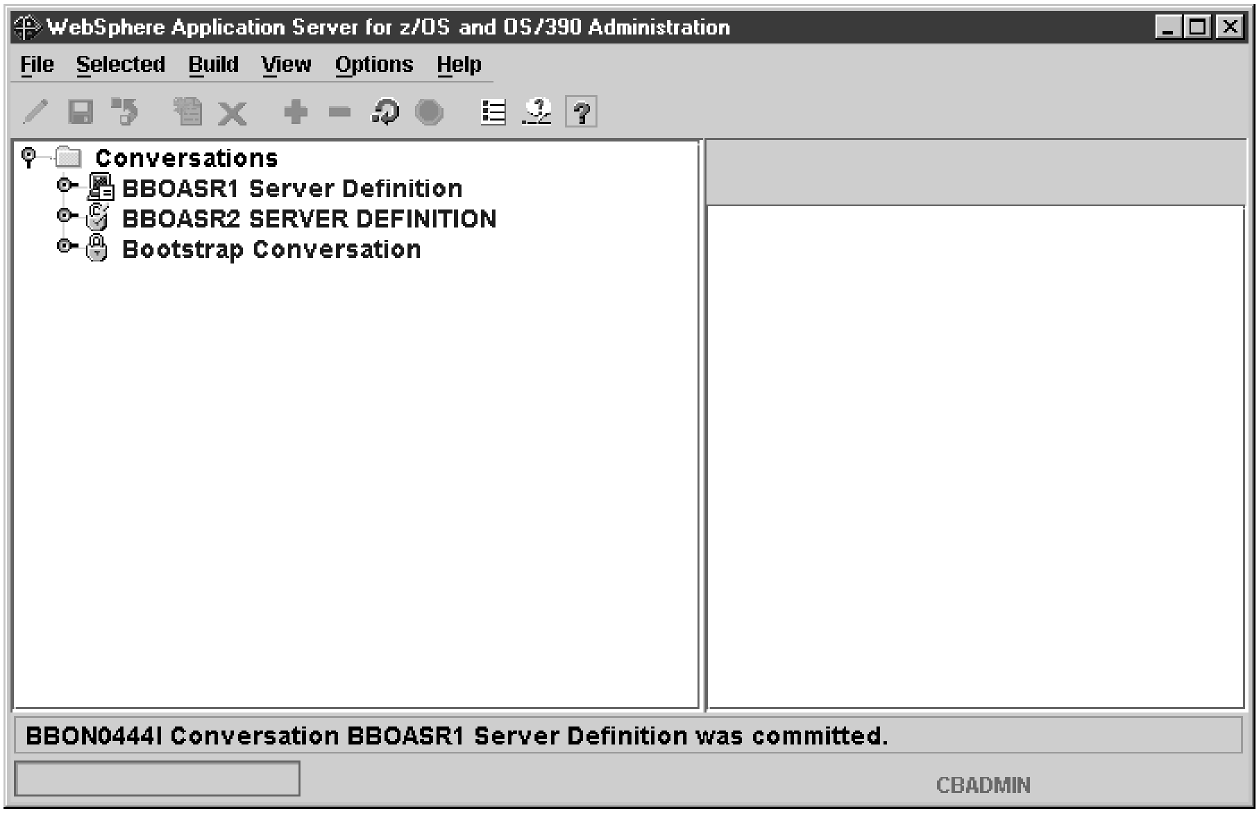
⇔ Select the conversation with the left mouse button. Then, using the right mouse button, click the conversation, then select Commit. Answer Yes to the question:

```
BBON0534I You cannot undo Commit.  Do you still want to commit?
```

The words “Committing... BBOASR1 Server Definition” appear in the tree.

You know you are done when the following message appears in the status bar:

```
BBON0444I Conversation BBOASR1 Server Definition was committed.
```


WebSphere Application Server for z/OS and OS/390 Administration
File
Selected
Build
View
Options
Help
Conversations
BBOASR1 Server Definition
BBOASR2 SERVER DEFINITION
Bootstrap Conversation
CBADMIN

BBON0444I Conversation BBOASR1 Server Definition was committed.

Step for viewing the WebSphere for z/OS Host Instructions

Before you begin: You must validate and commit the current conversation.

Perform the following step to view the instructions:

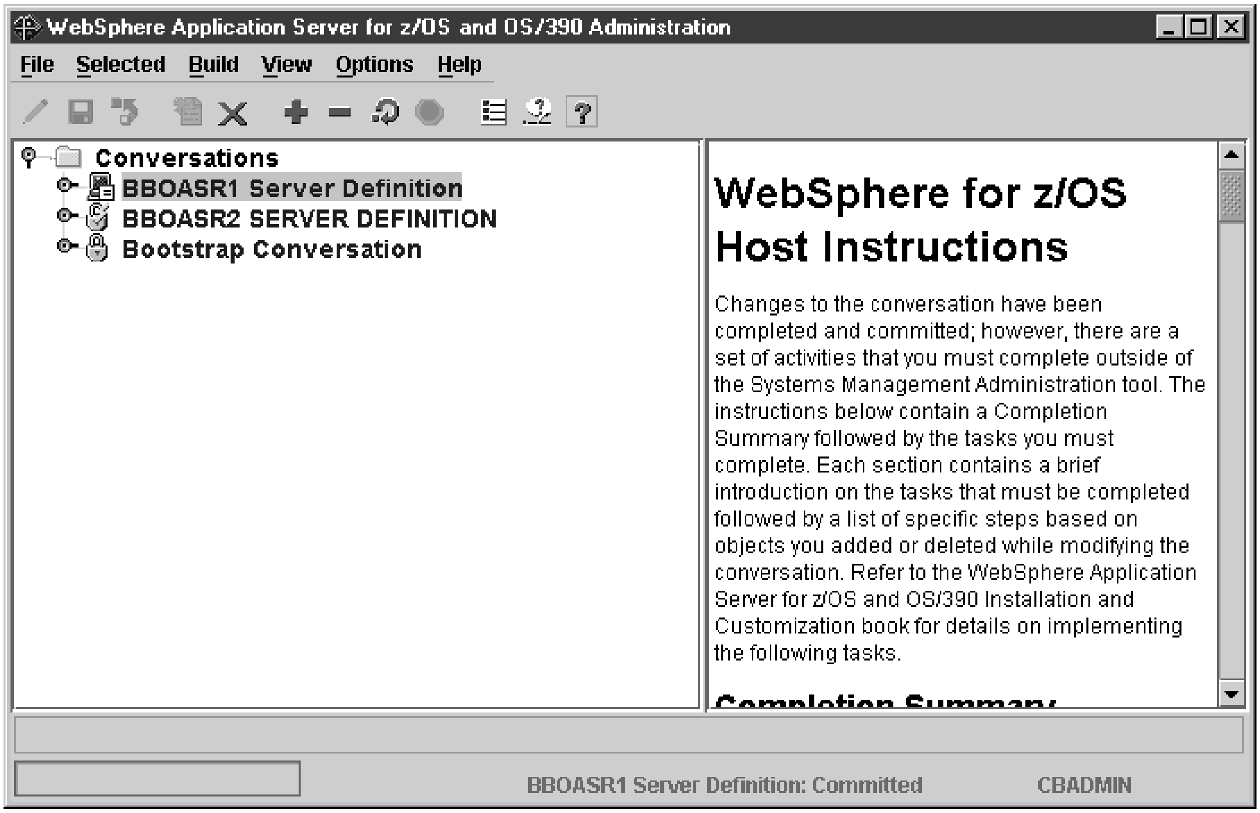
- Select the BBOASR1 Server Definition conversation with the left mouse button. Then, using the right mouse button, click the conversation, then select Instructions.

  Result: The words "Getting instructions..." appear in the tree.

You are done when you see the WebSphere for z/OS Host Instructions.

Note: Normally when defining servers, you would need to follow these instructions. However, the jobs from the customization dialog already accomplished all tasks prescribed by the host instructions. You may, for your information, read these instructions, but you do not have to perform the tasks for this server definition.

The screen looks like this:


WebSphere Application Server for z/OS and OS/390 Administration
File
Selected
Build
View
Options
Help
Conversations
BBOASR1 Server Definition
BBOASR2 SERVER DEFINITION
Bootstrap Conversation

WebSphere for z/OS Host Instructions

Changes to the conversation have been completed and committed; however, there are a set of activities that you must complete outside of the Systems Management Administration tool. The instructions below contain a Completion Summary followed by the tasks you must complete. Each section contains a brief introduction on the tasks that must be completed followed by a list of specific steps based on objects you added or deleted while modifying the conversation. Refer to the WebSphere Application Server for z/OS and OS/390 Installation and Customization book for details on implementing the following tasks.

Completion Summary

BBOASR1 Server Definition: Committed

CBADMIN

Steps for marking all tasks complete

Before you begin: You must complete all required z/OS or OS/390 tasks.

Perform these steps to mark all tasks complete:

1. Select the BBOASR1 Server Definition conversation with the left mouse button. Then, with the right mouse button, click the conversation, select Complete, then All tasks.

   ____

2. Answer Yes to the question:

   ```
   BBON0550I  Are you sure that all tasks have been completed?
   ```

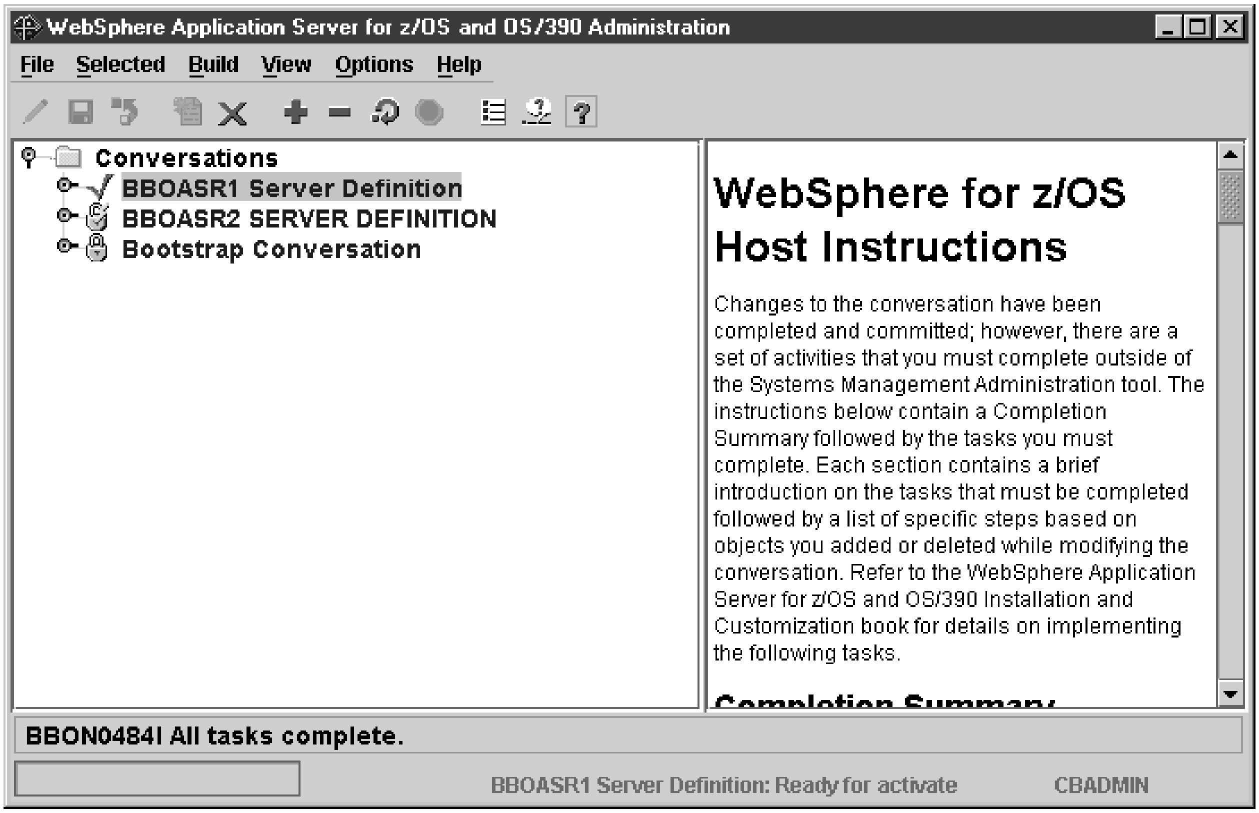
   Result: The words "Completing tasks... BBOASR1 Server Definition" appear in the tree.

   ____

You know you are done when the following message appears in the status bar:

```
BBON0484I All tasks complete.
```

The screen looks like this:


WebSphere Application Server for z/OS and OS/390 Administration
File
Selected
Build
View
Options
Help
Conversations
BBOASR1 Server Definition
BBOASR2 SERVER DEFINITION
Bootstrap Conversation

WebSphere for z/OS Host Instructions

Changes to the conversation have been completed and committed; however, there are a set of activities that you must complete outside of the Systems Management Administration tool. The instructions below contain a Completion Summary followed by the tasks you must complete. Each section contains a brief introduction on the tasks that must be completed followed by a list of specific steps based on objects you added or deleted while modifying the conversation. Refer to the WebSphere Application Server for z/OS and OS/390 Installation and Customization book for details on implementing the following tasks.

Completion Summary

BBON0484I All tasks complete.

BBOASR1 Server Definition: Ready for activate   CBADMIN

Steps for activating your new conversation

Before you begin: You must complete all previous instructions in this section.

Perform these steps to activate your new conversation:

1. Select the BBOASR1 Server Definition conversation with the left mouse button. Then, with the right mouse button, click the conversation, then select Activate.

   ---

2. Answer Yes to the question:

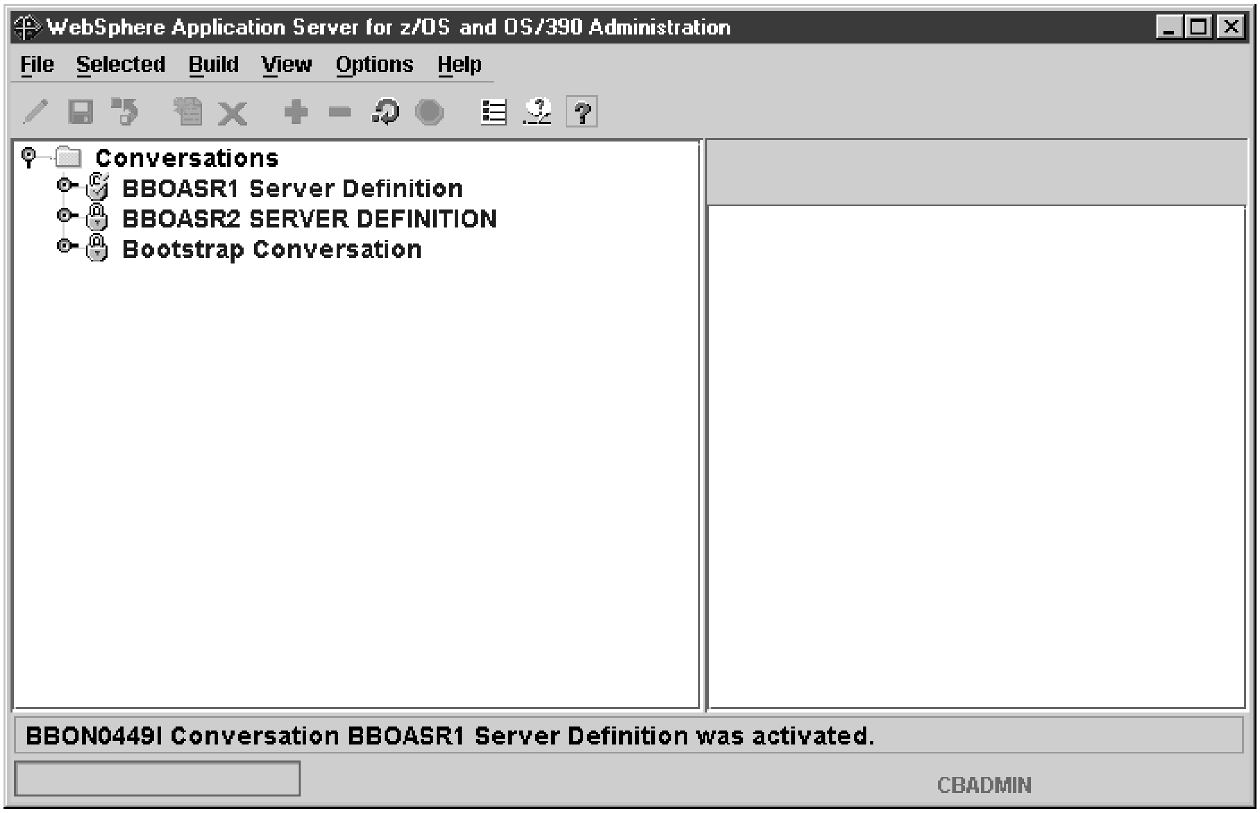
   ```
   BBON0539I  Activate cannot be undone.  Do you want to activate conversation
              BBOASR1 Server Definition?
   ```

   Result: The words "Activating... BBOASR1 Server Definition" appear in the tree.

You know you are done when the following message appears in the status bar:

```
BBON0449I Conversation BBOASR1 Server Definition was activated.
```

The screen looks like this:



WebSphere Application Server for z/OS and OS/390 Administration
File
Selected
Build
View
Options
Help
Conversations
BBOASR1 Server Definition
BBOASR2 SERVER DEFINITION
Bootstrap Conversation
CBADMIN

BBON0449I Conversation BBOASR1 Server Definition was activated.

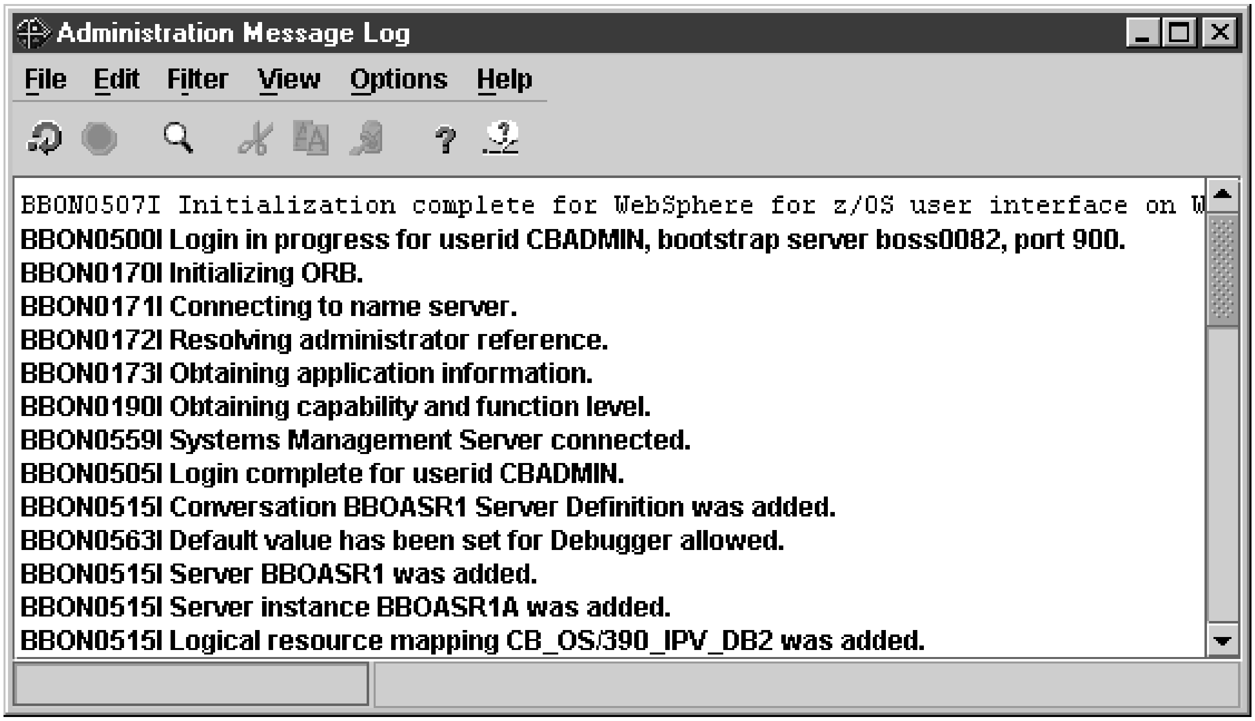
Steps for printing the Administration Message Log

Before you begin: You must activate your conversation.

Follow these steps to print the Administration Message Log:

1. Click File, then Message log...

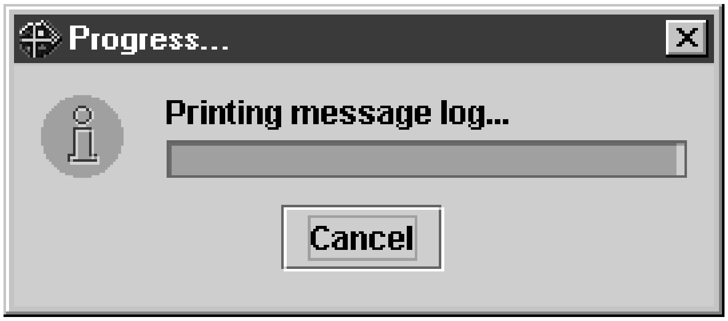
   Result: The screen looks like this:



```
BBON0507I Initialization complete for WebSphere for z/OS user interface on W
BBON0500I Login in progress for userid CBADMIN, bootstrap server boss0082, port 900.
BBON0170I Initializing ORB.
BBON0171I Connecting to name server.
BBON0172I Resolving administrator reference.
BBON0173I Obtaining application information.
BBON0190I Obtaining capability and function level.
BBON0559I Systems Management Server connected.
BBON0505I Login complete for userid CBADMIN.
BBON0515I Conversation BBOASR1 Server Definition was added.
BBON0563I Default value has been set for Debugger allowed.
BBON0515I Server BBOASR1 was added.
BBON0515I Server instance BBOASR1A was added.
BBON0515I Logical resource mapping CB_OS/390_IPV_DB2 was added.
```

2. From the Administration Message Log window, click File, then Print...

   Result: You see the Windows print dialog. Select a printer and click ok. You see the following pop-up:



You know you are done when you get a printout of the Administration Message Log. You may exit the program.

Steps for creating the database for the installation verification programs (IVPs)

Before you begin: You need your copies of BBOICD, BBOIBN, and BBOIGRT. After you run the customization dialog, these jobs are in *hlq*.CNTL, where *hlq* is the high-level qualifier you specified for the .CNTL and .DATA target datasets in the customization dialog.

Perform the following steps to create the database for the IVP.

1. Submit your copy of BBOICD from a user ID with DB2 SYSADM authority.

   ____

2. Submit your copy of BBOIBN from a user ID with DB2 SYSADM authority.

   ____

3. Submit your copy of BBOIGRT from a user ID with DB2 SYSADM authority.

   ____

You know you are done when the jobs execute successfully.

Running the WebSphere for z/OS installation verification programs (IVPs)

WebSphere for z/OS provides the following installation verification programs (IVPs). Now that you have WebSphere for z/OS customized, you may run one or more, depending on which application servers (BBOASR2 or BBOASR1) you set up and which software components you plan to run on the system.

- The batch client IVP for J2EE (BBOIVPE) is a z/OS or OS/390 client that runs a shell script. The shell script interacts with an enterprise bean running in the BBOASR2 server. For setup and execution instructions, see "Steps for running the BBOIVPE (J2EE) installation verification program."
- Two Web application IVPs:
  - WebSphereSampleApp is a servlet application that you access through your browser. The IVP verifies that your Web container is functioning properly.
  - PolicyIVP has a servlet and a JSP that interact with an enterprise bean running in the BBOASR2 server.

  Both Web application IVPs have a common setup. See "Steps for setting up the Web application IVPs" on page 169. After you do the setup, follow the instructions in "Steps for running the Web application IVPs" on page 172.
- The batch client IVP for CORBA (BBOIVP) is a z/OS or OS/390 client that runs a shell script. The shell script interacts with a CORBA program running in BBOASR1. For setup and execution instructions, see "Steps for running the BBOIVP (MOFW) installation verification program (IVP)" on page 175.

The IVPs are pre-packaged applications. All the application development work has been done for you. If you want to see how to develop applications for WebSphere for z/OS, see *WebSphere Application Server V4.0.1 for z/OS and OS/390: Assembling J2EE Applications*, SA22-7836,and *WebSphere Application Server V4.0.1 for z/OS and OS/390: Assembling CORBA Applications*, SA22-7848.

Steps for running the BBOIVPE (J2EE) installation verification program

These instructions explain how to run the BBOIVPE (J2EE) installation verification program. You can find the sample source used for the IVP in the `/usr/lpp/WebSphere/samples/PolicyIVP/ejb` directory in the file system after SMP/E installation is complete. This sample runs an enterprise bean.

Before you begin: You need the BBOIVPE job customized by the customization dialog. The job is in *hlq*.CNTL, where *hlq* is the high-level qualifier you specified for the .CNTL and .DATA target datasets in the customization dialog.

Perform the following steps to run the BBOIVPE IVP:

1. If you have not already started the LDAP server, do so now.

   Example:

   ```
   S BBOLDAP
   ```

   Result: Wait for the following message:

   ```
   GLD0122I Slapd is ready for requests
   ```

2. If you have not already started WebSphere for z/OS, do so now.

   Example:

   ```
   S BBODMN.DAEMON01
   ```

3. Start the BBOASR2A server instance:

   ```
   s bboasr2.bboasr2a
   ```

   Wait until BBOASR2A fully initializes and you see the following message on the console:

   ```
   BBOU0695I Naming registration completed for server BBOASR2
   ```

   Note: Any administration using the Administration application or System Management Scripting API during server startup and naming registration may cause problems.

4. Edit BBOIVPE. On the JOB statement, change the user ID to correspond to the user ID you chose to run the J2EE IVP in the customization dialog (the default is CBIVP2).

5. Ensure that JDBC MULTICONTEXT is enabled in your WebSphere for z/OS environment. It is actually enabled by default, but there are two things you should do if you find it disabled:

   - Ensure the property is present in the db2sqlj.properties file. See *DB2 Application Programming Guide and Reference for Java*, GC26-9932, for more information about how to associate a set of properties with a JVM.
   - Do one of the following:
     - Remove the `DB2SQLJMULTICONTEXT=NO` property from the sqljjdbc.properties file **OR**
     - Explicitly enable the `DB2SQLJMULTICONTEXT=YES` property.

   If MULTICONTEXT is disabled, the BBOIVPE (J2EE) installation verification program will fail during a JDBC getConnection() method.

6. Submit BBOIVPE.

You know you are done when BBOIVPE runs successfully.

Steps for setting up the Web application IVPs

Before you begin: You need to set up an HTTP server through which requests can be forwarded to the Web container in the J2EE IVP server, BBOASR2.

Recommendation: Set up an HTTP server specifically for the purpose of testing the IVP. For information, see *z/OS HTTP Server Planning, Installing, and Using*, SC34-4826.

The HTTP server will need its own copies of the httpd.conf and httpd.envvars files. You can find samples of these files in the `/usr/lpp/internet/samples` directory. Customize the HTTP server cataloged procedure and configuration files to meet your installation requirements. You may also want to ensure the HTTP server starts correctly. Then shut the HTTP server down and continue with the Web application IVP below.

You need the webcontainer.conf file from the `/usr/lpp/WebSphere/bin` directory.

Perform the following steps to set up the Web application IVPs.

Note: We use the default WebSphere for z/OS installation and customization directory names (`/usr/lpp/WebSphere` and `/WebSphere390/CB390`). If you use different directory names, modify the example commands and statements as appropriate.

1. Customize the configuration files used by the Web container in the BBOASR2 server. The configuration files for the Web container can all go in the control file directory for the BBOASR2A server (`/WebSphere390/CB390/controlinfo/envfile/`*`sysplex`*`/BBOASR2A`, where *sysplex* is your sysplex name.)
   a. In the OMVS shell, switch to the control file directory:
   ```
   cd  /WebSphere390/CB390/controlinfo/envfile/sysplex/BBOASR2A
   ```
   b. Copy the Web container configuration file, webcontainer.conf, from the WebSphere for z/OS bin directory into the control file directory for the BBOASR2A server:
   ```
   cp /usr/lpp/WebSphere/bin/webcontainer.conf  .
   ```
   c. Edit your copy of the webcontainer.conf. Change the host.default_host.alias statement as follows:
   ```
   host.default_host.alias=host_name:host_port, sysname:host_port
   ```
   where

   host_name
   Is the IP name (or address) of your base z/OS or OS/390 system

   host_port
   Is the port at which the HTTP server listens for the IVP

   sysname
   Is the z/OS or OS/390 system name of the system on which WebSphere for z/OS is running

   host_port
   Is the port at which the HTTP server listens for the IVP

   d. Create a file called trace.dat in the control file directory. If you want to run with tracing on, insert the following statement into the file:
   ```
   *=all=enabled
   ```

If you want to run with tracing off, insert the following statement into the file:

```
*=all=disabled
```

e. Create a file called jvm.properties in the control file directory. This file points the BBOASR2 server to the two files you just created. Add the following two properties into the file:

```
com.ibm.ws390.wc.config.filename=/WebSphere390/CB390/controlinfo/envfile/sysplex/BBOASR2A/webcontainer.conf
com.ibm.ws390.trace.settings=/WebSphere390/CB390/controlinfo/envfile/sysplex/BBOASR2A/trace.dat
```

where *sysplex* is the name of your sysplex.

f. Ensure all three files have the same ownership and permissions as the current.env file in the control file directory.

---

2. Edit the httpd.conf file for the HTTP server as follows:
   - Remove any ServerInit, ServerTerm and Service statements for previous WebSphere versions.
   - Add the following statements:

```
ServerInit  /usr/lpp/WebSphere/WebServerPlugIn/bin/was400plugin.so:init_exit /usr/lpp/WebSphere
ServerTerm /usr/lpp/WebSphere/WebServerPlugIn/bin/was400plugin.so:term_exit
Service    /PolicyIVP/*       /usr/lpp/WebSphere/WebServerPlugIn/bin/was400plugin.so:service_exit
Service    /webapp/examples/* /usr/lpp/WebSphere/WebServerPlugIn/bin/was400plugin.so:service_exit
```

   Rule: Each statement (ServerInit, ServerTerm, Service) must go on a single line in the httpd.conf file.

   - Change the Port statement to listen on port *host_port*:

```
Port host_port
```

   where *host_port* is the same port you specified on the host.default_host.alias statement in the webcontainer.conf file.

   - Change the default user ID used for HTTP clients to PUBLIC (or whatever unrestricted public user ID your installation uses):

```
Userid PUBLIC
```

---

3. Edit the httpd.envvars file for the HTTP server.

a. Add or edit the JAVA_HOME environment variable to supply the value for your SDK home directory.

Example:

```
JAVA_HOME=/usr/lpp/java/IBM/J1.3
```

b. Add the following directory to the NLSPATH environment variable:

```
/usr/lpp/WebSphere/WebServerPlugIn/msg/%L/%N
```

c. Add the following directory to the LIBPATH environment variable:

```
/usr/lpp/WebSphere/wc/lib
```

d. Add the following directory to the CLASSPATH environment variable:

```
/usr/lpp/WebSphere/wc/lib
```

---

4. If you have not already started the LDAP server and WebSphere for z/OS, do so now.

Example:

```
S BBOLDAP
S BBODMN.DAEMON01
```

---

5. If BBOASR2A is runnning, stop it:

   ```
   p bboasr2.bboasr2a
   ```

6. Start the BBOASR2A server instance:

   ```
   s bboasr2.bboasr2a
   ```

   Watch for the following message:

   ```
   +Server "BBOASR2A" open for business.
   ```

   Wait until BBOASR2A fully initializes. If you have not previously run BBOASR2A as part of the J2EE IVP, wait for the following message to appear on the MVS console:

   ```
   BBOU0695I Naming registration completed for server BBOASR2
   ```

7. Start the httpd daemon.

   Result: If the initialization process completed successfully, you should receive the following two messages in the HTTP server job output:

   ```
   ...........IBM WebSphere Application Server native plugin initialization went OK :-)
   IMW0235I Server is ready.
   ```

   Tip: It is possible to get message IMW0235I without the preceding ″smiley face″ message if the WebSphere for z/OS V3.5 run-time environment did not successfully initialize. If you do not receive message IMW0235I, an error occurred during the Web server initialization process.

You are done when the BBOASR2A server instance and httpd daemon start successfully.

Steps for running the Web application IVPs

Before you begin: You must set up the Web applications. See “Steps for setting up the Web application IVPs” on page 169.

Perform the following steps to run the Web application IVPs:

1. Enter the following URL from your browser:

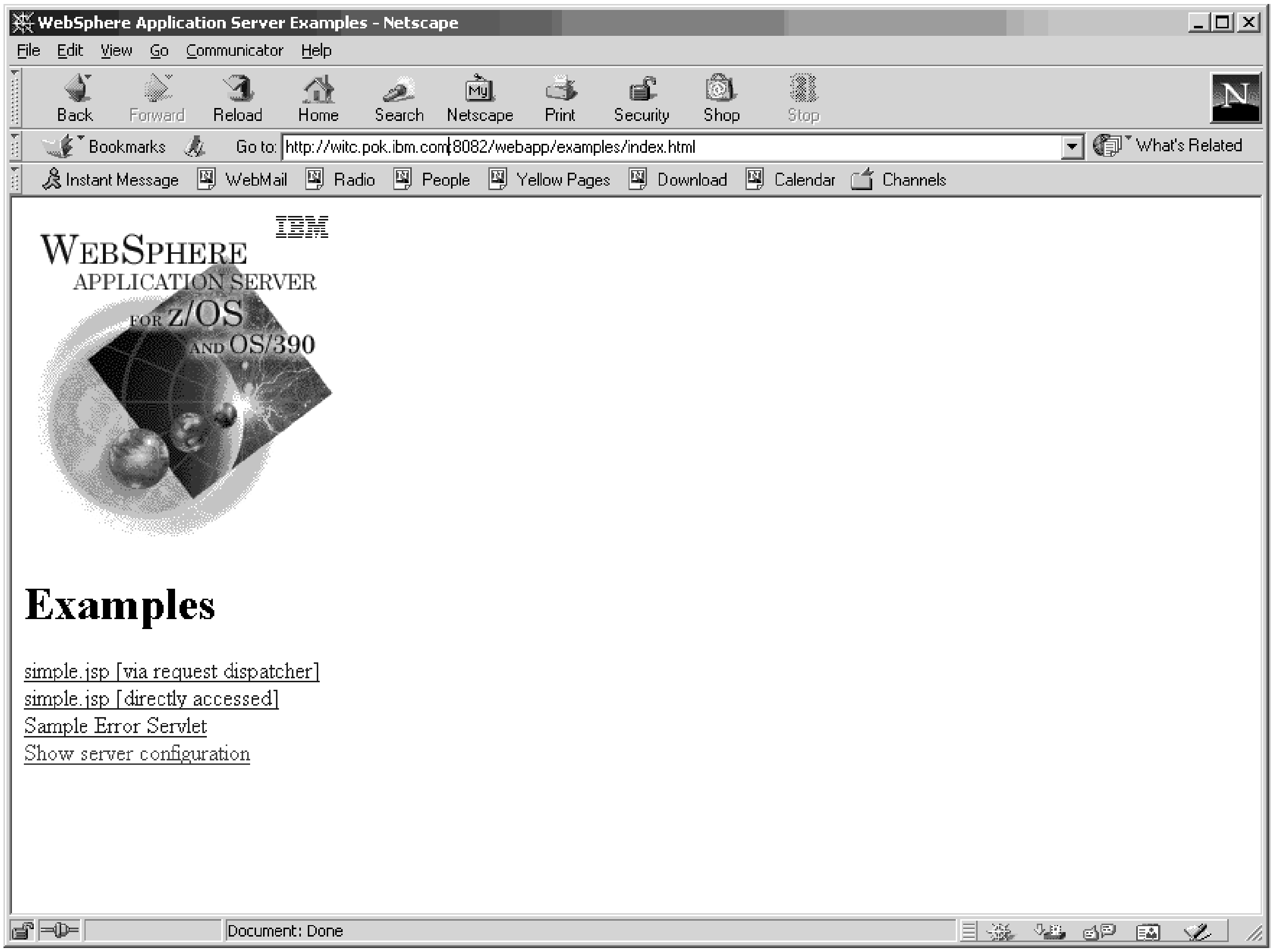
   ```
   http://host_name:host_port/webapp/examples/index.html
   ```

   where

   host_name
   Is the host.default_host.alias from the webcontainer.conf file.

   host_port
   Is the port at which the HTTP server listens for the IVP

   Result: If the WebSphereSampleApp IVP is successfully installed, you should see the following Web page:



Go to: http://witc.pok.ibm.com:8082/webapp/examples/index.html

Examples

simple.jsp [via request dispatcher]
simple.jsp [directly accessed]
Sample Error Servlet
Show server configuration

Document: Done

2. From your workstation Web browser, enter the following URL:

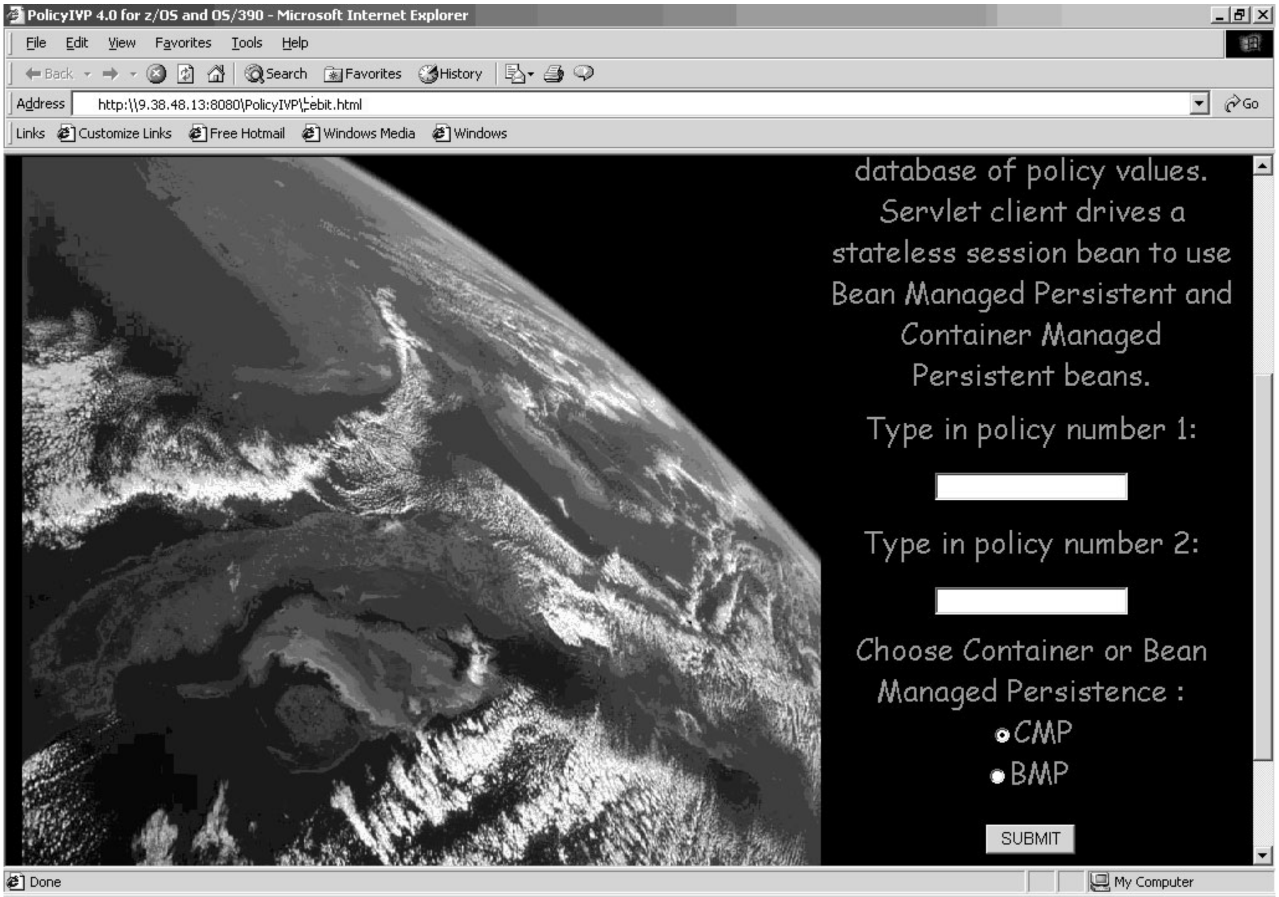
   ```
   http://host_name:host_port/PolicyIVP/cebit.html
   ```

   where

host_name
Is the host.default_host.alias from the webcontainer.conf file.

host_port
Is the port at which the HTTP server listens for the IVP

Result: You see a page like this:


PolicyIVP 4.0 for z/OS and OS/390 - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites History
Links Customize Links Free Hotmail Windows Media Windows
Go
Done
My Computer

Address http:\\9.38.48.13:8080\PolicyIVP\cebit.html

database of policy values. Servlet client drives a stateless session bean to use Bean Managed Persistent and Container Managed Persistent beans.

Type in policy number 1:

Type in policy number 2:

Choose Container or Bean Managed Persistence :

● CMP

○ BMP

SUBMIT

---

3. On the servlet page:
   a. Type 1111 in the field labelled `Type in policy number 1`.
   b. Type 7777 in the field labelled `Type in policy number 2`.
   c. Click BMP, then Submit.

   Result: You should see a page with the words “BMP IVP has completed successfully.”.

---

4. From your workstation Web browser, enter the following URL:

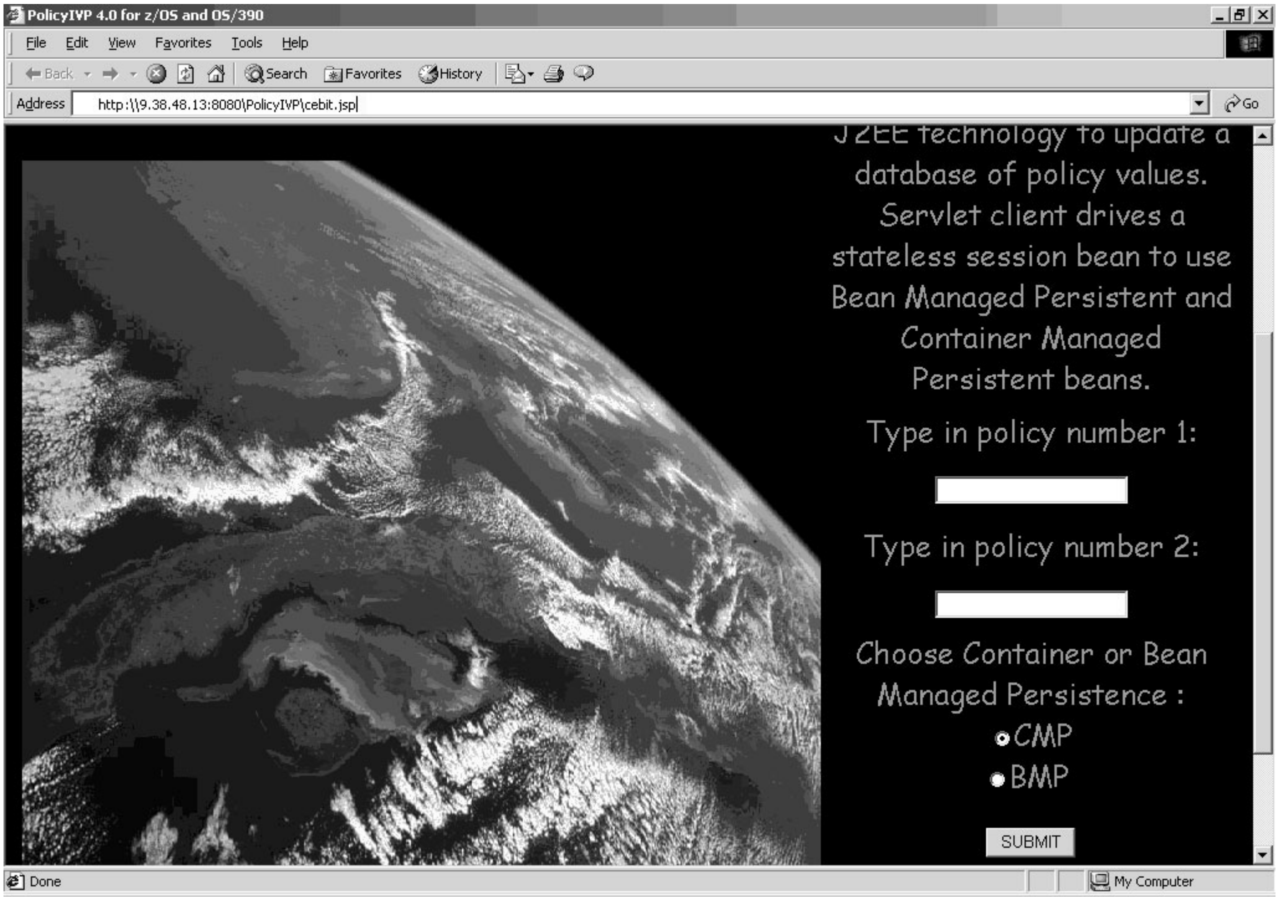
   ```
   http://host_name:host_port/PolicyIVP/cebit.jsp
   ```

   where

   host_name
   Is the host.default_host.alias from the webcontainer.conf file.

host_port
Is the port at which the HTTP server listens for the IVP

Result: You see a page like this:


PolicyIVP 4.0 for z/OS and OS/390
File Edit View Favorites Tools Help
Back Search Favorites History
Address http:\\9.38.48.13:8080\PolicyIVP\cebit.jsp
Go
Done
My Computer

J2EE technology to update a database of policy values. Servlet client drives a stateless session bean to use Bean Managed Persistent and Container Managed Persistent beans.

Type in policy number 1:

Type in policy number 2:

Choose Container or Bean Managed Persistence :

○ CMP

● BMP

SUBMIT

---

5. On the jsp page:
   a. Type 2222 in the field labelled `Type in policy number 1`.
   b. Type 8888 in the field labelled `Type in policy number 2`.
   c. Click CMP, then Submit.

   Result: You should see a page with the words “CMP IVP has completed successfully.”.

---

6. As a clean-up step, edit the jvm.properties file you created in the control file directory and delete or comment out the com.ibm.ws390.trace.settings environment variable.

You are done when you receive the success messages and do the clean-up step.

Steps for running the BBOIVP (MOFW) installation verification program (IVP)

These instructions explain how to run the BBOIVP (MOFW) installation verification program. You can find the sample source used for the IVP in the `usr/lpp/WebSphere/samples/PolicyIVP` directory in the file system after SMP/E installation is complete. This sample runs a C++ program, followed by a Java program.

Before you begin: You need the BBOIVP job customized by the customization dialog. The job is in *hlq*.CNTL, where *hlq* is the high-level qualifier you specified for the .CNTL and .DATA target datasets in the customization dialog.

Perform these steps to set up the IVP and run it:

1. If you have not already started the LDAP server, do so now.

   Example:

   ```
   S BBOLDAP
   ```

   Result: Wait for the following message:

   ```
   GLD0122I Slapd is ready for requests
   ```

2. Start the BBOASR1A server instance:

   ```
   s bboasr1.bboasr1a
   ```

   Wait until BBOASR1A fully initializes and you see the following message on the console:

   ```
   BBOU0695I Naming registration completed for server BBOASR1
   ```

   Note: Any administration using the Administration application or System Management Scripting API during server startup and naming registration may cause problems.

3. Copy the environment file for the BBOASR1A server instance (`*targetdir*/controlinfo/envfile/*SYSPLEX*/BBOASR1A/current.env`) to the directory you specified in the customization dialog as the location of the IVP shell script (the default is `/tmp`). The environment file will become the environment file for the IVP client run by the BBOIVP job.

   For details on the environment variables, see Appendix A, "Environment files," on page 321.

4. Change the file permissions of the file you just copied so that everyone can read the environment file.

   Example:

   ```
   chmod 755 /tmp/current.env
   ```

5. Edit your copy of BBOIVP. On the JOB statement, change the user ID to correspond to the user ID you chose to run the CORBA IVP in the customization dialog (the default is CBIVP).

6. Run the client IVP program by submitting BBOIVP.

You know you are done when you see the following messages in the SYSPRINT output files from the IVP client: the first for the C++ business objects, the second for the Java business objects, and the third for the Java client.

```
All tests completed successfully
All tests completed successfully
Java Client test complete and successful
```

Congratulations

The WebSphere for z/OS installation and customization is now complete. You may now wish to do certain post-installation tasks. See Chapter 4, "Performing post-installation tasks," on page 183.

Chapter supplement

This section provides a general reference for operations and jobs you might need during the installation.

Steps for cold-starting RRS

Perform the following steps to cold-start RRS:

1. Shut down WebSphere for z/OS (if running) and DB2.

2. Shut down RRS using the `SETRRS CANCEL` command.

3. Delete and redefine the RRS resource manager data logstream (RM.DATA) using the same attributes you used to create it.

   Note: See member ATRCOLD in SYS1.SAMPLIB for a sample jobstream.

4. Start RRS using the `S ATRRRS,SUB=MSTR` command.

You know you are done when the job completes successfully.

Steps for checking the contents of the name space

Before you begin: You must have an LDAP server installed.

Perform the following steps to check the contents of the name space.

1. Start the LDAP server.

   Example:

   ```
   S BBOLDAP
   ```

   The message “Starting slapd” will appear on the operator′s console, and a message such as “Listening on 0” will appear in the SLAPDOUT data set defined in the job.

2. Check the job output for the words `done with initial namespace`.

3. Create a CLIST to search the contents of LDAP (for example, BOSS.SLAPD.CLIST(BBOLSRCH)). Put the following in the CLIST:

   ```
   /* REXX */
   queue('GLDSRCH  -h 127.0.0.1 -p 1389 -b "o=BOSS,c=US"  "objectclass=*"')
   queue('GLDSRCH  -h 127.0.0.1 -p 1389 -b "o=WASNaming,c=US"  "objectclass=*"')
   ```

4. Execute the CLIST.

   Example: Use ISPF Option 6 to view contents of LDAP by entering:

   ```
   ex 'boss.slapd.clist(bbolsrch)'
   ```

   There will be several screens of output.

You know you are done when you see the screen output from the CLIST.

Steps for deleting LDAP entries

If the Naming client job fails during installation and customization, use this procedure to recover.

Due to the structure of the Interface Repository name space, you cannot use this procedure to delete Interface Repository entries.

Attention: After installation and customization is complete, do not use this procedure to recover LDAP tables for Naming or Interface Repository servers unless absolutely necessary. Using this procedure after installation and customization would require that you re-customize WebSphere for z/OS (that is, do a cold start). Use normal backup and data migration procedures for the LDAP tables.

Before you begin: You need the SDELETE module. You will find the SDELETE module in BBO.SBBOLOAD(BBOLSDEL). For more information about SDELETE, see *z/OS Security Server LDAP Server Administration and Use*, SC24-5923.

You must have an LDAP server installed.

To delete the entries:

1. Start the LDAP server.

   Example:

   ```
   S BBOLDAP
   ```

2. Create a CLIST to delete the LDAP entries (for example, BOSS.SLAPD.CLIST(BBOLSDEL)). Put the following in the CLIST:

   ```
   /* REXX */
   queue('sdelete -h 127.0.0.1 -p 1389 -D "cn=admin,cn=localhost" -w secret
   "TypelessRDN=/,o=BOSS,c=US"')
   ```

3. Execute the CLIST.

   Example: Use ISPF Option 6 to run the CLIST by entering:

   ```
   ex 'boss.slapd.clist(bbolsdel)'
   ```

4. If running BBOLSDEL is unsuccessful:
   a. Drop the LDAP table using BBOLDTBD.
   b. Recreate the LDAP table using BBOLDTBC.
   c. Rerun the bind jobs, BBO1JCL and BBO2JCL.
   d. Rerun the GRANT jobs, BBOCBGRT and BBOLDGRT.
   e. Rerun the LDAP bulk loader (sample BBOLD2DB).

You are done when BBOLD2DB runs successfully.

Handling workload management and server failures

During operations, if your application fails repeatedly, causing the application server regions to terminate, workload management may terminate the application environment for the application. WebSphere for z/OS issues the following message if it tries to use a failed application environment:

```
BBOU199E Unable to schedule work.  WLM application environment applenv has
         stopped.
```

You must fix the problem with your application, then restart the application environment with the RESUME option on the VARY WLM command.

Steps for checking and starting the workload management application environment

Perform these steps to check and start the workload management application environment:

1. To display the application environment, issue:

   ```
   d wlm,applenv=*
   ```

   ____

2. To start the application environment, issue:

   ```
   v wlm,applenv=environment_name,resume
   ```

   where **environment_name** is the application environment name.

   ____

You know you are done when a re-display of the application environment shows it is available.

Steps for changing any item in the active conversation

Before you begin: Before you create a new conversation, it is strongly recommended that you delete all old conversations. Refer to “Managing DB2 space occupied by SM tables” on page 180 for more information. Also make sure you complete all previous instructions in this section.

Perform these steps to change any item in the active conversation (the one that is currently active on your system):

1. Start a new conversation. See “Steps for starting a new conversation” on page 107 for more information.

   ____

2. Make whatever changes you want to make (e.g. deploying a new application or adding a server).

   If the changes are adding items, that also adds more information into the DB2 tables.

   ____

3. Activate the modified conversation, which makes it the active conversation. See “Steps for activating your new conversation” on page 129 for more information.

   Only one conversation can be active at a time, so the previous active conversation becomes a ″replaced conversation″ when the new conversation is activated.

   ____

You know you are done when the active conversation is the one bearing your modifications.

A ″replaced conversation,″ which can never be modified or reactivated, stays on the system until you manually delete it. It is of obvious limited use—mainly there just to see how things were previously set up. All the information about the conversation is still in the DB2 tables, however, so, if you never delete replaced conversations, the DB2 tables can eventually become very large.

Managing DB2 space occupied by SM tables

Steps for determining the DB2 space currently occupied by the SM tables

To determine the DB2 space currently occupied by the SM tables:

1. Determine the names of the ″BLOB″ tables associated with key SM tables.

   Example: SQL statement to display names/sizes of ″BLOB″ tables associated with key SM tables (these are the tables most likely to get large):

   ```
   SELECT Y.TBNAME,
          X.TSNAME,
          Z.PQTY,
          Z.SECQTYI,
          Z.SPACE,
          Z.EXTENTS,
          Z.STATSTIME
   FROM SYSIBM.SYSTABLES X,
        SYSIBM.SYSAUXRELS Y,
        SYSIBM.SYSTABLEPART Z
   WHERE X.NAME = Y.AUXTBNAME
     AND X.TSNAME = Z.TSNAME
     AND Y.TBNAME IN ('BBOMT80_J2EEAPP',
                      'BBOMT81_MODULE',
                      'BBOMT82_COMPONENT',
                      'BBOMT83_METHOD')  ;
   ```

2. Use RUNSTATS to gather size data for SM tables

   Example: Sample JCL to perform RUNSTATS for SM tables

   Replace the ″????????″ in the first five statements with the TSNAME values from Step 1. These are generated names and will likely contain special characters (for example, L1$M@NJV).

   ```
   //IBMUSERA JOB (ACCOUNT),'NAME',NOTIFY=IBMUSER
   //*
   //UTIL EXEC DSNUPROC,SYSTEM=DB2,UID='TEMP',UTPROC=''
   //DSNUPROC.SYSIN    DD  *
   RUNSTATS TABLESPACE BBOMDB01.????????  ;
   RUNSTATS TABLESPACE BBOMDB01.????????  ;
   RUNSTATS TABLESPACE BBOMDB01.????????  ;
   RUNSTATS TABLESPACE BBOMDB01.????????  ;
   RUNSTATS TABLESPACE BBOMDB01.????????  ;
   RUNSTATS TABLESPACE BBOMDB01.BBOMS00   ;
   RUNSTATS TABLESPACE BBOMDB01.BBOMS02   ;
   RUNSTATS TABLESPACE BBOMDB01.BBOMS04   ;
   RUNSTATS TABLESPACE BBOMDB01.BBOMS06   ;
   RUNSTATS TABLESPACE BBOMDB01.BBOMS10   ;
   RUNSTATS TABLESPACE BBOMDB01.BBOMS15   ;
   RUNSTATS TABLESPACE BBOMDB01.BBOMS19   ;
   RUNSTATS TABLESPACE BBOMDB01.BBOMS23   ;
   RUNSTATS TABLESPACE BBOMDB01.BBOMS25   ;
   RUNSTATS TABLESPACE BBOMDB01.BBOMS27   ;
   RUNSTATS TABLESPACE BBOMDB01.BBOMS29   ;
   RUNSTATS TABLESPACE BBOMDB01.BBOMS31   ;
   RUNSTATS TABLESPACE BBOMDB01.BBOMS33   ;
   RUNSTATS TABLESPACE BBOMDB01.BBOMS35   ;
   RUNSTATS TABLESPACE BBOMDB01.BBOMS37   ;
   RUNSTATS TABLESPACE BBOMDB01.BBOMS39   ;
   RUNSTATS TABLESPACE BBOMDB01.BBOMS41   ;
   RUNSTATS TABLESPACE BBOMDB01.BBOMS43   ;
   RUNSTATS TABLESPACE BBOMDB01.BBOMS45   ;
   RUNSTATS TABLESPACE BBOMDB01.BBOMS48   ;
   ```

```
RUNSTATS TABLESPACE BBOMDB01.BBOMS51   ;
RUNSTATS TABLESPACE BBOMDB01.BBOMS52   ;
RUNSTATS TABLESPACE BBOMDB01.BBOMS53   ;
RUNSTATS TABLESPACE BBOMDB01.BBOMS54   ;
RUNSTATS TABLESPACE BBOMDB01.BBOMS56   ;
RUNSTATS TABLESPACE BBOMDB01.BBOMS58   ;
RUNSTATS TABLESPACE BBOMDB01.BBOMS60   ;
RUNSTATS TABLESPACE BBOMDB01.BBOMS62   ;
RUNSTATS TABLESPACE BBOMDB01.BBOMS64   ;
RUNSTATS TABLESPACE BBOMDB01.BBOMS66   ;
RUNSTATS TABLESPACE BBOMDB01.BBOMS68   ;
RUNSTATS TABLESPACE BBOMDB01.BBOMS70   ;
RUNSTATS TABLESPACE BBOMDB01.BBOMS72   ;
RUNSTATS TABLESPACE BBOMDB01.BBOMS74   ;
RUNSTATS TABLESPACE BBOMDB01.BBOMS76   ;
RUNSTATS TABLESPACE BBOMDB01.BBOMS80   ;
RUNSTATS TABLESPACE BBOMDB01.BBOMS81   ;
RUNSTATS TABLESPACE BBOMDB01.BBOMS82   ;
RUNSTATS TABLESPACE BBOMDB01.BBOMS83   ;
RUNSTATS TABLESPACE BBOMDB01.BBOMS84   ;
RUNSTATS TABLESPACE BBOMDB01.BBOMS85   ;
RUNSTATS TABLESPACE BBOMDB01.BBOMS86   ;
RUNSTATS TABLESPACE BBOMDB01.BBOMS87   ;
RUNSTATS TABLESPACE BBOMDB01.BBOMS90   ;
```

3. Display the size statistics for key SM DB2 ″BLOB″ tables by rerunning the SELECT statement in Step 1. After RUNSTATS, it will show valid statistics.

4. Display the size statistics for standard SM DB2 tables using the following SELECT statement.

   Note: RUNSTATS must be run before doing this to get correct values.

   Example: SQL statement to display sizes of SM tables (most will never get very large, but it is probably easiest to just look at them all.)

```
SELECT X.NAME,
       Z.TSNAME,
       Z.PQTY,
       Z.SECQTYI,
       Z.SPACE,
       Z.EXTENTS,
       Z.STATSTIME
FROM SYSIBM.SYSTABLES X,
     SYSIBM.SYSTABLEPART Z
WHERE X.TSNAME = Z.TSNAME
  AND X.TSNAME LIKE 'BBOMS%';
```

You are done when all the desired size statistics are displayed.

Note: If your tables turn out to be larger than expected, see “Steps for managing large DB2 tables” on page 181 to reduce their size and protect them from reaching their maximum. If, however, the tables are already at their maximum, see “Steps for managing DB2 tables at their maximum” on page 182.

Steps for managing large DB2 tables

If you notice that your DB2 tables are getting too big, there are two main things that you can do to ensure they don’t reach the maximum:

1. Delete any conversations you don’t need, because that will remove information from the DB2 tables and free up space.

2. Increase the secondary extent size (SECQTY) for any tables that have expanded to more than 10 extents and which you expect will continue to grow. Doing this will mean it takes longer to reach the maximum number of extents—because each newly allocated extent is larger, it will hold more and you won't need to allocate more extents as often. This won't change the existing allocations, but will make any future added extents larger, so the number of extents won't grow as quickly.

   Note: Make sure you first follow the steps in "Steps for determining the DB2 space currently occupied by the SM tables" on page 180.

   Example: Here is an SQL statement you can use to alter the secondary extent size for SM tables or ″BLOB″ tables:

   ```
   ALTER TABLESPACE BBOMDB01.tsname  SECQTY  SizeInK
   ```

   - ″tsname″ is the table space name shown in the TSNAME column of the display output.
   - ″SizeInK″ is the desired new secondary extent size in K (kilobytes).

   Note: The display output PRIQTY and SECQTY values are the number of 4K blocks allocated, but when doing the ALTER command shown, you must specify the value in K. So, for example, if the current SECQTY shown in the display output is 100, that means there are 100 4K blocks or 400K. To make the extent larger, you must specify a number larger than 400 on the ALTER command (for example, 800 to request 200 4K blocks).

You are done when the ALTER command has completed successfully. To verify this, rerun the SELECT statement in step 1 or step 4 (depending on which table you altered) to see that the new SECQTY value is set.

Steps for managing DB2 tables at their maximum

If your DB2 table is at its maximum and reducing its size doesn't work, try the following:

1. Do a ″prepare for cold start.″ This makes a copy of everything necessary to restore the conversations. See "Cold start" on page 308 for more information.
2. Redefine the DB2 tables with larger primary/secondary extent sizes.
3. Do a ″cold start″ to reload the DB2 tables. See "Cold start" on page 308 for more information.

You are done when your system is back up and the DB2 tables are no longer at their maximum.

Note: A coldstart costs you a fairly significant outage, so it is not a desirable option for most customers. The best thing to do is make sure your DB2 tables never reach their maximum in the first place.

Chapter 4. Performing post-installation tasks

This chapter covers topics and tasks that can occur after you have installed WebSphere for z/OS. Topics include:

- Guidelines for backing up your system
- Updating the LDAP access control list
- Product service
- Setting up RACF protection for DB2
- Setting up automation and automatic restart management

Guidelines for backup of the WebSphere for z/OS system

Use the following guidelines to back up parts of your WebSphere for z/OS system:

1. Be sure to back up the RMDATA log for RRS. Otherwise, a failure could force you to do a cold start of RRS.
2. Set the ARCHIVE log retention period to one day.
3. Follow your own backup procedures to back up the LDAP database that contains naming and interface repository data and the JNDI name space.

   If you restore LDAP data, be sure to coordinate the restoration with other WebSphere systems in the federated naming space. Otherwise, your naming space will not be consistent.
4. Incorporate the following in your normal backup procedures:
   - WebSphere for z/OS proclibs
   - WebSphere for z/OS loadlibs
   - The directory where WebSphere for z/OS run-time information is written (the value of the CBCONFIG environment variable; the default is `/WebSphere390/CB390`).
5. Back up your own application executables, databases, and bindings.
6. When you activate a conversation, System Management automatically backs up the current environment files for each server instance in `/`*`path`*`/envfile/`*`sysplex`*`/`*`server_instance`*`/backup/`, where

   path
   Is the value of the CBCONFIG environment variable (default is `/WebSphere390/CB390`).

   sysplex
   Is the name of your sysplex.

   server_instance
   Is the name of the server instance.

   The backup files have a time stamp in their names. You may wish to erase the older backup files as the backup directory fills up.
7. If you wish to back up a single server instance, you can use the export/import function in the Administration application. For details on how to do this, see *WebSphere Application Server V4.0.1 for z/OS and OS/390: Assembling J2EE Applications*, SA22-7836.
8. Follow your own backup procedures to back up the WebSphere for z/OS database that contains system management, reference collection, and J2EE data.

Back up all table spaces created by jobs BBOMCRDB and BBOICD. Coordinate your backup of the WebSphere for z/OS database with the backup of the LDAP database, because it is very important that both be synchronized. If you restore the database, be sure to coordinate the restoration with that of the LDAP database.

Adding a new administrator for the Administration application

The default administrator for the Administration application is CBADMIN. If you want to add an administrator, you must perform the following tasks:

Subtask	Associated procedure (See . . .)
Creating an MVS user ID or using a current one **Note:** Give the new administrator user ID the same RACF authorizations as CBADMIN.	*z/OS TSO/E Administration*, SA22-7780, or *z/OS Security Server RACF Security Administrator's Guide*, SA22-7683
Updating the access control list for LDAP	"Steps for updating the access control list for LDAP"
Defining the new administrator to the Administration application	*WebSphere Application Server V4.0.1 for z/OS and OS/390: System Management User Interface*, SA22-7838
Granting the administrator user ID System Management database authority	"Step for granting the new administrator database authorities" on page 186

Steps for updating the access control list for LDAP

If you add an administrator for the Administration application, you must add that administrator to the access control list in LDAP.

Before you begin: You need to set up the LDAP server. We assume you have already set up an exclusive LDAP server for WebSphere for z/OS administrative purposes. For more information about setting up the LDAP server, see "DB2 database and LDAP" on page 39.

You also need the bboslapd.conf file currently in use by the LDAP server.

Perform the following steps to change the access control list for LDAP:

1. View the bboslapd.conf file and note the following:
   a. Administrator distinguished name.

      Example:
      ```
      adminDN       "cn=CBAdmin"
      ```
   b. Administrator password.

      Example:
      ```
      adminPW       mypass
      ```
   c. Root naming context (RDN) for the WebSphere for z/OS name space structure.

      Example:
      ```
      suffix        "o=BOSS,c=US"
      ```

2. Start the LDAP server:
   ```
   S BBOLDAP
   ```

3. Extract the current access control list.
   - If you are running z/OS 1.3 or earlier, extract the current access control list with the `ldapcp` command.

     Example:

     ```
     /u/myself-> ldapcp -p 1389 -h 127.0.0.1 -d "cn=CBAdmin" -w *****
     GLD6019I Communicating with server on port 1389.
     ldapcp> acl q ob "o=boss,c=us"
      object = o=boss,c=us
      aclSource = O=BOSS,C=US
      aclPropagate = TRUE

      acl = access-id:CBADMIN:object:ad:normal:rwsc

      acl = access-id:CBSYMCR1:object:ad:normal:rwsc

      acl = group:CN=ANYBODY:normal:rsc

      acl = access-id:CN=BOSSAdmin,O=BOSS,C=US:object:ad:normal:rwsc

     ldapcp>quit
     ```
   - If you are running z/OS 1.4, use the `ldapsearch` command.

     Example:

     ```
     ldapsearch -p 1389 -h 127.0.0.1 -D "cn=<adminid>" -w <password>
     -b "o=WASNaming,c=us" -s base "objectclass=*" aclEntry
     aclPropagate aclSource entryOwner ownerPropagate ownerSource
     ```

     where `<adminid>` is the value of the entry owner access id and `<password>` is the value of the userpassword value.

     Note: See Chapter 23 of Security Server LDAP Server Administration and Use, SC24-5923, for more information about the `ldapsearch` command.

4. Create a new file in your home directory (for example, acl_update.txt). Add these lines to the file:

   ```
   dn: o=boss, c=us
   changetype:modify
   replace:x
   ```

5. Following the first three lines you added to the file, add aclentry statements for each of the acl lines you extracted in step 3. Add a new aclentry statement for USER1.

   Notes:

   a. It is important to add the dash ('`-`') at the end.
   b. The output format of the ldapcp command is not the same as the input aclentry lines ("`acl=`" must change to "`aclentry:`", for example).
   c. The `aclentry` for USER1 in the RDBM example gives USER1 the same authority as CBADMIN.

   Example: The following are examples of aclentry statements you should use if your backend is RDBM.

   ```
   aclentry: access-id:cn=BOSSAdmin, o=boss, c=us:normal:rwsc:object:ad
   aclentry: access-id:USER1:normal:rwsc:object:ad
   aclentry: access-id:CBADMIN:normal:rwsc:object:ad
   aclentry: access-id:CBSYMCR1:normal:rwsc:object:ad
   aclentry: group:CN=ANYBODY:normal:rsc
   -
   ```

Example: The following are examples of aclentry statements you should use if your backend is TDBM.

```
aclentry: group:CN=ANYBODY:normal:rsc
aclentry: access-id:racfid=CBSYMCR1,profiletype=user,o=WASLRAC:normal:rwsc:sensitive:rwsc:critica
aclentry: access-id:racfid=CBADMIN,profiletype=user,o=WASLRAC:normal:rwsc:sensitive:rwsc:critical
```

6. Save the update file and issue the following `ldapmodify` command:

   ```
   u/myself-> ldapmodify -v -p 1389 -D "cn=CBAdmin,o=BOSS,c=US" -w mypass -f acl_update.txt
   ```

   Result: ldapmodify responds with:

   ```
   modifying entry o=BOSS, c=US
   ```

7. Repeat step 3 on page 185 to verify that you have added a new user to the access control list.

You know you are done when you see the new user in the access control list.

Step for granting the new administrator database authorities

Your new administrator requires execute authority for `CBSYSMGT_PKG` and select, update, insert, and delete authority for the tables required for an administrator to deploy a J2EE application in the system management database.

Before you begin: You need to have a user ID with DB2 for OS/390 SYSADM authority.

Perform the following step to grant the new administrator database authorities.

Issue the following DB2 commands:

```
GRANT EXECUTE ON PACKAGE CBSYSMGT_PKG.*    TO user_ID

GRANT SELECT,UPDATE,INSERT,DELETE ON TABLE
BBO.BBOMT80_J2EEAPP TO user_ID;

GRANT SELECT,UPDATE,INSERT,DELETE ON TABLE
BBO.BBOMT81_MODULE TO user_ID;

GRANT SELECT,UPDATE,INSERT,DELETE ON TABLE
BBO.BBOMT82_COMPONENT TO user_ID;

GRANT SELECT,UPDATE,INSERT,DELETE ON TABLE
BBO.BBOMT83_METHOD TO user_ID;

GRANT SELECT,UPDATE,INSERT,DELETE ON TABLE
BBO.BBOMT86_DATASI TO user_ID;

GRANT SELECT,UPDATE,INSERT,DELETE ON TABLE
BBO.BBOMT87_COMP_DS TO user_ID;
```

where *`user_ID`* is the administrator user ID you defined.

You know you are done when the GRANT commands succeed.

Overview of product service

Contact the IBM Software Support Center for information about preventive service planning (PSP) upgrades for WebSphere for z/OS. For more information about PSP upgrades, see *WebSphere Application Server V4.0.1 for z/OS and OS/390: Program Directory*, GI10-0680. Although the *Program Directory* contains a list of required PTFs, the most current information is available from the IBM Software Support Center.

When applying service to WebSphere for z/OS, make copies of the product data sets and HFS, and apply maintenance to the copies. When you are ready to put the maintenance into production, the process is:

Stage	Description
1	Stop the application servers and the WebSphere for z/OS Daemon.
2	Switch to the newly-serviced WebSphere for z/OS product data sets. You can do this by • Renaming the new data sets to replace the old ones • Re-cataloging product data sets, if the names are identical, or • Changing WebSphere for z/OS cataloged procedures to refer explicitly to the new data sets. Make sure the MVS link list and APF list refer to the newly-serviced data sets.
3	If the WebSphere for z/OS run time is loaded into the link pack area, delete the old modules and load the new ones, or IPL the system to load the new modules into the LPA.
4	Verify that the newly-serviced HFS data sets are correctly mounted.
5	Perform any other migration actions (such as DB2 binds) as instructed in PTF or APAR cover letters.
6	Start the Daemon and application servers.

Setting up RACF protection for DB2

You can use the RACF DSNR resource class to protect DB2 resources. This helps you centralize security management. This section gives you pointers to general information about setting up RACF protection for DB2 and specific information about the resources, groups, user IDs, and permissions used by WebSphere for z/OS.

There are three functional areas in RACF to consider regarding protection for DB2:

- The RACF DSNR class controls access to the DB2 subsystems. If the DSNR class is active, then WebSphere for z/OS control regions and server regions need access to the *db2_ssn*.RRSAF profiles, where *db2_ssn* is your DB2 subsystem name. If a control region or server region does not have access, then that region will not initialize.
- DB2 identification and signon exits (DSN3@ATH and DSN3@SGN) assign authorization IDs. If you want to use secondary authorization IDs (RACF group names), then you must replace the default exits with these two sample routines. For details on how to install these sample routines, see *DB2 Administration Guide*, SC26-9931.
- WebSphere for z/OS does not support the protection of DB2 objects through the DSNX@XAC exit. To protect DB2 objects, you must use GRANT statements.

We provide a commented section in sample BBOCBRAC that uses the required RACF commands to protect DB2 resources used by WebSphere for z/OS. You can use the sample RACF commands to authorize the WebSphere for z/OS run time or model authorization for your application servers. The sample:

- Defines a DSNR class profile *db2_ssn*.RRSAF, where *db2_ssn* is your DB2 subsystem name.

  Note: For a sysplex, you must define *db2_ssn*.RRSAF class profiles for each DB2 subsystem in the sysplex using their unique subsystem names.
- Gives READ authority to the *db2_ssn*.RRSAF class profile to the following:
  – The Daemon control region
  – The System Management Server control region
  – Every server region

The following table shows the subtasks and associated procedures for setting up RACF protection for DB2 as required by WebSphere for z/OS.

Subtask	**Associated procedure (See . . .)**
Adding entries to the RACF router table	*DB2 Administration Guide*, SC26-9931
Installing identification and signon exits (DSN3@ATH and DSN3@SGN)	*DB2 Administration Guide*, SC26-9931
Defining RACF user IDs for DB2 started tasks	*DB2 Administration Guide*, SC26-9931
Defining DB2 resources and authorizations required by WebSphere for z/OS in RACF	"Steps for defining DB2 authorizations in RACF"

Steps for defining DB2 authorizations in RACF

Before you begin: You must complete general tasks for enabling RACF protection for your DB2 system. This includes adding entries to the RACF router table, installing identification and signon exits, and defining RACF user IDs for DB2 started tasks. You must also have your copies of the BBOCBRAJ and BBOCBRAC samples provided with WebSphere for z/OS.

Perform the following steps to define DB2 resources and authorizations in RACF:

1. Edit the BBOCBRAC sample, copy the section labeled "DSNR PROFILES," then paste the section into a new file.
2. Remove the comment marks that surround the REXX and RACF commands. As shipped, the DSNR profile section is commented out.
3. Copy the BBOCBRAJ job to a new file.
4. Change the BBOCBRAC member name in BBOCBRAJ to your new member name that has the DSNR profile commands.
5. Submit the job from a user ID with RACF SPECIAL authority.

You know you are done when the job completes successfully.

Setting up automation and automatic restart management

This section discusses recommendations for automation. See “Restarting WebSphere for z/OS” on page 206 for the steps for setting up automatic restart management and rules and restrictions for changing the automatic restart management policies.

Recommendation for automation for WebSphere for z/OS and its applications

You need to decide whether to start WebSphere for z/OS servers automatically at system IPL and implement this decision in your system automation. The automation policies should initialize WebSphere for z/OS and associated functions in the correct order, which is:

1. System Logger
2. RRS
3. DB2
4. TCP/IP
5. LDAP (optional)
6. DCE (if used)
7. The Daemon Server, which automatically starts the System Management Server, Naming Server, and Interface Repository Server
8. Your business application servers

For more information about automating WebSphere for z/OS servers, see *WebSphere Application Server V4.0.1 for z/OS and OS/390: Operations and Administration*, SA22-7835.

Preparing DB2 to support SQLIDs on WebSphere for z/OS managed datasources

DB2 must be properly prepared to support SQLIDs on WebSphere for z/OS managed datasources.

Steps for preparing DB2 to support SQLIDs on WebSphere for z/OS managed datasources

Before you begin: See *WebSphere Application Server V4.0.1 for z/OS and OS/390: Assembling J2EE Applications*, SA22-7836 for an overview of SQLID for managed datasources.

Perform the following steps to prepare DB2 to support SQLIDs on WebSphere for z/OS managed datasources.

1. Configure DB2 to support secondary authorization IDs, which are enabled through a DB2 sign-on exit.

   Notes:

   a. The sample DB2 sign-on exit does this and can be used for this purpose.
   b. See *DB2 Administration Guide*, SC26-9931 for more information.

   ____

2. Define secondary authorization IDs through the security server (for example, RACF).

Notes:

a. This must be done by the administrator, once the DB2 sign-on exit is in place.

b. Secondary authorization IDs are actually group names. The security administration task is to define the group name, then connect it to the userid of the WebSphere for z/OS application server. If you don’t connect the group to the server’s userid, it doesn’t work.

You know you are done if you complete the two steps and don’t receive an SQLException.

Chapter 5. Performing advanced tasks

This section covers advanced tasks, such as sysplex setup, advanced TCP/IP setup, and procedural application adapter setup.

Enabling WebSphere for z/OS on a sysplex

Once you have installed the WebSphere for z/OS run time and associated business application servers on a monoplex, you can migrate the run time and associated application servers to a sysplex configuration. The benefits of migrating to a sysplex include:

- You can balance the workload across multiple systems, thus providing better performance management for your applications.
- As your workload grows, you can add new systems to meet demand, thus providing a scalable solution to your processing needs.
- By replicating the run time and associated business application servers, you provide the necessary system redundancy to assure availability for your users. Thus, in the event of a failure on one system, you have other systems available for work.
- You can upgrade WebSphere for z/OS from one release or service level to another without interrupting service to your users.

The following table shows the subtasks and associated procedures for enabling WebSphere for z/OS in a sysplex.

Subtask	Associated procedure (See . . .)
Setting up a sysplex	*z/OS MVS Setting Up a Sysplex*, SA22-7625
Making decisions about the WebSphere for z/OS configuration and sysplex	“Steps for planning WebSphere for z/OS and sysplex” on page 196
Preparing your security system	“Steps for preparing your security system” on page 197
Setting up data sharing	*DB2 Data Sharing: Planning and Administration*, SC26-9935 “Steps for setting up data sharing” on page 198
Customizing base z/OS or OS/390 functions on the other systems in the sysplex	“Steps for customizing base z/OS or OS/390 functions on the other systems in the sysplex” on page 198
Making changes to TCP/IP	“Steps for making changes to TCP/IP” on page 200
Setting up LDAP files for other systems in the sysplex	“Steps for setting up LDAP files for other systems in the sysplex” on page 201
Defining new WebSphere for z/OS clustered host instances in the sysplex	“Defining new WebSphere for z/OS clustered host instances in the sysplex” on page 202
Refreshing the WebSphere for z/OS systems	“Steps for restarting WebSphere for z/OS on another system in the sysplex” on page 205
Checking your configuration with the installation verification program	“Steps for running the installation verification program” on page 205

WebSphere for z/OS and the sysplex

Before you perform the procedures in this chapter, it is important for you to understand the following topics:

- The WebSphere for z/OS host cluster
- Setting up your sysplex for a rolling upgrade

Overview of the host cluster

To systems and application programs outside of the sysplex, the WebSphere for z/OS sysplex configuration appears to be a single system, even though there may be two or more physical systems within the sysplex. We call such a configuration a *host cluster*, and a single set of WebSphere for z/OS server instances within the host cluster we call a *clustered host instance*.

Example: Figure 7 on page 193 shows an example host cluster, in which each of the three z/OS or OS/390 systems in the sysplex support a WebSphere for z/OS clustered host instance. The triangle in the diagram represents the coupling facility linking the three z/OS or OS/390 systems together.

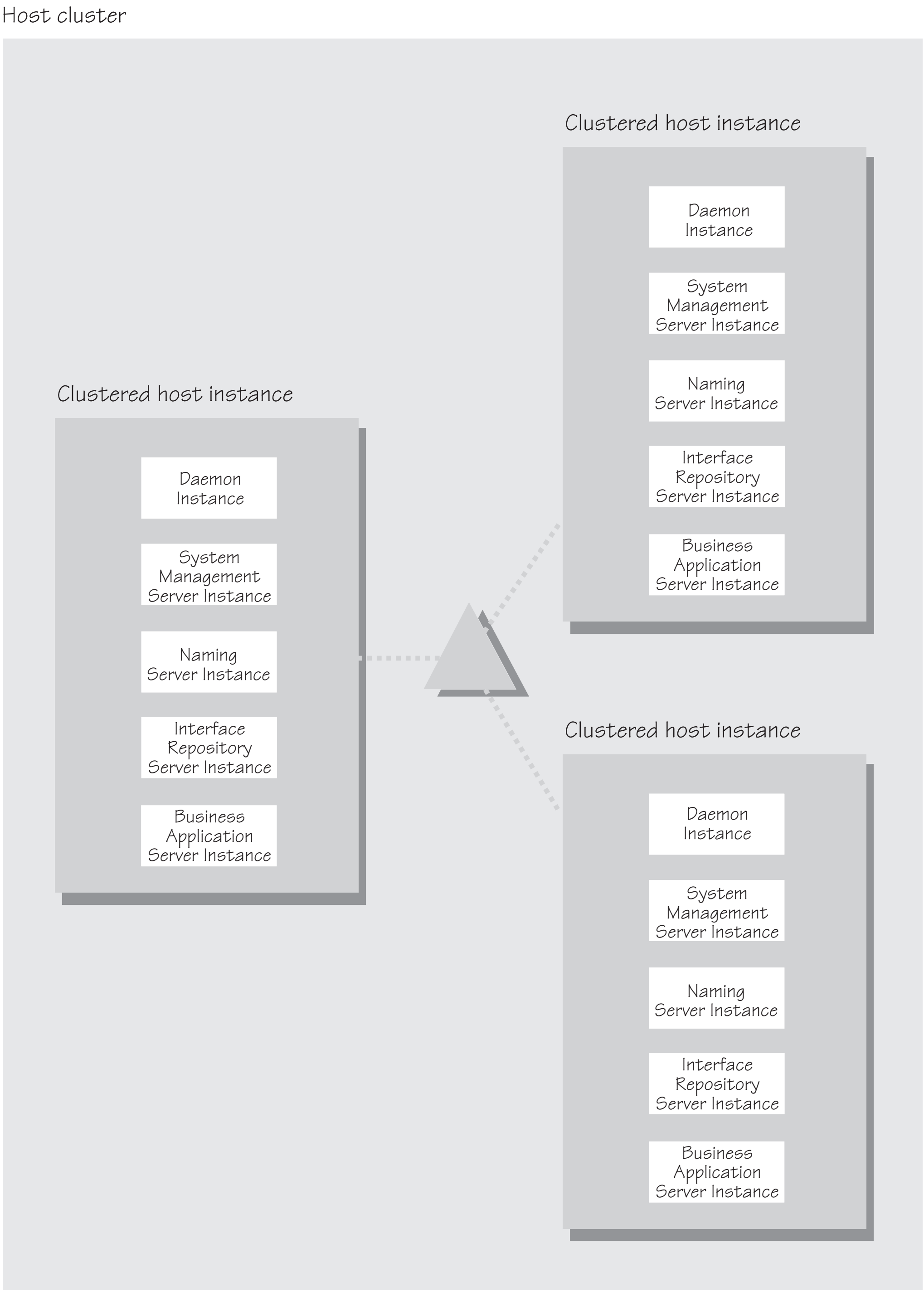

Host cluster
Clustered host instance
Daemon Instance
System Management Server Instance
Naming Server Instance
Interface Repository Server Instance
Business Application Server Instance
Clustered host instance
Daemon Instance
System Management Server Instance
Naming Server Instance
Interface Repository Server Instance
Business Application Server Instance
Clustered host instance
Daemon Instance
System Management Server Instance
Naming Server Instance
Interface Repository Server Instance
Business Application Server Instance

Figure 7. A host cluster

A host cluster is configured into the WebSphere for z/OS name space as a host and is represented by a single Daemon IP Name. Because there is a single Daemon IP Name, systems and applications outside the sysplex treat the sysplex as a single host. Functions in WebSphere for z/OS, in cooperation with subsystems in z/OS or OS/390, such as TCP/IP, the domain name server (DNS), and workload management, route work through the sysplex according to availability of server instances and workload balancing rules.

Overview of setting up your sysplex for a rolling upgrade

Setting up WebSphere for z/OS in a sysplex allows you to upgrade the system with release and service upgrades by following a method called the *rolling upgrade*. Through the rolling upgrade method, you upgrade the WebSphere for z/OS host cluster by upgrading each clustered host instance one at a time, allowing you to keep service to clients available while you do the upgrade. Availability of service continues because only one system is removed from the host cluster, allowing the other clustered host instances to keep running.

A rolling upgrade requires a special Hierarchical File System (HFS) structure. To understand this HFS structure, let us compare a conventional sysplex HFS structure to one using the rolling upgrade.

The conventional way to set up a sysplex is to create the following types of Hierarchical File Systems (HFSes) mounted at the sysplex root.

1. System-specific HFSes that contain directories and files unique to each system in the sysplex. Each system in the sysplex has its own HFS that contains directories such as /dev, /tmp, /var, and /etc.
2. Version-specific HFSes that contain system code and binaries shared by all systems in the sysplex. Typically, there is only one version-specific HFS per sysplex, which contains directories such as /bin, /usr, /lib, /opt, and /samples.

   Note: Because some of WebSphere for z/OS's code is in an HFS mounted off the /usr directory, and the /usr directory is in the version-specific HFS, all systems in the sysplex share the WebSphere for z/OS code.
3. Shared files systems, some of which are in read/write mode, such as /WebSphere390.

Figure 8 shows the structure of a conventional sysplex HFS.

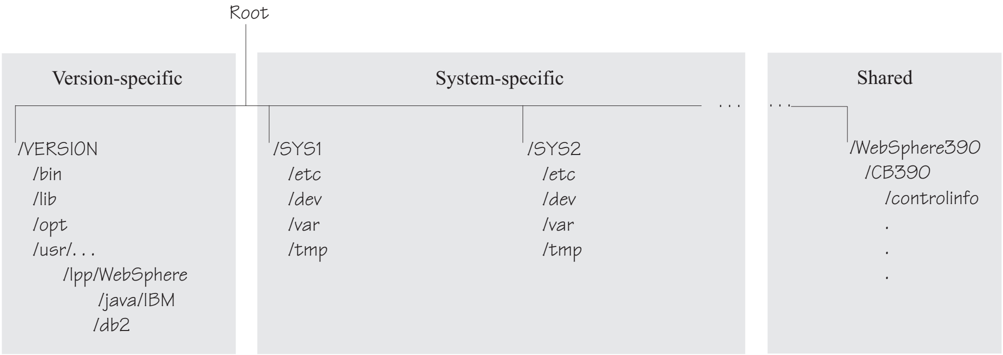


Figure 8. Conventional sysplex HFS structure

There are other important things to know about the sysplex environment:

1. Each system uses a special symbol, $VERSION, which is equal to a value chosen by the installation. This value is set either in the BBXPRMxx member of PARMLIB or through the SETOMVS command.
2. There are many symbolic links established in the sysplex environment. An important one for versioning is the symbolic link for /usr:

```
/usr --> $VERSION/usr
```

Through this symbolic link, a reference to a file in /usr resolves to a file in $VERSION/usr.

In the conventional sysplex environment, you would only have one version-specific HFS and all systems in the sysplex would share it. By contrast, the rolling upgrade method requires two mount points for version-specific HFSes. To take advantage of the rolling upgrade method, you must set up an additional version-specific HFS when you initially set up your sysplex. Then, when you need to upgrade WebSphere for z/OS, you have the necessary system infrastructure in place to do the upgrades.

Recommendation for the HFS structure: IBM recommends that you set up the sysplex root, WebSphere for z/OS mount points, and z/OS or OS/390 system mount points like Figure 9.

Note: For information about an alternate HFS structure you can use, see Appendix D, "Using an alternate HFS structure for product upgrades," on page 397.

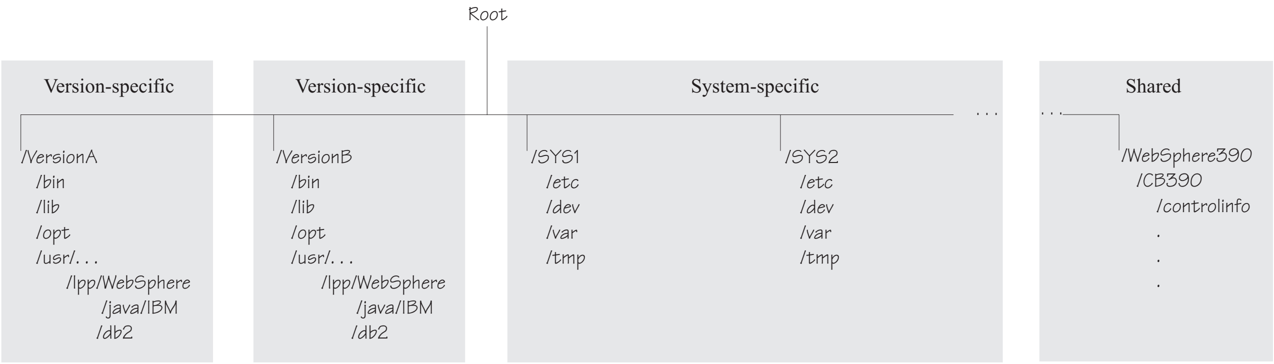


Figure 9. Mount points for rolling upgrade

In Figure 9, there are **two** mount points for version-specific HFSes. Each mount point corresponds to a specific code level of WebSphere for z/OS and associated Java and JDBC HFSes.

Figure 9 also shows system-specific directories (/SYS1 and /SYS2) for each z/OS or OS/390 system in the sysplex and a shared HFS (/WebSphere390).

For now, we will discuss only the first version-specific mount point. The second version-specific mount point becomes important when you need to make a code change for a release or maintenance level (more on that in Chapter 6, "Installing new releases and maintenance levels of WebSphere for z/OS," on page 305). When setting up WebSphere for z/OS in a sysplex initially, you would mount the current code level at the first version-specific mount point.

Example: Assume you have a version-specific HFS for one service level (PTF 10) mounted at /VersionA.

```
mount omvs.ptf10.was.hfs  at /VersionA/usr/lpp/WebSphere
mount omvs.ptf10.java.hfs at /VersionA/usr/lpp/java/IBM
mount omvs.ptf10.jdbc.hfs at /VersionA/usr/lpp/db2
```

The host cluster is running on code from the /VersionA mount point, the version-specific HFS for PTF10. That is, $VERSION on all systems in the sysplex is set to VersionA, so all references to /usr are actually resolved to /VersionA/usr through the symbolic link.

Steps for planning WebSphere for z/OS and sysplex

Once you have installed WebSphere for z/OS on a monoplex or on a single system in a sysplex, you can enable it on a sysplex. This topic covers planning steps for your sysplex deployment.

Before you begin: You should have completed the WebSphere for z/OS installation and customization on a monoplex or on a single system in a sysplex. Also, you must have enabled a z/OS or OS/390 sysplex. For more information on sysplex, see *z/OS MVS Setting Up a Sysplex*, SA22-7625.

Follow these steps to plan WebSphere for z/OS and sysplex:

1. Decide whether you want a single-system view of the error log. If you want a single-system view of the error log, and initially you set up the error log in the system logger and used DASD for logging, you must now configure the error log in the coupling facility.

   ____

2. You must establish some means of sharing an HFS in read/write mode across the sysplex. WebSphere for z/OS uses this HFS for writing environment files used by the server start procedures. (For more information, see Appendix A, “Environment files,” on page 321.) For z/OS or OS/390 Version 2 Release 8, you must use the Network File System. For z/OS or OS/390 Version 2 Release 9, you can choose either the Network File System or the shared HFS function.

   ____

3. Following z/OS or OS/390 recommendations, set up two version-specific mount points for maintenance, as exemplified in “Overview of setting up your sysplex for a rolling upgrade” on page 194. For more information about sysplex recommendations, see *z/OS Parallel Sysplex Test Report*, SA22-7663.

   ____

4. Decide how you will share application executables in the sysplex. For tips and recommendations, see *WebSphere Application Server V4.0.1 for z/OS and OS/390: Assembling J2EE Applications*, SA22-7836.

   ____

5. Set up ARM. This release does not support cross-system restart, so you must set up your ARM policy accordingly. Make sure you specify TARGET_SYSTEM for the system on which each element runs (if you take the default TARGET_SYSTEM=*, you get cross-system restart).

   ____

6. Decide whether you will run all the WebSphere for z/OS run-time servers on every system in the sysplex.

   Note: The Administration application automatically defines all WebSphere for z/OS run-time servers. Also, the Daemon starts all run-time servers when it initializes. You are allowed, following the recommendations and requirements in the following table, to cancel certain run-time servers after they initialize.

   Recommendations: The following table provides recommendations and requirements for running server instances in a sysplex.

Table 36. Running server instances in a sysplex

Server	Recommendations and requirements for running server instances in a sysplex
Daemon Server and System Management Server	• You must run both these server instances on each system in the sysplex in which you wish WebSphere for z/OS work to run. Thus, you may have some systems in your sysplex that do not run WebSphere for z/OS or WebSphere for z/OS applications at all. But, for those systems on which you want WebSphere for z/OS applications to run, you must have the Daemon and System Management server instances. • If a server indicates that PassTickets are desirable for interaction with a client, you must run the Daemon and System Management server instances on the system where the z/OS or OS/390 client resides.
Naming Server	• You must have at least one Naming server instance in the sysplex and it must be on the system where you do the WebSphere for z/OS bootstrap. • IBM strongly recommends you run the Naming server instance on each system in the sysplex. If you do not run the Naming server instance on all systems in the sysplex, we recommend you run it on at least one other system for availability. • If you use the rolling upgrade method to change code and functional levels of WebSphere for z/OS, you must run a Naming server on each system in the sysplex. That ensures a Naming server will always be available when you shut down a clustered host instance.
Interface Repository Server	• You must have at least one Interface Repository server instance and it must be on the system where you do the WebSphere for z/OS bootstrap. • You can run this server instance on other systems in the sysplex for availability. • If you have applications that do predicate evaluation queries, IBM recommends you run this server instance on every system in the sysplex.

Steps for preparing your security system

Before you begin: Read the background information about security in “Setting up security” on page 19.

Follow these steps to prepare your security system:

1. When you place WebSphere for z/OS on several systems in the sysplex, you must implement a shared RACF database. WebSphere for z/OS assumes that a user ID represents the same user identity on all systems in the sysplex.

2. Define each replicated control region and server region to have the same authorizations throughout the sysplex. You can accomplish this by using generic RACF profiles in the STARTED class and authorizing common user IDs to those profiles. For example, a BBOASR1* profile would cover all start procedures for the BBOASR1 server instances.

3. Define authentitcation mechanisms for sysplex interactions. The choices you have are:
   - PassTickets
   - Asserted identities
   - Kerberos
   - DCE

   For an example of how to make your choice, see "Example of choosing system security" on page 33.

You are done with setting up security on the sysplex.

Steps for setting up data sharing

Before you begin: You must have a coupling facility.

Perform the following steps to set up data sharing:

1. Set up DB2 data sharing. For details, see *DB2 Data Sharing: Planning and Administration*, SC26-9935.
2. You must have BP32K buffer pools in the coupling facility. Review the number of BP32K buffer pools you have and the size of your DSNDB07 database.

You know you are done when data sharing is functioning.

Steps for customizing base z/OS or OS/390 functions on the other systems in the sysplex

Repeat the same customizations to base z/OS or OS/390 functions that you did for your initial installation and customization of WebSphere for z/OS. The steps are repeated here for convenience.

Before you begin: You must have the WebSphere for z/OS product code installed through SMP/E and have created copies of the product sample files.

Perform the following steps to change the base system:

1. Change SCHEDxx to include the statements from the BBOSCHED sample file in BBO.SBBOJCL.
2. APF-authorize the BBO.SBBOLOAD, BBO.SBBOLD2, and BBO.SBBOLPA data sets.

   Example: Your PROGxx PARMLIB member could include:

```
APF FORMAT(DYNAMIC)
/*********************************************************************/
/* BOSS LOCAL DATASETS                                               */
/*********************************************************************/
APF ADD
    DSNAME(BBO.SBBOLOAD)
    VOLUME(vvvvvv)
APF ADD
    DSNAME(BBO.SBBOLD2)
    VOLUME(vvvvvv)
APF ADD
    DSNAME(BBO.SBBOLPA)
    VOLUME(vvvvvv)
```

where vvvvvv is your volume identifier.

3. Ensure that the Language Environment data set, SCEERUN, and the DB2 data set, SDSNLOAD, are authorized.

4. Do **not** APF-authorize BBO.SBBOULIB or SBBOMIG, because they should run under the authority of the client user.

5. Use the following table to place WebSphere for z/OS modules:

Table 37. Placing modules in LPA or link list

Modules	Notes
BBO.SBBOLPA	Load all members into the LPA.
BBO.SBBOLOAD	We recommend you dynamically load all members into the LPA. If your virtual storage is constrained, place the members in the link list.
BBO.SBBOMIG	You can put members into the link list or LPA.
BBO.SBBOLD2	Do **not** put members from SBBOLD2 in the LPA. Place these members in the link list.
BBO.SBBOULIB	Do **not** place these members in **either** the LPA or link list.

Rule: These data sets are PDSEs and cannot be added to members in LPALSTxx or IEALPAxx.

Recommendation: For automation, if you want to ensure WebSphere for z/OS modules are loaded into dynamic LPA and available after an IPL, create a new PROGxx member with the SETPROG LPA commands and invoke the PROGxx member from PARMLIB COMMNDxx.

Example:

```
SETPROG LPA,ADD,MASK=*,DSNAME=hlq.SBBOLOAD
SETPROG LPA,ADD,MASK=*,DSNAME=hlq.SBBOLPA
```

where *hlq* is the high-level qualifier for your WebSphere for z/OS data sets.
Note: If using SETPROG on a running system, be sure to purge modules with the same name as those from BBO.SBBOLPA, BBO.SBBOLOAD, or BBO.SBBOMIG that are already in the LPA.

Attention: Be sure that the size of your LPA can hold the WebSphere for z/OS modules. See "Recommendations for using memory" on page 46.

6. If you used a PROGxx file for APF authorizations or the LPA, be sure to issue:

```
SET PROG=xx
```

where xx is the suffix on your PROGxx member.

7. Make sure all the BBO.* data sets and all LDAP data sets are cataloged. While not required, this is highly recommended.

---

8. Update your SYS1.PARMLIB(BLSCUSER) member with the IPCS models supplied by member BBOIPCSP in BBO.SBBOJCL. For details in BLSCUSER, see *z/OS MVS IPCS User's Guide*, SA22-7596.

---

9. If you want to start SMF recording to collect system and job-related information on the WebSphere for z/OS system:
   a. Edit the SMFPRMxx parmlib member.
      1) Insert an 'ACTIVE' statement to indicate SMF recording.
      2) Insert a SYS statement to indicate the types of SMF records you want the system to create.

         Example: Use SYS(TYPE(120:120)) to select type 120 records only. Keep the number of selected record types small, to minimize the performance impact.
   b. To start writing records to DASD, issue the following command:

      ```
      t smf=xx
      ```

      Where xx is the suffix of the SMF parmlib member (SMFPRMxx). For more information about the SMF parmlib member, see *z/OS MVS System Management Facilities (SMF)*, SA22-7630.

      When you activate writing to DASD, the data is recorded in a data set (specified in SMFPRMxx).

   Note: Later, when you have installed the Administration application, you will enable the server to collect SMF records by defining properties on the server properties form. For more information about WebSphere for z/OS and its use of SMF recording, see *WebSphere Application Server V4.0.1 for z/OS and OS/390: Operations and Administration*, SA22-7835.

Steps for making changes to TCP/IP

Before you begin: You must have TCP/IP installed and configured.

Perform the following steps to make changes to TCP/IP

1. Change DNS entries. Assuming you use an implementation of the DNS that allows use of generic IP names that dynamically resolve to replicated server instances, you must adjust the IP names in your DNS. Keep the generic IP name of the Daemon, but add a new IP name for the second and subsequent Daemon server instances. This is important not only for workload balancing, but in the event of a server instance failure: the DNS can direct work to other server instances.

   For more information, see "Connection optimization" on page 212 and "IBM Network Dispatcher" on page 213.

---

2. In the TCP/IP profile for each additional system in the sysplex, add port 900 for the resolve IP port and associate it with a new System Management server instance name. By default, WebSphere for z/OS named the first System Management server instance SYSMGT01, and increments the suffix on that

name for each new System Management server instance (SYSMGT02, SYSMGT03, and so forth). Thus, on your second system in the sysplex, add port 900 and associate it with SYSMGT02.

Example:

```
900   TCP     SYSMGT02
```

Follow the same pattern for your third and subsequent systems in the sysplex.

3. In the TCP/IP profile for each additional system in the sysplex, add a port for the Daemon and associate it with a new Daemon server instance name. By default, WebSphere for z/OS uses port 5555 for the Daemon. Also, WebSphere for z/OS names the first Daemon server instance DAEMON01 and increments the suffix on that name for each new Daemon server instance (DAEMON02, DAEMON03, and so forth). Thus, on your second system in the sysplex, add a port and associate it with DAEMON02.

   Example:

```
5555   TCP     DAEMON02
```

   Follow the same pattern for your third and subsequent systems in the sysplex.

4. Update the workstation hosts file on the workstation where the Administration application runs to include the IP names of the sysplex and systems running in the sysplex.

   Example: The sysplex name is WSCCB and there are two systems, WSCCB1 and WSCCB2, in the sysplex. The entries in the workstation hosts file would be:

```
#
9.82.93.1 wsccb1.washington.ibm.com  wsccb1  #CB Daemon_IPname and alias for wsccb1
#
9.82.93.2 wsccb2.washington.ibm.com  wsccb2  #CB Daemon_IPname and alias for wsccb2
#
9.82.93.1 wsccb.washington.ibm.com   wsccb  #CB Daemon_IPname and alias for wsccb
#
```

You should now have completed your TCP/IP updates.

Steps for setting up LDAP files for other systems in the sysplex

You do not need to create a new LDAP database as you did during your initial installation and customization. You need to create unique bboslapd.conf, bboldif.cb, and dsnaoini files for each new system on which Naming and Interface Repository server instances run. This is due to the fact that each dsnaoini file is system-specific and refers to a unique DB2 subsystem. When multiple server instances exist in a multi-system configuration, each Naming and Interface Repository server region must refer to a system-specific dsnaoini file.

We follow the naming convention established for these files during initial installation and customization of WebSphere for z/OS. That is, we use the system name in the filename and data set name for these files and data sets. The steps below tell you how.

Before you begin: You must have LDAP configured for WebSphere for z/OS.

Attention: If you have already set up LDAP as you should have during initial installation and customization, do **not** rerun the table creation, bind, or bulk loader jobs for LDAP. Those jobs will destroy your existing name space.

This procedure assumes you have already created a shared HFS directory for LDAP files during initial installation and customization. The directory is created by the BBOMCFG job and the default directory is `/WebSphere390/CB390/`*`sysplex_name`*`/etc/ldap`, where *sysplex_name* is the name of your sysplex.

Perform the following steps to set up LDAP files for other systems in the sysplex.

1. In `/WebSphere390/CB390/`*`sysplex_name`*`/etc/ldap`, create new bboslapd.conf, bboldif.cb, and dsnaoini files. We suggest the following naming convention:
   - *system*.bboslapd.conf
   - *system*.bboldif.cb
   - *system*.dsnaoini

   where *system* is the name of the second system in the sysplex. Repeat this step for the third and subsequent systems in the sysplex on which you want to deploy WebSphere for z/OS.

   ____

2. Modify each new dsnaoini file to refer to the subsystem name for DB2 on that system. You cannot use the DB2 group attachment name.

   ____

3. If you plan to do rolling upgrades, create a start procedure for an LDAP server on each system in the sysplex.

   Recommendation: Configure LDAP within the sysplex—this assures that naming services are fully transactional. It is possible to configure LDAP as a server outside the sysplex, in which case you would not specify the LDAPCONF environment variable.

   Guideline: You can have one LDAP server in the sysplex, but, if you are concerned about availability of naming services, you should have more than one.

   ____

You should now have the LDAP files you need.

Defining new WebSphere for z/OS clustered host instances in the sysplex

Use the Administration application to define additional systems in the sysplex with their server instances. We assume you have already created the first WebSphere for z/OS system with an application server called BBOASR2, BBOASR1, or both (the application servers used for the installation verification programs).

We provide instructions for defining the second system. Follow the same pattern of steps for the third and subsequent systems.

Steps for defining the second WebSphere for z/OS system

This procedure explains how to use the Administration application to create a second WebSphere for z/OS run-time system.

Before you begin: You must have your initial WebSphere for z/OS system installed and running. If not, start RRS, then DB2. Then start WebSphere for z/OS:

```
S BBODMN.DAEMON01
```

Follow these steps to define the second WebSphere for z/OS system:

1. Log onto the Administration application.

   ____

2. Add a conversation.

   ____

3. Define a second system in the sysplex. The run-time server instances are defined automatically for you.

   ____

4. Check the environment variables for each run-time sever instance on the second system. The environment variables are defined hierarchically in the following order: sysplex, server, then server instance. An environment variable lower in the hierarchy overrides a matching one higher in the hierarchy. Check the environment variables for the following server instances. Some environment variables are common for all systems in the sysplex, while others are unique for each system.

   You must override the following environment variables at the server instance level. Go to the properties form for each run-time server instance and code environment variable values as specified in Table 38.

Table 38. Server instance environment variables in a sysplex

Server	Server instance	Environment variable to change	Value
Daemon	DAEMON02	DM_SPECIFIC_SERVER_NAME	DAEMON02
		SM_SPECIFIC_SERVER_NAME	SYSMGT02
		NM_SPECIFIC_SERVER_NAME	NAMING02
		IR_SPECIFIC_SERVER_NAME	INTFRP02
		SYS_DB2_SUB_SYSTEM_NAME	Your DB2 subsystem name
System Management	SYSMGT02	DM_SPECIFIC_SERVER_NAME	DAEMON02
		SM_SPECIFIC_SERVER_NAME	SYSMGT02
		NM_SPECIFIC_SERVER_NAME	NAMING02
		IR_SPECIFIC_SERVER_NAME	INTFRP02
		SYS_DB2_SUB_SYSTEM_NAME	Your DB2 subsystem name
Naming	NAMING02	DM_SPECIFIC_SERVER_NAME	DAEMON02
		SM_SPECIFIC_SERVER_NAME	SYSMGT02
		NM_SPECIFIC_SERVER_NAME	NAMING02
		IR_SPECIFIC_SERVER_NAME	INTFRP02
		SYS_DB2_SUB_SYSTEM_NAME	Your DB2 subsystem name
		com.ibm.ws.naming.ldap.masterurl	ldap://*IP_name:port*
		LDAPCONF	The appropriate bboslapd.conf file

Table 38. Server instance environment variables in a sysplex (continued)

Server	Server instance	Environment variable to change	Value
Interface Repository	INTFRP02	DM_SPECIFIC_SERVER_NAME	DAEMON02
		SM_SPECIFIC_SERVER_NAME	SYSMGT02
		NM_SPECIFIC_SERVER_NAME	NAMING02
		IR_SPECIFIC_SERVER_NAME	INTFRP02
		SYS_DB2_SUB_SYSTEM_NAME	Your DB2 subsystem name
		LDAPIRCONF	The appropriate bboslapd.conf file

5. Specify start procedures to be used by the Daemon Server to start the System Management, Naming, and Interface Repository server instances (control regions) on the second system. After you start the Daemon, it starts these server instance control regions automatically. Specify these start procedures on the SMPROC, NMPROC, and IRPROC environment variables.

   If you do not want additional Naming and Interface Repository server instances in the sysplex, set the NMPROC and IRPROC environment variables to nulls. For guidelines on replicating Naming and Interface Repository server instances, see Table 36 on page 197.

6. For each default LRM (CB_OS/390_Base_DB2, CB_OS/390_Lifecycle_DB2, CB_OS/390_Naming_DB2, CB_OS/390_SysMgt_DB2, and CB_OS390_Repository_DB2) open the LRM instance associated with the second system and add the connection data for the DB2 subsystem on the second system.

You have defined the new WebSphere for z/OS run time. Continue with “Steps for replicating new application server instances and activating the conversation.”

Steps for replicating new application server instances and activating the conversation

This procedure explains how to replicate J2EE or MOFW server instances and activate your new conversation.

Recommendation: For availability, replicate all server instances on the new clustered host instance.

Before you begin: You must define a second WebSphere for z/OS run-time system.

Follow these steps to replicate server instances and activate the conversation:

1. Replicate the J2EE or MOFW server instances on the second system (for example, a J2EE server instance called BBOASR2B under server BBOASR2.).

2. If the replicated server instance is a J2EE server instance, create a new resource instance associated with the server resource.

Example: Create a new resource instance associated with BBOASR2_EJB_IVP_RESOURCE for server instance BBOASR2B. Add the connection data for the DB2 subsystem for the second system.

3. If the replicated server instance is a MOFW server instance, create a new LRM instance associated with the server LRM.

   Example: Create a new LRM instance associated with CB_OS/390_IVP_DB2 for server instance BBOASR1B. Add the connection data for the DB2 subsystem for the second system.

4. Validate the new conversation.

5. Commit the new conversation.

6. Complete all tasks.

7. Mark all tasks complete.

8. Activate the new conversation.

You are done when the conversation activates successfully.

Steps for restarting WebSphere for z/OS on another system in the sysplex

Note: See "Restarting WebSphere for z/OS" on page 206 for more sysplex restart options.

Before you begin: You must complete all previous procedures in this section.

Follow these steps to cancel and restart WebSphere for z/OS on the second system:

1. Restart WebSphere for z/OS on the second system:

   ```
   S BBODMN.DAEMON02,SRVNAME='DAEMON02'
   ```

2. Start each application server instance on the second system.

You are done when all server instances initialize on the second system.

Steps for running the installation verification program

Before you begin: You must complete all procedures in this section.

You must have your copy of the BBOIVPE client job, the BBOIVP client job, or both, depending on whether you want to test the J2EE server or the CORBA (MOFW) server.

Follow these steps to run the installation verification program:

1. Run BBOIVPE or BBOIVP (or both) on the new system you have defined.

2. Cancel the local BBOASR2 J2EE server instance or BBOASR1 CORBA (MOFW) server instance and run the corresponding client job locally, forcing the work to move to a server instance on another system in the sysplex.

   Example: Cancel the BBOASR2B server instance on the second system. Leave BBOASR2A running on the first system. Use the Administration application or the CANCEL command:

   ```
   c BBOASR2.BBOASR2B
   ```

   Submit BBOIVPE on the second system.

   ____

You are done when the installation verification programs run successfully.

Restarting WebSphere for z/OS

This section describes various methods for restarting your system when you are running in a sysplex environment. See "Enabling WebSphere for z/OS on a sysplex" on page 191 to set up WebSphere for z/OS to run in a sysplex environment.

Setting up automatic restart management

If you have an application that is critical for your business, you need facilities to manage failures. z/OS or OS/390 provides rich automation interfaces that you can use to detect and recover from failures, but there are some recovery situations that are too specialized to handle with automation. For such situations, z/OS or OS/390 provides automatic restart management, which handles the restarting of servers when failures occur. WebSphere for z/OS uses automatic restart management.

Each WebSphere for z/OS server instance (including server instances you create for your business applications) automatically registers with the automatic restart management default group. Each registration uses a special element type called SYSCB, which automatic restart management treats as restart level 3, assuring that RRS and DB2 restart before any server instance.

One thing to remember is that no data is ″lost″ because we cannot restart. Only the accessibility to that data may be deferred until the transaction that was accessing it is resolved. A transaction always guarantees an atomic, consistent, and durable outcome. Either every update in the unit of work will take effect or none will. The data will usually remain in a consistent state (barring resource manager failures or heuristic decisions). Restart merely determines which of these two outcomes is appropriate based on when the failure occurred. Also, restart does not ″authorize″ a resource manager to make an update. The authorization and update (from an application point of view) must have already occurred at the time of failure.

Peer restart and recovery

Note: For a full overview of peer restart and recovery and more information, see *WebSphere Application Server V4.0.1 for z/OS and OS/390: Operations and Administration*, SA22-7835.

If a failure occurs, automatic restart management can restart WebSphere for z/OS and related server instances on the same system or on an alternate system in the sysplex. The latter condition is achieved through peer restart and recovery, which restarts the control region on another system and goes through the transaction restart and recovery process so that we can assign outcomes to transactions that were in progress at the time of failure.Resource managers (such as DB2) that were being accessed at the time of failure may hold locks that are scoped to a transaction UR (unit of recovery). Once an outcome has been assigned to a UR, the resource managers will, generally, drop those locks.

Rule: Make sure **every** system (your original system as well as any systems intended for recovery) has the following installed:

- z/OS v1.2
- WebSphere Application Server V4.0.1 for z/OS and OS/390
- RRS APAR OW51091
- DB2 APAR PQ57123

Note: The following products individually support peer restart and recovery, providing the above prerequisites are all properly installed:

- IMS 7.10
- CICS 1.3
- MQSeries 5.2

The products mentioned above may not work in conjunction with other subsystems in the same transaction.

To allow WebSphere for z/OS to restart on an alternate system, the prerequisites must be met on every participating system in the sysplex **before** reconfiguring the ARM policies to enable peer restart and recovery. Installing the SPE on all your systems will not hinder your current running atmosphere if you want to continue to only restart in place. If this is not done, there is a possibility that the control region will not be able to move back—OTS will attempt to restart on the alternate system and fail. If there are any URs that are unresolved with RRS once this happens, the control region will not be allowed to restart on the home system until RRS is cancelled on the alternate system. In a nutshell, you'll be stuck, so make sure your prerequisites are met beforehand! For more information on OTS and RRS, see *z/OS MVS Programming: Resource Recovery*, SA22-7616.

Note: If you do not plan to use peer restart, you do not need to abide by these functional prerequisites. Your system will instead use the restart in place function that already exists.

Prior to peer restart, you must ensure that the Daemon and SM server are already running on ALL the systems in the sysplex so that the recovering servers can collect the appropriate configuration information. If a system in the sysplex is not running the Daemon and SM server, then this system must be ARM disabled. Otherwise, the recovering system might attempt to recover on the system not runnning the Daemon and SM server. In this case, the recovery will fail and the workload manager will issue a sysplex-wide stop for the workload, therefore causing a sysplex-wide outage.

You must be running in a sysplex with a WebSphere for z/OS datasharing configuration to utilize peer restart and recovery. You cannot restart on a system that is not in datasharing with you, and you cannot restart out of place at all if you are not in datasharing with any other system. If you don't run in datasharing, your configuration is not known to the recovery system, and it cannot properly execute the restart and recovery. Your only option in that case, and in the case where you are not in a sysplex at all, would be to restart in place. See *z/OS MVS Setting Up a Sysplex*, SA22-7625 for instructions on setting up a sysplex.

System management server restart and recovery:

Note: This section is a continuation of the ″Server startup sequencing″ section in *WebSphere Application Server V4.0.1 for z/OS and OS/390: Operations and Administration*, SA22-7835.

System management behaves differently depending on whether it is running in normal mode or restart and recovery mode.

System management in normal mode: When running in normal mode, only one systems management server can be running on a system. This server will always bind to the same `RESOLVE_PORT` port.

System management in restart and recovery mode: When running in restart mode, the functional SM server is the one that is configured on the restart system (the server that performs recovery). It isn't there to aid in recovery.

Example: You have WebSphere for z/OS running on system SY1 and system SY2. If SY1 fails, the SM running on SY2 is the ″functional″ SM. It is there to provide configuration infomation to the servers that were started on SY2—the same ones that continue to take on work after a SY1 failure.

The recovering SM server will behave instead like a regular recovering application control region and will bind to the `SERVER_PORT` or `SERVER_SSL_PORT` port. Recovery mode gives SM servers configured to other systems the opportunity to get started on the restart system.

Activating automatic restart management

Though server instances automatically register with automatic restart management, you must activate the arm component itself, which means you must:

1. Allocate an ARM couple data set
2. Start the automatic restart management policy

If automatic restart management is not active, WebSphere for z/OS issues an error message to the hardcopy log.

You should also consider modifying the default automatic restart management policies for WebSphere for z/OS server instances. It is not necessary to modify the policies to get started with WebSphere for z/OS, but you should consider doing so when you move your applications into production. We provide information about WebSphere for z/OS requirements for automatic restart management policies in "Rules and restrictions for changing automatic restart management policies for WebSphere for z/OS" on page 209. For complete information about how to modify the policies, see *z/OS MVS Setting Up a Sysplex*, SA22-7625.

Steps for activating automatic restart management: The following procedure is intended to give you enough information to get automatic restart management running. Defining automatic restart management policies is beyond the scope of this manual. We do define WebSphere for z/OS requirements for automatic restart management in "Rules and restrictions for changing automatic restart management policies for WebSphere for z/OS" on page 209, but, for general information about defining automatic restart management policies, see *z/OS MVS Setting Up a Sysplex*, SA22-7625.

Before you begin: You must have access to the couple data set format utility, IXCL1DSU, in SYS1.MIGLIB. If you plan to modify the automatic restart management policy, you must have access to the administrative data utility, IXCMIAPU, also in SYS1.MIGLIB, and have UPDATE authorization to the RACF FACILITY class MVSADMIN.XCF.ARM. To start a policy, you must have READ authorization to the RACF FACILITY class MVSADMIN.XCF.ARM.

Follow these steps to activate automatic restart management for WebSphere for z/OS:

1. If you have not already formatted a couple data set for policies, do so now. For details, see *z/OS MVS Setting Up a Sysplex*, SA22-7625.

   ____

2. Submit the job to format the ARM couple data set.

   ____

3. If you do not want to modify the automatic restart management policy at this time, skip to the next step. To get started, you do not need to modify the policy.

   If you do want to modify the automatic restart management policy, first read WebSphere for z/OS's requirements for automatic restart management policies in "Rules and restrictions for changing automatic restart management policies for WebSphere for z/OS," then go to *z/OS MVS Setting Up a Sysplex*, SA22-7625, and follow the instructions in that manual.

   ____

4. Issue the following operator commands to start the automatic restart management policy:

   ```
   SETXCF COUPLE,TYPE=ARM,PCOUPLE=(dsname,vvvvvv)
   SETXCF START,POLICY,TYPE=ARM
   ```

   where

   dsname
   Is the data set name for the couple data set.

   vvvvvv
   Is the volume serial of the volume on which the couple data set resides.

   ____

You are done when the SETXCF commands complete successfully.

Rules and restrictions for changing automatic restart management policies for WebSphere for z/OS

"Setting up automatic restart management" on page 206 led you through the steps to set up automatic restart management for WebSphere for z/OS, but did not discuss changing automatic restart management policies. You are not required to change the automatic restart management policy, but you might want to modify the policy to create custom restart groups. Because server instances register with the default restart group, a system failure means automatic restart management attempts to restart the entire default group on another system in the sysplex and you might want a restart group other than the default.

This section describes rules and restrictions for the use of WebSphere for z/OS automatic restart management policies. It is beyond the scope of this manual to describe how to change the policies. For more information about changing automatic restart management policies, see, *z/OS MVS Setting Up a Sysplex*, SA22-7625.

Follow these rules and restrictions:

- To change the policy, you need to know the existing element names for WebSphere for z/OS run-time server instances and how to name new elements for additional run-time server instances.

  The element names for the WebSphere for z/OS run-time server instances are shown in Table 39 on page 210:

Table 39. Automatic Restart Management element names for WebSphere for z/OS run-time server instances

Server instance	Element name*
Daemon	CBDMNDAEMON01
System Management	CBSRVSYSMGT01
Naming	CBSRVNAMING01
Interface Repository	CBSRVINTFRP01

* The first server instance has the suffix 01. Each subsequent server instance replica increments the suffix by 1.

  As Table 39 on page 210 shows, WebSphere for z/OS creates element names for server instances by prefixing the server instance name with CBSRV. The Daemon server instance is an exception: its server instance name is prefixed with CBDMN. For example, the element name for a system management server instance called SYSMGT01 is CBSRVSYSMGT01, but the element name for a Daemon server instance called DAEMON01 is CBDMNDAEMON01.
- Prefix the names of your application server instances with `CBSRV`. For instance, if your server instance is called `MYSERVER`, the element name would be `CBSRVMYSERVER`.
- Do not enable ARM for non-data sharing WebSphere for z/OS configurations in a sysplex (that is, multiple discreet WebSphere for z/OS systems running in a sysplex, but not doing data sharing).
- If you create a restart group, keep the following in the same restart group and set the restart order for the elements as indicated:
  1. RRS
  2. DB2 with IRLM
  3. IMS, CICS, and other transaction or resource managers, if used by your application servers in the restart group
  4. WebSphere for z/OS Daemon server instance

     Note: The daemon will not successfully restart on an alternate system because a daemon will already exist there. In this case, you will get the expected error BBOU0371E. This only applies to peer restart and recovery where we require WebSphere for z/OS to be configured and running on the alternate system.
  5. WebSphere for z/OS System Management, Naming, and Interface Repository server instances

     Note: Though the Daemon server instance usually starts the System Management, Naming, and Interface Repository server instances, it does not do so during a restart. **Automatic restart management restarts these server instances**, so be sure to include them in your restart policy, should you change it.
  6. Your application server instances.

Implementing an advanced TCP/IP network

This topic describes advanced TCP/IP configurations, including:

- The use of multiple TCP/IP stacks on z/OS or OS/390
- Connection optimization, a z/OS or OS/390 function by which workload management and the DNS cooperate to route requests
- The IBM Network Dispatcher, which is a network router
- Bind-specific support, which allows you to control the use of TCP/IP resources in WebSphere for z/OS

Multiple TCP/IP stacks

You may want to run multiple TCP/IP stacks on the same system to provide network isolation for one or more of your applications. For instance, you may have multiple OSA Features, each one connecting your system to a different network. You may assign a TCP/IP stack to each one. To do so, use the common INET physical file system (C_INET PFS). This physical file system allow you to configure multiple physical file systems (network sockets) and make them active concurrently. First, specify common INET through the NETWORK DOMAINNAME parameter of SYS1.PARMLIB(BPXPRMxx). Second, if you plan to configure WebSphere for z/OS to use a non-default TCP/IP stack, consult *z/OS UNIX System Services Planning*, GA22-7800, and *z/OS Communications Server: IP Configuration Reference*, SC31-8776, for details.

When configuring WebSphere for z/OS on a system with multiple stacks, you must first establish WebSphere for z/OS's stack affinity to the desired stack so that all socket communications are bound to that stack, and then you establish WebSphere for z/OS's allocation of the proper host name resolution configuration data sets so that host name lookups have the desired results.

Steps for establishing WebSphere for z/OS's stack affinity to the desired stack

Perform the following steps to establish WebSphere for z/OS's stack affinity to the desired stack:

1. Set the BPXK_SETIBMOPT_TRANSPORT environment variable to the value of the desired transport.

   ____

2. Place the BPXK_SETIBMOPT_TRANSPORT environment variable in the current.env file for each server.

   ____

3. Export the BPXK_SETIBMOPT_TRANSPORT environment variable in client shell scripts.

   ____

Note: See *z/OS UNIX System Services Planning*, GA22-7800, for more information on the BPXK_SETIBMOPT_TRANSPORT environment variable.

Steps for establishing WebSphere for z/OS's host name resolution configuration data set

Perform the following steps to establish WebSphere for z/OS's host name resolution configuration data set:

1. Set the RESOLVER_CONFIG environment variable to the desired data set name.

   ____

2. Place the RESOLVER_CONFIG environment variable in the current.env file for each server.

   ____

3. Export the RESOLVER_CONFIG environment variable in client shell scripts.

   ____

Notes:

1. You can also use JCL to specify the name resolution configuration data set. To use JCL, add //SYSTCPD DD DSN=some.tcpip.DATA,DISP=SHR to the server JCL. The RESOLVER_CONFIG environment variable overrides the SYSTCPD DD statement.
2. See *z/OS Communications Server: IP Configuration Reference*, SC31-8776, for more information on the RESOLVER_CONFIG environment variable.

Connection optimization

Figure 10 on page 213 shows a configuration in which the Domain Name Server cooperates with workload management (WLM) to route client requests throughout a sysplex. Characteristics of this configuration are:

- The domain name server (DNS) is replicated by setting up a secondary DNS on more than one system in the sysplex.
- The client needs to know the Daemon IP Name in order to connect to WebSphere for z/OS.
- Each system in the sysplex has the same Daemon IP Name and Resolve IP Name. Workload management and the Domain Name Server determine the actual system to which client requests go. The client sees the sysplex as a single system, though its requests may be balanced across systems in the sysplex.
- As part of workload balancing and maximizing performance goals, workload management also routes work requests to systems in the sysplex. This function is possible because WebSphere for z/OS cooperates with workload management (see “Workload management and WebSphere for z/OS” on page 256 for details). Because the system references that a client sees are indirect, even requests from that same client may be answered by differing systems in the sysplex.
- The implication for clients is that they should not cache IP addresses unless they can recover from failed connections. That is, if a connection fails, a client should be able to reissue a request, but, because the IP address is an indirect address, a reissue of the request can be answered by another system in the sysplex.

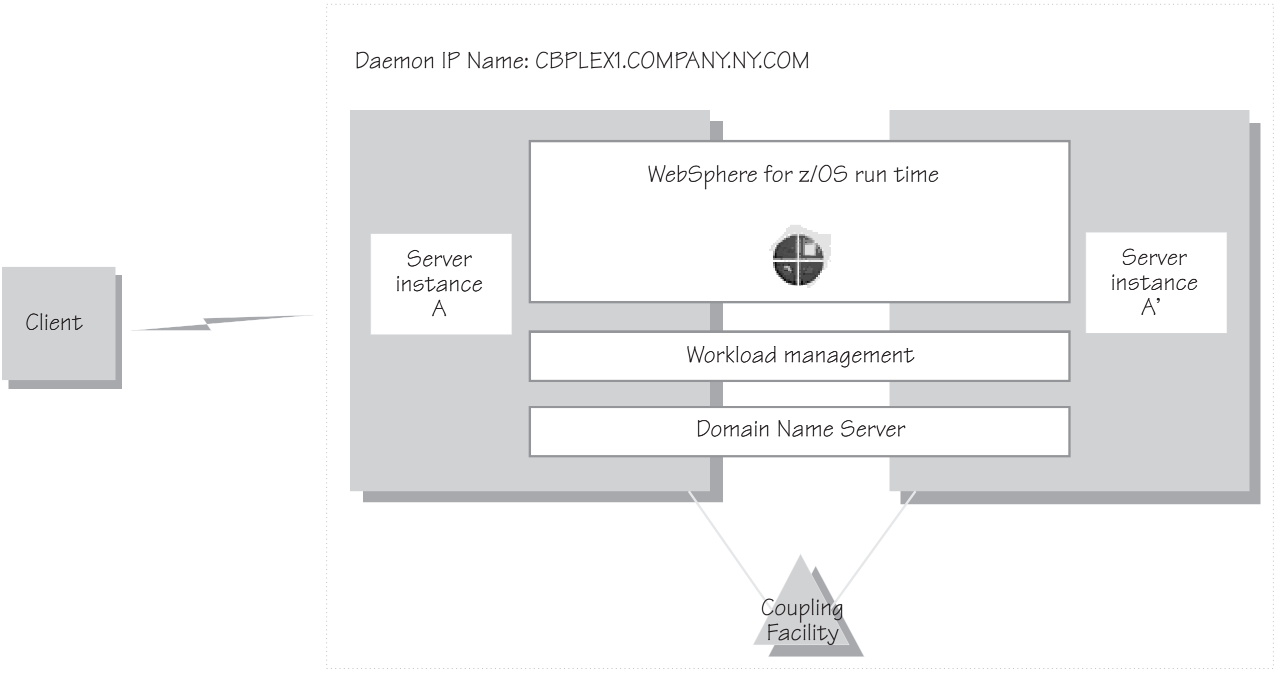


Figure 10. Connection optimization configuration

For details on setting up servers for connection optimization, see *z/OS Communications Server: IP Configuration Reference*, SC31-8776.

IBM Network Dispatcher

The IBM Network Dispatcher (see Figure 11 on page 214) is a router that handles network requests for the sysplex. Characteristics of such a configuration are:

- The Daemon IP Name is associated with the IP address of the router.
- The IBM Network Dispatcher cooperates with workload management to route requests through the sysplex. The client never sees a change in IP addresses.
- The implication for clients is that they can cache the IP addresses, because this configuration does not change them dynamically.

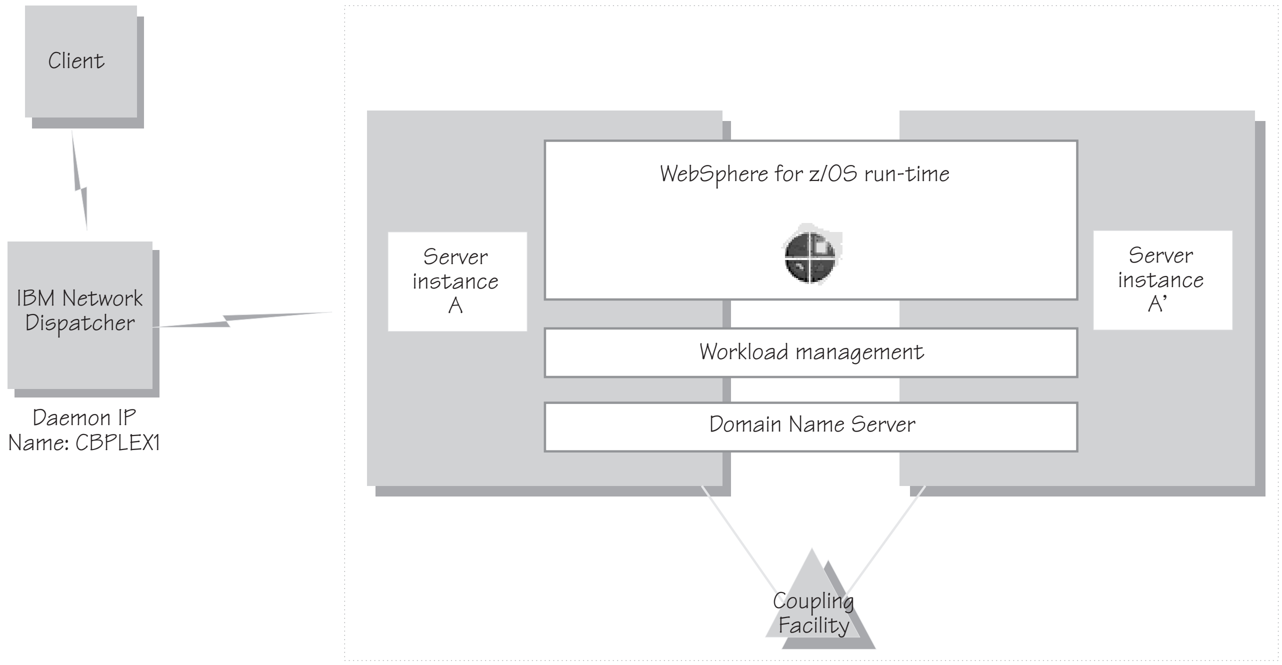


Figure 11. IBM Network Dispatcher configuration

Bind-specific support in WebSphere for z/OS

Bind-specific support in WebSphere for z/OS allows you to control the use of TCP/IP resources in WebSphere for z/OS. This support allows you to have the WebSphere for z/OS ORB and other products and applications on the same z/OS or OS/390 system without requiring the client code to configure unique ports. In other words, this support allows use of port 900 by WebSphere for z/OS and other products and applications on the same system. This support allows the utilization of multiple TCP/IP stacks (Common INET) by the WebSphere for z/OS ORB and the use of multiple IP addresses on the same TCP/IP stack.

To use bind-specific support, use the SRVIPADDR environment variable, which specifies the IP address in dotted decimal format. WebSphere for z/OS servers listen for client connection requests on this IP address.

Because a given IP address is associated with a given TCP/IP stack, you could specify the SRVIPADDR variable in the environment file so that a WebSphere for z/OS server uses a specific TCP/IP stack.

In addition, because you can define multiple IP addresses for a given TCP/IP stack, WebSphere for z/OS port 900 servers could share the same TCP/IP stack with other products and applications requiring port 900, because you made their IP addresses unique with SRVIPADDR.

Alternatively, you can, without the use of bind-specific support, define alternate ports for port 900 and the daemon, which are the only values defined by the CORBA standard. However it is not clear that all client ORBs will easily support configuring the bootstrap port to something other than 900. Configure the ports for the daemon and system management server by specifying port numbers on the DAEMON_PORT and RESOLVE_PORT environment variables.

For details on environment variables, see Appendix A, “Environment files,” on page 321.

For more information about multiple TCP/IP stacks (Common INET), see *z/OS UNIX System Services Planning*, GA22-7800. For more information about multiple IP addresses on the same TCP/IP stack, see *z/OS Communications Server: IP Configuration Reference*, SC31-8776.

Implementing advanced security

This topic covers advanced security issues:

- How clients and servers negotiate security protocols
- Setting up SSL security
- Setting up the asserted identity function
- Setting up the Web container security collaborator
- Setting up Kerberos security

How clients and servers negotiate security protocols

Because there are several security protocols supported by clients and servers, there are many possible ways a client and server can secure their communications. A server may support many security mechanisms simultaneously. At run time, a client and server dynamically negotiate the kind of security used for their interaction. For instance, one client may support user ID/password security, another client may support SSL security, while the server they interact with may support SSL, DCE, and user ID/password security. Each client and server negotiates the type of security to use based on an ordered list of choices. The negotiation starts at the top of the list. If the client and server cannot agree to the type of security at the top of the list, negotiation continues to the second type of security on the list, then the third, and so on. This negotiation continues until the client and server agree on the type of security they will use. Once the type of security to use is negotiated, the authentication phase begins. If authentication fails, communication ends and the client request fails.

Notes:

1. Currently, the order of security preferences for servers specified through the Administration application is ignored by clients.
2. It is possible that the negotiation between client and server ends in no security being used.

The ordered list of choices a client uses varies depending on the kind of interaction between the client and server. Figure 12 on page 216 shows the types of interactions between clients and servers. The number labels on the diagram are explained in Table 40 on page 216.

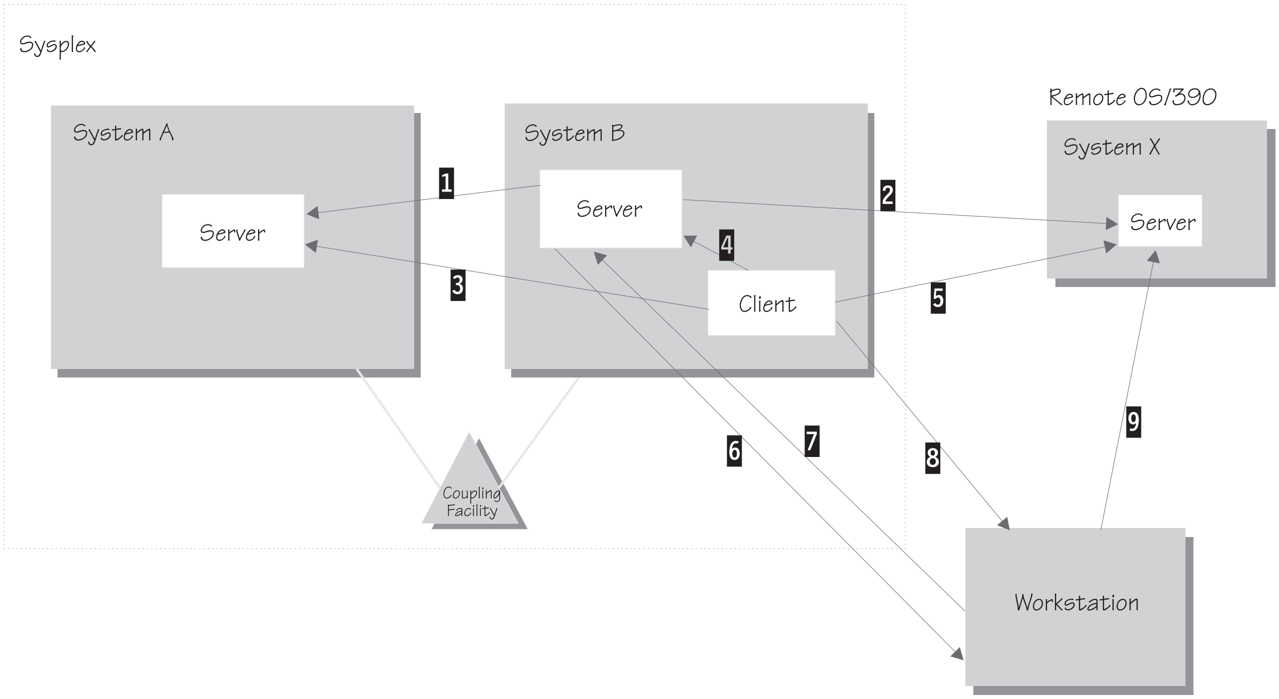


Figure 12. Interactions between clients and servers

Table 40. Ordered list of choices based on interaction

Item	Type of interaction	Ordered list used for this interaction
1	Server to server within the sysplex	1. Kerberos over SSL 2. Asserted identity 3. User ID/PassTicket 4. DCE 5. SSL client certificates 6. User ID/password 7. No security
2	Server to a remote z/OS or OS/390 server	1. Kerberos over SSL 2. Asserted identity 3. DCE 4. SSL client certificates 5. User ID/password 6. No security
3	Client to server within a sysplex	1. SSL client certificates 2. Kerberos over SSL 3. SSL basic authentication 4. User ID/PassTicket 5. DCE 6. User ID/password 7. No security
4	Client to server within a z/OS or OS/390 system	User ID (RACO) always used

Table 40. Ordered list of choices based on interaction (continued)

Item	Type of interaction	Ordered list used for this interaction
5	Client to a remote z/OS or OS/390 server	1. SSL client certificates 2. Kerberos over SSL 3. SSL basic authentication 4. DCE 5. User ID/password 6. No security
6[1]	Server to workstation	1. DCE 2. SSL client certificates 3. No security
7[1] and 9[1]	Workstation to z/OS or OS/390 server	Determined by the workstation client configuration
8[1]	Client to workstation	1. SSL with DCE principal/password authentication 2. DCE 3. No security

1. Subject to the workstation configuration. See the specific workstation product documentation. SSL Client Certificates are standard in the industry. Depending on the type and configuration, WebSphere on a distributed platform may support proprietary authentication mechanisms such as DCE and SSL Basic Authentication.

Setting up SSL security for WebSphere for z/OS

This topic assumes you understand the SSL protocol and how Cryptographic Services System SSL works on z/OS or OS/390. For information about the SSL protocol, go to the following web site:

```
http://home.netscape.com/eng/ssl3/ssl-toc.html
```

For more information about Cryptographic Services System SSL, see *z/OS System Secure Sockets Layer Programming*, SC24-5901.

If you want the added security of protected communications and user authentication in a network, you can use Secure Sockets Layer (SSL) security. The SSL support in WebSphere for z/OS has several objectives:

- To provide ways accepted by the industry to protect the security of messages as they flow across the network. This is often called *transport layer security*. Transport layer security is a function that provides privacy and data integrity between two communicating applications. The protection occurs in a layer of software on top of the base transport protocol (for example, on top of TCP/IP).

  SSL provides security over the communications link through encryption technology, ensuring the integrity of messages in a network. Because communications are encrypted between two parties, a third party cannot tamper with messages. SSL also provides confidentiality (ensuring the message content cannot be read), replay detection, and out-of-sequence detection.
- To provide a secure communications medium through which various authentication protocols may operate. A single SSL session can carry multiple authentication protocols, that is, methods to prove the identities of the parties communicating.

SSL support always provides a mechanism by which the server proves its identity. The SSL support on WebSphere for z/OS allows these ways for the client to prove its identity:

  - Basic authentication (also known as SSL Type 1 authentication), in which a client proves its identity to the server by passing a user identity and password known by the target server.

    With SSL basic authentication:

    - A z/OS or OS/390 client can communicate securely with a WebSphere for z/OS server by using a user ID and password.
    - A z/OS or OS/390 client can communicate securely with a WebSphere Application Server Enterprise Edition server on a distributed platform by using a DCE principal and password.
    - A distributed platform client can communicate securely with a WebSphere for z/OS server by using a MVS user ID and password.
    - Because a password is always required on a request, only simple client-to-server connections can be made. That is, the server cannot send a client's user ID to another server for a response to a request.
  - Client certificate support, in which both the server and client supply digital certificates to prove their identities to each other.

    Web applications may have thousands of clients, which makes managing client authentication an administrative burden. Through RACF *certificate name filtering*, SSL support on WebSphere for z/OS allows you to map client certificates, without storing them, to MVS user IDs. Through certificate name filtering, you can authorize sets of users to access servers without the administrative overhead of creating MVS user IDs and managing client certificates for every user.
  - Kerberos security, in which a server proves its identity by passing a digital certificate to the client. A client proves its identity to the server using Kerberos authentication.
  - Identity assertion, or trusted association, in which an intermediate server can send the identities of its clients to a target server in a secure yet efficient manner. This support uses client certificates to establish the intermediate server as the owner of an SSL session. Through RACF, the system can check that the intermediate server can be trusted (to confer this level of trust, CBIND authorization is granted by administrators to RACF IDs that run secure system code exclusively). Once trust in this intermediate server is established, client identities (MVS user IDs) need not be separately verified by the target server; those client identities are simply asserted without requiring authentication.
- To interoperate in a secure way with other products such as:
  - CICS Transaction Server for z/OS
  - WebSphere on distributed platforms
  - CORBA-compliant Object Request Brokers

SSL support is optional: running WebSphere for z/OS without using SSL affects only the SSL functions that protect communication and authenticate clients and servers.

The following describes how an SSL connection works:

Stage	Description
Negotiation	After the client locates the server, the client and server negotiate the type of security for communications. If SSL is to be used, the client is told to connect to a special SSL port.
Handshake	The client connects to the SSL port and the SSL handshake occurs. If successful, encrypted communication starts. The client authenticates the server by inspecting the server's digital certificate. If client certificates are used during the handshake, the server authenticates the client by inspecting the client's digital certificate.
Ongoing communication	During the SSL handshake, the client and server negotiate a cipher spec to be used to encrypt communications.
First client request	The client identity is established during the first request. The determination of client identity depends upon the client authentication mechanism chosen, which is one of the following: • Basic Authentication • SSL client certificates • Kerberos • Asserted identities

Rules:

- Only server control regions and z/OS or OS/390 clients require access to Cryptographic Services System SSL. Your control regions and z/OS or OS/390 clients require access to the *hlq*.SGSKLOAD data set. If not in the linklist or LPA, ensure that the STEPLIB identifies the PDS name (pdsname.SGSKLOAD) that contains the System [SSL] DLLs. For more information, see *z/OS System Secure Sockets Layer Programming*, SC24-5901.
- Either a Java or C++ client on z/OS or OS/390 can interoperate with a WebSphere for z/OS or workstation server and use SSL.
- Part of the handshake is to negotiate the cryptographic specs used by SSL for message protection. There are two factors that determine the cipher specs and key sizes used:
  - The security level of the Cryptographic Services installed on the system, which determines the cipher specs and key sizes available to WebSphere for z/OS.
  - The configuration of the server through the Administration application, which, through the "Use SSL Confidentiality Only" attribute, can force the use of the confidentiality level of cipher suites, else the SSL handshake fails.

  (For more information, see *z/OS System Secure Sockets Layer Programming*, SC24-5901.)
- You must use RACF or equivalent for storing digital certificates and keys. Placing digital certificates and keys into a key database in the HFS is not an option.
- The Daemon server does not use SSL.

Overview of SSL basic authentication security for your application server and clients

To define SSL basic authentication security, you must first request a signed certificate for your server and a certificate authority (CA) certificate from the certificate authority that signed your server certificate. The process of requesting certificates is beyond the scope of this manual. For more information about requesting a certificate, see *z/OS System Secure Sockets Layer Programming*, SC24-5901.

After you have received a signed certificate for your server and a CA certificate from the certificate authority, you must use RACF to authorize the use of digital certificates, store server certificates and server key rings in RACF, and define SSL security properties for your server through the Administration application.

For clients, you must create a key ring and attach to it the CA certificate from the certificate authority that issued the server's certificate. For a z/OS or OS/390 client, you must use RACF to create a client key ring and to attach the CA certificate to that key ring.

Figure 13 on page 221 shows the certificate arrangement involved in SSL basic authentication.

- **For the client to authenticate the server**, the server (actually, the control region user ID) must possess a signed certificate created by a certificate authority (CA). The server passes the signed certificate to prove its identity to the client. The client must possess the CA certificate from the same certificate authority that issued the server's certificate. The client uses the CA certificate to verify that the server's certificate is authentic. Once verified, the client can be sure that messages are truly coming from that server, not someone else.
- **For the server to authenticate the client**, note that there is no client certificate that the client passes to prove its identity to the server. In the SSL basic authentication scheme, the server authenticates the client by challenging the client for a user ID and password.

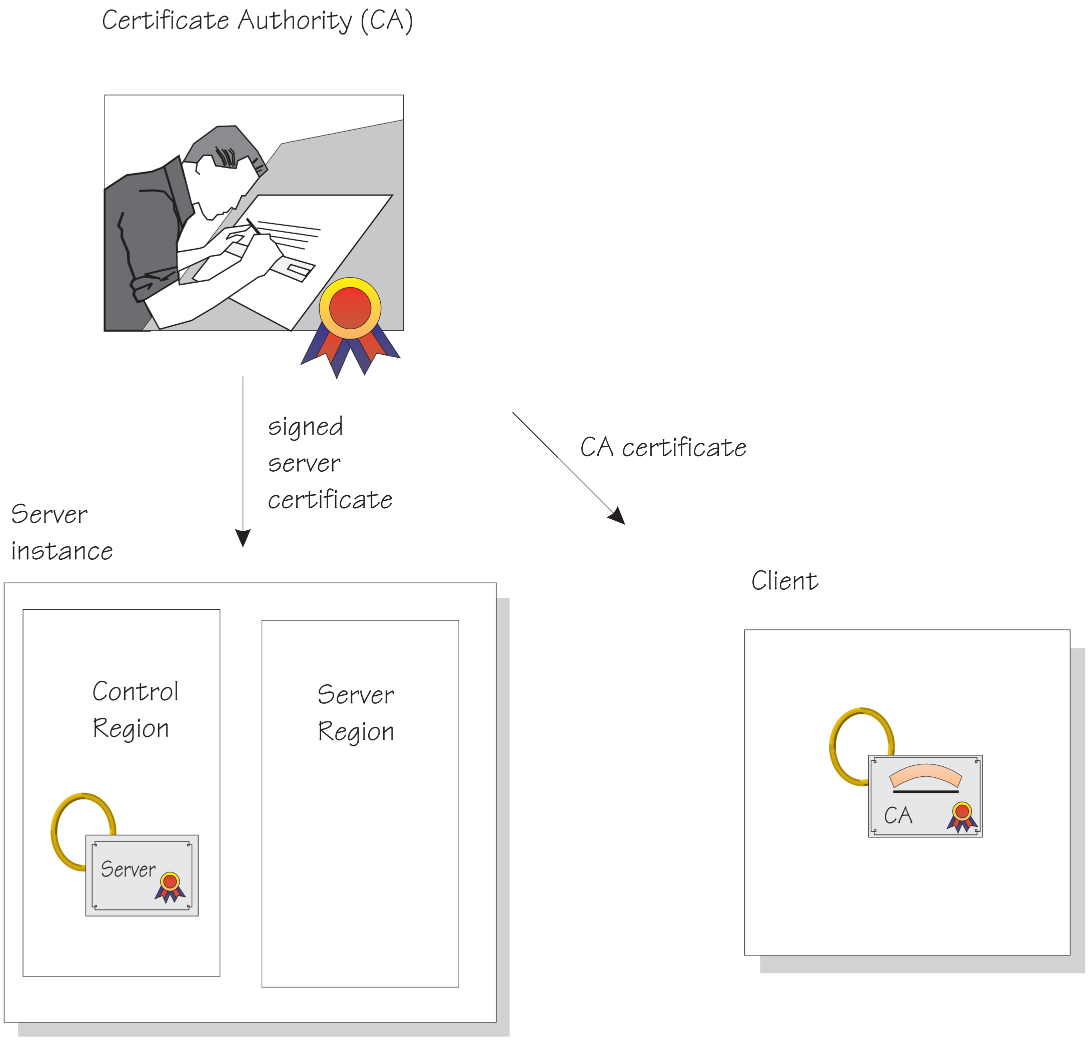


Figure 13. Certificate arrangement for SSL basic authorization

Rules:

- For Java clients on platforms other than z/OS or OS/390, you must have WebSphere Application Server Enterprise Edition 3.5 or WebSphere Advanced Edition 4.0 on those platforms to interoperate with a WebSphere for z/OS server and use SSL basic authentication. C++ clients on other platforms cannot use SSL basic authentication when interoperating with WebSphere for z/OS.
- For SSL basic authentication, clients are authenticated in the following ways:
  - A z/OS or OS/390 client communicating with a remote z/OS or OS/390 server uses the remote user ID and password (REM_USERID and REM_PASSWORD) environment variables in the client environment file to authenticate the client identity.
  - If a z/OS or OS/390 client uses SSL with a Component Broker server on other platforms, the client must pass a DCE principal and password defined to the server by using the REM_DCEPRINCIPAL and REM_DCEPASSWORD environment variables.
  - A z/OS or OS/390 client must also identify its key ring through the SSL_KEYRING environment variable.

- A client on a WebSphere Application Server distributed platform communicating with a z/OS or OS/390 server uses a user dialog supplied by the ORB, in which the user supplies a user ID and password.

The following table shows the subtasks and associated procedures for defining SSL basic authentication security:

Subtask	**Associated procedure (See . . .)**
Requesting a server certificate and a certificate authority (CA) certificate	*z/OS System Secure Sockets Layer Programming*, SC24-5901
Setting up SSL basic authentication security for servers	“Steps for using RACF to authorize the server to use digital certificates” on page 225 “Steps for defining server security properties for SSL-based security” on page 226
Setting up SSL basic authentication security for clients	“Steps for setting up SSL security for clients” on page 227

Overview of SSL client certificate security for your application server and clients

To define SSL client certificate security, you must first request signed certificates for your server and clients and certificate authority (CA) certificates from the certificate authority that signed those certificates. The process of requesting certificates is beyond the scope of this manual. For more information about requesting a certificate, see *z/OS System Secure Sockets Layer Programming*, SC24-5901.

After you have received signed certificates and CA certificates from the certificate authority, you must use RACF to authorize the use of digital certificates, store certificates and key rings in RACF, and define SSL security properties for your server through the Administration application.

Each client identified by a digital certificate must eventually be converted into a MVS user ID by the target WebSphere for z/OS server. If the client and server share the same RACF database, then you do not have to do any additional configuration for this mapping. If the client and server do not share the same RACF database, you can configure the mapping by:

- Adding client certificates to the RACF database of the target server. This may be impractical in most cases.
- Mapping groups of clients into RACF identities using RACF certificate name filtering.
- Using a combination of the two.

Figure 14 on page 224 shows the certificate arrangement involved in SSL client certificate authentication.

- **For the client to authenticate the server**, the server (actually, the control region user ID) must possess a signed certificate created by a certificate authority (CA). The server passes the signed certificate to prove its identity to the client. The client must possess the CA certificate from the same certificate authority that issued the server's certificate. The client uses the CA certificate to verify that the server's certificate is authentic. Once verified, the client can be sure that messages are truly coming from that server, not someone else.
- **For the server to authenticate the client**, the client must possess a signed certificate created by a certificate authority (CA2). (In Figure 14 on page 224 we show two different certificate authorities for clarification; it is possible that the same certificate authority supplies signed certificates to both the server and client.) The server must possess the CA2 certificate from the same certificate authority that issued the client's certificate. The server uses the CA2 certificate to verify that the client's certificate is authentic. Once verified, the server can be sure that messages are truly coming from that client, not someone else.

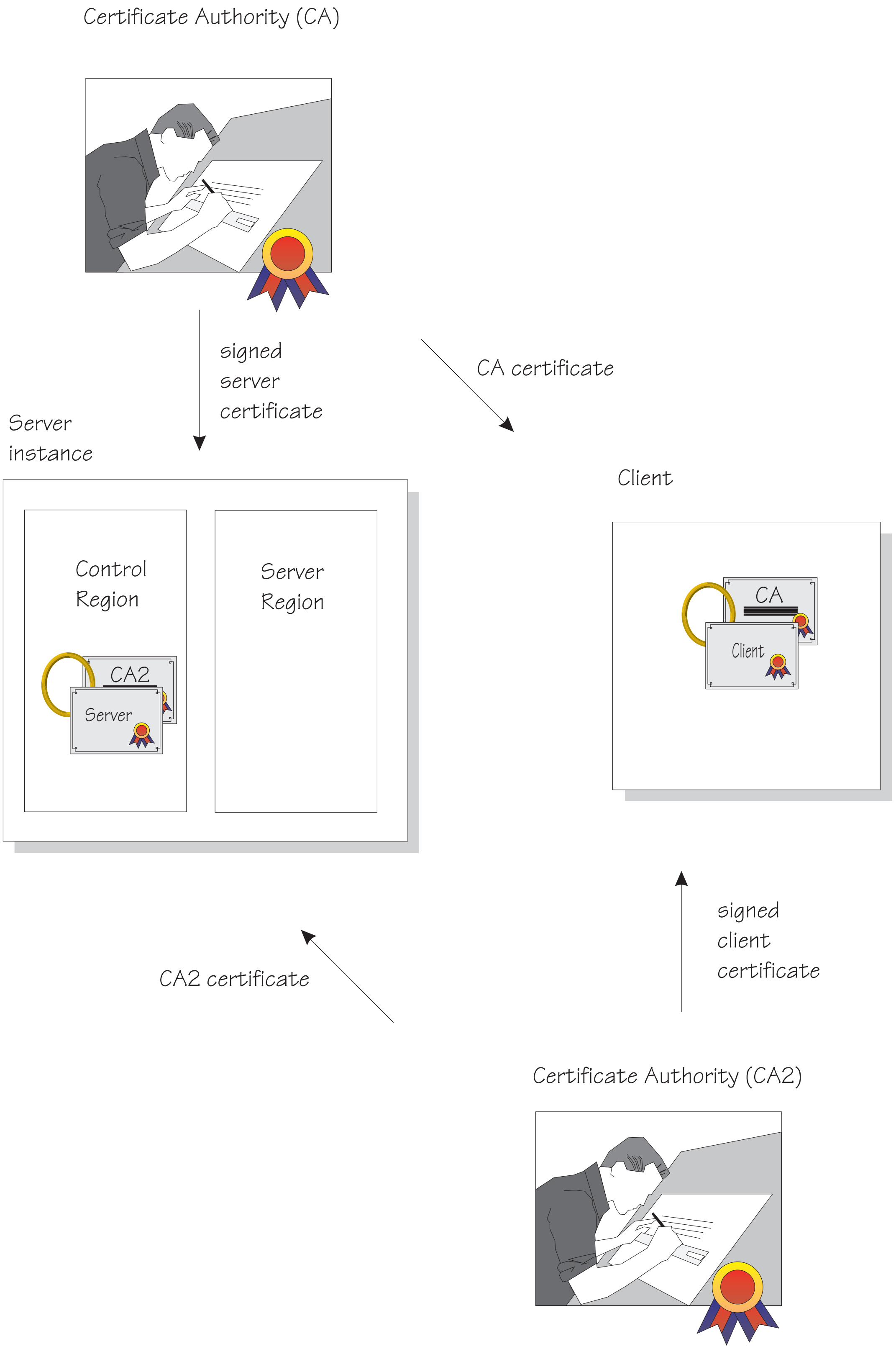


Figure 14. Certificate arrangement for SSL client certificate security

The following table shows the subtasks and associated procedures for defining SSL client certificate security:

Subtask	Associated procedure (See . . .)
Requesting a server certificate and a certificate authority (CA) certificate	*z/OS System Secure Sockets Layer Programming*, SC24-5901
Setting up SSL client certificate security for servers	“Steps for using RACF to authorize the server to use digital certificates” “Steps for defining server security properties for SSL-based security” on page 226
Setting up SSL client certificate security for clients	“Steps for setting up SSL security for clients” on page 227
Mapping client digital certificates to MVS user IDs on your server’s system	“Steps for mapping client digital certificates to MVS user IDs on your server’s system” on page 228

Defining SSL security for clients and servers

This section includes the procedures you must follow to implement all SSL–based authentication mechanisms.

Steps for using RACF to authorize the server to use digital certificates: SSL uses digital certificates and public/private keys. If your application server uses SSL, you must use RACF to store digital certificates and public/private keys for the user identities under which the server control regions run.

Before you begin: You need to request a certificate authority (CA) certificate and a signed certificate for your server.

If you plan to implement SSL client certificate support, you must also have certificate authority (CA) certificates from each certificate authority that verifies your client certificates. See *z/OS System Secure Sockets Layer Programming*, SC24-5901.

You must have a user ID with the authority to use the RACDCERT command in RACF (for example, SPECIAL authority). For details about RACDCERT, see *z/OS Security Server RACF Command Language Reference*, SA22-7687, and *z/OS Security Server RACF Security Administrator’s Guide*, SA22-7683.

Perform the following steps authorizing the use of digital certificates:

1. For each server that uses SSL, create a key ring for that server’s control region user ID.

   Example: Your control region is associated with the user ID called CBACRU1. Issue:

   ```
   RACDCERT ADDRING(ACRRING) ID(CBACRU1)
   ```

2. Receive the certificate for your application server from the certificate authority.

   Example: You requested a certificate and the certificate authority returned the signed certificate to you, which you stored in a file called CBACRU1.CA. Issue:

   ```
   RACDCERT ID (CBACRU1) ADD('CBACRU1.CA') WITHLABEL('ACRCERT') PASSWORD('password')
   ```

3. Connect the signed certificate to the control region user ID’s key ring and make the certificate the default certificate.

   Example: Connect the certificate labelled ACRCERT to the key ring ACRRING owned by CBACRU1. Issue:

```
RACDCERT ID(CBACRU1) CONNECT (ID(CBACRU1) LABEL('ACRCERT') RING(ACRRING) DEFAULT)
```

4. If you plan to have the server authenticate clients (SSL client certificate support):
   - Receive each certificate authority (CA) certificate that verifies your client certificates. Give each CA certificate the CERTAUTH attribute.

     Example: Receive the CA certificate that will verify a client with user ID CLIENT1. That certificate is in a file called USER.CLIENT1.CA. Issue:

     ```
     RACDCERT ADD('USER.CLIENT1.CA') WITHLABEL('CLIENT1 CA') CERTAUTH
     ```
   - Connect each client's certificate authority (CA) certificate to the control region user ID's key ring.

     Example: Connect the CLIENT1 CA certificate to the ring ACRRING owned by CBACRU1.

     ```
     RACDCERT ID(CBACRU1) CONNECT(CERTAUTH LABEL('CLIENT1 CA') RING(ACRRING))
     ```

5. Give read access for IRR.DIGTCERT.LIST and IRR.DIGTCERT.LISTRING in the RACF FACILITY class to the control region user ID.

   Example: Your control region user ID is CBACRU1. Issue:

   ```
   PERMIT IRR.DIGTCERT.LIST     CLASS(FACILITY) ID(CBACRU1) ACC(READ)
   PERMIT IRR.DIGTCERT.LISTRING CLASS(FACILITY) ID(CBACRU1) ACC(READ)
   ```

You are done with the RACF phase when the RACF commands succeed. Continue on to "Steps for defining server security properties for SSL-based security."

Steps for defining server security properties for SSL-based security: This procedure tells you how to specify that a server use SSL client certificate security through the Administration application.

Before you begin: You need to start the Administration application, log on, and create a new conversation. For more information, see *WebSphere Application Server V4.0.1 for z/OS and OS/390: System Management User Interface*, SA22-7838.

Perform the following steps to define security characteristics for the server:

1. Expand Servers in the Conversations tree.

2. Create a new server, or click the name of your existing server.

3. In the properties form:
   - If you are implementing SSL basic authentication, click the SSL Type 1 (basic authentication) check box.
   - If you are implementing SSL client certificates, click the SSL Client Certificates check box.
   - If you are implementing Kerberos, click the Kerberos check box.
   - If you are implementing asserted identities, click the Asserted identity check box. Be sure to also click the SSL client certificates check box.
   - If you require the confidentiality of cipher suites, click the SSL Confidentiality Only check box.

4. Specify the SSL RACF key ring. This is the key ring you defined in step 1 in "Steps for using RACF to authorize the server to use digital certificates" on page 225.

   Note: If you specify the wrong RACF key ring, the server gets an error message at run time.

   ____

5. Specify the SSL V2 timeout value, which is the length of time, in seconds, that the system holds session keys. The range is 0-100 seconds. The default is 100 seconds.

   ____

6. Specify the SSL V3 timeout value, which is the length of time, in seconds, that the system holds session keys. The range is 0-86400 (1 day). The default is 600 seconds.

   ____

7. Order the security preference list. For more information about the security preference list, see "How clients and servers negotiate security protocols" on page 215.

   ____

8. Complete all other specifications for the server, then validate, commit, complete all tasks, and activate the conversation.

   ____

You know you are done when the system tells you the conversation is activated.

Steps for setting up SSL security for clients: All clients must have access to the server's certificate authority (CA) certificate so they can authenticate the server during the SSL handshake. If you plan to implement SSL client certificate support, clients additionally must have their own certificates as the default certificate on their key rings.

- If your clients are connecting to WebSphere for z/OS from WebSphere on workstations, you must import SSL certificates into the workstation system. For more information and instructions, see IBM WebSphere InfoCenter.
- On z/OS or OS/390, clients must have certificates attached to their keyrings in RACF.

This procedure explains how to attach certificates to z/OS or OS/390 clients.

Before you begin: For SSL basic authentication and Kerberos, you must request a CA certificate from the same certificate authority that issued signed certificates for your application servers. If you plan to implement SSL client certificate support, you must additionally request a signed certificate for the client from a certificate authority.

You must have a user ID with the authority to use the RACDCERT command in RACF (for example, SPECIAL authority). For details about RACDCERT, see *z/OS Security Server RACF Command Language Reference*, SA22-7687, and *z/OS Security Server RACF Security Administrator's Guide*, SA22-7683.

Perform the following steps to authorize use of digital certificates by z/OS or OS/390 clients:

1. Create a key ring for the z/OS or OS/390 client.

Example: Your client user ID is CLIENT1. Issue:

```
RACDCERT ADDRING(C1RING) ID(CLIENT1)
```

2. Receive the server's certificate authority (CA) certificate and give it the CERTAUTH attribute.

   Example: You requested a CA certificate and the certificate authority returned its certificate to you, which you stored in a file called USER.CBSERVER.CA. Issue this command:

   ```
   RACDCERT ADD('USER.CBSERVER.CA') WITHLABEL('VERI CA') CERTAUTH
   ```

3. Connect the server's CA certificate to the client key ring.

   Example: Connect the VERI CA certificate to the C1RING key ring owned by CLIENT1.

   ```
   RACDCERT ID(CLIENT1) CONNECT(CERTAUTH LABEL('VERI CA') RING(C1RING))
   ```

4. In the client's environment file, code the SSL_KEYRING environment variable to correspond to the client's key ring.

   For more information, see Appendix A, "Environment files," on page 321.

5. If you are implementing SSL client certificate support:
   - Receive the certificate for your client from the certificate authority.

     Example: You requested a certificate and the certificate authority returned a signed certificate which you stored in CLIENT1.SIGNED.CERT. Issue:

     ```
     RACDCERT ID (CLIENT1) ADD('CLIENT1.SIGNED.CERT') WITHLABEL('CLIENT1 CERT') PASSWORD('password')
     ```
   - Connect the client's signed certificate to the client user ID's key ring and make the certificate the default certificate.

     Example: Connect the certificate labelled CLIENT1 to the key ring C1RING owned by CLIENT1. Issue:

     ```
     RACDCERT ID(CLIENT1) CONNECT (ID(CLIENT1) LABEL('CLIENT1 CERT') RING(C1RING) DEFAULT)
     ```

You are done when the RACF commands succeed and you save your environment file.

Steps for mapping client digital certificates to MVS user IDs on your server's system: Each client that presents a digital certificate to authenticate its identity, but does not have an individual certificate registered with RACF on the target server's system or sysplex, must have a mapping to a valid MVS user ID. You can create this mapping by using RACF certificate name filters.

You can create RACF certificate name filters based on either the client's or certificate issuer's distinguished name, as contained in the X.509 digital certificates.

Before you begin: You should know how you want to organize sets of clients that will be presenting digital certificates, and what sort of access those clients need.

You need to have the authority to issue the RACDCERT MAP command.

Perform the following steps to set up certificate name filtering:

1. Define a MVS user ID for each user ID you associate with a certificate name filter. Consider assigning the PROTECTED and RESTRICTED attributes to each

one. The PROTECTED attribute protects the user ID from being used to log on directly to the system and from being revoked through incorrect password attempts. The RESTRICTED attribute ensures that the user ID will not be used to access protected resources it is not explicitly authorized to access. **Example:**

```
ALTUSER WEBUSER NOPASSWORD RESTRICTED
```

2. Activate certificate name filtering. **Example:**

   ```
   SETROPTS CLASSACT(DIGTNMAP) RACLIST(DIGTNMAP)
   ```

3. Create a certificate name filter. **Example:** The following filter associates the user ID WEBUSER to any user presenting a certificate issued by VeriSign Class 1, who does not have an individual certificate registered with RACF on your system:

   ```
   RACDCERT ID(WEBUSER) MAP WITHLABEL('INTERNET OTHERS') +
           IDNFILTER('OU=VeriSign Class 1 Individual Subscriber.O=VeriSign, Inc.L=Internet')
   ```

   This filter is based on the issuer's name. You can create other filters based on the subject's name, or on combinations of the issuer's and subject's names. For more information about certificate name filtering, see *z/OS Security Server RACF Security Administrator's Guide*, SA22-7683.

4. Refresh the DIGTNMAP class. **Example:**

   ```
   SETROPTS RACLIST(DIGTNMAP) REFRESH
   ```

You are done when the SETROPTS command completes.

Using certificates to set up secure HTTPS Transport Handler connections: An HTTPS Transport Handler can use server and client certificates to set up secure server-client connections for HTTPS application requests. The HTTPS Transport Handler enables you to set up client authentication using:

- Server certificates you have created and are administering, and for which you are your own certificate authority (CA).
- Client certificates signed by an internal CA. (Using an internal CA to sign your client certificates is independent of whether you used an internal or external CA to sign your server certificate.)
- Server certificates signed by an external CA .
- Client certificates that are signed by an external CA. (Using an external CA to sign your client certificates is independent of whether you used an internal or external CA to sign your server certificate.)

Before you can use a server certificate to set up secure HTTPS Transport Handler connections, you must:

- Create or obtain a server certificate, if you don't already have one.
- Create or obtain a CA certificate if you don't already have one.
- Create a control region key ring that is connected to your server certificate, and has this certificate as the default for this key ring.
- Use the Administration application to:
  1. Add a BBOC_HTTP_SSL_PORT environment variable to the current.env file containing the port number on which the HTTPS Transport Handler will listen for requests. (See Appendix A, "Environment files," on page 321 for more information about this environment variable.)
  2. Register the control region key ring as an SSL RACF key ring.

If you also want to use a client certificate to set up secure HTTPS Transport Handler connections, you must perform the following additional tasks:

- Use the Administration application to specify that client certificates are allowed.
- Create or obtain a client certificate, if you don't already have one.

See "Steps for setting up secure HTTPS Transport Handler connections using a server certificate signed by an internal CA," "Steps for setting up secure HTTPS Transport Handler connections using client certificates signed by an internal CA" on page 235,"Steps for setting up secure HTTPS Transport Handler connections using server certificates signed by an external CA" on page 239, and "Steps for setting up secure HTTPS Transport Handler connections using client certificates signed by an external CA" on page 245 for more information on how to perform these steps.

Steps for setting up secure HTTPS Transport Handler connections using a server certificate signed by an internal CA: Using SSL, WebSphere for z/OS allows you to set up your own certificate authority, and administer your own certificates.

Notes:

1. Acting as your own certificate authority (CA) is recommended only for test environments and private intranets. With this method, you set up your own CA and sign certificates. You can optionally use client authentication to verify the identity of those accessing your control region.
2. You must use System SSL to establish secure connections. To use System SSL with the HTTPS Transport Handler, the System SSL load library must exist in linklist and must be under program control. If you have not already done so:
   - Add the load library to the linklist.
   - Turn on program control for the library by issuing the following RACF commands from a user ID that has the proper authority:

     ```
     RALTER PROGRAM * ADDMEM('hlq.SGSKLOAD'//NOPADCHK) UACC(READ)
     SETROPTS WHEN(PROGRAM) REFRESH
     ```

     If turning on program control for the first time, use the RDEFINE command instead of the RALTER command.
3. You will issue the RACF command, RACDCERT, to create certificates and key rings for your J2EE server instance. On most of the RACDCERT commands you must specify a user ID. This ID must be the same user ID as the control region ID for your server instance. If it is not, SSL will not initialize. The following example uses CBACRU1 as the control region ID. Therefore, CBACRU1 is specified as the ID on the RACCERT commands in this example.

Before you begin: Before issuing any of the RACF commands in the following steps, make sure you are using an MVS ID that:

1. Has the authority to use the RACDCERT command in RACF (for example, SPECIAL authority).

   For details about RACDCERT, see *z/OS Security Server (RACF): Security Administrator's Guide* or the *OS/390 Security Server (RACF): Security Administrator's Guide*. To access these books on the Web, go to the z/OS or OS/390 Book Server Web site at URL:

   `http://www.ibm.com/servers/eserver/zseries/zos/bkserv/`

   or

   `http://www.ibm.com/s390/os390/bkserv/`
2. Has been defined as a WebSphere for z/OS administrator for the J2EE server instance to which the certificates will apply. (Use the Administrators dialog in

the Administration application to give an MVS ID administrative authority over a J2EE server instance.) See *WebSphere Application Server V4.0.1 for z/OS and OS/390: Operations and Administration* for more information. To access this book on the Web, go to the product library page at URL:

```
http://www-3.ibm.com/software/webservers/appserv/zos_os390/library.html
```

Perform these steps to set up secure connections using self-signed CA certificates:

1. Create a self-signed CA certificate. In this step you will:
   a. Create a self-signed CA certificate with label **CA certificate for CBACRU1**.
   b. Create an ASCII z/OS or OS/390 data set, **CERT.ARM**, which contains your CA public-private key pair and self-signed CA certificate.

   Example: To create your self-signed CA certificate, issue the RACF command:

   ```
   RADCERT CERTAUTH GENCERT SUBJECTSDN(CN('IBM Raleigh Webapps CA')
   o('IBM Webapps Raleigh') ou('IBM Webapps') L('Raleigh') SP('North Carolina')
   C('US')) SIZE(512) WITHLABEL('CA certificate for CBACRU1') NOTBEFORE(DATE
   (2002-07-01)) NOTAFTER(DATE(2004-10-12))
   ```

   where

   - The Distinguished Name consists of the:
     – Common name (Domain Name), IBM Raleigh Webapps CA
     – Organization name, IBM Webapps Raleigh
     – Optional organizational unit, IBM Webapps
     – Optional city or locality, Raleigh
     – Optional state or province, North Carolina
     – Country code, US
   - **CERTAUTH** indicates that a CA certificate is being generated.
   - 512 is the key size
   - **CA certificate for CBACRU1** is the label of the CA certificate.
   - NOTBEFORE(DATE(2002–07–01)) NOTAFTER(DATE(2004–10–12)) indicates that the certificate is valid from July 1, 2002 through October 12, 2004.

   Example: To export the CA certificate to an MVS data set so that in Step 8 the CA can be added to the list of trusted CAs on the browser, issue the following command:

   ```
   RACDCERT CERTAUTH EXPORT(LABEL('CA certificate for CBACRU1')) DSN(CERT.ARM)
   FORMAT(CERTB64)
   ```

   where:

   - **CERTAUTH** indicates that a CA certificate is being exported.
   - **CA certificate for CBACRU1** is the label of the CA certificate
   - **CERT.ARM** is the data set that will contain the CA certificate
   - **CERTB64** indicates that the CA certificate is saved to the data set in BASE 64 encoded ASCII.

---

2. Create an SSL RACF control region key ring and connect your CA certificate to that key ring.

   Example: To create an SSL RACF control region key ring, and connect it to the CA certificate, issue the following commands:

   ```
   RACDCERT ID(CBACRU1) ADDRING(CRRING)
   RACDCERT ID(CBACRU1) CONNECT(CERTAUTH LABEL('CA certificate for CBACRU1')
   RING(CRRING))
   ```

where:

- **CERTAUTH** indicates that a CA certificate is being connected.
- **CA certificate for CBACRU1** is the label of the CA certificate
- **CRRING** is the control region key ring
- **CBACRU1** is the control region ID under which the CRRING key ring resides.

---

3. Create and sign your server certificate.

   In Step 1, you set up your CA environment which enables you to act as your own CA and sign certificates. A signed server certificate is required before clients can establish an SSL connection to your J2EE server control region. Because you are acting as your own CA, you will sign the server certificate that you create in this step. If you were using an external commercial CA, such as VeriSign, you would send the server certificate request to the CA for signature.

   In this step you will create a server certificate with label **Certificate for CBACRU1** signed by the internal CA using label **Certificate for CBACRU1**.

   Example: To create the server certificate signed by the internal CA, issue the following command:

```
RACDCERT ID(CBACRU1) GENCERT SUBJECTSDN(CN('IBM Raleigh Webapps')
O('IBM Webapps Raleigh')  OU('IBM Webapps')  L('Raleigh')
SP('North Carolina')  C('US')) SIZE(512) WITHLABEL('Certificate
for CBACRU1') SIGNWITH(CERTAUTH LABEL('(Certificate for CBACRU1'))
```

   where

   - The Distinguished Name consists of the:
     - Common name (Domain Name), **IBM Raleigh Webapps**
     - Organization name, **IBM Webapps Raleigh**
     - Optional organizational unit, **IBM Webapps**
     - Optional city or locality, **Raleigh**
     - Optional state or province, **North Carolina**
     - Country code, **US**
   - **CBACRU1** is the control region ID under which the server certificate is created.
   - 512 is the key size
   - **Certificate for CBACRU1** is the label of the server certificate request.
   - **CA certificate for CBACRU1** is the label of the CA certificate that is used to sign the server certificate.

---

4. Connect your signed server certificate to the control region key ring. In this step you will:

   - Connect the server certificate with label **Certificate for CBACRU1** to the control region key ring.
   - Ensure the certificate will be the default in this key ring.

   Example: To connect the server certificate to the control region key ring **CRRING**, and make this server certificate the default certificate in this key ring, issue the following command:

```
RACDCERT ID (CBACRU1) CONNECT(ID(CBACRU1) LABEL('Certificate for CBACRU1')
RING(CRRING) DEFAULT)
```

   where:

- **CBACRU1** is the control region's ID under which this key ring and certificate reside.
- **CRRING** is the control region key ring
- **Certificate for CBACRU1** is the label that identifies the key and server certificate in the key ring.
- **DEFAULT** makes the server certificate the default in this key ring.

  Note: DEFAULT **must** be included on this command.

---

5. Using the TSO/E OPUT command in MVS, copy the MVS data set containing your server certificate to your document root directory in the HFS.In step 8, you will add the certificate to the list of trusted CAs in your browser.

   Example: To copy the MVS data set CERT.ARM from MVS to your document root directory, issue the following TSO/E OPUT command:

   ```
   oput 'USER1.CERT.ARM' '/usr/lpp/WebSphere/mydoc/cert.arm'
   ```

   Note: You can execute this TSO/E command from TSO/E, ISPF option 6, and the shell. To find out more about this command, including where to execute it, please see the *z/OS UNIX System Services Command Reference*. To access this book on the Web, go to the z/OS Book Server Web site at URL:

   ```
   http://www.ibm.com/servers/eserver/zseries/zos/bkserv/
   ```

---

6. Permit the control region ID to access the key ring through DIGTCERT.

   In this step you will permit the control region user ID **CBACRU1** to access the key ring through the **DIGTCERT** general resource class.

   This ID must have access to the key ring that was created using RACDCERT. If the ID does not have access, SSL initialization fails. To permit CBACRU1 to access the control region key ring, issue RACF commands to perform the following tasks:

   - Define the IRR.DIGTCERT.LIST and IRR.DIGTCERT.LISTRING resources with universal access of None.
   - Permit the CBACRU1 ID read access to the IRR.DIGTCERT.LIST and IRR.DIGTCERT.LISTRING resources in the FACILITY class.
   - Activate the FACILITY general resource class.
   - Refresh the FACILITY general resource class.

   Example: To perform the preceding tasks, issue the following commands:

   ```
   RDEFINE FACILITY IRR.DIGTCERT.LIST UACC(NONE)
   PE IRR.DIGTCERT.LIST CLASS(FACILITY) ID (CBACRU1) ACCESS(READ)

   RDEFINE FACILITY IRR.DIGTCERT.LISTRING UACC(NONE)
   PE IRR.DIGTCERT.LISTRING CLASS(FACILITY) ID (CBACRU1) ACCESS(READ)

   SETR CLASSACT(FACILITY)
   SETR RACLIST(FACILITY) REFRESH
   ```

   To find out more about controlling access to the RACDCERT function through the FACILITY general resource class, see the *z/OS Security Server (RACF): Security Administrator's Guide* or the *OS/390 Security Server (RACF): Security Administrator's Guide*. To access these books on the Web, go to the z/OS or OS/390 Book Server Web site at URL:

http://www.ibm.com/servers/eserver/zseries/zos/bkserv/

or

http://www.ibm.com/s390/os390/bkserv/

---

7. Register the control region key ring with the J2EE server.

   Using the WebSphere for z/OS Administration application, open a conversation for the appropriate J2EE server:

   a. Select **Conversations** → the name of the conversation → **Sysplexes** → sysplex name → **J2EE Servers** → the name of the appropriate J2EE server → **modify**.
   b. In the properties form:
      - Check the **SSL Client Certificates** box, if it is not already checked to indicate that SSL client certificates are allowed.
      - Register the key ring you created in step 2 with the J2EE server:

        Example: To register the key ring, find the **SSL RACF Keyring** keyword on the right panel and type in the name of the control region key ring, which in this example is CRRING.
      - Set the following environment variables:
        – `BBOC_HTTP_SSL_PORT`
        – `BBOC_HTTP_SSL_IDENTITY` (Optional. If not set the identity of the J2EE server is used as the value for this environment variable.)

        Example: To set these environment variables:

        1) Scroll to the **Environment variable list**.
        2) Double-click on the `BBOC_HTTP_SSL_PORT` environment variable and specify the port number for the HTTPS Transport Handler (for example, 443). If this environment variable is not in the list, double click on a blank line. You can then add the environment variable, along with the appropriate port number.
        3) Close the Edit Variable dialog.
        4) Double-click on the `BBOC_HTTP_SSL_IDENTITY` environment variable and specify the client's ID (for example, CBGUEST). If this environment variable is not in the list, double click on a blank line. You can then add the environment variable, along with the client's ID.
      - Close the Edit Variable dialog.
      - Click on the tool bar or choose the **Save action** of the Selected menu bar choice.
      - Validate the conversation.
      - Commit the conversation.

---

8. Verify that you can establish a secure connection with the control region.

   To verify that you can establish a secure connection with the control region, make sure the J2EE server instance is running, and then point your browser at the following URL:

   https://*domain*:*port_number*/*directory*/*webapp_name*
   where:

   domain
   is the domain where the Web application being requested resides.

port_number
is the port number specified for the BBOC_HTTP_SSL_PORT environment variable in step 7.

directory
is the directory that contains the application.

webapp_name
is the name of the certificate protected Web application being requested.

Example: :

```
https://www.raleigh.ibm.com:443/webap1/my.jsp
```

The first time you enter this URL, you should receive a warning that the CA certificate is not trusted. You will then be prompted to accept the certificate for the current request and all future requests. If you accept the certificate, it will be added the the browser's list of trusted CA certificates. The next time you enter this URL, you should not receive the warning.

9. Optionally, set up client authentication.

   For instructions, see "Steps for setting up secure HTTPS Transport Handler connections using client certificates signed by an internal CA" or "Steps for setting up secure HTTPS Transport Handler connections using client certificates signed by an external CA" on page 245.

Steps for setting up secure HTTPS Transport Handler connections using client certificates signed by an internal CA: Using SSL, WebSphere for z/OS allows you to set up client authentication using client certificates signed by an internal CA. Using an internal CA to sign your client certificates is independent of whether you used an internal or external CA to sign your server certificate.

Before you begin:

- Before issuing any of the RACF commands in the following steps, make sure you are using an MVS ID that:
  1. Has the authority to use the RACDCERT command in RACF (for example, SPECIAL authority).

     For details about RACDCERT, see *z/OS Security Server (RACF): Security Administrator's Guide* or the *OS/390 Security Server (RACF): Security Administrator's Guide*. To access these books on the Web, go to the z/OS or OS/390 Book Server Web site at URL:

     ```
     http://www.ibm.com/servers/eserver/zseries/zos/bkserv/
     ```

     or

     ```
     http://www.ibm.com/s390/os390/bkserv/
     ```
  2. Has been defined as a WebSphere for z/OS administrator for the J2EE server instance to which the certificates will apply. (Use the Administrators dialog in the Administration application to give an MVS ID administrative authority over a J2EE server instance.) See *WebSphere Application Server V4.0.1 for z/OS and OS/390: Operations and Administration* for more information. To access this book on the Web, go to the product library page at URL:

     ```
     http://www-3.ibm.com/software/webservers/appserv/zos_os390/library.html
     ```
- You must set up secure connections using one of the following processes:
  - "Steps for setting up secure HTTPS Transport Handler connections using a server certificate signed by an internal CA" on page 230

  - "Steps for setting up secure HTTPS Transport Handler connections using server certificates signed by an external CA" on page 239
- You must ensure that the internal CA that signs your client certificates is marked with a status of TRUST and that it is connected to your control region key ring. During the SSL handshake, the control region tells the client which CAs it trusts based on the trusted CAs in the control region key ring. The browser then searches its client certificates for ones issued by these CAs and allows the user to choose which client certificate to send to the control region.

  If you created and signed your server certificate using the process described in "Steps for setting up secure HTTPS Transport Handler connections using a server certificate signed by an internal CA" on page 230, you can use the internal CA defined in that example for the internal CA in this process. If you created and signed your server certificate using the process described in "Steps for setting up secure HTTPS Transport Handler connections using server certificates signed by an external CA" on page 239, you must set up an internal CA as described in Step 1 of "Steps for setting up secure HTTPS Transport Handler connections using a server certificate signed by an internal CA" on page 230 and connect the CA certificate to the control region key ring as described in Step 2 of that process before proceeding.

Perform these steps to set up client authentication using client certificates signed by an internal CA:

1. Using the WebSphere for z/OS Administration application, open a conversation for the appropriate J2EE server, and verify that SSL client certificates are allowed:
   a. Select Conversations → the name of the conversation → Sysplexes → sysplex name → J2EE Servers → the name of the appropriate J2EE server → modify.
   b. In the properties form, check the SSL Client Certificates box, if it is not already checked to indicate that SSL client certificates are allowed.

2. Ensure the CA certificate is in the client's browser, if this is a requirement for the client's browser. (Some browsers do not require the CA certificate to reside in the browser.) The following example assumes it is not already there.

   Example: Assuming that:
   - Your CA certificate must be added to the client's browser.
   - You are using the same CA certificate you created in section "Steps for setting up secure HTTPS Transport Handler connections using a server certificate signed by an internal CA" on page 230 to sign client certificates, as well as your server certificate. (This certificate resides in the data set CERT.ARM.)

   Download the CA certificate:
   a. Point your browser at the site.
   b. You will receive a message asking if you want to accept the certificate. Select ″Accept″.

   Note: If the browser doesn't ask if you want to receive the certificate, use the file transfer program (ftp) set in ASCII mode to copy the CA certificate data set to your client machine. You can then use your browser to open the file.

Follow the browser prompts to install the CA certificate. Newer versions of the Netscape and Microsoft Internet Explorer browsers automatically start a wizard to help you install the certificate. If you use Microsoft Internet Explorer, you may need to open the file rather than saving it to disk to start the wizard. See the online help in your browser or browser documentation for additional information. Generally for Netscape, if you receive a window asking if you would like to accept the CA to certify network sites, electronic mail (e-mail) users, and software developers, do so.

---

3. Create the client certificate and associate it with a RACF user ID.

   Assuming your CA certificate was added to the list of trusted CAs in your browser, generate a client certificate under a RACF user ID. This enables the client certificate to be used to authenticate the user ID.

   Example: In this example, you will create the client certificate with label **Certificate for Jane Smith** signed by the internal CA using label **CA certificate for CBACRU1**. The client certificate will be created under user ID **JSMITH**.

   To create the client certificate signed by the internal CA, issue the RACF command:

   ```
   RADCERT ID(JSMITH) GENCERT SUBJECTSDN(CN('Jane Smith')
   o('IBM ID Raleigh') ou('IBM ID z/OS') L('Raleigh') SP('North Carolina')
   C('US')) SIZE(512) WITHLABEL('Certificate for Jane Smith')
   SIGNWITH(CERTAUTH LABEL('CA certificate for CBACRU1'))
   ```

   where

   - The Distinguished Name consists of the:
     - Common name (Domain Name), **Jane Smith**
     - Organization name, **IBM ID Raleigh**
     - Optional organizational unit, **IBM ID z/OS**
     - Optional city or locality, **Raleigh**
     - Optional state or province, **North Carolina**
     - Country code, **US**
   - **JSMITH** is the z/OS user ID under which the client certificate is to be added.
   - 512 is the key size
   - **Certificate for Jane Smith** is the label of the client certificate.
   - **CA certificate for CBACRU1** is the label of the CA certificate that will sign the client certificate.

   The client certificate will be created with status **TRUST**. Trust indicates that the client certificate can be used to authenticate the user ID **JSMITH**.

4. Add the signed client certificate to the client's browser. To perform this step, you must:

   - Export the client certificate to a z/OS data set.

     Example: To export the client certificate to a data set so that the client certificate can be added to the client's browser, issue the following command:

     ```
     RACDCERT ID(JSMITH) EXPORT(LABEL('Certificate for Jane Smith'))
     DSN('JSMITH.CLIENT.P12') FORMAT(PKCS12DER) PASSWORD('Test')
     ```

     where:

     - **JSMITH** is the user ID associated with the client certificate being exported.
     - **Certificate for Jane Smith** is the label of the client certificate.

- **'JSITH.CLIENT1.P12'** is the data set that will contain the client certificate.
- **PKCS12DER** indicates that the client certificate and private key are DER encoded when saved to the data set.
- **Test** is the password associated with the encrypted client certificate. You will be required to provide this password when you import the client certificate into the browser. The password is case sensitive.

- FTP the client certificate to the client's workstation.

  Example: This example shows how to use the FTP command to transfer the PKCS12 data set containing the signed client certificate to the client's workstation. The following steps are performed on the workstation:

  a. Enter the FTP command and the host name or IP address of the control region. For example:

  ```
  ftp www.raleigh.ibm.com
  ```

  b. When prompted, enter your user ID and password.

  c. Enter **bin** to transfer the file in binary format.

  d. Transfer the file to the workstation by entering:

  ```
  get 'JSMITH.CLIENT1.P12' client1.p12
  ```

  e. Enter **quit** or **bye** to exit.

- Load the client certificate into the client's browser.

  Example: This example shows how to load the PKCS12 file into the Netscape Communicator browser:

  a. Start the browser.

  b. To access the security information, click **Communicator, Tools, Security, Info**.

  c. Under **Certificates**, click **Yours**.

  d. Click **Import a Certificate**. You may need to scroll down to see this option.

  e. Highlight the PKCS12 file.

  f. Click **Open**, and enter the case sensitive password protecting the file.

  g. Click **OK**. The following messages will be displayed:

  ```
  Your certificates have been successfully imported.
  ```

  h. Click OK. You should be able to see this certificate label in the window called **These are your certificates**. You may need to scroll down to find the label.

  Note: On browser versions prior to Netscape 4.6.1, there may be a problem displaying the label. For example, the label name may appear as ????@????.

---

5. Verify that the client can use the client certificate to access a protected page.

   To verify that the client can establish a secure connection with a protected page, make sure the J2EE server instance is running, and point your browser at the following URL:

   `https://`*`domain`*`:`*`port_number/directory/webapp_name`*
   where:

   domain
   is the domain where the Web application being requested resides.

port_number
is the port number specified for the BBOC_HTTP_SSL_PORT environment variable in step 7.

directory
is the directory that contains the application.

webapp_name
is the name of the certificate protected Web application being requested.

Example: :

```
https://www.raleigh.ibm.com:443/webap1/my.jsp
```

When prompted by the browser, select the label for the client certificate. If the setup is correct, you will be able to view the protected page without prompts for a user ID and password.

Steps for setting up secure HTTPS Transport Handler connections using server certificates signed by an external CA: Using SSL, WebSphere for z/OS allows you to use an external Commercial CA to sign your server certificate.

Notes:

1. You must use System SSL to establish secure connections. To use System SSL with the HTTPS Transport Handler, the System SSL load library must exist in linklist and must be under program control. If you have not already done so:
   - Add the load library to the linklist.
   - Turn on program control for the library by issuing the following RACF commands from a user ID that has the proper authority:
     ```
     RALTER PROGRAM * ADDMEM('hlq.SGSKLOAD'//NOPADCHK) UACC(READ)
     SETROPTS WHEN(PROGRAM) REFRESH
     ```
     If turning on program control for the first time, use the RDEFINE command instead of the RALTER command.
2. You will issue the RACF command, RACDCERT, to create certificates and key rings for your J2EE server instance. On most of the RACDCERT commands you must specify a user ID. This ID must be the same user ID as the control region ID for your server instance. If it is not, SSL will not initialize. The following example uses CBACRU1 as the control region ID. Therefore, CBACRU1 is specified as the ID on the RACCERT commands in this example.

Before you begin: Before issuing any of the RACF commands in the following steps, make sure you are using an MVS ID that:

1. Has the authority to use the RACDCERT command in RACF (for example, SPECIAL authority).

   For details about RACDCERT, see *z/OS Security Server (RACF): Security Administrator's Guide* or the *OS/390 Security Server (RACF): Security Administrator's Guide*. To access these books on the Web, go to the z/OS or OS/390 Book Server Web site at URL:

   ```
   http://www.ibm.com/servers/eserver/zseries/zos/bkserv/
   ```

   or

   ```
   http://www.ibm.com/s390/os390/bkserv/
   ```
2. Has been defined as a WebSphere for z/OS administrator for the J2EE server instance to which the certificates will apply. (Use the Administrators dialog in the Administration application to give an MVS ID administrative authority over a J2EE server instance.) See *WebSphere Application Server V4.0.1 for z/OS and*

OS/390: Operations and Administration for more information. To access this book on the Web, go to the product library page at URL:

```
http://www-3.ibm.com/software/webservers/appserv/zos_os390/library.html
```

Perform these steps to set up secure connections using server certificates signed by an external CA:

1. Create the control region key ring.

   A key ring is required for each control region that clients connect to using a secure SSL connection.

   Example: To create the control region key ring, CRRING, issue the following RACF command:

   ```
   RACDCERT ID(CBACRU1) ADDRING(CRRING)
   ```
2. Create a server certificate request. In this step you will:
   a. Create a self-signed certificate in order to establish your common name (host name) and public-private key pair.

      Example: To create the self-signed CA certificate for the control region with user ID CBACRU1, issue the following RACF command:

      ```
      RADCERT ID(CBACRU1) GENCERT SUBJECTSDN(CN('cbacru1.Raleigh.ibm.com')
      o('IBM ID Raleigh') ou('IBM ID z/OS') L('Raleigh') SP('North Carolina')
      C('US')) SIZE(512) WITHLABEL('certificate for CBACRU1')
      ```
      where
      - The Distinguished Name consists of the:
        - Common name (Domain Name), **cbacru1.Raleigh.ibm.com**
        - Organization name, **IBM ID Raleigh**
        - Optional organizational unit, **IBM ID z/OS**
        - Optional city or locality, **Raleigh**
        - Optional state or province, **North Carolina**
        - Country code, **US**
      - **CBACRU1** is the control region ID under which the server certificate resides.
      - 512 is the key size.
      - **Certificate for CBACRU1** is the label of the server certificate request.

   b. Generate a server certificate request from the self-signed certificate and save it to a data set.

      Example: To generate a server certificate request and save it to a data set, issue the following RACF command:

      ```
      RACDCERT ID(CBACRU1) GENREQ(LABEL('Certificate for CBACRU1')) DSN(CERTREQ.ARM)
      ```
      where
      - **CBACRU1** is the control region ID under which the server certificate resides.
      - **Certificate for CBACRU1** is the label of the server certificate request.
      - **CERTREQ.ARM** is the data set which contains your public-private key pair and unsigned server certificate.

   The self-signed certificate that you create will contain the control region's common name and public-private key pair. This information is required in order to generate the certificate request and obtain a server certificate signed by your external CA.

3. Transfer the server certificate request to your workstation.

   Example: To use the File Transfer Protocol (FTP) command to transfer the CERTREQ.ARM data set containing the server certificate request to your workstation, perform the following steps from your workstation:

   a. From a DOS prompt line, enter an FTP command specifying either the host name or IP address of the control region. For example:

      ```
      ftp www.raleigh.ibm.com
      ```

   b. When prompted, enter your user ID and password.

   c. Change to the directory where you put the data set containing the server certificate request, CERTREQ.ARM. For example, if the data set resides in the directory USER1, enter:

      ```
      cd 'USER1'
      ```

   d. Transfer the file in ASCII format to the workstation by entering:

      ```
      get certreq.arm
      ```

   e. Enter **quit** or **bye** to exit the FTP command process.

   ____

4. Send the request to a CA to be signed, using the CA's instructions for sending certificate requests and receiving signed server certificates.

   ____

5. Ensure that your CA certificate is in the RACF list of CA certificates and marked with a status of **TRUST**. These conditions must be met before you can receive the CA-signed certificated into your control region key ring.

   By default, the following CAs are designated in RACF, with a status of **NO TRUST**. Before you can use one of these CAs, you must first mark the CA with a status of **TRUST**:

   - Integration Certification Authority Root
   - IBM World Registry Certification Authority
   - Thawte Personal Premium CA
   - Thawte Personal Freemail CA
   - Thawte Personal Basic CA
   - Thawte Premium Server CA
   - Thawte Server CA
   - RSA Secure Server Certification Authority
   - Verisign Class 1 Public Primary Certification Authority
   - Verisign Class 2 Public Primary Certification Authority
   - Verisign Class 3 Public Primary Certification Authority

   In this step you must:

   - Check whether your external CA is in the list of CAs in RACF and whether it is marked with a status of **TRUST**.
     a. If the CA certificate is not already in the list of CAs, add it to the list and mark it with a status of **TRUST**.
     b. If the CA certificate is already in the list of CAs, but has a status of **NO TRUST**, change the status to **TRUST**.
   - Connect the CA certificate to your **CRRING** key ring.

   To check the list of CAs, issue the following RACF command:

   ```
   RACDCERT CERTAUTH LIST
   ```

After receiving the CA certificate, add it to RACF with **TRUST** status.
For example: Issue the following RACF command:

```
RACDCERT CERTAUTH ADD(CERT1.ARM) TRUST WITHLABEL('CA cert for CBACRU1')
```

where:

- **CERTAUTH** indicates the type of certificate you are adding to RACF, in this case, a certificate authority certificate.
- **CERT1.ARM** is the data set containing the CA certificate.
- **CA cert for CBACRU1** is the label for the CA certificate.

If your CA is in the list of CAs in RACF, but has a current status of **NO TRUST**, then change the status to **TRUST**. For example, issue the following command:

```
 RACDCERT CERTAUTH ALTER(LABEL('CA cert for CBACRU1')) TRUST
```

where:

- **CERTAUTH** indicates the type of certificate you are adding to RACF, in this case, a certificate authority certificate.
- **CA cert for CBACRU1** is the label for the CA certificate.

Now that your CA certificate is in the RACF list of CA certificates and has a status of trust, connect the CA certificate to your CRRING key ring. To connect the CA certificate to the key ring, issue the following RACF command:

```
RACDCERT ID(CBACRU1) CONNECT(CERTAUTH LABEL('CA cert for CBACRU1') RING(CRRING)
```

where:

- **CBACRU1** is the control region ID under which the key ring resides.
- **CA cert for CBACRU1** is the label for the CA certificate.
- **CERTAUTH** indicates the type of certificate you are adding to RACF, in this case, a certificate authority certificate.

6. Add your server certificate to the control region key ring.

   In this step, you will:

   - Alter the server certificate if necessary to make it look like the example.
   - Put the server certificate in an MVS data set, **CRCERT.ARM**.
   - Add the server certificate to RACF and associate it with the **CBACRU1** ID.

   Before you can add the signed server certificate to your control region key ring, you must put this certificate in an MVS data set. The certificate data set you create in this example is **CRCERT.ARM**. Alter the certificate data set if necessary. Include the BEGIN CERTIFICATE and END CERTIFICATE lines and all data in between as shown in the following example. If your certificate contains additional information before BEGIN CERTIFICATE or after END CERTIFICATE , remove all of the extraneous information in the file.

```
-----BEGIN CERTIFICATE-----
MIIB0DCCATkCBDV8PgswDQYJKoZIhvcNAQECBQAwcjELMAkGA1UEBhMCVVMxDTAL
BgNVBAgTBE4uQy4xDDAKBgNVBAcTA1JUUDEMMAoGA1UEChMDSUJNMRcwFQYDVQQL
Ew5XZWJzZXJ2ZXIgVGVzdDEfMB0GA1UEAxMWbXZzMTY3LnJhbGVpZ2guaWJtLmNv
bTAaFws5ODA2MDgxOTM5WhcLOTkwNjA4MTkzOVowNDELMAkGA1UEBhMCVVMxDDAK
BgNVBAoTA0lCTTEXMBUGA1UEAxMOcGtjczEwLmlibS5jb20wXDANBgkqhkiG9w0B
AQEFAANLADBIAkEA1IYGldVmnKAI8hJQGT074oXTD0Tb+jFN8wkPqc+DVhYix1fj
h/sbiuDZF66BMh5hnHfJr75633CgjW10EpID0wIDAQABMA0GCSqGSIb3DQEBAgUA
```

```
A4GBAF1KVppAM7Gh2F9BBIY/jPMFlRp8+HAAVkK29Q4DxeF2FrTzQutKmO8duCWv
xnJo4pgl5Uj29DSAsrX8mULfczyuZwVVXiCGnhN03pYj8bbQjo0edqQ7hYsRl3P4
C72I+yRwtWUukfVgwdo0mWXyEclx7eT5jsW4weVEqWvuht8j
-----END CERTIFICATE-----
```

This example assumes that you received the server certificate on your workstation, and need to FTP this certificate, in ASCII format, to a z/OS or OS/390 data set. The following steps are performed on the workstation:

a. Enter the FTP command and the host name or IP address of the control region. For example:

   ```
   ftp www.raleigh.ibm.com
   ```

b. When prompted, enter your user ID and password.

c. Transfer the file to the z/OS or OS/390 data set that will be created on execution of the PUT command by entering:

   ```
   put crcert.arm 'CRCERT.ARM'
   ```

d. Type **quit** or **bye** to exit.

Issue the following RACF command to add the server certificate signed by your external CA to RACF and associate it with the CBACRU1 ID. In doing so, you will replace the self-signed certificate created in Step 2:

```
RACDCERT ID(CBACRU1) ADD(CRCERT.ARM) WITHLABEL('Certificate for CBACRU1')
```

where:

- **CRCERT.ARM** is the server certificate data set.
- **Certificate for CBACRU1** is the label of the server certificate.

---

7. Connect your signed server certificate that is now in RACF to your CRRING key ring and make this certificate the default certificate in the key ring. For example, issue the following RACF command:

   ```
   RACDCERT ID(CBACRU1) CONNECT(ID(CBACRU1) LABEL('Certificate for CBACRU1')
   RING(CRRING) DEFAULT)
   ```

   where:

   - **CBACRU1** is the control region ID under which the control region key ring and the server certificate reside.
   - **CRRING** is the control key ring.
   - **Certificate for CBACRU1** is the label that identifies the key and server certificate in the key ring.
   - **DEFAULT** makes the server certificate the default in the key ring.

---

8. Permit the control region ID to access the key ring through DIGTCERT general resource class.

   The control region ID must have access to the key ring created using RACDCERT. If the ID does not have access, SSL initialization fails. In this example the control region ID is CBACRU1. To permit CBACRU1 to access the control region key ring, you issue RACF commands to perform the following tasks:

   - Define the IRR.DIGTCERT.LIST and IRR.DIGTCERT.LISTRING resources with universal access of None.
   - Permit the CBACRU1 ID read access to the IRR.DIGTCERT.LIST and IRR.DIGTCERT.LISTRING resources in the FACILITY class.
   - Activate the FACILITY general resource class.

- Refresh the FACILITY general resource class.

To perform these tasks, issue the following commands:

```
RDEFINE FACILITY IRR.DIGTCERT.LIST UACC(NONE)
PE IRR.DIGTCERT.LIST CLASS(FACILITY) ID(CBACRU1) ACCESS(READ)

RDEFINE FACILITY IRR.DIGTCERT.LISTRING UACC(NONE)
PE IRR.DIGTCERT.LISTRING CLASS(FACILITY) ID(CBACRU1) ACCESS(READ)

SETR CLASSACT(FACILITY)
SETR RACLIST(FACILITY) REFRESH
```

To find out more about controlling access to the RACDCERT function through the FACILITY general resource class, see the *z/OS Security Server (RACF): Security Administrator's Guide* and the description of the RACDCERT command in the *z/OS Security Server (RACF): Security Administrator's Guide*. To access these books on the Web, go to the z/OS Book Server Web site at URL:

```
http://www.ibm.com/servers/eserver/zseries/zos/bkserv/
```

---

9. Use the Administration application to register your control region key ring with the J2EE server:

Example: To register your key ring:

a. Select **Conversations** → the name of the conversation → **Sysplexes** → sysplex name → **J2EE Servers** → the name of the appropriate J2EE server → **modify**.

b. On the right panel find **SSL RACF Keyring** and type in the name of the key ring, which in this example is CRRING.

c. Set the following environment variables:

- `BBOC_HTTP_SSL_PORT`
- `BBOC_HTTP_SSL_IDENTITY` (Optional. If not set the identity of the J2EE server is used as the value for this environment variable.)

Example: To set these environment variables:

1) Scroll to the **Environment variable list**.

2) Double-click on the `BBOC_HTTP_SSL_PORT` environment variable and specify the port number for the HTTPS Transport Handler (for example, 443). If this environment variable is not in the list, double click on a blank line. You can then add the environment variable, along with the appropriate port number.

3) Close the Edit Variable dialog.

4) Double-click on the `BBOC_HTTP_SSL_IDENTITY` environment variable and specify the client's ID (for example, CBGUEST). If this environment variable is not in the list, double click on a blank line. You can then add the environment variable, along with the client's ID.

d. Click on the tool bar or choose the Save action of the Selected menu bar choice.

e. Validate the conversation.

f. Commit the conversation.

---

10. Verify that you can establish a secure connection with the control region.

To verify that you can establish a secure connection with the control region, make sure the J2EE server instance is running, and point your browser at the following URL:

`https://`*`domain`*`:`*`port_number/directory/webapp_name`* where:

domain
is the domain where the Web application being requested resides.

port_number
is the port number specified for the BBOC_HTTP_SSL_PORT environment variable in step 7.

directory
is the directory that contains the application.

webapp_name
is the name of the certificate protected Web application being requested.

Example: :

```
https://www.raleigh.ibm.com:443/webap1/my.jsp
```

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11. Optionally, set up client authentication.

    For instructions, see “Steps for setting up secure HTTPS Transport Handler connections using client certificates signed by an internal CA” on page 235 or “Steps for setting up secure HTTPS Transport Handler connections using client certificates signed by an external CA.”

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Steps for setting up secure HTTPS Transport Handler connections using client certificates signed by an external CA: WebSphere for z/OS allows you to set up client authentication using client certificates that are signed by an external CA. Using an external CA to sign your client certificates is independent of whether you used an internal or external CA to sign your server certificate. However, before using this example, there are a few things you must do first.

- You must set up secure connections by following the instructions in one of the following sections:
  - “Steps for setting up secure HTTPS Transport Handler connections using a server certificate signed by an internal CA” on page 230
  - “Steps for setting up secure HTTPS Transport Handler connections using server certificates signed by an external CA” on page 239
- You must ensure that the external CA that signs your client certificates is marked with a status of TRUST and that it is connected to your control region key ring. During the SSL handshake, the control region tells the client which CAs it trusts based on the trusted CAs in the control region key ring. The browser then searches its client certificates for ones issued by these CAs and allows the user to choose which client certificate to send to the control region.
- If you created and signed your server certificate using the steps in the section “Steps for setting up secure HTTPS Transport Handler connections using server certificates signed by an external CA” on page 239, you can use the external CA defined in that example for the external CA in this example.
- If you created and signed your server certificate using the steps in the section “Steps for setting up secure HTTPS Transport Handler connections using a server certificate signed by an internal CA” on page 230, you must ensure that your CA certificate is in RACF and marked with a status of TRUST, and that the external CA is connected to the control region key ring. (See “Steps for setting up secure HTTPS Transport Handler connections using server certificates signed by an external CA” on page 239 for a description of how to do this.)

Notes:

1. Choose the environment in which you execute the RACF commands (TSO READY, ISPF option 6, and so forth). Implementing these commands varies from one environment to another. See your local RACF administrator for assistance, or review the appropriate books for your environment.

Before you begin: Before issuing any of the RACF commands in the following steps, make sure you are using an MVS ID that:

1. Has the authority to use the RACDCERT command in RACF (for example, SPECIAL authority).

   For details about RACDCERT, see *z/OS Security Server (RACF): Security Administrator's Guide* or the *OS/390 Security Server (RACF): Security Administrator's Guide*. To access these books on the Web, go to the z/OS or OS/390 Book Server Web site at URL:

   `http://www.ibm.com/servers/eserver/zseries/zos/bkserv/`

   or

   `http://www.ibm.com/s390/os390/bkserv/`
2. Has been defined as a WebSphere for z/OS administrator for the J2EE server instance to which the certificates will apply. (Use the Administrators dialog in the Administration application to give an MVS ID administrative authority over a J2EE server instance.) See *WebSphere Application Server V4.0.1 for z/OS and OS/390: Operations and Administration* for more information. To access this book on the Web, go to the product library page at URL:

   `http://www-3.ibm.com/software/webservers/appserv/zos_os390/library.html`

Perform these steps to set up client authentication using client certificates signed by an external CA:

1. Using the WebSphere for z/OS Administration application, open a conversation for the appropriate J2EE server, and verify that SSL client certificates are allowed:
   a. Select Conversations → the name of the conversation → Sysplexes → sysplex name → J2EE Servers → the name of the appropriate J2EE server → modify.
   b. In the properties form, check the SSL Client Certificates box, if it is not already checked to indicate that SSL client certificates are allowed.

   ____
2. Ensure the CA certificate is in the client's browser. Browsers vary as to whether they require the CA certificate to be in the browser. This example assumes you will ensure that your CA certificate is added to your browser if it is not already there.

   Example: If you are using the same external CA certificate to sign client certificates that you used to sign your server certificate, then clients may have already loaded the CA certificate into their browsers in step 5 of section "Steps for setting up secure HTTPS Transport Handler connections using server certificates signed by an external CA" on page 239. If they have not, they should contact the external CA to obtain the CA certificate.

   ____
3. Obtain client certificate. Follow the external CA's instructions for obtaining the signed client certificate and loading it into your browser.

   ____

4. Map a client certificate to a RACF user ID. RACF maps client certificates that are in various formats, including PKCS12, binary, and base 64 encoded ASCII. Some browsers may be able to output the client certificate in these formats or other formats. If, for instance, either the binary or base 64 encoded ASCII format is outputted, the resulting file would contain the client certificate without the private key. If the PKCS12 format is outputted, the resulting file would contain the private key (which RACF doesn't use) and the client certificate. If a browser does not output the client certificate in the format that you want, contact the signing authority to obtain the client certificate in the desired format. The format of the client certificate in RACF can be different from the format of the client certificate in the browser.

   Since some browsers require client certificates in PKCS12 format, we will map a PKCS12 formatted certificate to a RACF user ID. You can export the client certificate from the browser so that it can be input to RACF.

   You can use the following Resource Access Control Facility (RACF) options to map a client certificate to RACF when the client certificate is created with some method other than RACF commands or a RACF application such as PKISERV:

   - **Certificate Name Filtering function:** This function is available for OS/390 Release 10 and later.
   - **Automatic registration of digital certificates on the Web**: The Autoregistration Web application enables a client to automatically register a certificate with the control region.
   - Using ISPF panels or the RACDCERT command: These two options take the same inputs, but you use panels with ISPF and a command line with RACDCERT.

     For information on these options, see the *z/OS Security Server (RACF): Security Administrator's Guide* or the *OS/390 Security Server (RACF): Security Administrator's Guide*. To access these books on the Web, go to the z/OS or OS/390 Book Server Web site at URL:

     `http://www.ibm.com/servers/eserver/zseries/zos/bkserv/`

     or

     `http://www.ibm.com/s390/os390/bkserv/`

   You can use one or more of these options. This example shows how to use the RACDCERT command.

   In this step you will:

   - FTP the PKCS12 formatted client certificate from the workstation to the HFS on your z/OS system.
   - Copy the PKCS12 formatted client certificate from the HFS to an MVS data set.
   - Issue RACF commands to associate the client certificate with a RACF user ID.

   FTP the client certificate from the client's workstation to the HFS: We will FTP the client certificate from the workstation into the HFS in this section and then do an OGET of the file into an MVS data set in the next section to insure that the data set containing the client certificate has the correct format. This example shows how to use the FTP command to transfer the signed PKCS12 formatted client certificate on a client's workstation to the HFS. The following steps are performed on the workstation:

a. Enter the FTP command and the host name or IP address of the control region. For example:

```
ftp www.raleigh.ibm.com
```

b. When prompted, enter your user ID and password.

c. Change to the directory where you will place the client certificate. For example:

```
cd /ibm/security/user1
```

d. Enter **bin** to transfer the file in binary format.

e. Transfer the file to the HFS by entering:

```
put client1.p12
```

f. Type **quit** or **bye** to exit.

Copy the client certificate from the HFS to an MVS data set: You must store client certificates on MVS in variable block (VB) format. The client certificates in this example are in an HFS directory. Use the TSO/E OGET command to move the certificate file from the HFS directory into an MVS sequential data set. If you move the client certificate into a new data set, the OGET command creates a VB sequential data set by default. You must use the OGET command to move the client certificate into the MVS sequential data set; exporting it from the browser to FTP it directly into the MVS data set does not work because the certificate file is not in the correct format.

Example:

```
oget '/ibm/security/user1/client1.p12' 'jsmith.client1.p12' binary
```

Note: You can execute this TSO/E command from TSO/E, ISPF option 6, and the shell. To find out more about this command, including where to execute it, please see the z/OS UNIX System Services Command Reference. To access this book on the Web, go to the z/OS Book Server Web site at URL:

```
http://www.ibm.com/servers/eserver/zseries/zos/bkserv/
```

Associate the client certificate with a RACF user ID: To perform the following steps, ensure that you are using an MVS user ID that has the authority to map a client certificate to an MVS user ID:

a. Issue the RACDCERT command to add the client certificate to the RACF data base for each client. For example:

```
RACDCERT ID(RACFID1) ADD('JSMITH.CLIENT1.P12')
WITHLABEL('Certificate for Jane Smith') TRUST PASSWORD('X2RL')
```

- **RACFID1** is the RACF user ID under which the client certificate is added.
- **’JSMITH.CLIENT1.P12’** is the name of the data set where the certificate file is located.
- **TRUST** indicates that you can use the client certificate to authenticate the user ID RACFID1.
- **Certificate for Jane Smith** is the label of the client certificate.
- **X2RL** is the required password for PKCS12 certificates.

b. Issue the following SETROPTS command to refresh the DIGTCERT class for all the clients:

```
SETROPTS RACLIST(DIGTCERT) REFRESH
```

c. Verify that the client certificate is associated with a user ID that has been defined to RACF, by issuing the following RACDCERT command and specifying the user ID in the ID field:

```
RACDCERT ID(RACFID1) LIST
```

If you are logged onto the user ID you are trying to verify, you can issue the RACDCERT command without operands to display the client certificate for that user ID.

---

5. Verify that a client can establish a secure connection with the control region.

   To verify that a client can establish a secure connection with the control region, make sure the J2EE server instance is running, and point your browser at the following URL:

   `https://`*`domain`*`:`*`port_number`*`/`*`directory`*`/`*`webapp_name`*
   where:

   domain
   is the domain where the Web application being requested resides.

   port_number
   is the port number specified for the BBOC_HTTP_SSL_PORT environment variable in step 7.

   directory
   is the directory that contains the application.

   webapp_name
   is the name of the certificate protected Web application being requested.

   Example: :

   ```
   https://www.raleigh.ibm.com:443/webap1/my.jsp
   ```
   When prompted by the browser, select the label for the client certificate. If the setup is correct, you will be able to view the protected page without prompts for a user ID and password.

Setting up the asserted identity function

SSL client certificate support provides a function called asserted identity, in which an intermediate server can send the identities of its clients to a target server in a secure yet efficient manner. This function requires client certificate support to establish the intermediate server as the owner of the SSL session. Through RACF, the system can check that the intermediate server can be trusted (special RACF permission is given to the address spaces, such as control regions, that run secure system code). Once trust in this intermediate server is established, client identities (MVS user IDs) need not be separately verified by the target server; those client identities are simply asserted without requiring authentication.

Steps for setting up the asserted identity function

Before you begin: The target server must be set up for SSL client certificate support, but the certificates it receives are those from the intermediate servers. The intermediate servers must run on a system that has SSL configured, but do not have to have SSL client certificate support enabled. See “Overview of SSL client certificate security for your application server and clients” on page 223.

Perform the following steps to set up the asserted identity function:

1. Open the Administration application and log on. Start a new conversation. If necessary, define new servers.

2. For the server that will receive an asserted identity (the target server), add these properties in the properties form:
   - Accept asserted identity allowed
   - SSL client certificates allowed

3. For the server that will send asserted identities (the intermediate server), specify “Send asserted identities allowed” on its properties form. Fill in the values for the SSL-related elements (SSL RACF keyring, SSL V2 timeout, and SSL V3 timeout).

4. Validate, commit, and activate the conversation.

5. On z/OS or OS/390, give CONTROL authority for CB.BIND.*servername* to the user ID (*controlRegionUserid*) of the intermediate server’s control region, where *servername* is the **target** server’s name.

   ```
   PERMIT CB.BIND.servername CLASS(CBIND) ID(controlRegionUserid) ACCESS(CONTROL)
   ```

   Attention: Scrutinize the user IDs that receive CONTROL authority. Such authority should be granted to system code (control regions) only. If you use RACF certificate name filtering to map digital certificates to user IDs, you may inadvertently grant CONTROL authority to users that should not have this powerful authority.

6. Activate the CBIND class.

You are done when you have finished the RACF commands.

Selecting a Web container security collaborator level

The security functions the Web container can provide is determined by the version of the Web container security collaborator that is specified in the webcontainer.conf file:

- Version 1 of the Web container security collaborator uses a SAF user registry and only provides the following security functions for requests received by the IBM HTTP Server for z/OS and forwarded to the Web container via the WebSphere for z/OS Local Redirector plug-in. None of these functions were available for requests received by the HTTP or HTTPS Transport Handlers:
  - Basic authentication
  - Form Based authentication
  - Client Certificates
  - Single Sign-On across WebSphere/390 Servers
- Version 2 of the Web container security collaborator enables the Web container to provide most of these security functions for requests that are received by the HTTP or HTTPS Transport Handler as well as for requests received by the IBM HTTP Server for z/OS. This version of the collaborator also enables you to use a trust association interceptor with WebSphere for z/OS.

The following table summarizes the capability and configuration requirements for the version 1 and Version 2 web security collaborators.

Table 41. Summary of the two Versions of the Web container security collaborator

	Version 1	**Version 2**
Security functions supported	• Basic authentication • Form Based authentication[1] • Client certificate authentication • Single sign-on authentication across IBM HTTP Servers for z/OS[1]	• Basic authentication • Form Based authentication[2] • Single sign-on across IBM HTTP Servers for z/OS[2] • Trust asssociation interceptor[3]
Security is applied to requests received via	IBM HTTP Server for z/OS and forwarded to the Web container via the WebSphere for z/OS Local Redirector plug-in.	• HTTPTransport Handler • HTTPS Transport Handler • IBM HTTP Server for z/OS and forwarded to the Web container via the WebSphere for z/OS Local Redirector plug-in.
Enabled by	Specifying WEB_SECURITY_VERSION=1 in the JVM properties file or by not including a WEB_SECURITY_VERSION property in the JVM properties file (1 is the default value).	Specifying WEB_SECURITY_VERSION=2 in the JVM properties file.

Table 41. Summary of the two Versions of the Web container security collaborator (continued)

Notes:

1. To enable Form Based authentication or single sign-on capability for Web applications being received by the IBM HTTP Server for z/OS, you must:
   - Set the following properties in the webcontainer.conf file:
     - The **WebAuth.EncryptionKeyLabel** property must specify the label of the cryptographic key that is to be used for Web application security.
     - The **WebAuth.LoginToken.Encrypt** property must be set to true.
   - Grant bpx.surrogat authority to the IBM HTTP Server for z/OS's address space.
   - Create ICSF keys and grant the IBM HTTP Server for z/OS's address space access to them.
   - Set the JAVA_PROPAGATE variable In the IBM HTTP Server for z/OS's httpd.envvars file to NO.
2. To enable Form Based authentication or single sign-on capability for Web applications being received by the HTTP/HTTPS, you must:
   - Set the following properties in the webcontainer.conf file:
     - The **WebAuth.EncryptionKeyLabel** property must specify the label of the cryptographic key that is to be used for Web application security.
     - The **WebAuth.LoginToken.Encrypt** property must be set to true.
   - Add the WEB_SECURITY_VERSION property to the jvm.properties file and set it to 2.
   - Create ICSF keys and make them available to the server region.
   - Permit the server region user ID to the CSFSERV general resource class.
   - Add the ENABLE_TRUSTED_APPLICATIONS environment variable to your J2EE server's current.env. file, and set it to 1.
3. To enable trust association interceptor support, you must:
   - Make the following changes to your J2EE server's current.env file:
     - Add the ENABLE_TRUSTED_APPLICATIONS=1 environment variable.
     - Add tthe TrustAssociationInterceptor class to the CLASSPATH environment variable.
   - Add the following properties to the WebSphere for z/OS webcontainer.conf configuration file:
     - WebAuth.TrustAssociationInterceptor.<value>.ImplClass=<classname>
     - WebAuth.TrustAssociationInterceptor.<value>.Properties=<filename>
   - Add the WEB_SECURITY_VERSION property to the jvm.properties file and set it to 2.

Setting up Kerberos security for WebSphere for z/OS

On WebSphere for z/OS, Kerberos works with SSL to provide a complete authentication mechanism:

- SSL secures the transportation layer to protect messages. SSL also provides the mechanism whereby the client authenticates the server.
- Kerberos provides the mechanism whereby the server authenticates the client. That is, the client sends the server a Kerberos Generic Security Service Application Program Interface (GSS_API) token, which is used by the server to authenticate the identity of the client.
- Through the GSS_API token, a server is able to pass the client's identity to another server in order to satisfy a client's request. This is called delegation.

The following describes how a Kerberos over SSL connection works:

Stage	Description
Negotiation	After the client locates the server, the client and server negotiate the type of security for communications. If Kerberos is to be used, the client is told to connect to a special SSL port.
Handshake	The client connects to the SSL port and the SSL handshake occurs. If successful, SSL message protection begins. The client authenticates the server by inspecting the server's digital certificate.
Client authentication	After the SSL handshake occurs, the client establishes its Kerberos identity and obtains a Kerberos GSS_API token based on this identity and the server's Kerberos principal. The client sends this token to the server along with a unique SSL connection identifier. The server uses the GSS_API token to authenticate the Kerberos principal that represents the client. Once the client has been authenticated, the system uses RACF to obtain the z/OS user ID that has been mapped to the client's Kerberos principal. This z/OS user identity is used in future authorization checks. By default the client constructs the GSS_API token so that delegation is enabled. This will allow the server to impersonate the client on requests made on its behalf. The z/OS user ID, the Kerberos delegated credentials, and the unique SSL connection identifier are stored for use on future requests made over this SSL Kerberos connection. If the Kerberos client authentication, or the mapping of the authenticated principal fails, communication stops.
Ongoing communication	Communication between the client and server use SSL services for message protection. Each message includes the unique SSL connection identifier, which allows the server to match a request to its stored z/OS user ID and Kerberos delegated credentials.

This support requires SSL security to be set up. In addition to SSL requirements, Kerberos requires the following to be installed and configured on your z/OS or OS/390 system:

- OS/390 SecureWay Security Server Network Authentication and Privacy Service for OS/390. For OS/390 V2R8 and V2R9, this support is available through the following Web site:

  `http://www.software.ibm.com`

  For OS/390 V2R10 and z/OS, this support is part of SecureWay Security Server.
- The PTFs for your z/OS or OS/390 system. Consult the PSP bucket for more information.
- The Kerberos security server must be active on the client and server systems where this support is used.
- All z/OS or OS/390 user IDs (for clients and servers) that participate in Kerberos authentication must have a Kerberos RACF segment that defines their Kerberos principal.
- The Kerberos server is not required to have a file that contains its Kerberos secret key. Kerberos on z/OS or OS/390 has eliminated this requirement and can

use the Kerberos principal associated with the current system identity to decrypt the service ticket. WebSphere for z/OS servers must use this feature.

- The WebSphere for z/OS server must have READ access to the IRR.RUSERMAP resource in the RACF FACILITY class.
- Kerberos security relies on time coordination among its participants. The Kerberos security administrator should select a time provider and ensure that participants in Kerberos security use that time source to maintain their system time.

The following table shows the subtasks and associated procedures for defining Kerberos security:

Subtask	Associated procedure (See . . .)
Enabling the Kerberos server	*z/OS SecureWay Security Server Network Authentication Service Administration*, SC24-5926
Setting up the server for SSL authorization	"Steps for using RACF to authorize the server to use digital certificates" on page 225
Associating the server identity with a Kerberos principal	"Step for associating a server identity with a Kerberos principal"
Defining server attributes for Kerberos	"Steps for defining server security properties for SSL-based security" on page 226
Setting up a client to use Kerberos	"Steps for setting up a client to use Kerberos" on page 255

Step for associating a server identity with a Kerberos principal

Before you begin: You need to have a RACF user ID established for the server's control region.

You need to install and configure OS/390 SecureWay Security Server Network Authentication and Privacy Service for OS/390 (Kerberos). Enable a SecureWay Security Server (KDC) on each z/OS or OS/390 image where servers will use Kerberos. For more information, see *z/OS SecureWay Security Server Network Authentication Service Administration*, SC24-5926.

Perform the following step to associated the server identity with a Kerberos principal:

⇔ Issue the ALTUSER command to make the association. **Example:**

```
ALTUSER ctl_ID PASSWORD(new_password) NOEXPIRED
       KERB(KERBNAME(kerberos_principal))
```

where

ctl_ID
Is the user ID assigned to the server's control region through the STARTED class.

new_password
Is the shared z/OS or OS/390 and Kerberos password.

kerberos_principal
Is the Kerberos principal name associated with this z/OS or OS/390 user ID.

You know you are done when the RACF command succeeds.

Steps for setting up a client to use Kerberos

Before you begin: You must have SSL communication set up on your system.

You need to install and configure OS/390 SecureWay Security Server Network Authentication and Privacy Service for OS/390 (Kerberos). Enable a SecureWay Security Server (KDC) on each z/OS or OS/390 image where clients will use Kerberos. For more information, see *z/OS SecureWay Security Server Network Authentication Service Administration*, SC24-5926.

Perform the following steps to set up a client to use Kerberos.

1. Use RACF to map each z/OS or OS/390 user that will participate as a Kerberos client to a Kerberos principal on the local realm.

   Example:

   ```
   ALTUSER client_ID PASSWORD(CBIVP) NOEXPIRED KERB(KERBNAME(kerberos_principal))
   ```

   where

   client_ID
   Is the client's user ID.

   kerberos_principal
   Is the Kerberos principal name that will be associated with this z/OS or OS/390 user ID.

   Tip: You can use a utility to help a security adminstrator migrate a z/OS or OS/390 RACF registry to Kerberos. The utility is located at the following Web site:

   ```
   http://sandbox.s390.ibm.com/products/racf/kmigrate.html
   ```

2. Use RACF to set up cross-realm trust relationships between the realms where the target servers reside and the clients reside.

   Example: A client is in Kerberos realm CLIENTREALM and the server is in SERVERREALM:

   ```
   RDEFINE REALM /.../CLIENTREALM/krbtgt/SERVERREALM KERB(PASSWORD(password1))
   RDEFINE REALM /.../SERVERREALM/krbtgt/CLIENTREALM KERB(PASSWORD(password2))
   ```

   where *password1* and *password2* are passwords. These two commands must be issued to each RACF database.

3. Use RACF to set up foreign user mapping in server realms.

   Examples:

   a. To map all principals from a foreign-realm to a single user ID, issue:

      ```
      RDEFINE KERBLINK /.../foreign_realm APPLDATA('user_ID')
      ```

   b. To map an individual principal from a foreign-realm to a user ID, issue:

      ```
      RDEFINE KERBLINK /.../foreign_realm/principal APPLDATA('user_ID')
      ```

   where

   foreign_realm
   Is the foreign realm.

   user_ID
   Is the MVS user ID.

principal
Is the principal.

You know you are done when the RACF commands succeed.

Implementing advanced performance controls

This section discusses performance issues for:

- Resource serialization
- WLM classification rules and work qualifiers

Recommendation for resource serialization

For performance reasons, we recommend you use a global resource serialization star complex. For more information, see *z/OS MVS Planning: Global Resource Serialization*, SA22-7600.

Workload management and WebSphere for z/OS

This topic discusses how WebSphere for z/OS uses the z/OS or OS/390 workload management subsystem and tells you how to set up workload management controls.

Background on workload management and WebSphere for z/OS

WebSphere for z/OS exploits workload management for the following general functions:

- Sysplex routing of work requests
- Address space management for work requests

Sysplex routing of work requests: WebSphere for z/OS routes work requests throughout the sysplex by using the domain name server (DNS). Figure 15 on page 257 shows how work gets routed in the sysplex. The DNS accepts a generic host name from the client and maps the name to a specific system. In order to select the best available system, the DNS asks workload management (WLM) for a recommendation. Workload management analyzes the current state of the sysplex and considers a number of factors, such as CPU, memory, and I/O utilization, to determine the best placement of new work. The DNS then routes the client request to the optimal system for execution. This use of workload management and the DNS is optional but highly recommended because it eliminates a single point of failure.

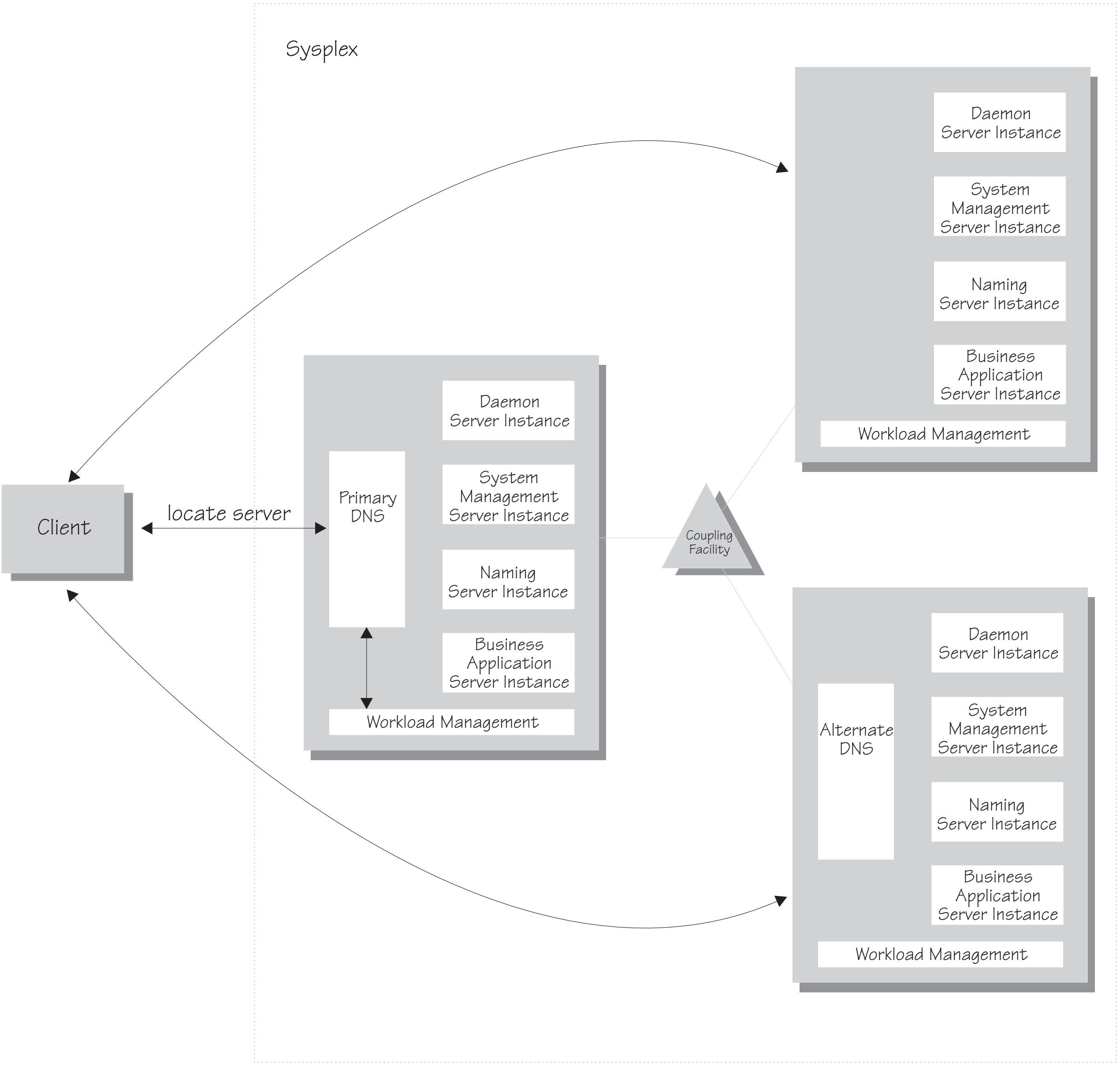


Figure 15. WebSphere for z/OS, the domain name server (DNS), and workload management

In Figure 15, each system in the sysplex has the WebSphere for z/OS run time (the Daemon, System Management, and Naming Servers), plus business application servers. The client uses the CORBA General Inter-ORB Protocol (GIOP) to make requests of WebSphere for z/OS. The Daemon acts as a location service agent. It accepts locate requests with object keys in the requests. The Daemon uses the object key to locate a server that supports the object represented by the object key, then hands the server name to workload management. Workload management chooses the optimal server instance in the sysplex to handle the request. The Daemon merges specific IOR information related to the chosen server instance with object key information stored in the original IOR. The result of this merging is a direct IOR that gets returned to the client. The client ORB uses this returned reference to establish the IOR connection to the server instance holding the object of interest.

The transport mechanism that WebSphere for z/OS uses depends on whether the client is local or remote. If the client is remote (that is, not running on the same z/OS or OS/390 system), the transport is TCP/IP. If the client is local, the transport is through a program call. Local transport is fast because it avoids the physical trip over the network, eliminates data transforms, simplifies the marshalling of requests, and uses optimized RACF facilities for security rather than having to invoke Kerberos or SSL.

Address space management for work requests: WebSphere for z/OS propagates the performance context of work requests through the use of workload management (WLM) enclaves. Each transaction has its own enclave and is managed according to its service class. As depicted in Figure 16, the control region of a server instance, which workload management views as a queue manager, uses the enclave associated with a client request to manage the priority of the work. If the work has a high priority, workload management can direct the work to a high-priority server region in the server instance. If the work has a low priority, workload management can direct the work to a low-priority server region. The effect is to partition the work according to priority within the same server instance.

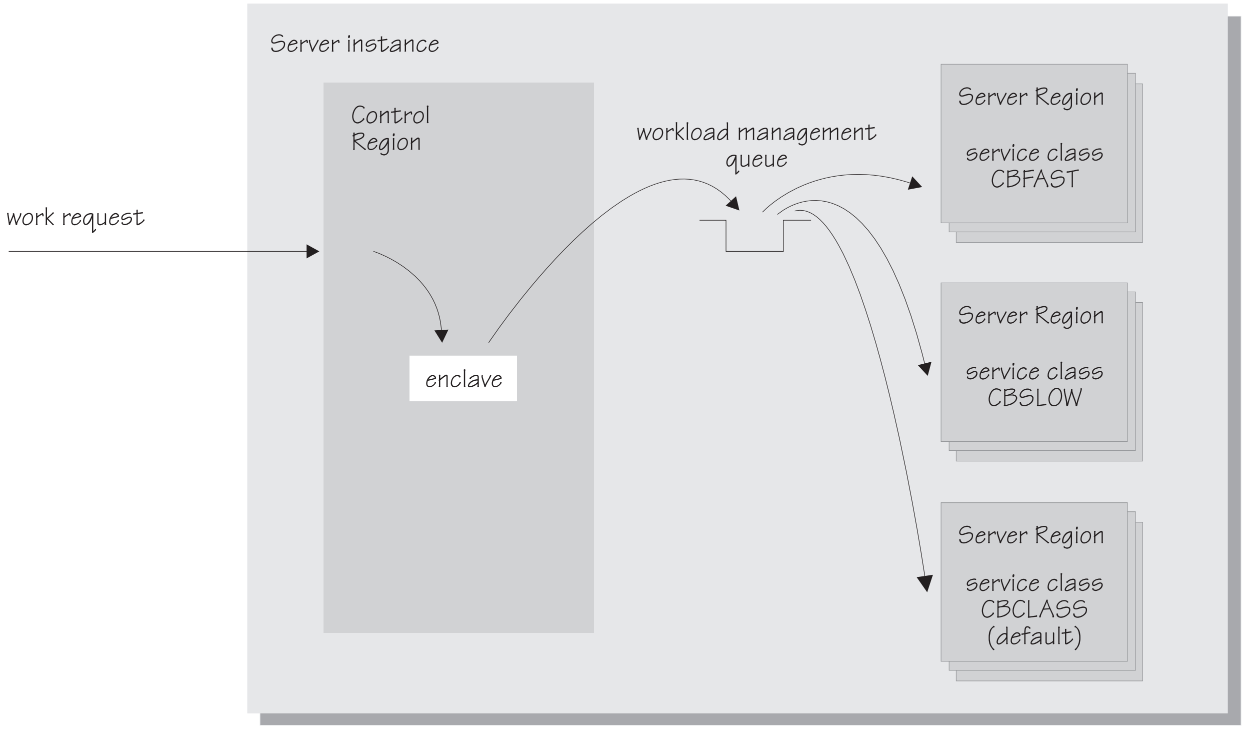


Figure 16. Use of enclaves for managing the priority of work

Enclaves can originate in several ways:

- WebSphere for z/OS uses its own set of rules to create an enclave for a client request from the network.
- Some subsystems (such as Web Server) create enclaves and pass them to WebSphere for z/OS, which, in turn, passes the enclaves on.
- WebSphere for z/OS treats batch jobs as if they were remote clients.

To communicate the performance context to workload management, you must classify the workloads in your system according to the following work qualifiers.

Table 42. WLM work qualifiers and corresponding WebSphere for z/OS entities

Work qualifier abbreviation	Work qualifier	Corresponding WebSphere for z/OS entity
CN	Collection name	Server name
UI	User ID	User ID under which work is running

For more information about classification rules and workload qualifiers, see *z/OS MVS Planning: Workload Management*, SA22-7602.

In addition to client workloads, you must consider the performance of the WebSphere for z/OS run-time servers and your business application servers. In general, server control regions act as work routers, so they must have high priority. Because workload management starts and stops server regions dynamically, server regions also need high priority in order to be initialized quickly. Once initialized, however, server regions run work according to the priority of the client enclave, so the server region priority you assign has no significance after initialization.

In summary, use the following table to set the performance goals for each class:

Table 43. Workload management rules

If you are classifying...	... assign it to:	Reason
The Daemon	SYSSTC	The system treats it as a started task, and it must route work requests quickly.
An WebSphere for z/OS run-time server **control** region	SYSSTC	A control region must route work quickly.
An WebSphere for z/OS run-time server **server** region	SYSSTC	A server region must initialize quickly, but, once initialized, it runs work according to the priority of the client enclave.
Your business application **control** region	A class having at least as much importance as that of the work that flows through it.	A control region must route work quickly, but you must balance the priority of your business application server with other work in the system.
Your business application **server** region	SYSSTC	A server region must initialize quickly, but, once initialized, it runs work according to the priority of the client enclave.
A client workload	A class having importance relative to other work in your system	WebSphere for z/OS and workload management run the work according to the goals you set.

Example of classification rules

Example: Let us assume you have three workload management service classes defined for WebSphere for z/OS (subsystem type CB):

1. CBFAST—designed for transactions requiring fast response times.
2. CBSLOW—designed for long-running applications that do not require fast response times.
3. CBCLASS–designed for remaining work requests.

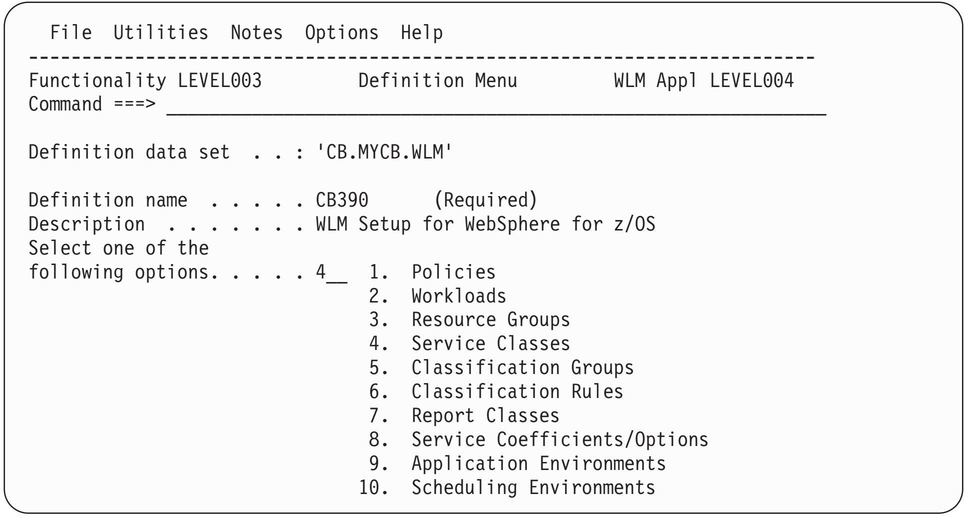
You design a client workload called BBOASR1 that requires fast response times. Also, you want to give work that runs under your boss' user ID (DBOOZ) slower response times. Finally, all remaining work requests should run under the default service class, CBCLASS.

Table 44. Classification rules example

Type column	Name column	Service column	Goal
CN	BBOASR1	CBFAST	90% complete in 2 seconds
UI	DBOOZ	CBSLOW	Velocity 50, importance = 3
(default)	(blank)	CBCLASS	Discretionary

You could set the following performance goals through IWMARIN0:

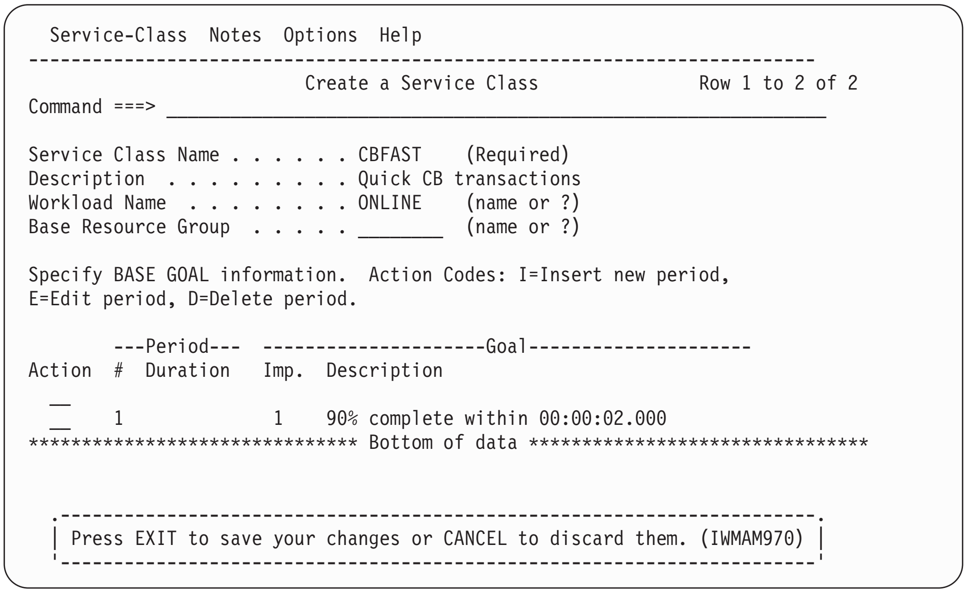
1. Issue IWMARIN0 and choose option 4:



```
  File  Utilities  Notes  Options  Help
--------------------------------------------------------------------------
Functionality LEVEL003        Definition Menu        WLM Appl LEVEL004
Command ===> ______________________________________________________________

Definition data set  . . : 'CB.MYCB.WLM'

Definition name  . . . . . CB390      (Required)
Description  . . . . . . . WLM Setup for WebSphere for z/OS
Select one of the
following options. . . . . 4__  1.  Policies
                                2.  Workloads
                                3.  Resource Groups
                                4.  Service Classes
                                5.  Classification Groups
                                6.  Classification Rules
                                7.  Report Classes
                                8.  Service Coefficients/Options
                                9.  Application Environments
                               10.  Scheduling Environments
```

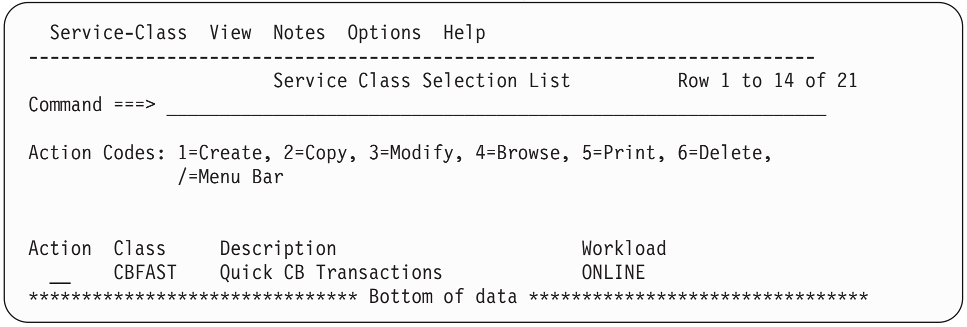
2. Create a service class called CBFAST and specify that it be 90% complete in 2 seconds.

   Note: The example assumes you have defined a workload called ONLINE.



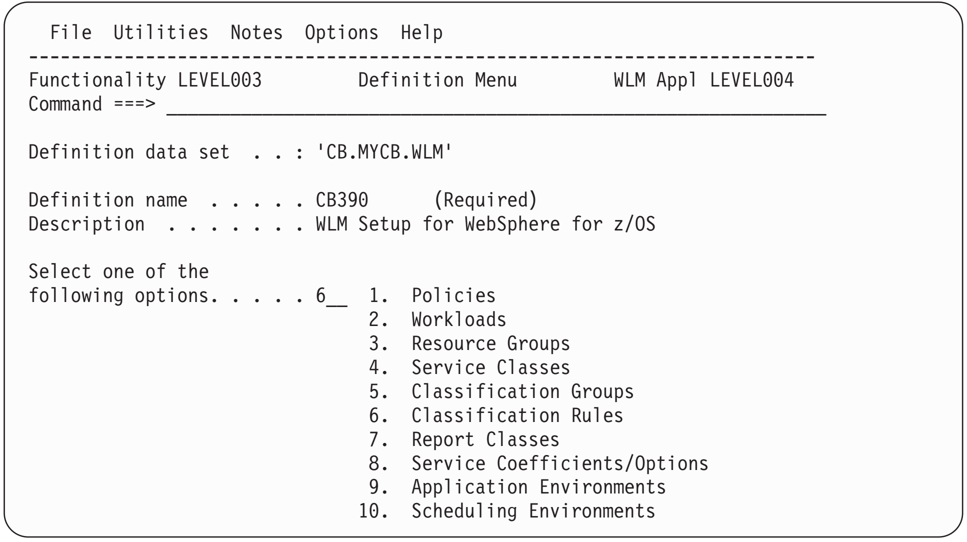
```
  Service-Class  Notes  Options  Help
--------------------------------------------------------------------------
                          Create a Service Class             Row 1 to 2 of 2
Command ===> ______________________________________________________________

Service Class Name . . . . . . CBFAST    (Required)
Description  . . . . . . . . . Quick CB transactions
Workload Name  . . . . . . . . ONLINE    (name or ?)
Base Resource Group  . . . . . ________  (name or ?)

Specify BASE GOAL information.  Action Codes: I=Insert new period,
E=Edit period, D=Delete period.

        ---Period---  ---------------------Goal---------------------
Action  #  Duration   Imp.  Description
  __
  __    1              1    90% complete within 00:00:02.000
******************************* Bottom of data ********************************


  .------------------------------------------------------------------------.
  | Press EXIT to save your changes or CANCEL to discard them. (IWMAM970) |
  '------------------------------------------------------------------------'
```

3. Save the service class. You see the following:



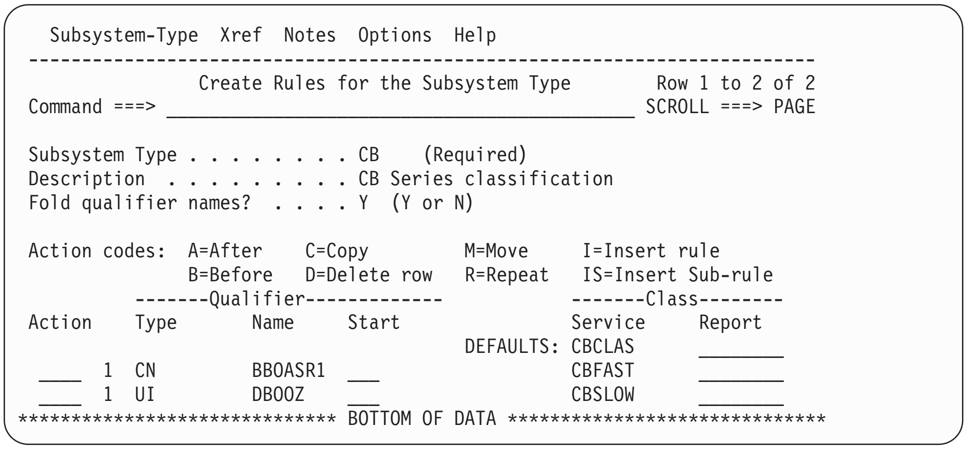
```
  Service-Class  View  Notes  Options  Help
--------------------------------------------------------------------------
                       Service Class Selection List         Row 1 to 14 of 21
Command ===> ______________________________________________________________

Action Codes: 1=Create, 2=Copy, 3=Modify, 4=Browse, 5=Print, 6=Delete,
              /=Menu Bar


Action  Class     Description                      Workload
  __    CBFAST    Quick CB Transactions            ONLINE
******************************* Bottom of data ********************************
```

4. Repeat these steps for the CBSLOW service class.
5. Create classification rules using the new service class. Choose option 6 on the main panel:



```
  File  Utilities  Notes  Options  Help
--------------------------------------------------------------------------
Functionality LEVEL003        Definition Menu        WLM Appl LEVEL004
Command ===> ______________________________________________________________

Definition data set  . . : 'CB.MYCB.WLM'

Definition name  . . . . . CB390      (Required)
Description  . . . . . . . WLM Setup for WebSphere for z/OS

Select one of the
following options. . . . . 6__  1.  Policies
                                2.  Workloads
                                3.  Resource Groups
                                4.  Service Classes
                                5.  Classification Groups
                                6.  Classification Rules
                                7.  Report Classes
                                8.  Service Coefficients/Options
                                9.  Application Environments
                               10.  Scheduling Environments
```

6. Create a set of rules for your service classes:



```
  Subsystem-Type  Xref  Notes  Options  Help
--------------------------------------------------------------------------
                Create Rules for the Subsystem Type        Row 1 to 2 of 2
Command ===> ____________________________________________ SCROLL ===> PAGE

Subsystem Type . . . . . . . . CB    (Required)
Description  . . . . . . . . . CB Series classification
Fold qualifier names?  . . . . Y  (Y or N)

Action codes:  A=After    C=Copy        M=Move     I=Insert rule
               B=Before   D=Delete row  R=Repeat   IS=Insert Sub-rule
          -------Qualifier-------------            -------Class--------
Action    Type       Name     Start                Service     Report
                                         DEFAULTS: CBCLAS      ________
 ____   1  CN        BBOASR1  ___                  CBFAST      ________
 ____   1  UI        DBOOZ    ___                  CBSLOW      ________
****************************** BOTTOM OF DATA ******************************
```

In this example, all work for BBOASR1, except for work running under the user ID DBOOZ, gets classified as CBFAST. Work for DBOOZ gets classified as CBSLOW. All other work, such as work coming from clients outside the sysplex and including the work for WebSphere for z/OS run-time servers, gets classified as CBCLASS.

Configuring the WebSphere for z/OS-supported connectors

Overview

WebSphere for z/OS supports the following CICS or IMS connectors, which are designed to use the Sun Microsystems Corporation's Java 2 Platform, Enterprise Edition (J2EE) Connector Architecture:

- CICS Transaction Gateway External Call Interface (ECI) Connector
- IMS Connector for Java
- IMS JDBC Connector

These connectors, which are also known as resource adaptors, not only implement the J2EE connector interfaces but also are RRS-compliant; in other words, they are designed specifically to work with the resource recovery services (RRS) component of z/OS or OS/390. Resource recovery consists of the protocols and program interfaces that allow WebSphere for z/OS, the RRS component of z/OS or OS/390, and CICS or IMS to work together to make consistent changes to multiple protected resources. Protected resources are considered so critical to a company's work that the integrity of these resources must be guaranteed.

Because of their design, WebSphere for z/OS, the RRS component of z/OS or OS/390, CICS or IMS subsystems and these RRS-compliant connectors can participate in two-phase commit processing, which enables z/OS or OS/390 to restore critical resources to their original state if they become corrupted because of a hardware or software failure, human error, or a catastrophe. These J2EE connectors are shipped as part of separate CICS or IMS products, and are considered the strategic connectors for connecting to CICS and IMS.

For its supported connectors, WebSphere for z/OS also provides additional advantages:

- The ability for system administrators to define connection management at a sysplex level, so that all WebSphere for z/OS J2EE servers benefit from efficient use of the system resources associated with connections. Connection management support is a configuration extension available through the WebSphere for z/OS Administration application.

- The ability for application assemblers to specify:
  - Connection management policy, which is a quality of service issue for applications using connectors. This ability allows finer control of the management of valuable back-end resources, which is especially useful to prevent a misbehaving application from tying up system-wide resources, thereby making the system unusable.
  - Resource authentication for applications using connectors. This ability determines which user identities WebSphere for z/OS will pass to back-end products (such as CICS and IMS) through connectors.

  Connection management policies and resource authorization are set through the WebSphere for z/OS Application Assembly tool.

These configuration and application extensions are functions that WebSphere for z/OS provides in addition to the implementation of the J2EE interfaces. Use of these extensions does not cause any loss of function provided for J2EE compliance at the current level.

WebSphere for z/OS also extends its connection management capabilities to its JDBC resources, so J2EE application components that use JDBC to access DB2 also benefit from additional qualities of service. Although WebSphere for z/OS treats DB2 JDBC datasources as managed connections, it does not treat DB2 JDBC connections exactly the same as CICS and IMS managed connections. For example, WebSphere for z/OS enforces resource authentication and connection reuse for DB2 JDBC connections, even when connection management support is not explicitly selected through the WebSphere for z/OS Administration application. When these differences affect how your installation uses a specific connector, further details are provided in the appropriate procedures.

WebSphere Application Server V4.0.1 for z/OS and OS/390 also provides "beta" CICSEXCI and IMSAPPC connectors, which are available as a download at:

```
http://www.ibm.com/software/webservers/appserv/zos_os390/support.html
```

WebSphere for z/OS also treats these connectors as managed connections; these connectors also are J2EE-compliant and RRS-compliant.

WebSphere for z/OS also supports the use of Common Connector Framework (CCF) connectors by Web components (servlets) only. This support is equivalent to the same level of support provided with previous versions of WebSphere for z/OS, and is intended as a migration aid for existing Standard Edition customers. IBM recommends moving to WebSphere for z/OS-supported connectors that are designed to implement the Sun Microsystems Corporation's J2EE Connector Architecture.

Use the following table to find more information about the WebSphere for z/OS-supported connectors.

For information about:	See . . .
Deciding which connector to use	"Deciding which connector to use" on page 264
Configuring the CICS Transaction Gateway ECI connector	"Overview of setting up the CICS Transaction Gateway ECI connector for J2EE applications" on page 265

For information about:	See . . .
Configuring the IMS Connector for Java	“Overview of setting up the IMS Connector for Java for J2EE applications” on page 272
Configuring the IMS JDBC Connector	“Overview of setting up the IMS JDBC Connector for J2EE applications” on page 279
Configuring the WebSphere for z/OS “beta” IMSAPPC connector	WebSphere for z/OS provides this connector and associated documentation through a download package that is available through the WebSphere Application Server Web page: `http://www.ibm.com/software/webservers/appserv/zos_os390/`

Deciding which connector to use

Table 45 lists the J2EE connectors that you may use to access CICS or IMS resources. You must adhere to the configuration requirements in the referenced procedures; any attempt to use these connectors in alternative configurations is not supported.

Use Table 45 to determine which connector to use, based on the requirements of your J2EE application components or the network configuration at your installation.

Table 45. Deciding which connector to use

For these application requirements or network configuration:	Use the following connector:	Guidelines and notes:
Access to CICS CommArea-based transaction programs		
On the same z/OS or OS/390 system	CICS Transaction Gateway ECI Connector	If you currently are using the CICS Common Connector Framework (CCF) connector, which is not a J2EE connector, you should rework your application components to use this new CICS ECI connector, as soon as you can. For configuration requirements and procedures, see “Overview of setting up the CICS Transaction Gateway ECI connector for J2EE applications” on page 265.
Access to IMS transaction programs		
On the same z/OS or OS/390 system	IMS Connector for Java	If you currently are using the Common Connector Framework (CCF) implementation of IMS Connector for Java, you should rework your application components to use this new IMS connector, as soon as you can. For configuration requirements and procedures, see “Overview of setting up the IMS Connector for Java for J2EE applications” on page 272.

Table 45. Deciding which connector to use (continued)

For these application requirements or network configuration:	Use the following connector:	Guidelines and notes:
On remote systems	The "beta" IMSAPPC connector	If you require access to IMS resources on a remote z/OS or OS/390 system, you may use the IMSAPPC connector, which implements the J2EE Connector Architecture. APPC is another z/OS or OS/390 component that is designed to work with RRS using the two-phase commit protocol, so using this connector provides support for resource recovery that is equivalent to the support provided through the strategic connectors. For configuration requirements and procedures, see the documentation for the "beta" connectors, which is available through the WebSphere Application Server Web page: `http://www.ibm.com/software/webservers/appserv/zos_os390/`
On remote systems, using TCP/IP	IMS Connector for Java	If you must use the TCP/IP protocol rather than APPC, you may use this connector to access IMS on remote systems. Note, however, that this connector configuration does not provide resource recovery protection. For configuration requirements and procedures, see "Overview of setting up the IMS Connector for Java for J2EE applications" on page 272.
Access to IMS databases		
On z/OS or OS/390, using JDBC	IMS JDBC Connector	For configuration requirements and procedures, see "Overview of setting up the IMS JDBC Connector for J2EE applications" on page 279.

Overview of setting up the CICS Transaction Gateway ECI connector for J2EE applications

J2EE application components running in a WebSphere for z/OS J2EE server can use the IBM CICS Transaction Gateway to access business-critical applications running on a CICS Transaction Server. On z/OS or OS/390, WebSphere for z/OS can be configured to provide a connection to the CICS Transaction Gateway, which works with the CICS subsystem through the External CICS Interface (EXCI). This CICS Transaction Gateway ECI connector conforms to the Sun Microsystems Java™ 2 Platform, Enterprise Edition (J2EE™) Connector Architecture.

To enable communication between J2EE application components and CICS applications:

- Use an application environment such as WebSphere Studio Application Developer Integration Edition to create J2EE application components that use CICS Transaction Gateway-provided ECI Connector classes and interfaces, which are described in *CICS Transaction Gateway: Programming Guide*.
- Use WebSphere Studio Application Developer and 390fy, which is the preferred method of deploying applications, or the WebSphere for z/OS Application Assembly tool to assemble the J2EE application components for installation in a J2EE server. Assembly guidelines and further details about using connectors appears in *WebSphere Application Server V4.0.1 for z/OS and OS/390: Assembling J2EE Applications*, SA22-7836.

- Configure the CICS products and WebSphere for z/OS J2EE server to support the use of the CICS Transaction Gateway ECI connector. To do so, complete the procedures listed in the following table. These procedures assume that the required CICS products and WebSphere for z/OS run-time have been separately installed, configured, and tested on z/OS or OS/390. The procedures address only those configuration changes and other tasks that are required so that J2EE application components installed in a WebSphere for z/OS J2EE server can use the CICS Transaction Gateway ECI connector to access CICS applications. If these products have not been installed, see the following resources:
  - For release levels and other requirements, see Table 2 on page 11.
  - For installation instructions for the CICS Transaction Server, see *CICS Transaction Server for OS/390 Installation Guide*, GC34-5985.
  - For installation instructions for the CICS Transaction Gateway, see *CICS Transaction Gateway for OS/390 Administration*, SC34-5528.

  Rule: You must install WebSphere for z/OS, the CICS Transaction Gateway ECI connector, and the target CICS subsystem to which it connects on the same z/OS or OS/390 image. WebSphere for z/OS does not support any other configurations. All three products must reside on the same image to provide resource recovery and two-phase commit processing. See *CICS Transaction Gateway for OS/390 Administration*, SC34-5528, for information about configuring the CICS Transaction Gateway in local mode.

Subtask	Associated procedure (See . . .)
Configuring the CICS products	"Steps for configuring CICS products to support the CICS Transaction Gateway ECI connector"
Protecting CICS products and resources	"Steps for defining security profiles for the CICS Transaction Gateway" on page 267
Configuring the CICS Transaction Gateway ECI connector for use with the WebSphere for z/OS J2EE server	"Steps for configuring the CICS Transaction Gateway ECI connector" on page 268
Configuring the WebSphere for z/OS J2EE server	"Steps for defining the CICS Transaction Gateway ECI connector as a J2EE server resource" on page 269

Steps for configuring CICS products to support the CICS Transaction Gateway ECI connector

Before you begin:

- You need to know that, by default, WebSphere for z/OS and the CICS Transaction Gateway ECI connector use a CICS generic pipe to connect to the target CICS application server. You may decide to use an alternative configuration:

  Alternative: You may define a specific connection in the target CICS configuration and assign that specific connection as reserved for the CICS Transaction Gateway ECI connector. If you decide to set up this alternative configuration, you must complete the following steps:

  1. Modify the CICS configuration definitions for the target CICS application-owning region (AOR) as follows:

     Add a `CONNECTION` definition with the `CONNTYPE(SPECIFIC)` parameter for each WebSphere for z/OS J2EE server that will be configured with the CICS Transaction Gateway ECI connector.

   2. Define the DFHJVPIPE environment variable for the J2EE server. The value you supply for this variable must match the value you specify for NETNAME on the CONNECTION definition. For more information about specifying J2EE server environment variables, see 2 on page 269.

   General instructions for configuring EXCI appear in *CICS External Interfaces Guide*, SC34-6006.

- You must complete this procedure on z/OS or OS/390.

Perform the following steps to configure CICS products to support the CICS Transaction Gateway ECI connector:

1. For each CICS region that will be accessed through the CICS Transaction Gateway ECI connector, start the CICS region with RRMS=YES specified as an initialization parameter. This parameter ensures that CICS uses the z/OS or OS/390 resource recovery services (RRS) component to coordinate transaction processing across multiple resource managers.

2. Make sure the WebSphere for z/OS J2EE server can access and load the CICS module DFHXCSTB. To do so, complete one of the following steps:
   - Place module DFHXCSTB in the link pack area (LPA), or
   - Add the CICSTS13.SDFHEXCI data set to either the system linklist concatenation, or to a steplib concatenation defined in the start procedure for the J2EE server region.

Steps for defining security profiles for the CICS Transaction Gateway

CICS RACF Security Guide, SC34-6011, describes security options that you can define through the z/OS or OS/390 Security Server (RACF). If your installation uses SURROGAT checking for CICS regions, you need to complete the following procedure. This procedure authorizes the user ID associated with the J2EE server region to act as a DFHEXCI surrogate for the clients that invoke J2EE application components running in the J2EE server.

Before you begin:

- You need to complete the procedure described in “Steps for configuring CICS products to support the CICS Transaction Gateway ECI connector” on page 266.
- You must complete this procedure on z/OS or OS/390.

Perform the following steps to define security profiles for clients of J2EE application components that use the CICS Transaction Gateway ECI connector:

1. For all potential clients of J2EE application components that use the CICS Transaction Gateway ECI connector, define a RACF CICS DFHEXCI SURROGAT profile definition. You may define one profile for each user, one profile for each group of users, or a single surrogate profile for all users.

   Example:

   ```
   RDEFINE SURROGAT *.DFHEXCI UACC(NONE) OWNER(profile-owner-userid)
   ```

2. Authorize the user ID of the J2EE server region to be the CICS DFHEXCI surrogate for the specific user ID or set of user IDs that you just identified through the profile in the RACF SURROGAT class.

   Example:

```
PERMIT *.DFHEXCI CLASS(SURROGAT) ID(server-region-userid) ACCESS(READ)
```

Steps for configuring the CICS Transaction Gateway ECI connector

To configure the CICS Transaction Gateway ECI connector, you need to find the CICS ECI 390 resource adapter archive file that is installed as part of CICS Transaction Gateway, move the file to an HFS directory that the WebSphere for z/OS J2EE server can access, and expand the file.

Before you begin:

- You need to complete the procedure described in “Steps for configuring CICS products to support the CICS Transaction Gateway ECI connector” on page 266.
- (Optional) You may complete the procedure described in “Steps for defining security profiles for the CICS Transaction Gateway” on page 267.
- You must complete this procedure on the same z/OS or OS/390 on which the CICS products and WebSphere for z/OS are installed.

Perform the following steps to configure the CICS Transaction Gateway ECI connector:

1. Create an HFS work directory that permits both read, write, and execute authority. Use a meaningful name for the directory; for example: `/usr/lpp/connectors`

2. In the install directory for CICS Transaction Gateway, look for the file `cicseciRRS.rar` and copy it into the work directory you created in the previous step.

   Tip: If your installation used the default directory for installing CICS Transaction Gateway, you will find the `cicseciRRS.rar` file in the directory `/usr/lpp/ctg/deployable`

3. Under the work directory, expand the `cicseciRRS.rar` file by entering the following command:

   ```
   jar -xvf cicseciRRS.rar
   ```

   Result: The expansion extracts the following files into the directory:
   - cicseciRRS.jar
   - cicsframe.jar
   - ctgserver.jar
   - ctgclient.jar
   - libCTGJNI.so
   - libCTGJNI_g.so

   Note: Additional files also are extracted, but you do not need to do anything with them.

4. Use the following commands to give execute permission to the `libCTGJNI.so` and `libCTGJNI_g.so` files:

   ```
   chmod ugo+x libCTGJNI.so
   chmod ugo+x libCTGJNI_g.so
   ```

Note the full path and file names for use in the procedure “Steps for defining the CICS Transaction Gateway ECI connector as a J2EE server resource” on page 269.

Steps for defining the CICS Transaction Gateway ECI connector as a J2EE server resource

Before you begin: You need to:

- Install and configure the WebSphere for z/OS run-time.
- Complete the procedures described in:
  - "Steps for configuring CICS products to support the CICS Transaction Gateway ECI connector" on page 266, and
  - "Steps for defining security profiles for the CICS Transaction Gateway" on page 267.
- Decide whether you want to collect trace data related to connector processing. If you do not want to collect trace data, you need to change the initial setting for the trace level property, which is described in Step 4. If you want to enable tracing, you need to complete steps in addition to using the appropriate trace level property value; these additional steps are listed in the procedure for setting up tracing for connectors in *WebSphere Application Server V4.0.1 for z/OS and OS/390: Messages and Diagnosis*, GA22-7837.
- Start the WebSphere for z/OS Administration application. You can begin a new conversation, and either create a new J2EE server or modify an existing J2EE server definition.

Perform the following steps to define the CICS Transaction Gateway ECI connector as a J2EE resource for a WebSphere for z/OS J2EE server:

1. Make sure that connection management is configured into the sysplex. To do so, complete the following steps:
   a. Highlight the sysplex name in the conversation.
   b. Click on `Selected` → `Modify` to update the sysplex definition.
   c. Under the `Configuration Extensions` section of the sysplex definition, check the box labelled `Connection Management`
   d. Click on `Selected` → `Save` to save your changes.

---

2. For the new or existing J2EE server, use the properties form for the server to enter the following environment variable values:
   - For the CLASSPATH environment variable, add the full directory name for the following files:
     - cicseciRRS.jar
     - cicsframe.jar
     - ctgserver.jar
     - ctgclient.jar

     Rule: Separate entries on the classpath by using a colon (:) before each entry.

     Example: `:/usr/lpp/connectors/cicseciRRS.jar`
   - For the LIBPATH environment variable, add the full name of the work directory that contains the `libCTGJNI.so` and `libCTGJNI_g.so` files.

     Rule: Separate entries on the libpath by using a colon (:) before each entry.

     Example: `:/usr/lpp/connectors`
   - (Optional) If you decided to configure CICS with a specific connection, as described in "Steps for configuring CICS products to support the CICS Transaction Gateway ECI connector" on page 266, define the DFHJVPIPE environment variable. Specify the `netname` for the specific connection you defined in Step 1 on page 266.

Note: For a new server definition, also define a server instance.

---

3. Define a CICS ECIConnectionFactory as a new J2EE resource:
   a. Highlight the label `J2EE resources` in the conversation.
   b. Click on `Selected` → `Add` to add a new resource.
   c. In the properties form, enter a name for the J2EE resource.
   d. (Optional) Enter a description of the J2EE resource.
   e. Find the property labelled `J2EE resource type`, and select `CICS_ECIConnectionFactory`.

      The Administration application fills in the fields above with the information that is appropriate for a CICS Transaction Gateway ECI connector.
   f. Click on `Selected` → `Save` to save your changes.

      Result: The words "Adding... J2EE resources" appear in the tree.

   You know you are done when the following message appears in the status bar:

   ```
   BBON0515I J2EE Resources name was added.
   ```

   where *name* is the name you chose for the J2EE resource.

---

4. Define the CICS Transaction Gateway ECI connector by adding a new J2EE resource instance:
   a. Highlight the label `J2EE resource instances` under the J2EE resource you created in the previous step.
   b. Click on `Selected` → `Add` to add a new resource instance.
   c. In the properties form, enter the appropriate values:
      - J2EE resource instance name.
      - J2EE resource instance description (optional).
      - The name of the system with which this J2EE resource instance is to be associated.
      - The properties that are required to create an `CICS_ECIConnectionFactory`:

Table 46. CICS_ECIConnectionFactory properties

Property	Description	Required or Optional Value
CICS server name	A one- through eight-alphanumeric character name of the target CICS application server.	Required
Connection URL	This property cannot be set or changed. **Default**: `local`	Required
UserName	A one- through eight-alphanumeric character value to be used as the default user for a connection when neither the container nor the application component provides a user name and password to CICS Transaction Gateway ECI connector.	Required
Password	A one- through eight-alphanumeric character value to be used as the default password for a connection when neither the container nor the application component provides a password to CICS Transaction Gateway ECI connector.	Required

Table 46. CICS_ECIConnectionFactory properties (continued)

Property	Description	Required or Optional Value
TranName	A four-character value containing the ID of a CICS transaction. This property is ignored if the TPNName property is specified. When a TranName property value is specified and the TPNName property is null, however, then the specified TranName is associated with client requests to invoke a program under CICS. The called program will run under the mirror transaction, CPMI, but the program will be linked to using the name specified by the TranName property. This name is available to the called program for querying the transaction ID. Also, some servers use the transaction ID to determine security and performance attributes for the called program.	Optional
TPNName	A four-character value that specifies the transaction ID of the transaction that will be used in the server to process the ECI request. This transaction must be defined in the CICS server as a CICS mirror transaction. If this property is not specified, the default mirror transaction, CPMI, is used. If this property is specified, any value specified for the TranName property will be ignored.	Optional
Trace level	The level of information for IMS Connector for Java to trace. Possible values are: **0** No tracing or logging **1** Error and exception logging only. This value is the initial setting. **2** Select method entry and exit tracing **3** All method entry and exit tracing, as well as buffer contents sent to and received from IMS Connect.	Required

d. Click on `Selected` → `Save` to save your changes.

Result: The words "Adding... J2EE resource instances" appear in the tree.

You know you are done when the following message appears in the status bar:

```
BBON0515I J2EE resource Instance name was added.
```

where *name* is the name you chose for the J2EE resource instance.

---

5. Install the J2EE application components that use the CICS Transaction Gateway ECI connector to access CICS applications:

a. In the tree, select the server.

b. Choose `Install J2EE Application...` from the Selected menu bar. The Install J2EE Application dialog box appears.

c. In the dialog box, enter the following values:

- The name of the EAR file that contains your J2EE application.
- The name of the FTP server for the sysplex in which you want to install your application.

Click OK.

Result: A pop-up appears with the words "Loading ear file," then the Reference and Resource Resolution window appears and displays the application content in the ear file.

d. Expand each folder listed in the Reference and Resource Resolution window by clicking the node to the left of the folder. Set the JNDI Path and JNDI Name for each bean in turn by clicking the bean, then clicking the button labelled "Set Default JNDI Path & Name."

e. Select each bean by clicking the bean symbol. For each resource reference that needs to be an `CICS_ECIConnectionFactory`:

   1) Click `J2EE Resource` tab.
   2) Click on the blank space in the table in the `J2EE Resource` column, which brings up a list of J2EE resources.
   3) Click on the name of the J2EE resource you created earlier in Step 3 on page 270.

Click OK to begin the automatic FTP transfer of the EAR file contents from your workstation to z/OS or OS/390.

You know you are done when the following message appears in the status bar:

```
BBON0470I EAR file file_name has been successfully installed on server server_name.
```

---

6. Validate and commit the new conversation (the new or modified server configuration).

---

7. If necessary, complete manual z/OS or OS/390 tasks, such as creating or modifying start procedures for the J2EE server's control and server regions. When you are finished, use the Administration application to mark the tasks as complete.

---

8. Activate the new conversation.

You know you are done when the following message appears in the status bar:

```
BBON0449I Conversation server server_name SERVER DEFINITION was activated.
```

Overview of setting up the IMS Connector for Java for J2EE applications

J2EE application components running in a WebSphere for z/OS J2EE server can use the IBM IMS Connector for Java to access business-critical applications running in the IMS subsystem. On z/OS or OS/390, WebSphere for z/OS can be configured to provide a connection to the IMS Connector for Java, which is shipped as part of the IMS Connect product. The IMS Connector for Java works with the IMS subsystem through IMS Connect and the IMS Open Transaction Manager Access (OTMA) interface. The IMS Connector for Java conforms to the Sun Microsystems Java™ 2 Platform, Enterprise Edition (J2EE™) Connector Architecture.

To enable communication between J2EE application components and IMS applications:

- Use an application environment such as WebSphere Studio Application Developer Integration Edition to create J2EE application components that use IMS Connector for Java-provided Java classes and interfaces, which are described in *IMS Connector for Java User's Guide and Reference, Version 1.2*. This information is available from the IBM Web site at:

`http://www.ibm.com/software/data/ims/about/imsico/documentation.htm`

- Use WebSphere Studio Application Developer and 390fy, which is the preferred method of deploying applications, or the WebSphere for z/OS Application Assembly tool to assemble the J2EE application components for installation in a J2EE server. Assembly guidelines and further details about using connectors appears in *WebSphere Application Server V4.0.1 for z/OS and OS/390: Assembling J2EE Applications*, SA22-7836.
- Configure the IMS products and WebSphere for z/OS J2EE server to support the use of the IMS Connector for Java. To do so, complete the procedures listed in the following table. These procedures assume that the required IMS products and WebSphere for z/OS run-time have been separately installed, configured, and tested on z/OS or OS/390. The procedures address only those configuration changes and other tasks that are required so that J2EE application components installed in a WebSphere for z/OS J2EE server can use the IMS Connector for Java to access IMS applications. If these products have not been installed, see the following resources:
  - For release levels and other requirements, see Table 2 on page 11.
  - For installation instructions for the IMS subsystem, see:
    - *IMS/ESA Installation Volume 1: Installation and Verification*, GC26-8736, and
    - *IMS/ESA Installation Volume 2: System Definition and Tailoring*, GC26-8737
  - For installation instructions for IMS Connect, see *IMS Connect Guide and Reference*, SC27-0946. This book is available from the IBM Web site, at:

    `http://www.ibm.com/software/data/db2imstools/imstools/imsconnect.html`

  Rule: You must use one of the following configuration choices for the IMS Connector for Java. WebSphere for z/OS does not support any other configurations than the two choices described below, and in the following procedures.

  Local configuration

  With this choice, WebSphere for z/OS, IMS Connect, and the target IMS subsystem all must be installed on the same z/OS or OS/390 system. In this configuration, the IMS Connector for Java runs under WebSphere for z/OS as an RRS-transactional connector; in other words, it participates in RRS-coordinated transactions and two-phase commit processing.

  Restriction: Although it is possible to configure WebSphere for z/OS and IMS Connect on the same system to work with IMS on a different system within the same sysplex, this configuration is not supported for global transaction processing. Results will be unpredictable if an application component running under a global transaction uses the IMS Connector for Java to access IMS on a remote system. Coordinated global transactions and two-phase commit processing are possible only if WebSphere for z/OS, IMS Connect, and the target IMS subsystem are all installed on the same z/OS or OS/390 system.

  Remote TCP/IP configuration

  With this choice, you may set up the IMS Connector for Java to use TCP/IP to communicate with a remote IMS Connect (that is, an IMS Connect on a different system than WebSphere for z/OS). In this configuration:
  - WebSphere for z/OS resides on one z/OS or OS/390 system.
  - IMS Connect resides on a different z/OS or OS/390 system.

    Recommendation: Although it is possible to use TCP/IP to communicate to a local IMS Connect on the same system as WebSphere for z/OS, IBM recommends using the Local configuration.

– The target IMS subsystem can reside on any system within the same sysplex as IMS Connect.

When the IMS Connector for Java is configured to use TCP/IP, the connector runs as non-transactional, and all requests to the target IMS subsystem are handled as sync-on-return requests. In other words, any changes made by IMS are committed by the time control is returned to the J2EE application component that made the request. With this configuration, two-phase commit processing is not supported.

Subtask	Associated procedure (See . . .)
Configuring the IMS subsystem	"Steps for configuring the IMS subsystem"
Configuring the IMS Connector for Java for use with the WebSphere for z/OS J2EE server	"Steps for configuring the IMS Connector for Java" on page 275
Configuring the WebSphere for z/OS J2EE server	"Steps for defining the IMS Connector for Java as a J2EE server resource" on page 275

Steps for configuring the IMS subsystem

Before you begin: You need to know that a transaction in a WebSphere for z/OS application may result in several transactions in IMS. For instance, within a transactional scope in a WebSphere for z/OS application, a program may perform a `findByPrimaryKey`, three setters, and three getters, resulting in three separate IMS transactions. This multiplying effect on transactions affects the number of message processing regions IMS must have. You must specify the number of message processing regions in the DFSMPR job to equal the number of transactions that could result from a WebSphere for z/OS transaction.

Perform the following steps to configure IMS for use with the IMS Connector for Java and WebSphere for z/OS:

1. Size the number of message processing regions (MPRs) that IMS must have, based on the number of transactions that could result from a WebSphere for z/OS transaction. Specify the number of MPRs in the DFSMPR job.

   Example: If you have a WebSphere for z/OS transaction that could generate 5 IMS transactions, set the number of message processing regions to 5.

   Guideline: If additional WebSphere for z/OS applications generate additional IMS transactions on the same database, set the number of message processing regions according to the maximum number of transactions that could be generated from all applications.

2. Set the IMS parallel scheduling limit to 0 (any number of transactions can be scheduled).

   Example:

   ```
   assign parlim 0 tran tranname
   ```

   Note: The IMS parallel scheduling limit also can be specified at IMS generation during configuration time using the `TRANSACT` statement. This value allows transactions to be scheduled in multiplicity (or parallel) so that more transactions can run at the same time.

Steps for configuring the IMS Connector for Java

To configure the IMS Connector for Java, you need to find the IMS Connector for Java resource adapter archive file installed as part of IMS Connect, move the file to an HFS directory that the WebSphere for z/OS J2EE server can access, and expand the file.

Before you begin: You must complete this procedure on the same z/OS or OS/390 on which IMS Connect and WebSphere for z/OS are installed.

Perform the following steps to configure the IMS Connector for Java:

1. Create an HFS work directory that permits both read, write, and execute authority. Use a meaningful name for the directory; for example: `/usr/lpp/connectors`

   ---

2. In the install directory for IMS Connect, look for the file `imsico.rar` and copy it into the work directory you created in the previous step.

   Tip: If your installation used the default directory for installing IMS Connect, you will find the `imsico.rar` file in the directory `/usr/lpp/imsico/J2C`

   ---

3. Under the work directory, expand the `imsico.rar` file by entering the following command:

   ```
   jar -xvf imsico.rar
   ```

   Result: The expansion extracts the following files into the directory:
   - imsico.jar
   - libimsico.so

   Note: Additional files also are extracted, but you do not need to do anything with them.

   Recommendation: Read the `howto.html` file for more information about the files and the IMS Connector for Java.

   Tip: Use an Internet browser to view the `howto.html` file.

   ---

4. Use the following command to give execute permission to the `libimsico.so` file:

   ```
   chmod ugo+x libimsico.so
   ```

Note the full path and file names for use in the procedure "Steps for defining the IMS Connector for Java as a J2EE server resource."

Steps for defining the IMS Connector for Java as a J2EE server resource

Before you begin: You need to:

- Install and customize the WebSphere for z/OS run-time.
- Complete the procedures described in "Steps for configuring the IMS Connector for Java."
- Find out whether your installation has set up security for IMS Connect and the IMS OTMA. If so, you must supply a user ID, password, or group name when

you define the IMS Connector for Java as a J2EE server resource instance. The user ID or group must have appropriate authority to access IMS Connect and the IMS subsystem.

- Decide whether you want to collect trace data related to connector processing. If you do not want to collect trace data, you need to change the initial setting for the trace level property, which is described in Step 4. If you want to enable tracing, you need to complete steps in addition to using the appropriate trace level property value; these additional steps are listed in the procedure for setting up tracing for connectors in *WebSphere Application Server V4.0.1 for z/OS and OS/390: Messages and Diagnosis*, GA22-7837.
- Start the WebSphere for z/OS Administration application. You can begin a new conversation, and either create a new J2EE server or modify an existing J2EE server definition.

Perform the following steps to define the IMS Connector for Java as a J2EE resource for a WebSphere for z/OS J2EE server:

1. Make sure that connection management is configured into the sysplex. To do so, complete the following steps:
   a. Highlight the sysplex name in the conversation.
   b. Click on `Selected` → `Modify` to update the sysplex definition.
   c. Under the `Configuration Extensions` section of the sysplex definition, check the box labelled `Connection Management`
   d. Click on `Selected` → `Save` to save your changes.

   ---

2. For a new or existing J2EE server, use the properties form for the server to enter the following environment variable values:
   - For the CLASSPATH environment variable, add the full directory name for the file `imsico.jar`, as noted in "Steps for configuring the IMS Connector for Java" on page 275.

     Rule: Separate entries on the classpath by using a colon (:) before each entry.

     Example: `:/usr/lpp/connectors/imsico.jar`
   - For the LIBPATH environment variable, add the full name of the work directory that contains the `libimsico.so` file.

     Rule: Separate entries on the libpath by using a colon (:) before each entry.

     Example: `:/usr/lpp/connectors`

   Note: For a new server definition, also define a server instance.

   ---

3. Define an IMS ConnectionFactory as a new J2EE resource:
   a. Highlight the label `J2EE resources` in the conversation.
   b. Click on `Selected` → `Add` to add a new resource.
   c. In the properties form, enter a name for the J2EE resource.
   d. (Optional) Enter a description of the J2EE resource.
   e. Find the property labelled `J2EE resource type`, and select `IMSConnectionFactory`.

      The Administration application fills in the fields above with the information that is appropriate for IMS Connector for Java.
   f. Click on `Selected` → `Save` to save your changes.

      Result: The words "Adding... J2EE resources" appear in the tree.

   You know you are done when the following message appears in the status bar:

```
BBON0515I J2EE Resources name was added.
```

where *name* is the name you chose for the J2EE resource.

4. Define specific IMS connection information by adding a new J2EE resource instance:
   a. Highlight the label `J2EE resource instances` under the J2EE resource you created in the previous step.
   b. Click on `Selected` → `Add` to add a new resource instance.
   c. In the properties form, enter the appropriate values:
      - J2EE resource instance name.
      - J2EE resource instance description (optional).
      - The name of the system with which this J2EE resource instance is to be associated.
      - The properties that are required to create an `IMSConnectionFactory`:

Table 47. IMSConnectionFactory properties

Property	Description	Required or Optional Value	
		Local configuration	**Remote TCP/IP configuration**
IMS Connect name	A one- through eight-alphanumeric character name of the target IMS Connect. This name must match the `HWS ID` of IMS Connect.	Required	(Must be blank or IMS Connector for Java assumes local configuration, not TCP/IP)
Host name	The TCP/IP host name of the target IMS Connect.	N/A	Required
Port number	The TCP/IP port number of the target IMS Connect.	N/A	Required
Datastore name	A one- through eight-alphanumeric character name of the target IMS datastore defined in IMS Connect.	Required	Required
User name	A one- through eight-alphanumeric character value to be used as the default user for a connection when neither the container nor the application component provides a user name to IMS Connector for Java.	Required if your installation has set up security for IMS Connect and IMS OTMA.	Required if your installation has set up security for IMS Connect and IMS OTMA.
Password	A one- through eight-alphanumeric character value to be used as the default password for a connection when neither the container nor the application component provides a password to IMS Connector for Java.	Required if your installation has set up security for IMS Connect or IMS OTMA.	Required if your installation has set up security for IMS Connect or IMS OTMA.
Group name	A one- through eight-alphanumeric character value to be used as the default group name for a connection when neither the container nor the application component provides a group name to IMS Connector for Java.	Required if your installation has set up security for IMS Connect or IMS OTMA.	Required if your installation has set up security for IMS Connect or IMS OTMA.

Table 47. IMSConnectionFactory properties (continued)

Property	Description	Required or Optional Value	
		Local configuration	Remote TCP/IP configuration
Trace level	The level of information for IMS Connector for Java to trace. Possible values are: **0** No tracing or logging **1** Error and exception logging only. This value is the initial setting. **2** Select method entry and exit tracing **3** All method entry and exit tracing, as well as buffer contents sent to and received from IMS Connect.	Required	Required

d. Click on `Selected → Save` to save your changes.

Result: The words "Adding... J2EE resource instances" appear in the tree.

You know you are done when the following message appears in the status bar:

```
BBON0515I J2EE resource Instance name was added.
```

where *name* is the name you chose for the J2EE resource instance.

---

5. Install the J2EE application components that use the IMS Connector for Java to access IMS applications:
   a. In the tree, select the server.
   b. Choose `Install J2EE Application...` from the Selected menu bar. The Install J2EE Application dialog box appears.
   c. In the dialog box, enter the following values:
      - The name of the EAR file that contains your J2EE application.
      - The name of the FTP server for the sysplex in which you want to install your application.

      Click OK.

      Result: A pop-up appears with the words “Loading ear file,” then the Reference and Resource Resolution window appears and displays the application content in the ear file.
   d. Expand each folder listed in the Reference and Resource Resolution window by clicking the node to the left of the folder. Set the JNDI Path and JNDI Name for each bean in turn by clicking the bean, then clicking the button labelled “Set Default JNDI Path & Name.”
   e. Select each bean by clicking the bean symbol. For each resource reference that needs to be an `IMSConnectionFactory`:
      1) Click `J2EE Resource` tab.
      2) Click on the blank space in the table in the `J2EE Resource` column, which brings up a list of J2EE resources.
      3) Click on the name of the J2EE resource you created earlier in Step 3 on page 276.

Click OK to begin the automatic FTP transfer of the EAR file contents from your workstation to z/OS or OS/390.

You know you are done when the following message appears in the status bar:

```
BBON0470I EAR file file_name has been successfully installed on server server_name.
```

6. Validate and commit the new conversation (the new or modified server configuration).

7. If necessary, complete manual z/OS or OS/390 tasks, such as creating or modifying start procedures for the J2EE server's control and server regions. When you are finished, use the Administration application to mark the tasks as complete.

8. Activate the new conversation.

You know you are done when the following message appears in the status bar:

```
BBON0449I Conversation server server_name SERVER DEFINITION was activated.
```

Overview of setting up the IMS JDBC Connector for J2EE applications

J2EE application components running in a WebSphere for z/OS J2EE server can use the IBM IMS JDBC Connector to access business-critical data in databases that the IMS subsystem manages. On z/OS or OS/390, WebSphere for z/OS can be configured to provide a connection to the IMS JDBC Connector, which works with the IMS subsystem through Java Database Connectivity (JDBC). The IMS JDBC Connector implements the Sun Microsystems Java™ 2 Platform, Enterprise Edition (J2EE™) Connector Architecture.

To enable J2EE application components to access IMS databases:

- Use an application environment such as WebSphere Studio Application Developer Integration Edition to create J2EE application components that use JDBC to access databases. Information about writing such Java programs appears in *IMS Java User's Guide*, SC27-0832.
- Use WebSphere Studio Application Developer and 390fy, which is the preferred method of deploying applications, or the WebSphere for z/OS Application Assembly tool to assemble the J2EE application components for installation in a J2EE server. Assembly guidelines and further details about using connectors appears in *WebSphere Application Server V4.0.1 for z/OS and OS/390: Assembling J2EE Applications*, SA22-7836.
- Configure IMS and WebSphere for z/OS J2EE server to support the use of the IMS JDBC Connector. To do so, complete the procedures listed in the following table. These procedures assume that IMS and the WebSphere for z/OS run-time have been separately installed, configured, and tested on z/OS or OS/390. The procedures address only those configuration changes and other tasks that are required so that J2EE application components installed in a WebSphere for z/OS J2EE server can use the IMS JDBC Connector to access IMS databases. If these products have not been installed, see the following resources:
  - For release levels and other requirements, see Table 2 on page 11.
  - For installation instructions for the IMS subsystem, see:
    - *IMS/ESA Installation Volume 1: Installation and Verification*, GC26-8736, and

- *IMS/ESA Installation Volume 2: System Definition and Tailoring*, GC26-8737

Rule: Install WebSphere for z/OS, the IMS subsystem to which it connects, and the IMS JDBC Connector on the same z/OS or OS/390 image. WebSphere for z/OS does not support any other configurations.

Subtask	Associated procedure (See . . .)
Configuring the IMS JDBC Connector for use with the WebSphere for z/OS J2EE server	"Steps for configuring the IMS JDBC Connector"
Configuring the WebSphere for z/OS J2EE server	"Steps for defining the IMS JDBC Connector as a J2EE server resource" on page 281

Steps for configuring the IMS JDBC Connector

To configure the IMS JDBC Connector, you need to find the IMS JDBC Connector resource adapter archive file installed as part of the IMS subsystem, move the file to an HFS directory that the WebSphere for z/OS J2EE server can access, and expand the file.

Before you begin: You must complete this procedure on the same z/OS or OS/390 on which IMS and WebSphere for z/OS are installed.

Perform the following steps to configure the IMS JDBC Connector:

1. Create an HFS work directory that permits read, write, and execute authority. Use a meaningful name for the directory; for example: `/usr/lpp/connectors`

   ____

2. In the install directory for IMS, look for the file `imsjavaxx.rar` where `xx` is the release number. Copy the rar file into the work directory you created in the previous step.

   Tip: If your installation used the default directory for installing IMS, you will find the `imsjavaxx.rar` file in the directory `/usr/lpp/ims/imsjavaxx` where `xx` is the IMS release number.

   Example: In IMS 7.1, the "rar" filename is `imsjava71.rar`, and it is found in the directory `/usr/lpp/ims/imsjava71`.

   Note: The IMS install directory should also contain the files `imsjava.jar` and `libJavTDLI.so`, to which you will later refer when doing the steps in "Steps for defining the IMS JDBC Connector as a J2EE server resource" on page 281.

   ____

3. Under the work directory, expand the `imsjavaxx.rar` file (where `xx` is the IMS release number).

   Example: If you are using IMS 7.1, enter the following command to expand `imsjava71.jar`:

   ```
   jar -xvf imsjava71.rar
   ```

   Result: The expansion extracts the following files into the directory:
   - `IMSJdbcCustomService.xml`
   - `howto.html`

   Recommendation: Read the `howto.html` file for more information about the files and the IMS JDBC Connector.

   Tip: Use an Internet browser to view the `howto.html` file.

Steps for defining the IMS JDBC Connector as a J2EE server resource

Before you begin: You need to:

- Install and customize the WebSphere for z/OS run-time.
- Complete the procedures described in “Steps for configuring the IMS JDBC Connector” on page 280.
- Start the WebSphere for z/OS Administration application. You can begin a new conversation, and either create a new J2EE server or modify an existing J2EE server definition.

Perform the following steps to define the IMS JDBC Connector as a J2EE resource for a WebSphere for z/OS J2EE server:

1. Make sure that connection management is configured into the sysplex. To do so, complete the following steps:
   a. Highlight the sysplex name in the conversation.
   b. Click on `Selected` → `Modify` to update the sysplex definition.
   c. Under the `Configuration Extensions` section of the sysplex definition, check the box labelled `Connection Management`
   d. Click on `Selected` → `Save` to save your changes.

2. For a new or existing J2EE server, use the properties form for the server to enter the following environment variable values:
   - For the CLASSPATH environment variable, add the full directoy name of the `imsjava.jar` file that is shipped with IMS and included in the IMS install directory.

     Example: If you are using IMS 7.1 and you used the default directory for installing IMS, the fully qualified directory file name would be:

     ```
     /usr/lpp/ims/imsjava71/imsjava.jar
     ```
   - For the LIBPATH environment variable, add the full directory name of the IMS install directory containing the `libJavTDLI.so` file that is shipped with IMS.

     Example: If you are using IMS 7.1 and you used the default directory for installing IMS, the name of the directory would be:

     ```
     /usr/lpp/ims/imsjava71
     ```

   Note: For a new server definition, also define a server instance.

3. Define an IMS JDBC datasource as a new J2EE resource:
   a. Highlight the label `J2EE resources` in the conversation.
   b. Click on `Selected` → `Add` to add a new resource.
   c. In the properties form, enter a name for the J2EE resource.
   d. (Optional) Enter a description of the J2EE resource.
   e. Find the property labelled `J2EE resource type`, and select `IMSJdbcDataSource`.

      The Administration application fills in the fields above with the information that is appropriate for IMS JDBC Connector.
   f. Click on `Selected` → `Save` to save your changes.

      Result: The words "Adding... J2EE resources" appear in the tree.

You know you are done when the following message appears in the status bar:

```
BBON0515I J2EE Resources name was added.
```

where *name* is the name you chose for the J2EE resource.

---

4. Define specific IMS connection information by adding a new J2EE resource instance:
   a. Highlight the label `J2EE resource instances` under the J2EE resource you created in the previous step.
   b. Click on `Selected` → `Add` to add a new resource instance.
   c. In the properties form, enter the appropriate values:
      - J2EE resource instance name.
      - J2EE resource instance description (optional).
      - The name of the system with which this J2EE resource instance is to be associated.
      - The properties that are required to create an `IMSJdbcDataSource`:

Table 48. IMSJdbcDataSource properties

Property	Description	Required or Optional Value
DLIDatabaseView subclass name	The fully qualified Java class name of a DLIDatabaseView subclass that identifies the metadata for an IMS program status block (PSB).	Required
DRA startup table name	The one- through four-alphanumeric identifier of a database resource adapter (DRA) startup table that identifies the IMS subsystem with which the IMS JDBC Connector is to communicate.	Required

   d. Click on `Selected` → `Save` to save your changes.

      Result: The words "Adding... J2EE resource instances" appear in the tree.

You know you are done when the following message appears in the status bar:

```
BBON0515I J2EE resource Instance name was added.
```

where *name* is the name you chose for the J2EE resource instance.

---

5. Install the J2EE application components that use the IMS JDBC Connector to access IMS databases:
   a. In the tree, select the server.
   b. Choose `Install J2EE Application...` from the Selected menu bar. The Install J2EE Application dialog box appears.
   c. In the dialog box, enter the following values:
      - The name of the EAR file that contains your J2EE application.
      - The name of the FTP server for the sysplex in which you want to install your application.

      Click OK.

      Result: A pop-up appears with the words "Loading ear file," then the Reference and Resource Resolution window appears and displays the application content in the ear file.

d. Expand each folder listed in the Reference and Resource Resolution window by clicking the node to the left of the folder. Set the JNDI Path and JNDI Name for each bean in turn by clicking the bean, then clicking the button labelled "Set Default JNDI Path & Name."

e. Select each bean by clicking the bean symbol. For each resource reference that needs to be an `IMSJdbcDataSource`:

   1) Click `J2EE Resource` tab.
   2) Click on the blank space in the table in the `J2EE Resource` column, which brings up a list of J2EE resources.
   3) Click on the name of the J2EE resource you created earlier in Step 3 on page 281.

Click OK to begin the automatic FTP transfer of the EAR file contents from your workstation to z/OS or OS/390.

You know you are done when the following message appears in the status bar:

```
BBON0470I EAR file file_name has been successfully installed on server server_name.
```

---

6. Validate and commit the new conversation (the new or modified server configuration).

---

7. If necessary, complete manual z/OS or OS/390 tasks, such as creating or modifying start procedures for the J2EE server's control and server regions. When you are finished, use the Administration application to mark the tasks as complete.

---

8. Activate the new conversation.

---

9. After setting up the server and activating the new conversation, you must install the IMS Custom Service file, `IMSJdbcCustomService.xml`:

   a. Add the following property to the WebSphere server region JVM properties file:

   ```
   com.ibm.websphere.preconfiguredCustomServices=
   ```

   The property must specify the full directory name of the IMS custom service xml file which you previously extracted from the IMS "rar" file into your work directory.

Example: If your work directory was `/usr/lpp/connectors`, add the following line to the `jvm.properties` file:

```
com.ibm.websphere.preconfiguredCustomServices=/usr/lpp/connectors/
     IMSJdbcCustomService.xml
```

Note: The `IMSJdbcCustomService.xml` file identifies the IMS Custom Service that needs to be called at initialization and termination in the WebSphere J2EE server region. Failure to install the service will result in PSB allocation failures when using the IMS JDBC Resource Adapter.

---

10. Give the WebSphere J2EE server region (where the defined IMS JDBC J2EE resource will be used) access to the load library that contains the DRA Startup Table that was specified for the IMS JDBC J2EE resource instance. You can provide this access using one of two methods:

- Add the load library that contains the DRA Startup Table to the STEPLIB in the server region PROC.
- Include the library in the system's LINKLST definition.

  Note: Using the second method means that you then don't need to define the library in the STEPLIB definition for the server's PROC.

You know you are done when the following message appears in the status bar:

```
BBON0449I Conversation server server_name SERVER DEFINITION was activated.
```

Setting up procedural application adapters for CORBA applications

WebSphere for z/OS supports the following procedural applications adaptors for CORBA applications:

- CICS-EXCI
- IMS-OTMA
- IMS-APPC

Setting up the CICS-EXCI Procedural Application Adapter for CORBA applications

The CICS Procedural Application Adapter uses the CICS-EXCI interface. This section covers steps you should take to set up the CICS-EXCI interface for WebSphere for z/OS.

Steps for setting up the CICS-EXCI Procedural Application Adapter

Before you begin: You must have Java for z/OS or OS/390, WebSphere for z/OS, and the CICS subsystem to which it connects on the same z/OS or OS/390 image. This limitation exists because the EXCI interface, which allows RRS to coordinate the transaction, requires that the client and CICS server reside on the same system.

Follow these steps to set up the CICS-EXCI Procedural Application Adapter:

1. Specify RRMS=YES in the CICS *hlq*.SYSIN(*member*) data set to make CICS participate in the RRS context.

   ____

2. Include CICS in the same restart group as WebSphere for z/OS and DB2. See "Setting up automatic restart management" on page 206.

   ____

3. Set up the CICS region for your application. We provide a sample job, BBOADEFS, that sets up the CICS region for an application (in our case, the BCASHAC program).

   ____

4. Follow these requirements and guidelines for business application servers that use the CICS Procedural Application Adapter:
   - You must define a *specific* type connection in the CICS resource definition with a NETNAME that is the same as the WebSphere for z/OS server name.
   - When defining the logical resource manager for a server, you must choose CICS_EXCI_PAA as the logical resource manager subsystem type and identify the following for the logical resource manager instance connection data:

CICS applid
The CICS application ID.

Details about coding WebSphere for z/OS applications that use CICS, including the setup of the server, are in *WebSphere Application Server V4.0.1 for z/OS and OS/390: Assembling J2EE Applications*, SA22-7836.

You are done with configuration steps. You will need to test the CICS-EXCI set up with your buiness application testing.

Guidelines for the IMS-OTMA Procedural Application Adapter (CORBA applications)

The IMS-OTMA Procedural Application Adapter uses the Open Transaction Manager Access (OTMA) protocol for IMS. As such, there are guidelines and requirements you must follow:

- IMS, Java for z/OS or OS/390, and WebSphere for z/OS must be on the same system in the sysplex. This limitation exists because the OTMA interface, which allows RRS to coordinate transactions, requires that the client (WebSphere for z/OS) and IMS server reside on the same system.
- Include IMS in the same restart group as WebSphere for z/OS and DB2. See “Setting up automatic restart management” on page 206.
- A WebSphere for z/OS application server instance acts as an IMS-OTMA client, which means it must be in the same XCF group to communicate with the IMS-OTMA.

  The IMS-OTMA XCF group name is one of the parameters required when you define an IMS-OTMA PAA Logical Resource Mapping (LRM) through the Administration application. The other is the XCF partner name that identifies the specific IMS with which the server communicates. The XCF partner name is the name specified by the OTMANM parameter in the IMS DFSPBxxx proclib member used for initialization. If no OTMANM parameter is defined, then the name specified by the APPLID1 parameter in the IMS DFSPBxxx member will be used as the default XCF partner name.
- You must give the control region user ID in the application server instance READ authority to the IMSXCF.OTMACI resource in the RACF FACILITY class. For details, see *IMS/ESA Open Transaction Manager Access Guide*, SC26-8743.
- Set the IMS parallel scheduling limit to 0 (any number of transactions can be scheduled).
- A transaction in a WebSphere for z/OS application may result in several transactions in IMS. For instance, within a transactional scope in a WebSphere for z/OS application, a program may perform a findByPrimaryKey, three setters, and three getters, resulting in three separate IMS transactions. This multiplying effect on transactions affects the number of message processing regions IMS must have. You must specify the number of message processing regions in the DFSMPR job to equal the number of transactions that could result from a WebSphere for z/OS transaction.

  Example: If you have a WebSphere for z/OS transaction that could generate 5 IMS transactions, set the number of message processing regions to 5.

  If additional WebSphere for z/OS applications generate additional IMS transactions on the same database, set the number of message processing regions according to the maximum number of transactions that could be generated from all applications.

- You may use only SendReceive requests when communicating with a target transaction program in IMS. Requests to do Send-only or Receive-only processing with an IMS transaction program are not supported.
- For more information about OTMA, see *IMS/ESA Open Transaction Manager Access Guide*, SC26-8743.
- The following are planning requirements and guidelines for business application servers that use the IMS-OTMA Procedural Application Adapter. Details about coding WebSphere for z/OS applications that use IMS, including the setup of the server, are in *WebSphere Application Server V4.0.1 for z/OS and OS/390: Assembling J2EE Applications*, SA22-7836:
  - When defining the logical resource manager for a server, you must choose IMS_OTMA_PAA as the logical resource manager subsystem type and identify the following for the logical resource manager instance connection data:

    XCF group name
    Fill in the name specified on the GRNAME parameter in the DFSPBxxx proclib member used for IMS initialization.

    XCF partner name
    Fill in the name specified on the OTMANM parameter in the DFSPBxxx proclib member used for IMS initialization. Otherwise, use the name specified by the APPLID1 parameter in the DFSPBxxx member, which is the default XCF partner name if no OTMANM parameter is defined.

    number of sessions
    Specify 1.

    TPIPE prefix
    Specify a prefix, which must be four characters or less, for the system to use for all transaction pipes required for this LRM. When creating a transaction pipe for this LRM, the system generates a unique transaction pipe name by using this prefix and appending four characters of session-related information.

    Rule: You cannot have more than one logical resource manager instance with the same XCF group name configured to a given server instance.

    For a given server instance, WebSphere for z/OS connects once, and only once, to a single IMS member within an IMS XCF group specified by a logical resource manager instance. If you have configured the server instance with another logical resource manager instance that has the same XCF group name, but a different IMS member name, TPIPE name, or number of sessions, initialization of that logical resource manager instance will fail when it attempts to connect to the same IMS XCF group. This is because the server instance will already be a member of the IMS group as a result of the first connection.
  - Make sure you specify enough members in the XCF data set definitions. You must specify an XCF data set member for each server using the IMS-OTMA Procedural Application Adapter.

Setting up the IMS-APPC Procedural Application Adapter

The IMS-APPC Procedural Application Adapter allows WebSphere for z/OS to communicate through APPC/MVS with IMS on a remote or local system. APPC/MVS provides a programming interface (LU 6.2 architecture) that WebSphere for z/OS exploits to communicate on a peer-to-peer basis with application programs. Through settings in WebSphere for z/OS, you can determine whether an APPC conversation is protected. Three possibilities exist:

- You can require protected conversations. By using protected conversations (`syncpt` specified on the logical resource manager instance), APPC/MVS becomes a communications resource manager and has expressed interest in the outcome of a WebSphere for z/OS transaction, driving the IMS transaction running on another system under the same transactional scope as WebSphere for z/OS. All of the processing done on behalf of a distributed application is treated as an atomic, or single, operation. In other words, APPC/MVS, WebSphere for z/OS, and IMS coordinate their processing so that all application updates are either made (committed) or not made (rolled back). This coordination is most beneficial for applications that have a critical dependency on data integrity.

  This transaction management happens automatically when you create a server with the IMS-APPC Procedural Application Adapter and protected conversations. We say that the conversations have syncpoint capabilities; that is, data in your application is synchronized with data in the IMS database.
- You can allow unprotected conversations. If your application does not require the use of protected conversations, you may create a server with the IMS-APPC Procedural Application Adapter without syncpoint capabilities (`none` specified on the logical resource manager instance). With no syncpoint capabilities, there is no guarantee that data in the IMS database is synchronized with data in your client application—your client application becomes responsible to recheck the data in IMS if it makes an update. Although there is no synchronization of data, there are benefits:
  - Your application no longer pays the performance cost associated with distributed transactions.
  - Fewer IMS message processing regions (MPRs) become busy. In a transaction, a simple read/write operation requires two message processing regions to remain busy until a transaction commitment occurs. If you use no syncpoint capabilities, one message processing region can serve a data request, then immediately become available for another request.
- You can allow WebSphere for z/OS to determine whether an APPC conversation is protected when the conversation is allocated (`autotran` specified on the logical resource manager instance). WebSphere for z/OS makes the determination based on the container transaction policy and the type of transaction the current execution thread is running under.

  Container transaction policies control the type of transaction under which an execution thread runs. Containers can require global transactions (TX_REQUIRED) or allow variations of local transactions started by your application (these variations are collectively called HYBRID_GLOBAL policies). If `autotran` is the setting when WebSphere for z/OS is about to allocate an APPC conversation, WebSphere for z/OS will:
  - Allocate a protected conversation if the execution thread is running under a global transaction (the container policy requires a global transaction)
  - Allocate an unprotected conversation if the execution thread is running under a local transaction (the container policy allows a local transaction)

Before you set up the APPC connection, you must determine the transactional characteristics of your application and know the appropriate container transaction policy. Details on transaction policies are in *WebSphere Application Server V4.0.1 for z/OS and OS/390: Assembling J2EE Applications*, SA22-7836. You need to know these things because this determines whether you must define the APPC connection with syncpoint capabilities. If you plan to use the `syncpt` or `autotran` settings on the logical resource manager instance, you should define syncpoint capabilities for the APPC connection. If you plan to use the `none` setting on the logical resource manager instance, you do not need to define syncpoint capabilities for the APPC connection.

Setting up a server that uses IMS-APPC Procedural Application Adapter

To set up a server with the IMS-APPC Procedural Application Adapter, you must coordinate the configuration on both sides of the communication path, then define the connection to your WebSphere for z/OS server through the Administration application:

- On the WebSphere for z/OS side (which we designate as the local system), you must coordinate the configuration for VTAM and APPC.
- On the IMS side (which we designate as the partner system), you must coordinate the configuration for VTAM, APPC, and IMS.
- Finally, you must define the connection for your WebSphere for z/OS server through the Administration application.

The following table shows the subtasks and associated procedures for setting up a server that uses the IMS-APPC Procedural Application Adapter:

Subtask	Associated procedure (See . . .)
Setting up the WebSphere for z/OS (local) side	"Steps for setting up the WebSphere for z/OS (local) side"
Setting up the IMS (partner) side	"Steps for setting up the IMS (partner) side" on page 289
Defining the connection to your WebSphere for z/OS server	"Step for defining the connection to your WebSphere for z/OS server" on page 291

For more information on configuring APPC/MVS, see *z/OS MVS Planning: APPC/MVS Management*, SA22-7599.

Steps for setting up the WebSphere for z/OS (local) side: **Before you begin:** You must have VTAM and APPC installed on your WebSphere for z/OS system. Also, you must decide whether your application requires syncpoint capabilities.

Perform the following steps to set up the WebSphere for z/OS (local) side:

1. Define a logical unit (LU) to VTAM in its APPL definitions.
   - To enable syncpoint capabilities for the LU, you must code the VTAM APPL definition with SYNCLVL=SYNCPT and ATNLOSS=ALL. Also, you must configure RRS and make it active.
   - To run without syncpoint capabilities, you do not need to specify either the SYNCLVL or ATNLOSS keywords.

   Recommendation: Create an LU specifically for WebSphere for z/OS because you can manage the LU more easily. You need define only one LU through which all WebSphere for z/OS-initiated conversations will pass. For sample LU definitions, see the sample in SYS1.SAMPLIB(ATBAPPL).

2. Create at least one APPC TP Profile data set. See SYS1.SAMPLIB(ATBTPVSM) for a sample job that creates an APPC TP Profile data set.

3. Define an APPC LU that matches the LU you defined for VTAM. On the TPDATA keyword, specify the APPC TP Profile data set you created in step 2 on page 288.

   Tip: Since this LU will likely support outbound conversations only, you can avoid starting up a transaction scheduler and increasing resource overhead by specifying NOSCHED on the LU.

   The LU names are defined in the APPCPMxx member in SYS1.PARMLIB. For a sample member, see SYS1.SAMPLIB(APPCPMxx).

4. To implement syncpoint capabilities, define the ATBAPPC.LU.LOGNAMES log stream to the system logger.

   Note: If WebSphere for z/OS and IMS are on different systems in the same sysplex, you must use the coupling facility for the log stream. APPC/MVS supports a DASD-only log stream in a single system environment only.

5. Ensure you have VTAM connectivity to the IMS system. You can use VTAM Subarea, VTAM APPN, or SNA over TCP/IP network configurations.

6. Enable the VTAM APPL into the VTAM configuration.

7. Start APPC with the new WebSphere for z/OS LU defined or dynamically activate the new WebSphere for z/OS LU into the APPC configuration. Issue the following command to verify that the local LU is active. If you want syncpoint capabilities, check that Protected=YES:

   ```
   DISPLAY APPC,LU,ALL
   ```

You know you are done when you see the local LU active and, if you want syncpoint capabilities, that Protected=YES.

Steps for setting up the IMS (partner) side: **Before you begin:** You must have VTAM and APPC installed on your IMS system. Also, you must decide whether your application requires syncpoint capabilities.

Perform the following steps to set up the IMS (partner) side:

1. Define a logical unit (LU) to VTAM that is associated with IMS. This is the LU with which WebSphere for z/OS will allocate a conversation to establish communications with IMS.
   - To enable syncpoint capabilities for the LU, you must code the VTAM APPL definition with SYNCLVL=SYNCPT and ATNLOSS=ALL. Also, you must configure RRS and make it active. For sample LU definitions, see SYS1.SAMPLIB(ATBAPPL).
   - To run without syncpoint capabilities, you do not need to specify either the SYNCLVL or ATNLOSS keywords.

   Rule: This partner LU must be able to accept a user ID without a password when communication is initiated (WebSphere for z/OS already verifies the password). You can set this up through the VTAM APPL definition, in which you specify the parameter SECACPT=ALREADYV. An alternative is to set up a RACF APPCLU profile, in which you specify CONVSEC(ALREADYV). Details on APPC security are in the chapter on security in *z/OS MVS Planning: APPC/MVS Management*, SA22-7599.

2. Create at least one APPC TP Profile data set. See SYS1.SAMPLIB(ATBTPVSM) for a sample job that creates an APPC TP Profile data set.

3. Define an APPC LU that matches the partner LU you defined in VTAM. On the TPDATA keyword, specify the APPC TP Profile data set you created in step 2. Specify the SCHED keyword with the value of the IMS System Identifier on the LU definition.

   The LU names are defined in the APPCPMxx member in SYS1.PARMLIB. For a sample member, see SYS1.SAMPLIB(APPCPMxx).

4. To implement syncpoint capabilities, make sure you have a log stream defined for APPC on the IMS side:
   - If IMS is running on the same system as WebSphere for z/OS, APPC needs a DASD-only or coupling facility log stream called ATBAPPC.LU.LOGNAMES.
   - If IMS is running on a different system in the sysplex than WebSphere for z/OS, APPC needs a log stream called ATBAPPC.LU.LOGNAMES to be defined to use the coupling facility. That is because APPC/MVS supports a DASD-only log stream in a single system environment only.
   - If IMS is running on a remote system (not on the same system or sysplex as WebSphere for z/OS), it needs a log stream called ATBAPPC.LU.LOGNAMES on that remote system. The log stream can use either a DASD-only or coupling facility configuration.

5. Set the IMS parallel scheduling limit to 0 (any number of transactions can be scheduled).

6. Size the number of message processing regions IMS must have. The sizing depends on whether you use syncpoint capabilities:
   - Using syncpoint capabilities. A transaction in a WebSphere for z/OS application may result in several transactions in IMS. For instance, within a transactional scope in a WebSphere for z/OS application, a program may perform a findByPrimaryKey, three setters, and three getters, resulting in three separate IMS transactions. This multiplying effect on transactions affects the number of message processing regions IMS must have. You must specify the number of message processing regions in the DFSMPR job to equal the number of transactions that could result from a WebSphere for z/OS transaction.

     Example: Iif you have a WebSphere for z/OS transaction that could generate 5 IMS transactions, set the number of message processing regions to 5.
   - Not using syncpoint capabilities. Specify the number of message processing regions according to the number of simultaneous operations you expect IMS to process.

If additional WebSphere for z/OS applications generate additional IMS transactions on the same database, set the number of message processing regions according to the maximum number of transactions that could be generated from all applications.

7. Enable the VTAM APPL into the VTAM configuration.

8. Start APPC with the new IMS LU defined or activate the new IMS LU dynamically into the APPC configuration.

9. To enable the APPC-IMS LU, issue the following IMS command from the MVS or IMS console:

   ```
   /START APPC
   ```

10. Issue the following command to verify that the Local LU is active:

    ```
    DISPLAY APPC,LU,ALL
    ```

You know you are done when APPC starts successfully. If you want syncpoint capabilities, check that Protected=YES.

Step for defining the connection to your WebSphere for z/OS server: **Before you begin:** You must have WebSphere for z/OS installed, including the Administration application.

Perform the following step to define the connection to your WebSphere for z/OS server:

⇔ Use the Administration application to define the logical resource manager (LRM) for that server. Choose IMS_APPC_PAA as the LRM subsystem type and identify the following for the logical resource manager instance connection data:

Local LU name

Fill in the logical unit (LU) name associated with WebSphere for z/OS. This local LU name is defined in an LUADD statement in the APPCPMxx parmlib member for the system on which WebSphere for z/OS runs.

Look for the LUADD statement for the LU associated with WebSphere for z/OS. Use the value specified on the ACBNAME parameter as the **local** LU name.

Rule: Use only the value specified on the ACBNAME parameter, which is the network LU name. If you specify a network-qualified (or fully qualified) name for the local LU, you will receive error message BBOU0106E, which indicates that the local LU name is not valid.

Partner LU name

Fill in the name of the LU with which the WebSphere for z/OS server will initiate an APPC conversation. This partner LU is defined in an LUADD statement in the APPCPMxx parmlib member for the system on which IMS runs. The IMS subsystem may be, but does not have to be, on a system other than the one on which the WebSphere for z/OS server runs.

Look for the LUADD statement for the LU associated with IMS (an LU associated with IMS has the IMS subsystem name specified for the SCHED parameter on the LUADD statement). Use the value specified on the ACBNAME parameter as the **partner** LU name.

Tip: When you specify the partner LU name, you may use one of the following forms:

- Only the value specified on the ACBNAME parameter (in other words, the network LU name)
- A network-qualified name (in the form *networkID***.***networkLUname*)

  networkID is the value specified for the VTAM start option NETID and *networkLUname* is the value specified on the ACBNAME parameter.
- A VTAM generic resource name, if your installation is configured to use generic resources.

VTAM logmode name

Fill in the name of the VTAM logmode that designates the network properties to be associated with any APPC conversations between this local LU and its partner LU. Logmode names appear in the VTAM logon mode table, which reside in your installation's VTAMLIB data set.

APPC conversation time-out value

Specify the length of time, in minutes, for the WebSphere for z/OS server to wait for a response to the Allocate call and any subsequent calls the server issues during its conversation with IMS. Valid time-out values range from 0 through 1440, which is 24 hours.

If you specify a value that is less than the value set for the `OTS_DEFAULT_TIMEOUT` environment variable, the APPC conversation time-out value will have no effect. Look for the `OTS_DEFAULT_TIMEOUT` environment variable setting that you use for the application server's control and server regions.

APPC sync level

Fill in one of the values listed in following table. This value controls the type of APPC/MVS conversation the WebSphere for z/OS server uses to communicate with IMS. Base your choice on the transaction policies you select for containers in this server configuration, and the characteristics of the applications to be deployed in this server.

Recommendation: Use a sync level value that corresponds with the transactional context of the request that the server is currently processing. The easiest way to match the sync level and context is to select **Autotran**, which lets the system determine the matching sync level.

If this LRM is connected to:	Then specify this sync level value:	Notes
One or more containers that **all** use the TX Required transaction policy	**Syncpt** (in certain cases, **None** is also acceptable)	Because this transaction policy enforces the use of a global transaction, the most logical value for the APPC sync level is **Syncpt**. With **Syncpt**, the server allocates a protected conversation, which preserves the global transactional context for the interaction between the server and the IMS subsystem, and allows the system to recover any resources if conversation errors or failures occur. In certain cases, however, you might consider using **None** when your application's processing does not depend on the ability to recover resources at this point in its processing. With **None**, APPC/MVS, WebSphere for z/OS, and IMS do not coordinate any processing done on behalf of a distributed application; without the overhead of coordination, your application's performance improves. **Recommendations:** • Use **Syncpt** if you cannot guarantee that your server application will always run on the same z/OS or OS/390 system on which the IMS subsystem runs. • Use **None** judiciously. In this case, resources that the application uses might be in inconsistent states if conversation errors or failures occur.
One or more containers that use a transaction policy other than TX Required	**Autotran**	Use **Autotran** with these policies, so the system can determine which conversation type, Syncpt or None, is appropriate for the transactional context associated with the current thread of execution. In other words, if the current thread has a local transactional context, the server uses a sync level of None; for a global transactional context, the server uses Syncpt.

If you need additional information about the transaction policies for containers, see *WebSphere Application Server V4.0.1 for z/OS and OS/390: Assembling J2EE Applications*, SA22-7836.

You know you are done when you save the logical resource manager and receive the message that the system added the logical resource manager.

Guideline for recovery of IMS transactions

Consider automatic restart management and what would happen if a system fails and WebSphere for z/OS is restored on a second system in the sysplex. As long as RRS is not running on the failed system, transactions could complete on the restored system if you had an LU with the same name and attributes as that on the failed system. However, you cannot set up two LUs in the sysplex with the same name and attributes in anticipation of a failure, because VTAM will not allow it (it would be like having the same telephone number in two places). Rather, you could manually reactivate the WebSphere for z/OS LU on the restored system after a failure on the first system (similar to moving a telephone number to a new location).

Configuring your systems for test and production

Overview

WebSphere for z/OS was designed and built to take advantage of the sysplex environment, which includes such shared facilities as datasharing, intelligent workload balancing, and shared transaction management. Sysplex defines the scope for management of shared resources.

Recommendation: Sharing resources between a production workload and a test workload potentially can expose the production workload to a set of error conditions to which it would not be exposed if the production and test workloads ran in different sysplexes. For this reason, it is IBM's recommendation that production and test workloads be run in separate sysplexes.

That said, it is possible to run test and production systems in various configurations in the same sysplex. One of those configurations allows you to run two separate *WebSphere for z/OS nodes* or *host clusters* in the same sysplex. This configuration is enabled through a function called multiple nodes in a sysplex. There are other configurations you can set up, which this topic explains. For each test and production configuration, you need to understand the risks associated with the configuration and the steps you can take to reduce these risks.

Normally, even though there may be more than one WebSphere for z/OS image running in a sysplex, the entire configuration, or *host cluster* (also known as a *WebSphere for z/OS node*) acts as a single entity. A single WebSphere for z/OS image, called a *clustered host instance*, consists of a run time (the Daemon, System Management, Naming, and Interface Repository server instances) and application server instances that you define. When WebSphere for z/OS runs on other z/OS or OS/390 systems in the sysplex, each clustered host instance cooperates with the others (through shared facilities, such as a shared system management database) to act as a single entity. Thus, isolating a test system from production within the sysplex becomes a challenge.

Testing and production phases

Before explaining the test and production configurations for WebSphere for z/OS, you must understand which test phase should be done on the z/OS or OS/390 platform and which should be done on other platforms. Figure 17 on page 295 shows the test and production phases. The paragraphs that follow explain the phases.

The development platform for WebSphere for z/OS is a WebSphere distributed system (for example, Windows or Linux Intel). The development environment includes tools such as WSAD for Web content delivery. The IBM tooling solution assumes that you develop enterprise beans in WSAD and perform basic (or *unit*) testing of the business logic in the WebSphere Test Environment.

Component testing involves the joining of several beans together into logical components, providing them with access to data, and testing them together. While this can be done on WebSphere for z/OS, most of our current installations perform this level of testing using a distributed platform such as Windows 2000 running WebSphere Application Server Advanced Edition. This allows a small team of developers to join the pieces of code that they have developed together and test the interactions. This testing does not test z/OS or OS/390 platform functions and features directly, but focuses on the individual beans and the relationships between them.

Function testing involves joining the various components together, connecting them to test data in the target database, and validating the function that the application will provide. Where this test is performed is dependent on what the function is, and what its data requirements are. If the target deployment platform is z/OS or OS/390, then it may make sense to do this level of testing there. This is possible by setting up one or more **test servers** into which the application is installed. (Where those test servers run is determined by the test and production configuration you set up, which is the subject of “Possible test and production configurations.”)

When the application is installed into the test server, the installer will define where in the JNDI directory that the references to the application will be stored. The test clients will need to be configured with this information that tells the clients where the test application is located. The test clients will then drive requests against the test server to do the functional testing. Remote debugging tools can be used to diagnose problems encountered.

System testing. Before you put an application into production on z/OS or OS/390, you should deploy the code into a WebSphere for z/OS server for testing. You may bring up the application and simulate a real load on the application. The important point here is that the code needs to run on z/OS or OS/390 before it goes into production. To do this, you need to define an additional **test server** and install the application into it. It is possible to have different levels of the application installed within the same sysplex, inside different test servers (one level for functional test, one for system test, and one for production). When they get installed, the beans that are part of the application should be registered in a different subtree of the JNDI directory (this occurs by default). The test clients need to be configured to the version of the application that is being tested and the tests run.

You can install the application in a *production* WebSphere for z/OS server after you are satisfied with the functional and system testing. The difference between a production server and a test server is whether the remote debugger is allowed to be attached. Normally, it is not acceptable for a production workload to stop because someone flowed a remote debugging request to it.

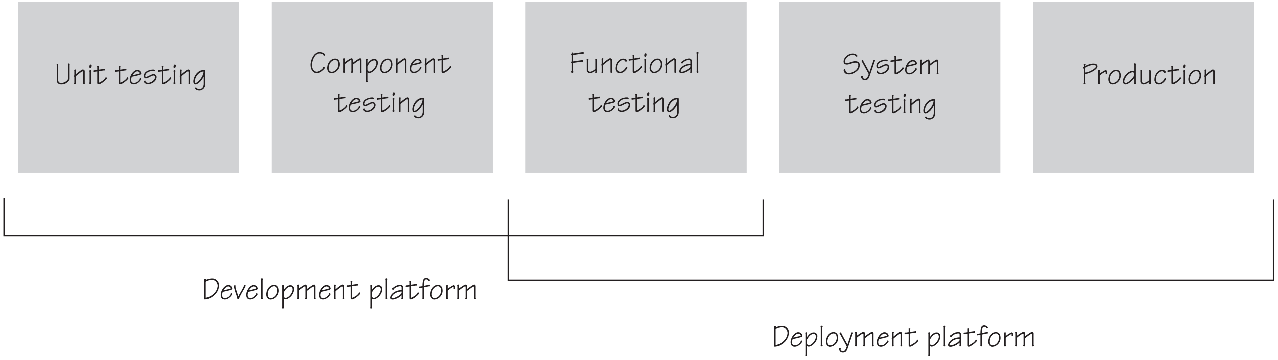


Figure 17. Test and production phases

Possible test and production configurations

It is technically possible to run functional test, system test, and production on the same system or within the same sysplex. Which configuration you adopt depends on how much risk you are willing to take. In order to analyze the potential risks, the following explains test and production configurations and how those configuration share resources. Possible configurations are:

- Production on one sysplex and test on another sysplex

- Production in one server instance and test in another server instance on a single system
- Production in one server instance on one system and test in a server instance on a separate system in the sysplex, but still on the same WebSphere for z/OS node
- Production on one WebSphere for z/OS node and test on another WebSphere for z/OS node, both nodes running in the same sysplex

Production on one sysplex and test on another sysplex: As Figure 18 shows, placing test and production servers into separate sysplexes eliminates all local sharing between test and production and provides the highest risk reduction possible. If you require complete availability of your production system, this configuration eliminates the risk of including production and test in the same sysplex.

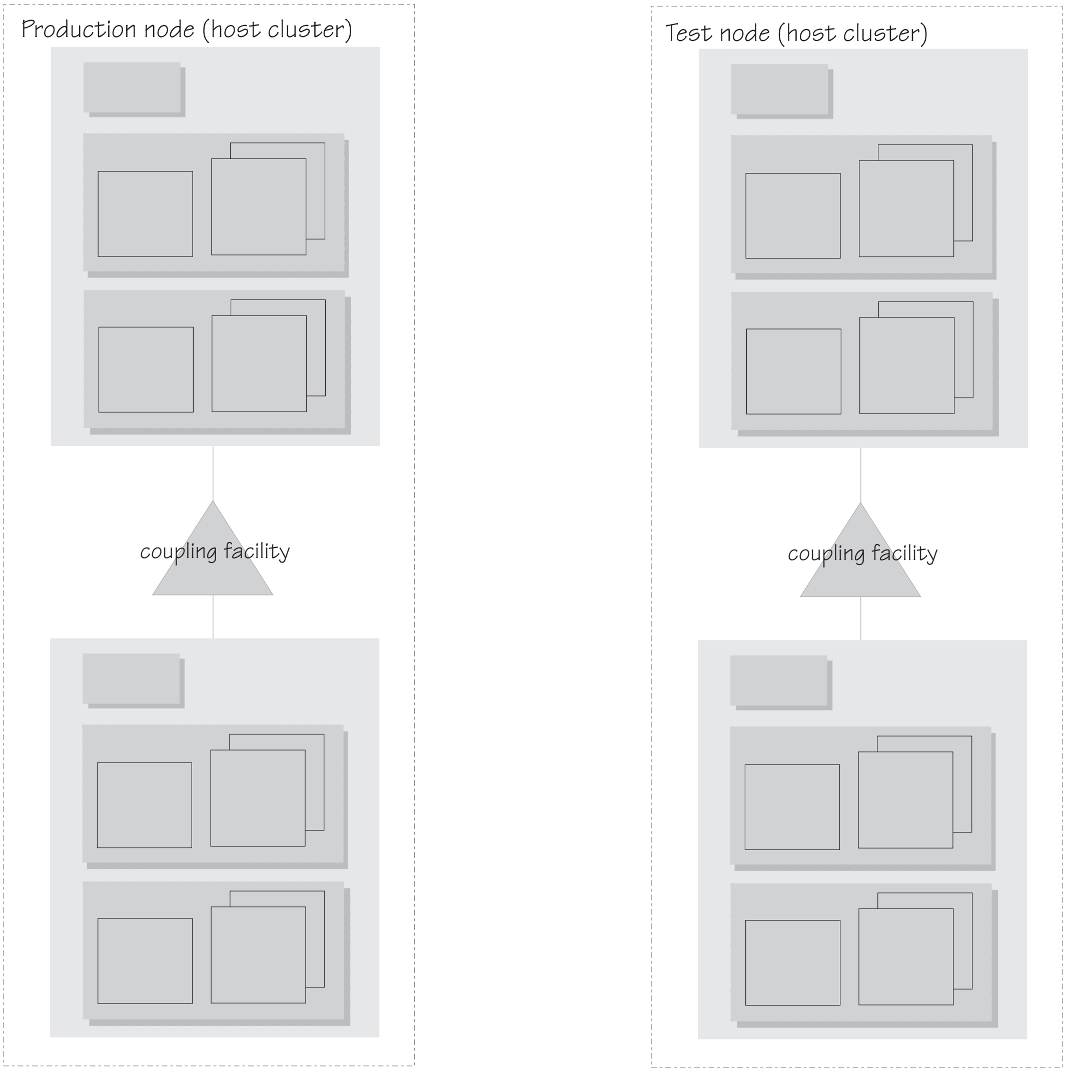


Figure 18. Test and production separated by different sysplexes

Recommendation: Use separate sysplexes to completely isolate clustered host instances.

Production in one server instance and test in another server instance on a single system:

Attention: IBM does not advise the use of this configuration.

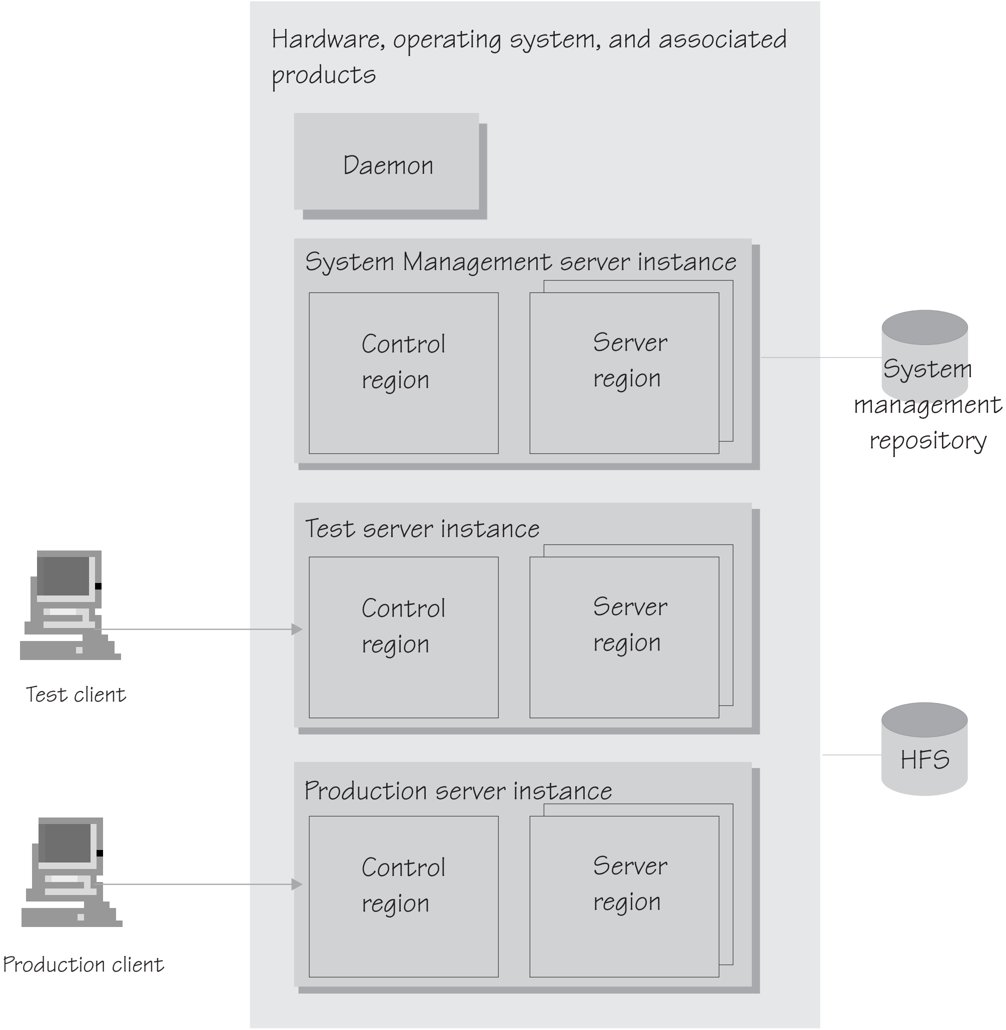

Hardware, operating system, and associated products
Daemon
System Management server instance
Control region
Server region
System management repository
Test server instance
Control region
Server region
Test client
HFS
Production server instance
Control region
Server region
Production client

Figure 19. Test and production in the same system

Figure 19 shows production and test server instances sharing:

- The hardware, operating system, and associated products
- The Daemon instance
- The System Management server instance and its shared repository
- The HFS file system that contains the data for the application

The test applications have the potential to damage the elements that are shared between the test and production server. The access between the two servers is mediated by system code, so the risk is low to moderate.

Production in one server instance on one system and test in a server instance on a separate system in the sysplex, but still on the same WebSphere for z/OS node:

Attention: IBM does not advise the use of this configuration.

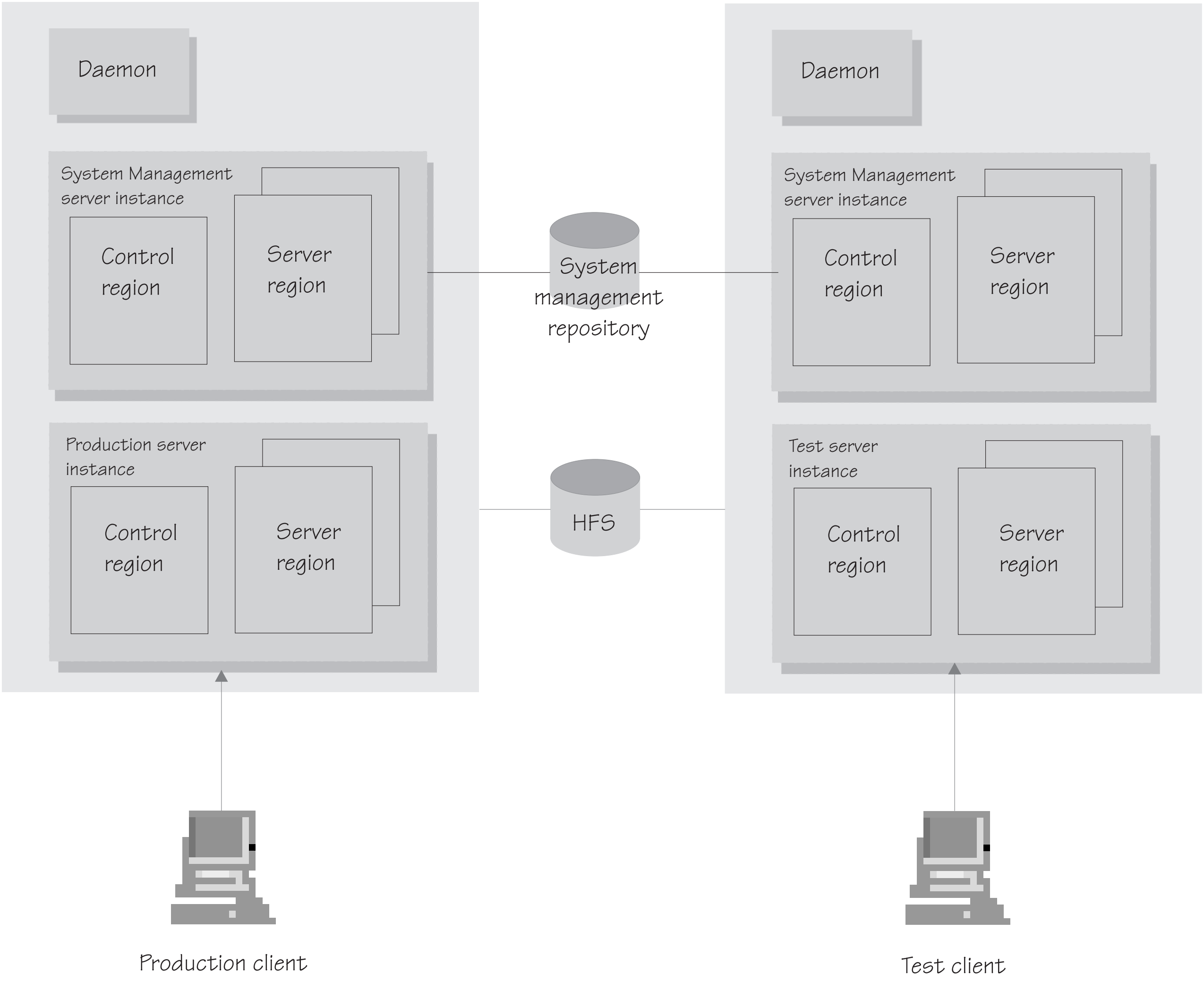


Figure 20. Test and production in the same WebSphere for z/OS node, but separated by different systems in the sysplex

In the configuration shown in Figure 20, the following are shared:

- The shared state that is kept by the instances of the System Management server in its repository to manage the WebSphere for z/OS node
- The shared HFS file system that contains the executables for the application

  Recommendation: You should allow only the System Management server, which uses authorized code, to write to this HFS.

The shared state is mediated by authorized system code, but it is still shared. The risk is low to moderate.

Production on one WebSphere for z/OS node and test on another WebSphere for z/OS node, both nodes running in the same sysplex:

Attention: IBM does not advise the use of this configuration.

You may want to test not only new applications, but also the interaction of the applications with WebSphere for z/OS in a controlled test environment within the same sysplex. We call this configuration *multiple WebSphere for z/OS nodes in a* *sysplex*. The configuration requires that at least one WebSphere for z/OS instance become independent of the other clustered host instances in the sysplex.

Figure 21 on page 300 shows an example configuration with a production node (host cluster) that has three WebSphere for z/OS instances and, within the same sysplex, a test node that has one WebSphere for z/OS instance.

Rules:

1. The independent WebSphere for z/OS instance must run on its own system in the sysplex (other production clustered host instances cannot run on that system).
2. The server names for the Daemon, System Management, Naming, Interface Repository, and all other application servers must be unique within the sysplex.
3. Do not change the scope of enqueues. If you change the scope of the following enqueues, System Management will not be able to detect duplicate servers within the sysplex. The enqueue minor names are:
   - CB:SYSMGMT:*dmnipname*:7
   - CB:*ctl_generic_server_name*:multiNodes:6

   dmnipname and *ctl_generic_server_name* vary.

Note: When it initializes, the System Management server detects WebSphere for z/OS nodes with duplicate server names. If System Management detects a duplicate server name, it issues console message BBOU0758W. After System Management initialization, there is no checking for duplicate names.

If you define a new server, we suggest you restart WebSphere for z/OS to be sure server names are unique within the sysplex. To do this while preventing an outage on the production system, restart each clustered host instance in the production node, one after the other.

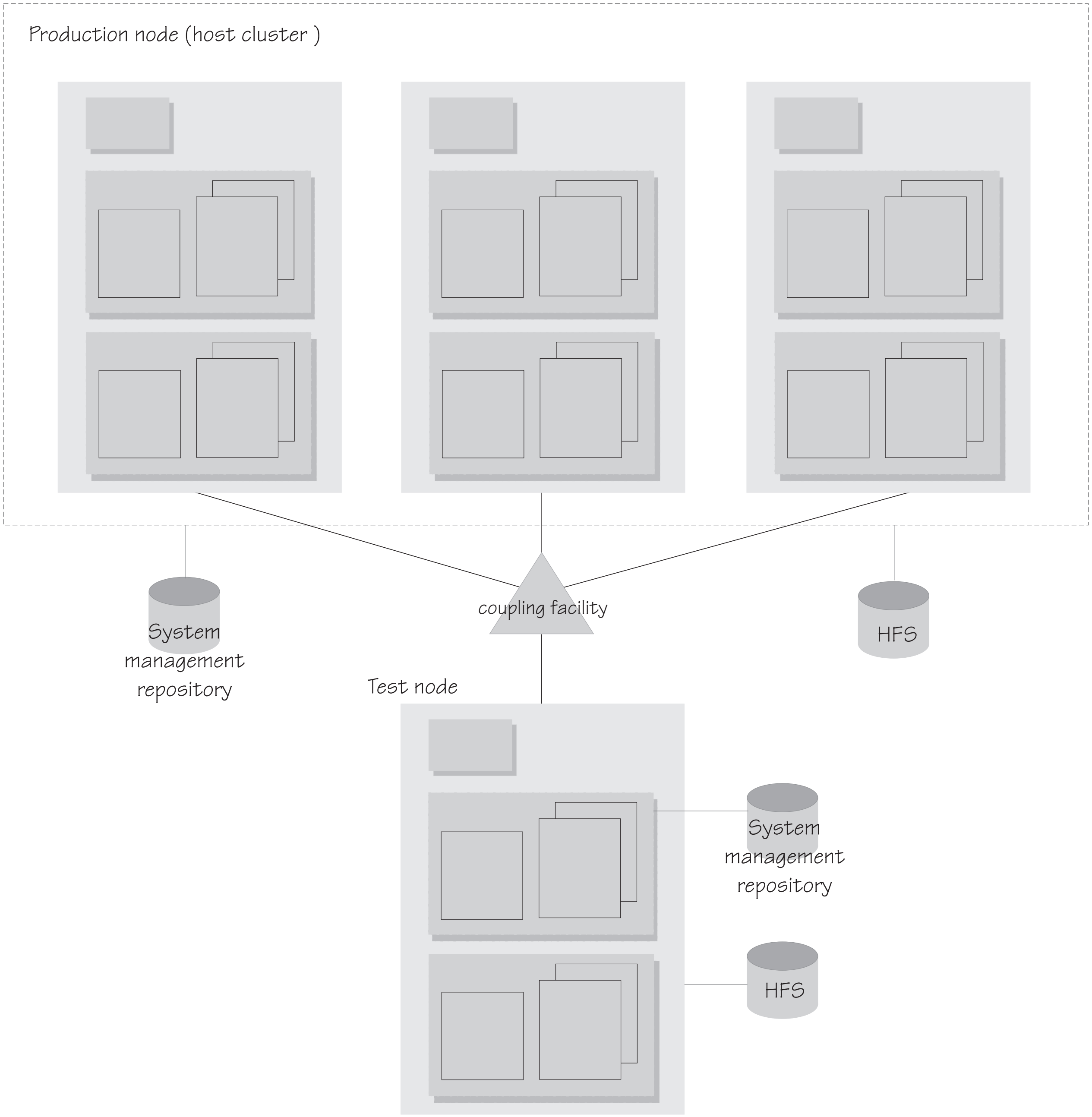


Figure 21. Test and production separated by different WebSphere for z/OS nodes in the sysplex

You must perform special procedures to set up this configuration. See "Setting up multiple WebSphere for z/OS nodes in the same sysplex" on page 301 for more information.

Though the test and production WebSphere for z/OS nodes are in the same sysplex, they do not share the state kept by the System Management servers, nor the HFS file system that contains application executables. They do share:

- The same sysplex name.
- The RACF database. Definitions for each node, servers, user IDs, and groups are distinct. Profile names can be distinct by prefixing them with unique characters, such as "CB" for production profiles and "TB" for test profiles.

- The WLM service policy. The application environments are distinct because, through naming conventions, the server names are distinct.
- The RRS logstream.
- ENF signals and GRS enqueues. If you have unique server names (application environments) in the different nodes, then these items are separated.
- The system console.

The risk is low.

Setting up multiple WebSphere for z/OS nodes in the same sysplex

Let us assume you have four systems in your sysplex: PRD1, PRD2, PRD3, and TST1. Systems PRD1, PRD2, and PRD3 are in the same DB2 data sharing group, forming one WebSphere for z/OS node (host cluster), and the node runs WebSphere for z/OS production. TST1 has a DB2 subsystem that is not part of the data sharing group running production. TST1 is the system on which you want to set up a WebSphere for z/OS test node.

The first WebSphere for z/OS node, spanning PRD1, PRD2, and PRD3, has the following characteristics:

- Uses DB2 in datasharing mode.
- Has a generic IP host name (**Example:** prdcb.company.com).
- Uses port 900 for the resolve IP port and port 5555 for the Daemon IP port.
- Has a dedicated LDAP server running on PRD1 using port 1389. The server is not replicated on other systems.
- Has application servers all prefixed with “CB”. All RACF profiles start with “CB”.
- Has a configuration HFS mounted at `/WebSphere390/CB390`.

To create a test WebSphere for z/OS node on TST1, you must follow these procedures:

- “Steps for configuring a test node through the customization dialog”
- “Steps for running the jobs to create the test node” on page 303

Steps for configuring a test node through the customization dialog

Before you begin: You need access to the customization dialog.

Rule: The z/OS or OS/390 system on which you are setting up the WebSphere for z/OS test node must have a DB2 subsystem that is not a part of the same data sharing group as the production node.

Perform the following steps to configure the test node:

1. Use the customization dialog as if you were creating a WebSphere for z/OS system for the first time, keeping in mind the following:
   - Use new target data sets for your test node so you will not overwrite the target data sets you used to set up your production system. If these new target data sets have different names than those of your production node, create a separate PROGxx member in your PARMLIB for the system running your test node and have it specify the appropriate data set names to be placed in the LNKLST.

- If you have any automation that issues operator commands to add the hlq.SBBOLOAD and hlq.SBBOLPA members to the LPA for the system where the test node runs, make sure you modify it.
- Create a new DB2 classes directory containing the JDBC serial profile DSNJDBC_JDBCProfile.ser file for each node you configure. Using the same file for multiple nodes can generate SQL -805 errors because the time stamps will be out of sync.

---

2. Through the customization dialog, do the following:
   a. Identify the DB2 subsystem that your test node will use. Enter the values on panel “System Locations (3 of 3)”.
   b. Identify a configuration HFS mount point different from your production configuration mount point on panel “WebSphere Customization (1 of 4)”.

      Example: Your production configuration mount point is `/WebSphere390/CB390`. Create a new configuration mount point called `/WebSphereTest/TB390` and enter that value in the customization dialog.

      Note: If your test node is to use different data sets than the production node, you need to also determine a product HFS mount point and a Java HFS mount point different than those of your production node. This is because your test node might run a higher maintenance level of WebSphere for z/OS than your production node, and both need to be mounted in the shared HFS.
   c. Create a DASD-only logging error log through panel “WebSphere Customization (2 of 4)”. Give it a different name than the production error log.
   d. Create a new unauthenticated user ID for the base servers through panel “WebSphere for z/OS Customization (3 of 4)”.

      Example: Your production system uses CBGUEST for the unauthenticated user ID. For your test node, define TBGUEST as the unauthenticated user ID.
   e. Create a new Daemon through panel “Server Customization (1 of 4)”. The attributes must be different from the attributes of your production system Daemon.

      Example: Create a new Daemon called TBDAEMON:
      - Server name: TBDAEMON
      - Server instance: TAEMON01
      - Procedure name: TBODMN
      - User ID: TBDMNCR1
      - UID: 12111
      - Port: 15555
      - IP name: tst1.company.com
      - SSL port: 15556

      Rule: The IP name and address must be unique, so you can vary the IP name, the IP port, or both.
   f. Create a new System Management server through panel “Server Customization (2 of 4)”. The attributes must be different from the attributes of your production System Management server.

      Example: Create a new System Management server called TBSYSMGT:

- Server name: TBSYSMGT
- Server instance: TYSMGT01
- Control region procedure name: TBOSMS
- Control region user ID: TBSYMCR1
- Control region UID: 12112
- Server region procedure name: TBBOSMSS
- Server region user ID: TBSYMSR1
- Server region UID: 12104
- Resolve IP port: 1900
- Resolve IP name: tst1.company.com

Rule: The IP name and address must be unique, so you can vary the IP name, the IP port, or both.

g. Create a new Naming server (panel "Server Customization (3 of 4)") and Interface Repository server (panel "Server Customization (4 of 4)") using the same conventions as you used for the Daemon and System Management servers.

h. If you plan to test your test WebSphere for z/OS node with the installation verification programs, create new IVP servers through the IVP customization panels.

i. Create an LDAP server that will be dedicated to the WebSphere for z/OS node.

Rule: The IP name and address must be unique, so you can vary the IP name, the IP port, or both.

3. Generate the jobs (option 3).

4. View or print the the customization instructions (option 4).

You know you are done when you successfully have a set of customization instructions. Use these instructions for the next procedure.

Steps for running the jobs to create the test node

Before you begin: You need the customization instructions that you produced in "Steps for configuring a test node through the customization dialog" on page 301. You also need the authorities documented in the customization instructions to run the customization jobs.

Perform the following steps to run the jobs:

1. Follow the customization instructions up to the bootstrap phase, then **stop**.

   Note: When you run the BBOWCPY1 job, specify a CTIBBOxx member different than that of your production node. If you don't do this, your test node will overwrite your original CTIBBO00 member. Along with this, also ensure you specify the TRACEPARM environment variable for the daemon server of your test node.

2. Open the configuration.env file in the *sysplex*/initial subdirectory under your test configuration HFS mount point.

   Example: /WebSphereTest/TB390/PRDPLEX/initial/configuration.env

   ____

3. In configuration.env, specify DATASHARING=0, then save the file.

   ____

4. Continue with the bootstrap phase and finish all customization instructions.

   ____

5. If you plan to test your test WebSphere for z/OS node with the installation verification programs, follow the instructions in the following sections in *WebSphere Application Server V4.0.1 for z/OS and OS/390: Installation and Customization*, GA22-7834,

   - "Installing the Administration and Operations applications"
   - "Defining application servers for the installation verification programs"
   - "Steps for creating the database for the installation verification programs (IVPs)"
   - "Running the WebSphere for z/OS installation verification programs (IVPs)"

   but note the following differences:

   a. When logging in with the Administration application, use the new bootstrap server IP name, resolve port, and user ID you defined for the test node.
   b. Define your IVP servers using the naming convention you used in the customization dialog.
   c. When setting up the Web application IVPs, add the following three entries to the httpd.envvars file:

      ```
      DAEMON_PORT=test_daemon_port
      DAEMON_SSL_PORT=test_daemon_ssl_port
      RESOLVE_PORT=test_resolve_port
      ```

      Example:

      ```
      DAEMON_PORT=15555
      DAEMON_SSL_PORT=15556
      RESOLVE_PORT=1900
      ```

You are done when you have completed all customization instructions and, if testing your configuration, when you have finished running the installation verification programs.

Chapter 6. Installing new releases and maintenance levels of WebSphere for z/OS

IBM provides functions and methods to meet the need of migrating from one functional level of WebSphere for z/OS to another with as little disruption as possible. These functions and methods include the following:

- Documenting types of migration methods.
- Providing a function to off-load WebSphere for z/OS configuration data and later reload that data into a new or existing configuration.
- Managing environment variables in a central location, the system management database, so that there is no confusion about where to go for authoritative configuration data.
- Supporting differing functional levels of WebSphere for z/OS within the same network or within the same z/OS or OS/390 sysplex while you perform an orderly migration of the WebSphere for z/OS run time from one functional level to another. We assume this migration happens over a relatively short period of time, perhaps weeks.

Overview of code upgrading methods

There are several methods used to install a new functional level of WebSphere for z/OS. The methods are classified by the kind of change that is made to WebSphere for z/OS and the way you start the Daemon server. The methods are:

- Cold start
- Warm start
- Hot start
- Quick start

Before we describe the various upgrading methods, we need to discuss an important point about your sysplex HFS structure.

Overview of creating the proper HFS structure for upgrades

You can install new functional levels of WebSphere for z/OS without disrupting service to your clients provided you have the proper HFS structure in a sysplex and you use what we call a rolling upgrade. Through the rolling upgrade method you can upgrade the WebSphere for z/OS host cluster by upgrading each clustered host instance one at a time, allowing you to keep service to clients available while you do the upgrade. Availability of service continues because only one system is removed from the host cluster, allowing the other clustered host instances to keep running.

Obviously, if you have WebSphere for z/OS running in a monoplex, or on a single system in a sysplex, and you need to install a new code level that requires shutting down WebSphere for z/OS, you have no choice except to disrupt service to your clients. Also, if you have the luxury of being able to disrupt service to your clients, even when you have WebSphere for z/OS running in a sysplex, then interruption of service to your clients is not a problem. But, if you cannot disrupt service while upgrading code levels, you must set up your HFSes in a sysplex as we describe in this section.

To use the rolling upgrade method, you need to have two different versions of WebSphere for z/OS in use in the sysplex at the same time, each version installed on what we call a version-specific HFS. In the conventional sysplex environment, you would have only one version-specific HFS and all systems in the sysplex would share it. But since you want to be able to have two different versions of WebSphere for z/OS in use in the sysplex at the same time, you must create a second version-specific HFS. See Figure 22.

Note: For information about an alternate HFS structure that accomplishes the same objective, see Appendix D, "Using an alternate HFS structure for product upgrades," on page 397.

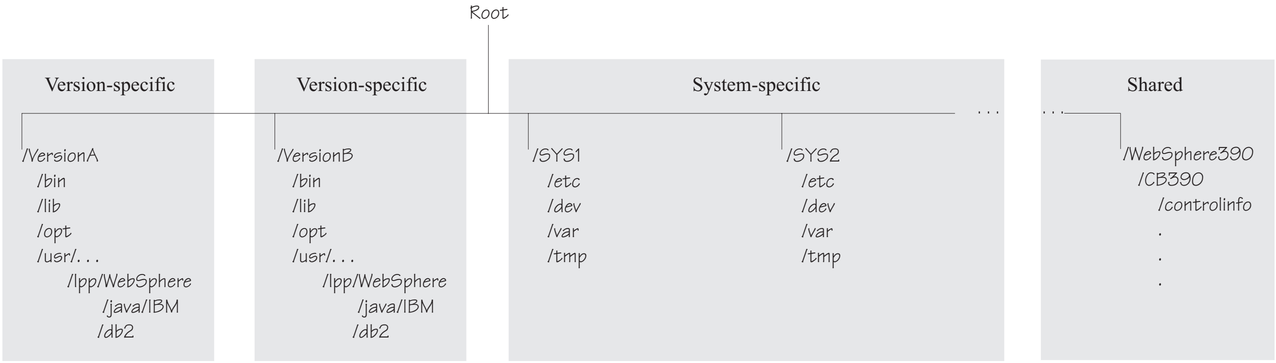


Figure 22. HFS structure for the rolling upgrade method

Because of code level interdependencies between products, both version-specific HFSes require the /usr directory (containing a version-specific level of WebSphere for z/OS and Java) and the /db2 directory (containing a version-specific level of JDBC).

With the dual HFS structure in place, you can mount a code level of WebSphere for z/OS on one mount point and run the host cluster from that mount point while upgrading the other mount point.

Example: Assume you have a version-specific HFS for one service level (PTF 10) mounted at /VersionA and another version-specific HFS for service level (PTF 15) mounted at /VersionB.

```
mount omvs.ptf10.was.hfs  at /VersionA/usr/lpp/WebSphere
mount omvs.ptf10.java.hfs at /VersionA/usr/lpp/java/IBM
mount omvs.ptf10.jdbc.hfs at /VersionA/usr/lpp/db2

mount omvs.ptf15.was.hfs  at /VersionB/usr/lpp/WebSphere
mount omvs.ptf15.java.hfs at /VersionB/usr/lpp/java/IBM
mount omvs.ptf15.jdbc.hfs at /VersionB/usr/lpp/db2
```

See Figure 23 on page 307.

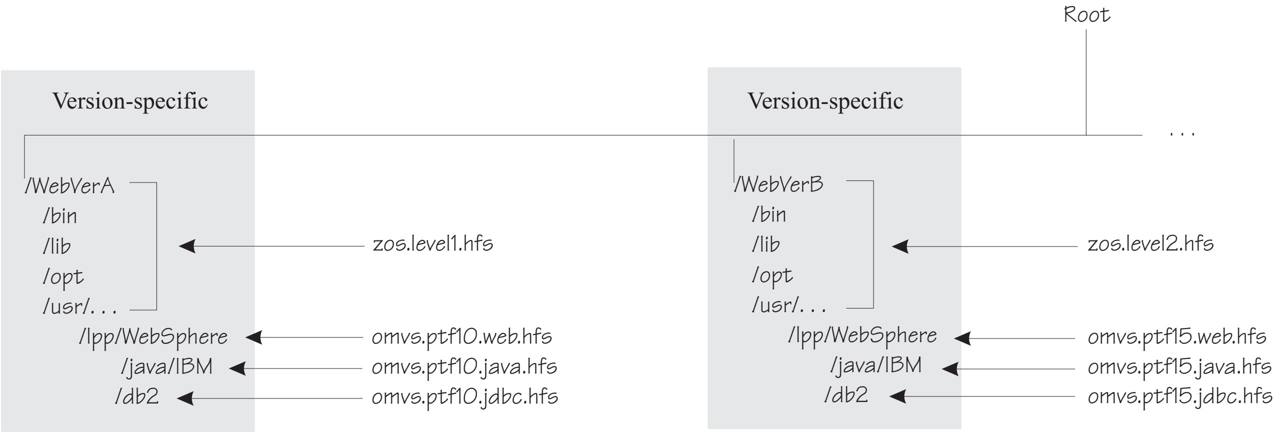


Figure 23. Mount point configuration for WebSphere for z/OS

Through the symbolic link

```
/usr --> $VERSION/usr
```

you can determine which code version any system in the sysplex addresses. You can control how $VERSION is resolved with the SETOMVS command. In this example, $VERSION for each system in the sysplex is set initially to VersionA, so all references to /usr by all systems are actually resolved to /VersionA/usr through the symbolic link.

If you wanted any system in the sysplex to use the HFSes associated with PTF15, you would change the value of $VERSION on that system (and only on that system) to VersionB. Accordingly, any references on that system to /usr are actually revolved to /VersionB/usr through the symbolic link.

To switch the code level for a given clustered host instance, you would:

- Install the new code, copy it to a new data set, and mount the data set at the VersionB mount point.
- Shut down all application servers and WebSphere for z/OS on that clustered host instance
- Use SETOMVS to change $VERSION to VersionB
- Using SET PROG, load the LPA modules from data sets associated with the new level
- Change the start procedures to address the new code level load libraries
- Restart WebSphere for z/OS and the application servers.

By repeating this process for each clustered host instance, one at a time, you can upgrade the code level of WebSphere for z/OS throughout the sysplex without disrupting service to your clients.

Each code level of WebSphere for z/OS is designed to tolerate an older code level, so differing levels of WebSphere for z/OS can coexist compatibly within the sysplex during the upgrade process. In cases when WebSphere for z/OS introduces new functions, all members of the host cluster run in compatibility mode during this upgrade process. Then, when all clustered host instances are at the new code level, you restart each instance, one by one, in warm start mode, which enables the new function. More on this in “Warm start” on page 309.

Cold start

Cold start is a method for:

- Installing WebSphere for z/OS initially. For your first installation and customization of WebSphere for z/OS, we provide a default system configuration. Those procedures are described in Chapter 3, “Installing and customizing your first run time,” on page 51.
- Recreating WebSphere for z/OS when, for some reason, your WebSphere for z/OS databases have been corrupted and cannot be recovered.

Release changes after WebSphere for z/OS V4.0 do not require the cold start method.

Note: The prepare for cold start function described in this topic is not suitable for backing up your system. If you want to back up all persistent data for your WebSphere for z/OS system, you must back up:

- The system management database
- The LDAP database tables containing the naming space and the interface repository
- The directory where WebSphere for z/OS run time information is written (the value of the CBCONFIG environment variable. The default is `/WebSphere390/CB390`.)
- WebSphere for z/OS PROCLIBs
- WebSphere for z/OS LOADLIBs

For more information, see “Guidelines for backup of the WebSphere for z/OS system” on page 183.

Once you have completed your initial installation and customization of WebSphere for z/OS, there are two main tasks you must do to cold start WebSphere for z/OS:

1. Prepare the system for cold start, which off-loads the existing configuration to off-load files.
2. Shut down WebSphere for z/OS (or the entire host cluster, if WebSphere for z/OS is running in a sysplex), install the functional changes, and restart the Daemon with the cold start option.

The cold start process

The following describes how the cold start process works.

Stage	Description
Prepare for cold start.	From the Administration application, a system programmer executes prepare for cold start. WebSphere for z/OS stops all application servers. The system stores configuration data in XML format in the HFS. The system also stores environment variable data for the servers into files in the HFS.
Shut down WebSphere for z/OS (or the entire host cluster, if running in a sysplex).	The entire WebSphere for z/OS or host cluster must be shut down.
Make base component changes.	Install the new functional level of WebSphere for z/OS.

Stage	Description
Run the customization dialog.	As you would for a first-time installation and customization, run the customization dialog and select option 1 “New customization” to create the necessary jobs for the cold start. When finished, you have a customized set of instructions to follow.
Follow the customized instructions starting at job BBOMCRDB.	Start using the customized instructions at job BBOMCRDB, which is where the system management database is recreated. Follow the instructions to recreate the LDAP tables. This will bring you to the first phase of the bootstrap by starting the daemon with the cold start option (`-ORBCBI COLD`). At this point, the system reads the saved XML file instead of the default base configuration, thereby restoring your configuration. Complete the naming and interface repository bootstraps as instructed, then continue to the second phase of the WebSphere for z/OS bootstrap.
Start one server instance for each application server	Start a server instance for each application server one after the other. Wait for the naming registration to complete for each server instance before starting the next server instance.
Rerun any application initialization routines.	This stage creates application naming contexts or persistent data.
Rerun any Interface Repository routines.	This stage recreates Interface Repository entries for applications.
Note: If you change any LDAP configuration information, rerun the appropriate portion of the BBOWCPY job to refresh the HFS.	

Backout plan for cold start

If you need to restore the previous WebSphere for z/OS functional level, use the same cold start process, but restore the previous functional level of WebSphere for z/OS after you prepare for cold start and shut down WebSphere for z/OS. Any new configuration data generated during preparation for cold start will be ignored by the previous level.

Warm start

Warm start is a method to move from one functional level of WebSphere for z/OS to another that requires changes to persistent data (for example, the system management database). If performed in a sysplex with the proper HFS structure, the method does not disrupt WebSphere for z/OS service to clients.

To be non-disruptive for your running applications, the warm start method requires that you have WebSphere for z/OS set up in a sysplex as explained in “Enabling WebSphere for z/OS on a sysplex” on page 191. In particular, you need to have a shared HFS with two mount points, each holding a level of WebSphere for z/OS. The method allows you to bring down one clustered host instance at a time, then switch the HFS for that instance to the new level. Because other clustered host instances are operating when one is down, clients still get service from WebSphere for z/OS.

The warm start process

The following describes the warm start process in general. For detailed procedures about release migrations that use the warm start method, see the procedures that follow this topic. For detailed procedures about service level changes that use the warm start method, see the documentation accompanying the service level changes.

Stage	Description
Code installation	Install the new WebSphere for z/OS code and mount it in an HFS at a mount point that is not currently in use.
System backup	During this stage, you back up the system management database, the LDAP database, files in the HFS (default `/WebSphere390/CB390`) containing run-time information, WebSphere for z/OS PROCLIBs, and WebSphere for z/OS LOADLIBs.
Cancellation of WebSphere for z/OS operations	Stop WebSphere for z/OS. If you have WebSphere for z/OS enabled on your sysplex, stop WebSphere for z/OS (the clustered host instance) on one system. Other systems continue with WebSphere for z/OS operations.
New level of code enabled	On the system that you stopped WebSphere for z/OS: • Perform the necessary migration actions, such as running jobs to alter databases • Update the run-time start procedures to point to the data sets with the new code • Load new run-time modules into LPA and change the link list • Switch the HFS the system references to the one with the new code
WebSphere for z/OS Daemon and application servers restarted	Restart the WebSphere for z/OS Daemon and application servers. If you have WebSphere for z/OS enabled on a sysplex, do the following for each clustered host instance, one at a time: • Stop the Daemon • Update the run-time start procedures to point to the HFS with the new code • Load new run-time modules into LPA • Switch the HFS the system references to the one with the new code • Restart the WebSphere for z/OS Daemon and application servers
WebSphere for z/OS restarted in warm start mode	Restart the Daemon with the warm start option. Restart your application server instances with the warm start option. If you have WebSphere for z/OS enabled on a sysplex, restart the Daemon and application server instances in warm start mode for each system in the sysplex, one at a time.

Backout plan for warm start

If you need to restore your previous WebSphere for z/OS system:

- Stop WebSphere for z/OS. On a sysplex, you must stop the entire host cluster.
- Change your server instance start procedures to reference the HFS with the previous version's code.
- Load the previous version's run-time modules into LPA and restore the old link list.
- Switch the HFS that your system references with the SETOMVS command. Use the command to change the $VERSION symbolic.

  Example: To switch back to the previous version's HFS (VersionA) that a system references, issue:

  ```
  setomvs version=VersionA
  ```
- Restore the databases, environment variable and configuration files, PROCLIBs, and LOADLIBs that you backed up.
- Restore the previous levels of the Administration application and Operations application.
- Start the Daemon. On a sysplex, start the Daemon for each clustered host instance.
- Start your application servers. On a host cluster, start all your application server instances.

Hot start

Hot start is a method that allows you to change a functional level of WebSphere for z/OS that does not require changes to the WebSphere for z/OS databases. If performed in a sysplex with the proper HFS structure, the method does not disrupt WebSphere for z/OS service to clients. You will likely use this method for most service level upgrades for WebSphere for z/OS.

To be non-disruptive for your running applications, the hot start method requires that you have WebSphere for z/OS set up in a sysplex as explained in "Enabling WebSphere for z/OS on a sysplex" on page 191. In particular, you need to have a shared HFS with two mount points, each holding a service level of WebSphere for z/OS. The method allows you to bring down one clustered host instance at a time, then switch the HFS for that instance to the new service level. Because other clustered host instances are operating when one is down, clients still get service from WebSphere for z/OS.

The hot start process

The following describes how the hot start process works.

Stage	Description
Code installation	Install the new WebSphere for z/OS code and mount it in an HFS at a mount point that is not currently in use.
System backup	During this stage, you back up the system management database, the LDAP database, files in the HFS (usually /WebSphere390/CB390) containing run-time information, WebSphere for z/OS PROCLIBs, and WebSphere for z/OS LOADLIBs.

Stage	Description
Cancellation of WebSphere for z/OS operations	Stop WebSphere for z/OS. If you have WebSphere for z/OS enabled on your sysplex, stop WebSphere for z/OS (the clustered host instance) on one system. Other systems continue with WebSphere for z/OS operations.
New level of code enabled	On the system that you stopped WebSphere for z/OS: • Update the run-time start procedures to point to the data sets with the new code • Load new run-time modules into LPA and update the link list • Switch the HFS the system references to the one with the new code
WebSphere for z/OS restarted	Restart the Daemon. Restart your application server instances. If you have WebSphere for z/OS enabled on a sysplex, do the following to each system, one at a time: • Update the run-time start procedures to point to the data sets with the new code • Load new run-time modules into LPA and update the link list • Switch the HFS the system references to the one with the new code • Restart the Daemon and application server instances on each clustered host instance, one at a time.

Backout plan for hot start

If you need to restore your previous WebSphere for z/OS system:

- Stop WebSphere for z/OS. In a sysplex, stop one clustered host instance while the other instances remain running.
- Change your server instance start procedures to reference the HFS with the previous version’s code.
- Load the previous version’s run-time modules into LPA and restore the old link list.
- Switch the HFS that your system references with the SETOMVS command. Use the command to change the $VERSION symbolic.

  Example: To switch back to the previous version’s HFS (VersionA) that a system references, issue:

  ```
  setomvs version=VersionA
  ```
- Start the Daemon.
- Start your application servers.
- In a sysplex, repeat the above for each clustered host instance, one at a time.

Quick start

Quick start is a method you use when no changes to the WebSphere for z/OS databases are required, there are code changes only to data sets, and only single servers need to be restarted selectively. In this case, a single server instance on a clustered host instance is brought down, the code installed, then the server instance is restarted. Because other server instances are running, the server is still available for client requests.

Service updates are likely candidates for quick start. You will always receive specific instructions on how to do the quick start for a given service update.

The quick start process

The following describes how the quick start process works.

Stage	Description
Stop the server instance on the first clustered host instance.	An operator or system programmer stops one server instance only.
Make the necessary code updates.	At this stage, install the new WebSphere for z/OS code.
Restart the server instance.	The server instance restarts and can now serve clients.
Repeat this process for each additional server instance, one at a time.	

Procedures for upgrading WebSphere for z/OS code

This topic provides procedures for you to follow for upgrading WebSphere for z/OS code.

Base your choice of which procedure to use on the following table:

If you are upgrading WebSphere for z/OS and the upgrade requires . . .	Then follow . . .	Notes
A warm start from WebSphere for z/OS V4.0 to V4.0.1 (either on a monoplex or a sysplex)	"Steps for performing a warm start from WebSphere for z/OS V4.0 to V4.0.1"	The procedure uses a migration path through the customization dialog. If you did not use the customization dialog to customize WebSphere for z/OS V4.0, and prefer to use the sample jobs instead, see Appendix C, "Migrating from WebSphere for z/OS V4.0 to V4.0.1 without the customization dialog," on page 389.
A hot start, and you can interrupt service to clients (either on a monoplex or a sysplex)	"Steps for performing a hot start with a system or sysplex-wide restart" on page 317	
A hot start on a sysplex, but you cannot interrupt service to clients	"Steps for performing a rolling hot start" on page 318	A rolling hot start requires the dual HFS structure described in "Overview of creating the proper HFS structure for upgrades" on page 305.

You can now perform the steps for the decision you have made.

Steps for performing a warm start from WebSphere for z/OS V4.0 to V4.0.1

Before you begin:

Requirement: Your V4.0 system must have the proper level of service installed. See "Overall migration tasks to go from WebSphere for z/OS V4.0 to WebSphere for z/OS V4.0.1" in *WebSphere Application Server V4.0.1 for z/OS and OS/390: Migration*, GA22-7860, and consult the PSP bucket for the latest service information.

Rules: Regarding your display:

- Your logon display must support a minimum of 32 rows by 80 columns (32 x 80) in order for the ISPF customization dialog to run.
- If you have a 32-row display and use the ISPF split screen function, deselect "Always show split line" on the ISPF Settings panel and split the screen at the extreme top or bottom of the display. This prevents the split screen line from displaying and lines in the customization dialog from being obscured. Other uses of split screen will obscure lines in the customization dialog.
- If you have a 32-row display, you cannot display the PF key settings. Displaying the PF key settings will obscure lines at the bottom of the dialog panels. Issue `PFSHOW OFF`.

Perform the following steps to do the warm start.

1. Use SMP/E to install the new WebSphere for z/OS code. Be sure to install the new WebSphere for z/OS code into a separate set of MVS and HFS data sets.

2. Back up your current system. This includes:
   - The system management database
   - The LDAP database tables containing the naming space and the interface repository
   - Files in the HFS containing WebSphere for z/OS run-time information (usually mounted at `/WebSphere390/CB390`).
   - WebSphere for z/OS PROCLIBs
   - WebSphere for z/OS LOADLIBs

   For more information, see "Guidelines for backup of the WebSphere for z/OS system" on page 183.

3. From the ISPF command line, enter the following:

   ```
   ex 'hlq.sbboclib(bbowstrt)' 'options'
   ```

   where

   hlq
   Is the high-level qualifier for the SBBOCLIB data set.

   options
   Are command options. Enclose any and all options in a single set of quotes.

   hlq(*value*)
   Specifies the data set qualifier(s) for the WebSphere for z/OS product data sets. The default value is the same as what you specify as the high-level qualifier for BBOWSTRT. If you do not specify a high-level qualifier for BBOWSTRT, the default is `BBO`.

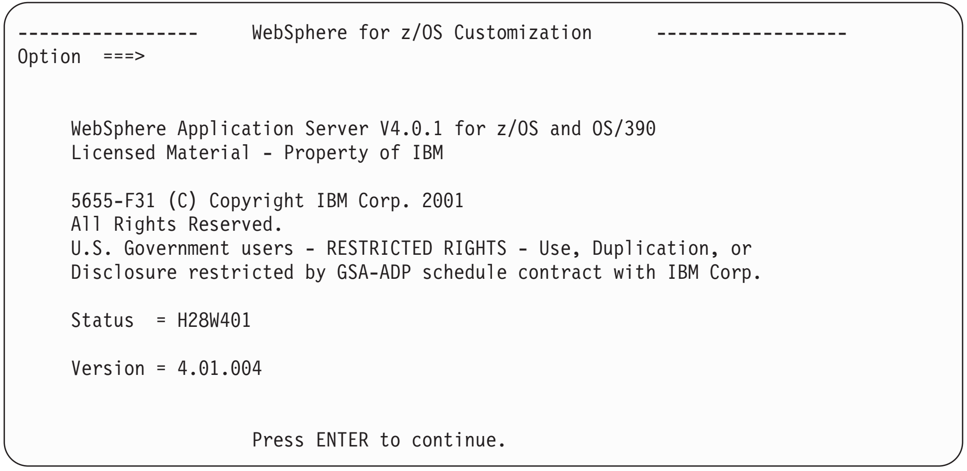
   appl(*value*)
   Specifies the ISPF application name. The default value is `BBO`.

   lang(*value*)
   Specifies the national language. Values can be either `ENUS` (English) or `JAPN` (Japanese). The default is `ENUS`.

   Example:

   ```
   ex 'bbo.sbboclib(bbowstrt)' 'hlq(bbo) appl(bbo) lang(enus)'
   ```

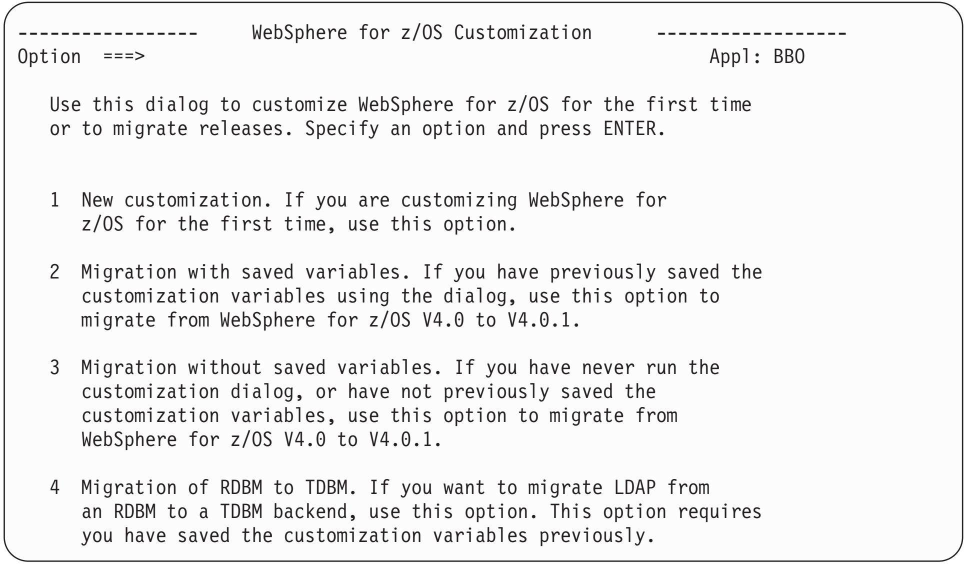
Result: You see the splash screen:



```
-----------------     WebSphere for z/OS Customization      ------------------
Option  ===>


     WebSphere Application Server V4.0.1 for z/OS and OS/390
     Licensed Material - Property of IBM

     5655-F31 (C) Copyright IBM Corp. 2001
     All Rights Reserved.
     U.S. Government users - RESTRICTED RIGHTS - Use, Duplication, or
     Disclosure restricted by GSA-ADP schedule contract with IBM Corp.

     Status  = H28W401

     Version = 4.01.004


                      Press ENTER to continue.
```

4. Press Enter.

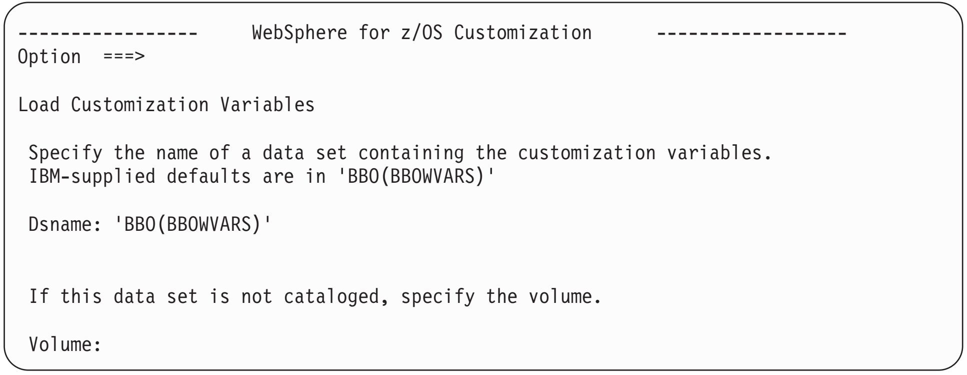
   Result: You see the following panel:



```
-----------------     WebSphere for z/OS Customization      ------------------
Option  ===>                                                     Appl: BBO

   Use this dialog to customize WebSphere for z/OS for the first time
   or to migrate releases. Specify an option and press ENTER.


   1  New customization. If you are customizing WebSphere for
      z/OS for the first time, use this option.

   2  Migration with saved variables. If you have previously saved the
      customization variables using the dialog, use this option to
      migrate from WebSphere for z/OS V4.0 to V4.0.1.

   3  Migration without saved variables. If you have never run the
      customization dialog, or have not previously saved the
      customization variables, use this option to migrate from
      WebSphere for z/OS V4.0 to V4.0.1.

   4  Migration of RDBM to TDBM. If you want to migrate LDAP from
      an RDBM to a TDBM backend, use this option. This option requires
      you have saved the customization variables previously.
```

5. If you used the customization dialog in V4.0 and saved your customization variables, choose option 2.

   Result: If this is the first time through the migration path in the dialog, you see the Load Customization Variables panel.



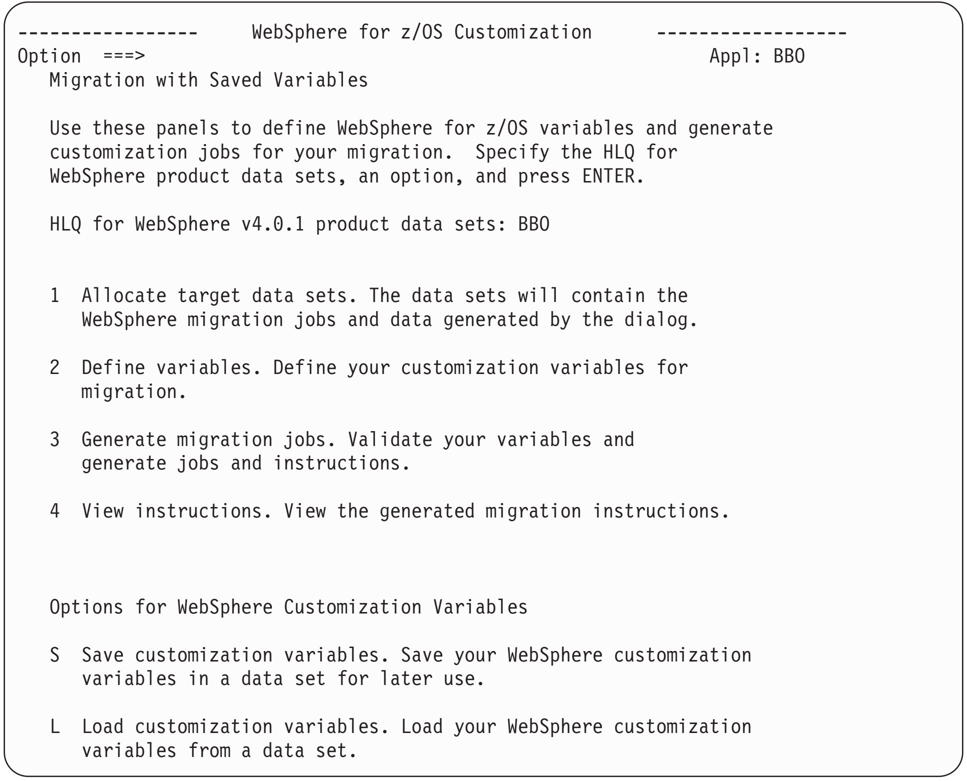
```
-----------------     WebSphere for z/OS Customization      ------------------
Option  ===>

Load Customization Variables

 Specify the name of a data set containing the customization variables.
 IBM-supplied defaults are in 'BBO(BBOWVARS)'

 Dsname: 'BBO(BBOWVARS)'


 If this data set is not cataloged, specify the volume.

 Volume:
```

Type the name of the sequential data set you created with the S option during a previous dialog session, then press Enter.

Tips:

- You may want to review the data set first to be sure the settings are correct.
- Before continuing with the migration, you may want to save the settings. Use the S option.

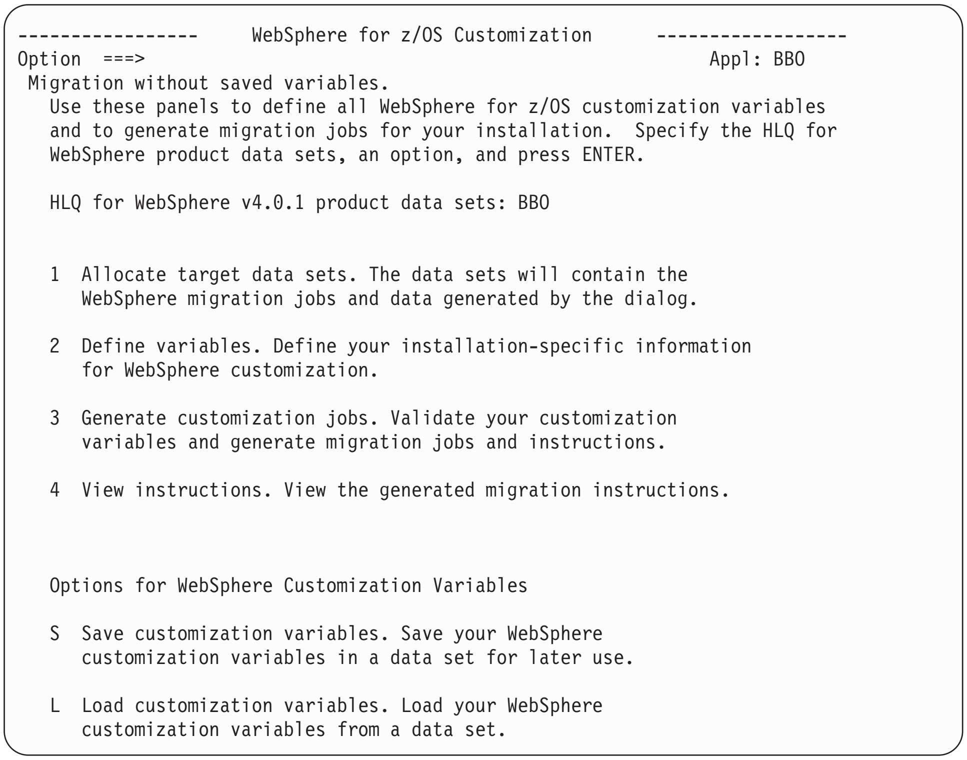
Result: You see the main dialog panel:



```
-----------------     WebSphere for z/OS Customization      ------------------
Option  ===>                                                    Appl: BBO
   Migration with Saved Variables

   Use these panels to define WebSphere for z/OS variables and generate
   customization jobs for your migration.  Specify the HLQ for
   WebSphere product data sets, an option, and press ENTER.

   HLQ for WebSphere v4.0.1 product data sets: BBO


   1  Allocate target data sets. The data sets will contain the
      WebSphere migration jobs and data generated by the dialog.

   2  Define variables. Define your customization variables for
      migration.

   3  Generate migration jobs. Validate your variables and
      generate jobs and instructions.

   4  View instructions. View the generated migration instructions.



   Options for WebSphere Customization Variables

   S  Save customization variables. Save your WebSphere customization
      variables in a data set for later use.

   L  Load customization variables. Load your WebSphere customization
      variables from a data set.
```

6. If you did not use the customization dialog in V4.0 or did not save your customization variables, choose option 3.

   Result: You see the main dialog panel:



```
-----------------     WebSphere for z/OS Customization      ------------------
Option  ===>                                                     Appl: BBO
 Migration without saved variables.
   Use these panels to define all WebSphere for z/OS customization variables
   and to generate migration jobs for your installation.  Specify the HLQ for
   WebSphere product data sets, an option, and press ENTER.

   HLQ for WebSphere v4.0.1 product data sets: BBO


   1  Allocate target data sets. The data sets will contain the
      WebSphere migration jobs and data generated by the dialog.

   2  Define variables. Define your installation-specific information
      for WebSphere customization.

   3  Generate customization jobs. Validate your customization
      variables and generate migration jobs and instructions.

   4  View instructions. View the generated migration instructions.



   Options for WebSphere Customization Variables

   S  Save customization variables. Save your WebSphere
      customization variables in a data set for later use.

   L  Load customization variables. Load your WebSphere
      customization variables from a data set.
```

7. Follow the customization dialog to allocate target data sets, define variables, generate the customization jobs, and view the migration instructions.

8. Use the migration instructions to complete your migration to WebSphere for z/OS V4.0.1.

   Note: For pre-migration planning, we provide a **sample** set of migration instructions in “Sample customized migration instructions” on page 375. Be sure to follow the instructions you generate for your system, since they will differ from the sample.

You are done when you complete the migration instructions.

Steps for performing a hot start with a system or sysplex-wide restart

Before you begin: You must be prepared to stop WebSphere for z/OS. If you have WebSphere for z/OS running in a sysplex as a host cluster, this procedure has you shut down the entire host cluster. If you have WebSphere for z/OS running in a sysplex as a host cluster and want to maintain service to your clients during the hot start, see “Steps for performing a rolling hot start” on page 318.

Perform the following steps to do the hot start.

1. Use SMP/E to install the new WebSphere for z/OS code. Be sure to install the new WebSphere for z/OS code into a separate set of MVS and HFS data sets.

2. Back up your current system. This includes:
   - The system management database

- The LDAP database tables containing the naming space and the interface repository
- Files in the HFS containing WebSphere for z/OS run-time information (usually mounted at `/WebSphere390/CB390`).
- WebSphere for z/OS PROCLIBs
- WebSphere for z/OS LOADLIBs

For more information, see "Guidelines for backup of the WebSphere for z/OS system" on page 183.

3. On either the monoplex or each system in the sysplex, do the following:
   a. Stop the application servers and the WebSphere for z/OS Daemon.
   b. Switch to the newly-serviced WebSphere for z/OS product data sets. You can do this by
      - Renaming the new data sets to replace the old ones
      - Re-cataloging product data sets, if the names are identical, or
      - Changing WebSphere for z/OS cataloged procedures to refer explicitly to the new data sets.

      Make sure the MVS link list and APF list refer to the newly-serviced data sets.
   c. If the WebSphere for z/OS run time is loaded into the link pack area, delete the old modules and load the new ones, or IPL the system to load the new modules into the LPA.
   d. Verify that the newly-serviced HFS data sets are correctly mounted.
   e. Perform any other migration actions (such as DB2 binds) as instructed in PTF or APAR cover letters.
   f. Start the Daemon and application servers.

You are done when WebSphere for z/OS and all your application servers are running.

Steps for performing a rolling hot start

Before you begin: Read "Recommendation for the HFS structure" on page 195 to understand the HFS structure you need.

Perform the following steps to do a hot start:

1. Use SMP/E to install the new WebSphere for z/OS code. Be sure to install the new WebSphere for z/OS code into a separate set of MVS and HFS data sets.

   Example: Install a service level (PTF15) and copy the code to OMVS.PTF15.WEB.HFS.

2. Mount the new data set and the appropriate Java and JDBC data sets at the alternate mount point.

   Example:

```
mount omvs.ptf15.web.hfs  at /VersionB/usr/lpp/WebSphere
mount omvs.ptf15.java.hfs at /VersionB/usr/lpp/java/IBM
mount omvs.ptf15.jdbc.hfs at /VersionB/usr/lpp/db2
```

3. Select a clustered host instance to begin the hot start process. On that clustered host instance:
   a. Stop the application servers and the WebSphere for z/OS Daemon.
   b. Switch to the newly-serviced WebSphere for z/OS product data sets. You can do this by
      - Renaming the new data sets to replace the old ones
      - Re-cataloging product data sets, if the names are identical, or
      - Changing WebSphere for z/OS cataloged procedures to refer explicitly to the new data sets.

      Make sure the MVS link list and APF list refer to the newly-serviced data sets.
   c. If the WebSphere for z/OS run time is loaded into the link pack area, delete the old modules and load the new ones, or IPL the system to load the new modules into the LPA.
   d. Switch the HFS that your system references with the SETOMVS command. Use the command to change the $VERSION symbolic.

      Example: Previously, the $VERSION symbolic was VersionA for all systems in the sysplex. Through the use of a built-in symbolic link, references to /usr resolved to VersionA/usr. To switch the HFS that this system references to, say, VersionB, issue:

      ```
      setomvs version=VersionB
      ```
   e. Perform any other migration actions (such as DB2 binds) as instructed in PTF or APAR cover letters.
   f. Start the Daemon and application servers.

4. Repeat step 3 for each remaining clustered host instance, one at a time.

You are done when you have completed the hot start on each system in the sysplex.

Appendix A. Environment files

This appendix provides reference information for environment files and environment variables.

Environment files and environment variables

This section describes:

- How WebSphere for z/OS manages environment variables and environment files.
- How run-time server start procedures point to their environment files.
- Environment variables for z/OS or OS/390 clients.
- The syntax and meaning of the run-time environment variables.

How WebSphere for z/OS manages server environment variables and environment files

After the bootstrap process during installation and customization, WebSphere for z/OS manages environment data through the Administration application and writes the environmental data into the system management database. To add or change environment variable data, you must enter environment data pairs (an environment variable name and its value) on the sysplex, server, or server instance properties form. When you activate a conversation or prepare for a cold start, the environment variable data is written to HFS files. WebSphere for z/OS determines which values are the most specific for an environment file. For instance, a setting for a server instance takes precedence over the setting for the same variable for its server, and a setting for a server takes precedence over the setting for the same variable for its sysplex.

If you modify an environment file directly and not through the Administration application, any changes are overwritten when you activate a conversation or prepare for a cold start.

When you activate a conversation or prepare for a cold start, WebSphere for z/OS writes the environment data to an HFS file for each server instance. The path and name for each environment file is:

```
CBCONFIG/controlinfo/envfile/SYSPLEX/SRVNAME/current.env
```

where

CBCONFIG

Is a read/write directory that you specify at installation time as the directory into which WebSphere for z/OS is to write configuration data and environment files. At installation time, we call this directory TARGETDIR. The default is `/WebSphere390/CB390`.

Rule: The System Management group (default CBCFG1) and user ID (default CBSYMSR1) must own each directory and subdirectory in CBCONFIG. If the System Management group and user ID do not own CBCONFIG, use the chown command to make them the owner of each directory and subdirectory in CBCONFIG. Thus, if you use the default CBCONFIG, you must use the chown command to give the System Management group and user ID ownership of /WebSphere390 and /WebSphere390/CB390.

Example:

```
chown -R CBSYMSR1:CBCFG1 /WebSphere390
```

SYSPLEX
Is the name of your sysplex. WebSphere for z/OS derives this name from the predefined &SYSPLEX JCL variable.

SRVNAME
Is the server instance name.

Except for the initial installation of WebSphere for z/OS, you must manage the environment variables through the Administration application. At initial installation, the customization dialog modifies an initial environment file, which the bootstrap job uses.

There are, therefore, two distinct situations in which you define environmental data for your servers. Matching those situations are two distinct ways you create the environment data:

1. Prior to the bootstrap process, the customization dialog creates the environment file for you. The bootstrap job reads the file and places the environmental data into the system management database.
2. Defining and managing environmental data through the Administration application. In this situation, you enter environment data pairs (an environment name and its value—no "=") through a panel in the Administration application.

How run-time server start procedures point to their environment files

WebSphere for z/OS run-time server start procedures must point to an environment file for configuration information. The start procedures use a BBOENV DD statement with a PATH parameter that points to an HFS file. The BBOENV DD statement is:

```
//BBOENV    DD   PATH='&CBCONFIG/&RELPATH/&SYSPLEX/&SRVNAME/current.env'
```

where

&CBCONFIG
Is a variable you set in the start procedure. It must match the read/write directory that you specify at installation time as the directory into which WebSphere for z/OS is to write configuration data and environment files. The default is `WebSphere390/CB390`.

&RELPATH
Is a subdirectory (`controlinfo/envfile`). Its value must not change.

&SYSPLEX
Is the name of your sysplex. Because it is a predefined JCL variable, you do not need to set it in your start procedure.

&SRVNAME
Is the server instance name. By specifying the server instance name when you start the procedure, you can use the same start procedure for other server instances.

Example: To pass the server instance name BBOASR1A to its start procedure, specify:

```
s bboasr1.bboasr1a,srvname='BBOASR1A'
```

To use the same start procedure for server instance BBOASR1B, specify:

```
s bboasr1.bboasr1b,srvname='BBOASR1B'
```

Environment variables for z/OS or OS/390 clients

The Administration application does not manage environment variables for z/OS or OS/390 clients. You must create and manage z/OS or OS/390 client environment files and point to them from client programs. Table 49 on page 325 tells you which environment variables are required or optional for z/OS or OS/390 clients.

Note on using substitution variables

You cannot use variable substitution ($ variables) in environment statements. The variable substitution that is used in UNIX shell environments is not implemented in the Language Environment (LE). Because WebSphere for z/OS processes environment variables in the Language Environment, use of variables such as $PATH in a path environment variable will fail.

Example:

UNIX shell environments often set up paths by appending the new path to the existing path, like this:

```
PATH=yourdir
PATH=$PATH/mydir
```

The resulting path is PATH=yourdir/mydir after substitution for the $PATH variable. However, because WebSphere for z/OS processes the environment variables in the Language Environment, where no variable assignment is made, the resulting path would be PATH=$PATH/mydir.

Environment variable syntax

You must follow this syntax only when defining your initial environment file before the bootstrap process.

Rules: The following are the syntax rules:

- The syntax of the environment variables follows this pattern:

  ```
  VARIABLE=VALUE
  ```

  Where:

  VARIABLE
  is the environment variable.

  VALUE
  is the setting for the variable. The descriptions define possible values for each variable.
- Leading and trailing white space (blanks or tabs) for both variables and values is ignored.

  Example: The two following lines yield the same result:

  ```
  VARIABLE1=VALUE1
  ```

  and

  ```
        VARIABLE1      =      VALUE1
  ```
- "=" is required.
- Blank lines are ignored.
- Code upper and lowercase characters as documented in this topic.

- To comment out an environment variable, simply add a character, such as '#', to the variable. For example, you could change `TRACEALL=0` to `#TRACEALL=0`. The system ignores such coding because the variable does not begin with an alphabetic character.
- Language Environment limits the size of environment variables to 2K.

Environment variable use

Not all environment variables need to be used for each server or client. Table 49 on page 325 tells you where to use a given environment variable. Here are the meanings for what appears in each column:

- "R" means required.
- "O" means optional.
- "F" means required in a future release.
- A blank in the Default column means the variable is not set.
- A blank in other columns means the variable is not used.

Footnotes appear at the end of the table.

Note: The default settings and examples use the standard _CEE_ENVFILE syntax. You do not use this syntax when defining environmental data in the Administration application.

Table 49. Where to use environment variables

Environment variable=<default>	Daemon server instance	System Management server instance	Naming server instance	Interface Repository instance	Business application server instance	z/OS or OS/390 client
APP_EXT_DIR= *CBCONFIG*/apps/*SRVNAME*/app					R[19]	
BBOC_HTTP_BACKLOG=10	O	O	O	O	O	
BBOC_HTTPS_BACKLOG=10	O	O	O	O	O	
BBOC_HTTP_IDENTITY=					R[1]	
BBOC_HTTP_INPUT_TIMEOUT=10					R[1]	
BBOC_HTTP_LISTEN_IP_ADDRESS=					R[1]	
BBOC_HTTP_MAX_PERSIST_REQUESTS=50					O	
BBOC_HTTP_MODE=					O	
BBOC_HTTP_OUTPUT_TIMEOUT=120					R[1]	
BBOC_HTTP_OUTPUT_TIMEOUT_RECOVERY=[SERVANT]		O	O	O	O	
BBOC_HTTP_SSL_OUTPUT_TIMEOUT_RECOVERY=[SERVANT]		O	O	O	O	
BBOC_HTTP_PERSISTENT_SESSION_TIMEOUT=30					R[1]	
BBOC_HTTP_PORT=					R[1]	
BBOC_HTTP_SSL_CBIND =					O	
BBOC_HTTP_SSL_IDENTITY=					R[2]	
BBOC_HTTP_SSL_INPUT_TIMEOUT=10					O	
BBOC_HTTP_SSL_LISTEN_IP_ADDRESS=					R[1]	
BBOC_HTTP_SSL_MAX_PERSIST_REQUESTS=50					O	
BBOC_HTTP_SSL_MODE=					O	
BBOC_HTTP_SSL_OUTPUT_TIMEOUT=120					O	
BBOC_HTTP_SSL_PERSISTENT_SESSION_TIMEOUT=30					O	
BBOC_HTTP_SSL_PORT=					R[2]	
BBOC_HTTP_SSL_TRANSACTION_CLASS=					R[2]	
BBOC_HTTP_SSL_V3CIPHERS=					O	
BBOC_HTTP_TRANSACTION_CLASS=					R[1]	
BBOC_HTTPALL_NETWORK_QOS=					O[4]	

Table 49. Where to use environment variables (continued)

Environment variable=<default>	Daemon server instance	System Management server instance	Naming server instance	Interface Repository instance	Business application server instance	z/OS or OS/390 client
BBOC_HTTPALL_TCLASS_FILE =					O	
BBOC_IIOP_BACKLOG=10	O	O	O	O	O	
BBOC_IIOPSSL_BACKLOG=10	O	O	O	O	O	
BBOC_LOG_RESPONSE_FAILURE=NO	O	O	O	O	O	
BBOC_LOG_RETURN_EXCEPTION=NO	O	O	O	O	O	
BBOC_PROPAGATE_UNKNOWN_SERVICE_CONTEXTS=0	O	O	O	O	O	O
BBODUMP=3	O	O	O	O	O	
BBODUMP_CEE3DMP_OPTIONS=	O	O	O	O	O	
BBOLANG=ENUS	O	O	O	O	O	O
BBOO_ACCEPT_HTTP_WORK_AFTER_MIN_SRS=0					O	
BBOO_WORKLOAD_PROFILE=*value*		O			O	
BEAN_DELETE_SLEEP_TIME=4200		R[5]			O[21]	
CBCONFIG=/WebSphere390/CB390	R	R	R	R	R	
CLASSPATH=		O	O	O	O[6]	
CLIENT_DCE_QOP=NO_PROTECTION						O
CLIENT_HOSTNAME=						O
CLIENTLOGSTREAMNAME=						O
CLIENT_RESOLVE_IPNAME=<value for RESOLVE_ IPNAME>		O	O	O	O	O
CLIENT_TIMEOUT=						
CLONEID=					O	
com.ibm.ws.naming.ldap.containerdn= <ibm-wsnTree=t1,o=<org>, c=<country>>			O			
com.ibm.ws.naming.ldap.domainname= *domain name*			O			
com.ibm.ws.naming.ldap.masterurl= ldap://<ip name>:<port>			O			
com.ibm.ws390.server.classloadermode=2					O	
CONFIGURED_SYSTEM=	R[7]	R[7]	R[7]	R[7]	R[7]	

Table 49. Where to use environment variables *(continued)*

Environment variable=<default>	Daemon server instance	System Management server instance	Naming server instance	Interface Repository instance	Business application server instance	z/OS or OS/390 client
DAEMON_IPNAME=	R	O				
DAEMON_PORT=5555	O[8]	O[8]				
DATASHARING=1	O	O	O	O		
DEFAULT_CLIENT_XML_PATH=						O[9]
DEFAULT_UNAUTH_CLIENT_ID=CBGUEST		O				
DM_GENERIC_SERVER_NAME=CBDAEMON	O[8]	O[8]				
DM_SPECIFIC_SERVER_NAME=DAEMON01	O[10]	O[10]	O[10]	O[10]	O[10]	
ENABLE_TRUSTED_APPLICATIONS=0						R[3]
HOME=						O
IBM_JVM_ST_VERBOSEGC_LOG=		O			O	
IBM_OMGSSL=0					O	
ICU_DATA=/usr/lpp/WebSphere/bin/		R				
IIOP_SERVER_SESSION_KEEPALIVE=*n*	O	O			O[20]	
IR_GENERIC_SERVER_NAME=CBINTFRP		O				
IR_SPECIFIC_SERVER_NAME=INTFRP01	O[10]	O[10]	O[10]	O[10]	O[10]	
IRPROC=BBOIR	O	O				
IVB_DEBUG_ENABLED=					O[11]	O[11]
IVB_DRIVER_PATH= /usr/lpp/WebSphere		R				
IVB_TRACE_HOST=						O[11]
IVB_TRACE_PORT=2102						O[11]
java.naming.security.credentials=<password>		O				
java.naming.security.principal=<userid>		O				
JAVA_COMPILER=					O	O
JAVA_IEEE754=						O[12]
JVM_BOOTCLASSPATH=		O			O	
JVM_BOOTLIBRARYPATH=		O			O	

Table 49. Where to use environment variables (continued)

Environment variable=<default>	Daemon server instance	System Management server instance	Naming server instance	Interface Repository instance	Business application server instance	z/OS or OS/390 client
JVM_DEBUG=		O			O	
JVM_DEBUG_PORT=					O	O[11]
JVM_ENABLE_CLASS_GC=		O			O	
JVM_ENABLE_VERBOSE_GC=		O			O	
JVM_EXTRA_OPTIONS=					O	
JVM_HEAPSIZE=256					O	
JVM_LOCALREFS=		O			O	
JVM_LOGFILE=					O	O
JVM_MINHEAPSIZE=		O			O	
LDAPBINDPW=		F	R[13]			
LDAPCONF=		F	R[13]			
LDAPHOSTNAME=		F	R[13]			
LDAPIRBINDPW=		F		R[14]		
LDAPIRCONF=		F		R[14]		
LDAPIRHOSTNAME=		F		R[14]		
LDAPIRNAME=		F		R[14]		
LDAPIRROOT=		F		R		
LDAPNAME=		F	R[13]			
LDAPROOT=		F	R			
LIBPATH=		O	O	O	O[6]	
LOGSTREAMNAME=	O	O				
MAX_SRS=0					O	
MIN_SRS=[0 for MOFW, 1 for J2EE]					O	
NM_GENERIC_SERVER_NAME=CBNAMING		O				
NM_SPECIFIC_SERVER_NAME=NAMING01	O[10]	O[10]	O[10]	O[10]	O[10]	
NMPROC=BBONM	O	O				

Table 49. Where to use environment variables (continued)

Environment variable=<default>	Daemon server instance	System Management server instance	Naming server instance	Interface Repository instance	Business application server instance	z/OS or OS/390 client
OTS_DEFAULT_TIMEOUT=30	O	O	O	O	O	
OTS_MAXIMUM_TIMEOUT=60	O	O	O	O	O	
PATH=					O	O
RAS_MINORCODEDEFAULT= NODIAGNOSTICDATA						
RECOVERY_TIMEOUT=15		O	O	O	O	
RECYCLE_J2EE_SERVERS=Y		O	O	O	O	
REM_DCEPASSWORD=						O
REM_DCEPRINCIPAL=						O
REM_PASSWORD=		O[15]	O[15]	O[15]	O[15]	O
REM_USERID=		O[15]	O[15]	O[15]	O[15]	O
RESOLVE_IPNAME=		O[16]	O[17]	O[17]	O[17]	R[18]
RESOLVE_PORT=900		O	O	O	O	O
SESSION_COOKIE_NAME=					O	
SM_DEFAULT_ADMIN= CBADMIN		O				
SM_GENERIC_SERVER_NAME=CBSYSMGT		O				
SM_SPECIFIC_SERVER_NAME=SYSMGT01	O[10]	O[10]	O[10]	O[10]	O[10]	
SMPROC=BBOSMS	O	O				
SOMOOSQL=					O	
SRVIPADDR=	O	O	O	O	O	
SSL_HANDSHAKE_THREAD_COUNT=3		O	O	O	O	
SSL_KEYRING=						O
SSL_SERVER_V3CIPHERS=	R	O	O	O	O	
SYS_DB2_SUB_SYSTEM_NAME=DB2	R	R	R	R	R	
TRACEALL=1	O	O	O	O	O	O
TRACEBASIC=	O	O	O	O	O	O
TRACEBUFFCOUNT=4	O	O	O	O	O	

Table 49. Where to use environment variables (continued)

Environment variable=<default>	Daemon server instance	System Management server instance	Naming server instance	Interface Repository instance	Business application server instance	z/OS or OS/390 client
TRACEBUFFLOC=(Server: BUFFER, Client: SYSPRINT)	O	O	O	O	O	O
TRACEBUFFSIZE=1M	O	O	O	O	O	
TRACEDETAIL=	O	O	O	O	O	O
TRACEMINORCODE=						
TRACEPARM=00	O					
TRACESPECIFIC=	O	O	O	O	O	O
WAS_JAVA_OPTIONS=	O	O	O	O	O	
WS_EXT_DIRS=					O	

Table 49. Where to use environment variables (continued)

Environment variable=<default>	Daemon server instance	System Management server instance	Naming server instance	Interface Repository instance	Business application server instance	z/OS or OS/390 client

Notes:

1. Required if using the HTTP Transport Handler to handle HTTP protocol requests to the J2EE server.
2. Required if using the HTTPS Transport Handler to handle HTTPS requests to the J2EE server.
3. Required if using single sign-on capability, Form Based authentication, or a trust association interceptor.
4. Must be running on z/OS Version 1 Release 2 or higher for this environment variable to have any affect. It will be ignored for z/OS Release 1 or OS/390 releases.
5. Required when stateful session beans in J2EE servers are activated based on a transaction, rather than activated only once.
6. Required for server regions that use Java, including the IMS PAA and CICS PAA.
7. This environment variable is automatically added to each server instance's environment file and should not be edited.
8. If you specify a value for the Daemon Server, you must provide the same value for the System Management Server control region.
9. Required when the client uses the System Management Scripting API.
10. You must specify this for the second and subsequent systems in a sysplex.
11. Required only when you are using the IBM Object Level Trace and Distributed Debugger Tools to trace and/or debug client and server application components.
12. Required for Java clients that run on z/OS or OS/390.
13. LDAPCONF is mutually exclusive with LDAPBINDPW, LDAPHOSTNAME, and LDAPNAME. Either LDAPCONF is required, or LDAPBINDPW, LDAPHOSTNAME, and LDAPNAME are required.
14. LDAPIRCONF is mutually exclusive with LDAPIRBINDPW, LDAPIRHOSTNAME, and LDAPIRNAME. Either LDAPIRCONF is required, or LDAPIRBINDPW, LDAPIRHOSTNAME, and LDAPIRNAME are required.
15. Used when a server becomes a remote client of another server.
16. For the control region, the default is the value of DAEMON_IPNAME during bootstrap.
17. For the server region, the default is the local system IP name. Generally, do not code.
18. Optional if a Daemon Server is on the same system as the client, in which case the default is the local system IP name.
19. Required if common JAR files and directories are going to be accessed by multiple applications running in the same J2EE server instance.
20. Control region only.
21. If you have an application that uses large numbers of ″activate once″ stateful session beans, taking the default for BEAN_DELETE_SLEEP_TIME could cause Java out of memory errors.

Environment variable descriptions

APP_EXT_DIR=*path*

Specifies a directory that can be accessed by multiple applications running in the same J2EE server instance. Classes in JAR or zip files in this directory are loaded into the WebSphere for z/OS run-time by the Application Extension class loader.

Note: See the related information about WebSphere for z/OS class loaders and application modules in *WebSphere Application Server V4.0.1 for z/OS and OS/390: Assembling J2EE Applications*, SA22-7836.

Default:

```
CBCONFIG/apps/SRVNAME/app
```

where

CBCONFIG

Is a read/write directory that you specify at installation time as the directory into which WebSphere for z/OS is to write configuration data and environment files. The default is `/WebSphere390/CB390`.

SRVNAME

Is the generic server name.

Example: `APP_EXT_DIR=/tmp/ws_com_apps`

BBOC_HTTP_BACKLOG=*n*

An integer value that indicates the maximum queue length for pending connections that use HTTP. You may set the maximum value up to 2147483647, but the specification of the SOMAXCONN statement in the TCP/IP profile may result in limitations to this. The default is 10.

Example:

```
BBOC_HTTP_BACKLOG=25
```

BBOC_HTTPS_BACKLOG=*n*

An integer value that indicates the maximum queue length for pending connections that use HTTPS. You may set the maximum value up to 2147483647, but the specification of the SOMAXCONN statement in the TCP/IP profile may result in limitations to this. The default is 10.

Example:

```
BBOC_HTTPS_BACKLOG=25
```

BBOC_HTTP_IDENTITY=*USER_ID*

Specifies a valid SAF user ID which will be used as the current security principal for this HTTP request. The user ID will be treated as an authenticated user by the Web container. If this variable is not specified, the request will be executed under the server region's identity.

Example:

```
BBOC_HTTP_IDENTITY=SECUR001
```

BBOC_HTTP_INPUT_TIMEOUT=*n*

Sets a time, in seconds, that the J2EE server will wait for the complete HTTP request to arrive after the connection has been established before cancelling the connection. The default value is 10 seconds. Specifying a value of zero disables the time-out function.

Example:

```
BBOC_HTTP_INPUT_TIMEOUT=10
```

BBOC_HTTP_LISTEN_IP_ADDRESS=*IP_ADDRESS*

Specifies the IP address, in dotted decimal format, that WebSphere for z/OS J2EE servers use to listen for HTTP client connection requests. This environment variable is used to specify a specific IP address over which the J2EE server is to receive requests. It causes the server to bind to this specific a specific IP address rather than to the default, which is to bind to all addresses (inaddrany). Normally, the server will listen on all IP addresses configured to the local TCP/IP stack. However, if you want to fence the work or allow multiple heterogeneous servers to listen on the same port, you can use BBOC_HTTP_LISTEN_IP_ADDRESS. The specified IP address becomes the only IP address over which this control region receives inbound HTTP requests.

Example:

```
BBOC_HTTP_LISTEN_IP_ADDRESS=9.117.43.16
```

BBOC_HTTP_MAX_PERSIST_REQUESTS=*n*

An integer value indicating the maximum number of HTTP requests that will be processed over a single connection from an HTTP client. When the maximum number of requests have been processed, the client connection will be closed. Set this value to 0 or 1 to turn off persistent connection processing. The default value is 50.

Example:

```
BBOC_HTTP_MAX_PERSIST_REQUESTS=50
```

Note: This environment variable is a replacement for environment variable BBOC_HTTP_SESSION_GC. Once you add the BBOC_HTTP_MAX_PERSIST_REQUESTS environment variable to your current.env file, any value specified for the BBOC_HTTP_SESSION_GC environment variable will be ignored. Therefore, if you have already added environment variable BBOC_HTTP_SESSION_GC to your current.env file, you should delete it.

BBOC_HTTP_MODE=INTERNAL

Indicates that Private Headers received from a WebSphere plug-in for Web servers, over the port specified on the `BBOC_HTTP_PORT` environment variable, are to be trusted. There is no default value for this property. If this property is not included in the current.env file, or if it has a value other than INTERNAL, all Private Headers received over this port will be ignored.

Example:

```
BBOC_HTTP_MODE=INTERNAL
```

BBOC_HTTP_OUTPUT_TIMEOUT=*n*

The time, in seconds, that the J2EE server will wait for the response from the application once the HTTP request has been completed. If the response is not received within the specified length of time, the server region will fail with ABENDEC3 and RC=04130001. The default value is 120 seconds.

Example:

```
BBOC_HTTP_OUTPUT_TIMEOUT=120
```

BBOC_HTTP_OUTPUT_TIMEOUT_RECOVERY=[SESSION|SERVANT]

Controls the recovery action taken on timeouts for requests received over the HTTP transport.

Specifying ″SERVANT″ allows for the termination of server regions when timeouts occur. If an HTTP request is under dispatch in a server region when its timeout value is reached, the server region terminates with an ABENDEC3 RSN=04130001. The HTTP request and socket are then cleaned up.

A setting of ″SESSION″ only cleans up the HTTP request and socket. No attempt is made to disrupt the execution of a dispatched HTTP request within a server region. Be careful using this setting as it may lead to a loss of resources if the dispatched HTTP request loops or hangs.

The default value is ″SERVANT.″

Example:

```
BBOC_HTTP_OUTPUT_TIMEOUT_RECOVERY=SERVANT
```

BBOC_HTTP_SSL_OUTPUT_TIMEOUT_RECOVERY=[SESSION|SERVANT]
Controls the recovery action taken on timeouts for requests received over the HTTP SSL transport.

Specifying ″SERVANT″ allows for the termination of server regions when timeouts occur. If an HTTP SSL request is under dispatch in a server region when its timeout value is reached, the server region terminates with an ABENDEC3 RSN=04130001. The HTTP SSL request and socket are then cleaned up.

A setting of ″SESSION″ only cleans up the HTTP SSL request and socket. No attempt is made to disrupt the execution of a dispatched HTTP SSL request within a server region. Be careful using this setting as it may lead to a loss of resources if the dispatched HTTP SSL request loops or hangs.

The default value is ″SERVANT.″

Example:

```
BBOC_HTTP_SSL_OUTPUT_TIMEOUT_RECOVERY=SESSION
```

BBOC_HTTP_PERSISTENT_SESSION_TIMEOUT=*n*
Specifies the time, in seconds, that the J2EE server will wait for a subsequent request from an HTTP client on a persistent connection. If another request is not received from the same client within this time limit, the connection is closed. The default value is 30 seconds.

Example:

```
BBOC_PERSISTENT_SESSION_TIMEOUT=30
```

BBOC_HTTP_PORT=*n*
Specifies the port at which the J2EE server listens for HTTP requests. Any requests received over the HTTP port will be directed to the Web container for processing.

If this variable is not specified, the J2EE server will not listen for HTTP requests directly.

The use of this HTTP port does not preclude the use of the WebSphere for z/OS plug-in with this J2EE server instance. The Web container is capable of simultaneously processing requests received directly through the HTTP port as well as from the WebSphere for z/OS plug-in.

Note: Currently, HTTP requests received over this HTTP port are not able to be authenticated using the mechanisms described in the J2EE Specification.

Example:

```
BBOC_HTTP_PORT=8080
```

BBOC_HTTP_SSL_CBIND=ON|OFF

If this environment variable is set to ON, all SSL connections from a browser must have a client certificate, and the user ID associated with that client certificate must have RACF CONTROL authority for CB.BIND.servername. If these conditions are not met, the connection will be closed. Issue the following RACF command to give the user ID associated with that client certificate RACF CONTROL authority:

```
PERMIT CB.BIND.servername CLASS(CBIND) ID(clientCertUserid) ACCESS(CONTROL)
```

Example:

```
BBOC_HTTP_SSL_CBIND=OFF
```

BBOC_HTTP_SSL_IDENTITY=*USER_ID*

Specifies a valid SAF user ID which will be used as the current security principal for this HTTPS request. The user ID specified on this variable will be used as the default user ID for the current security principal if no other mechanism is available for establishing client identity (such as a client supplied user ID and password).

The user ID will be treated as an authenticated user by the Web container. If this variable is not specified, the remote identity specified when the J2EE server was configured will be used as the current security principal. (See *WebSphere Application Server 4.0.1 for z/OS and OS/390: System Management User Interface* for more information about specifying the Remote Identity.)

Example:

```
BBOC_HTTP_SSL_IDENTITY=CBGUEST
```

BBOC_HTTP_SSL_INPUT_TIMEOUT=*n*

The time in seconds that the J2EE server will allow for the complete HTTPS request to be received before cancelling the connection. The default value is 10 seconds.

Example:

```
BBOC_HTTP_SSL_INPUT_TIMEOUT=10
```

BBOC_HTTP_SSL_LISTEN_IP_ADDRESS=*IP_ADDRESS*

Specifies the IP address, in dotted decimal format, that WebSphere for z/OS J2EE servers use to listen for HTTPS client connection requests. This IP address is used by the server to bind to TCP/IP. Normally, the server will listen on all IP addresses configured to the local TCP/IP stack. However, if you want to fence the work or allow multiple heterogeneous servers to listen on the same port, you can use BBOC_HTTP_SSL_LISTEN_IP_ADDRESS. The specified IP address becomes the only IP address over which this control region receives inbound HTTPS requests.

Example:

```
BBOC_HTTP_SSL_LISTEN_IP_ADDRESS=9.117.43.16
```

BBOC_HTTP_SSL_MAX_PERSIST_REQUESTS=*n*

An integer value indicating the maximum number of HTTPS requests that will be processed over a single connection from an HTTPS client. When the maximum number of requests have been processed, the client connection will be closed. Set this value to 0 or 1 to turn off persistent connection processing. The default value is 50.

Example:

```
BBOC_HTTP_SSL_MAX_PERSIST_REQUESTS=50
```

BBOC_HTTP_SSL_MODE=INTERNAL

Indicates the Private Headers received from a WebSphere plug-in for Web servers, over the port specified on the `BBOC_HTTP_SSL_PORT` environment variable, are to be trusted. There is no default value for this property. If this property is not included in the current.env file or if it has a value other than INTERNAL, all Private Headers received over this port will be ignored.

Example:

```
BBOC_HTTP_SSL_MODE=INTERNAL
```

BBOC_HTTP_SSL_OUTPUT_TIMEOUT=*n*

The time, in seconds, that the J2EE server will wait for the response from the application once the HTTPS request has been completed. If the response is not received within the specified length of time, the server region will fail with ABENDEC3 and RC=04130001. The default value is 120 seconds.

Example:

```
BBOC_HTTP_SSL_OUTPUT_TIMEOUT=120
```

BBOC_HTTP_SSL_PERSISTENT_SESSION_TIMEOUT=*n*

Specifies the time, in seconds, that the J2EE server will wait between requests issued over a persistent connection from an HTTPS client. After the server sends a response, it uses the persistent timeout to determine how long it should wait for a subsequent request before cancelling the persistent connection. The default value is 30 seconds.

Example:

```
BBOC_HTTP_SSL_PERSISTENT_SESSION_TIMEOUT=30
```

BBOC_HTTP_SSL_PORT=*n*

Specifies the port at which the J2EE server listens for HTTPS requests. Any requests received over the HTTPS port will be directed to the Web container for processing.

If this variable is not specified, the J2EE server will not listen for HTTPS requests directly.

The use of this HTTPS port does not preclude the use of an IBM HTTP Server for z/OS with this J2EE server instance. The Web container is capable of simultaneously processing requests received directly through the HTTPS port as well as from an IBM HTTP Server for z/OS.

Example:

```
BBOC_HTTP_SSL_PORT=8080
```

BBOC_HTTP_SSL_TRANSACTION_CLASS=*TRANSACTION_CLASS*

A valid WLM transaction class, which will be used in the creation of the WLM enclave for all HTTPS requests. If a valid WLM transaction class is not specified, no transaction class will be set for the enclave.

Example:

```
BBOC_HTTP_SSL_TRANSACTION_CLASS=TCLASSA
```

BBOC_HTTP_SSL_V3CIPHERS=*string*

Defines the SSL Version 3 cipher suites that system SSL uses in the SSL handshake for an HTTP SSL connection. It overrides any server-wide setting set via the Administration Application or SSL_SERVER_V3CIPHERS. Specify a string as documented in ″z/OS System Secure Sockets Layer Programming″ (SC24-5901). Each cipher is represented by two characters (for example, ″09″ instead of ″9″). You can specify the string with or without comma delineation.

If you delineate with commas, a validity check will run against the installed ciphers. The default is an empty string, meaning no change is made to the cipher suites.

Examples:

```
BBOC_HTTP_SSL_V3CIPHERS=09,0A,05
BBOC_HTTP_SSL_V3CIPHERS=090A05
```

BBOC_HTTP_TRANSACTION_CLASS=*TRANSACTION_CLASS*

A valid WLM transaction class, which will be used in the creation of the WLM enclave for all HTTP requests. If a valid WLM transaction class is not specified, no transaction class will be set for the enclave.

Example:

```
BBOC_HTTP_TRANSACTION_CLASS=TCLASSA
```

BBOC_HTTPALL_NETWORK_QOS=HOST|URI|HOSTURI|TCLASS

Specifies the parameters that will be used to classify outbound data that is delivered in response to HTTP and HTTPS requests. The classification parameters and values can be used to construct a network Quality of Service (QOS) policy. This environment variable is only effective if you are running WebSphere for z/OS on z/OS Version 1 Release 2 or higher. It will be ignored for lower releases.

For more information about setting a QOS policy, see the *z/OS Communications Server IP Configuration Guide* at URL:

```
http://www.ibm.com/servers/eserver/zseries/zos/bkserv/
```

If valid values are not provided for this environment variable or if this environment variable is not specified, the response data will not be classified to the network agent. The following parameters can be specified for this environment variable:

HOST

If this parameter is specified, WebSphere for z/OS will classify the outbound response data using the value that was provided in the host header of the request. This value will typically be the domain name by which this response will be exposed to Web clients in a DNS. The port number will be included.

Example:

```
www.mycompany.com
```

URI

If this parameter is specified, WebSphere for z/OS will use the value of the URI in the request line of the request to classify the outbound response data. Any query string will be truncated.

Example:

```
/mywebap/myservlet
```

HOSTURI

If this parameter is specified, WebSphere for z/OS will classify the outbound response data using the values specified for the HOST and URI parameters concatenated together.

Example:

```
www.mycompany.com/mywebap/myservlet
```

TCLASS

If this parameter is specified, WebSphere for z/OS will use the resultant transaction class value that was used to classify the inbound request to the

Z/OS Workload Manager. See *z/OS V1R3.0 MVS Workload Management Services*, SA22-7619, for information on specifying a transaction class value.

Note: This environment variable is ignored if you are running WebSphere for z/OS on an OS/390 Release 8 system.

BBOC_HTTPALL_TCLASS_FILE =<filename>
Specifies the fully qualified name of the file containing the rules for classifying an HTTP or HTTPS request.

Example:

```
/mydir/tclass.conf
```

In this example, the content of the file tclass.conf will be used to map requests to a transaction class.
If multiple entries match the request, the first successful match is used. If there are not matching entries, the value specified for the `BBOC_HTTP_TRANSACTION_CLASS` environment variable will be used for a non-SSL request, and the value specified for the `BBOC_HTTP_SSL_TRANSACTION_CLASS` environment variable will be used, for an SSL request. If no value was specified for either the `BBOC_HTTP_TRANSACTION_CLASS` or `BBOC_HTTP_SSL_TRANSACTION_CLASS` environment variable, the enclave will get created without a transaction class value.
Following is the syntax for entries in this file:

```
TransClassMap <host>:<port> <uritemplate> <tclass>
```

where:

<host>
Is the value compared against the hostname of the HOST: header of the request. This value can be a wildcard '*'.

Note: A value of '*' for the host:port value is acceptable and is equivalent to '*:*'.

<port>
Is the value compared against the port of the request. This value can be a wildcard '*'.

<uritemplate>
Is the value compared against the URI of the request. Any query string will not be used in the comparison. This value can be a wildcard '*', or end in a wildcard.

<tclass>
Is the Workload Manager Transaction Class name that will be used in the creation of the enclave.

Examples:

```
TransClassMap www.ibm.com:80 /webap1/myservlet TCLASS1
TransClassMap www.ibm.com:* /webap1/myservlet TCLASS2
TransClassMap *:443 * TCLASS3
TransClassMap *:* /webap1/myservlet TCLASS4
TransClassMap www.ibm.com:* /webap2/* TCLASS5
TransClassMap * /myservlet TCLASS6
TransClassMap * * TCLASS6
```

| **BBOC_IIOP_BACKLOG=*n***
| An integer value that indicates the maximum queue length for pending
| connections that use IIOP. You may set the maximum value up to 2147483647,

but the specification of the SOMAXCONN statement in the TCP/IP profile may result in limitations to this. The default is 10.

Example:

```
BBOC_IIOP_BACKLOG=25
```

BBOC_IIOPSSL_BACKLOG=*n*

An integer value that indicates the maximum queue length for pending connections that use IIOP SSL. You may set the maximum value up to 2147483647, but the specification of the SOMAXCONN statement in the TCP/IP profile may result in limitations to this. The default is 10.

Example:

```
BBOC_IIOPSSL_BACKLOG=25
```

BBOC_LOG_RESPONSE_FAILURE=[YES|NO]

Determines whether message BBOU0733W is issued to record a failure detected when attempting to send a response to a client. The message is sent to the error log. YES causes the message to be issued. The default is NO.

The message text will contain the request method name, the reply status, and routing information identifying the client.

Example:

```
BBOC_LOG_RESPONSE_FAILURE=YES
```

BBOC_LOG_RETURN_EXCEPTION=[YES|NO]

Determines whether message BBOU0734W is issued to record a response that contains an SystemException. The message is sent to the error log. YES causes the message to be issued. The default is NO.

The message text will contain the exception identifier and minor code, the request method name, and routing information identifying the client.

Example:

```
BBOC_LOG_RETURN_EXCEPTION=YES
```

BBOC_PROPAGATE_UNKNOWN_SERVICE_CONTEXTS=[0|1]

Activates or deactivates the support for unknown IIOP Service Contexts.

Unknown IIOP Service Contexts received on requests are propagated with the Request. If the dispatched Request invokes an outbound Request, the current set of unknown IIOP Service Contexts are propagated with the new outbound Request. Upon receipt of the response to the new outbound Request, any unknown IIOP Service Contexts received are propagated back to the outbound Request. Also, the set of unknown IIOP Service Contexts are merged back from the outbound Request into the dispatched Request. The response for the original inbound Request contains the current set of unknown IIOP Service Contexts.

The default is 0, which instructs the ORB to not propagate unknown IIOP Service Contexts.

Example:

```
BBOC_PROPAGATE_UNKNOWN_SERVICE_CONTEXTS=1
```

BBODUMP=*n*

Specifies the default dump used by the signal handler. Valid values and their meanings are:

0 No dump is generated.

1 A ctrace dump is taken.

2 A cdump dump is taken.

3 A csnap dump is taken.

4 A CEE3DMP dump is taken. CEE3DMP generates a dump of Language Environment and the member language libraries. Sections of the dump are selectively included, depending on dump options specified, either by default or through the BBODUMP_CEE3DMP_OPTIONS environment variable. By default, this value passes THREAD(ALL) BLOCKS to CEE3DMP. You can override the default options for CEE3DMP through the BBODUMP_CEE3DMP_OPTIONS environment variable.

For more information about CEE3DMP and its options, see *z/OS Language Environment Programming Reference*, SA22-7562.

If you do not specify BBODUMP, the default value is 3 (a csnap dump is taken).

Example:

```
BBODUMP=3
```

BBODUMP_CEE3DMP_OPTIONS=*options*

Specifies dump options to be used with a CEE3DMP. This environment variable is used when you specify BBODUMP=4. For an explanation of CEE3DMP and valid dump options, see *z/OS Language Environment Programming Reference*, SA22-7562.

Rule: The maximum length of the option string on this environment variable is 255. If the option string is longer than 255, you receive message BBOU0514W and the CEE3DMP dump options are set to THREAD(ALL) BLOCKS.

Example:

```
BBODUMP_CEE3DMP_OPTIONS=NOTRACEBACK NOFILES
```

BBOLANG=*LANGUAGE*

The name of the WebSphere for z/OS message catalog used. The default is ENUS.

BBOO_ACCEPT_HTTP_WORK_AFTER_MIN_SRS=[0|1]

A value of 1 indicates that the minimum number of Server Regions must be ready for work before HTTP work will be accepted into the Server. The minimum number of Server Regions is specified on the MIN_SRS environment variable. Once the minimum number of Server Regions are ready for work, the HTTP/S transport will start accepting work. The default is 0 (no Server Regions need to be ready for work before work is accepted over the HTTP/S transport).

Example:

```
BBOO_ACCEPT_HTTP_WORK_AFTER_MIN_SRS=1
```

BBOO_WORKLOAD_PROFILE=*value*

Controls workload-pertinent decisions made by the WebSphere for z/OS runtime, such as the number of threads used in the server region. The default value is NORMAL, which is the appropriate value for most applications. Consider using one of the other values when your application requires more threads.

NORMAL

Gives you the thread count dictated by WebSphere for z/OS--either 1 (single-threaded) or 3 (multi-threaded). This value is the default.

IOBOUND
Use IOBOUND if you want more threads in applications that perform I/O-intensive processing on z/OS. The number of threads is calculated based on your number of CPUs.

CPUBOUND
Use CPUBOUND if you want more threads in applications that perform processor-intensive operations on z/OS. The number of threads is calculated based on your number of CPUs, and cannot be less than three.

LONGWAIT
Use LONGWAIT for application processing that involves sending or receiving information across a network.

Example: `BBOO_WORKLOAD_PROFILE=NORMAL`

BEAN_DELETE_SLEEP_TIME=n
The time in seconds allowed before an expired stateful session bean's state is deleted from its backing datastore (DB2). The default time is 4200 seconds (70 minutes). You can increase the time to 2147483 seconds (24.85 days). Recommendation: Do not set this variable less than 300 seconds (5 minutes).

Note: If you change the value of this variable for your application server, you may also need to adjust the bean timeout value for your stateful beans. The default stateful bean timeout is 8 hours, which, when coupled with the BEAN_DELETE_SLEEP_TIME default value, means it could take up to 9 hours and 10 minutes to delete a bean. See *WebSphere Application Server V4.0.1 for z/OS and OS/390: Assembling J2EE Applications*, SA22-7836, for more information about stateful session bean timeout.

Example:

```
BEAN_DELETE_SLEEP_TIME=1000000
```

CBCONFIG=*path*
Specifies a read/write directory in the HFS into which WebSphere for z/OS writes configuration and environment files when a conversation is activated. The &CBCONFIG variable in control and server region start procedures must match this value. In this way, WebSphere for z/OS can find the appropriate environment file for a server when those start procedures are executed. The default is /WebSphere390/CB390.

Example: `CBCONFIG=/WebSphere390/CB390`

Rules:

1. You cannot change the value for CBCONFIG through the Administration application (SM EUI).
2. The System Management group (default CBCFG1) and user ID (default CBSYMSR1) must own each directory and subdirectory in CBCONFIG. If the System Management group and user ID do not own CBCONFIG, use the chown command to make them the owner of each directory and subdirectory in CBCONFIG. Thus, if you use the default CBCONFIG, you must use the chown command to give the System Management group and user ID ownership of /WebSphere390 and /WebSphere390/CB390.

   Example:

   ```
   chown -R CBSYMSR1:CBCFG1 /WebSphere390
   ```

Recommendation: You should not change the value of CBCONFIG except prior to an initial bootstrap or a cold start of WebSphere for z/OS.

CLASSPATH=*path1***:***[path2]***:...**
Specifies Java class files—.jar files and classes.zip files—for use by Java business objects in server regions. Specify your Java business object's .jar files when you use Java business objects. The entire CLASSPATH statement must be on one line only.

Example:

```
CLASSPATH=/usr/lpp/db2/db2710/classes/db2j2classes.zip: . . .
```

CLIENT_DCE_QOP=*value*
The level of DCE message protection used by a local z/OS or OS/390 client to apply to the current transaction flows. Normally, you would set DCE security for an z/OS or OS/390 client that accesses servers on remote systems. Note that the DCE level for a server is set through the Administration application.

When enabled on client and server, DCE authentication offers each proof of the other's legitimacy with a handshake message exchange using DCE's third-party authentication scheme. Once this exchange has taken place, messages can be assigned one of three levels of protection, which are the values of this environment variable:

NO_PROTECTION
DCE assures only that the messages and their replies are from the legitimate sender. This is the default.

INTEGRITY
DCE assures that the message is from the legitimate sender and it has not been modified in any way since the sender sent it.

CONFIDENTIALITY
DCE encrypts the message so that none but the legitimate receiver can read it.

CLIENT_HOSTNAME=
Allows an z/OS or OS/390 client to determine its host IP name when no Daemon is running on the same system. When a client program issues the CBSeriesGlobal::hostName() method, the system checks the CLIENT_HOSTNAME environment variable first and returns this value, if it is set. If the value is not set, the system returns the IP name of the Daemon running on that system, if the Daemon is running. The default value is null.

Example: `CLIENT_HOSTNAME=MYSYS.SYS.COM`

CLIENTLOGSTREAMNAME=*LOG_STREAM_NAME*
The WebSphere for z/OS error log stream to which an z/OS or OS/390 client ORB writes error information.

Example: `CLIENTLOGSTREAMNAME=MY.CLIENT.ERROR.LOG`

CLIENT_RESOLVE_IPNAME=*IP_NAME*
The Internet Protocol name that an z/OS or OS/390 client, or server region acting as a client, uses to access the bootstrap server (that is, when the client or server region invokes the resolve_initial_references method). The default is the value specified by the RESOLVE_IPNAME environment variable, which is the Internet Protocol name associated with the System Management Server (the default bootstrap server). If RESOLVE_IPNAME is not set, the value is the system on which the client or server region is running.

The CLIENT_RESOLVE_IPNAME environment variable allows you to specify a bootstrap server running on a remote system, while other clients use a local bootstrap server defined by the RESOLVE_IPNAME environment variable.

Note: The TCP/IP port number for the CLIENT_RESOLVE_IPNAME is defined by the RESOLVE_PORT environment variable.

The value of CLIENT_RESOLVE_IPNAME can be up to 255 characters.

Example: `CLIENT_RESOLVE_IPNAME=REMHOST`

CLIENT_TIMEOUT=*n*

Sets the time-out value for response from a client method call. Set in the control region, the time is in tenths of seconds (thus, a value of 10 is 1 second). This is the only time-out available for remote method dispatches. Because the sysplex TCP/IP that runs through the coupling facility does not always tell the client when the other end of the socket is gone, you would normally wait indefinitely for a response. `CLIENT_TIMEOUT` ensures that you get a response within the configured time, even if it's a `COMM_FAILURE` exception. The default value is 0 (unlimited), which means no time-out value is set.

Example:

```
CLIENT_TIMEOUT=20
```

CLONEID=<id>

Specifies the cloneID that is used to provide session affinity across WebSphere for z/OS J2EE server instances. The value specified for this environment variable must match a value specified on a <Server CloneID> element in the plugin-cfg.xml file for the Web server plug-in that is being used with WebSphere for z/OS. The default value for this environment variable is created by the Web container based on the name of the J2EE server and the name of the J2EE server instance with which this cloneID is associated, and is of the form <ServerName.ServerInstanceName>.

If you change the default value, you must make sure:

- The new value matches a value specified on a <Server CloneID> element in the plugin-cfg.xml file for the Web server plug-in that you are using.
- The new value is a combination of the following:
  - English alphanumeric characters (uppercase or lowercase A to Z and numbers 0 to 9)
  - Periods (.)
  - Underscores (_)
  - Hyphens (-)

Note: Alphabetic characters are case-sensitive. The case of any alphabetic character specified here must exactly match the case of that character as it is specified on the <Server CloneID> element in the plugin-cfg.xml file.

com.ibm.ws.naming.ldap.containerdn=*ibm-wsnTree=t1,o=org,c=country*

The starting point of WsnName tree. Only the Naming server uses this environment variable. By default, the system expects the value to be `ibm-wsnTree=t1,o=WASNaming,c=us`. If you take the default, delete this environment variable from your environment file.

This value must match the value specified in LDAP initialization file (our sample is bboldif.cb). If you've modified the organization or country in your bboldif.cb file, use the same value on this environment variable. Note that case does not matter in LDAP, though it does matter for the environment variables. The ″o=,c=″ portion must also be specified as a suffix in bboslapd.conf.

Example:

```
suffix   "o=WASNaming,c=us"
```

Tip: The suffix statement appears as:

```
suffix        "<ws_rdn>"
```

in the sample bboslapd.conf we ship.

Example:

```
com.ibm.ws.naming.ldap.containerdn=ibm-wsnTree=t1,o=WASNaming,c=us
```

com.ibm.ws.naming.ldap.domainname=*domain name*

Uniquely identifies the host root and is the basis for partitioning the JNDI global name space. Only the Naming server uses this environment variable. By default, the system expects the value to be the domain name of the sysplex on which Naming Server is running. If you want the default, delete this environment variable from the environment file. If you want a different domain name, specify it.

Example:

```
com.ibm.ws.naming.ldap.domainname=plex1
```

com.ibm.ws.naming.ldap.masterurl=ldap://*IP_name***:***port*

The LDAP Server IP Name and port number. Only the Naming server uses this environment variable. By default, the system expects the IP name to be the same as the system on which the Naming Server runs and the port to be 1389. If your LDAP server is running on a system other then the one the Naming Server runs on or uses a port other than 1389, update this environment variable. Otherwise, delete this environment variable.

Example:

```
com.ibm.ws.naming.ldap.masterurl=ldap://wsldap:1389
```

com.ibm.ws390.server.classloadermode=*number*

Specifies the type and behavior of class loaders that the J2EE server uses to load a class from an application module. This capability supports different approaches to packaging application components for installation in a J2EE server, and influences the search-path order that WebSphere for z/OS class loaders use to find and load classes. For additional information about application packaging guidelines and classloader operation, see .

Recommendation: For most applications, use the default value (2, application mode).

Valid values for this property are:

0 Specifies module mode.

Recommendation: Use this value only if your applications have Manifest classpath statements in EJB JAR files or in WAR files. Even in this case, IBM recommends that you change this property setting to 2 (application mode).

With module mode, WebSphere for z/OS uses only one classloader per module. Each module (JAR or WAR file) has its own unique classloader. Visibility of other modules in the application is achieved only when Manifest classpath entries are added to a module.

If you specify module mode, you must include all application dependent files in each application's EAR file, or place them in the directory specified through the `APP_EXT_DIR` environment variable. Any JAR or zip files that exist in the directory specified on this environment variable are considered common files and can be accessed by any application running in the same J2EE server.

1 Specifies compatibility mode, which allows compatibility with applications from previous releases of WebSphere for z/OS. In this mode, all EJB module classloaders have visibility of all other EJB module classloaders, and all Web application modules have visibility of the EJB classloaders. The EJB classloaders are searched in the order in which the EJB modules were initialized.

If you specify compatibility mode, you must include all application dependent files in each application's EAR file, or place them in the directory specified through the `APP_EXT_DIR` environment variable. Any JAR or zip files that exist in the directory specified on this environment variable are considered common files and can be accessed by any application running in the same J2EE server.

2 Specifies application mode, which allows all classloaders in a J2EE application to have visibility of other classloaders in the same application. The search order is the same as the order in which the modules are defined in the application.xml for the EAR file.

If you specify application mode, you must include all application dependent files in each application's EAR file, or place them in the directory specified through the `APP_EXT_DIR` environment variable. Any JAR or zip files that exist in the directory specified on this environment variable are considered common files and can be accessed by any application running in the same J2EE server.

3 Specifies server mode, which allows all application classloaders on a J2EE server to have visibility to all other application classloaders in the server. This setting enables classes in one application to be visible to classes in all of the other applications residing on that server. When server mode is specified, common files do not have to be placed in the directory specified through the `APP_EXT_DIR` environment variable.

Default: 2 (application mode)

Example: `com.ibm.ws390.server.classloadermode=1`

CONFIGURED_SYSTEM=*system*

Specifies the name of the system to which the server instance was originally configured. During prepare for cold start, cold start, and server activation, the run time adds this environment variable to each server instance's environment file automatically.

Rule: Do not manually add or change this environment variable at any time, such as:

- In the initial environment file before bootstrap
- Through the Administration application (SM EUI)
- In an existing server environment file.

DAEMON_IPNAME=*IP_NAME*

The Internet Protocol name that the Daemon Server registers with the Domain Name Service (DNS). Any CORBA client communication with WebSphere for z/OS requires this IP name.

You must define the DAEMON_IPNAME environment variable at installation time, before you start the Daemon bootstrap process. Otherwise, WebSphere for z/OS issues an error message and terminates the Daemon.

The bootstrap process sets, among other things, the Daemon IP name in the system management database. After bootstrap, WebSphere for z/OS uses the value in the system management database. It is possible that, after bootstrap, the value of the DAEMON_IPNAME environment variable could change to a value other than what is in the system management database. If this happens, an error message is issued, but the Daemon initializes with the Daemon IP name from the system management database.

To place Daemon server instances in the same host cluster, you must code the same DAEMON_IPNAME value for each server instance.

Rules:

- The value for DAEMON_IPNAME must be a fully-qualified long name.
- The first-level qualifier can be from 1 to 18 characters.
- Once chosen, the port and IP name for the Daemon should not change, since every object reference includes the port and IP name—if you change them, existing objects will no longer be accessible.

Example: `DAEMON_IPNAME=CBQ091.PDL.POK.IBM.COM`

DAEMON_PORT=*n*

The port number at which the Daemon Server listens for requests. The default is 5555. If you specify a value, you must provide the same value for the System Management Server control region.

Example: `DAEMON_PORT=5555`

DATASHARING=[0 | 1]

Specifies whether a WebSphere for z/OS instance shares DB2 resources with one or more other WebSphere for z/OS members (clustered host instances) of the sysplex. The value can be 0 or 1. The default value 1 means data sharing is active. The value 0 means data sharing is not active. In a monoplex, this variable has no effect and can be set to 1 or 0.

Example:

```
DATASHARING=1
```

DEFAULT_CLIENT_XML_PATH=*path*

Specifies the location of a set of XML files that hold default parameter lists used by the System Management Scripting API. You must set this environment variable for clients that use the System Management Scripting API.

IBM provides a set of sample XML files that contain default parameter lists. After installation, these samples reside in `/usr/lpp/WebSphere/samples/smapi`. For information about the XML files and the parameter lists, see *WebSphere Application Server V4.0.1 for z/OS and OS/390: System Management Scripting API*, SA22-7839.

You can override the default behavior of the System Management Scripting API in two ways:

1. Specifying the parameters explicitly in the REXX script that calls the System Management Scripting API. By specifying parameters explicitly, you do not have to modify the XML samples IBM provides. You simply need to code

   ```
   DEFAULT_CLIENT_XML_PATH=/usr/lpp/WebSphere/samples/smapi
   ```

   in your client environment file.

2. Copying the XML files to another directory (the samples IBM provides are read-only), making modifications to the parameter lists, then changing the DEFAULT_CLIENT_XML_PATH to point to the new directory. Making these changes is required only if you want to override permanently the default behavior of the System Management Scripting API.

Example: `DEFAULT_CLIENT_XML_PATH=/usr/lpp/WebSphere/samples/smapi`

DEFAULT_UNAUTH_CLIENT_ID=*user_id*

The default local and remote user ID that the System Management server associates with servers. If you allow unauthenticated client requests on a server, and do not explicitly specify your own local and remote user ID for that server, those requests run under the authority of this user ID.

If you do not define this environment variable, the default local and remote user ID is CBGUEST.

You must define this user ID to z/OS or OS/390 and give it appropriate security authorizations (for example, RACF permissions and LDAP permissions).

This environment variable is used only by the System Management server. Using this environment variable in the environment file for other servers takes no effect. That is, you cannot use this environment variable for other servers to define the default local and remote ID that is used by those servers. Rather, you must define the default through the server properties panel in the Administration application. To do this

- Select the "Allow non-authenticated clients" checkbox. The Administration application supplies the value for the local and remote identity from the value on the DEFAULT_UNAUTH_CLIENT_ID variable (or, if not specified, it supplies CBGUEST).
- Type over the supplied values with your value.

The System Management server uses this environment variable during bootstrap. After bootstrap, you can modify the value only at the sysplex level through the Administration application.

Example: `DEFAULT_UNAUTH_CLIENT_ID=DUDE`

DM_GENERIC_SERVER_NAME=*SERVER_NAME*

The server name for the Daemon Server. The default is CBDAEMON. If you specify a value, you must provide the same value for the System Management Server control region.

Example: `DM_GENERIC_SERVER_NAME=CBDAEMON`

DM_SPECIFIC_SERVER_NAME=*SERVER_INSTANCE_NAME*

A server instance name of the Daemon Server. The default is DAEMON01. You must specify this environment variable for all server instances in the second and subsequent systems in a sysplex.

Example: `DM_SPECIFIC_SERVER_NAME=DAEMON01`

ENABLE_TRUSTED_APPLICATIONS=

Specifies whether or not custom user registries can be used. Setting this variable to 1 enables the custom user registry function. When this function is enabled, RACF checks if the user is authorized, and if the user is authorized, allows the call to complete. If this variable does not exist, or is not set to 1, the user will get an exception.

HOME=*path*

Specifies the home directory. This variable is set automatically from the security product user profile when the user logs in to the UNIX shell.

IBM_JVM_ST_VERBOSEGC_LOG=*filename*

Specifies the HFS file in which garbage-collection output will be logged. Use this variable with both of the following:

- JVM_ENABLE_CLASS_GC=1 to enable garbage collection, and
- JVM_ENABLE_VERBOSE_GC=1 to view verbose output from the garbage collection.

Recommendation: If you also are using the `JVM_LOGFILE` variable to specify an HFS file for JVM-related output, **do not** specify the same HFS file for the `IBM_JVM_ST_VERBOSEGC_LOG` variable. WebSphere for z/OS will not append data to an existing file; instead, the data will be overwritten if both of these variables specify the same HFS file.

IBM_OMGSSL=[0 | 1]

Specifies whether only CORBA-compliant security tags will be exported by the server. The value 1 means only CORBA-compliant tags are exported. The value 0 (the default) means CORBA-compliant and non-compliant tags are exported.

Use value 1 when the server uses only SSL basic authentication for its security and clients (such as CICS or other OEM ORBs) use CORBA-compliant tags. This is only in the case when the server uses SSL basic authentication. If your server supports SSL client certificates as well, you do not have to set this variable.

Use value 0 (or take the default) when your server uses SSL basic authentication and interoperates with WebSphere clients on distributed platforms or WebSphere Application Server Enterprise Edition for OS/390 V3.02.

Example: `IBM_OMGSSL=1`

ICU_DATA=*path*

The path to binary files required by the XML Parser used by the System Management server during bootstrap and import server processing. If you installed the WebSphere for z/OS code in the default directory, you do not need to change this path. The default path is `/usr/lpp/WebSphere/bin/`.

Example: `ICU_DATA=/usr/lpp/WebSphere/bin/`

IIOP_SERVER_SESSION_KEEPALIVE=*n*

This variable, if set, defines the value in seconds provided to TCP/IP on the SOCK_TCP_KEEPALIVE option for the IIOP listener. The function of this option is to verify if idle sessions are still valid by polling the client TCP/IP stack. If the client does not respond, the session is closed. If the client goes away without notifying the server, it would unnecessarily leave the session active on the server side. Use this option to clean up these unnecessary sessions. The default is zero.See TCP/IP APAR PQ18618 for more information about this option.

Notes:

1. If the environment variable is not set, the TCP/IP option is not set.
2. Setting the SOCK_TCP_KEEPALIVE option generates network traffic on idle sessions, which can be undesirable.

Example: `IIOP_SERVER_SESSION_KEEPALIVE=3600`

IR_GENERIC_SERVER_NAME=*SERVER_NAME*
The server name of the Interface Repository Server. The default is CBINTFRP. You must define a workload management (WLM) application environment using this name for the Interface Repository Server server regions to work.

IR_SPECIFIC_SERVER_NAME=*SERVER_INSTANCE_NAME*
A server instance name of the Interface Repository Server. The default is INTFRP01. You must specify this environment variable for all server instances in the second and subsequent systems in a sysplex.

IRPROC=*PROC_NAME*
The start procedure used by the Daemon Server to start the Interface Repository Server. The default is BBOIR. You can supply the name of your own start procedure. If you do so, copy the information from the default start procedure to your new start procedure.

Example: `IRPROC=BBOIR`

IVB_DEBUG_ENABLED=1
Enables the z/OS or OS/390 client and the application server to load the object level trace run time, and to use object level trace for tracing and/or debugging client and server application components. The value 1 is required for the application server, and for both C++ or Java clients running on z/OS or OS/390, when debugging C++ or Java business objects, servlets, JSPs, or Enterprise beans.

IVB_DRIVER_PATH=*path*
The name of the directory where WebSphere for z/OS files reside after SMP/E installation. The default is `/usr/lpp/WebSphere`.

Example: `IVB_DRIVER_PATH=/usr/lpp/WebSphere`

IVB_TRACE_HOST=*IP_ADDRESS (or HOSTNAME)*
Specifies the workstation IP address (or host name if you have the DNS server setup correctly) where the object level trace viewer runs. Use this when you are tracing and/or debugging your client and server components with the IBM Object Level Trace and Distributed Debugger Tools.

Example: `IVB_TRACE_HOST=MYHOST.IBM.COM`

IVB_TRACE_PORT=*port*
Specifies the same port as the TCP/IP port specified for the object level trace server. Use this when you are tracing and/or debugging your client and server components with the IBM Object Level Trace and Distributed Debugger Tools. The default is 2102.

Example: `IVB_TRACE_PORT=2102`

java.naming.security.credentials=*password*
The password used by the distinguished name specified by java.naming.security.principal. The password must match the password defined for the administrator access ID (default is WASAdmin) by the LDAP initialization file during initial system customization. IBM provides the WASAdmin access ID in a sample LDIF file called bboldif.cb. The default value is `secret`.

Example: `java.naming.security.credentials=secret`

Recommendation: You should change the IBM-supplied password.

java.naming.security.principal=*distinguished_name*
Distinguished name (user ID) defined to have write access to WsnName directory. Specify this only if you want to provide read/write access to all

JNDI users. The distinguished name must match the one defined for the administrator access ID (default is WASAdmin) by the LDAP LDIF file during initial system customization. IBM provides the WASAdmin access ID in a sample LDAP initialization file called bboldif.cb. The default value is `cn=WASAdmin,o=WASNaming,c=us`.

Example:

```
java.naming.security.principal=cn=WASAdmin,o=WASNaming,c=us
```

Recommendation: We suggest you keep the WASAdmin access ID.

JAVA_COMPILER=

Specifies the use of the just-in-time (JIT) compiler.

If you use the environment variable, a null value (`JAVA_COMPILER=`) turns the JIT compiler on. Any other value turns the JIT compiler off.

By default, a Java virtual machine (JVM) running on z/OS or OS/390 uses the JIT compiler, so you do not have to explicitly set this environment variable. If you are debugging Java business objects or J2EE application components, however, turn off the JIT compiler by specifying a non-null value.

Example: `JAVA_COMPILER=NONE`

JAVA_IEEE754=EMULATION

Specifies the correct executable code for the system to load for the Java virtual machine (JVM) in which Java clients on z/OS or OS/390 run. This environment variable setting is required only for Java clients that run on z/OS or OS/390.

JVM_BOOTCLASSPATH=*path1***:***[path2]*

Enables the use of bootclasspath. This option is equivalent to the `-Xbootclasspath/p:` Java invocation option.

JVM_BOOTLIBRARYPATH=*path1***:***[path2]*

Enables the use of bootlibrarypath. This option is equivalent to the `-Dsun.boot.library.path=` Java invocation option.

JVM_DEBUG=1

This option is equivalent to the `–verbose:class,jni` Java invocation option. It reroutes JNI and class debug messages to SYSOUT for debugging purposes. Set JVM_DEBUG=1 to invoke JVM messaging.

Note: Setting this variable does not result in garbage collection processing; to enable garbage collection, you must specify JVM_ENABLE_CLASS_GC=1.

JVM_DEBUG_PORT=*port*

Specifies a TCP/IP port that the distributed debugger uses to connect to the JVM.

JVM_ENABLE_CLASS_GC=1

Enables garbage collection of class objects when this environment variable is set to the value 1. Without this setting, garbage collection is not enabled for class objects, so the default behavior is equivalent to the `-Xnoclassgc` Java invocation option.

If you need garbage-collection output in an output file, specify the filename through the IBM_JVM_ST_VERBOSEGC_LOG environment variable. Otherwise, garbage-collection output appears in SYSOUT for the server region.

JVM_ENABLE_VERBOSE_GC=1

Sets verbose garbage collection on or off. The value 1 is required for enabling garbage collection messages. This option is equivalent to the `-verbose:gc` Java invocation option.

If you need garbage-collection output in an output file, specify the filename through the IBM_JVM_ST_VERBOSEGC_LOG environment variable. Otherwise, garbage-collection output appears in SYSOUT for the server region.

JVM_EXTRA_OPTIONS=*string*

Allows you to specify one new Java environment variable that is not already predefined by IBM (those predefined variables start with `JVM_`). With `JVM_EXTRA_OPTIONS`, *string* is the new Java option or property that you want to specify.

JVM_HEAPSIZE=*n*

Sets the maximum size (in megabytes) of the JVM heap. The default is 256 MB. This option is equivalent to the `-Xmx=xxxM` Java invocation option.

Example: `JVM_HEAPSIZE=256 # specifies a 256 MB heap`

JVM_LOCALREFS=

Should only be used under the direction of IBM support. The default is 128.

JVM_LOGFILE=*filename*

Specifies the HFS file in which JNI and class debug messages from the JVM will be logged.

Recommendations:

- Use this variable only in a single-server environment. If you use `JVM_LOGFILE` in a multiple-server environment, all the servers write to the same file, so you might have difficulty using the file for diagnostic purposes. In a multiple-server environment, use `JVM_DEBUG=1` to direct JNI and class debug messages to the SYSOUT for a specific server.
- This log file does not contain garbage-collection output. If you enable garbage collection by specifying JVM_ENABLE_CLASS_GC=1, the output appears in SYSOUT for the server region, or in an HFS file you specify through the IBM_JVM_ST_VERBOSEGC_LOG environment variable. **Do not** specify the same HFS file for the `IBM_JVM_ST_VERBOSEGC_LOG` variable as you do for the `JVM_LOGFILE` variable. WebSphere for z/OS will not append data to an existing file; instead, the data will be overwritten if both of these variables specify the same HFS file.

JVM_MINHEAPSIZE=*n*

Sets the mimimum size (in megabytes) of the JVM heap. The default is 256 MB. This option is equivalent to the `-Xms=xxxM` Java invocation option. For optimal performance, specify the same value for `JVM_HEAPSIZE` and `JVM_MINHEAPSIZE`.

LDAPBINDPW=*password*

The password the Naming Server uses to bind to the LDAP server. Used in conjunction with LDAPNAME.

LDAPCONF=*filename*

The LDAP configuration file used by WebSphere for z/OS. If you designate a file in the HFS, do not use quotes. If you designate an MVS data set, enclose the data set in single quotes.

Example: `LDAPCONF='bbo.s21slapd.conf'`

LDAPHOSTNAME=*name:port*

The host name of the LDAP server that the Interface Repository Server uses as its data store.

LDAPIRBINDPW=*password*

The password the Interface Repository Server uses to bind to the LDAP server. Used in conjunction with LDAPIRNAME.

LDAPIRCONF=*filename*

The LDAP configuration file used by the LDAP server that the Interface Repository Server uses as its data store. If you designate a file in the HFS, do not use quotes. If you designate an MVS data set, enclose the data set in single quotes.

LDAPIRHOSTNAME=*name:port*

The host name of the LDAP server that the Interface Repository Server uses as its data store.

LDAPIRNAME

The LDAP entry name that the Interface Repository Server uses to authenticate itself to the LDAP server that it uses as its data store.

LDAPIRROOT=*root*

The LDAP entry name at which the Interface Repository Server anchors its data.

Example: `LDAPIRROOT=o=BOSS,c=U`

LDAPNAME

The LDAP entry name that the Naming Server uses to authenticate itself to the LDAP server that it uses as its data store.

LDAPROOT=*root*

The LDAP entry name at which the Naming Server anchors its data.

Example: `LDAPROOT=o=BOSS,c=US`

LIBPATH=*path1***:***[path2]***:...**

Specifies the DLL search paths for Java in the hierarchical file system (HFS). Specify system, WebSphere for z/OS, and Java DLLs.

Example:

```
LIBPATH=/db2_path/lib:/usr/lpp/java/J1.3/bin:/usr/lpp/java/J1.3/bin/classic:/usr/lpp/WebSphere/lib
```

where *db2_path* is the HFS where you installed DB2.

LOGSTREAMNAME=*LOG_STREAM_NAME*

The WebSphere for z/OS error log stream name the Daemon and System Management servers use during bootstrap. If not specified in the environment file for the Daemon and System Management servers during bootstrap, the system uses the following algorithm to form an error log stream name. WebSphere for z/OS:

1. Takes the first qualifier in the Daemon Server’s IP name.
2. If the first qualifier is more than 8 characters, divides the qualifier into 8-character strings and separates them with periods.
3. Adds a high-level qualifier “BBO”.

For example, if the Daemon IP name is MYDAEMONSERVER.IBM.COM, the algorithm would produce an error log stream name BBO.MYDAEMON.SERVER.

After bootstrap, you can create or change an error log stream name for the entire sysplex, a server, or a server instance through the Administration application. A server error log stream setting overrides the general WebSphere for z/OS setting, and a server instance setting overrides a server setting. Thus, you can set up general error logging, but direct error logging for servers or server instances to specific log streams.

During processing, if the specified log stream is not found or not accessible, a message is issued and errors are written to the server's joblog.

Example: `LOGSTREAMNAME=MY.CB.ERROR.LOG`

Tip: Do not put the log stream name in quotes. Log stream names are not data set names.

MAX_SRS=*nn*

Specifies the total number of server regions allowed by workload management to run concurrently in the server's application environment. That is, workload management will not start more server regions for a particular application environment than are specified through this environment variable.

Use this environment variable to limit the number of server regions created by workload management for a server. The default is zero, which means there is no limit.

Attention: If you specify MAX_SRS, you must ensure that you specify a MAX_SRS value that is greater than or equal to MIN_SRS times the number of service classes you have defined for this application environment. Failure to do so can result in timeouts due to an insufficient number of server regions.

Example: `MAX_SRS=10`

MIN_SRS=*nn*

The number of server regions to be kept running once those server regions have initialized. That is, workload management will not direct the server region to shut down even though it becomes inactive. Use this environment variable when the response time for the workload requires that several server regions are always ready to process work.

The default for J2EE servers is 1. For MOFW servers, the default is 0. The maximum value is 20. If you specify more than 20, the variable is set to 20.

WebSphere for z/OS garbage collection may cause a server region to refresh, but the minimum number of server regions will not fall below the value specified on this environment variable.

Example: `MIN_SRS=2`

NM_GENERIC_SERVER_NAME=*SERVER_NAME*

The server name of the Naming Server. The default is CBNAMING. You must define a workload management (WLM) application environment using this name for the Naming Server server regions to work.

Example: `NM_GENERIC_SERVER_NAME=CBNAMING`

NM_SPECIFIC_SERVER_NAME=*SERVER_INSTANCE_NAME*

The server instance name of the Naming Server. The default is NAMING01. You must specify this environment variable for all server instances in the second and subsequent systems in a sysplex.

Example: `NM_SPECIFIC_SERVER_NAME=NAMING01`

NMPROC=*PROC_NAME*

The start procedure used by the Daemon Server to start the Naming Server.

The default is BBONM. You can supply the name of your own start procedure. If you do so, copy the information from the default start procedure to your new start procedure.

Example: `NMPROC=BBONM`

OTS_DEFAULT_TIMEOUT=*n*

The amount of time (in seconds) given by default to an application transaction to complete. This amount of time is given to the application transaction if it does not set its own time-out value through the `current –> set_timeout` method.

The default is 30 seconds and the maximum value is 2147483 seconds (24.85 days). You should not use a null or 0 value.

Note: When a conversation is activated, the system performs special processing for the System Management server instances **only**.

- If the OTS_DEFAULT_TIMEOUT variable is not set, it is added.
- If the value for OTS_DEFAULT_TIMEOUT is less than 3600 (seconds), it is set to 3600.

This special processing is performed for the System Management server instances because the server instances sometimes perform long-running transactions. Other server instances do not require such lengthy transaction defaults.

Example: `OTS_DEFAULT_TIMEOUT=30`

OTS_MAXIMUM_TIMEOUT=*n*

The maximum allowable amount of time (in seconds) given to an application transaction to complete. If an application assigns a greater amount of time, the system limits the time to the OTS_MAXIMUM_TIMEOUT value.

The default is 60 seconds and the maximum value is 2147483 seconds (24.85 days). You should not use a null or 0 value.

Note: When a conversation is activated, the system performs special processing for the System Management server instances **only**.

- If the OTS_MAXIMUM_TIMEOUT variable is not set, it is added.
- If the value for OTS_MAXIMUM_TIMEOUT is less than 3600 (seconds), it is set to 3600.

This special processing is performed for the System Management server instances because the server instances sometimes perform long-running transactions. Other server instances do not require such lengthy transaction defaults.

Example: `OTS_MAXIMUM_TIMEOUT=60`

PATH=*path*

Specifies the path.

RAS_MINORCODEDEFAULT=*value*

Determines the default behavior for gathering documentation about system exception minor codes. Use only under the guidance of IBM Service.

CEEDUMP

Captures callback and offsets.

Tip: It takes time for the system to take CEEDUMPs and this may cause transaction timeouts. For instance, your OTS_DEFAULT_TIMEOUT may be set to 30 seconds, but, since taking a CEEDUMP can take longer than 30 seconds, your application transaction may time out. To prevent this from happening, either:

- Increase the transaction timeout value.

  or

- Code RAS_MINORCODEDEFAULT=NODIAGNOSTICDATA. Be sure TRACEMINORCODE is **not** in the environment file.

TRACEBACK
Captures Language Environment and z/OS UNIX traceback data.

SVCDUMP
Captures an MVS dump (but will not produce a dump in the client).

NODIAGNOSTICDATA
The default. This setting will not cause the gathering of a CEEDUMP, TRACEBACK, or SVCDUMP.

Note: Sometimes results depend on the setting of another environment variable, TRACEMINORCODE. If you code TRACEMINORCODE=(null value) and RAS_MINORCODEDEFAULT=TRACEBACK you get a traceback. But, if you code RAS_MINORCODEDEFAULT=NODIAGNOSTICDATA and TRACEMINORCODE=ALL, you also get a traceback. So, specifying RAS_MINORCODEDEFAULT=NODIAGNOSTICDATA does not cancel TRACEBACK; it simply does not cause a TRACEBACK to be gathered.

RECOVERY_TIMEOUT=*n*
The time in minutes that this control region uses to attempt to resolve transactions before asking the installation if it should:

1. Give up trying to resolve,
2. Write transaction-related information to the joblog or hard copy log, then
3. Terminate.

If the installation replies that it would like the recovery to continue, the control region will attempt recovery for another *n* minutes before re-issuing the WTOR. Of course, once all the transactions are resolved, the control region will just terminate and you won’t see the WTOR again. This variable applies only to control regions in restart and recovery mode, when you are not running on your configured system. The default value is 15 minutes.

Example:

```
RECOVERY_TIMEOUT=7
```

| **RECYCLE_J2EE_SERVERS=Y|N**
| Specifies whether or not the Systems Management server will automatically recycle a J2EE server instance when a modified conversation for the associated J2EE server is activated. If **Y** is specified, the Systems Management server will automatically recycle J2EE server instances whenever a modified conversation is activated. When **Y** is specified, the environment variable performs the same function that was implemented prior to the introduction of this new variable. If **N** is specified, the Systems Management server:

- | Will not automatically recycle J2EE server instances whenever a modified conversation for the associated J2EE server is activated. The servers must still be restarted (manually or with some customer-provided automation) to allow changes to the server instance to take effect.

- Will not delete files associated with deleted applications on these server instances from the HFS because the application will still be running until the server instance is restarted. To prevent accumulation of obsolete files on the HFS, you should delete all files and directories associated with the deleted applications after restarting the server instances. This includes:

```
 * /<CBCONFIG>/apps/<server_name>/A/A<uuid>/  (directory)
* /<CBCONFIG>/apps/<server_name>/A/A<uuid>.*  (files)
* /<CBCONFIG>/apps/<server_name>/<j2ee_application_name>/   (directory)
* /<CBCONFIG>/working/<server_name>/temp/<sysplex_name>/
         <server_inst_name>/<app_name>/   (directory
```

Note: RECYCLE_J2EE_SERVERS is only used by the Systems Management server. If specified on any other server, it is ignored.

Default: Y

Example: RECYCLE_J2EE_SERVERS=Y

REM_DCEPASSWORD=*password*

The password of the remote DCE principal passed in the security context when an z/OS or OS/390 client makes a request to a system outside the sysplex and SSL Type 1 authentication is being used. The password must conform to DCE requirements for passwords.

Example: `REM_DCEPASSWORD=mydcePW`

REM_DCEPRINCIPAL=*principal*

The principal passed in the security context when a client makes a request to a system outside the sysplex and SSL Type 1 authentication is being used. This principal must be defined on the target server. The value must conform to DCE requirements for principals.

Example: `REM_DCEPRINCIPAL=myDCEprin`

REM_PASSWORD=*password*

The password used in the security context when a client makes a request to a remote z/OS or OS/390 system and user ID/password security or SSL security is being used.

Example: `REM_PASSWORD=MYPASSW`

REM_USERID=*USER_ID*

The user ID used in the security context when a client makes a request to a remote z/OS or OS/390 system and user ID/password security or SSL security is being used.

Example: `REM_USERID=MCOX`

RESOLVE_IPNAME=*IP_NAME*

The Internet Protocol name that the System Management Server registers with the Domain Name Service (DNS). Any CORBA client communication with WebSphere for z/OS requires this IP Name. If not set, the Resolve IP Name is the system on which the program is running.

Rule: The value for RESOLVE_IPNAME should be a fully-qualified name, but it cannot exceed 255 characters.

Example: `RESOLVE_IPNAME=CBQ091.COMPANY.NY.COM`

RESOLVE_PORT=*n*
The port number at which the System Management Server listens for requests. The default is 900. This is a well-known port for Object Request Brokers, so IBM advises that you do not change this variable. If you already have an application that uses this port, consider using TCP/IP bind-specific support and the SRVIPADDR environment variable.

Example: `RESOLVE_PORT=900`

SESSION_COOKIE_NAME=
Specifies the name of the cookie that is to be used for this J2EE server instance, if cookies are enabled. The cookie name must only contain:

- English alphanumeric characters (uppercase or lowercase A to Z and numbers 0 to 9)
- Underscore (_)
- Period (.)
- Hyphen (-)

The default value is "JSESSIONID".

Note: The value specified on this environment variable must match the value specified on the `session.cookie.name` property in the webcontainer.conf file.

SM_DEFAULT_ADMIN=*USER_ID*
The user ID for the administrator who uses the Administration and Operations applications. This environment variable is used by the System Management bootstrap during installation—setting this environment variable after the System Management bootstrap runs has no effect. If you do not define this environment variable, the default user ID is CBADMIN. You must define this user ID to z/OS or OS/390 and give it appropriate security authorizations (for example, RACF permissions and LDAP permissions).

Note: After the System Management bootstrap runs, you can define additional administrator user IDs only through the Administration application. Those user IDs do not replace the user ID defined by SM_DEFAULT_ADMIN.

Example: `SM_DEFAULT_ADMIN=DUDE`

SM_GENERIC_SERVER_NAME=*SERVER_NAME*
The server name of the Systems Management Server. The default is CBSYSMGT. You must define a workload management (WLM) application environment using this name for the Systems Management Server server regions to work.

Example: `SM_GENERIC_SERVER_NAME=CBSYSMGT`

SM_SPECIFIC_SERVER_NAME=*SERVER_INSTANCE_NAME*
The server instance name of the Systems Management Server. The default is SYSMGT01. You must specify this environment variable for all server instances in the second and subsequent systems in a sysplex.

Example: `SM_SPECIFIC_SERVER_NAME=SYSMGT01`

SMPROC=*PROC_NAME*
The start procedure used by the Daemon Server to start the Systems

Management Server. The default is BBOSMS. You can supply the name of your own start procedure. If you do so, copy the information from the default start procedure to your new start procedure.

Example: `SMPROC=BBOSMS`

SOMOOSQL=*value*

Improves performance for client applications that use object-oriented SQL queries on string attributes. By using SOMOOSQL=1, string comparisons are pushed down to the database.

The default value is null (SOMOOSQL=).

Rule: You can use SOMOOSQL=1 only when the database and server region address spaces have been declared to run in the same locale.

SRVIPADDR=*IP_ADDRESS*

The IP address in dotted decimal format that WebSphere for z/OS servers use to listen for client connection requests.

This IP address is used by the server to bind to TCP/IP. Normally, the server will listen on all IP addresses configured to the local TCP/IP stack. However if you want to fence the work or allow multiple heterogeneous servers to listen on the same port, you can use SRVIPADDR. The specified IP address becomes the only IP address over which WebSphere for z/OS receives inbound requests. Normally, you also have to map the Daemon IP name, resolve IP name, or host name of the server that you are on to this particular SRVIPADDR.

SSL_HANDSHAKE_THREAD_COUNT=*n*

Specifies the number of SSL handshake threads that are present in the control region. The default is 3.

Example: `SSL_HANDSHAKE_THREAD_COUNT=10`

SSL_KEYRING=*keyring*

The name of the z/OS or OS/390 client's key ring used in SSL processing. This key ring must reside in RACF.

Example: `SSL_KEYRING=IVPRING`

SSL_SERVER_V3CIPHERS=*string*

Defines the SSL Version 3 cipher suites that system SSL uses in the SSL handshake for an SSL connection. It overrides any server-wide setting set via the Administration Application. Specify a string as documented in ″z/OS System Secure Sockets Layer Programming″ (SC24-5901). Each cipher is represented by two characters (for example, ″09″ instead of ″9″). You can specify the string with or without comma delineation. If you delineate with commas, a validity check will run against the installed ciphers. The default is an empty string, meaning no change is made to the cipher suites.

Examples:

```
SSL_SERVER_V3CIPHERS=09,0A,05
SSL_SERVER_V3CIPHERS=090A05
```

SYS_DB2_SUB_SYSTEM_NAME=*NAME*

The DB2 name used by Daemon and System Management servers to connect to the database. Use either the DB2 subsystem name or group attachment name. The default is DB2. If the default is not correct for your installation, change the environment variable to match the correct value.

Example: `SYS_DB2_SUB_SYSTEM_NAME=DB21`

TRACEALL=*n*

Specifies the default tracing level for WebSphere for z/OS. Valid values and their meanings are:

0	No tracing
1	Exception tracing, the default
2	Basic and exception tracing
3	Detailed tracing, including basic and exception tracing

Use this variable in conjunction with the TRACEBASIC and TRACEDETAIL environment variables to set tracing levels for WebSphere for z/OS subcomponents. Do not change this variable unless directed by IBM service personnel.

Example: `TRACEALL=1`

TRACEBASIC=*n* | (*n*,...)

Specifies tracing overrides for particular WebSphere for z/OS subcomponents. Subcomponents, specified by numbers, receive basic and exception traces. If you specify more than one subcomponent, use parentheses and separate the numbers with commas. Contact IBM service for the subcomponent numbers and their meanings. Other parts of WebSphere for z/OS receive tracing as specified on the TRACEALL environment variable. Do not change TRACEBASIC unless directed by IBM service personnel.

Example: `TRACEBASIC=3`

TRACEBUFFCOUNT=*n*

Specifies the number of trace buffers to allocate. Valid values are 4 through 8. The default is 4.

TRACEBUFFLOC=SYSPRINT | BUFFER

Specifies where you want trace records to go: either to sysprint (SYSPRINT) or to a memory buffer (BUFFER), then to a CTRACE data set. The default is to direct trace records to sysprint for the client and to a buffer for all other WebSphere for z/OS processes. For servers, you may specify one or both values, separated by a space. For clients, you may specify TRACEBUFFLOC=SYSPRINT only.

Example: `TRACEBUFFLOC=SYSPRINT BUFFER`

TRACEBUFFSIZE=*n*

Specifies the size of a single trace buffer in bytes. You can use the letters “K” (for kilobytes) or “M” (for megabytes). Valid values are 128K through 4M. The default is 1M.

TRACEDETAIL=*n* | (*n*,...)

Specifies tracing overrides for particular WebSphere for z/OS subcomponents. Subcomponents, specified by numbers, receive detailed traces. If you specify more than one subcomponent, use parentheses and separate the numbers with commas. Contact IBM service for the subcomponent numbers and their meanings. Other parts of WebSphere for z/OS receive tracing as specified on the TRACEALL environment variable. Do not change TRACEDETAIL unless directed by IBM service personnel.

Examples:

```
TRACEDETAIL=3
```

```
TRACEDETAIL=(3,4)
```

TRACEMINORCODE=*value*

Enables traceback of system exception minor codes. Use only when instructed by IBM Service. Values are:

ALL|all

Enables traceback for all system exception minor codes.

minor_code

Enables traceback for a specific minor code. Specify the code in hex, such as X'C9C21234'.

(null value)

The default. This setting will not cause gathering of a traceback.

Note: Sometimes results depend on the setting of another environment variable, RAS_MINORCODEDEFAULT. If you code TRACEMINORCODE=ALL and RAS_MINORCODEDEFAULT=NODIAGNOSTICDATA, you get a traceback. But, if you code TRACEMINORCODE=(null value) and RAS_MINORCODEFAULT=TRACEBACK you also get a traceback. So, specifying TRACEMINORCODE=(null value) does not cancel TRACEBACK; it simply does not cause a TRACEBACK to be gathered.

TRACEPARM=*SUFFIX* **|** *MEMBER_NAME*

Identifies the CTRACE PARMLIB member. The value can be either a two-character suffix, which is added to the string CTIBBO to form the name of the PARMLIB member, or the fully-specified name of the PARMLIB member. For example, you could use the suffix "01", which the system resolves to "CTIBBO01". A fully-specified name must conform to the naming requirements for a CTRACE PARMLIB member. For details, see *z/OS MVS Diagnosis: Tools and Service Aids*, GA22-7589.

The default value is 00.

If this environment variable is specified and the PARMLIB member is not found, the default PARMLIB member, CTIBBO00, is used. If neither the specified nor the default PARMLIB member is found, tracing is defined to CTRACE, but there is no connection to a CTRACE external writer. For details on the PARMLIB member and the use of the CTRACE external writer, see *WebSphere Application Server V4.0.1 for z/OS and OS/390: Messages and Diagnosis*, GA22-7837.

Note that the Daemon Server is the only server that recognizes this environment variable.

Example: `TRACEPARM=01`

TRACESPECIFIC=*n* **|** **(***n***,...)**

Specifies tracing overrides for specific WebSphere for z/OS trace points. Trace points are specified by 8-digit, hexadecimal numbers. To specify more than one trace point, use parentheses and separate the numbers with commas. You can also specify an environment variable name by enclosing the name in single quotes. The value of the environment variable will be handled as if you had specified that value on TRACESPECIFIC. Do not use TRACESPECIFIC unless directed by IBM service personnel.

Examples:

```
TRACESPECIFIC=03004020
```

```
TRACESPECIFIC=(03004020,04005010)
```

```
TRACESPECIFIC='xyz' [where xyz is an environment variable name]

TRACESPECIFIC=('xyz','abc',03004021)
[where xyz and abc are environment variable names]
```

WAS_JAVA_OPTIONS=-*option1* **-***option2* **-***option3*
Should be used only under the direction of IBM support. The default is null.

WS_EXT_DIRS=*name:name: ...*
Specifies the common JAR files and directories for extensions to the run-time functions or configuration of a J2EE server instance. For example, if you are configuring Type 4 JDBC connector for Enterprise bean or servlet use, you use `WS_EXT_DIRS` to specify the location of the connector's JDBC resource factory jar file. Each JAR file and directory in the list is separated with a colon (:). These files are loaded into the WebSphere for z/OS run-time by the Web Container run-time class loader.

Note: See the related information about WebSphere for z/OS class loaders and application modules in *WebSphere Application Server V4.0.1 for z/OS and OS/390: Assembling J2EE Applications*, SA22-7836.

Example: `WS_EXT_DIRS=/tmp/OracleJdbcResourceFactory.java`

Appendix B. Sample instructions from the customization dialog

Sample customized instructions for initial installation and customization

Following are sample instructions for initial installation and customization that are produced by the customization dialog. You can use the sample instructions for pre-installation planning. Be sure to follow the instructions you generate for your system, since they will differ from the sample.

```
-----------------------------------------------
Instructions for customizing WebSphere for z/OS

The customization dialog has created jobs based on the information you
provided. These instructions tell you how to modify the operating
system and run the jobs to customize WebSphere for z/OS.

RULES:

1.  If you created the target data sets (*.CNTL and *.DATA) on another
    (driving) system, you must copy them to the target system and give
    them the same data set names.

2.  You must perform these instructions on your target system.

Doing manual configuration updates
----------------------------------

The customization dialog for WebSphere for z/OS does not attempt to
update configuration data for your base operating system or existing
subsystems.  You must do the following manual steps prior to running
the WebSphere for z/OS configuration jobs.

BEFORE YOU BEGIN: You must copy the target data sets (*.CNTL and
*.DATA) to your target system and give them the same data set names.

You must be running on your target system.

Perform these steps to do manual configuration updates:

1.  Update the workload management application environment.  Run
    IWMARIN0 to create the following application environments.

    NOTE:  The subsystem type for all WebSphere for z/OS application
    environments is "CB".

Application  Server                          Limit on
Environment  Region     Start                starting server
Name         PROC       Parameter string     address spaces
-----------  --------   ----------------     ------------------
CBNAMING     BBONMS     IWMSSNM=&IWMSSNM     No limit
CBSYSMGT     BBOSMSS    IWMSSNM=&IWMSSNM     No limit
CBINTFRP     BBOIRS     IWMSSNM=&IWMSSNM     No limit
BBOASR1      BBOASR1S   IWMSSNM=&IWMSSNM     Single A.S./system
BBOASR2      BBOASR2S   IWMSSNM=&IWMSSNM     No limit

    For more information about workload management and WebSphere for
    z/OS, see WebSphere for z/OS: Installation and Configuration,
    Chapter 2, "Setting up workload management."
    -------------------------------------------------------------------

2.  Update BLSCUSER.  Refer to member BBOIPCSP in
    'GNITSAH.WAS7.CNTL'.
    In order to use the IPCS support provided by the product, append
    the contents of this member to the BLSCUSER member in
    SYS1.PARMLIB.

    -------------------------------------------------------------------

3.  Update SCHEDxx.  Refer to member BBOSCHED in
    'GNITSAH.WAS7.CNTL'.
    In order to set the correct program properties for the WebSphere
    run-time executables, append the contents of this member to the
    SCHEDxx member in
    SYS1.PARMLIB.

    -------------------------------------------------------------------

4.  APF-authorize the following data sets:

        BBO.SBBOLPA
        BBO.SBBOLOAD
        BBO.SBBOLD2

    Cut/paste the contents of BBOPROG in
    'GNITSAH.WAS7.CNTL'
    into your PROGxx member in
    SYS1.PARMLIB.

    RULE: The following library must be APF-authorized:
    CEE.SCEERUN

    -------------------------------------------------------------------

5.  If you want to collect the SMF120 records created by the run-time
    servers, update SMFPRMxx.

    a.  Update the SYS or SUBSYS(STC,...) statement for started tasks
        to include the 120 record.
    b.  (Optional) You can specify designated subtypes 1-6.

    EXAMPLE:

       SUBSYS(STC,EXITS(IEFU29,IEFACTRT),INTERVAL(SMF,SYNC),
                          TYPE(0,30,70:79,88,89,120,245))
                                                ---
    For details on the SMF records, see WebSphere for z/OS: Operations
    and Administration.

    -------------------------------------------------------------------

6.  Update your active BPXPRMxx member to have the WebSphere
    configuration
    HFS: OMVS.WAS.CONFIG.HFS,
    mounted at:
    /WebSphere390/CB390
    in read/write mode.

    EXAMPLE:

       MOUNT FILESYSTEM('OMVS.WAS.CONFIG.HFS')
         MOUNTPOINT('/WebSphere390/CB390')
          TYPE(HFS)
          MODE(RDWR)
    --------------------------------------------------------------------

7.  Update TCP/IP by reserving the following ports for WebSphere for
    z/OS:

       Daemon IP port            - 5555
       Daemon SSL port           - 5556
       Systems Management IP port - 900
       LDAP server IP port       - 1389

    View member BBOTCPIP in
    'GNITSAH.WAS7.CNTL'.
    Add the contents of this member to the PORT section of the file
    referenced by the DD statement for the TCP/IP profile in the
    TCP/IP start procedure.  Cut/paste from this member into the data
    set used by your installation.

    --------------------------------------------------------------------

8.  Use the following to place WebSphere for z/OS modules in either
    LPA or the link list:

    BBO.SBBOLPA
              Load all members into the LPA.

    BBO.SBBOLOAD
              We recommend you dynamically load all members into the
              LPA.  If your LPA is constrained, place the members in
              the link list.

    BBO.SBBOMIG
              You can put members into the link list or LPA.

    BBO.SBBOLD2
              Do NOT put members in the LPA. Place these members in
              the link list.

    BBO.SBBOULIB
              Do NOT put members in EITHER the LPA or link list.

    RULE:  These data sets are PDSEs and cannot be added to members
    LPALSTxx or IEALPAxx.

    RECOMMENDATION: For automation, if you want to ensure WebSphere
    for z/OS modules are loaded into dynamic LPA and available after
    an IPL, create a new PROGxx member with the SETPROG LPA commands
    and invoke the PROGxx member from PARMLIB COMMNDxx.

    EXAMPLE:

      SETPROG LPA,ADD,MASK=*,DSNAME=BBO.SBBOLOAD
      SETPROG LPA,ADD,MASK=*,DSNAME=BBO.SBBOLPA

    NOTE:  If using SETPROG on a running system, be sure to purge
    modules with the same name as those from the following data sets
    that are already in LPA:

    o   BBO.SBBOLPA
    o   BBO.SBBOLOAD
    o   BBO.SBBOMIG

    ATTENTION:  Be sure that the size of your LPA can hold the
    WebSphere for z/OS modules.  See the topic "Recommendations for
    using memory" in Chapter 2 of WebSphere for z/OS: Installation and
    Customization.

    --------------------------------------------------------------------
```

```
9.  Update the CFRM Policy.  Prior to using log streams that have been
    indicated as CF-resident, you must update the CFRM policy to
    define the structures to be used. Tailor member BBOWCFRM in the
    following data set to define the log streams:
    'GNITSAH.WAS7.CNTL'

    -------------------------------------------------------------------

Running the customized jobs
---------------------------

The customization dialog built a number of batch jobs with the
variables you supplied.  You must run the jobs in the order listed
below using user IDs with the appropriate authority.

Step for running the customized jobs

BEFORE YOU BEGIN: Complete the section above entitled "Doing manual
configuration updates."

Perform this step:

Follow the table below, which lists in order the jobs you must submit
and the commands you must enter. Special handling notes are included
in the table.  All jobs are members of
GNITSAH.WAS7.CNTL.

+----------------------------------------------------------------------+
| This series of jobs and commands is referred to as preparing the     |
| system for the bootstrap process.                                    |
+-----------+----------------------------------------------------------+
| BBOMSGC   | User ID requirement: Update authority for data set       |
+-----------+ SYS1.MSGENU and/or SYS1.MSGJPN.                          |
| Done:     |                                                          |
|           | This job sets up MMS to translate messages for           |
|           | WebSphere.                                               |
|           |                                                          |
| By:       | This is optional unless you require message translation. |
|           |                                                          |
|           | There are two steps to update SYS1.MSGENU and            |
|           | SYS1.MSGJPN. Remove the unneeded step and change the     |
|           | target libraries, if necessary.                          |
+-----------+----------------------------------------------------------+
| BBOERRLG  | User ID requirement: Authority to define a log stream.   |
+-----------+                                                          |
| Done:     | If your installation already created a WebSphere for     |
|           | z/OS error log stream, skip this step.                   |
|           |                                                          |
|           | This job defines the error log stream.                   |
| By:       |                                                          |
|           | The customization dialog supplied the required           |
|           | parameters on the define log stream command.  Review and |
|           | supply any options you require. For more information,    |
|           | see z/OS MVS Setting Up a Sysplex.                       |
|           |                                                          |
|           | RESULT: Upon successful completion of this job, you see  |
|           | the following message in SYSPRINT:                       |
|           |                                                          |
|           |   IXG004I LOGR POLICY PROCESSING ENDED WITHOUT ERROR     |
|           |                                                          |
+-----------+----------------------------------------------------------+
| BBORRSLS  | User ID requirement: Authority to define a log stream.   |
+-----------+                                                          |
| Done:     | If your installation already has Resource Recovery       |
|           | Services (RRS) active, skip this job.  To check to see   |
|           | if RRS is active, go to SDSF or the operator console and |
|           | look for an address space named "ATRRS."                 |
| By:       |                                                          |
|           | This job defines the RRS log streams.                    |
|           |                                                          |
|           | The RRS group name is by default the sysplex name.       |
|           |                                                          |
|           | RESULT: Upon successful completion of this job, you see  |
|           | the following message in SYSPRINT:                       |
|           |                                                          |
|           |   IXG004I LOGR POLICY PROCESSING ENDED WITHOUT ERROR     |
|           |                                                          |
+-----------+----------------------------------------------------------+
| BBOWCTR   | User ID requirement: Authority to allocate data set      |
+-----------+                                                          |
| Done:     | SYS1.AQFT.WAS390.CTRACE.                                 |
|           |                                                          |
|           | This job allocates the CTRACE data set used by           |
|           |                                                          |
| By:       | BBOWTR.                                                  |
+-----------+----------------------------------------------------------+
| BBOCBRAJ  | User ID requirement: Authority to update data set        |
+-----------+                                                          |
| Done:     | GNITSAH.WAS7.DATA.                                       |
|           |                                                          |
|           | This job builds (but does not execute) the RACF commands |
|           | for the WebSphere run-time servers and places them into  |
| By:       | member BBOWBRAK of data set                              |
|           |                                                          |
|           | GNITSAH.WAS7.DATA.                                       |
|           |                                                          |
|           | Carefully review these definitions with your security    |
|           | administrator.                                           |
+-----------+----------------------------------------------------------+
| BBOCBRAK  | User ID requirement: RACF Special authority.             |
+-----------+                                                          |
| Done:     | This job instantiates the security rules set up in the   |
|           | previous job by invoking RACF commands.                  |
|           |                                                          |
|           | RESULT: You may receive errors from this job, such as    |
| By:       | INVALID USER messages because a user ID is already       |
|           | defined.                                                 |
|           |                                                          |
+-----------+----------------------------------------------------------+
| BBOLDRAJ  | User ID requirement: Authority to update data set        |
+-----------+                                                          |
| Done:     | GNITSAH.WAS7.DATA.                                       |
|           |                                                          |
|           | This job builds (but does not execute) the RACF commands |
|           | for the LDAP server and places then into member BBOLDRAK |
| By:       | of data set                                              |
|           |                                                          |
|           | GNITSAH.WAS7.DATA.                                       |
|           |                                                          |
|           | Carefully review these definitions with your security    |
|           | administrator.                                           |
+-----------+----------------------------------------------------------+
| BBOLDRAK  | User ID requirement: RACF Special authority.             |
+-----------+                                                          |
| Done:     | This job instantiates the security rules for the LDAP    |
|           | server that were set up in the previous job.             |
|           |                                                          |
|           |                                                          |
| By:       |                                                          |
+-----------+----------------------------------------------------------+
| BBOWCHFS  | User ID requirement: UID=0 and authority to allocate     |
+-----------+                                                          |
| Done:     | OMVS.WAS.CONFIG.HFS.                                     |
|           |                                                        |
|           | This job:                                              |
|           |                                                        |
| By:       | o   Creates a mount point directory                    |
|           |                                                        |
|           |     /WebSphere390/CB390.                               |
|           |                                                        |
|           | o   Allocates the configuration HFS                    |
|           |                                                        |
|           |     OMVS.WAS.CONFIG.HFS                                |
|           |                                                        |
|           |     and mounts it at the above mount point.            |
|           |                                                        |
|           | BEFORE YOU BEGIN: Your root HFS must be mounted in     |
|           | read/write mode. If the root HFS is not in read/write  |
|           | mode, manually create the                              |
|           |                                                        |
|           | /WebSphere390/CB390                                    |
|           |                                                        |
|           | directory and any needed higher directories, set file  |
|           | permissions to 775, and set the owning user ID and group|
|           | to CBSYMSR1 and CBCFG1 before running BBOWCHFS.        |
|           |                                                        |
|           | EXAMPLE: If you plan to use /WebSphere390/CB390 as your|
|           | directory, issue the following commands from within the|
|           | OMVS shell:                                            |
|           |                                                        |
|           |   mkdir -p -m 775 /WebSphere390/CB390                  |
|           |   chown -R CBSYMSR1:CBCFG1 /WebSphere390               |
|           |                                                        |
+-----------+--------------------------------------------------------+
| BBOMCFG   | User ID requirement: UID=0.                            |
+-----------+                                                        |
| Done:     | This job populates the previously-created HFS.         |
|           |                                                        |
|           | Upon completion, examine the job output and use the z/OS|
|           | UNIX shell to examine the directory structure.  See    |
| By:       | WebSphere for z/OS:  Installation and Customization for|
|           | more information about BBOMCFG and the HFS structure it|
|           | creates.                                               |
|           |                                                        |
+-----------+--------------------------------------------------------+
| BBOWCPY1  | User ID requirement: UID=0 and update authority for:   |
+-----------+                                                        |
| Done:     |     SYS1.PROCLIB                                       |
|           |                                                        |
|           |     SYS1.PROCLIB                                       |
|           |                                                        |
| By:       |     SYS1.PARMLIB                                       |
|           |                                                        |
|           |     MY.SYSEXEC                                         |
|           |                                                        |
|           |     z/OS UNIX-resident files                           |
|           |                                                        |
|           | ATTENTION: This job modifies SYS1.PROCLIB.  Because    |
|           | master subsystem address spaces like ATRRRS and BBOWTR |
|           | must have their jobs in a PROCLIB listed in the master |
|           | scheduler JCL, we copy members to SYS1.PROCLIB. You may|
|           | have a private master subsystem PROCLIB to which you   |
|           | want to copy the members.                              |
|           |                                                        |
|           | This job copies the tailored start procedures,         |
|           | parameters, and EXECs to the run-time libraries.       |
|           |                                                        |
|           | The job also copies files into the HFS, such as the    |
|           | customized environment variable file and customized    |
|           | files for LDAP.                                        |
|           |                                                        |
|           |                                                       |
|           | Before you run this job, be sure the following exists in |
|           | the HFS:                                              |
|           |                                                       |
|           | o   /tmp directory                                    |
|           |                                                       |
|           |                                                       |
+-----------+-------------------------------------------------------+
| --------  | If Resource Recovery Services (RRS) is not active, issue |
+-----------+ the following MVS command.  To check to see if RRS is |
| Done:     | active, go to SDSF or the operator console and see if |
|           | "RRS" is active.                                      |
|           |                                                       |
|           |   START ATRRRS,SUB=MSTR                               |
| By:       |                                                       |
|           | Then start DB2:                                       |
|           |                                                       |
|           |   -DB2 START DB2                                      |
|           |                                                       |
+-----------+-------------------------------------------------------+
| BBOMCRDB  | User ID requirement: DB2 SYSADM authority.            |
+-----------+                                                       |
| Done:     | This job defines the WebSphere for z/OS system        |
|           | management database.                                  |
|           |                                                       |
|           | The job has two steps:                                |
| By:       |                                                       |
|           | 1.  The first step of this job attempts to delete the |
|           |     existing database. If you have never run this job, |
|           |     the attempt will not be successful. This is OK.   |
|           |                                                       |
|           | 2.  The second step defines the system management     |
|           |     database.  Make certain step 2 runs correctly.    |
|           |                                                       |
|           |     NOTE:  Some tables created by BBOMCRDB require a 32K |
|           |     buffer pool.  If you do not have one, create a 32K |
|           |     buffer pool before you run this job.              |
|           |                                                       |
+-----------+-------------------------------------------------------+
| BBOBIND   | User ID requirement: DB2 SYSADM authority.            |
+-----------+                                                       |
| Done:     | This job binds the system management database.        |
|           |                                                       |
|           |                                                       |
|           |                                                       |
| By:       |                                                       |
+-----------+-------------------------------------------------------+
| BBO2JCL   | User ID requirement: DB2 SYSADM authority.            |
+-----------+                                                       |
| Done:     | This binds the DBRMs in the DSNACLI plan into a package |
|           | CBLIFECYCLE_PKG used by the WebSphere servers.        |
|           |                                                       |
|           | You may get return code 4 and the messages            |
| By:       |                                                       |
|           |   ONLY IBM-SUPPLIED PACKAGE-IDS SHOULD BEGIN WITH  "DSN" |
|           |   SYSIBM.SYSLOCATIONS IS NOT DEFINED                  |
|           |                                                       |
|           | This is OK.                                           |
+-----------+-------------------------------------------------------+
| BBOTDBMC  | User ID requirement: DB2 SYSADM authority             |
+-----------+                                                       |
| Done:     |                                                       |
|           | This job creates the LDAP database and table spaces for |
| By:       | your TDBM backend.                                    |
|           |                                                       |
|           | NOTE:  To delete the database, use job BBOLDTBD.  See |
|           | the description of this job at the end of these       |
|           | instructions.                                             |
|           |                                                           |
|           | RESULTS: Upon completion, you should see the following    |
|           | messages in the job log:                                  |
|           |                                                           |
|           | COMMIT                                                    |
|           | DSNT400I SQLCODE = 000,  SUCCESSFUL EXECUTION             |
|           |                                                           |
+-----------+-----------------------------------------------------------+
| BBO1JCL   | User ID requirement: DB2 SYSADM authority.                |
+-----------+                                                           |
| Done:     | If plan DSNACLI has already been bound in your            |
|           | installation, do not run this job. Proceed to the next    |
|           | step.                                                     |
|           |                                                           |
| By:       | This job binds the DSNACLI plan.                          |
|           |                                                           |
|           | You may get return code 4 and the messages                |
|           |                                                           |
|           |   ONLY IBM-SUPPLIED PACKAGE-IDS SHOULD BEGIN WITH "DSN"   |
|           |   SYSIBM.SYSLOCATIONS IS NOT DEFINED                      |
|           |                                                           |
|           | This is OK.                                               |
+-----------+-----------------------------------------------------------+
| BBOCBGRT  | User ID requirement: DB2 SYSADM authority.                |
+-----------+                                                           |
| Done:     | This job grants access to the system management           |
|           | databases.  You may get return code 4 and the message     |
|           |                                                           |
|           |   THE GRANTEE ALREADY HAS THE PRIVILEGE FROM THE GRANTOR  |
| By:       |                                                           |
|           | This is OK.                                               |
+-----------+-----------------------------------------------------------+
| BBOLDGRT  | User ID requirement: DB2 SYSADM authority.                |
+-----------+                                                           |
| Done:     | This job grants access to the LDAP databases.             |
|           |                                                           |
| By:       | RESULTS:  You may get return code 4 and the message       |
|           |                                                           |
|           | THE GRANTEE ALREADY HAS THE PRIVILEGE FROM THE GRANTOR    |
|           |                                                           |
|           | This is OK. Otherwise, you should see messages like the   |
|           | following in the job log:                                 |
|           |                                                           |
|           | GRANT DBADM ON DATABASE BBOLDAP    TO CBLDAP              |
|           | DSNT400I SQLCODE = 000,  SUCCESSFUL EXECUTION             |
|           |                                                           |
+-----------+-----------------------------------------------------------+
| --------  | Issue the MVS command:                                    |
+-----------+                                                           |
| Done:     |   START BBOLDAP                                           |
|           |                                                           |
|           | This command starts the LDAP server, which is used for    |
|           | J2EE servers.                                             |
| By:       |                                                           |
|           | RESULT: Look at the SYSPRINT and at SYSLOG for:           |
|           |                                                           |
|           |   GLD0122I Slapd is ready for requests.                   |
|           |                                                           |
|           | Keep the LDAP server running throughout the following     |
|           | steps.                                                    |
|           |                                                           |
+-----------+-----------------------------------------------------------+
| BBOMTDBM  |                                                           |
+-----------+                                                           |
| Done:     | User ID requirement: CBADMIN                              |
|           | command                                                   |
| By:       |                                                          |
|           |                                                          |
|           | This job primes the LDAP database.                       |
|           |                                                          |
|           | RESULTS:  You should see messages like the following in  |
|           | the job log:                                             |
|           |                                                          |
|           | adding new entry CN=LOCALHOST                            |
|           |                                                          |
|           | adding new entry o=BOSS,c=US                             |
|           |                                                          |
|           | adding new entry ...                                     |
|           |                                                          |
+-----------+----------------------------------------------------------+
| --------  | Issue the MVS command:                                   |
+-----------+                                                          |
| Done:     |   TRACE CT,WTRSTART=BBOWTR                               |
|           |                                                          |
|           | This command starts the CTRACE writer used by WebSphere. |
|           |                                                          |
| By:       | RESULT: Check the SYSLOG for:                            |
|           |                                                          |
|           |   ITT110T INITIALIZATION OF CTRACE WRITER COMPLETE.      |
|           |                                                          |
+-----------+----------------------------------------------------------+
| The following series of commands and jobs is called collectively the |
| bootstrap process. The bootstrap process is how WebSphere loads its  |
| configuration data from installation and product-provided            |
| information.                                                         |
+-----------+----------------------------------------------------------+
| --------  | Start and stop the servers.                              |
+-----------+                                                          |
| Done:     | Issue the MVS command:                                   |
|           |                                                          |
|           |   START BBODMN.DAEMON01,PARMS='-ORBCBI COLD'             |
|           |                                                          |
| By:       | This command performs phase 1 of the bootstrap.          |
|           |                                                          |
|           | When the message                                         |
|           |                                                          |
|           |   BBOU0134I WS BOOTSTRAP PHASE 1 IS COMPLETE.            |
|           |                                                          |
|           | appears on the console (also in the job log of           |
|           | BBOSMSS), issue the command:                             |
|           |                                                          |
|           |   STOP DAEMON01                                          |
|           |                                                          |
|           | If the Daemon and all servers fail to terminate, issue   |
|           | the command                                              |
|           |                                                          |
|           |   CANCEL DAEMON01                                        |
|           |                                                          |
+-----------+----------------------------------------------------------+
| --------  | Restart the servers.                                     |
+-----------+                                                          |
| Done:     | Issue the MVS command                                    |
|           |                                                          |
|           |   START BBODMN.DAEMON01                                  |
|           |                                                          |
| By:       | This command restarts the Daemon and the other run-time  |
|           | servers.  Wait until all servers are finished            |
|           | initializing.                                            |
+-----------+----------------------------------------------------------+
| BBONMC    | User ID requirement:  *** CBADMIN user ID. ***           |
+-----------+                                                          |
| Done:     | This job runs the naming client.                         |
|           |                                                          |
|           | RESULT: Upon completion, you should see the following in |
|           | SYSPRINT:                                                |
| By:       |                                                          |
|           |   BBOU0126I: The configuration of the global NameSpace   |
|           |              has succeeded.                              |
|           |              NameSpace configuration has been committed. |
|           |                                                          |
+-----------+----------------------------------------------------------+
| BBOIRC    | User ID requirement: *** CBADMIN user ID.  ***           |
+-----------+                                                          |
| Done:     | This job runs the first Interface Repository client.     |
|           |                                                          |
|           | RESULT: Upon completion, you should see the following in |
|           | SYSPRINT:                                                |
| By:       |                                                          |
|           |   BBOU0185I IR Bootstrap completed successfully for      |
|           |             INTFRP01                                     |
|           |                                                          |
+-----------+----------------------------------------------------------+
| --------  | Stop the servers.                                        |
+-----------+                                                          |
| Done:     | Issue the MVS command                                    |
|           |                                                          |
|           |   STOP  DAEMON01                                         |
|           |                                                          |
| By:       | Wait until all servers are finished terminating.  If the |
|           | servers fail to terminate, issue command:                |
|           |                                                          |
|           |   CANCEL DAEMON01                                        |
|           |                                                          |
+-----------+----------------------------------------------------------+
| --------  | Start and stop the servers to complete the bootstrap.    |
+-----------+                                                          |
| Done:     | Issue the MVS command                                    |
|           |                                                          |
|           |   START BBODMN.DAEMON01,PARMS='-ORBCBI COLD'             |
|           |                                                          |
| By:       | When the message                                         |
|           |                                                          |
|           |   BBOU0131I THE WEBSPHERE BOOTSTRAP HAS COMPLETED        |
|           |                                                          |
|           | appears on the console (also in the job log of           |
|           | BBOSMSS), issue the command:                             |
|           |                                                          |
|           |   STOP DAEMON01                                          |
|           |                                                          |
|           | If the Daemon and all servers fail to terminate, issue   |
|           | the command                                              |
|           |                                                          |
|           |   CANCEL DAEMON01                                        |
|           |                                                          |
+-----------+----------------------------------------------------------+
| --------  | Restart the servers.                                     |
+-----------+                                                          |
| Done:     | Issue the MVS command                                    |
|           |                                                          |
|           |   START BBODMN.DAEMON01                                  |
|           |                                                          |
| By:       | Wait until all servers are finished initializing.        |
+-----------+----------------------------------------------------------+
| BBOIRC2   | User ID requirement: CBADMIN user ID.                    |
+-----------+                                                          |
| Done:     | This job runs the second Interface Repository client.    |
|           |                                                          |
|           | Run this job with a user ID that is in the access list   |
|           | for the CORBA portion of the name space.                 |
| By:       |                                                          |
|           |                                                          |
|           | Check for a return code 0. If the job fails before       |
|           | completing:                                              |
|           |                                                          |
|           | 1.  Check the job log to determine the step at which the |
|           |     failure occurred.                                    |
|           |                                                          |
|           | 2.  Solve the problem that caused the failure.           |
|           |                                                          |
|           | 3.  In the job, change the START variable to restart at  |
|           |     the failed step. For instance, if the job failed at  |
|           |     step 39, change the START variable to read START=39. |
|           |                                                          |
|           | 4.  Resubmit the job.                                    |
|           |                                                          |
|           | If you get message BBOU0713W and/or abend EC3            |
|           | rsn-04130001, indicating a time-out, do the following:   |
|           |                                                          |
|           | 1.  Update the OTS_DEFAULT_TIMEOUT and                   |
|           |     OTS_MAXIMUM_TIMEOUT values in the environment file   |
|           |     for the INTFRP01 server instance.  The environment   |
|           |     file is located in:                                  |
|           |                                                          |
|           |       /WebSphere390/CB390                                |
|           |         /controlinfo                                     |
|           |            /envfile                                      |
|           |               /MCLXCF01                                  |
|           |                  /INTFRP01/configuration.env             |
|           |                                                          |
|           |     Set the values of both environment variables to 3600 |
|           |     or greater.                                          |
|           |                                                          |
|           | 2.  Re-run BBOIRC2, starting at the failed step as       |
|           |     explained above.                                     |
|           |                                                          |
|           | 3.  After BBOIRC2 completes successfully, re-set the     |
|           |     OTS_DEFAULT_TIMEOUT and OTS_MAXIMUM_TIMEOUT values   |
|           |     to 300.                                              |
|           |                                                          |
+-----------+----------------------------------------------------------+
| The product is now installed and ready to have application servers   |
| defined. Return to WebSphere for z/OS: Installation and              |
| Customization, Chapter 3, where you will:                            |
|                                                                      |
| o   Install the Administration and Operations applications on your   |
|     workstation                                                      |
|                                                                      |
| o   Run the Administration application to define servers for the     |
|     installation verification programs (IVPs)                        |
|                                                                      |
| o   Test the system using the IVPs.                                  |
|                                                                      |
+----------------------------------------------------------------------+

The following are jobs used by the IVPs and are used later in the
installation and customization process.  The information is provided
for reference purposes. For complete instructions about how to run the
jobs, see WebSphere for z/OS: Installation and Customization.

+-----------+----------------------------------------------------------+
| BBOICD    | User ID requirement: DB2 SYSADM authority.               |
+-----------+                                                          |
| Done:     | This job creates the Policy database used in the Policy  |
|           | IVP.  See WebSphere for z/OS: Installation and           |
|           | Customization for information about how to run this job. |
|           |                                                          |
| By:       |                                                          |
+-----------+----------------------------------------------------------+
| BBOIBN    | User ID requirement: DB2 SYSADM authority.               |
+-----------+                                                          |
| Done:     | This job binds the IVP Policy database.  See WebSphere   |
|           | for z/OS: Installation and Customization for information |
|           | about how to run this job.                               |
|           |                                                          |
| By:       |                                                          |
+-----------+----------------------------------------------------------+
| BBOIGRT   | User ID requirement: DB2 SYSADM authority.               |
+-----------+                                                          |
| Done:     | This job grants access to the IVP databases.  You may    |
|           | get return code 4 and the message                        |
|           |                                                          |
|           |   THE GRANTEE ALREADY HAS THE PRIVILEGE FROM THE GRANTOR |
| By:       |                                                          |
|           | This is OK.                                              |
+-----------+----------------------------------------------------------+
| BBOIVP    | User ID requirement: CBIVP                               |
+-----------+                                                          |
| Done:     | This job will run the CORBA (MOFW) IVP to test CORBA     |
|           | support.  See WebSphere for z/OS: Installation and       |
|           | Customization for information about how to run this job. |
|           |                                                          |
| By:       |                                                          |
+-----------+----------------------------------------------------------+
| BBOIVPE   | User ID requirement: CBIVP2                              |
+-----------+                                                          |
| Done:     | This job will run the J2EE IVP to test J2EE support.     |
|           | See WebSphere for z/OS: Installation and Customization   |
|           | for information about how to run this job.               |
|           |                                                          |
| By:       |                                                          |
+-----------+----------------------------------------------------------+

The following jobs may be useful when you define CORBA servers or
perform diagnostics.

+-----------+----------------------------------------------------------+
| BBONDUTL  | User ID requirement: CBADMIN                             |
+-----------+                                                          |
| Done:     | This job will dump the name space.  Use it for           |
|           | diagnostic purposes.                                     |
|           |                                                          |
|           |                                                          |
| By:       |                                                          |
+-----------+----------------------------------------------------------+
| BBOIRC3   | User ID requirement: CBADMIN                             |
+-----------+                                                          |
| Done:     | This job will update the interface repository server.    |
|           | Use it after installing a CORBA application. The job     |
|           | calls the executable module in a PDS.                    |
|           |                                                          |
| By:       |                                                          |
+-----------+----------------------------------------------------------+
| BBOIRC3A  | User ID requirement: CBADMIN                             |
+-----------+                                                          |
| Done:     | This job will update the interface repository server.    |
|           | Use it after installing a CORBA application. The job     |
|           | calls the executable module in the HFS.                  |
|           |                                                          |
| By:       |                                                          |
+-----------+----------------------------------------------------------+

The following are useful scripts that help you define security
controls for servers. They are in data set
'GNITSAH.WAS7.DATA'.
```

```
+-----------+--------------------------------------------------------+
| BBOWBRAC  | This is a sample exec that you may modify to include   |
+-----------+ installation-specific RACF controls. This exec defines |
| Done:     | all the user IDs and groups that are necessary and     |
|           | sufficient for installing WebSphere for z/OS and running|
|           | the initial verification program (IVP).                |
|           |                                                        |
| By:       | Additionally, there are commented sections for other   |
|           | components that might be used (for example, SSL, DCE). |
+-----------+--------------------------------------------------------+
| BBOWLDRA  |                                                        |
+-----------+ This script generates RACF commands for for the LDAP   |
| Done:     | server used by WebSphere.                              |
|           |                                                        |
|           |                                                        |
|           |                                                        |
| By:       |                                                        |
+-----------+--------------------------------------------------------+

The following job deletes the LDAP database. The job is a member of
GNITSAH.WAS7.CNTL.

+-----------+--------------------------------------------------------+
| BBOLDTBD  | User ID requirement: DB2 SYSADM authority.             |
+-----------+                                                        |
| Done:     | Optional.                                              |
|           |                                                        |
|           | ATTENTION:  This job DELETES the LDAP database and table|
| By:       | spaces.  Run this job only if the LDAP database creation|
|           | job has been run and you need to delete the LDAP       |
|           | database.                                              |
+-----------+--------------------------------------------------------+
```

Sample customized migration instructions

Following are sample migration instructions for migrating WebSphere for z/OS V4.0 to V4.0.1 that are produced by the customization dialog. You can use the sample instructions for pre-migration planning. Be sure to follow the instructions you generate for your system, since they will differ from the sample.

```
------------------------------------------------------------------------
Instructions for migrating from WebSphere for z/OS V4.0 to V4.0.1

The customization dialog has created migration jobs based on the
information you provided. These instructions tell you how to modify
the operating system and run the jobs for migrating to WebSphere for
z/OS V4.0.1.

RULES:

1.  If you created the target data sets

        GNITSAH.WAS4.CNTL
        GNITSAH.WAS4.DATA

    on another (driving) system, you must copy them to the target
    system and give them the same data set names.
```

2. You must perform these instructions on your target system.

3. You must use the jobs newly-created by the customization dialog, not your old V4.0 jobs, some of which have the same data set member names.

There are two procedures you can follow. Base your choice of which procedure to use on the following table:

IF YOU ARE MIGRATING TO WEBSPHERE FOR Z/OS V4.0.1 AND ...	THEN FOLLOW . . .	NOTES
You can interrupt service to clients (either on a monoplex or a sysplex)	"Steps for performing a warm start from WebSphere for z/OS V4.0 to V4.0.1 with a system or sysplex-wide restart"	
You cannot interrupt service to clients	"Steps for performing a rolling warm start from WebSphere for z/OS V4.0 to V4.0.1"	A rolling warm start requires the dual HFS structure described in "Overview of creating the proper HFS structure for upgrades" in WebSphere for z/OS: Installation and Customization.

Steps for performing a warm start from WebSphere for z/OS V4.0 to V4.0.1 with a system or sysplex-wide restart

BEFORE YOU BEGIN: You must be prepared to stop WebSphere for z/OS. If you have WebSphere for z/OS running in a sysplex as a host cluster, this procedure has you shut down the entire host cluster.

If you have WebSphere for z/OS running in a sysplex as a host cluster and want to maintain service to your clients during the warm start, see "Steps for performing a rolling warm start from WebSphere for z/OS V4.0 to V4.0.1."

You must copy the target data sets

```
GNITSAH.WAS4.CNTL
GNITSAH.WAS4.DATA
```

to your target system and give them the same data set names.

You must be running on your target system.

Perform the following steps to do the warm start.

1. Back up your current system. This includes:

   o The system management database

   o The LDAP database tables containing the naming space and the interface repository

   o Files in the HFS containing WebSphere for z/OS run-time information (usually mounted at "/WebSphere390/CB390").

```
    o   WebSphere for z/OS PROCLIBs

    o   WebSphere for z/OS LOADLIBs

    For more information, see "Guidelines for backup of the WebSphere
    for z/OS system" in WebSphere for z/OS: Installation and
    Customization.

    -------------------------------------------------------------------

2.  Stop all application servers and WebSphere for z/OS (on a sysplex,
    stop all clustered host instances).

    -------------------------------------------------------------------

3.  Unmount the WebSphere for z/OS V4.0 HFSes and mount the WebSphere
    for z/OS V4.0.1 HFSes:

    o   /usr/lpp/WebSphere
    o   /usr/lpp/java/IBM/J1.3

    -------------------------------------------------------------------

4.  If not already authorized, APF-authorize the following data sets:

        BBO.SBBOLPA
        BBO.SBBOLOAD
        BBO.SBBOLD2

    -------------------------------------------------------------------

5.  On either the monoplex or one system in the sysplex, do the
    following:

    a.  Run the following jobs.  The jobs are in
        GNITSAH.WAS4.CNTL.

+-----------+-----------------------------------------------------+
| BBOMCFG   | User ID requirement: UID=0.                         |
+-----------+                                                     |
| Done:     | This job updates the HFS previously-created for V4.0.|
|           |                                                     |
|           | Upon completion, examine the job output and use the z/OS
|           | UNIX shell to examine the directory structure.  For more
| By:       | information about BBOMCFG and the HFS structure it  |
|           | creates, see WebSphere for z/OS:  Installation and  |
|           | Customization.                                      |
+-----------+-----------------------------------------------------+
| BBOMPAT2  | User ID requirement: DB2 SYSADM authority.          |
+-----------+                                                     |
| Done:     | This job is a patch utility for the system management
|           | database.                                           |
|           |                                                     |
|           |                                                     |
| By:       |                                                     |
+-----------+-----------------------------------------------------+
| BBOBIND   | User ID requirement: DB2 SYSADM authority.          |
+-----------+                                                     |
| Done:     | This job rebinds the system management database.    |
|           |                                                     |
|           |                                                     |
|           |                                                     |
| By:       |                                                     |
+-----------+-----------------------------------------------------+
| BBOIVPP   | User ID requirement: DB2 SYSADM authority.          |
+-----------+                                                     |
| Done:     | This job is a patch job for the database used by the      |
|           | installation verification programs (IVPs).                |
|           |                                                           |
|           |                                                           |
| By:       |                                                           |
+-----------+-----------------------------------------------------------+
| BBOIBN    | User ID requirement: DB2 SYSADM authority.                |
+-----------+                                                           |
| Done:     | This job re-binds the database used by the installation   |
|           | verification programs (IVPs).                             |
|           |                                                           |
|           |                                                           |
| By:       |                                                           |
+-----------+-----------------------------------------------------------+
| BBOWMCP1  | Optional job.                                             |
+-----------+                                                           |
| Done:     | User ID requirement: Update authority for SYS1.PROCLIB.   |
|           |                                                           |
|           | ATTENTION: This job copies start procedures to            |
|           | SYS1.PROCLIB.  You may have a private master subsystem    |
| By:       | PROCLIB to which you want to copy the start procedures.   |
|           |                                                           |
|           | This job copies the tailored WebSphere for z/OS start     |
|           | procedures for the Daemon, System Management Server,      |
|           | Naming Server, Interface Repository Server, and IVP       |
|           | servers.  If you made additional changes to the V4.0      |
|           | start procedures, skip this job, do your changes, and     |
|           | copy the jobs by hand.                                    |
+-----------+-----------------------------------------------------------+
| BBOWMCP2  | User ID requirement: UID=0                                |
+-----------+                                                           |
| Done:     | This job copies                                           |
|           |                                                           |
|           | o   The J2EE IVP shell script to                          |
|           |     /tmp                                                  |
| By:       |                                                           |
|           | o   The CORBA IVP shell script to                         |
|           |     /tmp                                                  |
|           |                                                           |
+-----------+-----------------------------------------------------------+
```

b. Either re-catalog your system PROCLIB or modify your server start procedures, PROGxx, and link list to point to the data sets with the new code.

c. Delete, then add the new run-time modules into LPA and update the link list. You can do this dynamically, but IBM recommends you re-IPL the system.

d. Start the Daemon and application servers.

----

6. If you are running on a sysplex, for each system, one at at time, do the following:

   a. Either re-catalog your system PROCLIB or modify your server start procedures, PROGxx, and link list to point to the data sets with the new code.

   b. Delete, then add the new run-time modules into LPA and update the link list. You can do this dynamically, but IBM recommends you re-IPL the system.

   c. Start the Daemon and application servers.

      RESULT: When all run-time and application servers throughout

```
        the monoplex or sysplex have been restarted, you receive
        messages that the servers are ready for a warm start.

          BBOU0579I CB SERIES SERVER <server> IS READY FOR WARMSTART.

        where <server> is the name of the server.

        TIPS:

        o   If you do not receive message BBOU0579I, it may be that
            you have not restarted all run-time and application
            instances in the sysplex on the new code.  Even though you
            may not be using all run-time and application server
            instances, they are defined to system management and
            system management will not issue the message until all
            server instances are restarted on the new code.  Either
            restart all run-time and application server instances, or
            run the Administration application (SM EUI) and delete the
            run-time and application server instances you no longer
            use.

        o   There is no time limit set when you must warm start
            WebSphere for z/OS.

        o   The Operations application flags servers ready for warm
            start with a green bullet.

    -------------------------------------------------------------------

7.  Download and install the new level of the Administration
    application (SM EUI).

    NOTES:

    a.  The new level of the Administration application is designed to
        function within a sysplex in which some WebSphere for z/OS
        systems have been warm-started and some have not.

    b.  During the first connection between the Administration
        application and the system management server, each exchanges
        its code level information and the Administration application
        adjusts its processing accordingly. Administration application
        messages indicate potential mismatches.

    c.  In a sysplex, the Administration application may be
        reconnected from one system management server instance to
        another one during the warm start phase. The reconnection may
        cause a functional level switch. If this happens, you will
        receive a message requesting an explicit reconnection.
        Because the functional level of the Administration application
        depends on the functional level of the system management
        server to which it is connected, new functions may become
        visible or invisible during functional level switches.  For
        this reason, start using the new functions only after you have
        warm-started all systems successfully.

    -------------------------------------------------------------------

8.  When all servers are ready for warm start, on either the monoplex
    or each system in the sysplex, one at a time, do the following:

    a.  Stop the application servers and the Daemon.

    b.  Start the Daemon with the warm start option:

          s bbodmn,srvname='...',parms='-ORBCBI WARM'
```

c. Start your application servers with the warm start option:

```
s <server_proc>,srvname='...',parms='-ORBCBI WARM'
```

where <server_proc> is the application server start procedure.

You can also do the warm start for the application servers through the Operations application.

----

9. Run the following job. The job is in GNITSAH.WAS4.CNTL.

```
+-----------+---------------------------------------------------------+
| BBOWCMIG  | User ID requirement: a user ID that has Systems         |
+-----------+ Management administrative authority, such as CBADMIN.   |
| Done:     |                                                         |
|           | This job migrates J2EE servers with a V4.0 level of the |
|           | RemoteWebContainer object installed to a V4.0.1         |
|           | RemoteWebContainer object. Servlets and JSPs require    |
| By:       | this object in the server.                              |
|           |                                                         |
|           | If you receive a return code other than 0, see WebSphere|
|           | for z/OS: System Management Scripting API for problem   |
|           | determination information.                              |
+-----------+---------------------------------------------------------+
```

----

10. Re-run the installation verification programs (IVPs). For more information, see "Running the WebSphere for z/OS installation verification programs (IVPs)" in Chapter 3 of WebSphere for z/OS: Installation and Customization.

You are done when WebSphere for z/OS and all your application servers are running and the IVPs run successfully.

Steps for performing a rolling warm start from WebSphere for z/OS V4.0 to V4.0.1

BEFORE YOU BEGIN: You must have an HFS structure as described in "Recommendations for the HFS structure" in WebSphere for z/OS: Installation and Customization.

You must copy the target data sets

```
GNITSAH.WAS4.CNTL
GNITSAH.WAS4.DATA
```

to your target system and give them the same data set names.

You must be running on your target system.

Perform the following steps to do the warm start.

1. Back up your current system. This includes:

   o The system management database

```
    o   The LDAP database tables containing the naming space and the
        interface repository

    o   Files in the HFS containing WebSphere for z/OS run-time
        information (usually mounted at "/WebSphere390/CB390").

    o   WebSphere for z/OS PROCLIBs

    o   WebSphere for z/OS LOADLIBs

    For more information, see "Guidelines for backup of the WebSphere
    for z/OS system" in WebSphere for z/OS: Installation and
    Customization.

    -------------------------------------------------------------------

2.  Set up your version-specific HFS for the new level of code.

    -------------------------------------------------------------------

3.  If not already authorized, APF-authorize the following data sets:

        BBO.SBBOLPA
        BBO.SBBOLOAD
        BBO.SBBOLD2

    -------------------------------------------------------------------

4.  Select a clustered host instance to begin the warm start process.
    On that clustered host instance:

    a.  Stop the application servers and the WebSphere for z/OS
        Daemon.

    b.  Switch the HFS that your system references with the SETOMVS
        command. Use the command to change the $VERSION symbolic.

        EXAMPLE: Previously, the $VERSION symbolic was VersionA for
        all systems in the sysplex. Through the use of a built-in
        symbolic link, references to /usr resolved to VersionA/usr. To
        switch the HFS that this system references to, say, VersionB,
        issue:

          setomvs version=VersionB

    c.  Run the following jobs.  The jobs are in
        GNITSAH.WAS4.CNTL.

+-----------+----------------------------------------------------------+
| BBOMCFG   | User ID requirement: UID=0.                              |
+-----------+                                                          |
| Done:     | This job updates the HFS previously-created for V4.0.    |
|           |                                                          |
|           | Upon completion, examine the job output and use the z/OS |
|           | UNIX shell to examine the directory structure.  For more |
| By:       | information about BBOMCFG and the HFS structure it       |
|           | creates, see WebSphere for z/OS:  Installation and       |
|           | Customization.                                           |
+-----------+----------------------------------------------------------+
| BBOMPAT2  | User ID requirement: DB2 SYSADM authority.               |
+-----------+                                                          |
| Done:     | This job is a patch utility for the system management    |
|           | database.                                                |
|           |                                                          |
|           |                                                          |
| By:       |                                                          |
+-----------+----------------------------------------------------------+
| BBOBIND   | User ID requirement: DB2 SYSADM authority.                |
+-----------+                                                           |
| Done:     | This job rebinds the system management database.          |
|           |                                                           |
|           |                                                           |
|           |                                                           |
| By:       |                                                           |
+-----------+-----------------------------------------------------------+
| BBOIVPP   | User ID requirement: DB2 SYSADM authority.                |
+-----------+                                                           |
| Done:     | This job is a patch job for the database used by the      |
|           | installation verification programs (IVPs).                |
|           |                                                           |
|           |                                                           |
| By:       |                                                           |
+-----------+-----------------------------------------------------------+
| BBOIBN    | User ID requirement: DB2 SYSADM authority.                |
+-----------+                                                           |
| Done:     | This job re-binds the database used by the installation   |
|           | verification programs (IVPs).                             |
|           |                                                           |
|           |                                                           |
| By:       |                                                           |
+-----------+-----------------------------------------------------------+
| BBOWMCP1  | Optional job.                                             |
+-----------+                                                           |
| Done:     | User ID requirement: Update authority for SYS1.PROCLIB.   |
|           |                                                           |
|           | ATTENTION: This job copies start procedures to            |
|           | SYS1.PROCLIB.  You may have a private master subsystem    |
| By:       | PROCLIB to which you want to copy the start procedures.   |
|           |                                                           |
|           | This job copies the tailored WebSphere for z/OS start     |
|           | procedures for the Daemon, System Management Server,      |
|           | Naming Server, Interface Repository Server, and IVP       |
|           | servers.  If you made additional changes to the V4.0      |
|           | start procedures, skip this job, do your changes, and     |
|           | copy the jobs by hand.                                    |
+-----------+-----------------------------------------------------------+
| BBOWMCP2  | User ID requirement: UID=0                                |
+-----------+                                                           |
| Done:     | This job copies                                           |
|           |                                                           |
|           | o   The J2EE IVP shell script to                          |
|           |     /tmp                                                  |
| By:       |                                                           |
|           | o   The CORBA IVP shell script to                         |
|           |     /tmp                                                  |
|           |                                                           |
+-----------+-----------------------------------------------------------+
```

d. Either re-catalog your system PROCLIB or modify your server start procedures, PROGxx, and link list to point to the data sets with the new code.

e. Delete, then add the new run-time modules into LPA and update the link list. You can do this dynamically, but IBM recommends you re-IPL the system.

f. Start the Daemon and application servers.

----

5. For each of the remaining clustered host instances, one at a time, do the following:

   a. Stop the application servers and the WebSphere for z/OS

```
        Daemon.

    b.  Either re-catalog your system PROCLIB or modify your server
        start procedures, PROGxx, and link list to point to the data
        sets with the new code.

    c.  Delete, then add the new run-time modules into LPA and update
        the link list. You can do this dynamically, but IBM recommends
        you re-IPL the system.

    d.  Switch the HFS that your system references with the SETOMVS
        command. Use the command to change the $VERSION symbolic.

        EXAMPLE: Previously, the $VERSION symbolic was VersionA for
        all systems in the sysplex. Through the use of a built-in
        symbolic link, references to /usr resolved to VersionA/usr. To
        switch the HFS that this system references to, say, VersionB,
        issue:

          setomvs version=VersionB

    e.  Start the Daemon and application servers.

        RESULT:  When all run-time and application servers throughout
        the sysplex have been restarted, you receive messages that the
        servers are ready for a warm start.

          BBOU0579I CB SERIES SERVER <server> IS READY FOR WARMSTART.

        where <server> is the name of the server.

        TIPS:

        o   If you do not receive message BBOU0579I, it may be that
            you have not restarted all run-time and application
            instances in the sysplex on the new code.  Even though you
            may not be using all run-time and application server
            instances, they are defined to system management and
            system management will not issue the message until all
            server instances are restarted on the new code.  Either
            restart all run-time and application server instances, or
            run the Administration application (SM EUI) and delete the
            run-time and application server instances you no longer
            use.

        o   There is no time limit set when you must warm start
            WebSphere for z/OS.

        o   The Operations application flags servers ready for warm
            start with a green bullet.

    -------------------------------------------------------------------

6.  Download and install the new level of the Administration
    application (SM EUI).

    NOTES:

    a.  The new level of the Administration application is designed to
        function within a sysplex in which some WebSphere for z/OS
        systems have been warm-started and some have not.

    b.  During the first connection between the Administration
        application and the system management server, each exchanges
        its code level information and the Administration application
        adjusts its processing accordingly. Administration application
        messages indicate potential mismatches.
```

c. In a sysplex, the Administration application may be reconnected from one system management server instance to another one during the warm start phase. The reconnection may cause a functional level switch. If this happens, you will receive a message requesting an explicit reconnection. Because the functional level of the Administration application depends on the functional level of the system management server to which it is connected, new functions may become visible or invisible during functional level switches. For this reason, start using the new functions only after you have warm-started all systems successfully.

----

7. On each system in the sysplex do the following, one at a time:

   a. Stop the application servers and the Daemon.

   b. Start the Daemon with the warm start option:

      ```
      s bbodmn,srvname='...',parms='-ORBCBI WARM'
      ```

   c. Start your application servers with the warm start option:

      ```
      s <server_proc>,srvname='...',parms='-ORBCBI WARM'
      ```

      where <server_proc> is the application server start procedure.

      You can also do the warm start for the application servers through the Operations application.

----

8. Run the following job. The job is in:
   GNITSAH.WAS4.CNTL

```
+-----------+-----------------------------------------------------------+
| BBOWCMIG  | User ID requirement: a user ID that has Systems           |
+-----------+ Management administrative authority, such as CBADMIN.     |
| Done:     |                                                           |
|           | This job migrates J2EE servers with a V4.0 level of the   |
|           | RemoteWebContainer object installed to a V4.0.1           |
|           | RemoteWebContainer object. Servlets and JSPs require      |
| By:       | this object in the server.                                |
|           |                                                           |
|           | If you receive a return code other than 0, see WebSphere  |
|           | for z/OS: System Management Scripting API for problem     |
|           | determination information.                                |
+-----------+-----------------------------------------------------------+
```

----

9. Re-run the installation verification programs (IVPs). For more information, see "Running the WebSphere for z/OS installation verification programs (IVPs)" in Chapter 3 of WebSphere for z/OS: Installation and Customization.

You are done when WebSphere for z/OS and all your application servers are running and the IVPs run successfully.

Sample LDAP TDBM migration instructions

The following are sample customized instructions from the customization dialog for the LDAP TDBM migration.

```
------------------------------------------------------------------------
Overview of migrating LDAP from an RDBM to a TDBM backend

The customization dialog has created jobs based on the information you
provided.  These instructions tell you how to migrate your LDAP server
to a TDBM backend.

-------------------------------------------------------
Steps for migrating LDAP from an RDBM to a TDBM backend

BEFORE YOU BEGIN: You must be prepared to stop LDAP and WebSphere for
z/OS. If you have WebSphere for z/OS running in a sysplex as a host
cluster, this procedure has you shut down LDAP and the entire host
cluster.

RULES:

1.  You must copy the target data sets

        GNITSAH.WAS7.CNTL
        GNITSAH.WAS7.DATA

    to the system where your LDAP server resides and give them the
    same data set names.

2.  You must be running on the system where your LDAP server resides.

Perform the following steps to migrate to TDBM:

1.  Back up your current RDBM tables. Follow your installation's
    established backup procedures.

    -------------------------------------------------------------------

2.  Stop all application servers and WebSphere for z/OS (on a sysplex,
    stop all clustered host instances).

    -------------------------------------------------------------------


3.  Stop your LDAP server.

    -------------------------------------------------------------------

4.  Run the following jobs. The jobs are members of
    GNITSAH.WAS7.CNTL.

+-----------+----------------------------------------------------------+
| BBOTMLD1  | User ID requirement: DB2 SYSADM authority                |
+-----------+                                                          |
| Done:     |                                                          |
|           | This job exports your current LDIF entries from your DB2 |
|           | database and creates a file called export.ldif in the    |
|           | following directory:                                     |
| By:       |                                                          |
|           |   /tmp                                                   |
|           |                                                          |
|           | If this directory does not exist, you must create it     |
|           | before running the job.                                  |
|           |                                                          |
|           | RESULT: Upon completion, you should see a message like   |
|           | the following in the job log:                           |
|           |                                                         |
|           | GLD2099I db2ldif: nnn entries have been successfully    |
|           | read from the LDAP directory.                           |
|           |                                                         |
|           | where nnn is a number.                                  |
+-----------+---------------------------------------------------------+
| BBOTMLD2  | User ID requirement: DB2 SYSADM authority               |
+-----------+                                                         |
| Done:     |                                                         |
|           | This job drops your existing LDAP database in DB2.      |
| By:       |                                                         |
|           | RESULT: Upon completion, you should see the following   |
|           | messages in the job log:                                |
|           |                                                         |
|           | drop database   BBOLDAP                                 |
|           | DSNT400I SQLCODE = 000,  SUCCESSFUL EXECUTION           |
|           |                                                         |
+-----------+---------------------------------------------------------+
| BBOTDBMC  | User ID requirement: DB2 SYSADM authority               |
+-----------+                                                         |
| Done:     |                                                         |
|           | This job creates the new LDAP database, table spaces,   |
| By:       | and indexes.                                            |
|           |                                                         |
|           | RESULT: Upon completion, you should see the following   |
|           | messages in the job log:                                |
|           |                                                         |
|           | COMMIT                                                  |
|           | DSNT400I SQLCODE = 000,  SUCCESSFUL EXECUTION           |
|           |                                                         |
+-----------+---------------------------------------------------------+
| BBOLDGRT  | User ID requirement: DB2 SYSADM authority.              |
+-----------+                                                         |
| Done:     |                                                         |
|           | This job grants access to the new LDAP tables.          |
| By:       |                                                         |
|           |                                                         |
|           | RESULT:  You may get return code 4 and the message      |
|           |                                                         |
|           | THE GRANTEE ALREADY HAS THE PRIVILEGE FROM THE GRANTOR  |
|           |                                                         |
|           | This is OK. Otherwise, you should see messages like the |
|           | following in the job log:                               |
|           |                                                         |
|           | GRANT DBADM ON DATABASE BBOLDAP    TO CBLDAP            |
|           | DSNT400I SQLCODE = 000,  SUCCESSFUL EXECUTION           |
|           |                                                         |
+-----------+---------------------------------------------------------+
| BBOWMCPT  | User ID requirement: UID=0                              |
+-----------+                                                         |
| Done:     |                                                         |
|           | ATTENTION: This job copies the bboslapd.conf file into  |
|           | the following directory:                                |
| By:       |                                                         |
|           |   /WebSphere390/CB390/MCLXCF01/etc/ldap/                |
|           |                                                         |
|           | o   If this directory does not exist, you must create   |
|           |     it.                                                 |
|           |                                                         |
|           | o   If bboslapd.conf already exists in that directory,  |
|           |     the file will be overwritten and you will loose any |
|           |     changes made to the file since your initial         |
|           |     installation and customization of WebSphere for     |
|           |     z/OS.  Before you run this job, back up your current|
|           |     bboslapd.conf file.  After running this job, compare|
|           |     the new bboslapd.conf file with the version you     |
|           |     backed up and make changes, if necessary.          |
|           |                                                        |
|           | This job also copies the LDAP schema files and a shell |
|           | script (used later by job BBOMTDBM) to the following   |
|           | directory:                                             |
|           |                                                        |
|           |   /tmp                                                 |
|           |                                                        |
|           |                                                        |
|           | RESULT:  Upon completion, you should see the following |
|           | message for each of the four files copied in the job   |
|           | log:                                                   |
|           |                                                        |
|           | The EXEC has completed with Return Code 0              |
|           |                                                        |
+-----------+--------------------------------------------------------+

    --------------------------------------------------------------------

5.  Start the LDAP server.

      START BBOLDAP

    RESULT: Look at the SYSPRINT and at SYSLOG for:

      GLD0122I Slapd is ready for requests.

    Keep the LDAP server running throughout the following steps.

    --------------------------------------------------------------------

6.  Make sure the

      /tmp/export.ldif

    file can be read by the WebSphere for z/OS administrator,
    CBADMIN.  Use the following command to establish the required
    authority:

    chown CBADMIN:CBCFG1 /tmp/export.ldif

    --------------------------------------------------------------------

7.  Update the ACL entries in the file:

    /tmp/export.ldif

    a.  Search for the following ACL entries in this exported file:

        aclentry: group:CN=ANYBODY:normal:rsc
        aclentry: access-id:CBSYMCR1:normal:rwsc:object:ad
        aclentry: access-id:CBADMIN:normal:rwsc:object:ad

    b.  Edit the file by modifying the above ACL entries to the
        following entries.

        TIP:  Use the vi editor to make these modifications, since
        OEDIT may introduce unwanted characters into the file.

        RULE: Each aclentry must be on a SINGLE line. We used multiple
        lines due to document formatting constraints.

        aclentry: group:CN=ANYBODY:normal:rsc
        aclentry: access-id:racfid=CBSYMCR1,profiletype=user,o=WASLRAC
                  :normal:rwsc:sensitive:rwsc:critical:rwsc:object:ad
        aclentry: access-id:racfid=CBADMIN,profiletype=user,o=WASLRAC
                  :normal:rwsc:sensitive:rwsc:critical:rwsc:object:ad
    -------------------------------------------------------------------

8.  Run the following job. The job is a member of
    GNITSAH.WAS7.CNTL

+-----------+---------------------------------------------------------+
| BBOMTDBM  |                                                         |
+-----------+                                                         |
| Done:     | User ID requirement: CBADMIN                            |
|           |                                                         |
| By:       | This job primes the LDAP database.                      |
|           |                                                         |
|           | RESULTS:  You should see messages like the following in |
|           | the job log:                                            |
|           |                                                         |
|           | adding new entry CN=LOCALHOST                           |
|           |                                                         |
|           | adding new entry o=BOSS,c=US                            |
|           |                                                         |
|           | adding new entry ...                                    |
|           |                                                         |
+-----------+---------------------------------------------------------+

9.  Start WebSphere for z/OS (on a sysplex, start all clustered host
    instances), then start your application servers.

    -------------------------------------------------------------------
```

Appendix C. Migrating from WebSphere for z/OS V4.0 to V4.0.1 without the customization dialog

This topic has procedures for migrating to V4.0.1 without using the customization dialog. Base your choice of which procedure to use on the following table:

If you are migrating to WebSphere for z/OS V4.0.1 and . . .	Then follow . . .	Notes
You can interrupt service to clients (either on a monoplex or a sysplex)	"Steps for performing a warm start from WebSphere for z/OS V4.0 to V4.0.1 with a system or sysplex-wide restart and without the customization dialog"	
You cannot interrupt service to clients	"Steps for performing a rolling warm start from WebSphere for z/OS V4.0 to V4.0.1 without the customization dialog" on page 392	A rolling warm start requires the dual HFS structure described in "Overview of creating the proper HFS structure for upgrades" on page 305..

Steps for performing a warm start from WebSphere for z/OS V4.0 to V4.0.1 with a system or sysplex-wide restart and without the customization dialog

Before you begin:

Requirement: Your V4.0 system must have the proper level of service installed. See "Overall migration tasks to go from WebSphere for z/OS V4.0 to WebSphere for z/OS V4.0.1" in *WebSphere Application Server V4.0.1 for z/OS and OS/390: Migration*, GA22-7860 and consult the PSP bucket for the latest service information.

You must be prepared to stop WebSphere for z/OS. If you have WebSphere for z/OS running in a sysplex as a host cluster, this procedure has you shut down the entire host cluster.

If you have WebSphere for z/OS running in a sysplex as a host cluster and want to maintain service to your clients during the warm start, see "Steps for performing a rolling warm start from WebSphere for z/OS V4.0 to V4.0.1 without the customization dialog" on page 392.

Perform the following steps to do the warm start.

1. Use SMP/E to install the new WebSphere for z/OS code. Be sure to install the new WebSphere for z/OS code into a separate set of MVS and HFS data sets.
2. Back up your current system. This includes:
   - The system management database
   - The LDAP database tables containing the naming space and the interface repository
   - Files in the HFS containing WebSphere for z/OS run-time information (usually mounted at `/WebSphere390/CB390`).

- WebSphere for z/OS PROCLIBs
- WebSphere for z/OS LOADLIBs

For more information, see “Guidelines for backup of the WebSphere for z/OS system” on page 183.

3. Edit the BBOMCFG, BBOMPAT2, BBOBIND, BBOIVPP, BBOIBN, and BBOWCMIG members in the new SBBOJCL data set according to comments in the members.

4. Stop all application servers and WebSphere for z/OS (on a sysplex, stop all clustered host instances).

5. Unmount the V4.0 HFSes and mount the WebSphere for z/OS V4.0.1 HFSes. The following are the defaults:
   - `/usr/lpp/WebSphere`
   - `/usr/lpp/java/IBM/J1.3`

6. If not already authorized, APF-authorize the following data sets:
   - *hlq*.SBBOLPA
   - *hlq*.SBBOLOAD
   - *hlq*.SBBOLD2

   where *hlq* is the high-level qualifier for the V4.0.1 data sets.
7. On either the monoplex or one system in the sysplex, do the following:
   a. Submit the following jobs in this order:
      - BBOMCFG
      - BBOMPAT2
      - BBOBIND
      - BBOIVPP
      - BBOIBN
   b. Either re-catalog your system PROCLIB or modify your server start procedures, PROGxx, and link list to point to the data sets with the new code.
   c. Delete, then add the run-time modules into LPA and update the link list. You can do this dynamically, but IBM recommends you re-IPL the system.
   d. Start the Daemon and application servers.

8. If you are running on a sysplex, for each system, one at a time, do the following:
   a. Either re-catalog your system PROCLIB or modify your server start procedures, PROGxx, and link list to point to the data sets with the new code.
   b. Delete, then add the run-time modules into LPA and update the link list. You can do this dynamically, but IBM recommends you re-IPL the system.
   c. Start the Daemon and application servers.

Result: When all run-time and application servers throughout the monoplex or sysplex have been restarted, you receive messages that the servers are ready for a warm start.

```
BBOU0579I CB SERIES SERVER server IS READY FOR WARMSTART.
```

where *server* is the name of the server.

Tips:

- If you do not receive message BBOU0579I, it may be that you have not restarted all run-time and application instances in the sysplex on the new code. Even though you may not be using all run-time and application server instances, they are defined to system management and system management will not issue the message until all server instances are restarted on the new code. Either restart all run-time and application server instances, or run the Administration application and delete the run-time and application server instances you no longer use.
- There is no time limit set when you must warm start WebSphere for z/OS.
- The Operations application flags servers ready for warm start with a green bullet.

---

9. Download and install the new level of the Administration application.

   Notes:

   a. The new level of the Administration application is designed to function within a sysplex in which some WebSphere for z/OS systems have been warm-started and some have not.

   b. During the first connection between the Administration application and the system management server, each exchanges its code level information and the Administration application adjusts its processing accordingly. Administration application messages indicate potential mismatches.

   c. In a sysplex, the WebSphere for z/OS may be reconnected from one system management server instance to another one during the warm start phase. The reconnection may cause a functional level switch. If this happens, you will receive a message requesting an explicit reconnection. Because the functional level of the Administration application depends on the functional level of the system management server to which it is connected, new functions may become visible or invisible during functional level switches. For this reason, start using the new functions only after you have warm-started all systems successfully.

---

10. When all servers are ready for warm start, on either the monoplex or each system in the sysplex, one at a time, do the following:

    a. Stop the application servers and the Daemon.

    b. Start the Daemon with the warm start option:

    ```
    s bbodmn,srvname='...',parms='-ORBCBI WARM'
    ```

    c. Start your application servers with the warm start option:

    ```
    s server_proc,srvname='...',parms='-ORBCBI WARM'
    ```

    where *server_proc* is the application server start procedure.

You can also do the warm start for the application servers through the Operations application.

11. Run the BBOWCMIG job.

12. Re-run the installation verification programs. See "Running the WebSphere for z/OS installation verification programs (IVPs)" on page 167.

You are done when WebSphere for z/OS and the installation verification programs run successfully.

Steps for performing a rolling warm start from WebSphere for z/OS V4.0 to V4.0.1 without the customization dialog

Before you begin:

Requirement: Your V4.0 system must have the proper level of service installed. See "Overall migration tasks to go from WebSphere for z/OS V4.0 to WebSphere for z/OS V4.0.1" in *WebSphere Application Server V4.0.1 for z/OS and OS/390: Migration*, GA22-7860 and consult the PSP bucket for the latest service information.

You must have an HFS structure as described in "Recommendation for the HFS structure" on page 195 and "Overview of creating the proper HFS structure for upgrades" on page 305.

Perform the following steps to do the warm start.

1. Use SMP/E to install the new WebSphere for z/OS code. Be sure to install the new WebSphere for z/OS code into a separate set of MVS and HFS data sets.

2. Back up your current system. This includes:
   - The system management database
   - The LDAP database tables containing the naming space and the interface repository
   - Files in the HFS containing WebSphere for z/OS run-time information (usually mounted at `/WebSphere390/CB390`).
   - WebSphere for z/OS PROCLIBs
   - WebSphere for z/OS LOADLIBs

   For more information, see "Guidelines for backup of the WebSphere for z/OS system" on page 183.

3. Set up your version-specific HFS for the new level of code.

4. Edit the BBOMCFG, BBOMPAT2, BBOBIND, BBOIVPP, BBOIBN, and BBOWCMIG members in the new SBBOJCL data set according to comments in the members.

5. If not already authorized, APF-authorize the following data sets:

- *hlq*.SBBOLPA
- *hlq*.SBBOLOAD
- *hlq*.SBBOLD2

where *hlq* is the high-level qualifier for the V4.0.1 data sets.

---

6. Select a clustered host instance to begin the warm start process. On that clustered host instance:
   a. Stop the application servers and the WebSphere for z/OS Daemon.
   b. Switch the HFS that your system references with the SETOMVS command. Use the command to change the $VERSION symbolic.

      Example: Previously, the $VERSION symbolic was VersionA for all systems in the sysplex. Through the use of a built-in symbolic link, references to /usr resolved to VersionA/usr. To switch the HFS that this system references to, say, VersionB, issue:

      ```
      setomvs version=VersionB
      ```
   c. Submit the following jobs in this order:
      - BBOMCFG
      - BBOMPAT2
      - BBOBIND
      - BBOIVPP
      - BBOIBN
   d. Either re-catalog your system PROCLIB or modify your server start procedures, PROGxx, and link list to point to the data sets with the new code.
   e. Delete, then add the run-time modules into LPA and update the link list. You can do this dynamically, but IBM recommends you re-IPL the system.
   f. Start the Daemon and application servers.

---

7. For each of the remaining clustered host instance, one at a time, do the following:
   a. Stop the application servers and the WebSphere for z/OS Daemon.
   b. Either re-catalog your system PROCLIB or modify your server start procedures, PROGxx, and link list to point to the data sets with the new code.
   c. Delete, then add the run-time modules into LPA and update the link list. You can do this dynamically, but IBM recommends you re-IPL the system.
   d. Switch the HFS that your system references with the SETOMVS command. Use the command to change the $VERSION symbolic.

      Example: Previously, the $VERSION symbolic was VersionA for all systems in the sysplex. Through the use of a built-in symbolic link, references to /usr resolved to VersionA/usr. To switch the HFS that this system references to, say, VersionB, issue:

      ```
      setomvs version=VersionB
      ```
   e. Start the Daemon and application servers.

      Result: When all run-time and application servers throughout the sysplex have been restarted, you receive messages that the servers are ready for a warm start.

```
BBOU0579I CB SERIES SERVER server IS READY FOR WARMSTART.
```

where *server* is the name of the server.

Tips:

- If you do not receive message BBOU0579I, it may be that you have not restarted all run-time and application instances in the sysplex on the new code. Even though you may not be using all run-time and application server instances, they are defined to system management and system management will not issue the message until all server instances are restarted on the new code. Either restart all run-time and application server instances, or run the Administration application and delete the run-time and application server instances you no longer use.
- There is no time limit set when you must warm start WebSphere for z/OS.
- The Operations application flags servers ready for warm start with a green bullet.

---

8. Download and install the new level of the Administration application.

   Notes:

   a. The new level of the Administration application is designed to function within a sysplex in which some WebSphere for z/OS systems have been warm-started and some have not.
   b. During the first connection between the Administration application and the system management server, each exchanges its code level information and the Administration application adjusts its processing accordingly. Administration application messages indicate potential mismatches.
   c. In a sysplex, the WebSphere for z/OS may be reconnected from one system management server instance to another one during the warm start phase. The reconnection may cause a functional level switch. If this happens, you will receive a message requesting an explicit reconnection. Because the functional level of the Administration application depends on the functional level of the system management server to which it is connected, new functions may become visible or invisible during functional level switches. For this reason, start using the new functions only after you have warm-started all systems successfully.

---

9. On each system in the sysplex do the following, one at a time:
   a. Stop the application servers and the Daemon.
   b. Start the Daemon with the warm start option:
   ```
   s bbodmn,srvname='...',parms='-ORBCBI WARM'
   ```
   c. Start your application servers with the warm start option:
   ```
   s server_proc,srvname='...',parms='-ORBCBI WARM'
   ```

   where *server_proc* is the application server start procedure.

   You can also do the warm start for the application servers through the Operations application.

---

10. Run the BBOWCMIG job.

    ____

11. Re-run the installation verification programs. See “Running the WebSphere for z/OS installation verification programs (IVPs)” on page 167.

    ____

You are done when WebSphere for z/OS and the installation verification programs run successfully.

Appendix D. Using an alternate HFS structure for product upgrades

The HFS structure is key to using the rolling upgrade method. See Chapter 6, “Installing new releases and maintenance levels of WebSphere for z/OS,” on page 305 for more information about the rolling upgrade method and IBM’s recommended HFS structure used for upgrading WebSphere for z/OS. This topic introduces an alternate HFS structure and appropriate procedures.

Overview of creating the alternate HFS structure for upgrades

The alternate HFS structure does not mount product HFSes directly off the version-specific subdirectories (referenced by the $VERSION symbolic). Rather, the version-specific subdirectories refer to the system-specific subdirectories by using symbolic links with the $SYSNAME symbol. In turn, the system-specific subdirectories refer to program product subdirectories through symbolic links. The alternate HFS structure is depicted in Figure 24.

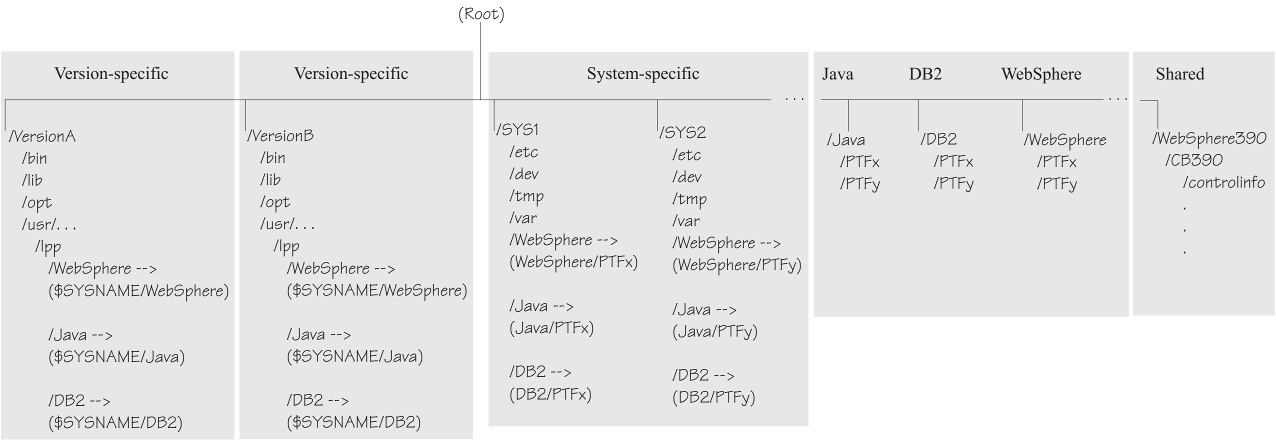


Figure 24. Alternate HFS structure

The alternate HFS structure has:

- Version-specific subdirectories that allow systems in the sysplex to refer to differing versions of system code. However, the WebSphere for z/OS, Java, and DB2 for OS/390 (JDBC) subdirectories do not contain product code. Those subdirectories contain symbolic links to system-specific subdirectories through the use of the $SYSNAME symbol. As far as WebSphere for z/OS is concerned, you do not have to change these symbolic links. You should still, however, plan for creating version-specific structures for future system upgrades.
- System-specific subdirectories that contain symbolic links to WebSphere for z/OS, Java, and DB2 for OS/390 (JDBC) subdirectories in the sysplex root. The symbolic links point to specific code levels (for example, `WebSphere/PTFx`). When you want to change the code level that a system uses, you change these symbolic links.
- Individual subdirectories for WebSphere for z/OS, Java, and DB2 for OS/390 (JDBC) components. Each of these subdirectories can have one or more subdirectories for a specific code level.
- Shared subdirectories, such as the `WebSphere390` subdirectory.

With the alternate HFS structure in place, you can mount one or more code levels of WebSphere for z/OS, Java, or DB2 for OS/390 (JDBC) under their individual component subdirectories. Each system-specific subdirectory uses symbolic links to component code levels and can refer to new code levels by changing those symbolic links.

There are certain advantages to the alternate HFS structure:

- This alternative HFS structure gives you the flexibility to stage product upgrades and service in a sysplex environment with minimal impact to availability. You can stage product upgrades or service without applying it to all products at the same time.
- By placing the level of control at the system-specific subdirectories and linking to those subdirectories through the $SYSNAME symbol, you do not need to duplicate another version-specific ($VERSION) structure when all you are doing is upgrading one product. It is, however, beneficial to plan for a second version-specific structure so you are prepared for future system upgrades.
- The version-specific subdirectories can remain read-only, benefiting performance. The changes are being done at the system-specific ($SYSNAME) subdirectory, which is read/write.
- This structure saves DASD space because you do not need to duplicate version-specific HFSes just for program product upgrades.

Example: Assume you have an individual component subdirectory for WebSphere for z/OS, Java, and DB2 for OS/390 (JDBC) and each contains two subdirectories, one for PTFx and one for PTFy. Also, the code for each component update is in its own HFS data set (OMVS.PTFX.WEB.HFS, OMVS.PTFX.JAVA.HFS, and so forth). The mount commands would be:

```
MOUNT FILESYSTEM('OMVS.PTFX.WEB.HFS')   MOUNTPOINT('/WebSphere/PTFx') TYPE(HFS) MODE(RDWR)
MOUNT FILESYSTEM('OMVS.PTFX.JAVA.HFS')  MOUNTPOINT('/Java/PTFx')      TYPE(HFS) MODE(RDWR)
MOUNT FILESYSTEM('OMVS.PTFX.JDBC.HFS')  MOUNTPOINT('/DB2/PTFx')       TYPE(HFS) MODE(RDWR)

MOUNT FILESYSTEM('OMVS.PTFY.WEB.HFS')   MOUNTPOINT('/WebSphere/PTFy') TYPE(HFS) MODE(RDWR)
MOUNT FILESYSTEM('OMVS.PTFY.JAVA.HFS')  MOUNTPOINT('/Java/PTFy')      TYPE(HFS) MODE(RDWR)
MOUNT FILESYSTEM('OMVS.PTFY.JDBC.HFS')  MOUNTPOINT('/DB2/PTFy')       TYPE(HFS) MODE(RDWR)
```

System SYS1 refers to the PTFx levels of code through these symbolic links:

```
/WebSphere --> /WebSphere/PTFx
/Java      --> /Java/PTFx
/DB2       --> /DB2/PTFx
```

If you want system SYS1 in the sysplex to use the HFSes associated with PTFy, change the symbolic links for /WebSphere, /Java, and /DB2:

```
/WebSphere --> /WebSphere/PTFy
/Java      --> /Java/PTFy
/DB2       --> /DB2/PTFy
```

Thus, to switch the code level for the WebSphere for z/OS clustered host instance on SYS1, you would:

- Install the new code for WebSphere for z/OS, Java, and DB2 for OS/390 (JDBC), copy each component to its own data set, and mount the data under its component subdirectory.

  Note: WebSphere for z/OS, Java, and DB2 for OS/390 (JDBC) code levels are usually interdependent, so keep the level of each component coordinated with the others.

- Shut down all application servers and the WebSphere for z/OS clustered host instance on SYS1.
- Change the symbolic links for the system-specific subdirectories for SYS1.
- Load new run-time modules into LPA and update the link list. You can do this dynamically, but IBM recommends you re-IPL the system.
- Change the start procedures to address the new code level load libraries.
- Restart WebSphere for z/OS and the application servers.

By repeating this process for each clustered host instance, one at a time, you can upgrade the code level of WebSphere for z/OS throughout the sysplex without disrupting service to your clients.

Procedures for upgrading WebSphere for z/OS code using the alternate HFS structure

This topic covers the procedures for doing a warm start and a hot start with the alternate HFS structure.

Steps for performing a rolling warm start from WebSphere for z/OS V4.0 to V4.0.1 with the alternate HFS structure

Before you begin: You must have an HFS structure as described in “Overview of creating the alternate HFS structure for upgrades” on page 397.

Requirement: Your V4.0 system must have the proper level of service installed. See “Overall migration tasks to go from WebSphere for z/OS V4.0 to WebSphere for z/OS V4.0.1” in *WebSphere Application Server V4.0.1 for z/OS and OS/390: Migration*, GA22-7860 and consult the PSP bucket for the latest service information.

Perform the following steps to do the warm start.

1. Use SMP/E to install the new WebSphere for z/OS code. Be sure to install the new WebSphere for z/OS code into a separate set of MVS and HFS data sets.

   ____

2. Back up your current system. This includes:
   - The system management database
   - The LDAP database tables containing the naming space and the interface repository
   - Files in the HFS containing WebSphere for z/OS run-time information (usually mounted at `/WebSphere390/CB390`).
   - WebSphere for z/OS PROCLIBs
   - WebSphere for z/OS LOADLIBs

   For more information, see “Guidelines for backup of the WebSphere for z/OS system” on page 183.

   ____

3. Set up new directories for the V4.0.1 level of code for WebSphere for z/OS, Java, and DB2 (JDBC).

   ____

4. Edit the BBOMCFG, BBOMPAT2, BBOBIND, BBOIVPP, BBOIBN, and BBOWCMIG members in the new SBBOJCL data set according to comments in the members.

5. If not already authorized, APF-authorize the following data sets:
   - *hlq*.SBBOLPA
   - *hlq*.SBBOLOAD
   - *hlq*.SBBOLD2

   where *hlq* is the high-level qualifier for the V4.0.1 data sets.

6. Select a clustered host instance to begin the warm start process. On that clustered host instance:
   a. Stop the application servers and the WebSphere for z/OS Daemon.
   b. Change the symbolic references for WebSphere for z/OS, Java, and DB2 (JDBC) for the system.
   c. Submit the following jobs in this order:
      - BBOMCFG
      - BBOMPAT2
      - BBOBIND
      - BBOIVPP
      - BBOIBN
   d. Either re-catalog your system PROCLIB or modify your server start procedures, PROGxx, and link list to point to the data sets with the new code.
   e. Delete, then add the run-time modules into LPA and update the link list. You can do this dynamically, but IBM recommends you re-IPL the system.
   f. Start the Daemon and application servers.

7. For each of the remaining clustered host instance, one at a time, do the following:
   a. Stop the application servers and the WebSphere for z/OS Daemon.
   b. Either re-catalog your system PROCLIB or modify your server start procedures, PROGxx, and link list to point to the data sets with the new code.
   c. Delete, then add the run-time modules into LPA and update the link list. You can do this dynamically, but IBM recommends you re-IPL the system.
   d. Change the symbolic references for WebSphere for z/OS, Java, and DB2 (JDBC) for the system.
   e. Start the Daemon and application servers.

      Result: When all run-time and application servers throughout the sysplex have been restarted, you receive messages that the servers are ready for a warm start.

      ```
      BBOU0579I CB SERIES SERVER server IS READY FOR WARMSTART.
      ```

      where *server* is the name of the server.

      Tips:

      - There is no time limit set when you must warm start WebSphere for z/OS.

- The Operations application flags servers ready for warm start with a green bullet.

8. Download and install the new level of the Administration application.

   Notes:

   a. The new level of the Administration application is designed to function within a sysplex in which some WebSphere for z/OS systems have been warm-started and some have not.
   b. During the first connection between the Administration application and the system management server, each exchanges its code level information and the Administration application adjusts its processing accordingly. Administration application messages indicate potential mismatches.
   c. In a sysplex, the WebSphere for z/OS may be reconnected from one system management server instance to another one during the warm start phase. The reconnection may cause a functional level switch. If this happens, you will receive a message requesting an explicit reconnection. Because the functional level of the Administration application depends on the functional level of the system management server to which it is connected, new functions may become visible or invisible during functional level switches. For this reason, start using the new functions only after you have warm-started all systems successfully.

9. On each system in the sysplex do the following, one at a time:
   a. Stop the application servers and the Daemon.
   b. Start the Daemon with the warm start option:
      ```
      s bbodmn,srvname='...',parms='-ORBCBI WARM'
      ```
   c. Start your application servers with the warm start option:
      ```
      s server_proc,srvname='...',parms='-ORBCBI WARM'
      ```

      where *server_proc* is the application server start procedure.

      You can also do the warm start for the application servers through the Operations application.

10. Run the BBOWCMIG job.

11. Re-run the installation verification programs. See "Running the WebSphere for z/OS installation verification programs (IVPs)" on page 167.

You are done when WebSphere for z/OS and all your application servers are running.

Steps for performing a rolling hot start with the alternate HFS structure

Before you begin: Read "Overview of creating the alternate HFS structure for upgrades" on page 397 to understand the HFS structure you need.

Perform the following steps to do a hot start:

1. Use SMP/E to install the new WebSphere for z/OS code. Be sure to install the new WebSphere for z/OS, Java, and DB2 (JDBC) code into their own HFS data sets.

   Example: Install a service level (PTFx) and copy the code to for WebSphere for z/OS into OMVS.PTFX.WEB.HFS, the code for Java into OMVS.PTFX.JAVA.HFS, and the code for DB2 (JDBC) into OMVS.PTFX.DB2.HFS.

   ____

2. Mount the new data sets under their component mount points.

   Example:

   ```
   MOUNT FILESYSTEM('OMVS.PTFX.WEB.HFS')   MOUNTPOINT('/WebSphere/PTFx') TYPE(HFS) MODE(RDWR)
   MOUNT FILESYSTEM('OMVS.PTFX.JAVA.HFS')  MOUNTPOINT('/Java/PTFx')      TYPE(HFS) MODE(RDWR)
   MOUNT FILESYSTEM('OMVS.PTFX.JDBC.HFS')  MOUNTPOINT('/DB2/PTFx')       TYPE(HFS) MODE(RDWR)
   ```

   ____

3. Select a clustered host instance to begin the hot start process. On that clustered host instance:
   a. Stop the application servers and the WebSphere for z/OS Daemon.
   b. Either re-catalog your system PROCLIB or modify your server start procedures, PROGxx, and link list to point to the data sets with the new code.
   c. Delete, then add the run-time modules into LPA and update the link list. You can do this dynamically, but IBM recommends you re-IPL the system.
   d. Change the symbolic references for WebSphere for z/OS, Java, and DB2 (JDBC) for the system.
   e. Start the Daemon and application servers.

   ____

4. Repeat step 3 for each remaining clustered host instance, one at a time.

   ____

You are done when you have completed the hot start on each system in the sysplex.

Appendix E. Configuring the name space

During system installation and configuration, configure the name space using a special naming configuration file. This file is specified on the NCONFIG DD statement in the naming client start procedure (BBONMC). IBM supplies a sample naming configuration file, called SBBOEXEC(BBOCNFG), that you can modify. This topic explains the syntax for naming configuration files.

The naming configuration file contains the following information:

- The location of a currently existing inter-domain root (IDR) or an indicator that says to create it locally.
- The name of hosts that contain cells to be bound to the IDR and the names of those cells. This identifies any non-WebSphere for z/OS hosts that may have already been configured and that house cell name space segments that should be made visible under the IDR. WebSphere for z/OS will traverse from the local root naming context of the specified host to its primary parent cell and bind that cell into the IDR using the supplied name.
- The names of cells to be created on this WebSphere for z/OS host.
- The names of workgroups to be created on this WebSphere for z/OS host along with the name of the primary and alternate cell relative to the IDR.
- The name of the host segment in the single local to be created on this host. The names of that local's primary and alternate parent workgroups and cells will also be provided relative to the IDR.

Note: Currently, z/OS or OS/390 LDAP supports a maximum distinguished name size of 1000 characters. If the name of an object or context binding exceeds that limit, the system issues an InvalidName exception. This may happen even if what you specify is much shorter than 1000 bytes because a name is mapped onto a significantly longer internal LDAP name.

Example: If you specify

```
a/b/c
```

LDAP creates the following distinguished names:

```
TypelessRDN=c,TypelessRDN=b,TypelessRDN=a,TypelessRDN=/,o=BOSS,c=US
TypelessRDN=c,TypelessRDN=b,TypelessRDN=a,TypelessRDN=/,o=WASNaming,c=US
```

The syntax of the naming configuration file uses stanzas as follows:

```
[NamingIDR]                      // Cells that currently exist on other
                                 // machines that should be bound under
                                 // the WebSphere for z/OS IDR.

IDRLocation=host:port            // Specifies the location of a remote host
                                 // where the IDR lives or 'local' if we
                                 // create one here.

RemoteHost1=host:port            // Remote host where a cell lives

RemoteCell1=cell                 // Name of that remote cell when bound
                                 // under IDR.

RemoteMemberHost1.1=host:port    // Bind remote host belonging to RemoteCell1
                                 // into the NameSpace
RemoteHost2=host:port
```

```
RemoteCell2=cell

⋮

[Cells]                            // Names of new cells to create on this
                                   // machine and bind to IDR.

Cell1=cell
Cell2=cell

⋮

[Workgroups]                       // Names of new workgroups to create on this
                                   // machine and the name of the cells to
                                   // bind them to.

WorkGroup1=workgroup               // Name for this new workgroup.
PrimaryCell1=cell                  // Primary cell bound to this workgroup.
AlternateCell1.1=cell              // Alternate cell bound to this workgroup.

Workgroup2=workgroup
PrimaryCell1=cell
AlternateCell1.1=cell
AlternateCell1.2=cell

⋮

[Hosts]                            // Locals to create on this machine
                                   // identified by their host name.  Also
                                   // specifies the name of the workgroup
                                   // and cells to bind the host under.

Host1=host|&DAEMON_IPNAME.         // Either the host name or variable for
                                   // the Daemon IP Name
PrimaryCell1=cell
AlternateCell1=cell
PrimaryWorkgroup1=workgroup
AlternateWorkgroup1.1=workgroup
```

The first stanza, NamingIDR, provides information that will allow the naming configuration to add any previously existing cells to the IDR. The IDR is supported on WebSphere for z/OS only. Thus, cells created on Component Broker for Windows NT must be specified in this way if they are to be visible from the IDR.

The IDR Location variable in the NamingIDR stanza indicates either to build the IDR locally or provide the location of a currently existing IDR. If the IDR is to be built locally, then specify IDRLocation=local. If a currently existing IDR is to be used, then specify a host name and port. The naming configuration utility will bootstrap to this host and navigate to the IDR to obtain its reference.

The RemoteHostn variable in the NamingIDR stanza is used to specify the host name and port number of a host whose primary cell should be visible under the IDR. Naming configuration processing will bootstrap to the specified host and resolve from that host's local root naming context to obtain the cell naming context.

Multiple remote hosts can be specified in the NamingIDR stanza. Each host is identified by the postfix modifier *n* on the RemoteHostn variable. The modifiers used should begin at 1 and be numbered sequentially for the multiple remote hosts specified. The RemoteCelln variable supplies the name relative to the IDR for the corresponding remote cell.

The RemoteMemberHost*n.n* binds remote hosts belonging to a RemoteCell into the NameSpace. A link from the host to the IDR is created (that is, the global IDR context is bound into the host's root context under the name ″...″, thus allowing users to navigate directly from their local host into the IDR, and thus into the entire federated name space). There should be a RemoteMemberHost statement for each host belonging to the cell being handled.

The Cells stanza specifies the names relative to the IDR of new cells to be created on this host. The Celln variable specifies the name using the same postfix notation as used previously.

The Workgroups stanza specifies the name of new workgroups to create on this host via the WorkGroupn variable. The primary and alternate cells under which to bind each new workgroup must be specified as well. A single primary cell is specified on the PrimaryCelln where *n* identifies the workgroup postfix. Multiple alternate cells are specified via the AlternateCellnz variable where *n* identifies the workgroup postfix and *z* is the alternate cell in the case of the workgroup stanza with respect to the name space structure. However, the new workgroup must be successfully bound with the primary cell in order for the build to be considered successful.

The Hosts stanza is used to guide the creation of the local name space segment on the current system. A single local name space segment must be built per system in the current release of WebSphere for z/OS. However, multiple local segments may be allowed in a future release. The name of the host portion of the new local name space segment is specified via the Host*n* variable, where *n* must be 1 in the current release (more hosts specifications in the file are tolerated—they are simply ignored). The names of primary and alternate cells and workgroups must also be specified.

Alternately, instead of Host*n*, use the variable &DAEMON_IPNAME. The variable name must be in uppercase letters, and it must be terminated with a period. The option is relevant if you set up federated name spaces, in which case the host names of the systems involved must be different. This variable allows you to change the local host name in the file, without modifying the file, when moving it across sysplexes.

There is a distinction between primary and alternate in the case of the local name space segment with respect to name space structure. The primary cell and primary workgroup can be resolved relative to the local root name context via cell and workgroup respectively. The primary cell and workgroup can also resolve down to the host. Alternate workgroup and cells also contain pointers down to the host. The distinction is that the host contains no direct pointers to the alternate cells and workgroups.

The primary and alternate cells for the host are specified on the PrimaryCelln and AlternateCellnz variables in the same manner as that for the Workgroup stanza. The names of primary and alternate workgroups are specified relative to the IDR on the PrimaryWorkgroupn and AlternateWorkgroupnz variables.

In the current release of WebSphere for z/OS, it is possible to run the naming configuration utility multiple times with different naming configuration files to build additional name space segments. Additional alternate segments can also be added. For example, a workgroup can be made to point to an additional alternate cell. However, it will not be possible to delete name space segments or modify their primary parents.

When subsequently running the naming configuration utility to build additional segments, it is permissible to simply update an existing configuration file. Any currently existing segments will be flagged with informational messages.

Scenarios

These scenarios show some of the configuration possibilities.

Scenario 1

A single, local workgroup and cell will be built on WebSphere for z/OS. One or more Component Broker for Windows NT hosts will build a local that is bound into the WebSphere for z/OS name space as an alternate. In Component Broker for Windows NT, the primary workgroup and cell must be on the Component Broker for Windows NT machine. A WebSphere for z/OS can be bound in as an alternate. The steps are:

1. The activities must begin with WebSphere for z/OS. A WebSphere for z/OS configuration file is created. The NamingIDR stanza is empty in this case. The remaining stanzas describe the name space to be built in WebSphere for z/OS. Because WebSphere for z/OS is the first host being configured, the parents of name space segments built must also reside on this WebSphere for z/OS host. All connections between the various segments are added as required.
2. Component Broker for Windows NT uses an administrative interface that allows the required alternate members of links between name space segments to be added. The administrator would need to define the following links:
   a. Link from local to workgroup
   b. Link from local to cell
   c. Link from cell to host
   d. Link from workgroup to host

Scenario 2

In this scenario, local, workgroup, and cell name space segments will be created on a Component Broker for Windows NT system. A WebSphere for z/OS local will be created and it will be bound into the Component Broker for Windows NT workgroup and cell. The steps are:

1. Configure Component Broker for Windows NT as is done today.
2. Create a WebSphere for z/OS configuration file. This configuration file will have an entry in the NamingIDR stanza to bind the Component Broker for Windows NT cell under the WebSphere for z/OS IDR. The Workgroups and Cells stanzas of the WebSphere for z/OS configuration file would be empty. The Hosts stanza would specify the names relative to the IDR of parent workgroups and cells in the same manner as previous examples.

Scenario 3

In this scenario, a local, workgroup, and cell segment is created in both the Component Broker for Windows NT and WebSphere for z/OS name servers. However, later we want to come back and add a new workgroup to the WebSphere for z/OS that resides under the Component Broker for Windows NT cell. The steps are:

1. Start with WebSphere for z/OS. Build the WebSphere for z/OS name space segments as in "Scenario 1."
2. Build the Component Broker for Windows NT name space segments as in "Scenario 2."

3. A cell was just created on Component Broker for Windows NT host. Since Component Broker for Windows NT has no awareness of the IDR, its cell must now be bound to the IDR so that it can be visible during future configuration activities. A second WebSphere for z/OS is created. This configuration file contains only the NamingIDR stanza to identify the Component Broker for Windows NT cell to be bound to the IDR. The naming configuration utility is then run again to bind the Component Broker for Windows NT cell to the IDR.
4. Sometime later, the new workgroup is created and bound to the Component Broker for Windows NT cell. A third WebSphere for z/OS naming configuration file is created and specifies only the Workgroups stanza to identify the information for the new workgroup. This information can be specified as usual, since the Component Broker for Windows NT cell is bound to the WebSphere for z/OS IDR.

Appendix F. Setting up DCE

This topic explains WebSphere for z/OS's use of DCE security, guidelines and requirements for this support, and instructions about setting up DCE security for z/OS or OS/390 clients and servers. For information about DCE and Component Broker for Windows NT, consult *WebSphere Application Server Enterprise Edition Component Broker System Administration Guide*.

Overview of WebSphere for z/OS and DCE

On z/OS or OS/390, the DCE Security Server is a component of the z/OS or OS/390 Security Server, which is an optional feature of z/OS or OS/390. RACF is another component in the z/OS or OS/390 Security Server, but you do not need to operate it with the DCE Security Server—you may use another security product, provided it can translate a DCE account's principal into a z/OS or OS/390 user ID (and vice versa) and can operate with the System Authorization Facility (SAF) interface. Whenever we cite RACF, you may substitute another security product that interoperates with the DCE Security Server.

Through DCE, WebSphere for z/OS supports CORBA standards for security. Whenever work requests come into or go out of the system (that is, the work request is remote), WebSphere for z/OS uses DCE security, provided it is called for, and maps the DCE account's principal to its corresponding z/OS or OS/390 user ID or vice versa.

DCE implements a form of the Kerberos security model where both clients and servers trust the security server but not each other. The security server operates as a third-party authenticator so that a client and a server can establish trust to effectively interoperate.

WebSphere for z/OS supports three quality-of-protection types through DCE: no protection (that is, two-way—mutual— authentication), message integrity, and message confidentiality (encryption). DCE quality-of-protection options for out-of-order messages and no-message-replay are not supported. In addition to the basic DCE support, message confidentiality requires you to implement the Data Encryption Standard (DES) feature in the DCE Security Server and DCE Base Services.

z/OS or OS/390 client quality of protection is enabled through the CLIENT_DCE_QOP environment variable (see Appendix A, "Environment files," on page 321). Server quality of protection is enabled by setting an attribute with the Administration application.

Important characteristics of WebSphere for z/OS support for DCE are:

- Server control regions, local clients, and remote clients participating in DCE security must be configured in the same DCE cell.

  Note: If a WebSphere for z/OS entity is going to use an *unauthenticated* transaction, that entity need not be in a DCE cell or could be in another DCE cell, but it cannot use WebSphere for z/OS with DCE security.

- Each z/OS or OS/390 system in the sysplex participating in DCE security must have its own DCE Security Replica Server operating properly within the same DCE cell. This requirement is due to a special DCE-WebSphere for z/OS DLL required by WebSphere for z/OS.
- You must maintain copies of keytab files on each z/OS or OS/390 system HFS where a server control region needs to reference the information in that file.

Guidelines and requirements for configuring DCE for use with WebSphere for z/OS

Implement DCE with WebSphere for z/OS like any other DCE configuration, but follow these guidelines and requirements:

- Familiarize yourself with the following books:
  - *z/OS DCE Planning*
  - *z/OS DCE Configuring and Getting Started*
  - *z/OS DCE Administration Guide*
  - *z/OS DCE Command Reference*
  - *z/OS Security Server RACF Security Administrator's Guide*
- Place all WebSphere for z/OS entities (server control regions, local clients, and remote clients) using DCE security into the same DCE cell.
- Create a DCE Security Replica Server on each z/OS or OS/390 system within the same DCE cell.
- For each WebSphere for z/OS system, a DCE Security Server Replica must be running in its own address space named DCESECD.

  Notes:

  1. A DCE Security Replica requires the DCE Base Services environment operating on that system.
  2. The default settings for the DCE Kernel assume a DCE Security Server running in its own address space rather than as part of the Kernel itself.
  3. The Cell Directory Service, if configured, defaults to a separate address space as DCECDSD.
- We strongly recommend that you set up all Security Server Replicas and the Security Server Master on platforms that have high availability. DCE remote clients and DCE administrative functions can be impacted by TCP/IP protocol timeouts when systems in the DCE cell that operate with Security Replica Servers are not available. If a system will not be available for a long period of time, consider deconfiguring the Security Server Replica to avoid server resolution processing delays. You can use environment variables to direct work requests to operating servers and override the normal Cell Directory Service process, but we advise you use this method only in test environments or error recovery processes.
- Set up and maintain keytab files in the HFS for each z/OS or OS/390 system that has servers (control regions) that use DCE security.
- Set up a fully-configured TCP/IP Domain Name Server for DCE. You do not have to put the DNS on z/OS or OS/390.
- To use WebSphere for z/OS message confidentiality quality of protection, install the DCE Base Services and Security Server Replica with the DES Feature of DCE.
- In addition to DCE account establishment, administration, and maintenance, you must match DCE accounts with RACF user IDs. RACF holds some of this information in the resources of the RACF DCE segment definitions that are

cross-referenced to the RACF resources in the RACF DCEUUIDS Class. It is this inter-relationship of RACF user IDs and DCE accounts that allows remote Component Broker clients and servers to operate securely using privileges set up for their RACF-mapped user IDs.

- If using RACF, see the RACF interoperability topic in the *z/OS DCE Administration Guide* for information on how to set up RACF to interoperate with DCE. Grant the appropriate RACF authority to the user IDs associated with the server control regions to allow them to resolve DCE account information into RACF user ID privileges. You must define the IRR.RDCERUID profile in the RACF Facility Class and grant the server control region user IDs READ privilege to this profile. Also, activate the DCEUUIDS class.

  We create a customized RACF sample when you run the customization dialog that includes these definitions. See “Running the customization dialog” on page 56..

  Note: If you plan to use DCE with a security product other than RACF, your security product must be able to map a DCE principal to a user ID.

Steps for setting up a server with DCE security

Before you begin: You must have the WebSphere for z/OS run-time server instances and the Administration application installed. See Chapter 3, “Installing and customizing your first run time,” on page 51.

Follow the guidelines and requirements for setting up DCE in “Guidelines and requirements for configuring DCE for use with WebSphere for z/OS” on page 410.

Note: Consult *WebSphere Application Server Enterprise Edition Component Broker System Administration Guide* for security information on Windows NT servers.

Perform the following steps to set up a server with DCE security:

1. If you are not creating a new conversation with the Administration application, create a new one. For information about how to start a conversation, see *WebSphere Application Server V4.0.1 for z/OS and OS/390: System Management User Interface*, SA22-7838.

2. Select or create the server that you want to make secure with DCE.

3. In the properties form, select the DCE allowed check box. Depending on whether you want other forms of security, select other check boxes.

4. In the properties form, select the type of DCE quality of protection you want. Types are no protection (that is, two-way—mutual— authentication), message integrity, and message confidentiality (encryption).

5. Enter the keytab file. The default is `/krb5/v5srvtab`.

6. In the security preference table, set DCE to 1. Depending on whether you want other forms of security, set the preferences for them.

7. Complete any other definitions in your conversation, then validate, commit, and activate the conversation.

You know you are done when the conversation is successfully activated.

Steps for setting up a z/OS or OS/390 client with DCE security

Before you begin: Follow the guidelines and requirements for setting up DCE in "Guidelines and requirements for configuring DCE for use with WebSphere for z/OS" on page 410.

Note: Consult *WebSphere Application Server Enterprise Edition Component Broker System Administration Guide* for security information on Windows NT clients.

Perform the following steps to set up a z/OS or OS/390 client with DCE security:

1. Map the DCE principal associated with the client to a z/OS or OS/390 user ID.
2. In your environment file, set the environment variable CLIENT_DCE_QOP. If not set, the default is NO_PROTECTION. See the description of this environment variable in Appendix A, "Environment files," on page 321.
3. In your environment file, set the environment variable RESOLVE_IPNAME to the host system to which the z/OS or OS/390 client will communicate.
4. Save the environment file.

You know you are done when the z/OS or OS/390 client successfully connects to the server using DCE security.

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Program Number: 5655–F31

Printed in the United States of America

GA22-7834-07