

Course Exercises Guide

# WebSphere Application Server V9 Administration

Course code WA590 / ZA590 ERC 1.0



## **November 2016 edition**

### **Notices**

This information was developed for products and services offered in the US.

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

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

*IBM Director of Licensing  
IBM Corporation  
North Castle Drive, MD-NC119  
Armonk, NY 10504-1785  
United States of America*

INTERNATIONAL BUSINESS MACHINES CORPORATION PROVIDES THIS PUBLICATION "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Some jurisdictions do not allow disclaimer of express or implied warranties in certain transactions, therefore, this statement may not apply to you.

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

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

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

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

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

### **Trademarks**

IBM, the IBM logo, and ibm.com are trademarks or registered trademarks of International Business Machines Corp., registered in many jurisdictions worldwide. Other product and service names might be trademarks of IBM or other companies. A current list of IBM trademarks is available on the web at "Copyright and trademark information" at [www.ibm.com/legal/copytrade.shtml](http://www.ibm.com/legal/copytrade.shtml).

**© Copyright International Business Machines Corporation 2016.**

**This document may not be reproduced in whole or in part without the prior written permission of IBM.**

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

# Contents

<b>Trademarks .....</b>	<b>v</b>
<b>Exercises description .....</b>	<b>vi</b>
<b>Exercise 1. Profile creation .....</b>	<b>1-1</b>
Section 1: Logging in .....	1-2
Section 2: Validation .....	1-6
Section 3: Create a profile with the Profile Management Tool .....	1-8
Section 4: Verify installation of WebSphere Application Server .....	1-19
<b>Exercise 2. Exploring the administrative console .....</b>	<b>2-1</b>
Exercise instructions .....	2
Section 1: Resetting the WebSphere environment .....	2-2
Section 2: Start the server .....	2-2
Section 3: Start the administrative console .....	2-3
Section 4: Explore the navigation tree .....	2-9
Section 5: Explore guided activities .....	2-11
Section 6: Explore server settings .....	2-12
Section 7: Examine application settings .....	2-22
Section 8: Examine environment settings .....	2-26
Section 9: Examine resource settings .....	2-30
Section 10: Examine troubleshooting .....	2-30
Section 11: Modify the administrative console session timeout .....	2-32
Section 12: Log out of the administrative console .....	2-35
Section 13: Explore configuration files .....	2-35
<b>Exercise 3. Assembling an application .....</b>	<b>3-1</b>
Section 1: Resetting the WebSphere environment .....	3-3
Section 2: Start Eclipse .....	3-3
Section 3: Create an enterprise application project .....	3-4
Section 4: Add the Plants By WebSphere utility module .....	3-12
Section 5: Add the web module .....	3-16
Section 6: Add a test server .....	3-21
Section 7: Configure WebSphere data sources .....	3-25
Section 8: Export the enterprise archive (EAR) file .....	3-33
<b>Exercise 4. Installing an application .....</b>	<b>4-1</b>
Section 1: Resetting the WebSphere environment .....	4-2
Section 2: Start the server and the administrative console .....	4-2
Section 3: Create J2C authentication aliases .....	4-3
Section 4: Create a JDBC provider and data sources for the application .....	4-9
Section 5: Install the PlantsByWebSphere enterprise application .....	4-18
Section 6: Test the enterprise application .....	4-27
Section 7: Use a monitored directory to deploy an enterprise application .....	4-33
<b>Exercise 5. Problem determination .....</b>	<b>5-1</b>
Section 1: Resetting the WebSphere environment .....	5-3
Section 2: Working with log files of the application server .....	5-3
Section 3: Setting up and configuring HPEL .....	5-11

Section 4: Using the Log Viewer in the administrative console to examine log data and trace data .....	5-18
Section 5: Enabling tracing for an application server and viewing trace data from the Log Viewer .....	5-21
Section 6: Enabling cross-component trace (XCT) .....	5-25
Section 7: Collecting JVM data .....	5-33
Section 8: Clean up server1 .....	5-42
Section 9: READ ONLY: Using IBM Support Assistant tools to analyze JVM data .....	5-42
<b>Exercise 6. Using wsadmin .....</b>	<b>6-1</b>
Section 1: Resetting the WebSphere environment .....	6-2
Section 2: wsadmin command-line arguments .....	6-2
Section 3: Configuring the wsadmin environment .....	6-7
Section 4: Work with wsadmin administrative objects .....	6-9
Section 5: Creating a wsadmin script .....	6-12
Section 6: Using console command assist .....	6-21
Section 7: Exploring the scripting libraries .....	6-25
Section 8: Using properties file-based configuration .....	6-30
Section 9: Using SWING with Jython (optional) .....	6-36
<b>Exercise 7. Configuring WebSphere Application Server security .....</b>	<b>7-1</b>
Section 1: Resetting the WebSphere environment .....	7-2
Section 2: Verify administrative security .....	7-2
Section 3: Defining WebSphere administrative console users .....	7-3
Section 4: Authenticate to the WebSphere administrative console and test mapped users .....	7-9
Section 5: Enabling fine-grained control .....	7-10
Section 6: Test the fine-grained access .....	7-16
<b>Exercise 8. Configuring application security .....</b>	<b>8-1</b>
Section 1: Resetting the WebSphere environment .....	8-2
Section 2: Enabling application security .....	8-2
Section 3: Securing the PlantsByWebSphere application .....	8-4
Section 4: Exploring the details (optional) .....	8-17
<b>Exercise 9. Using the performance monitoring tools .....</b>	<b>9-1</b>
Section 1: Resetting the WebSphere environment .....	9-3
Section 2: Enabling performance monitoring and setting user preferences .....	9-3
Section 3: Viewing servlet and web applications module data .....	9-8
Section 4: Using the Tivoli Performance Viewer performance advisor .....	9-15
Section 5: Using request metrics .....	9-17
<b>Appendix A. Resetting the WebSphere environment .....</b>	<b>A-1</b>

---

# Trademarks

The reader should recognize that the following terms, which appear in the content of this training document, are official trademarks of IBM or other companies:

IBM, the IBM logo, and ibm.com are trademarks or registered trademarks of International Business Machines Corp., registered in many jurisdictions worldwide.

The following are trademarks of International Business Machines Corporation, registered in many jurisdictions worldwide:

AIX®  
DB™  
Express®  
IBM z Systems™  
Rational®  
WebSphere®

Bluemix®  
DB2®  
HACMP™  
Notes®  
Redbooks®  
z Systems™

DataPower®  
developerWorks®  
IBM z™  
PureApplication®  
Tivoli®  
z/OS®

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

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

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

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

VMware and the VMware “boxes” logo and design, Virtual SMP and VMotion are registered trademarks or trademarks (the “Marks”) of VMware, Inc. in the United States and/or other jurisdictions.

SoftLayer® is a trademark or registered trademark of SoftLayer, Inc., an IBM Company.

Other product and service names might be trademarks of IBM or other companies.

---

# Exercises description

This course includes the following exercises:

- Profile creation
- Exploring the administrative console
- Assembling an application
- Installing an application
- Problem determination
- Using wsadmin
- Configuring WebSphere Application Server security
- Configuring application security
- Using the performance monitoring tools

In the exercise instructions, you can check off the line before each step as you complete it to track your progress.

Most exercises include required sections, which should always be completed. It might be necessary to complete these sections before you can start later exercises. If you have sufficient time and want an extra challenge, some exercises might also include optional sections that you can complete.



## Important

Online course material updates might exist for this course. To check for updates, see the Instructor wiki at: <http://ibm.biz/CloudEduCourses>

---

---

# Exercise 1. Profile creation

## Estimated time

00:45

## Overview

In this introductory exercise, you use the Profile Management Tool to create an application server profile.

## Objectives

After completing this exercise, you should be able to:

- Use the Profile Management Tool to create a profile
- Verify the profile creation

## Introduction

You use the Profile Management Tool to create a stand-alone application server profile.

## Requirements

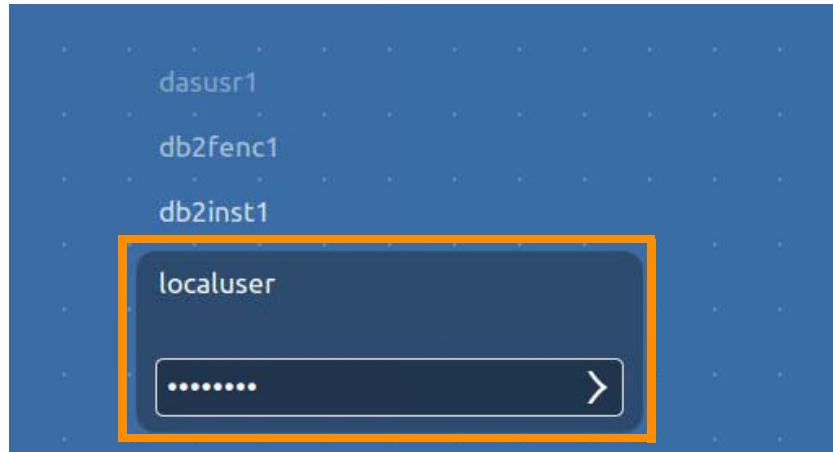
This exercise requires that the WebSphere Application Server and the Profile Management Tool are installed.

This exercise is required for you to complete the remaining exercises.

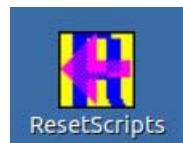
# Exercise instructions

## Section 1: Logging in

- \_\_\_ 1. When you start your computer, you are prompted for a user ID and password. At this prompt, enter:
- User ID: localuser
  - Password: passw0rd (lowercase with a zero instead of the o)



- \_\_\_ 2. Run the ResetScripts.  
\_\_\_ a. Double-click the **ResetScripts** icon on the desktop.



- \_\_\_ b. A shell window displays the list of possible reset states from which to choose. If problems occur, the reset states can be used to set up the initial machine configuration or to recover. Type **4** and press Enter. This option represents the state **4\_IHS-installed** where the following products are installed:
- IBM Installation Manager
  - WebSphere Application Server
  - IBM HTTP Server
  - IBM HTTP Server Plug-in
  - WebSphere Customization Toolbox



The terminal window title is "Terminal". The content shows a list of reset scripts:

The following reset scripts are available:

- ```
=====
1) 1_Initial-state
2) 2_IIM-installed
3) 3 WAS-installed
4) 4 IHS-installed
5) 5 WAS-installed_with_profile1
6) 6 WAS-installed_with_profile1_plus_PlantsByWebSphere
7) 7 WAS-Federated_dmgr-profile1-profile2
8) 8 WAS-Federated_plus_PlantsCluster
9) X_Reset_Plants-DB
```

To execute a script, enter the script number <#>. To view details for a reset script, enter d<#>.

Which exercise reset do you wish to execute (1-9, d1-d9, q) [q]:

- \_\_\_ c. The script confirms the reset state and prompts you for whether you would like to continue. Press **Enter**.



The terminal window title is "Terminal". The content shows a list of reset scripts:

- ```
8) 8 WAS-Federated_plus_PlantsCluster
9) X_Reset_Plants-DB
```

To execute a script, enter the script number <#>. To view details for a reset script, enter d<#>.

Which exercise reset do you wish to execute (1-9, d1-d9, q) [q]: **4**

Running script: /opt/labfiles/reset/reset\_scripts/reset\_4\_IHS-installed.sh

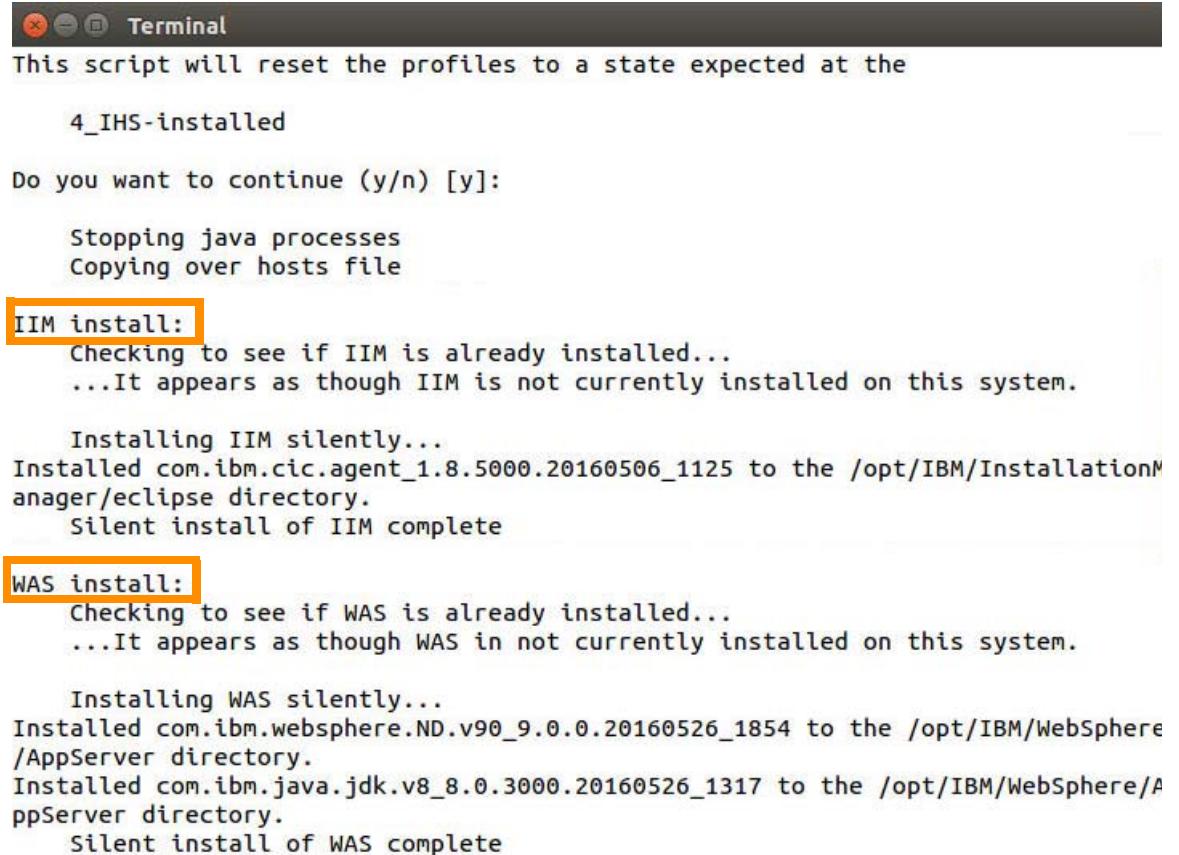
=====

This script will reset the profiles to a state expected at the

**4\_IHS-installed**

Do you want to continue (y/n) [y]: **[ ]**

- \_\_\_ 3. Wait for the scripts to complete and review the output.
- \_\_\_ a. The installation process starts with the following tasks:
  - Stopping any running Java processes
  - Installing IBM Installation Manager
  - Installing WebSphere Application Server



```
This script will reset the profiles to a state expected at the
4_IHS-installed

Do you want to continue (y/n) [y]:  
y

Stopping java processes
Copying over hosts file

IIM install:
Checking to see if IIM is already installed...
...It appears as though IIM is not currently installed on this system.

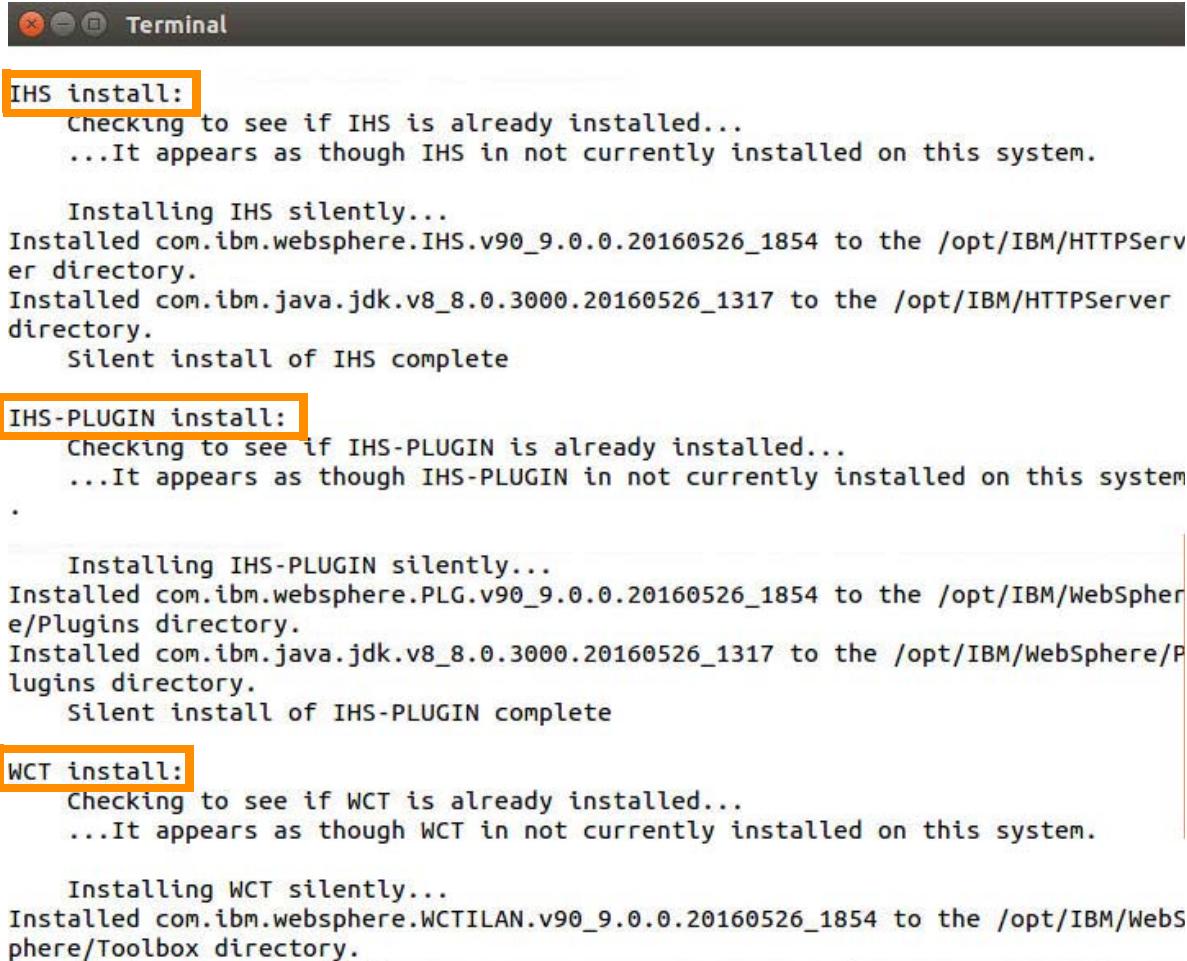
Installing IIM silently...
Installed com.ibm.cic.agent_1.8.5000.20160506_1125 to the /opt/IBM/InstallationManager/eclipse directory.
Silent install of IIM complete

WAS install:
Checking to see if WAS is already installed...
...It appears as though WAS is not currently installed on this system.

Installing WAS silently...
Installed com.ibm.websphere.ND.v90_9.0.0.20160526_1854 to the /opt/IBM/WebSphere/AppServer directory.
Installed com.ibm.java.jdk.v8_8.0.3000.20160526_1317 to the /opt/IBM/WebSphere/AppServer directory.
Silent install of WAS complete
```

\_\_ b. The installation then continues with these tasks:

- o Installing IBM HTTP Server
- o Installing the IBM HTTP Server plug-in
- o Installing WebSphere Customization Toolbox



```
IHS install:  
  Checking to see if IHS is already installed...  
    ...It appears as though IHS in not currently installed on this system.  
  
  Installing IHS silently...  
Installed com.ibm.websphere.IHS.v90_9.0.0.20160526_1854 to the /opt/IBM/HTTPServer directory.  
Installed com.ibm.java.jdk.v8_8.0.3000.20160526_1317 to the /opt/IBM/HTTPServer directory.  
  Silent install of IHS complete  
  
IHS-PLUGIN install:  
  Checking to see if IHS-PLUGIN is already installed...  
    ...It appears as though IHS-PLUGIN in not currently installed on this system  
  
  Installing IHS-PLUGIN silently...  
Installed com.ibm.websphere.PLG.v90_9.0.0.20160526_1854 to the /opt/IBM/WebSphere/Plugins directory.  
Installed com.ibm.java.jdk.v8_8.0.3000.20160526_1317 to the /opt/IBM/WebSphere/Plugins directory.  
  Silent install of IHS-PLUGIN complete  
  
WCT install:  
  Checking to see if WCT is already installed...  
    ...It appears as though WCT in not currently installed on this system.  
  
  Installing WCT silently...  
Installed com.ibm.websphere.WCTILAN.v90_9.0.0.20160526_1854 to the /opt/IBM/WebSphere/Toolbox directory.
```

\_\_\_ c. Finally, the installation script does these tasks:

- Configuring the IBM HTTP Server plug-in
- Starting the IBM HTTP Server processes

```
WCT install:
  Checking to see if WCT is already installed...
    ...It appears as though WCT is not currently installed on this system.
```

```
  Installing WCT silently...
  Installed com.ibm.websphere.WCTILAN.v90_9.0.0.20160526_1854 to the /opt/IBM/WebSphere/Toolbox directory.
  Installed com.ibm.java.jdk.v8_8.0.3000.20160526_1317 to the /opt/IBM/WebSphere/Toolbox directory.
  Silent install of WCT complete
```

```
Configuration of IHS plugin for webserver1:
  Importing definition location...
```

```
Definition location successfully imported
```

```
Launching tool pct ...
```

```
Tool execution completed successfully.
```

```
  Starting IHS server process
  Starting IHS Admin server process
  Configuration of IHS plugin complete
  Reset Complete. Press Enter to continue...■
```

\_\_\_ d. When the installation script is finished, press **Enter** to close the window.

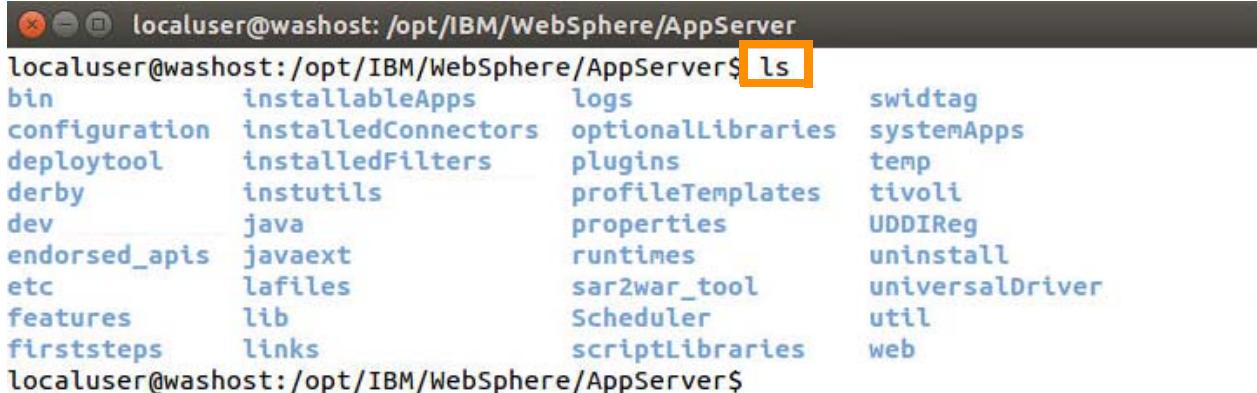
## Section 2: Validation

\_\_\_ 1. Confirm that the WebSphere Application Server is installed.

\_\_\_ a. Open a terminal window and change to the following directory:

```
/opt/IBM/WebSphere/AppServer/
```

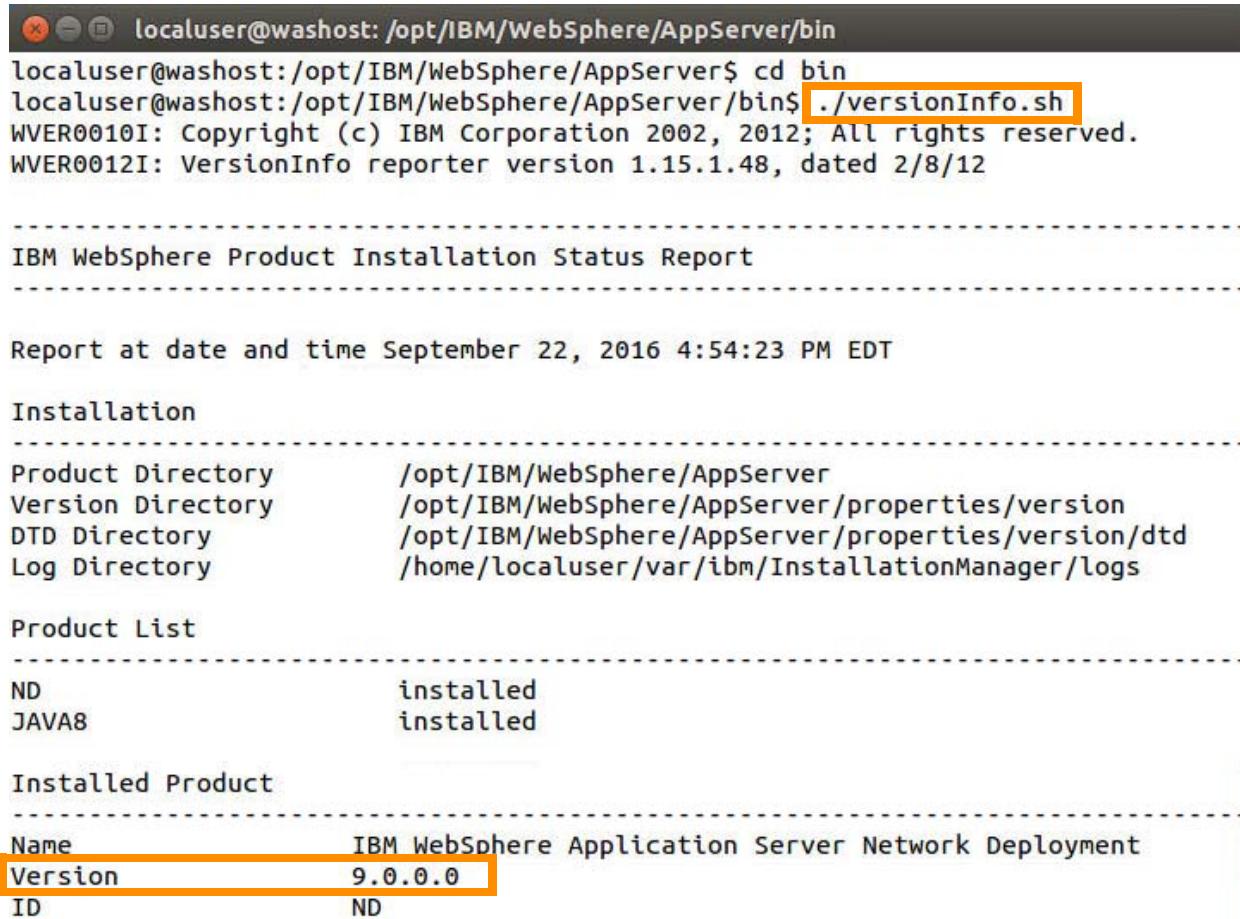
\_\_\_ b. Use the `ls` command to confirm that directory is populated.



```
localuser@washost:/opt/IBM/WebSphere/AppServer$ ls
bin           installableApps    logs          swidtag
configuration  installedConnectors optionalLibraries  systemApps
deploytool     installedFilters   plugins        temp
derby          instutils        profileTemplates tivoli
dev            java             properties      UDDIReg
endorsed_apis  javaext         runtimes       uninstall
etc            lafiles          sar2war_tool  universalDriver
features       lib              Scheduler      util
firststeps     links           scriptLibraries web
localuser@washost:/opt/IBM/WebSphere/AppServer$
```

- \_\_\_ c. Change into the `bin` directory and use the following command to check the version:

```
./versionInfo.sh
```



```
localuser@washost:/opt/IBM/WebSphere/AppServer/bin$ cd bin
localuser@washost:/opt/IBM/WebSphere/AppServer/bin$ ./versionInfo.sh
WVER0010I: Copyright (c) IBM Corporation 2002, 2012; All rights reserved.
WVER0012I: VersionInfo reporter version 1.15.1.48, dated 2/8/12

-----
IBM WebSphere Product Installation Status Report
-----

Report at date and time September 22, 2016 4:54:23 PM EDT

Installation
-----
Product Directory      /opt/IBM/WebSphere/AppServer
Version Directory     /opt/IBM/WebSphere/AppServer/properties/version
DTD Directory        /opt/IBM/WebSphere/AppServer/properties/version/dtd
Log Directory         /home/localuser/var/ibm/InstallationManager/logs

Product List
-----
ND                      installed
JAVA8                  installed

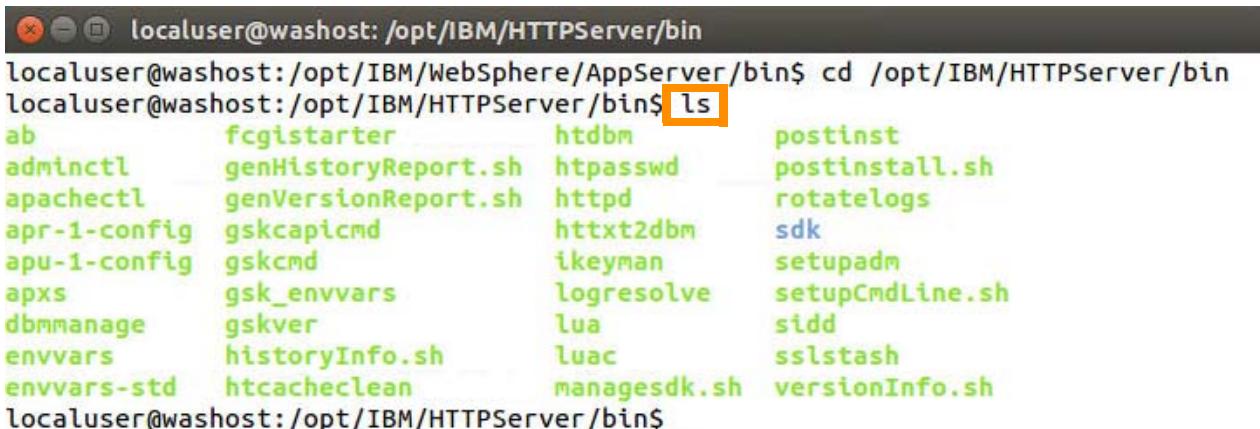
Installed Product
-----
Name          IBM WebSphere Application Server Network Deployment
Version       9.0.0.0
ID            ND
```

- \_\_\_ 2. Confirm that the IBM HTTP Server is installed.

- \_\_\_ a. In the terminal window, change to the following directory:

```
/opt/IBM/HTTPServer/bin
```

- \_\_\_ b. Use the `ls` command to confirm that directory has been populated.

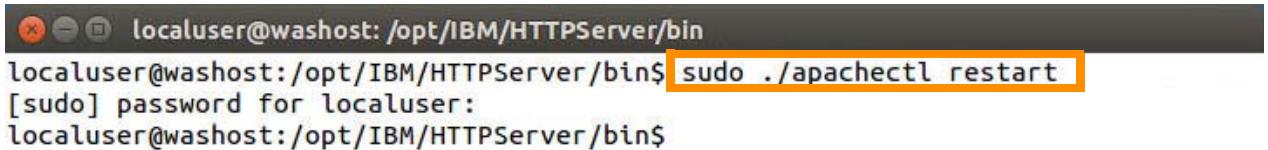


```
localuser@washost:/opt/IBM/HTTPServer/bin$ cd /opt/IBM/HTTPServer/bin
localuser@washost:/opt/IBM/HTTPServer/bin$ ls
ab           fcgistarter      htdbm      postinst
adminctl    genHistoryReport.sh  htpasswd   postinstall.sh
apachectl   genVersionReport.sh httpd      rotateLogs
apr-1-config gskcapicmd      httxt2dbm  sdk
apu-1-config gskcmd          ikeyman    setupadm
apxs         gsk_envvars      logresolve  setupCmdLine.sh
dbmmanage   gskver           lua        sidd
envvars      historyInfo.sh   luac       sslstash
envvars-std  htcachecclean   managesdk.sh versionInfo.sh
localuser@washost:/opt/IBM/HTTPServer/bin$
```

- \_\_\_ c. Use the following command to restart the web server:

```
sudo ./apachectl restart
```

When prompted, enter `passw0rd` for the password.



A terminal window with a dark background and light-colored text. The window title is "localuser@washost: /opt/IBM/HTTPServer/bin". The command `sudo ./apachectl restart` is highlighted with a yellow box. The prompt "[sudo] password for localuser:" is visible below it. The terminal ends with a "\$" sign.

```
localuser@washost:/opt/IBM/HTTPServer/bin$ sudo ./apachectl restart
[sudo] password for localuser:
localuser@washost:/opt/IBM/HTTPServer/bin$
```

### **Section 3: Create a profile with the Profile Management Tool**

After WebSphere Application Server is installed, you must create a profile to make the product functional. In this part of the exercise, you create an application server profile that is named `profile1` with the Profile Management Tool in the WebSphere Customization Toolbox. The Profile Management Tool is added to the WebSphere Customization Toolbox during the installation of WebSphere Application Server.

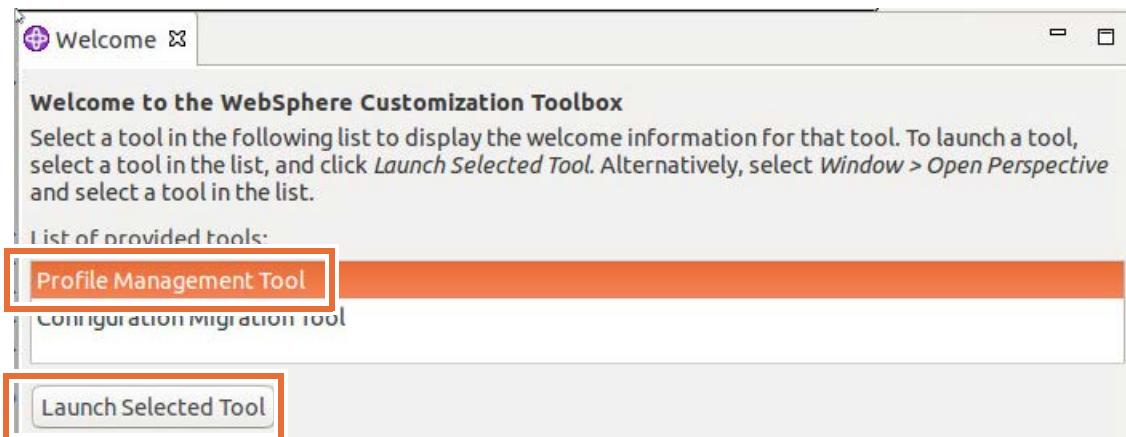


#### Information

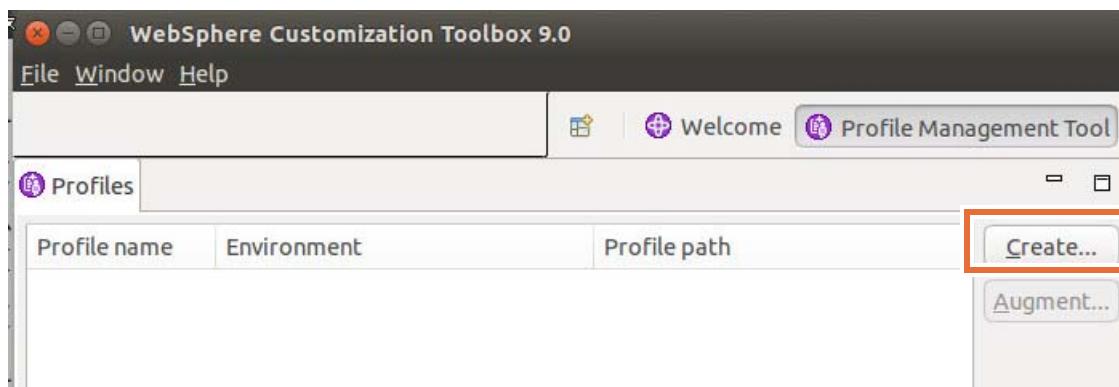
Note: The profile that is created is called **profile1**, which is profile number one. The name does not end with the character `1` or `L` (capital or lowercase "L").

- 
- \_\_\_ 1. Create an application server profile with the Profile Management Tool in the WebSphere Customization Toolbox.
- \_\_\_ a. In a terminal window, navigate to the following directory:  
`/opt/IBM/WebSphere/AppServer/bin/ProfileManagement`
  - \_\_\_ b. Enter the following command to start the WebSphere Customization Toolbox:  
`./wct.sh`

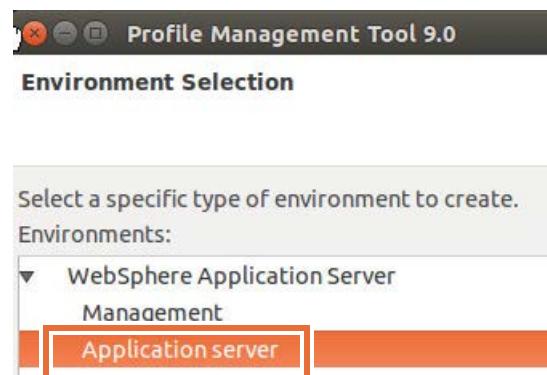
- c. The WebSphere Customization Toolbox opens. Select Profile Management Tool, and click **Launch Selected Tool**.



- d. The WebSphere Customization Toolbox opens the Profile Management Tool. Notice that the list does not contain any profiles. Click **Create**.



- e. In the Environment Selection panel, select **Application server** and click **Next**.





## Information

By creating profiles, you can create multiple runtime environments on a system without installing the core product files again. When you use the Profile Management Tool, several types of profiles can be created:

- **Cell (deployment manager and a federated application server)**

A cell creates two profiles: a management profile with a deployment manager and an application server profile. The application server is federated to the cell of the deployment manager.

- **Management**

A management profile provides the server and services for managing multiple application server environments. The administrative agent manages application servers on the same computer. A job manager provides loosely coupled management of topologies that are distributed over multiple computers. The Network Deployment edition also includes a deployment manager for tightly coupled management. Each instance of the deployment manager defines a unique cell.

- **Application server**

An application server environment runs your enterprise applications. An application server is managed from its own administrative console and functions independently from all other application servers. A new instance of a stand-alone node with a single application server is created. Stand-alone nodes have only one application server.

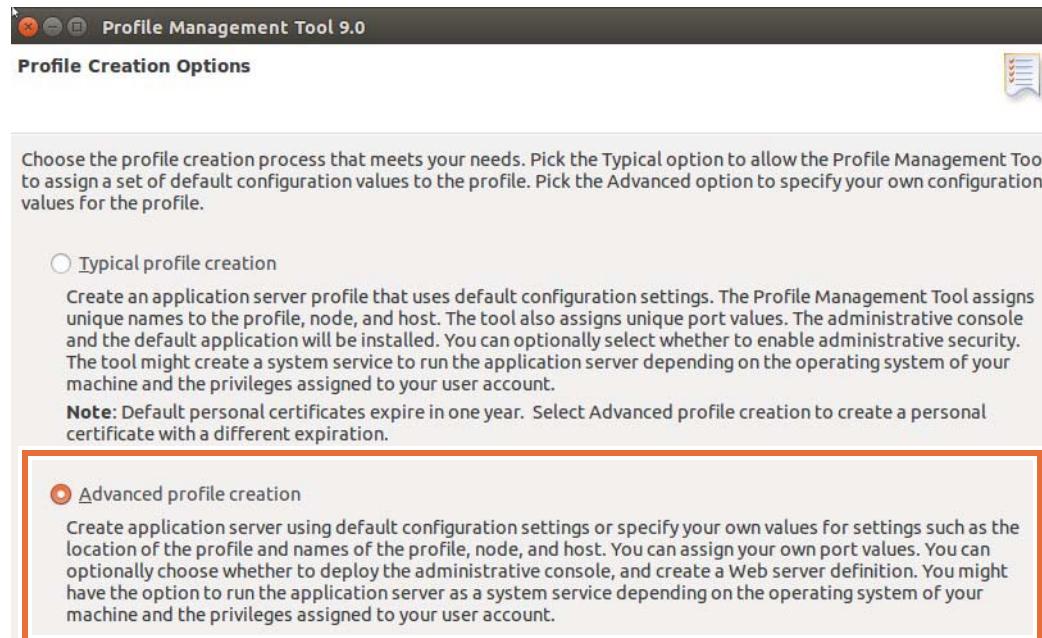
- **Custom profile**

A custom profile contains an empty node, which does not contain an administrative console or servers. The typical use for a custom profile is to federate its node to a deployment manager. After you federate the node, you use the deployment manager to create a server or a cluster of servers within the node.

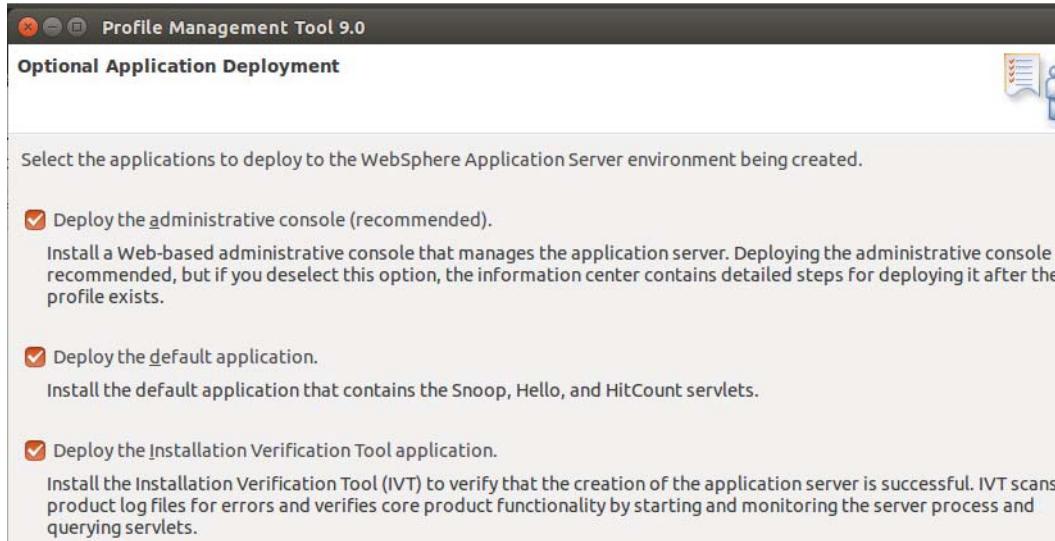
- **Secure proxy (configuration-only)**

A secure proxy profile is for use with a DMZ secure proxy server. You cannot start the secure proxy server on the Network Deployment installation. This configuration-only profile is intended to be used only to configure the profile with the administrative console. After you configure the profile, you can export the profile configuration and then import it into the secure proxy profile in your DMZ.

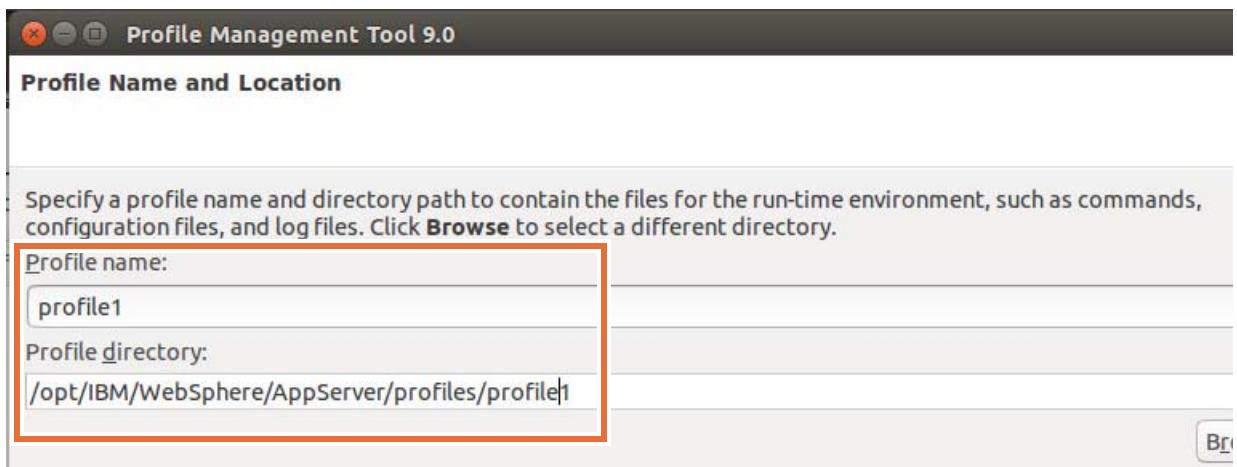
- \_\_\_ f. In the Profile Creation Options panel, select **Advanced profile creation**. With this selection, you can specify your own values for some settings. Click **Next**.



- \_\_\_ g. In the Optional Application Deployment panel, keep the default selections. Click **Next**.



- h. In the Profile Name and Location panel, make the following modifications (the values that are entered are not the default values):
- **Profile name:** profile1 (profile and the number one)
  - **Profile directory:** /opt/IBM/WebSphere/AppServer/profiles/profile1



## Information

The performance monitoring infrastructure service is enabled to gather statistics so you can further tune the server yourself. Settings include:

- **Standard:** The standard settings are optimized for general-purpose usage with conservative settings.
- **Peak:** The peak settings are optimized for runtime performance in environments where updates to applications are infrequent.
- **Development:** The development settings are optimized for environments with less powerful hardware and where updates to applications are frequent.

Select the performance tuning settings that most closely match the type of environment in which the application server will run. Review the information center article on performance tuning settings before choosing a setting because additional tuning still might be necessary to optimize the performance of the server for your applications.

Server runtime performance tuning setting:	Standard	Description
		The standard settings are optimized for general purpose usage with conservative settings. The performance monitoring infrastructure service is enabled to gather statistics so you can further tune the server yourself.

- i. Click **Next**.

- \_\_\_ j. In the Node and Host Names panel, enter the following values (the default values must be changed for the course exercises):
- **Node name:** washostNode01
  - **Server name:** server1
  - **Host name:** washost



- \_\_\_ k. Click **Next**.

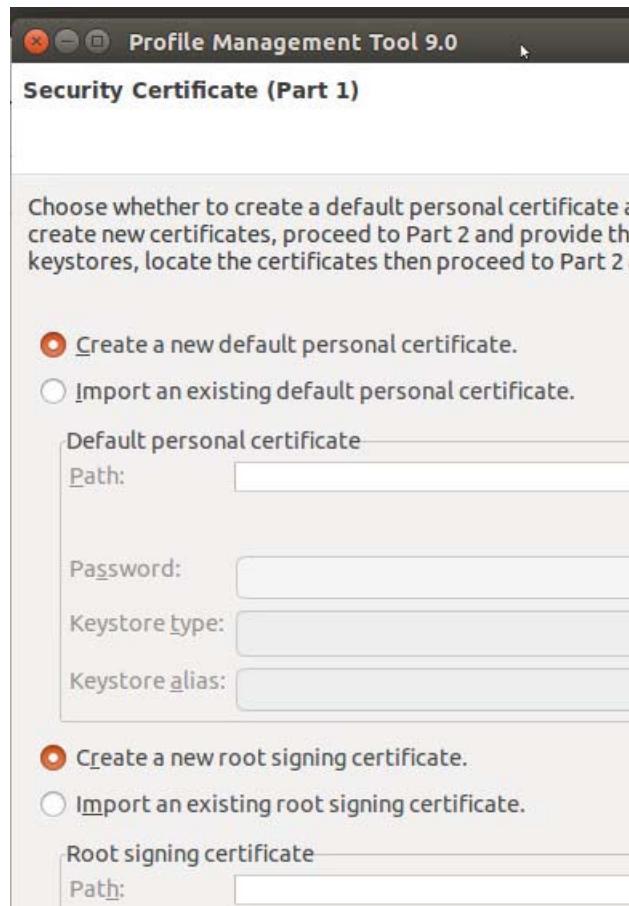
- \_\_ I. The Administrative Security panel specifies whether to use initial administrative security. If selected, you specify an initial administrative user name and password, which are used for administrative activities such as console access. Verify that **Enable administrative security** is selected. Enter the following values:

- **User name:** wasadmin
  - **Password:** websphere
  - **Confirm password:** websphere

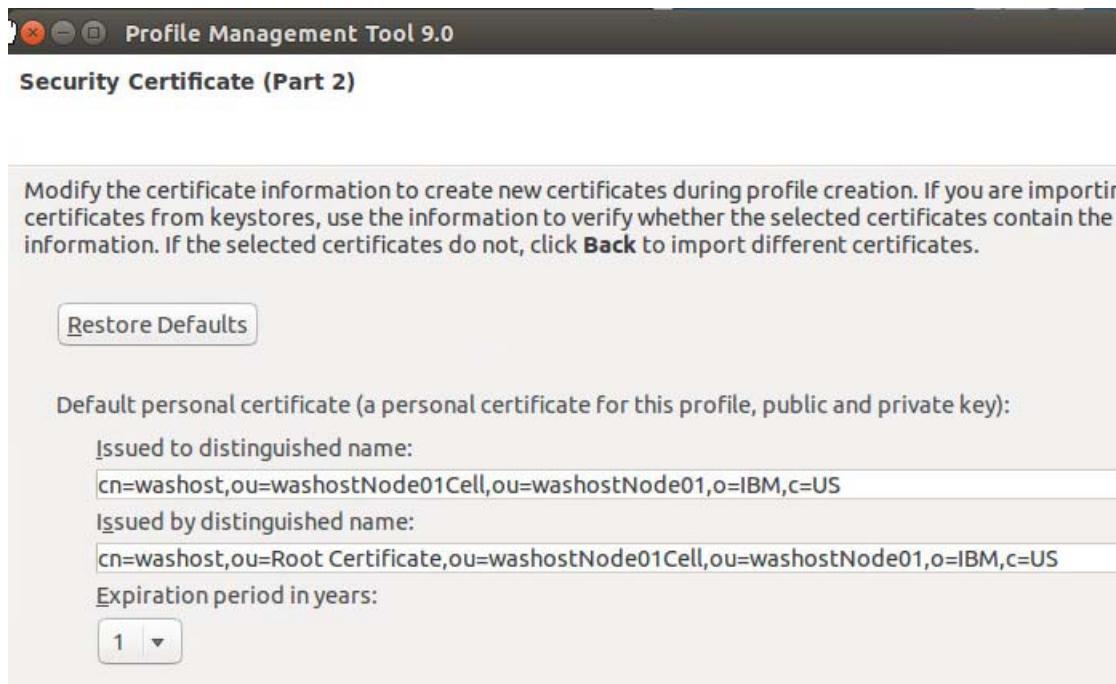


- m. Click **Next**.

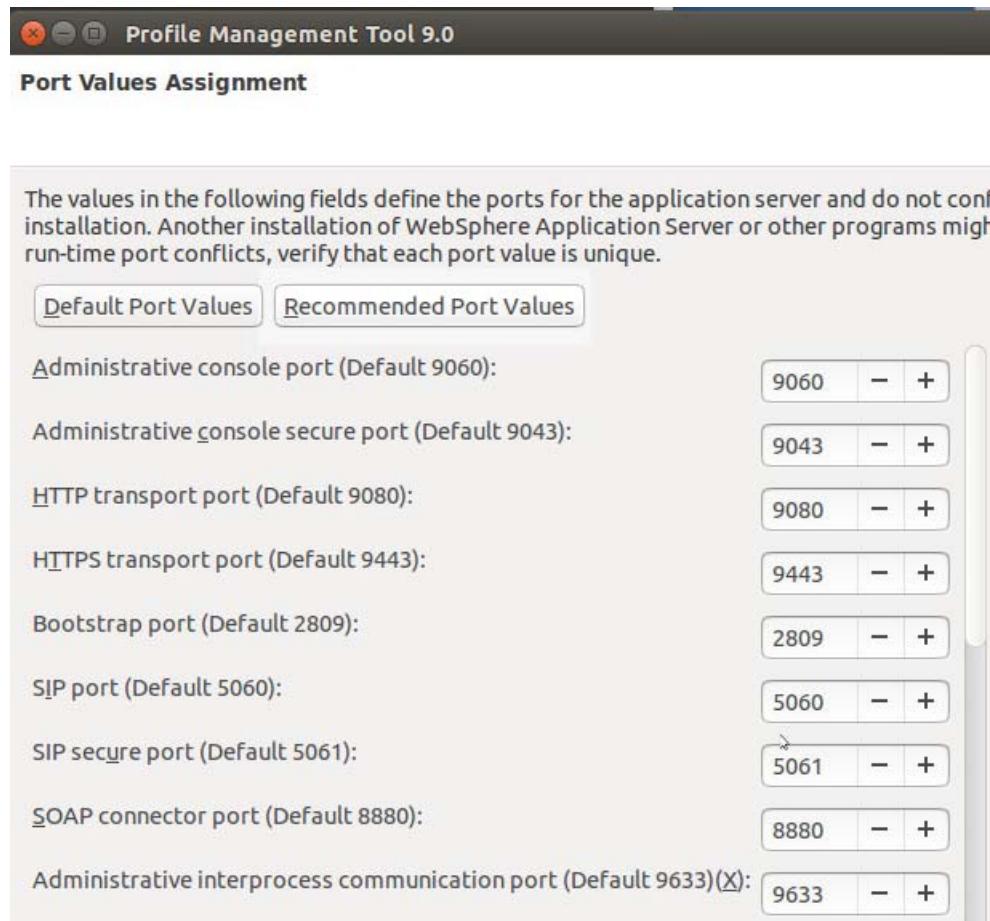
- \_\_\_ n. In the **Security Certificate (Part 1)** panel, accept the default selection. Click **Next**.



- 0. In the **Security Certificate (Part 2)** panel, accept the default selection. Click **Next**.



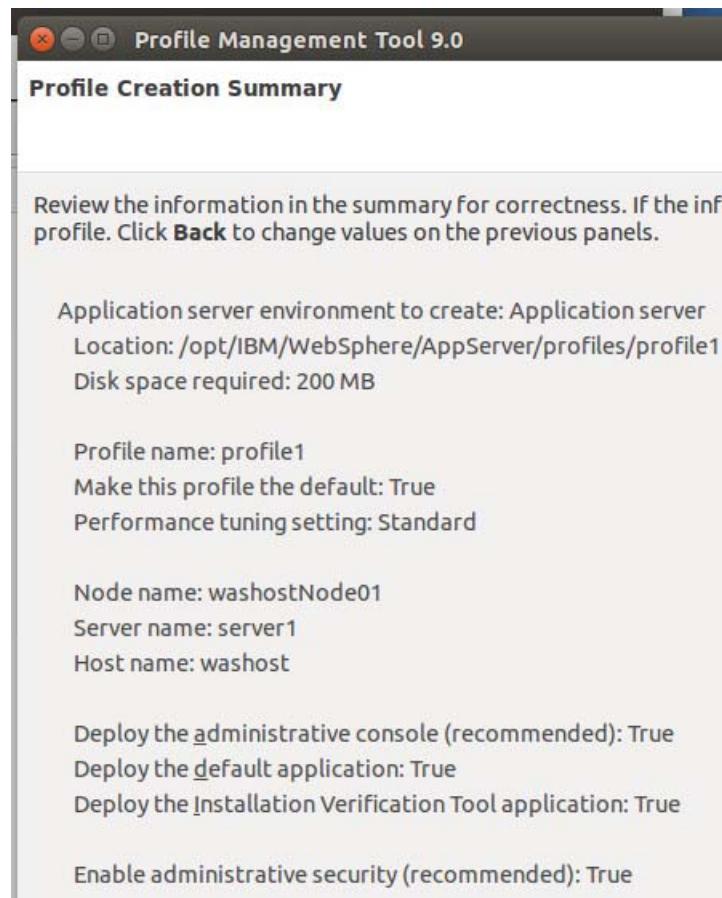
- \_\_\_ p. In the Port Values Assignment panel, accept the default values. Click **Next**.



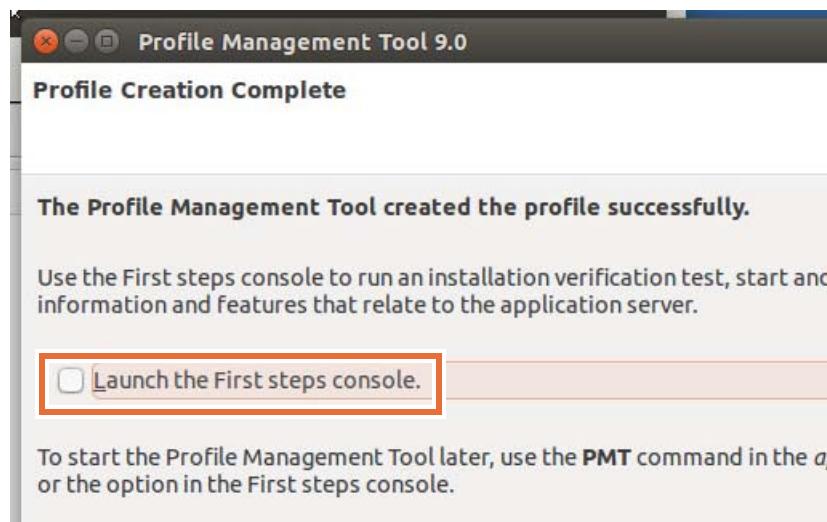
- \_\_\_ q. In the Web Server Definition panel, accept the default value. Do not create a web server definition. Click **Next**.



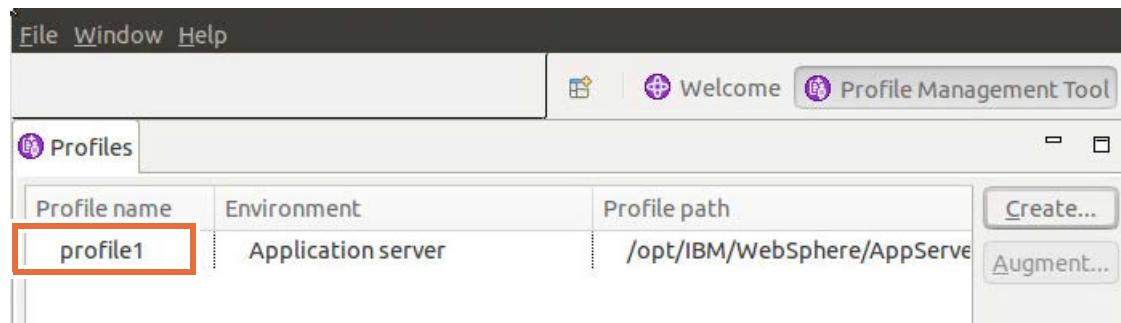
- \_\_\_ r. Review the **Profile Creation Summary** panel. Click **Create**.



- \_\_\_ s. The profile creation completes successfully in several minutes. In the Profile Creation Complete panel, clear the check box for **Launch the First steps console** and click **Finish**.



- \_\_\_ t. The newly created profile is listed in the Profile Management Tool.



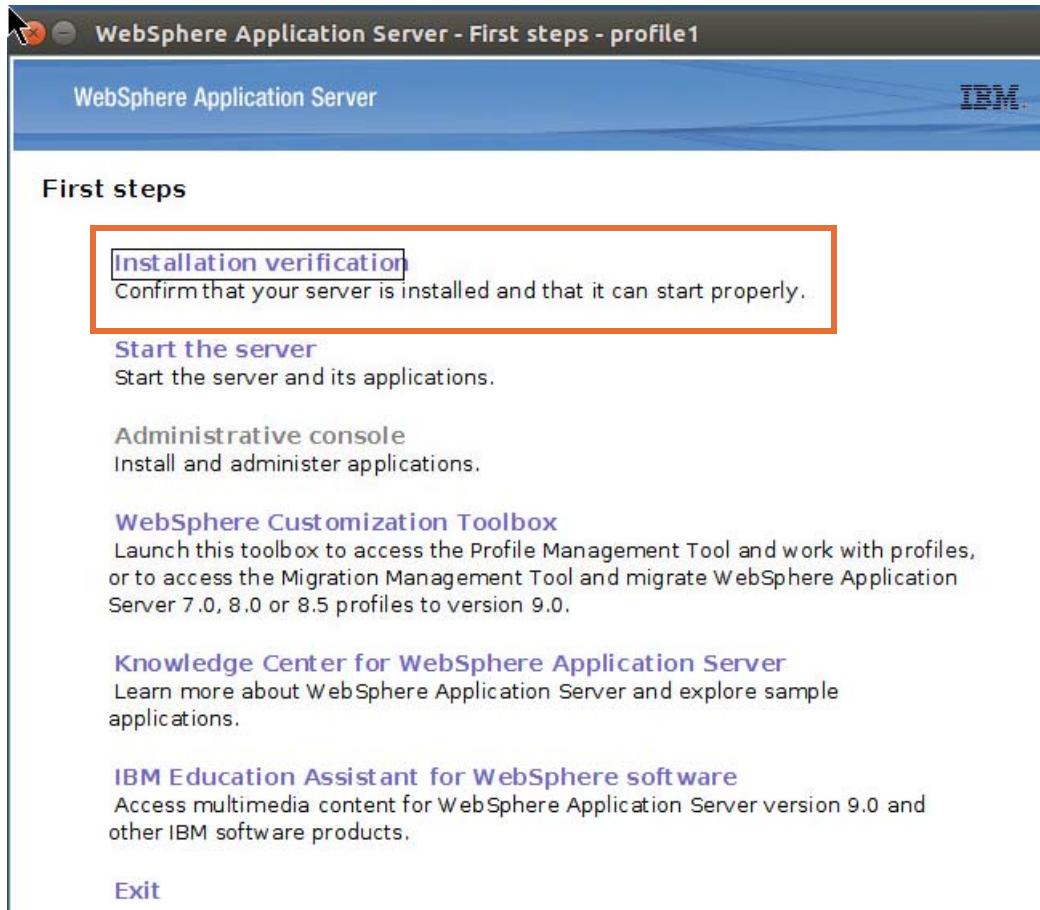
- \_\_\_ u. Exit the WebSphere Customization Toolbox.

#### **Section 4: Verify installation of WebSphere Application Server**

The First steps console is where you can start or stop the server, access the WebSphere documentation in the IBM Knowledge Center, and start various tools. Each application server profile has an associated First steps console.

- \_\_\_ 1. Start the First steps console for profile1.
  - \_\_\_ a. From a terminal window, navigate to the following directory:  
`/opt/IBM/WebSphere/AppServer/profiles/profile1/firststeps`
  - \_\_\_ b. Enter the following command to start the First steps console:  
`./firststeps.sh`

- \_\_ 2. Verify that the server is created and starts properly.
  - \_\_ a. Click **Installation verification**.



The installation verification test tool runs and displays messages to indicate the verification status. Use the scroll bar to view all messages. At the bottom of the message list are the messages (some errors and warnings before the final success messages are expected):

IVTL0070I: The Installation Verification Tool verification succeeded.  
 IVTL0080I: The installation verification is complete.



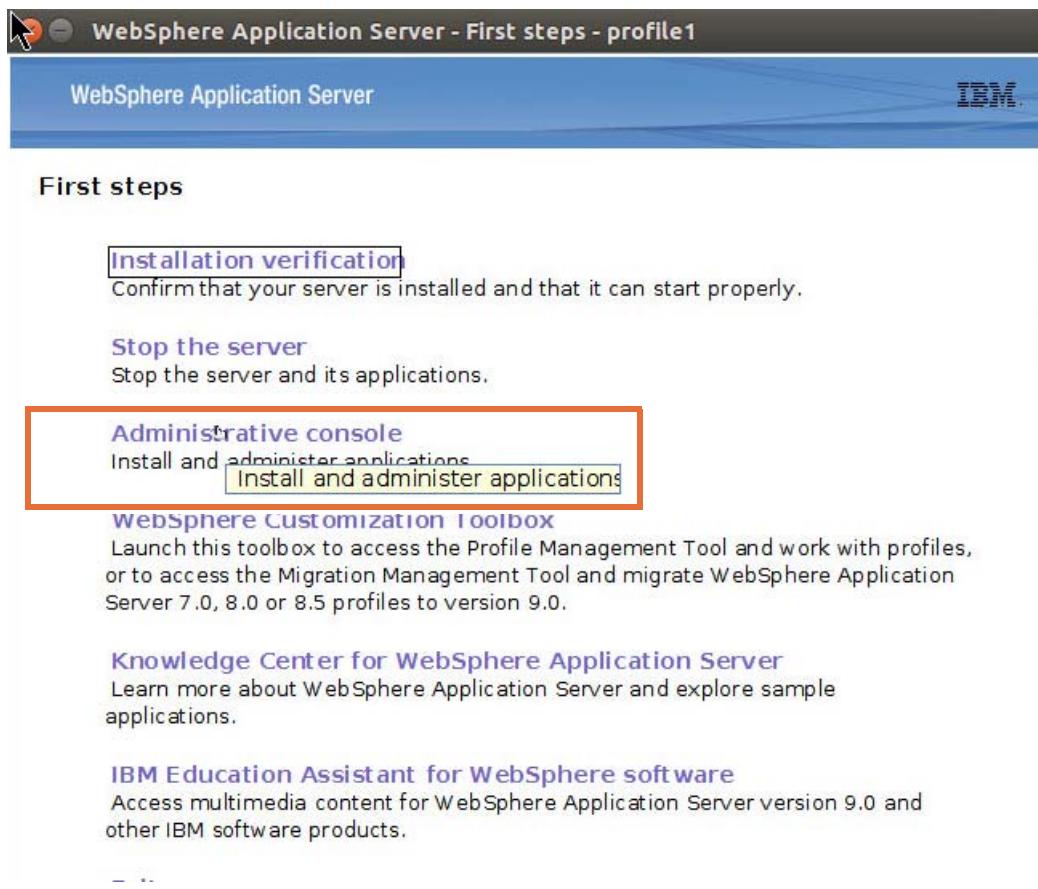
```

First steps output - Installation verification

Start running the following command:/opt/IBM/WebSphere/AppServer/profiles/profile1/bin/startServer.sh server1 -profileName
>ADMU0116I: Tool information is being logged in file
> /opt/IBM/WebSphere/AppServer/profiles/profile1/logs/server1/startServer.log
>ADMU0128I: Starting tool with the profile1 profile
>ADMU3100I: Reading configuration for server: server1
>ADMU3200I: Server launched. Waiting for initialization status.
>ADMU3000I: Server server1 open for e-business; process id is 50481
Server port number is:9080
IVTL0010I: Connecting to the washost WebSphere Application Server on port: 9080
IVTL0015I: WebSphere Application Server washost is running on port: 9080 for profile profile1
Testing server using the following URL:http://washost:9080/ivt/ivtserver?parm2=ivtservlet
IVTL0050I: Servlet engine verification status: Passed
Testing server using the following URL:http://washost:9080/ivt/ivtserver?parm2=ivtAddition.jsp
IVTL0055I: JavaServer Pages files verification status: Passed
Testing server using the following URL:http://washost:9080/ivt/ivtserver?parm2=ivtejb
IVTL0060I: Enterprise bean verification status: Passed
IVTL0035I: The Installation Verification Tool is scanning the /opt/IBM/WebSphere/AppServer/profiles/profile1/logs/server1/SystemOut.log
[5/10/16 12:28:27:641 EDT] 00000001 ComponentMeta E WSVR0153E: A single components element must be defined for
[5/10/16 12:28:30:188 EDT] 00000001 WSKeyStore W CWPK00041W: One or more key stores are using the default passw
M IVTL0070I: 2 errors/warnings are detected in the /opt/IBM/WebSphere/AppServer/profiles/profile1/logs/server1/SystemOut.log
M IVTL0070I: The Installation Verification Tool verification succeeded.
M IVTL0080I: The installation verification is complete.
  
```

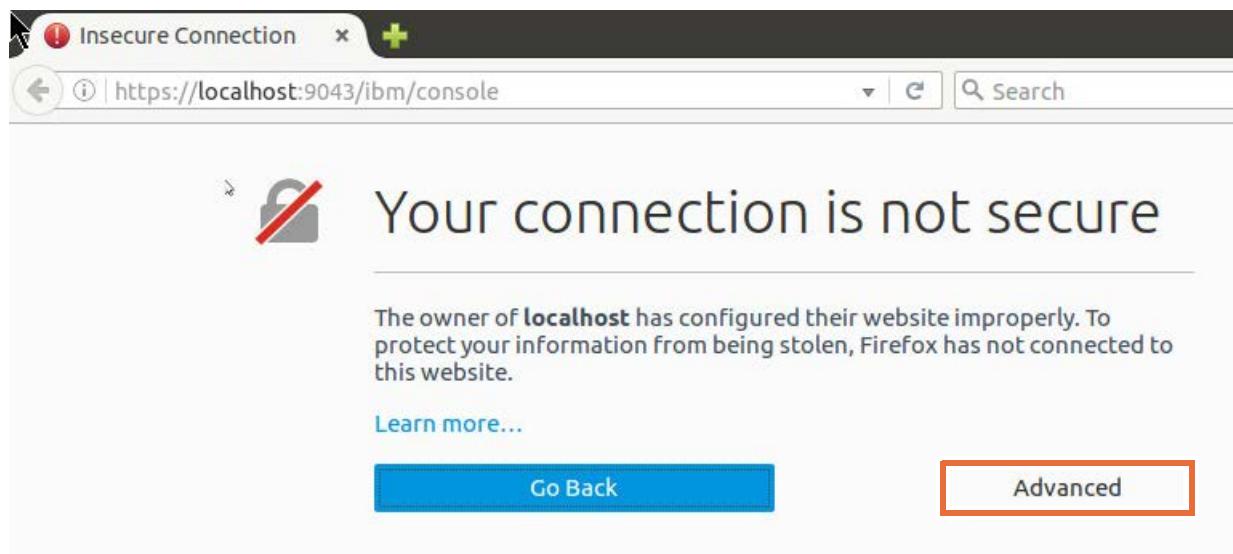
- \_\_\_ b. Close the “First steps output - Installation verification” window.

- c. From the First steps console, click **Administrative console** to start the administrative console for profile1. During the installation verification test, the application server from profile1 was started. Since the server is started, the administrative console is able to connect to the running application server.



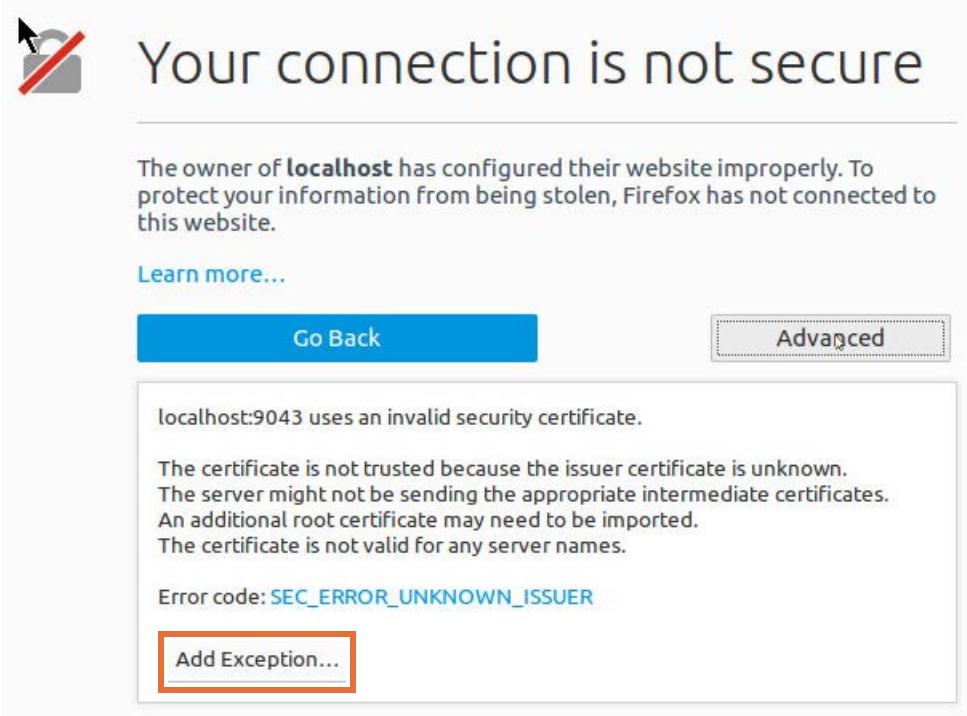
The screenshot shows the 'First steps' section of the WebSphere Application Server interface. It includes links for 'Installation verification', 'Stop the server', 'Administrative console' (which is highlighted with a red box), 'WebSphere Customization Toolbox', 'Knowledge Center for WebSphere Application Server', and 'IBM Education Assistant for WebSphere software'. The 'Administrative console' link is described as 'Install and administer applications'.

- d. A window opens with a warning. Click **Advanced**.



The screenshot shows a Firefox browser window with an 'Insecure Connection' warning. The address bar shows 'https://localhost:9043/ibm/console'. The main content area displays a warning message: 'Your connection is not secure' with a lock icon, followed by text stating 'The owner of localhost has configured their website improperly. To protect your information from being stolen, Firefox has not connected to this website.' Below the message are 'Learn more...' and two buttons: 'Go Back' and 'Advanced' (which is highlighted with a red box).

- \_\_\_ e. Click **Add Exception**.



- \_\_\_ f. Click **Confirm Security Exception**.





## Information

Two issues are present, and both involve the browser that uses SSL to communicate with the administrative console application. To establish the SSL connection, the application server presents a certificate to the browser. The browser complains about two aspects of this certificate and asks whether the user wants to continue. The two issues are as follows:

- **The host name for the certificate does not match what you entered in the URL.** In this case, the URL might use localhost, and the certificate was created during profile creation with a mapping to the host IP address. To resolve this issue, you can specify an appropriate host name during the certificate creation. You can also use the host name in the certificate when you enter the URL into the browser.
- **An unknown certificate authority signed the certificate that is presented to the browser.** By default, internal self-signed certificates are created for the WebSphere cell. As such, the browser does not necessarily trust this unknown certificate authority. Therefore, it asks the user whether it is appropriate to proceed.

- 
- \_\_\_ g. Log in to the administrative console with the following credentials:
- User ID: **wasadmin**
  - Password: **websphere**
- \_\_\_ h. Click **Log in**.

Licensed Materials - Property of IBM (c) Copyright IBM Corp. 1997, 2011 All Rights Reserved. IBM, the IBM logo, ibm.com and WebSphere are trademarks or registered trademarks of International Business Machines Corp., registered in many jurisdictions worldwide. Other product and service names might be trademarks of IBM or other companies. A current list of IBM trademarks is available on the Web at [Copyright and trademark information](#).



## Information

The user ID `wasadmin` was created during the profile creation process. It does not exist in the operating system registry or an LDAP registry, but instead exists in a file-based registry within the application server configuration. Now that the profile is created, security can be reconfigured to use any user registry.

- \_\_\_ 3. The main page for the WebSphere Integrated Solutions Console is displayed and looks like the following screen capture:

Suite Name	Version
<a href="#">WebSphere Application Server</a>	9.0.0.0

- \_\_\_ 4. Verify that the DefaultApplication is installed and is running.
  - \_\_\_ a. Using the administrative console navigation tree, click **Applications > Application Types > WebSphere enterprise applications**.

The application status for the DefaultApplication is displayed as a green arrow to indicate that the application is running. If you place your cursor over the arrow, a message indicates that the application is Started.

The screenshot shows the 'Enterprise Applications' management interface. At the top, there's a toolbar with buttons for Start, Stop, Install, Uninstall, Update, Rollout Update, Remove File, and Export. Below the toolbar is a toolbar with icons for selecting, creating, deleting, and updating applications. A search bar allows filtering by 'Select' or 'Name'. An 'Application Status' column shows the status of each application. The table lists three applications:

Select	Name	Application Status
<input type="checkbox"/>	<a href="#">DefaultApplication</a>	
<input type="checkbox"/>	<a href="#">ivtApp</a>	
<input type="checkbox"/>	<a href="#">query</a>	

Total 3

- \_\_\_ b. Open another browser window and enter the following URL:

`http://localhost:9080/snoop`

The URL runs a servlet that is called Snoop, which comes with the DefaultApplication. Snoop displays a page with information about the runtime environment of the server. The page provides further confirmation that the application server is operating correctly.



## Snoop Servlet - Request/Client Information

### Requested URL:

`http://localhost:9080/snoop`

### Servlet Name:

Snoop Servlet

### Servlet Context Initialization Parameters

WELD_CONTEXT_ID_KEY	DefaultApplication#DefaultWebApplication.war
---------------------	--

### Request Information:

Request method	GET
Request URI	/snoop
Request protocol	HTTP/1.1

- \_\_\_ c. Close the browser that is running Snoop servlet.
- \_\_\_ d. Close the administrative console by clicking **Logout**. The administrative console is examined more in later exercises. Close the browser.
- \_\_\_ 5. Exit from the First steps console.

### End of exercise

## Exercise review and wrap-up

In this exercise, you configured the lab machine so that it is ready to start the lab exercises.

The Profile Management Tool was used to create an application server profile called profile1. In the verification step, you checked that an application that is hosted on the application server ran successfully.

# Exercise 2. Exploring the administrative console

## Estimated time

00:45

## Overview

This exercise provides a guided tour of the administrative console interface by examining various resources and configuration information.

## Objectives

After completing this exercise, you should be able to:

- Verify that WebSphere Application Server is started
- Start the administrative console
- Explore the navigation and functions of the administrative console
- Use the administrative console to examine configuration information, resources, and properties

## Introduction

In this exercise, you explore the WebSphere Application Server V9 configuration. Exploration includes starting the server and browsing through key configuration files. You also start and explore the WebSphere administrative console.

The application server runs as a single JVM, including all shared services and the containers to run applications.

## Requirements

To complete this exercise, the application server must already be installed and tested, and you must be able to successfully start the server.

# Exercise instructions

## Section 1: Resetting the WebSphere environment

---



### Note

To reset your WebSphere environment, read **Appendix A** for instructions on how to complete this procedure.

---

## Section 2: Start the server

- \_\_\_ 1. Before you can configure the application server environment, you must start all the required processes. For this exercise, you use profile1 on server1.
  - \_\_\_ 2. Determine how many JVMs are running on your system.
    - \_\_\_ a. Use the command `ps -ef | grep java` to show the running Java processes.
- 



### Information

Take note of how many **Java** processes are running. No Java processes are running, unless the server is running from a previous exercise. Start the server unless it is already running.

---



### Note

These examples use the root account. Security policy at most production sites would not use the root account. Most sites define an account consistent with their security policies.

If you are prompted for an authorized account, use `wasadmin` with a password of `webSphere` for these commands.

---

- \_\_\_ b. In a terminal window, navigate to: `<profile_root>/profile1/bin`
- \_\_\_ c. Enter `sudo ./startServer.sh server1` to start the server.
- \_\_\_ d. After a successful startup of the server you see the message “Server server1 open for e-business”, which indicates that the server is ready and shows its process ID.



## Information

If the server does not start, look at the `startServer.log` in the `<profile_root>/profile1/logs/server1` directory.

```
localuser@washost:/opt/IBM/WebSphere/AppServer/profiles/profile1/bin$ sudo ./startServer.sh server1
[sudo] password for localuser:
ADMU0116I: Tool information is being logged in file
          /opt/IBM/WebSphere/AppServer/profiles/profile1/logs/server1/startServer.log
ADMU0128I: Starting tool with the profile1 profile
ADMU3100I: Reading configuration for server: server1
ADMU3200I: Server launched. Waiting for initialization status
ADMU3000I: Server server1 open for e-business; process id is 38741
localuser@washost:/opt/IBM/WebSphere/AppServer/profiles/profile1/bin$
```

- \_\_\_ 3. Examine the running Java processes. Use the command `ps -e | grep java` to show the running Java processes.

```
localuser@washost:/opt/IBM/WebSphere/AppServer/profiles/profile1/bin$ ps -e | grep java
11760 pts/1    00:17:15 java
|38741 pts/17   00:00:52 java
localuser@washost:/opt/IBM/WebSphere/AppServer/profiles/profile1/bin$
```

- \_\_\_ a. Compare the process ID for the server that the `startServer` command shows with the one shown by the `ps` command. Your process IDs are going to be different from the process IDs that are shown in the screen captures.

## **Section 3: Start the administrative console**

The administrative console is the graphical user interface for managing WebSphere Application Server configuration settings for servers, applications, and other resources. The administrative console is a browser-based web application that uses HTML and JavaScript.



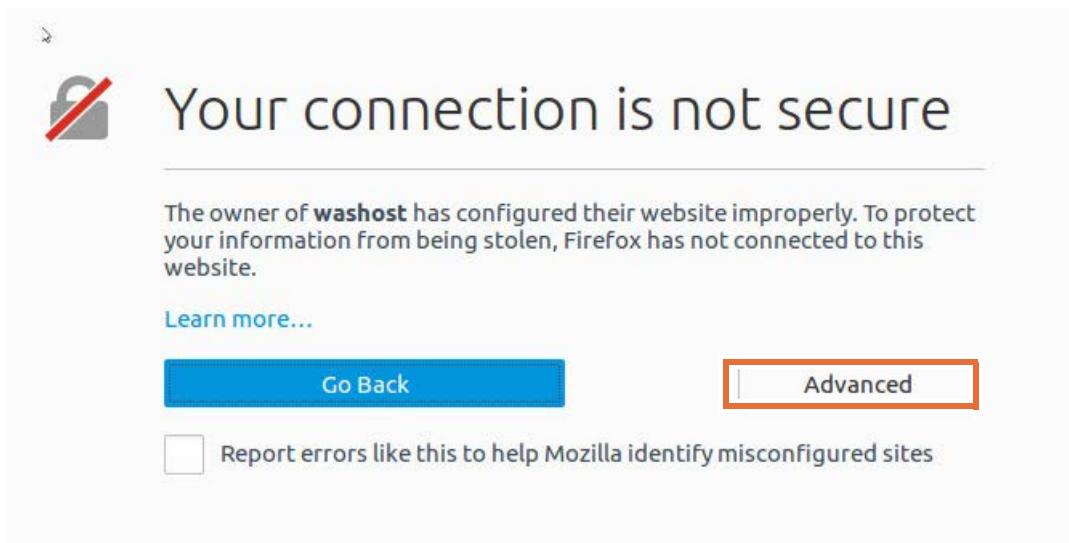
## Information

In a federated cell, you always use the administrative console that is connected to the deployment manager so that changes are synchronized across the cell. In a stand-alone application server, you connect directly to the administrative console on the server.

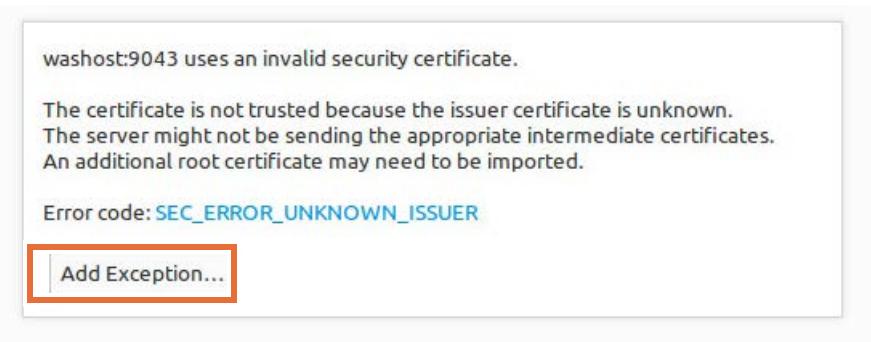
- \_\_\_ 1. Open the administrative console.
  - \_\_\_ a. Open a Firefox browser and enter the following URL:

`http://washost:9060/ibm/console`

The browser might show a message that the server connection is untrusted. This screen shows how Firefox shows this message. Click “**Advanced**”.

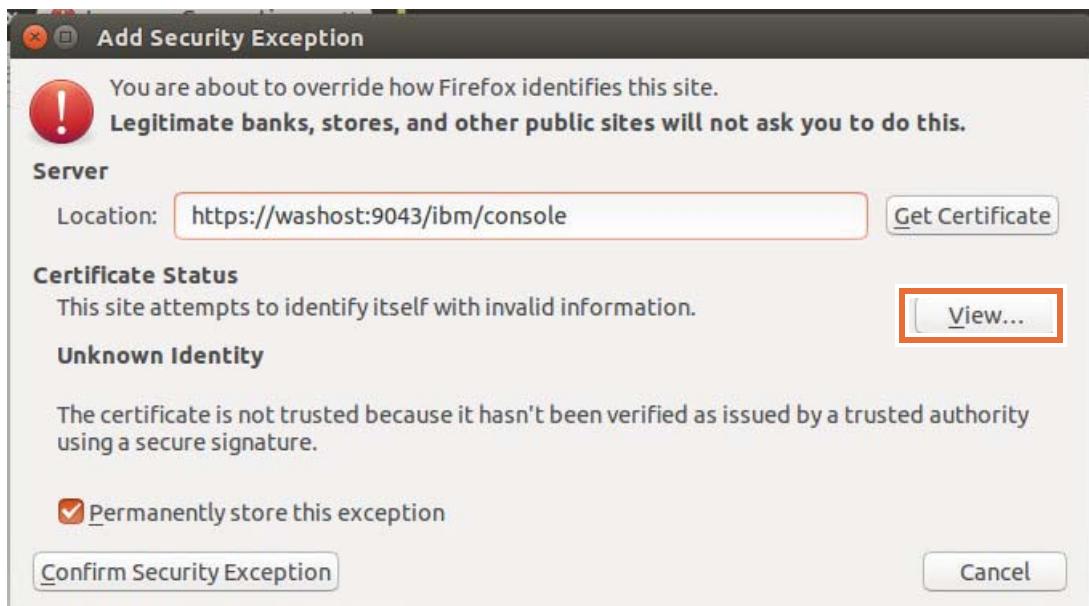


\_\_ b. Firefox shows this screen. Click **Add Exception**.

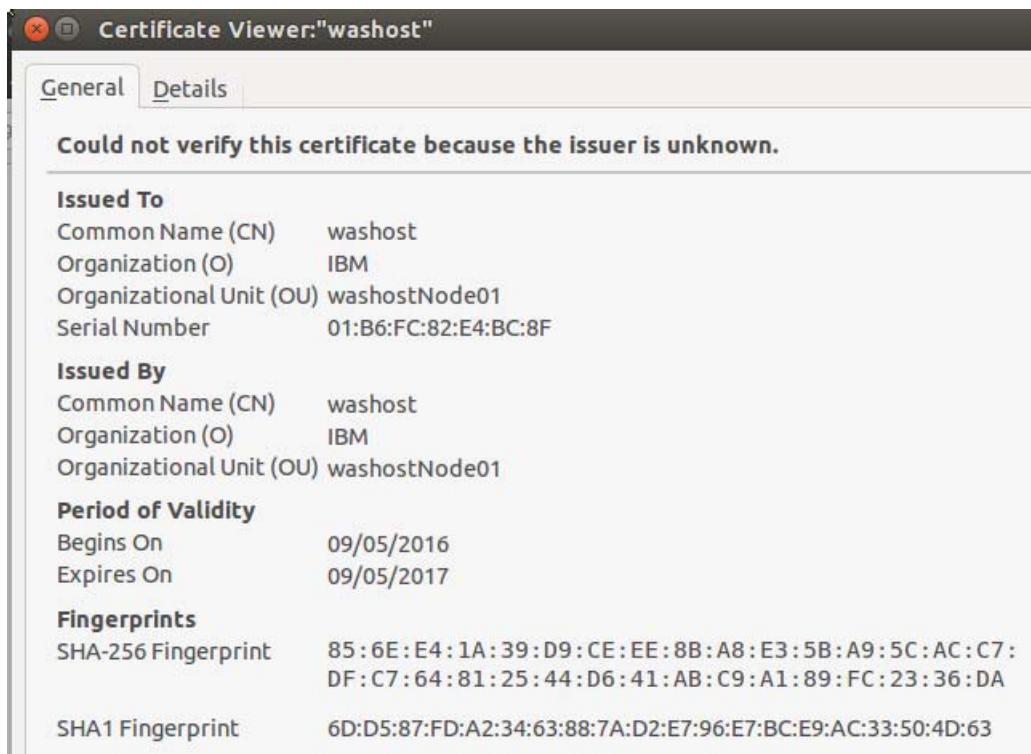


The next screen provides details about this security exception. Examine this screen before you accept this certificate.

- \_\_\_ c. With Firefox, you can view the details of the certificate before you confirm the security exception. It is important for you to view the certificate before you confirm this security exception. Click **View**.



- \_\_\_ d. The details of the certificate are shown. Why does the browser view this certificate as an error? Why is this issue not a concern for this WebSphere server? Close the certificate window and accept the security exception.



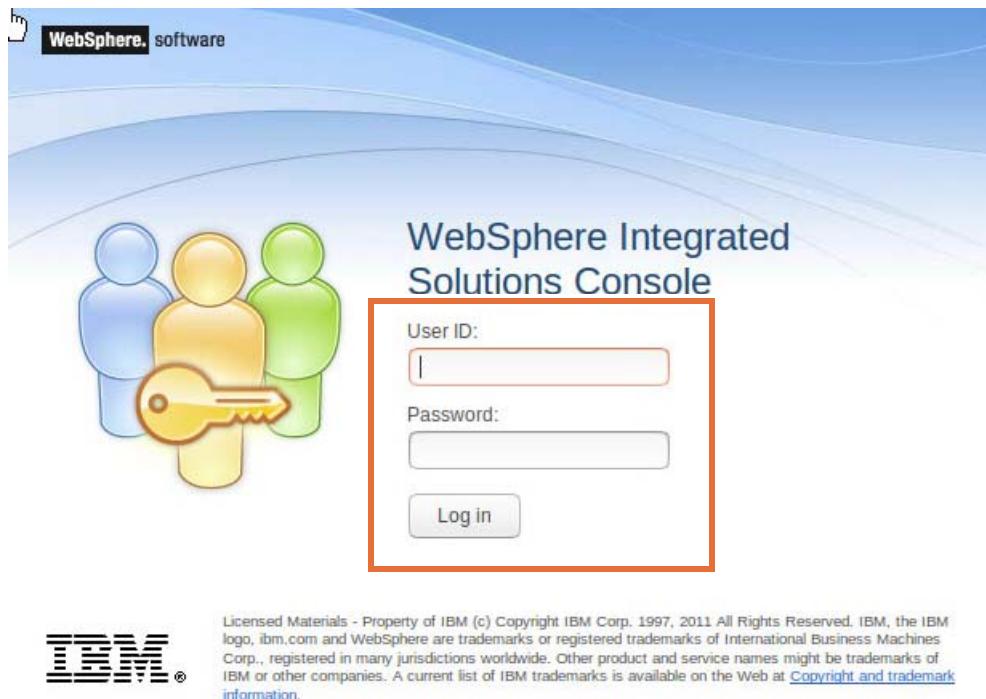
- \_\_\_ e. You must view the certificate, and you must understand the issue here. **Close** the certificate window and click **Confirm Security Exception**. **Permanently store this exception** must be checked.



## Information

It is important that you understand why the certificate for the administrative console generates this error in the browser. The browser is doing a useful security check. WebSphere has a valid certificate and is secure. It is incumbent upon the WebSphere administrator to understand this message and ensure that the certificate is correct.

The administrative console opens.



2. Enter **wasadmin** for the **User ID** and **websphere** for the **Password**. Click **Log in**.



## Information

If security is active, you must log in with a valid user ID and password. If administrative security is disabled, the user ID that you enter here does not matter, as it is used to track configuration changes.

A workspace is saved for each user, which includes unsaved configuration changes and navigation preferences.

The administrative console contains three frames as shown in the following screen capture.

**Welcome**

Suite Name	Version
<a href="#">WebSphere Application Server</a>	9.0.0.0

**About this Integrated Solutions Console**

Integrated Solutions Console,  
9.0.0.0  
Build Number: gm1621.04  
Build Date: 5/26/16

LICENSED MATERIALS PROPERTY  
OF IBM  
5724-J08, 5724-I63,  
5724-H88, 5724-H89, 5655-W65 (C)

- **Banner:** This area is the top of the administrative console. It shows a welcome message for your user ID. It shows links for logging out of the administrative console and accessing product information.

- **Navigation tree:** This area is the left frame of the administrative console. It shows the types of information you can configure. It has 13 areas:



- Guided Activities
- Servers
- Applications
- Services
- Resources
- Security
- Environment
- System administration
- Users and Groups
- Monitoring and Tuning
- Troubleshooting
- Service integration
- UDDI

Notice the Welcome link, which takes you back to the main work area home page.

- **Work area:** This area is the right frame of the administrative console. It shows the pages to create or change configuration information. The work area shows the installed product version.

## Section 4: Explore the navigation tree

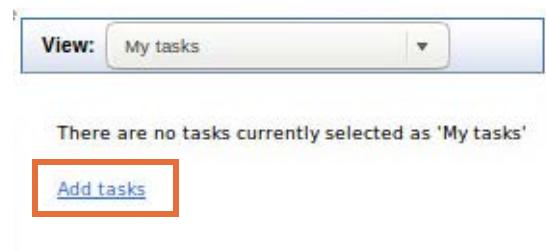
The administrative console navigation tree lists the tasks available in the administrative console. Tasks are grouped into organizational nodes that represent categories of tasks.

- \_\_\_ 1. View the categories of tasks in the navigation tree. When you click a task in the navigation tree, the work area contains one or more modules for completing the task. Use the **View** menu at the top of the navigation tree to modify the lists of tasks according to your preferences.

- \_\_\_ a. Click the **View** menu in the navigation tree.



- \_\_\_ b. You can organize the tasks as follows:
    - **All tasks:** Shows all tasks in the administrative console.
    - **My tasks:** Shows only the tasks that you added to the view. This list is initially empty, but provides a link to the My Tasks module.
    - **WebSphere Application Server:** Shows only the tasks for this particular product, WebSphere Application Server.
- \_\_\_ 2. You can use My tasks to create and edit a list of tasks to view in the navigation tree. The "My tasks" selection is especially useful to customize the navigation to show only the tasks that you use most often.
  - \_\_\_ a. Select **My tasks** from the menu in View.
  - \_\_\_ b. No tasks are currently selected. Click **Add tasks** to add a task to the view.



- \_\_\_ c. The work area shows the tasks that you can select to customize the My tasks view in the navigation tree.

- \_\_ d. Check the boxes for **Servers**, **Applications**, and **Resources**. Click **Apply**.

My Tasks

Select the tasks you wish to add to the 'My tasks' list.

Welcome  
 Guided Activities  
 Servers  
 Applications  
 Services  
 Resources  
 Security  
 Environment  
 System administration  
 Users and Groups  
 Monitoring and Tuning  
 Troubleshooting  
 Service integration

- \_\_\_ e. After applying your selections, your customized task list is seen in the navigation tree.

The screenshot shows the 'My Tasks' view in the WebSphere Administrative Console. The 'View' menu is open, with 'My tasks' selected. The main pane displays a list of tasks categorized under 'My Tasks'. At the bottom of the pane are buttons for 'Select All', 'Deselect All', 'Expand All', 'Collapse All', 'Apply', and 'Reset'. The 'Apply' button is highlighted.

- \_\_\_ f. Continue to explore and customize the **My tasks** view and add more tasks.  
 \_\_\_ g. Select **All tasks** from the View menu.

## Section 5: Explore guided activities

In this part of the exercise, you look at the guided activities for WebSphere Application Server V9. Guided activities lead you through common administrative tasks that require you to go to multiple administrative console pages.

- \_\_\_ 1. In the administrative console navigation tree, expand **Guided Activities**. In the stand-alone environment, the guided activities include:
- Connecting to a database
  - Routing requests through a web server to an application server



### Information

In the federated environment, the guided activities include:

- Connecting to a database
- Routing requests through a web server to an application server
- Configuring a cluster and configuring highly available applications

- \_\_ a. Click **Connecting to a database** to view the first activity.



The work area has information about the activity to help you complete this task successfully. It contains an introduction to the task, and details other tasks to do before and after completing this task. The work area also provides hints and tips to help you avoid and recover from problems and other tasks.

**Connecting to a database**

**Introduction**

This guided activity leads you through a set of steps to configure database access for an application. It is assumed that the database software is installed and configured. After completing these steps, your application will be able to access the data from a database.

To continue, click **Start**.

**Start** [?Help](#)

- [Configure credentials for secure database access](#)
- [Configure a JDBC provider](#)
- [Configure WebSphere variables](#)
- [Configure a data source](#)
- [Save and synchronize configuration](#)
- [Test database connection](#)

**Assumptions**

It is assumed that you are installing an application that needs to securely access data from a relational database. For more information on this task, see the following sources in the information center:

- [Configuring a JDBC provider and data source](#)
- [Deploying data access applications](#)
- [Learn about data access resources](#)

**Before you begin**

- Verify that the database and JDBC provider is supported by WebSphere Application Server. For

- \_\_ b. Continue to explore the details for connecting to a database, or select another guided activity to explore.

## Section 6: Explore server settings

In this part of the exercise, you look at some of the settings that can be configured with the administrative console. You begin by looking at the server section.

- \_\_ 1. Explore the server settings.

- \_\_ a. In the administrative console navigation tree, expand **Servers** and **Server Types**.

In the stand-alone environment, the only server types are:

- WebSphere application servers
- WebSphere MQ servers
- Web servers



## Information

In the federated environment, you can also manage:

- On-demand routers
- PHP servers
- WebSphere Application Server Community Edition servers
- Generic servers
- Proxy servers
- Apache servers
- Custom HTTP servers
- Clusters
- Cluster topology
- Generic server clusters
- Core groups

b. Click **WebSphere application servers**.

The work area is a table that lists the application servers. One server is available, which is named **server1**.

This page is a collection page because the list is a collection of objects. The page has two options for controlling the amount of information that is shown, Filter and Preferences.

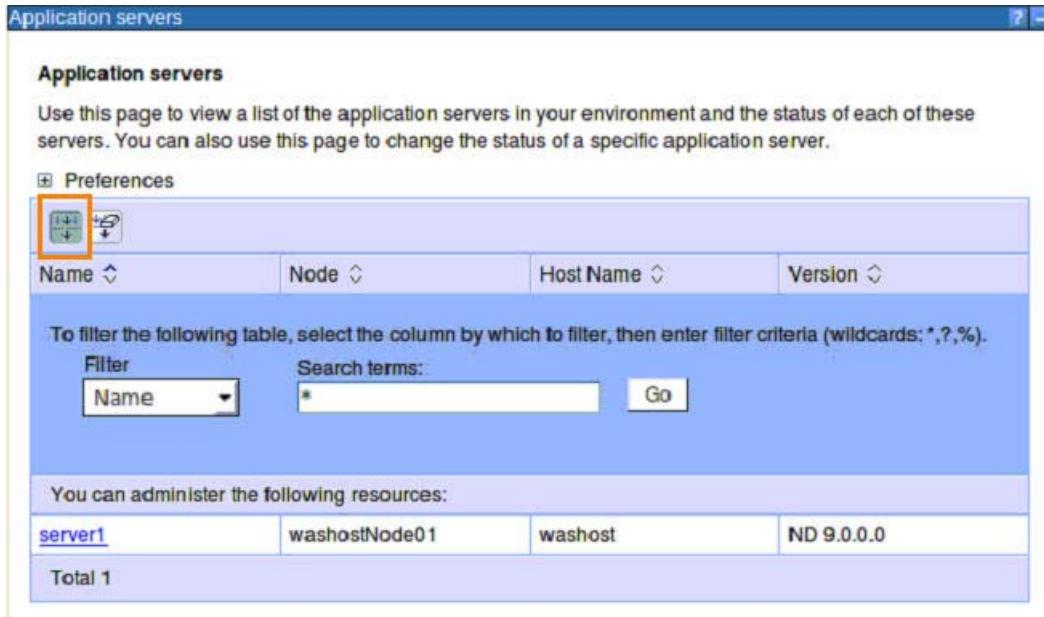
Name	Node	Host Name	Version
server1	washostNode01	washost	ND 9.0.0.0



## Information

For some collection pages, a Scope option is presented. An example of Scope is seen later.

- \_\_\_ c. Click the **Filter** icon.



The screenshot shows the 'Application servers' page. At the top, there's a header with a 'Help' button and a 'Close' button. Below the header, the title 'Application servers' is displayed. A descriptive text states: 'Use this page to view a list of the application servers in your environment and the status of each of these servers. You can also use this page to change the status of a specific application server.' There are 'Preferences' and 'Filter' buttons. The 'Filter' button is highlighted with a yellow box. Below the filter buttons is a table with columns: Name, Node, Host Name, and Version. The 'Name' column is currently selected for filtering. A search bar below the table allows users to enter search terms and click a 'Go' button. At the bottom of the page, it says 'You can administer the following resources:' followed by a table with one row containing 'server1', 'washostNode01', 'washost', and 'ND 9.0.0.0'. It also indicates 'Total 1' resource.

With the filter feature, you can use wildcards to match only the objects you want to work with if many objects have the same type. You can select a table column and specify the text to match.



### Information

This option is rarely necessary unless you are searching among many items.

- \_\_\_ d. Click **server1**. The configuration of server1 is seen. This page is known as a details page. This view shows two pages, each with a tab at the top:

- **Runtime**

Runtime lists the current information that the running server uses.

- **Configuration**

Configuration lists the saved settings that are used when the server is next started.

Some basic configuration settings are shown under **General Properties**, including the **Classloader policy** and the **Class loading mode**.

In Application servers > server1

Use this page to configure an application server. An application server is a server that provides services required to run enterprise applications.

**Runtime**   **Configuration**

**General Properties**

Name: server1

Node name: washostNode01

Run in development mode

Parallel start

Start components as needed

Access to internal server classes: Allow

**Server-specific Application Settings**

Classloader policy: Multiple

Class loading mode: Classes loaded with parent class loader first

**Container Settings**

- [Session management](#)
- ⊕ [SIP Container Settings](#)
- ⊕ [Web Container Settings](#)
- ⊕ [Portlet Container Settings](#)
- ⊕ [EJB Container Settings](#)
- ⊕ [Container Services](#)
- ⊕ [Business Process Services](#)

**Applications**

- [Installed applications](#)

**Server messaging**

- [Messaging engines](#)
- [Messaging engine inbound transports](#)
- [WebSphere MQ link inbound transports](#)
- [SIB service](#)

**Server infrastructure**

- ⊕ [Java and Process Management](#)

Apply   OK   Reset   Cancel

For a description of any of the settings, click **More information about this page** in the **Help** box. The Help section is on the far right of the screen. On some screens, it is necessary to scroll right to see the Help section.



- e. On the Configuration tab, expand **Server Infrastructure > Java and Process Management**. Click **Process definition**.



Use this page to view or change settings for a process definition. This page provides command-line information for starting or initializing a process. The Working directory entry starts with a \$ and is a **WebSphere variable** (\${USER\_INSTALL\_ROOT}). These

variables allow for substitutions to the absolute paths. You explore **WebSphere variables** later in this exercise.

- \_\_\_ f. Stay on the page **Application servers > server1 > Process definition**. Under **Additional Properties**, click **Java Virtual Machine**.



The advanced JVM settings for server1 are seen. Scroll down and examine the settings. Use the Help box to get default values for these settings.

- What is the value of Maximum heap size? \_\_\_\_\_
  - Is Debug Mode being used? \_\_\_\_\_
  - Is the JIT (just-in-time compiler) set? \_\_\_\_\_
- \_\_\_ g. Click **Cancel** to return to the Process Definition page.
- \_\_\_ h. Click **Process Logs** under Additional Properties.



The process log settings for server1 are shown. These logs are the native stdout and stderr log files for the JVM process.

**Note**

These logs are different from the `SystemOut.log` and `SystemErr.log` files, which capture most output from the JVM, and support log file rotation to prevent the files from growing too large.

- \_\_\_ 2. Explore the server details.
  - \_\_\_ a. At the top of the page, a breadcrumb trail shows the pages that you selected.

The screenshot shows a configuration interface for process logs. The title bar indicates the path: Application servers > server1 > Process definition > Process Logs. A red box highlights this title bar. Below the title, a descriptive text explains the purpose of the page. Two tabs are present: Configuration (selected) and Runtime. The Configuration tab contains a section titled General Properties with two fields: Stdout File Name and Stderr File Name, both set to \${SERVER\_LOG\_ROOT}/native\_stdout.log and \${SERVER\_LOG\_ROOT}/native\_stderr.log respectively. At the bottom of the configuration panel are four buttons: Apply, OK, Reset, and Cancel.

- \_\_\_ b. Click **server1** from the breadcrumb trail to return to the server1 configuration page.

- \_\_\_ c. Under Communications, expand **Ports**. The TCP/IP ports that server1 uses are listed.

The screenshot shows the 'Communications' section expanded in the left navigation pane. Below it, the 'Ports' section is expanded, displaying a table of port mappings. The table has two columns: 'Port Name' and 'Port'. A 'Details' button is visible at the top right of the table area.

Port Name	Port	Details
BOOTSTRAP_ADDRESS	2809	
SOAP_CONNECTOR_ADDRESS	8880	
ORB_LISTENER_ADDRESS	9100	
SAS_SSL_SERVERAUTH_LISTENER_ADDRESS	9401	
CSIV2_SSL_SERVERAUTH_LISTENER_ADDRESS	9403	
CSIV2_SSL_MUTUALAUTH_LISTENER_ADDRESS	9402	
WC_adminhost	9060	
WC_defaulthost	9080	
DCS_UNICAST_ADDRESS	9353	
WC_adminhost_secure	9043	
WC_defaulthost_secure	9443	
SIP_DEFAULTHOST	5060	
SIP_DEFAULTHOST_SECURE	5061	
SIB_ENDPOINT_ADDRESS	7276	
SIB_ENDPOINT_SECURE_ADDRESS	7286	
SIB_MQ_ENDPOINT_ADDRESS	5558	
SIB_MQ_ENDPOINT_SECURE_ADDRESS	5578	
IPC_CONNECTOR_ADDRESS	9633	
OVERLAY_UDP_LISTENER_ADDRESS	11003	
OVERLAY_TCP_LISTENER_ADDRESS	11004	

⊕ **Messaging**

\_\_ d. Click **Details** to get more information about these ports.

<input type="checkbox"/>	<a href="#">SIB_ENDPOINT_ADDRESS</a>	*	7276	<a href="#">View associated transports</a>
<input type="checkbox"/>	<a href="#">SIB_ENDPOINT_SECURE_ADDRESS</a>	*	7286	<a href="#">View associated transports</a>
<input type="checkbox"/>	<a href="#">SIB_MQ_ENDPOINT_ADDRESS</a>	*	5558	<a href="#">View associated transports</a>
<input type="checkbox"/>	<a href="#">SIB_MQ_ENDPOINT_SECURE_ADDRESS</a>	*	5578	<a href="#">View associated transports</a>
<input type="checkbox"/>	<a href="#">SIP_DEFAULTHOST</a>	*	5060	<a href="#">View associated transports</a>
<input type="checkbox"/>	<a href="#">SIP_DEFAULTHOST_SECURE</a>	*	5061	<a href="#">View associated transports</a>
<input type="checkbox"/>	<a href="#">SOAP_CONNECTOR_ADDRESS</a>	washost	8880	No associated transports
<input type="checkbox"/>	<a href="#">WC_adminhost</a>	*	9060	<a href="#">View associated transports</a>
<input type="checkbox"/>	<a href="#">WC_adminhost_secure</a>	*	9043	<a href="#">View associated transports</a>
<input type="checkbox"/>	<a href="#">WC_defaulthost</a>	*	9080	<a href="#">View associated transports</a>
<input type="checkbox"/>	<a href="#">WC_defaulthost_secure</a>	*	9443	<a href="#">View associated transports</a>
Total 20				

- \_\_\_ e. Click **SOAP\_CONNECTOR\_ADDRESS** to configure the port. The host and port that are associated with the SOAP listener are seen in the Port column. SOAP clients, such as wsadmin, use this port to connect to the server to do administrative tasks. On a single-server installation, the default SOAP port is 8880.

The screenshot shows the 'Configuration' tab of the 'SOAP\_CONNECTOR\_ADDRESS' settings. It includes fields for 'Port Name' (set to 'SOAP\_CONNECTOR\_ADDRESS'), 'Host' (set to 'washost'), and 'Port' (set to '8880'). Below the fields are 'Apply', 'OK', 'Reset', and 'Cancel' buttons.

- \_\_\_ f. Click **server1** in the breadcrumb trail to return to the server1 details page.  
 \_\_\_ g. Under Server Infrastructure, expand **Administration**. Click **Server Components**.

The internal components of server1 are listed. The resource that you can administer is **Name Server**.

The screenshot shows the 'Server Component' page for 'server1'. It lists 'Name Server' as a resource that can be administered, with a total count of 1.

- \_\_\_ h. Click **Name Server**.  
 The name service settings for the application server are seen.  
 \_\_\_ i. Click **server1** in the breadcrumb trail to return to the server1 details page.

- \_\_ j. Click the **Runtime** tab. The properties of the currently running instance of server1 are shown:
- Process ID (PID). Record your process ID: \_\_\_\_\_
  - Cell name
  - Node name
  - State (Started)
- \_\_ k. From a terminal window, use the command `ps -ef | grep java` and verify that the process ID shown matches the PID for server1.

```
localuser@washost:/opt/eclipse/jee-mars/eclipse$ ps -ef | grep java
localuser 25027 2449 0 10:51 pts/27 00:00:00 grep --color=auto java
localuser 30203 3932 0 Sep22 pts/26 00:29:42 /opt/IBM/WebSphere/AppServer/java
a/8.0/L...,java Dosgi.install.area=/opt/IBM/WebSphere/AppServer -Dosgi.configura
tion.area=/opt/IBM/WebSphere/AppServer/profiles/profile1/servers/server1/configu
ration -Djava.awt.headless=true -Dosgi.framework.extensions=com.ibm.cds,com.ibm.
```

The screenshot shows the 'Application servers' configuration interface. The title bar says 'Application servers'. Below it, a sub-header says 'Application servers > server1'. A note below the header says 'Use this page to configure an application server. An application server runs enterprise applications.' There are two tabs at the top: 'Runtime' (which is selected) and 'Configuration'. Under the 'Runtime' tab, there is a section titled 'General Properties' with the following fields:

Process ID	30203
Cell name	washostNode01Cell
Node name	washostNode01
State	Started
Current heap size	251 MB
Maximum heap size	1993 MB

At the bottom left of the form is a 'Back' button.

## Section 7: Examine application settings

- \_\_ 1. Go to the administrative console navigation tree. Expand **Applications** and **Application Types**. Three application types are available:
- WebSphere enterprise applications
  - Business-level applications
  - Assets

— 2. Click **WebSphere enterprise applications**.

A collection page lists the applications in the configuration and their status. If you move the mouse cursor over a status icon and click, a window opens and shows the status.

Select	Name	Application Status
<input type="checkbox"/>	<a href="#">DefaultApplication</a>	
<input type="checkbox"/>	<a href="#">ivtApp</a>	
<input type="checkbox"/>	<a href="#">query</a>	

The applications that are installed by default include:

- **DefaultApplication**: Includes the snoop servlet.
- **ivtApp**: Installation verification test.
- **query**: For information about Enterprise JavaBeans.
- If the sample applications were installed, they would also be listed here. Currently, one server exists, but potentially the list might include applications that are installed on multiple servers on the same computer or in a network deployment cell.



## Information

Tasks that can be executed on an application include:

- |   |  |
|---|--|
| <ul style="list-style-type: none"> <li>• Start</li> <li>• Stop</li> <li>• Install</li> <li>• Uninstall</li> <li>• Update</li> </ul> | <ul style="list-style-type: none"> <li>• Rollout Update</li> <li>• Remove File</li> <li>• Export</li> <li>• Export DDL</li> <li>• Export File</li> </ul> |
|---|--|

— 3. Click **DefaultApplication**.

This page shows the general properties of the application with links to a number of properties pages such as Details, Web Module, and Enterprise JavaBeans Properties. It also shows a References page.

— 4. Under Modules, click **Manage Modules**.

You see one web module, **Default Web Application**; one EJB module, **Increment EJB module**; and the servers with which they are associated.

Select	Module	URI	Module Type	Server
<input type="checkbox"/>	<a href="#">Increment EJB module</a>	Increment.jar,META-INF/ejb-jar.xml	EJB Module	WebSphere:cell=washostNode01Cell,node=washostNode01,server=server1
<input type="checkbox"/>	<a href="#">Default Web Application</a>	DefaultWebApplication.war,WEB-INF/web.xml	Web Module	WebSphere:cell=washostNode01Cell,node=washostNode01,server=server1

OK Cancel

— 5. Click the **Default Web Application** module.

A detail page shows the general properties that are associated with the deployment of the web module.

The screenshot shows the 'Enterprise Applications' interface with the path 'Enterprise Applications > DefaultApplication > Manage Modules > DefaultWebApplication.war'. The title bar says 'Enterprise Applications'. The main content area has a 'Configuration' tab selected. On the left, under 'General Properties', there are fields for 'URI' (set to 'DefaultWebApplication.war'), 'Alternate deployment descriptor' (empty), 'Starting weight' (set to '10000'), and 'Class loader order' (set to 'Classes loaded with parent class loader first'). On the right, under 'Additional Properties', there are links: 'View Module Class Loader', 'Custom properties', 'Target specific application status', 'View Deployment Descriptor', and 'Session Management'. At the bottom are 'Apply', 'OK', 'Reset', and 'Cancel' buttons.

— 6. Click **Manage Modules** in the breadcrumb trail and select the **Increment EJB module**.

A detail page shows the general properties that are associated with the deployment of the EJB module.

The screenshot shows the 'Enterprise Applications' interface with the path 'Enterprise Applications > DefaultApplication > Manage Modules > Increment.jar'. The title bar says 'Enterprise Applications'. The main content area has a 'Configuration' tab selected. On the left, under 'General Properties', there are fields for 'URI' (set to 'Increment.jar'), 'Alternate deployment descriptor' (empty), and 'Starting weight' (set to '5000'). On the right, under 'Additional Properties', there are links: 'View Module Class Loader', 'Custom properties', 'Target specific application status', and 'View Deployment Descriptor'. At the bottom are 'Apply', 'OK', 'Reset', and 'Cancel' buttons.

## Section 8: Examine environment settings

- 1. In the administrative console navigation tree, expand **Environment**. The Environment options include:
- Virtual hosts
  - Update global web server plug-in configuration
  - WebSphere variables
  - Shared libraries
  - SIP application routers
  - Replication domains
  - Naming
  - OSGi bundle repositories



- 2. Click **Virtual Hosts**.

The work area of a collection page lists the virtual hosts that are defined for the cell.

Select	Name
<input type="checkbox"/>	<a href="#">admin_host</a>
<input type="checkbox"/>	<a href="#">default_host</a>

Total 2

— 3. Click **default\_host**.

A details page shows the details for the virtual host. You can directly change only the virtual host name. Under Additional Properties, you find links to other properties pages.

The screenshot shows a web-based administrative interface for managing virtual hosts. The title bar says "Virtual Hosts". The main content area has a header "Virtual Hosts > default\_host". Below it is a descriptive text: "Use this page to create a virtual host with a unique set of web access ports. Such a configuration lets a single host machine resemble multiple host machines. Each virtual host has a logical name and a list of one or more domain name system (DNS) aliases by which it is known." A "Configuration" tab is selected. The configuration panel is divided into two sections: "General Properties" and "Additional Properties". In "General Properties", there is a field labeled "Name" with the value "default\_host". Below the fields are buttons for "Apply", "OK", "Reset", and "Cancel". In "Additional Properties", there are links for "Host Aliases" and "MIME Types".

\_\_\_ 4. Click **Host Aliases** under Additional Properties.

The host name and port combinations that are associated with this virtual host are shown.

For the default\_host, the default values are:

- \*:9080 (any host on the internal HTTP transport port)
- \*:80 (any host on the external HTTP transport port)
- \*:9443 (any host on the internal SSL transport port)
- \*:5060 (any host on the SIP transport port)
- \*:5061 (any host on the SIP transport port)
- \*:443 (any host on the external SSL transport port)

You can define more virtual hosts or modify default\_host to support more host-port combinations.

Select	Host Name	Port
<input type="checkbox"/>	*	9080
<input type="checkbox"/>	*	80
<input type="checkbox"/>	*	9443
<input type="checkbox"/>	*	5060
<input type="checkbox"/>	*	5061
<input type="checkbox"/>	*	443

Total 6

- \_\_\_ 5. Click **Virtual Hosts** in the breadcrumb trail to return to the Virtual Hosts page.  
 \_\_\_ 6. Click **admin\_host** and then click **Host Aliases**.  
 \_\_\_ 7. Examine the admin\_host virtual host and write down the port numbers that are associated with this virtual host: \_\_\_\_\_



**Note**

The browser accesses the administrative console on one of the ports that are associated with the admin\_host virtual host.

- \_\_\_ 8. In the administrative console navigation tree, under the Environment section, click **WebSphere variables**.

The work area of a WebSphere variables collection page is displayed. This page includes the scope feature because variables can be defined for a cell, node, or server. A menu of all available scopes is provided to narrow the list of variables that are based on scope.

The screenshot shows the 'WebSphere Variables' collection page. At the top, there's a header bar with the title 'WebSphere Variables'. Below it, a section titled 'WebSphere Variables' contains a brief description of what variables are used for and how they inherit values from higher scopes. A 'Scope' dropdown menu is open, showing options like 'All scopes', 'Cell=washostNode01Cell', 'Node=washostNode01', and 'Node=washostNode01, Server=server1'. Below the dropdown, there are sections for managing resources, including tables for 'Select' and 'Name' and 'Value'. A note at the bottom says you can administer resources like 'APP\_INSTALL\_ROOT' and 'CONNECTOR\_INSTALL\_ROOT'.

- \_\_\_ 9. From the scope menu, select scope **Cell=<cellname>**. How many variables are defined for the cell? \_\_\_\_\_
- \_\_\_ 10. From the scope menu, select scope **Node=<nodename>**. How many variables are defined for the node? \_\_\_\_\_

If there are more than the maximum rows (20 by default), click **Next** to see the additional entries.

Notice that many variable values include references to other variables, for example, \${USER\_INSTALL\_ROOT}.

- \_\_\_ 11. From the scope menu, select scope **Node=<nodename>, Server=<servername>**. How many variables are defined for the server? \_\_\_\_\_

## **Section 9: Examine resource settings**

- \_\_\_ 1. In the administrative console navigation tree, expand **Resources**. The resources options are:
  - Schedulers
  - Object pool managers
  - Java EE default resources
  - JMS
  - JDBC
  - Resource adapters
  - Asynchronous beans
  - Cache instances
  - Mail
  - URL
  - Resource environment
  
- \_\_\_ 2. Expand **JDBC** and click **JDBC providers**.

A collection page lists the JDBC providers in the configuration. In a later exercise, you configure a JDBC driver and data source for an application.

- \_\_\_ 3. Expand **JMS** and click **JMS providers**. Click an instance of **Default messaging provider**.

A details page shows some basic properties of the internal JMS provider. Under Additional Properties are links for:

- Connection factories (for configuring a JMS connection factory)
- Queue connection factories
- Topic connection factories
- Queues
- Topics
- Activation specifications

These settings can be defined at the cell, node, or server level, so a scope selection option is available.

A collection page lists queue connection factories (if any are defined). A queue connection factory is used to create connections to the associated JMS provider of JMS queue destinations, for point-to-point messaging.

A collection page lists topic connection factories (if any are defined). A topic connection factory is used to create connections to the associated JMS provider of JMS topic destinations, for publish/subscribe messaging.

## **Section 10:Examine troubleshooting**

The Troubleshooting area shows messages about runtime events and configuration problems. This area automatically refreshes, and you can view either the runtime messages or configuration problem totals.

- \_\_\_ 1. In the administrative console navigation tree, expand **Troubleshooting**.

- \_\_\_ 2. Expand **Runtime Messages**. You see entries for:

- Runtime error
- Runtime warning
- Runtime information



### Note

Runtime Events are disabled by default ("None"). To enable an event level, select from the list. "Error" would enable only Error runtime events. "Warning" would enable both Error and Warning runtime events. "Info" would enable all runtime events.

- \_\_\_ 3. The total number of errors, warnings, and information messages are shown when you select one of the options. Click **Runtime information** to view all of the messages.
- \_\_\_ 4. Select **Info** from the list and click **Apply**.

Timestamp	Message Originator	Message
None		
Total 0		

- \_\_\_ 5. Click **Save** to save the configuration.
- \_\_\_ 6. In the **Message** column, click one of the messages (if there are any listed) to see the message detail.
- \_\_\_ 7. In the navigation tree, expand **Configuration Validation**. You see entries for:
- Configuration error
  - Configuration warning
  - Configuration information

The total number of errors, warnings, and information messages are shown when you select one of the options. Click **Configuration error** to view all of the error messages. If you do not have any error messages, click the **Configuration information** messages.

- \_\_\_ 8. If you have a configuration problem, click the link to it. The problem detail is seen. On the next window, you see general properties information about the configuration problem.

- \_\_\_ 9. Click **Back** to return to the Configuration Validation list and view any other problems that might exist.

## Section 11:Modify the administrative console session timeout

If an administrative console session is idle for more than 30 minutes, the session expires. To continue working, you must log in again. Many administrators find the default session idle duration too short. You can change the session idle duration to a time that works best for you. The session idle duration time cannot be modified from the administrative console. The timeout must be modified by running a script.



### Information

The administrative console session expiration script that you use in this exercise is found in the IBM Knowledge Center by searching for: changing the console session expiration

- 
- \_\_\_ 1. Review the sample administrative console session expiration script.
    - \_\_\_ a. From a terminal window, navigate to the `/opt/labfiles/wsadmin/` directory.



### Note

If you have a favorite editor, feel free to use it. If you are not familiar with the editors available on Ubuntu, use gedit. It is similar to Notepad on Windows.

---

- \_\_\_ b. Open timeout.jacl with a text editor.

```

set dep [$AdminConfig getid /Deployment:isclite/]
set appDep [$AdminConfig list ApplicationDeployment $dep]
set sesMgmt [$AdminConfig list SessionManager $appDep]

# check if existing sesMgmt there or not, if not then create a new one, if exist
then modify it
if {$sesMgmt == ""} {
    # get applicationConfig to create new SessionManager
    set appConfig [$AdminConfig list ApplicationConfig $appDep]
    if {$appConfig == ""} {
        # create a new one
        set appConfig [$AdminConfig create ApplicationConfig $appDep {}]
        # then create a new SessionManager using new Application Config just created
        set sesMgmt [$AdminConfig create SessionManager $appConfig {}]
    } else {
        # create new SessionManager using the existing ApplicationConfig
        set sesMgmt [$AdminConfig create SessionManager $appConfig {}]
    }
}

# get tuningParams config id
set tuningParams [$AdminConfig showAttribute $sesMgmt tuningParams]
if {$tuningParams == ""} {
    # create a new tuningParams
    $AdminConfig create TuningParams $sesMgmt {{invalidationTimeout 120}}
} else {
    #modify the existing one
    $AdminConfig modify $tuningParams {{invalidationTimeout 120}}
}

# saving the configuration changes

```

- \_\_\_ c. Modify the file to set the delay to 120 minutes. Enter **120** for the variable invalidationTimeout.
- \_\_\_ d. Save your changes.
- \_\_\_ e. Close the timeout.jacl script.
2. Run the script to change the session expiration.
- \_\_\_ a. From the command line, run the timeout.jacl script with wsadmin from the /opt/IBM/WebSphere/AppServer/profiles/profile1/bin directory. Type in the following command string on one line.
- ```
. /wsadmin.sh -f /opt/labfiles/wsadmin/timeout.jacl -lang jacl -username wasadmin -password web1sphere
```

---

```

localuser@washost:/opt/IBM/WebSphere/AppServer/profiles/profile1/bin$ ./wsadmin.sh -f /opt/labfiles/wsadmin/timeout.jacl -lang jacl -username wasadmin -password webisphere
WASX7209I: Connected to process "server1" on node washostNode01 using SOAP connector; The type of process is: UnManagedProcess
localuser@washost:/opt/IBM/WebSphere/AppServer/profiles/profile1/bin$ █

```

---



### Note

The first time that a `wsadmin` command is started, the environment is set up. Several messages about “processing new jar” are displayed. These messages are expected the first time that `wsadmin` is run.

```
File Edit View Terminal Tabs Help
was8host01:/opt/IBM/WebSphere/AppServer/profiles/profile1/bin # ./wsadmin.sh -f /usr/software/wsadmin/
onsoleTimeout.py 120 -username wasadmin -password websphere
*sys-package-mgr*: processing new jar, '/opt/IBM/WebSphere/AppServer/lib/startup.jar'
*sys-package-mgr*: processing new jar, '/opt/IBM/WebSphere/AppServer/lib/bootstrap.jar'
*sys-package-mgr*: processing new jar, '/opt/IBM/WebSphere/AppServer/lib/lmproxy.jar'
*sys-package-mgr*: processing new jar, '/opt/IBM/WebSphere/AppServer/lib/urlprotocols.jar'
*sys-package-mgr*: processing new jar, '/opt/IBM/WebSphere/AppServer/java/lib/tools.jar'
*sys-package-mgr*: processing new jar, '/opt/IBM/WebSphere/AppServer/deploytool/itp/batchboot.jar'
*sys-package-mgr*: processing new jar, '/opt/IBM/WebSphere/AppServer/deploytool/itp/batch2.jar'
*sys-package-mgr*: processing new jar, '/opt/IBM/WebSphere/AppServer/optionalLibraries/jython/jython.j
r'
*sys-package-mgr*: processing new jar, '/opt/IBM/WebSphere/AppServer/plugins/com.ibm.ws.admin.system.j
r'
*sys-package-mgr*: processing new jar, '/opt/IBM/WebSphere/AppServer/plugins/com.ibm.ws.eba.admin.jar'
*sys-package-mgr*: processing new jar, '/opt/IBM/WebSphere/AppServer/plugins/org.eclipse.core.runtime_
jar'
```



### Information

In the commands above, the **user name** and **password** are specified on the command line. Administrative scripts, such as `wsadmin`, support specifying the user name and password on the command line, in the properties file, or through prompting (GUI or command line).

- b. The session expiration timeout is now set for 120 minutes.



### Information

The timeout session expiration must be set for each profile’s administrative console. Later in the class you create more profiles. To change the session timeout, you must rerun the timeout script for each profile that you want.



### Note

The `wsadmin` tool can be used to run scripts. You learn more about `wsadmin` later in the course.

## Section 12: Log out of the administrative console

When you are working in the administrative console, a work area is saved which includes all configuration changes you make in the session. When you log out, you can save or discard these changes. If you close the browser, the session work area is preserved. The next time you log in, you can recover the work area from the previous session.



### Information

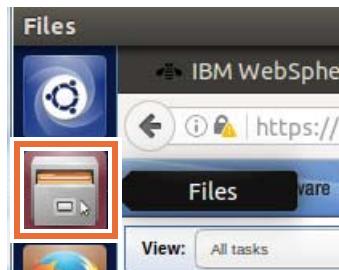
Any configuration changes that you want to keep must be saved to the master configuration; otherwise, the new settings are not used.

- 1. Click **Logout** at the top of the page in the taskbar.
- 2. If no resources are changed, then you are returned to the login page. If changes were made, the **Save** page is seen. Click **Discard** so that you do not overwrite the configuration. On the Discard WorkSpace Changes page, you see a prompt to confirm the discard. Click **Yes**, and you are returned to the login page.
- 3. Close the browser.

## Section 13: Explore configuration files

Examine some of the configuration files for WebSphere Application Server.

- 1. Explore the configuration directory structure and view some of the configuration files.
  - a. Click the **Files** icon.



- b. Examine the files within the `profile config` directory, which can be found under `/opt/IBM/WebSphere/AppServer/profiles/profile1`.



- \_\_\_ c. A few important files that are contained in the `config` directory are:
- <`cell`> is the cell name
  - <`node`> is the node name
  - <`server`> is the server name
  - Cell-wide resources  
`config/cells/<cell>/resources.xml`
  - Node-specific resources  
`config/cells/<cell>/nodes/<node>/resources.xml`
  - Server-specific resources such as JDBC and JMS providers  
`config/cells/<cell>/nodes/<node>/servers/<server>/resources.xml`
  - Global security settings  
`config/cells/<cell>/security.xml`
  - Virtual hosts  
`config/cells/<cell>/virtualhosts.xml`
  - Applications and endpoints for a node  
`config/cells/<cell>/nodes/<node>/serverindex.xml`
  - Configuration of a server  
`config/cells/<cell>/nodes/<node>/servers/<server>/server.xml`



### Information

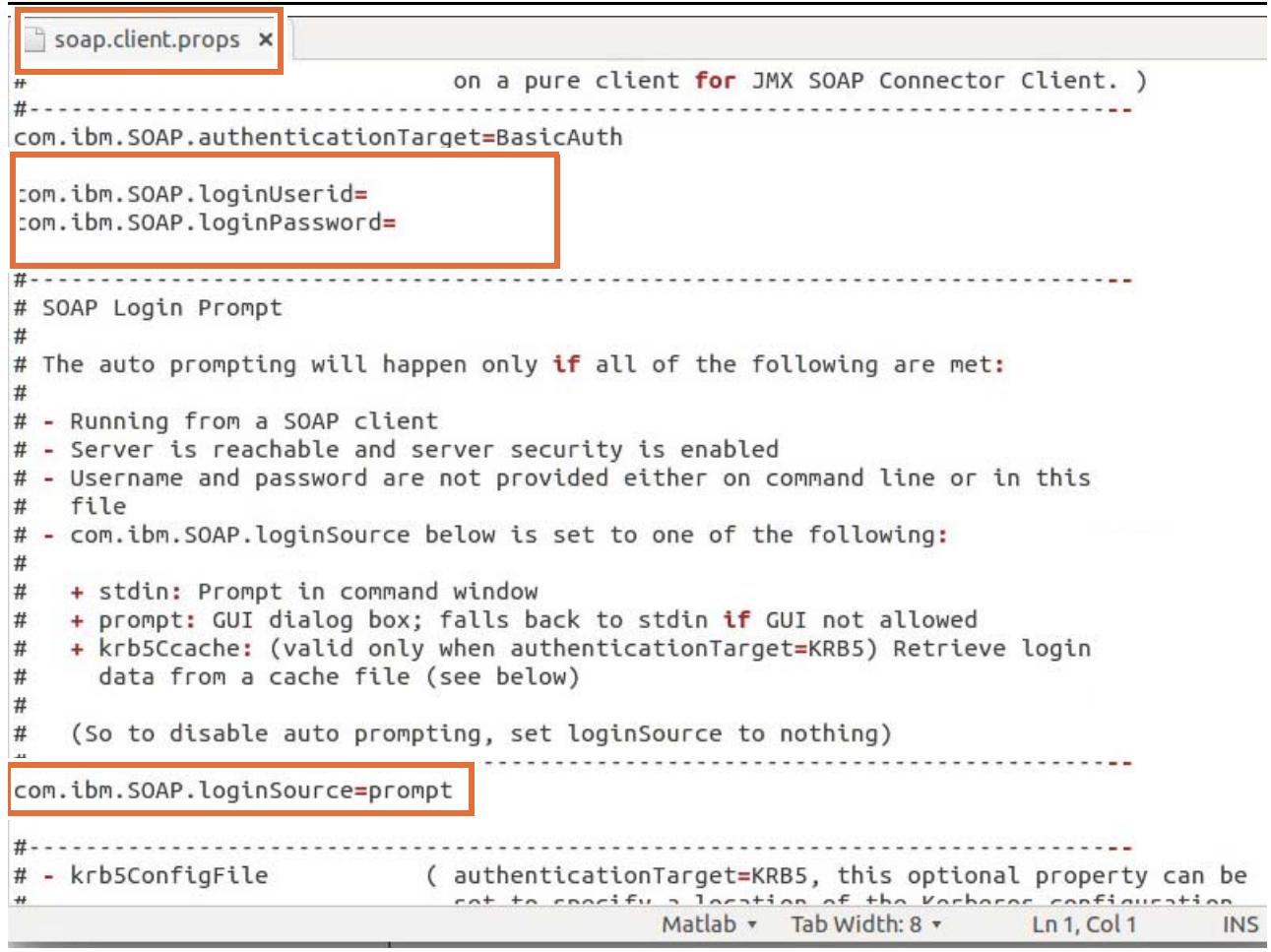
You must not edit these XML files manually; instead, you must use the administrative console or `wsadmin` command-line tool to make configuration changes that are shown in these files.

- \_\_\_ 2. Examine the SOAP client configuration file:  
`<profile_root>/profile1/properties/soap.client.props`
- \_\_\_ a. From a terminal window, navigate to: `<profile_root>/profile1/properties`

- \_\_\_ b. Open `soap.client.props` in an editor (such as gedit).

This file contains security configuration information that clients use to authenticate to the security service. The `wsadmin` client uses this file. Important parameters are:

- `loginUserId` and `loginPassword`: ID and password are specified when the parameter `loginSource=properties` is used. If they are not set here or on the command line, the user is prompted for them interactively.
- `loginSource`: Specifies how the authentication information is obtained. The default is `prompt`, which means that the user is prompted for a user ID and password.



```
# on a pure client for JMX SOAP Connector Client. )
#-----
com.ibm.SOAP.authenticationTarget=BasicAuth

com.ibm.SOAP.loginUserId=
com.ibm.SOAP.loginPassword=

#-----
# SOAP Login Prompt
#
# The auto prompting will happen only if all of the following are met:
#
# - Running from a SOAP client
# - Server is reachable and server security is enabled
# - Username and password are not provided either on command line or in this
#   file
# - com.ibm.SOAP.loginSource below is set to one of the following:
#
#   + stdin: Prompt in command window
#   + prompt: GUI dialog box; falls back to stdin if GUI not allowed
#   + krb5Ccache: (valid only when authenticationTarget=KRB5) Retrieve login
#     data from a cache file (see below)
#
# (So to disable auto prompting, set loginSource to nothing)
#
com.ibm.SOAP.loginSource=prompt

#-----
# - krb5ConfigFile      ( authenticationTarget=KRB5, this optional property can be
#   set to specify a location of the Kerberos configuration
#-----
```

- \_\_\_ 3. **Close** any editor windows still open.

## End of exercise

## Exercise review and wrap-up

This exercise examined many of the features of the administrative console. You looked at the properties of servers, applications, environment settings, and resources.

# Exercise 3. Assembling an application

## Estimated time

00:45

## Overview

In this exercise, you learn how to assemble the Enterprise JavaBeans (EJB) Java archive (JAR) files, the web archive (WAR) files, and auxiliary files into an enterprise archive (EAR) file for deployment to WebSphere Application Server.

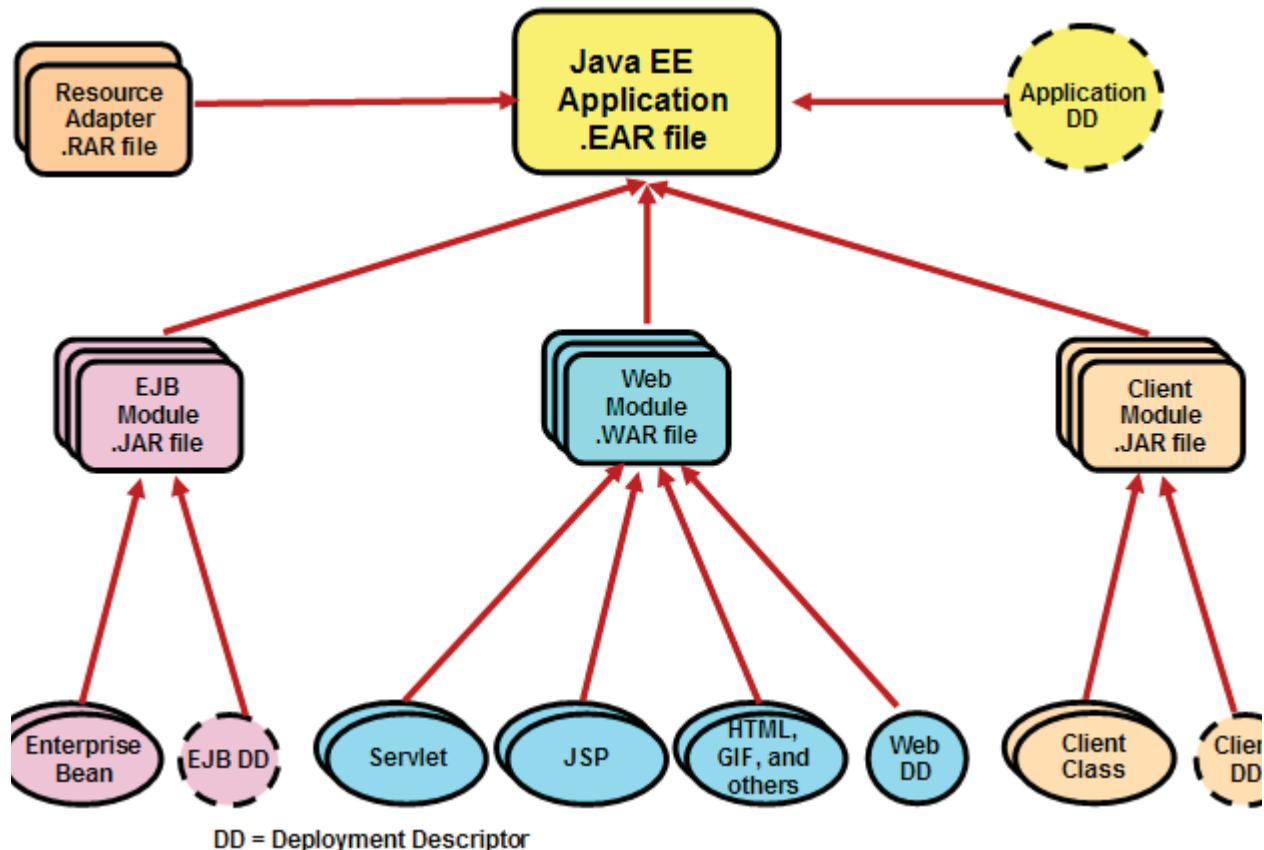
## Objectives

After completing this exercise, you should be able to:

- Explore the WebSphere Developer Tools for Eclipse
- Import and examine enterprise application components
- Define application-scoped resources: data source and authentication alias
- Export an enhanced EAR file that is ready for deployment

## Introduction

In this exercise, you assume the role of the application assembler. The developer is responsible for bean development and provides the application assembler with the `.jar` files that contain the code. The developer is also responsible for the presentation design. The design is in the `.war` files that contain the HTML pages, JSP pages, and servlets. It is now your task to take these pieces and assemble them into an EAR file that can be installed in the WebSphere Application Server.



Application developers provide the files for this application. The application consists of the following components:

- One Java utility.jar file. The application uses the code in this file.
- One web module .war file that contains the servlets, JavaServer Faces (JSF) files, Enterprise JavaBeans (EJB) files, and presentation (HTML and graphics) files, along with a deployment descriptor.

In some cases, you might also be given a resource archive (RAR) module. No resource archive modules exist for this exercise.

## Requirements

To complete this exercise, you need Eclipse and the WebSphere Developer Tools for Eclipse plug-in. This tool is used to complete the exercise. You also need the following files, which are in /opt/labfiles/assemble:

- PlantsByWebSphere.war
- pbw-lib.jar

# Exercise instructions

## Section 1: Resetting the WebSphere environment



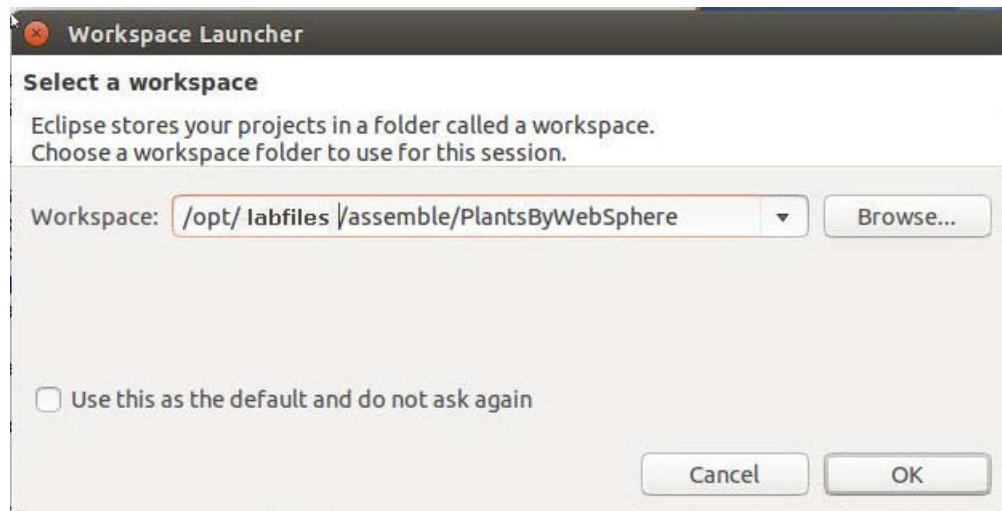
### Note

To reset your WebSphere environment, read **Appendix A** for instructions on how to complete this procedure.

## Section 2: Start Eclipse

- \_\_\_ 1. Start Eclipse.
  - \_\_\_ a. Open a command window.
  - \_\_\_ b. Change directory to `/opt/eclipse/jee-mars/eclipse`.
  - \_\_\_ c. Start Eclipse with the command: `./eclipse`

WebSphere Developer Tool for Eclipse starts by asking which directory to use for its workspace. This workspace is used during the life of the project. Each project can have its own separate workspace.
- \_\_\_ 2. Enter `/opt/labfiles/assemble/PlantsByWebSphere` for the **workspace** and click **OK**.



- \_\_\_ 3. Wait several seconds for the workspace to load. When the workspace opens, you are in the **Eclipse Java EE IDE for Web Developers** perspective to begin assembling the application.

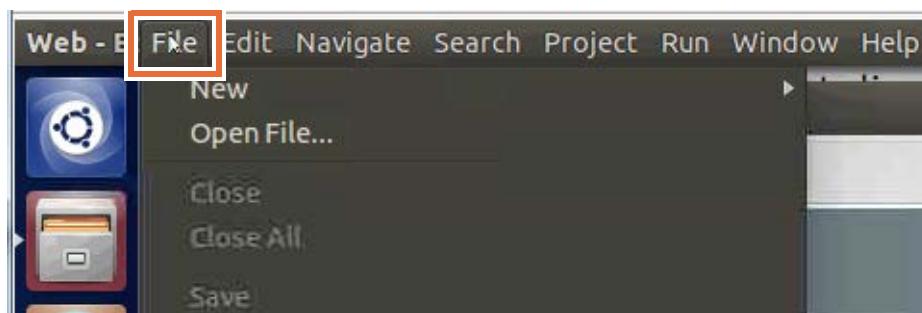


### **Section 3: Create an enterprise application project**

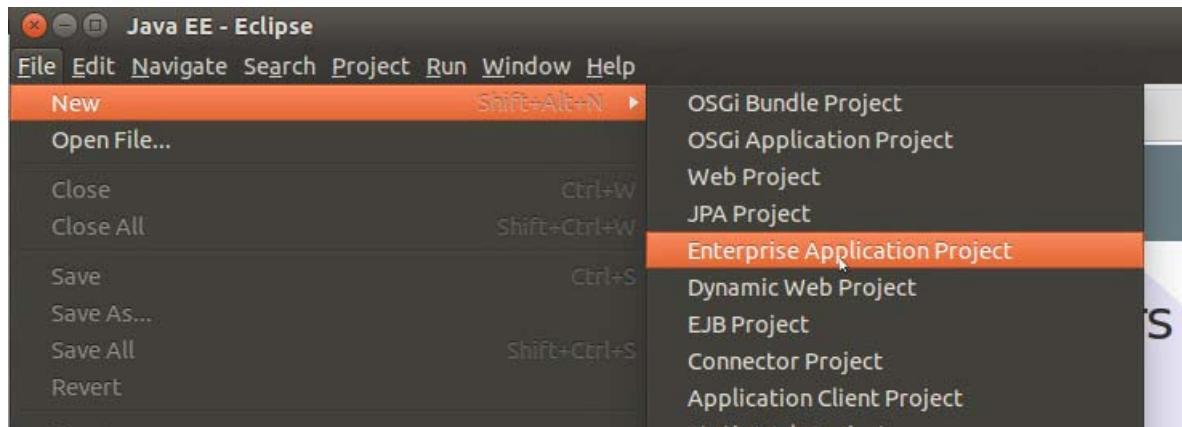
- \_\_\_ 1. Create an enterprise application project named `PlantsByWebSphereProject`.
  - \_\_\_ a. **Close** the Welcome page.

**Note**

The Unity desktop on Ubuntu hides the menu when it is not in use. If you do not see the File menu, move the cursor over the title bar and click the title bar.



- \_\_\_ b. Select the **File > New > Enterprise Application Project**.

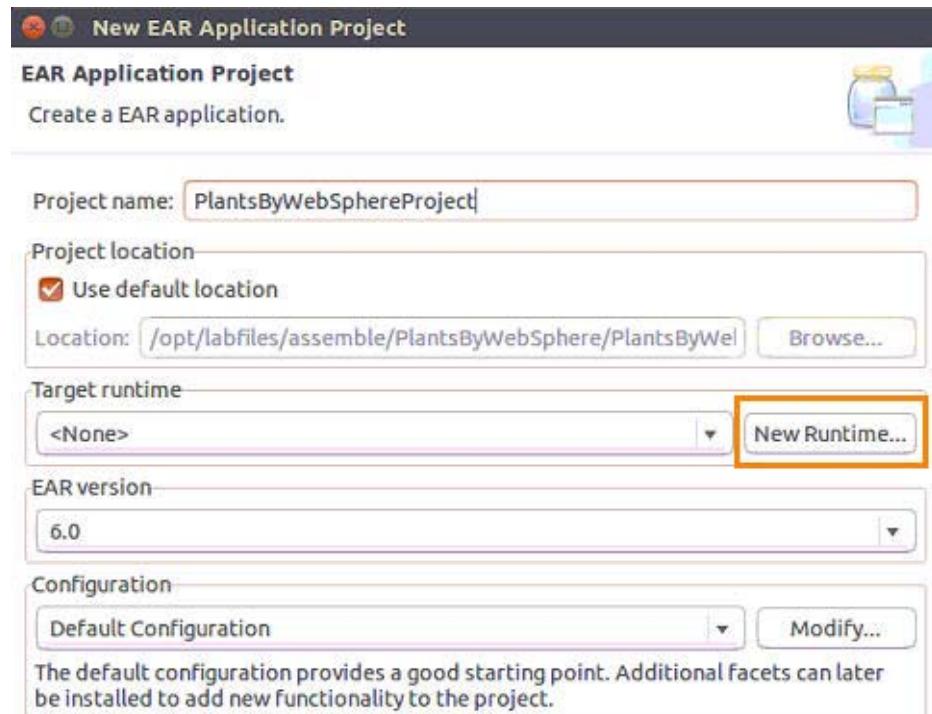


- \_\_\_ c. Name the project: `PlantsByWebSphereProject`

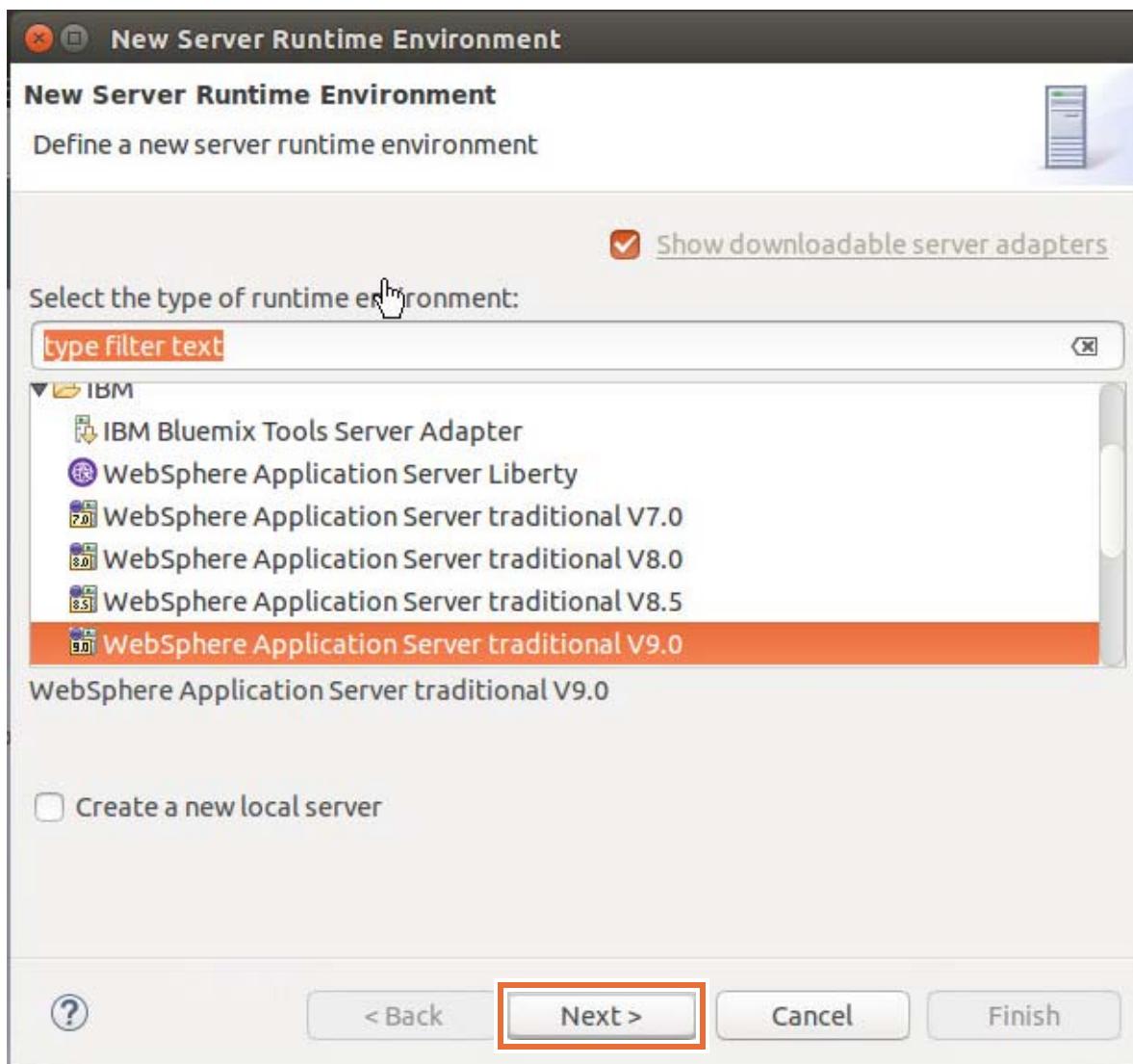
**Information**

This new workspace has no defined servers. An installed server must be defined in the workspace so its runtime libraries are added to new projects created in the workspace. To run an application on a server, the selected **Target runtime** defines where applications are deployed.

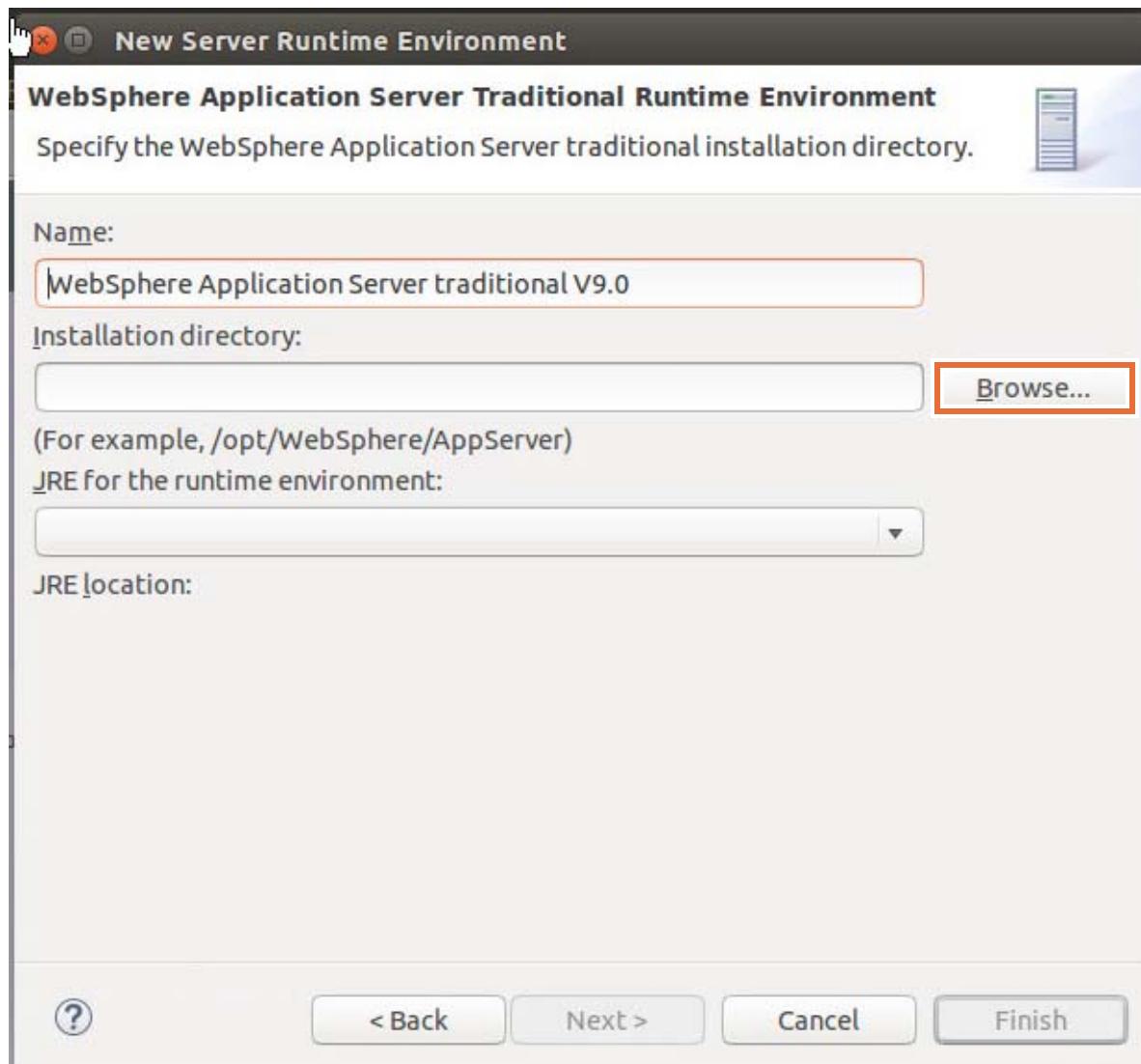
- \_\_ d. Click **New Runtime** to the right of Target runtime to define a new server.



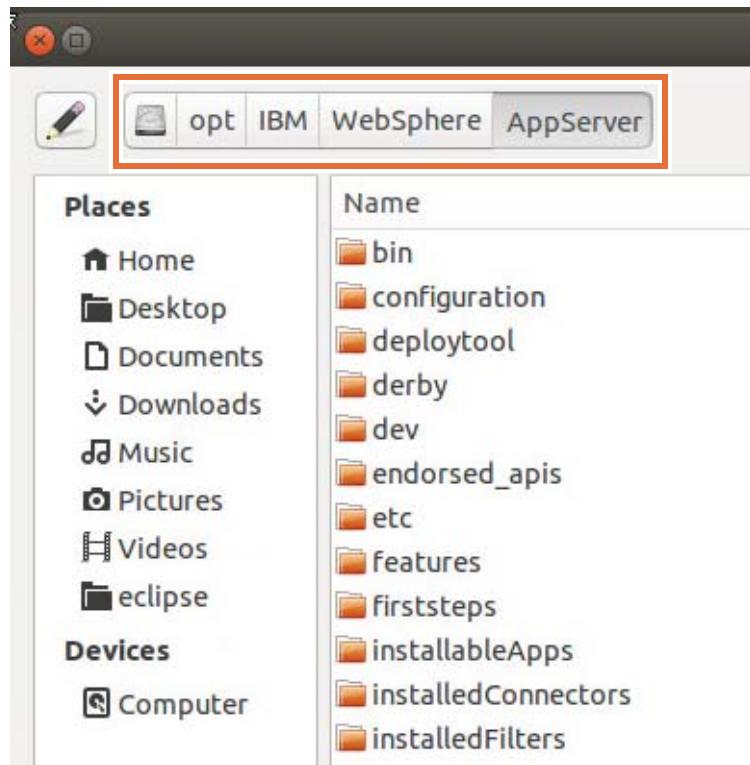
- \_\_ e. Select **WebSphere Application Server traditional V9.0**. Click **Next**.



\_\_ f. Click **Browse** for the Installation directory.

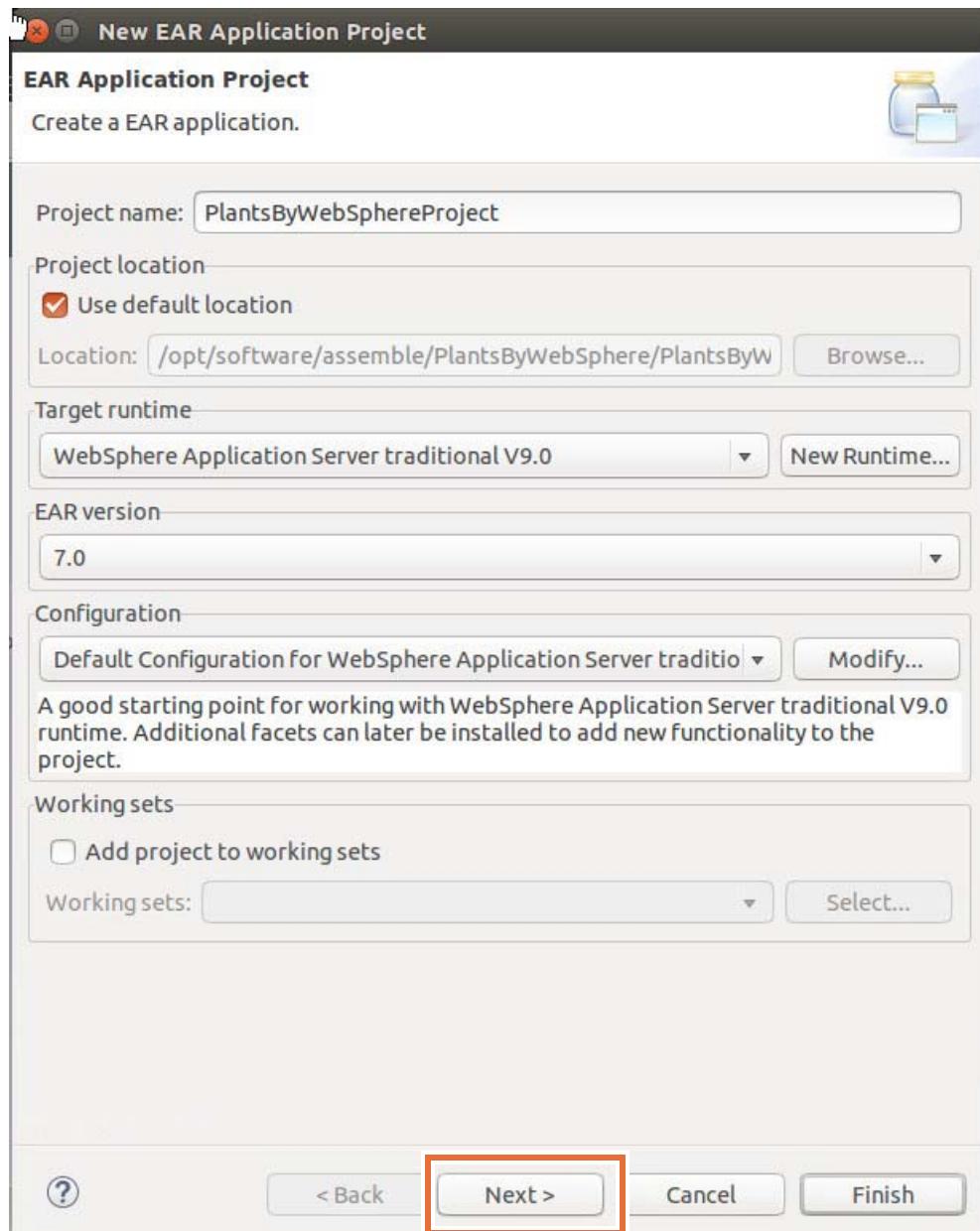


\_\_ g. Go to the `/opt/IBM/WebSphere/AppServer` directory and click **OK**.

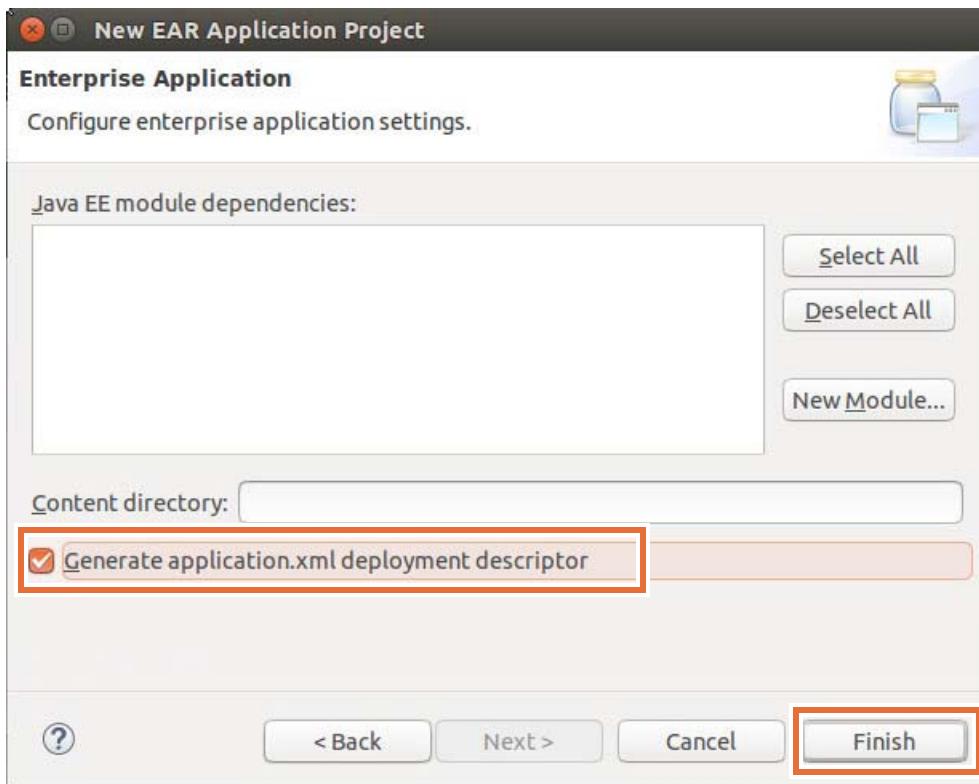


\_\_ h. Click **Finish**.

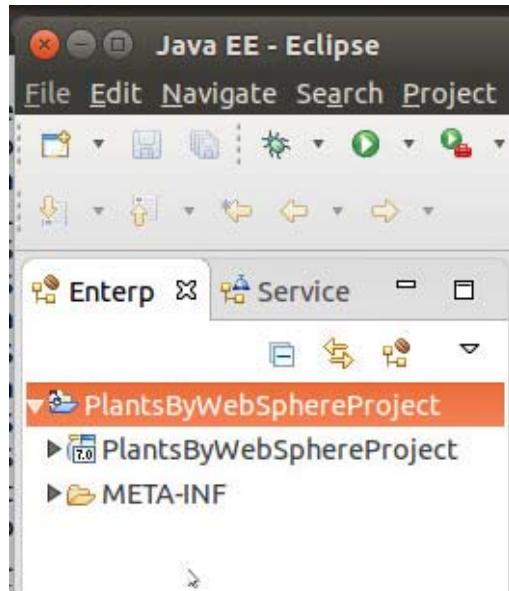
- \_\_ i. Make sure that the Project name is still set to PlantsByWebSphereProject. Click **Next**.



- \_\_ j. Check **Generate application.xml deployment descriptor**. Click **Finish**.



- \_\_ k. If the Welcome screen appears, close it. Verify that the `PlantsByWebSphere` project is now found in the Enterprise Explorer.



## Import the application modules

For this exercise, you work with a set of modules, .war and .jar files, provided by a development team. These modules must be assembled into a running application.



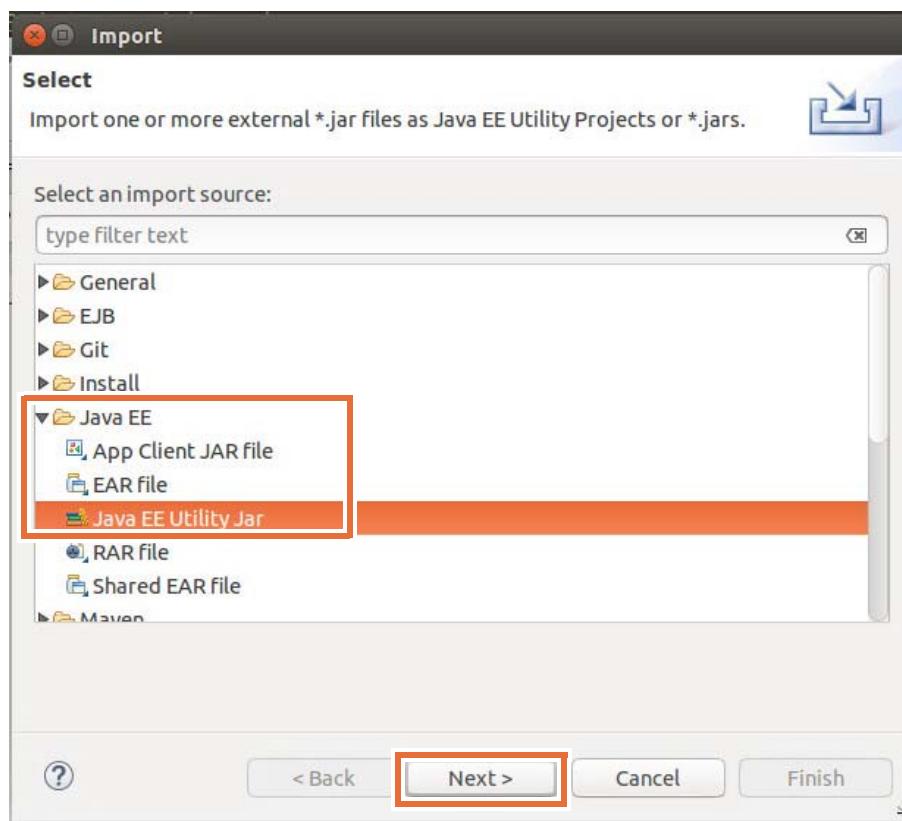
### Information

Handing over individual application modules is the most common way to receive application components, especially when more than one development team is involved. Each team is responsible for one or more modules. Another way to hand over an application for deployment is to receive an EAR file for the enterprise application.

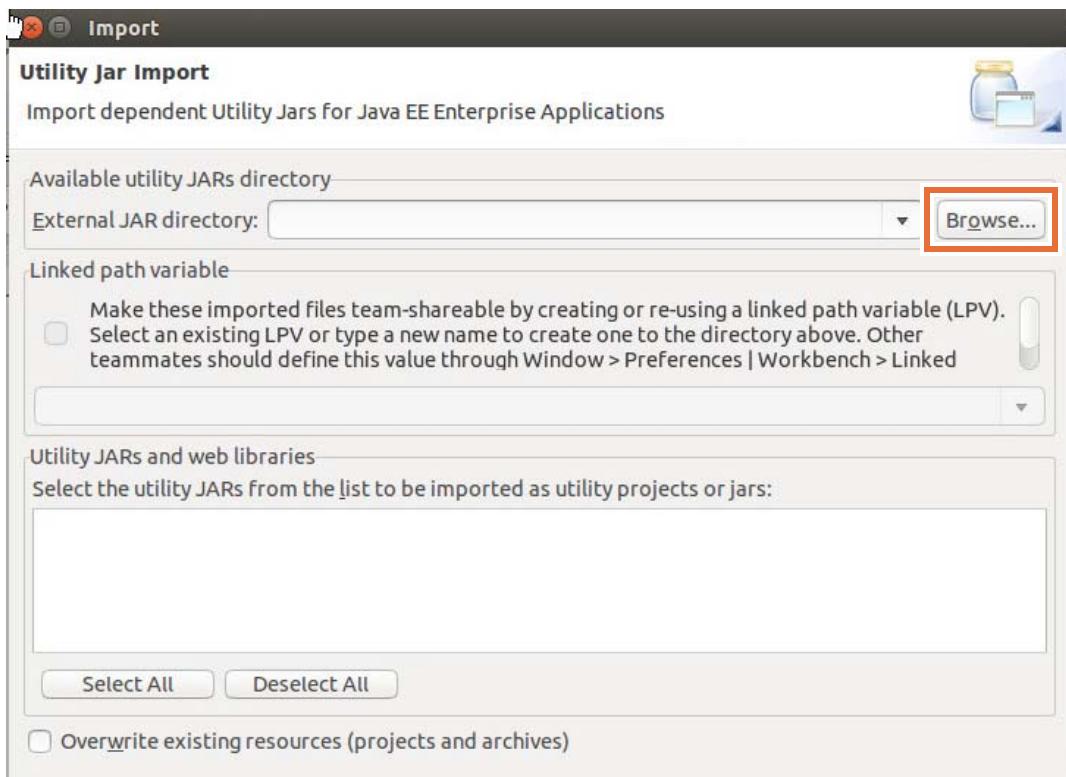
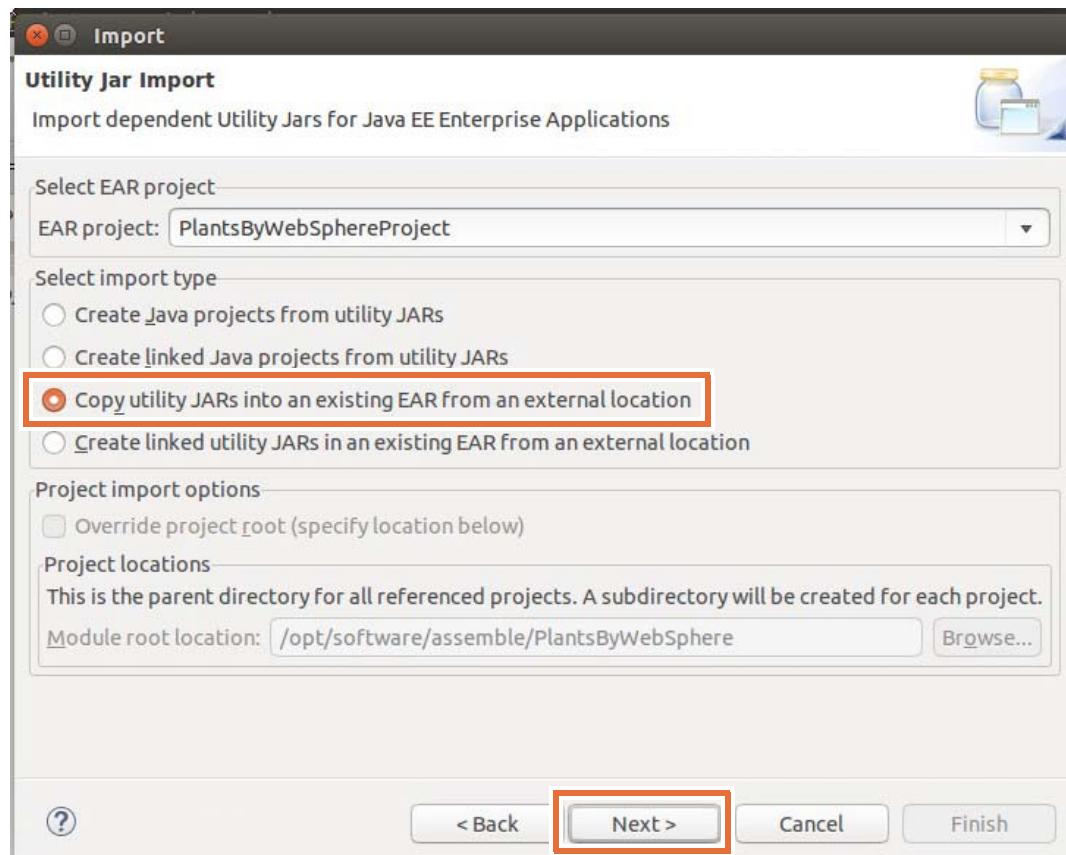
## Section 4: Add the Plants By WebSphere utility module

The application developers provide the utility .jar file for this application, which is named pbw-lib.jar. The JAR file contains the reusable code for multiple applications.

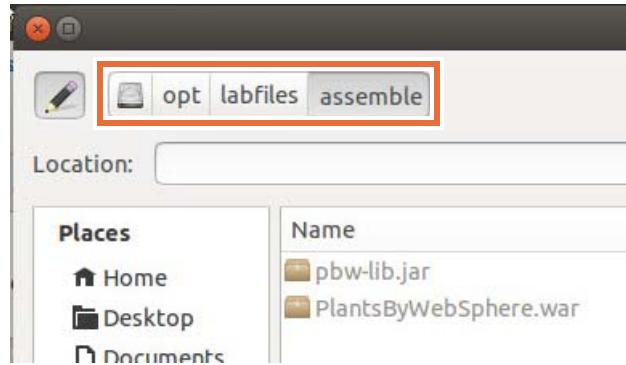
- 1. From the menu, select **File > Import**.
- 2. From the **Import** pane, expand the **Java EE** folder, select **Java EE Utility Jar**, and click **Next**.



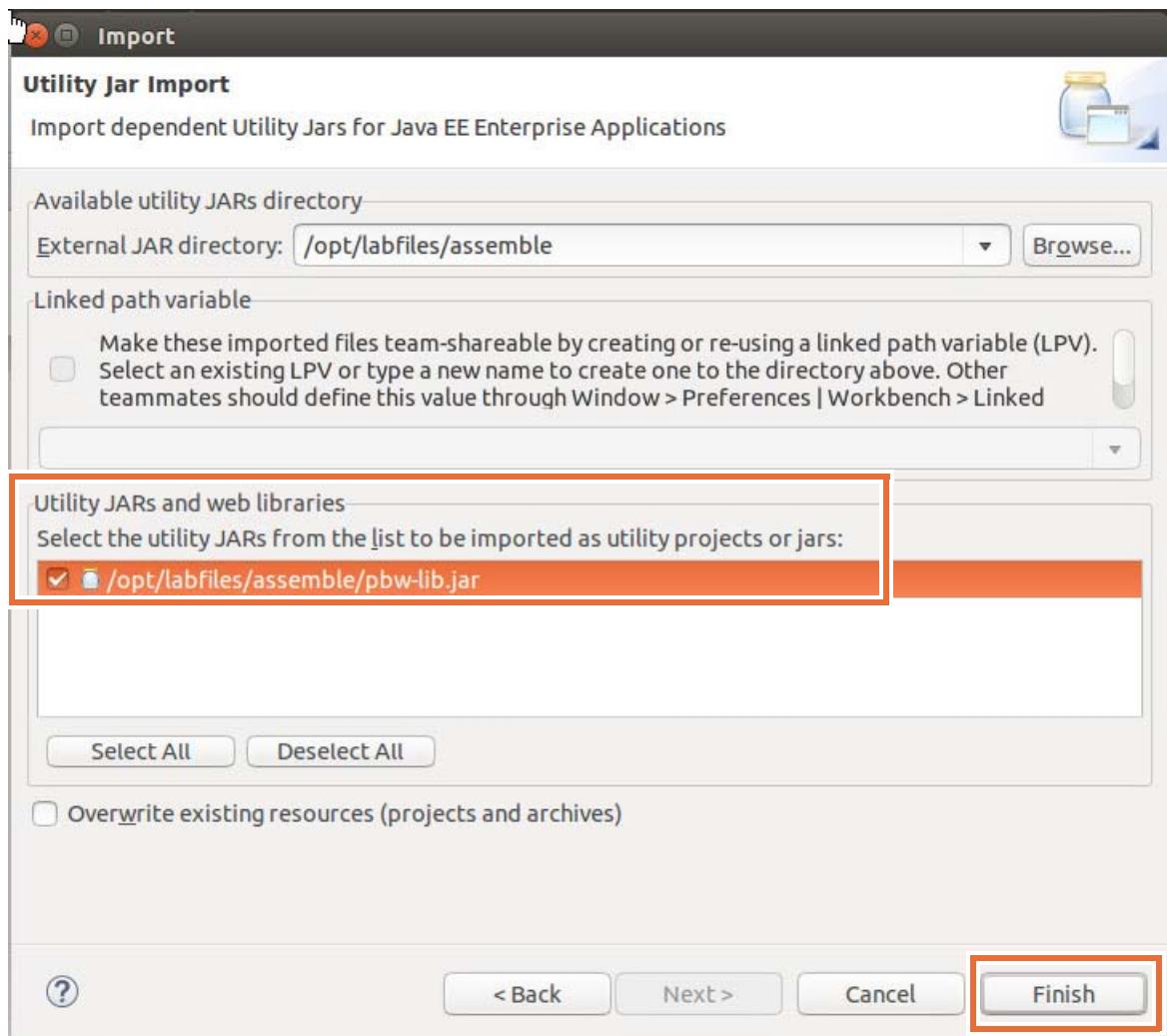
3. Verify that the EAR project is **PlantsByWebSphereProject**, and check **Copy utility JARs into an existing EAR from an external location**. Click **Next**.



- \_\_\_ 4. In the **Import** pane, click **Browse** and go to /opt/labfiles/assemble. Click **OK**.



- \_\_\_ 5. Check the utility JAR file named pbw-lib.jar. Ignore XML errors. Click **Finish**.





### Information

Double-clicking a module (the second entry) on the Enterprise Explorer view opens its deployment descriptor (if it exists) in a specialized editor. Deployment descriptor editors have tabs along the bottom of the pane to give you access to the various sections of the file. Using these editors makes working with deployment descriptors much easier.

If you change anything on a deployment descriptor, or any other file, you see an asterisk on the tab where its name is shown at the top of the editor pane. The asterisk indicates that the file has changes and must be saved. Do not save any changes that you make, and close the EJB deployment descriptor in the editor.

---

## Section 5: Add the web module

Next, add the web module that the application references. A web module consists of the JSP pages, HTML pages, and servlets that are contained within the `.war` file.



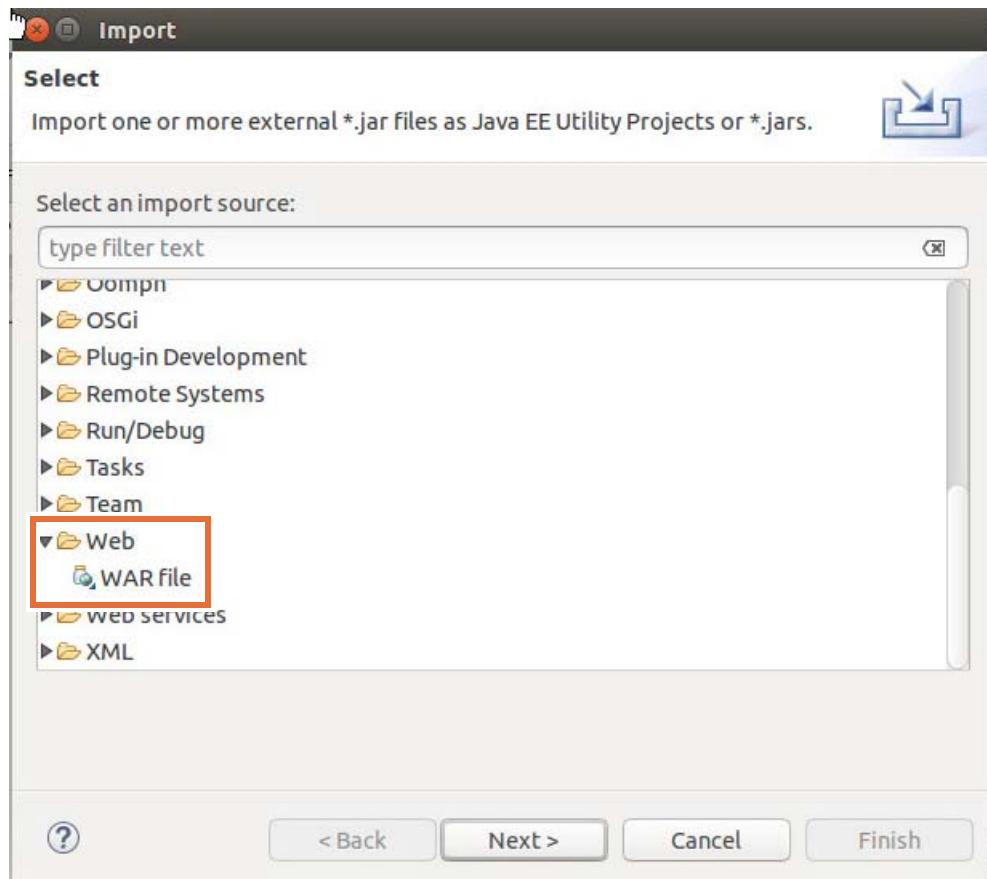
### Note

This `.war` file also contains EJBs.

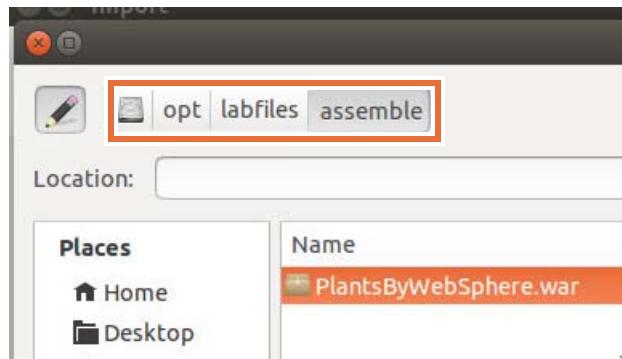
---

- \_\_ 1. From the menu, select **File > Import**.

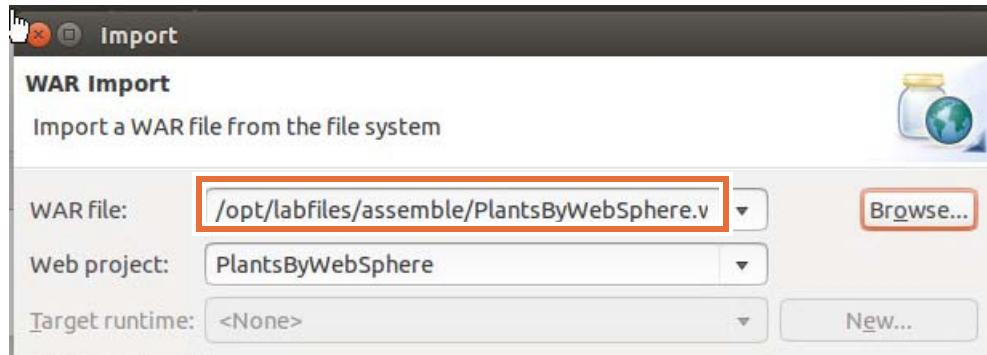
2. In the **Import** pane, expand the **Web** folder and select **WAR file**. Click **Next**.



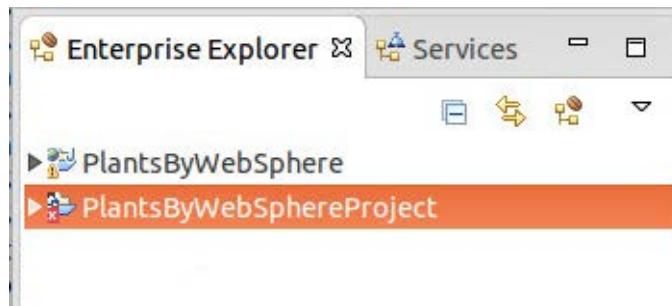
- \_\_\_ 3. Click **Next**. In the **Import** pane, click **Browse**, go to /opt/labfiles/assemble, and select **PlantsByWebSphere.war**. Click **OK**.



- \_\_\_ a. Click **Finish** to add the PlantsByWebSphere web module to the enterprise application.



- \_\_\_ b. Click **No** in the pane that asks to change to the Web perspective.  
\_\_\_ c. Verify that the web module is in the Enterprise Explorer.

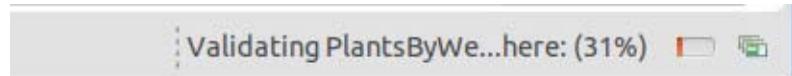


- \_\_\_ d. Look for errors or warnings in the **Markers** view.



## Information

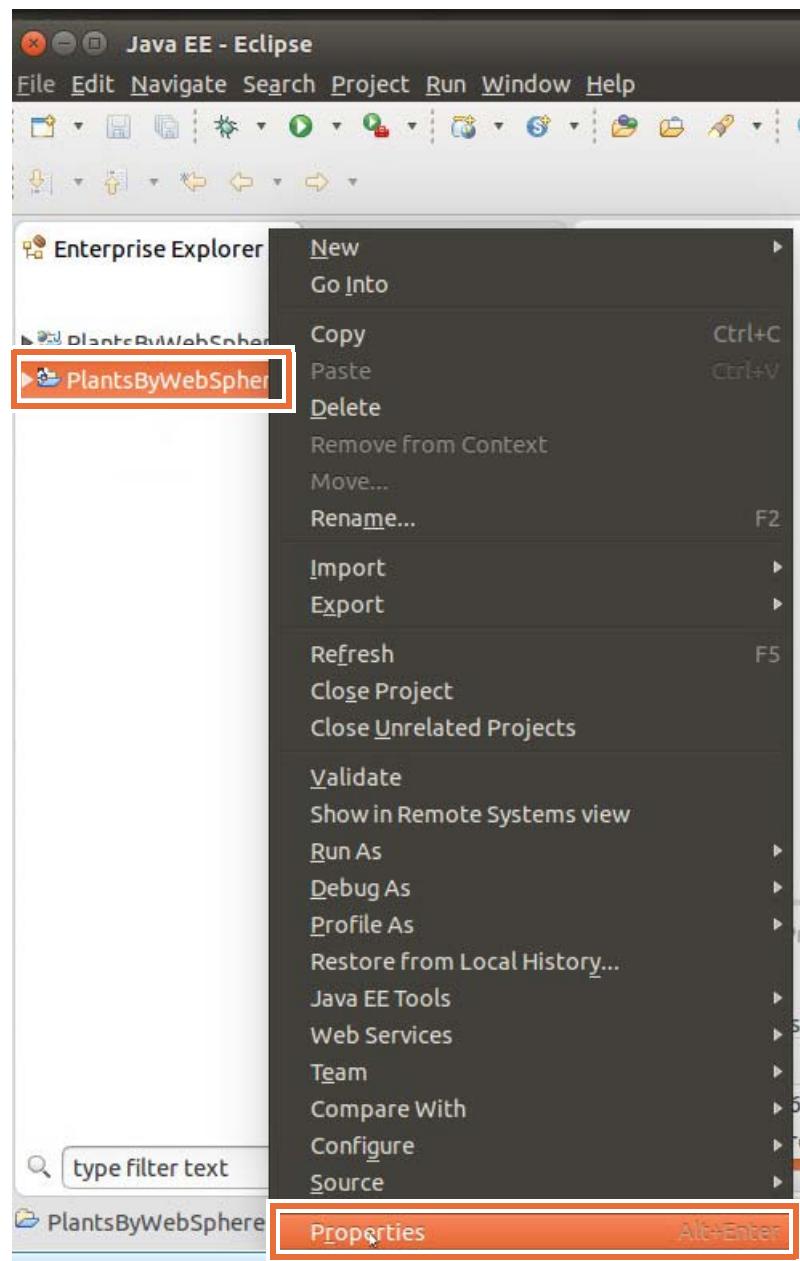
It takes a minute or two for the project to finish rebuilding. Ignore any errors until the rebuild process is complete. A status bar is in the lower right of the window.



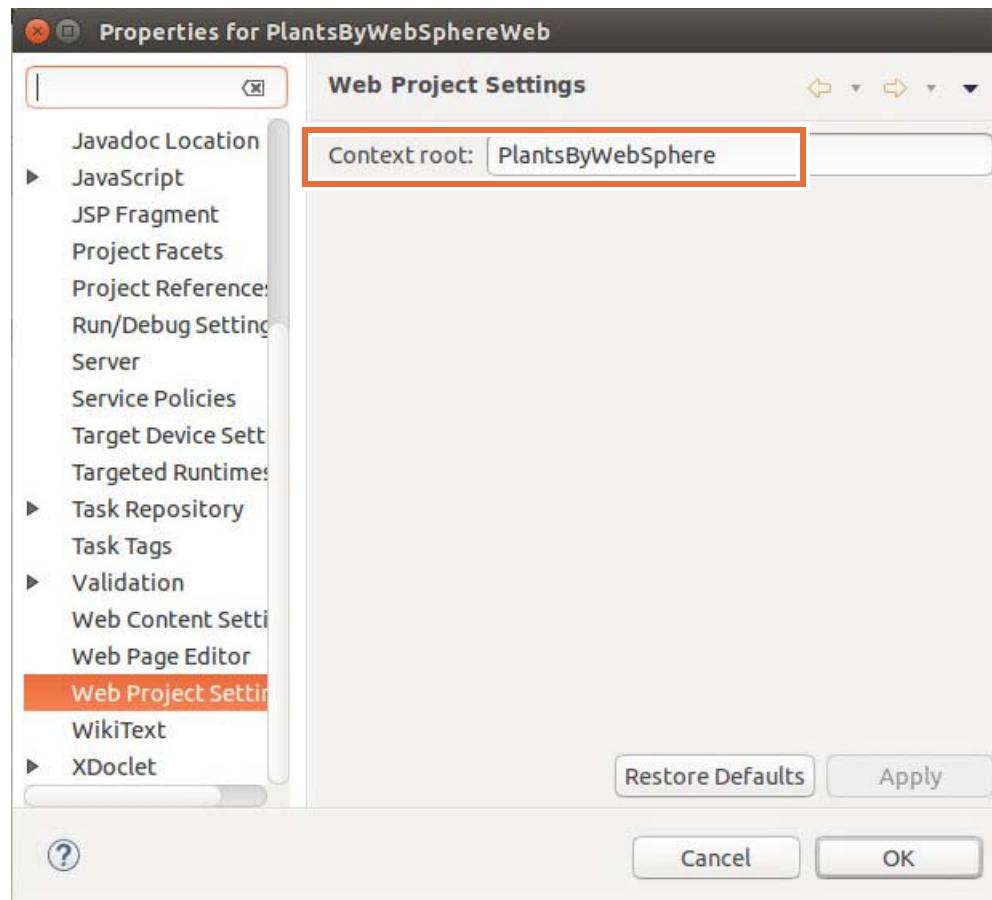
- 
- \_\_\_ 4. The Uniform Resource Identifier (URI) must be modified in the **PlantsByWebSphere** application.
    - \_\_\_ a. In the Enterprise Explorer view, select **PlantsByWebSphere**, right-click, and select **Properties** from the menu.

**Note**

Screen captures might vary from what you are seeing. Be careful to move by using the names that are specified rather than positions.

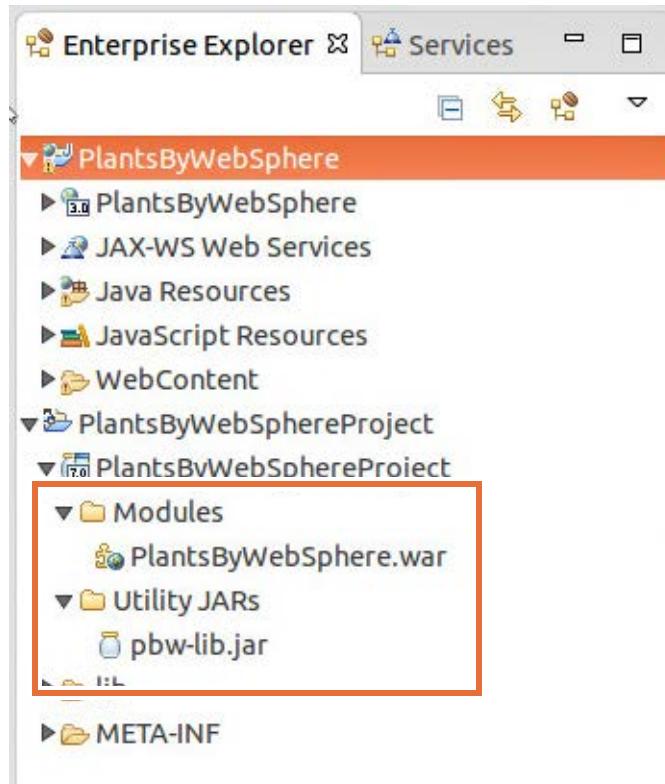


- \_\_\_ b. Select **Web Project Settings**. Change the Context root to `PlantsByWebSphere` and click **OK**.



- \_\_\_ c. A window might open to confirm this change. Click **OK**.

- \_\_ d. The web and utility modules are added to PlantsByWebSphere. You can see these modules in the Enterprise Explorer by expanding **PlantsByWebSphereProject > PlantsByWebSphereProject > Modules** and **PlantsByWebSphereProject > PlantsByWebSphereProject > Utility JARs**.



## Information

### Warnings

You are going to see several warnings such as JSP problems, XML problems, and possibly others. It is always a good practice to investigate any warnings you see in the Markers view. However, for the purposes of this exercise, you can ignore these warnings.

You can filter warnings by setting the preference feature to ignore certain types of warnings.

For example, if you see the XML warning **No grammar constraints (DTD or XML schema)** detected for the document, you can remove the warning by clicking **Window > Preferences > XML > XML Files > Validation**. Change the **“No grammar is specified”** option to **“Ignore”**. Accept the validation box that follows. Next, click **Project > Clean**.

## Section 6: Add a test server

Earlier, you specified that the target runtime environment is WebSphere Application Server V9.0. If one does not exist, add a WebSphere Application Server V9.0 that can be used to test the application.

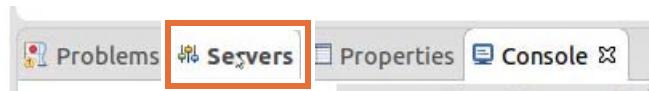


## Information

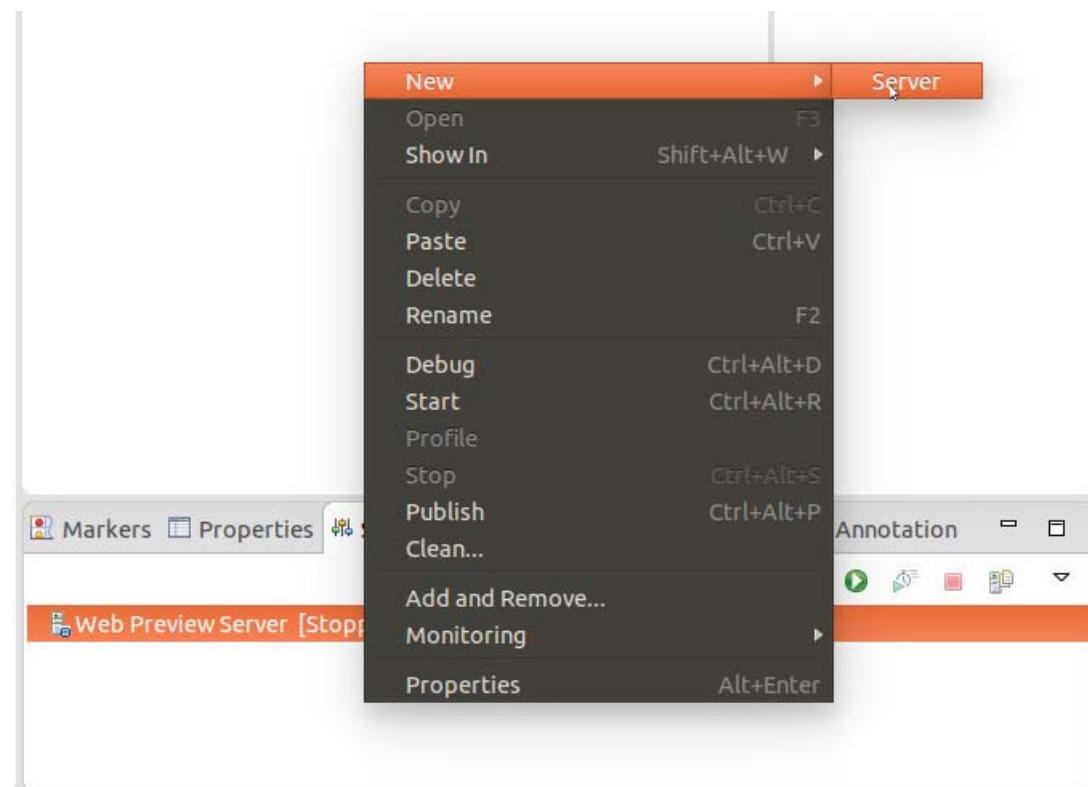
Adding a test server allows administrators, assemblers, or developers to test their enterprise applications directly from their development environment. The alternative is to export the EAR file and deploy it to a WebSphere Application Server runtime environment.

Although this test environment is being defined here, it is not used in this exercise.

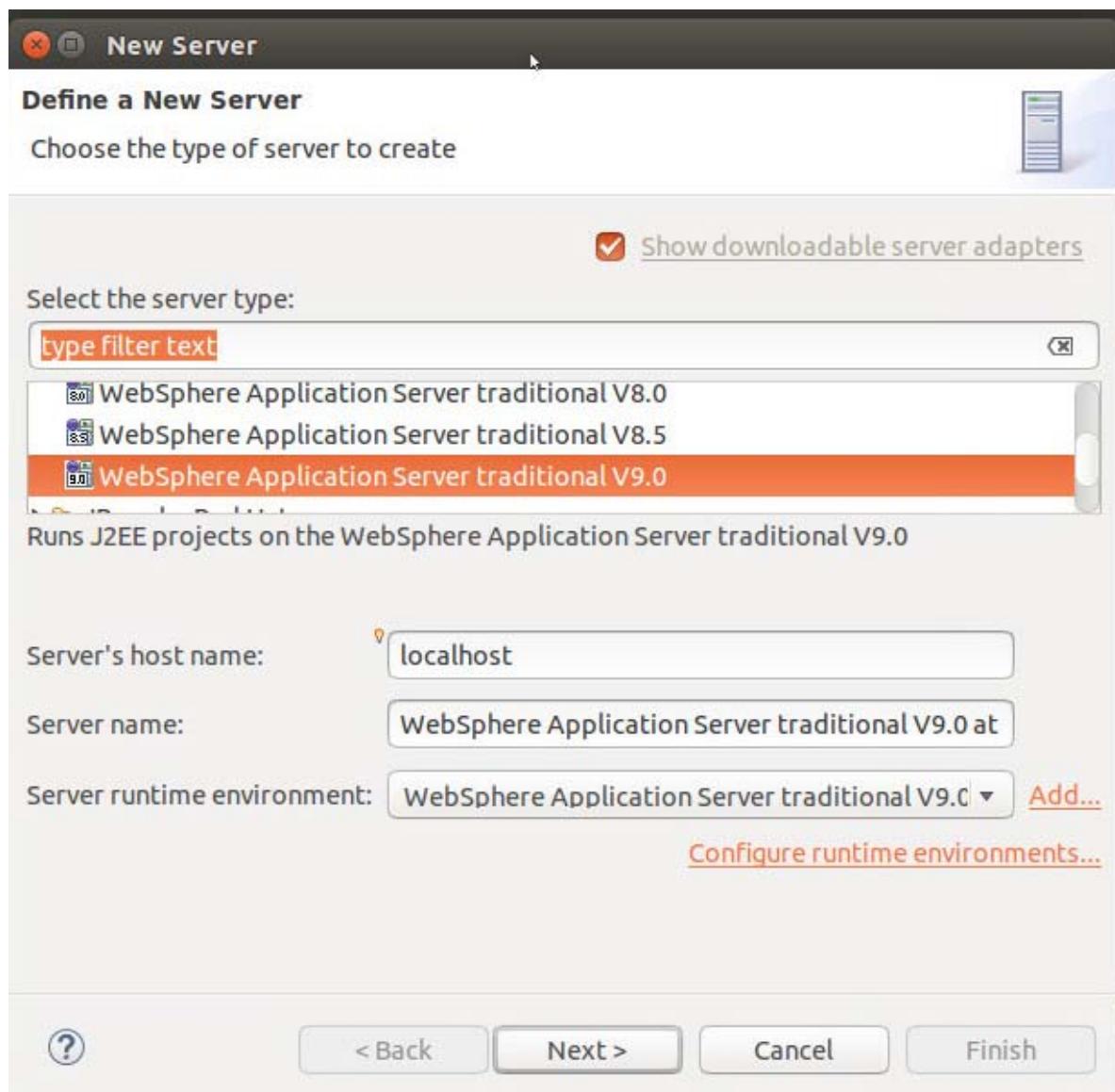
- 1. Select the **Servers** tab.



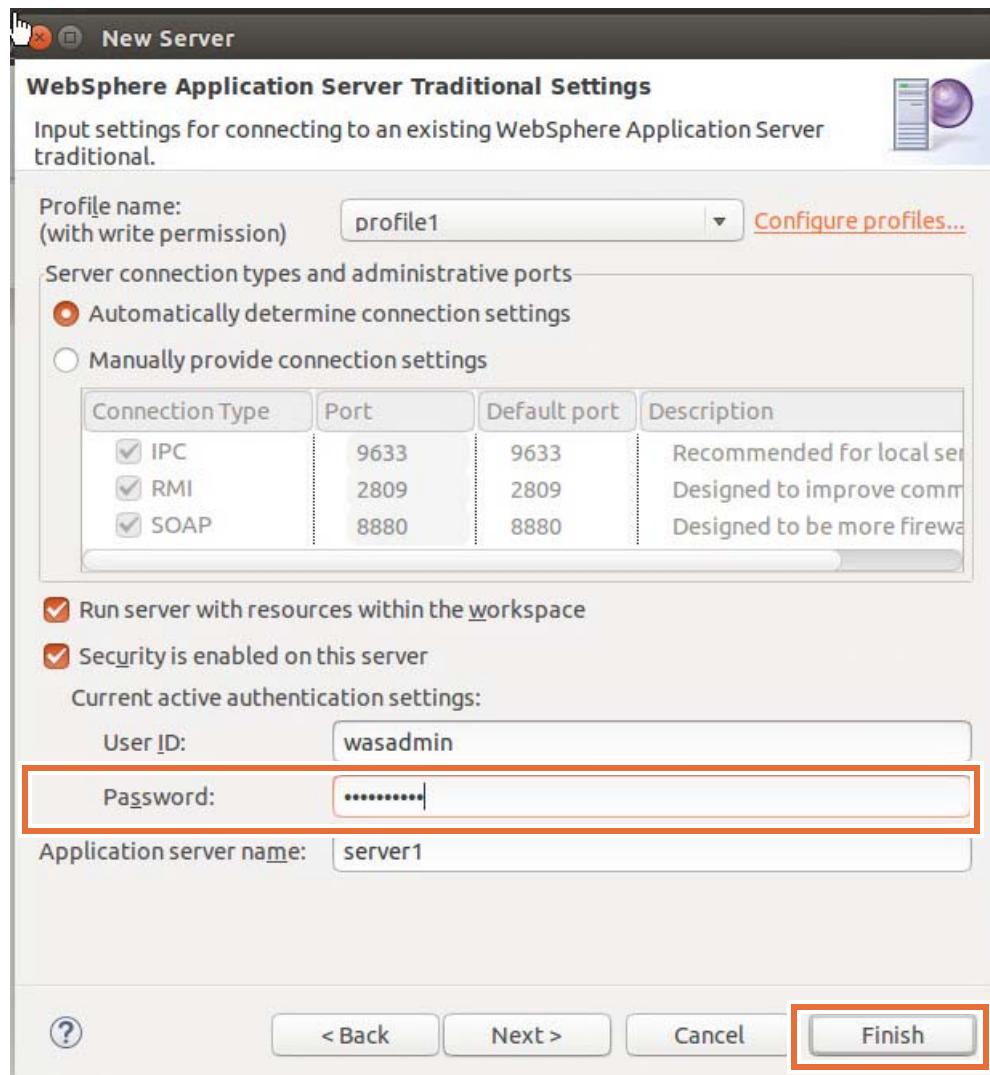
- 2. Right-click in the empty Servers view, and then select **New > Server** from the menu.



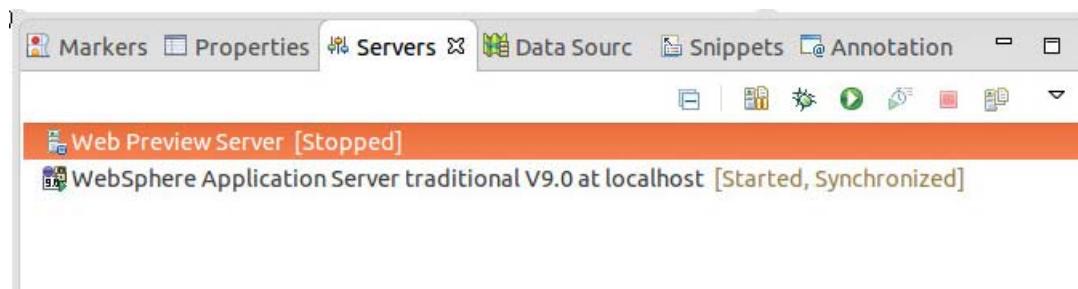
3. In the **Define a New Server** pane, select WebSphere Application Server traditional V9.0. Click **Next**.



- \_\_\_ 4. Type the password `web1sphere` in the WebSphere Server Settings pane. Click **Finish**.



- \_\_\_ 5. WebSphere Application Server V9.0 is shown in the Servers view.





### Information

Use the WebSphere Application Server V9.0 in the Servers view to test your application on an existing instance of the WebSphere runtime environment directly from the assembly tool. You can easily install enterprise applications from the menu by right-clicking **WebSphere Application Server V9.0** and selecting **Add and Remove Projects** from the menu.

You are not going to run through a test at this stage. Some additional configuration of the environment must be completed. You test the Plants application in a later exercise.

---

## Section 7: Configure WebSphere data sources

You can define certain resources that are included with the application in the WebSphere Application Server Deployment editor. Any resources that are defined on this page are defined at the application scope. This approach is valuable in a development or test environment, but is not considered a good approach in a production environment.

When you export the EAR file, resource definitions are included. An EAR file that contains these types of resource definitions is named an enhanced EAR. The resources that are defined within the EAR are scoped at the application scope level. These resources take precedence over any other resource definitions within the existing runtime environment.

Although the steps that follow create application scoped resources, they are not used in the labs that follow. The objective of the section is to demonstrate how to add resources.



### Information

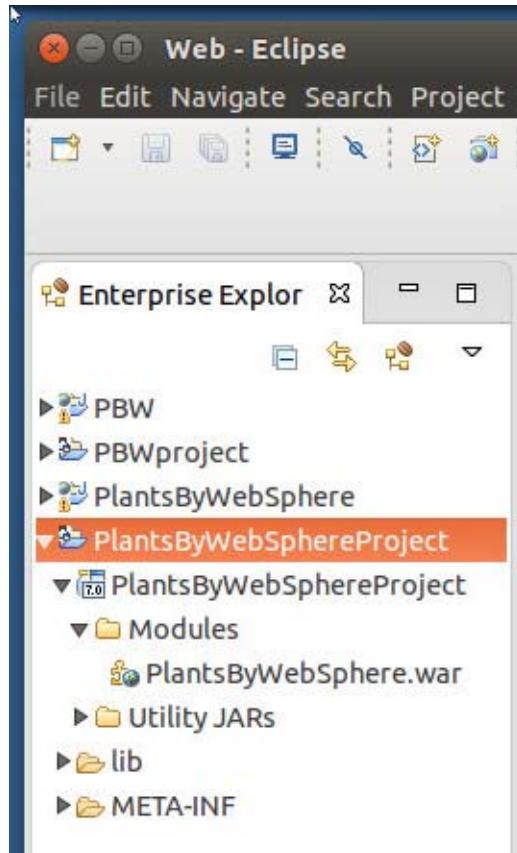
---

To work with application scoped resources in the WebSphere administrative console, you must select the application and then under **Resources**, select **Application scoped resources**.

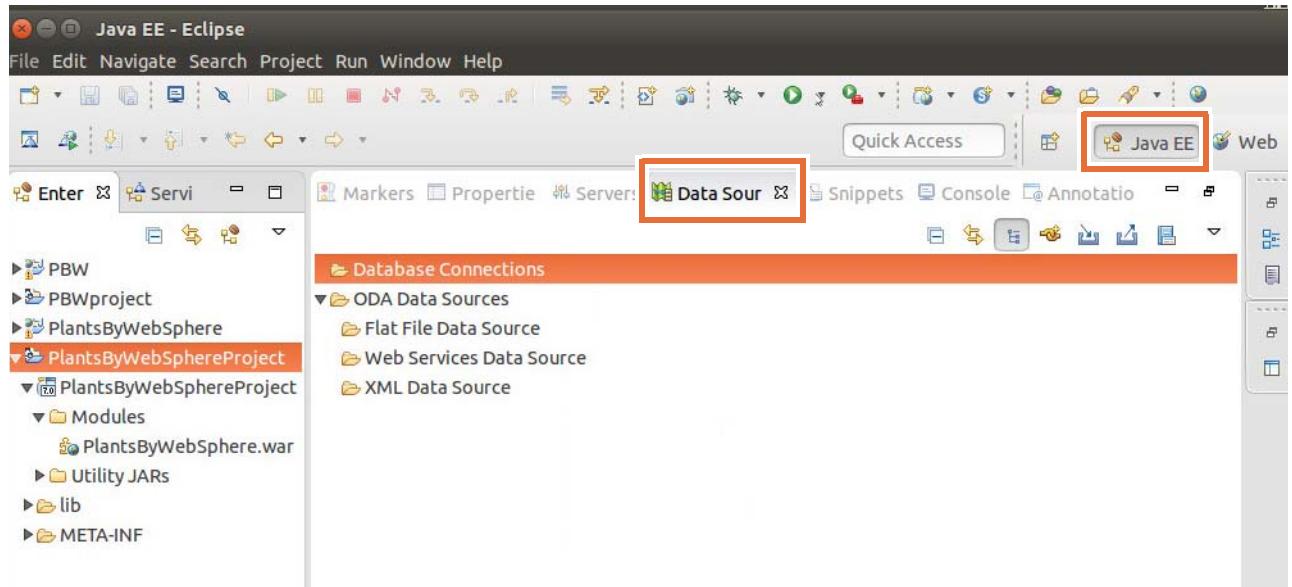
Next, you define a JDBC provider and data source for the PlantsByWebSphere application. Both of these resources are defined at the application scope and visible only to the application.

— 1. View the data sources.

— a. In the **Enterprise Explorer**, select the **PlantsByWebSphereProject**.

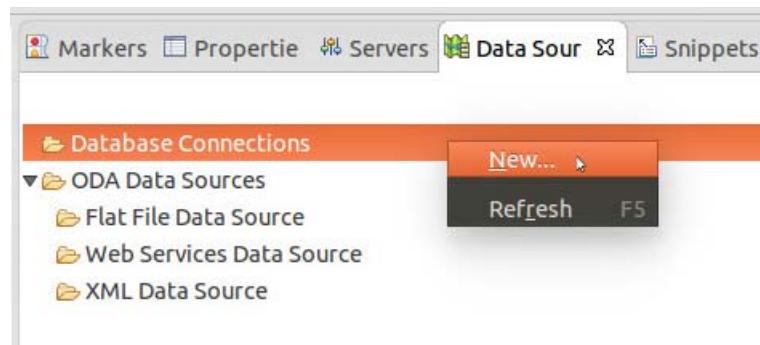


- \_\_ b. In the upper right corner, select **Java EE**. Then, select the **Data Source Explorer** tab. Currently, no data sources are listed.

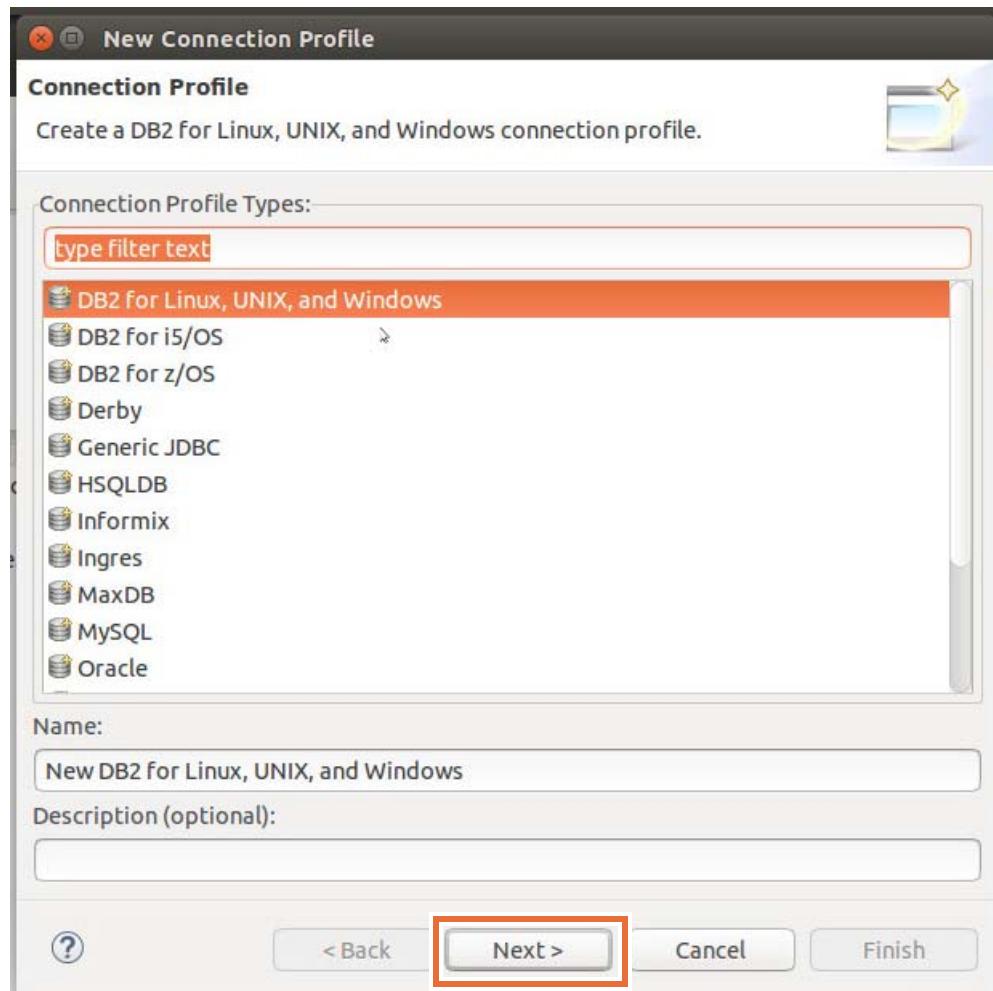


- \_\_ 2. Create a data source.

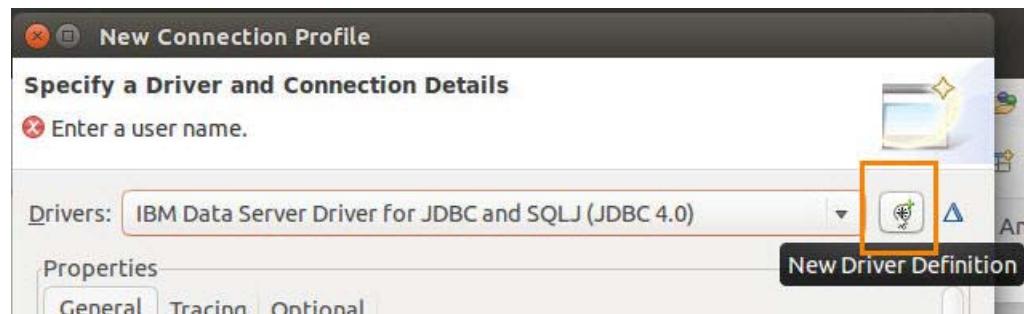
- \_\_ a. Right-click **Database Connections** and select **New**.



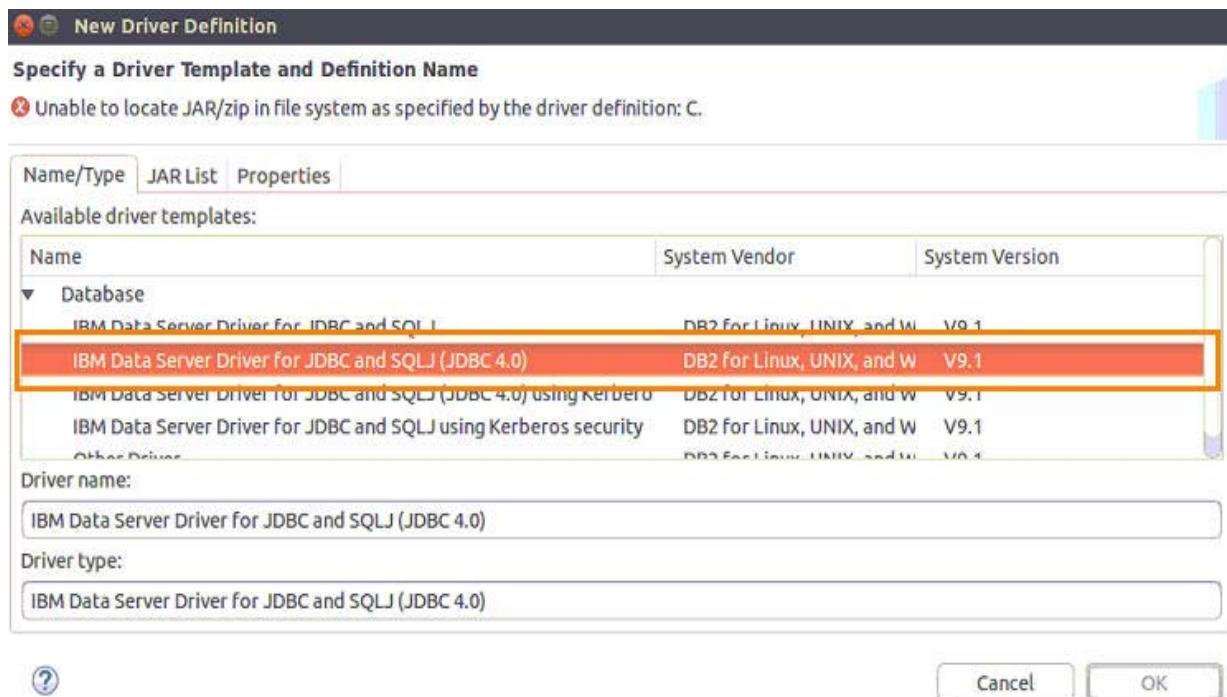
- \_\_ b. On the **New Connection Profile** window, select **DB2 for Linux, UNIX, and Windows**. Click **Next**.



- \_\_ c. The next window is the **New Connection Profile**. To the right of the driver type, click the **New Driver Definition** icon.



- \_\_\_ d. Select the **Name/Type** tab. Select **IBM Data Server Driver for JDBC and SQLJ (JDBC 4.0)** from the list of databases.



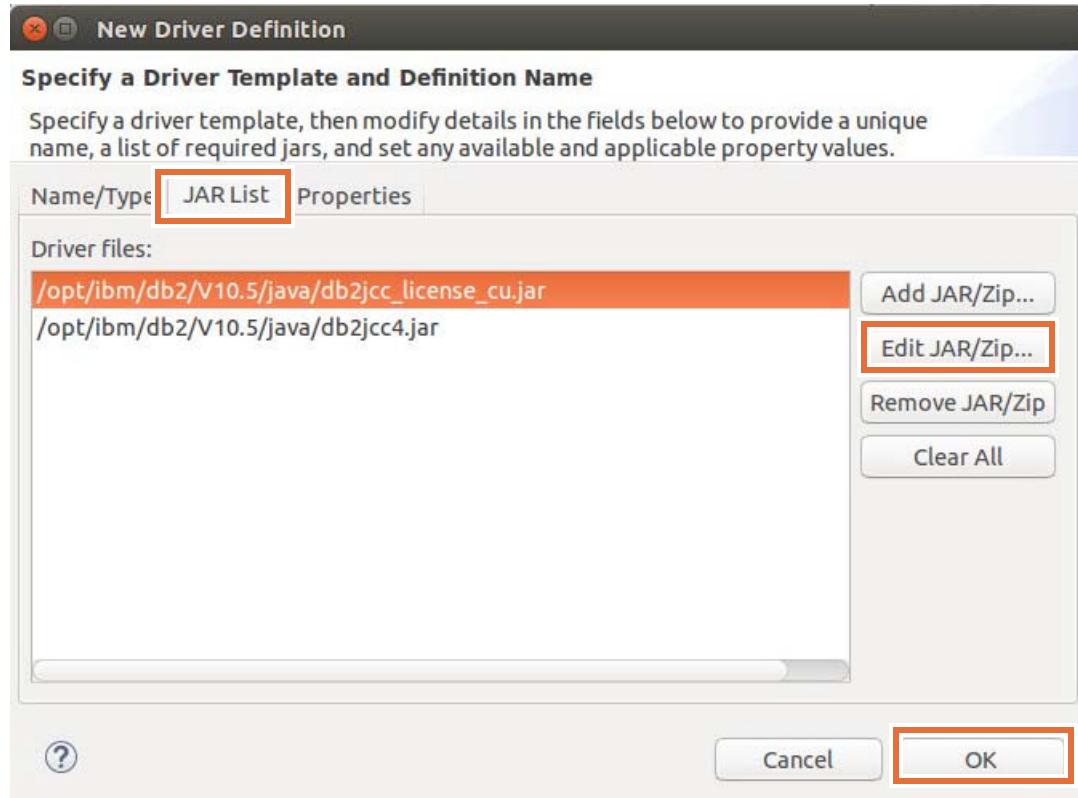
- \_\_\_ e. Select the JAR list tab.



- \_\_\_ f. Remove the first line that is the letter C. Also, remove the reference to C at the end of the second line.

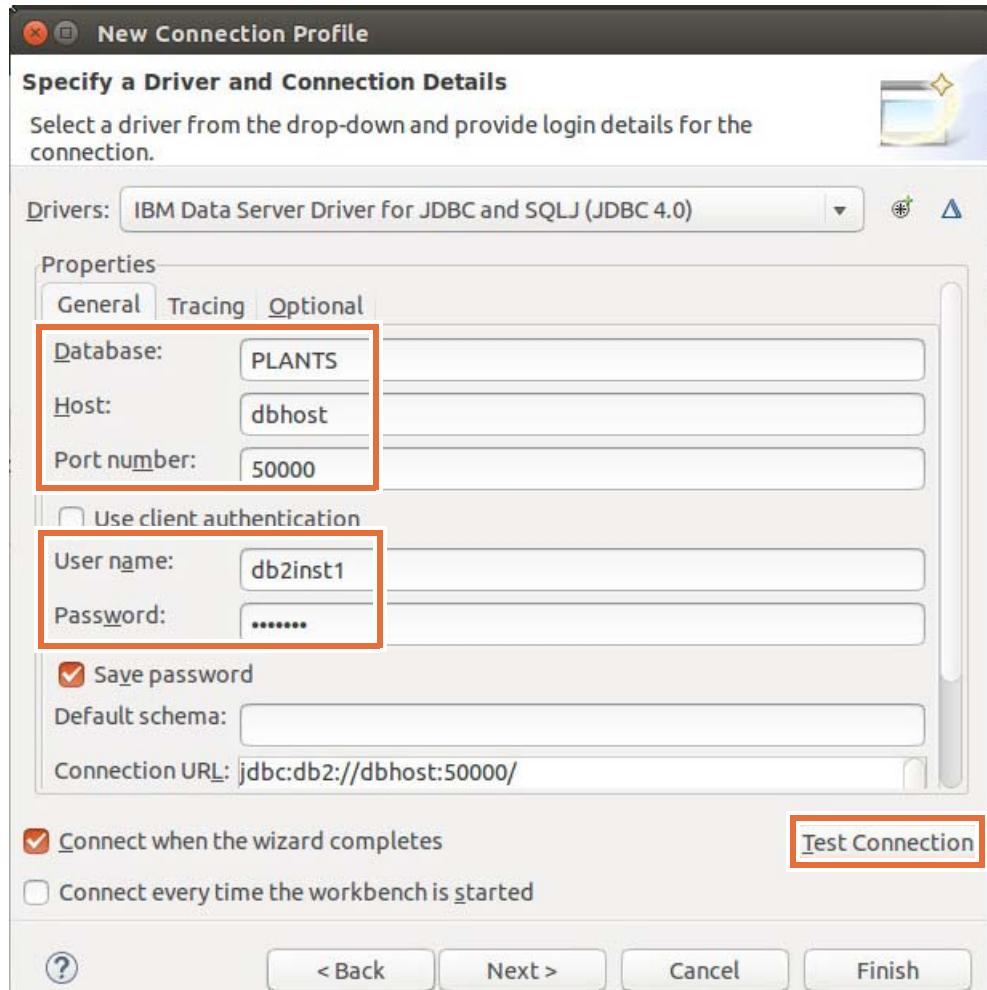
- g. The libraries default to Windows syntax. Change the paths to the following correct Linux paths. For each library, select the library name. Click **Edit JAR/Zip** and specify the Linux file. Click **OK**. The completed pane is similar to the following screen capture.

/opt/ibm/db2/V10.5/java/db2jcc4.jar  
/opt/ibm/db2/V10.5/java/db2jcc\_license\_cu.jar

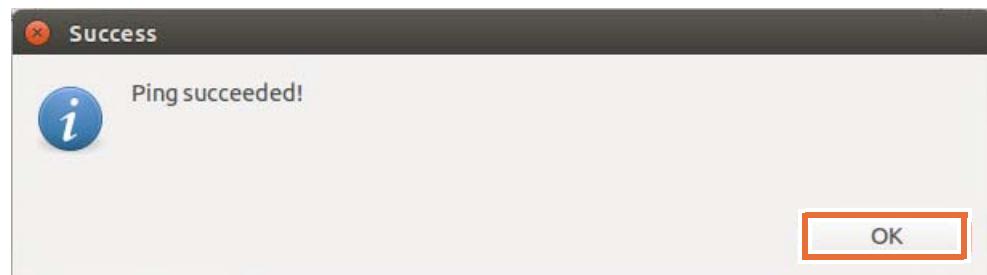


- \_\_ h. Back on the **New Connection Profile** window, specify the new data source as follows, select **Save password**, and click **Test Connection**.

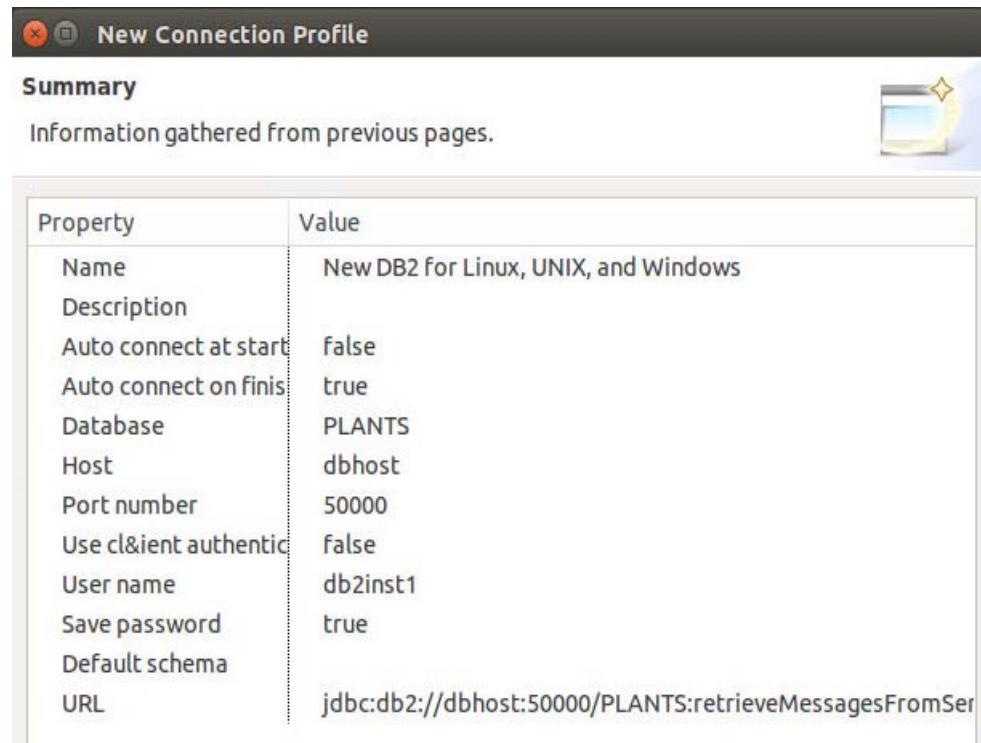
- o Database name PLANTS
- o Host dbhost
- o Port number 50000
- o User name db2inst1
- o Password was1edu



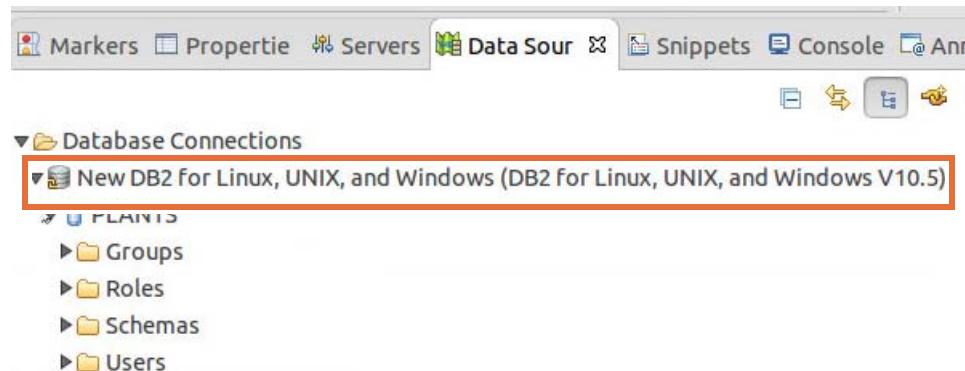
- \_\_ i. If the connection is not successful, double check the libraries and the other parameters. Click **OK** to close the message.



- \_\_\_ j. On the **New Connection Profile** window, click **Next**.
- \_\_\_ k. Review the **Summary** window and click **Finish**.



- \_\_\_ l. On the Data Source Explorer tab, the JDBC connector is listed.



### Information

These resource settings are saved within the EAR file in files under the `META-INF\ibmconfig` folder. These files are not part of the Java EE 6 specification; instead, WebSphere Application Server uses these files for attributes that the specification does not provide. This type of enterprise archive is called an enhanced EAR file.

Look at the data that is contained in the `resources.xml` file. Typically this information is defined in the server and is required before the enterprise application is run. In the enhanced EAR file, this

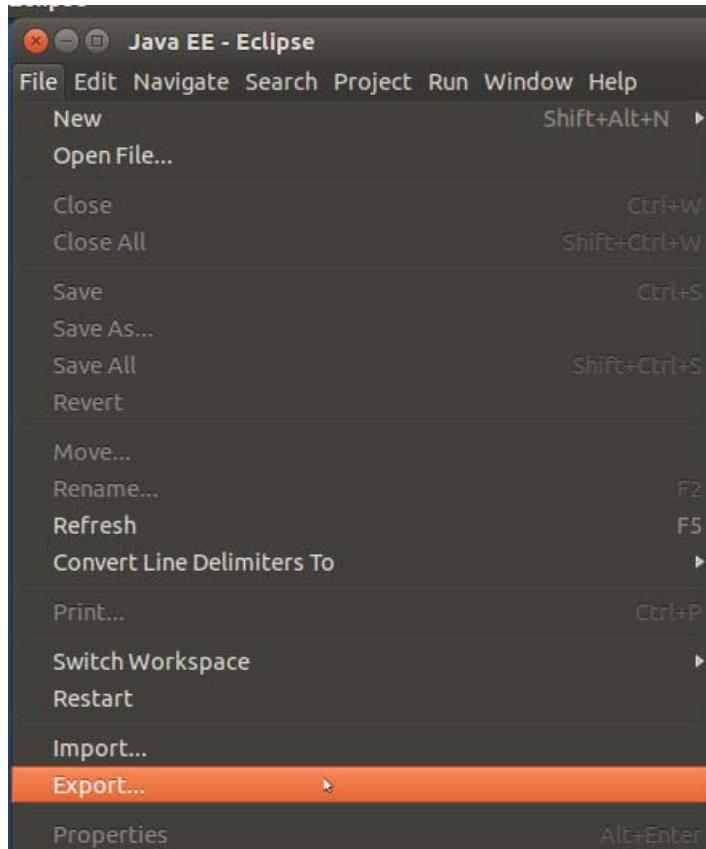
configuration data is stored with the application. These enhancements are useful for development and testing, but developers do not use them beyond testing. The enhanced EAR runs contrary to the separation of roles in Java EE.

Close the `resources.xml` file and do not save any changes.

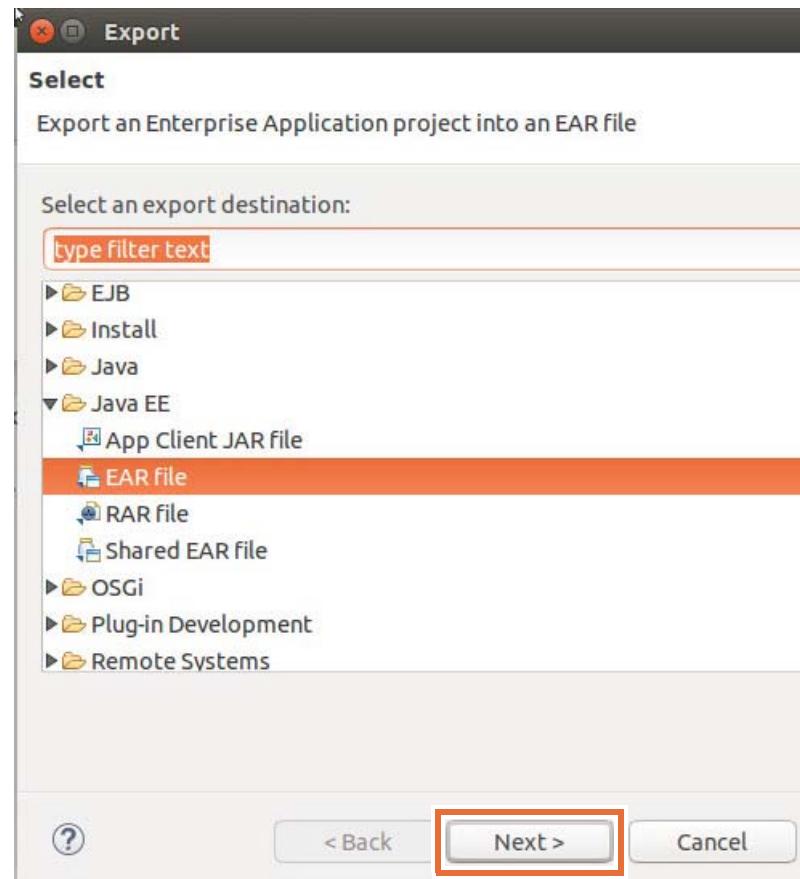
## Section 8: Export the enterprise archive (EAR) file

Save the file in the `<profile_root>/profile1/installableApps` directory.

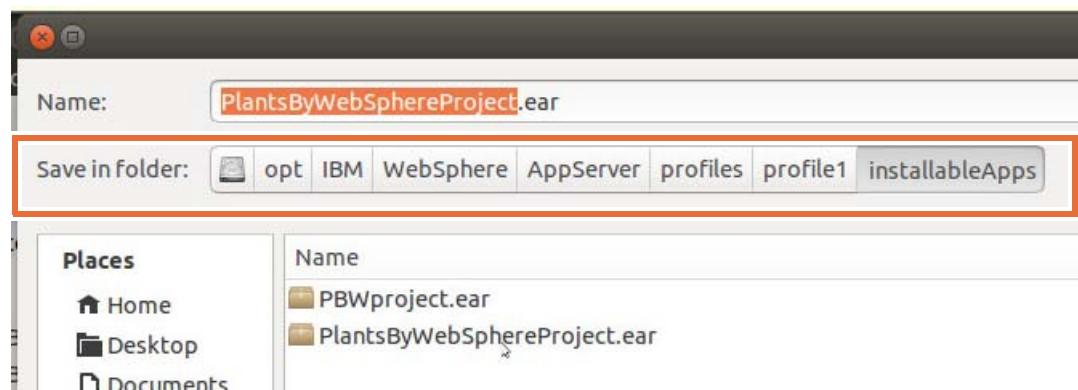
- \_\_ 1. Export the `PlantsByWebSphereProject` EAR file.
  - \_\_ a. In the **Enterprise Explorer** view on the upper left pane, select **File > Export**.



- \_\_\_ b. In the **Export** window, expand **Java EE** and select **EAR file**. Click **Next**.

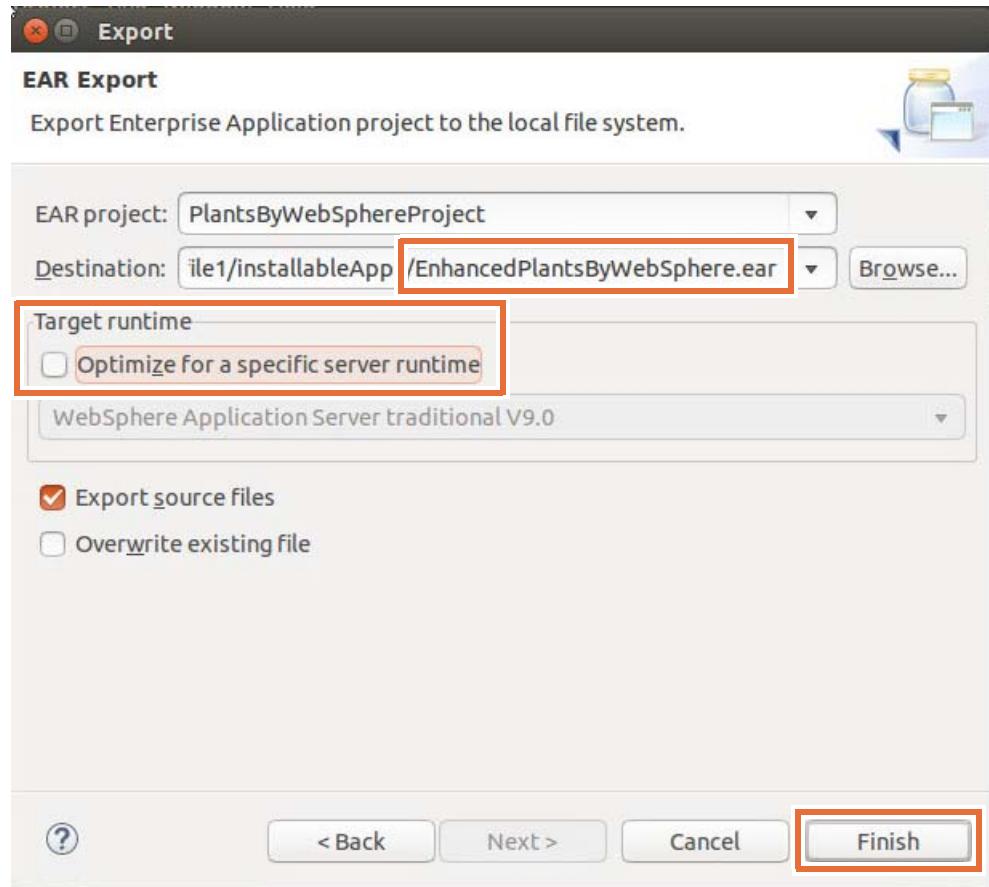


- \_\_\_ c. In the **EAR project** field, select `PlantsByWebSphereProject`.  
 \_\_\_ d. Click **Browse**, go to the  
`/opt/IBM/WebSphere/AppServer/profiles/profile1/installableApps` folder, and  
 click **OK**.



- \_\_\_ e. In the **Destination** field, change the name of the EAR file to:  
`EnhancedPlantsByWebSphere.ear`

- \_\_\_ f. Clear the check box for **Optimize for a specific server runtime**.



- \_\_\_ g. Click **Finish** to export the EAR file.



### Information

It is not always obvious when an EAR includes application scoped resources. To make the fact clearer, this exercise includes the word “enhanced” as part of the EAR file name. This convention makes it clear to anyone who might be deploying the EAR in the future that this EAR includes enhancements.

Deploying an enhanced EAR without realizing that application scoped resources are included can cause confusion.

- 
- \_\_\_ 2. Verify that the EAR file was saved successfully.
- \_\_\_ a. Use a file system browser to go to  
/opt/IBM/WebSphere/AppServer/profiles/profile1/installableApps.
  - \_\_\_ b. Verify that the EnhancedPlantsByWebSphere.ear file is present.
- \_\_\_ 3. Close WebSphere Developer Tools for Eclipse.
- \_\_\_ a. Click **File > Exit**.

## End of exercise

## Exercise review and wrap-up

In this exercise, WebSphere Developer paneTools for Eclipse was used to assemble the modules for the PlantsByWebSphere application into an enterprise archive. The PlantsByWebSphere application is tested in a later exercise.

# Exercise 4. Installing an application

## Estimated time

01:00

## Overview

In this exercise, you complete the tasks to install various enterprise applications in WebSphere Application Server by using the administrative console and the monitored directory features.

## Objectives

After completing this exercise, you should be able to:

- Use the administrative console to install an application
- Use a web browser to test the application
- Use the drag function to deploy an application

## Introduction

In this exercise, you install the PlantsByWebSphere enterprise archive (EAR) file that you assembled by using WebSphere Developer Tools for Eclipse. The EAR file contains all the application modules, and also contains the definition of other resources that the application requires.

This application is tested by accessing it from a web browser.

Next, you use the drag-and-drop function to install and uninstall the Cache Monitor enterprise archive (EAR) file.

## Requirements

To complete this exercise, WebSphere Application Server must be installed, including a working application server with an administrative console. In addition, you need a web browser and DB2 installed, and the PlantsByWebSphere database must be created and populated.

You also need the `EnhancedPlantsByWebSphere.ear` and `CacheMonitor.ear` files.

# Exercise instructions

## Section 1: Resetting the WebSphere environment



### Note

To reset your WebSphere environment, read **Appendix A** for instructions on how to complete this procedure.

## Section 2: Start the server and the administrative console

Use the WebSphere Application Server administrative console to install the PlantsByWebSphere application. Since the administrative console is an application that is running on the server, the server must be running before the administrative console is started.

- \_\_\_ 1. If it is not already running, start server1.
  - \_\_\_ a. The server can be started from the `/opt/IBM/WebSphere/AppServer/bin` directory. From the `/opt/IBM/WebSphere/AppServer/bin` directory, the profile name must also be specified in the command. In a command window, go to:  
`/opt/IBM/WebSphere/AppServer/bin`
  - \_\_\_ b. Enter the following command to start the server:

`./startServer.sh server1 -profileName profile1`

The server is started when a message similar to the following message is seen.

`Server server1 open for e-business; process id is 2136`

The process ID is a unique number, which represents the server process that is running on the system.



### Information

If you enter the `./startServer.sh server1` command from the `/opt/IBM/WebSphere/AppServer/profiles/profile1/bin` directory, the server can be started without the use of the profile name.

- \_\_\_ 2. Open the administrative console.
  - \_\_\_ a. Open a web browser and enter the following address:  
`http://washost:9060/ibm/console`  
If you see a security alert or warning from the web browser, click **OK** or the link to continue to the website.

- \_\_\_ b. Enter `wasadmin` for the user ID and `websphere` for the password, and then click **Login**.

### Section 3: Create J2C authentication aliases

Most system resources must be able to authenticate to a registry. Data sources must be able to authenticate to the database server. Next, the database is set up to use the local OS user registry.

- \_\_\_ 1. Create an authentication alias.  
\_\_\_ a. From the administrative console, expand **Security** and click **Global security**.



- \_\_\_ b. Under **Authentication** on the right, expand **Java Authentication and Authorization Service**.

**Authentication**  
Authentication mechanisms and expiration

- [LTPA](#)
- Kerberos and LTPA
  - [Kerberos configuration](#)
- SWAM (deprecated): No authenticated communication between servers
  - [Authentication cache settings](#)
- Web and SIP security
- RMI/IOP security
- Java Authentication and Authorization Service
  - [Application logins](#)
  - [System logins](#)
  - [J2C authentication data](#)
- Enable Java Authentication SPI (JASPI)
  - [Providers](#)
- Use realm-qualified user names

[Security domains](#)  
[External authorization providers](#)  
[Programmatic session cookie configuration](#)  
[Custom properties](#)

- \_\_\_ c. Click **J2C authentication data**.

- \_\_\_ d. Click **New**.

**Global security**

[Global security](#) > JAAS - J2C authentication data

Specifies a list of user identities and passwords for Java(TM) 2 connector security to use.

Prefix new alias names with the node name of the cell (for compatibility with earlier releases)

[Apply](#)

Preferences

|                        | Select                 | Alias | User ID | Description |
|------------------------|------------------------|-------|---------|-------------|
| <a href="#">New...</a> | <a href="#">Delete</a> |       |         |             |
| <a href="#">Select</a> | <a href="#">Alias</a>  |       |         |             |

- \_\_ e. In the **General Properties** area, enter the values in the following table.

*Table 1. J2C details*

| Field       | Value                     |
|-------------|---------------------------|
| Alias       | PlantsApp                 |
| User ID     | db2inst1                  |
| Password    | was1edu                   |
| Description | For PlantsByWebSphere App |

The screenshot shows a configuration interface for 'Global security'. The path 'Global security > JAAS - J2C authentication data > New...' is visible. The 'General Properties' section contains fields for 'Alias' (PlantsApp), 'User ID' (db2inst1), 'Password' (represented by a series of asterisks), and 'Description' (For PlantsByWebSphere App). At the bottom are buttons for 'Apply', 'OK', 'Reset', and 'Cancel'.

- \_\_ f. Click **OK**.

Notice that the alias was created, but the name is not exactly as you defined. The wizard adds the node name in front of the alias name you entered.

| Select                   | Alias                   | User ID  | Description               |
|--------------------------|-------------------------|----------|---------------------------|
| <input type="checkbox"/> | washostNode01/PlantsApp | db2inst1 | For PlantsByWebSphere App |

- g. Click the **Save** link to save your changes.
- 2. Edit the hosts file. The file is at /etc/hosts.
- a. Use an editor such as vi or gedit to edit the hosts file. Specify that the host name washost and a new alias dbhost are mapped to the localhost IP address. With Ubuntu, it is common to put aliases on the 127.0.1.1 line.

```

localuser@washost: /etc
127.0.0.1      localhost
127.0.1.1      washost dbhost
# The following lines are desirable for IPv6 capable hosts
::1      ip6-localhost ip6-loopback
fe00::0 ip6-localnet
ff00::0 ip6-mcastprefix
ff02::1 ip6-allnodes
ff02::2 ip6-allrouters

```



## Information

In this case, a host name alias of `dbhost` is being used. This alias allows the database to be moved without changing the configuration. For example, if other users want to test an application on a different host, but with the same database, they define `dbhost` on their host to point to a different location.

- \_\_\_ b. **Save** and close the hosts file when completed.
- \_\_\_ 3. Configure the correct persistence provider for PlantsByWebSphere.



## Information

WebSphere Application Server V9 uses a different Java Persistence Provider, JPA 2.1 than V8.5.5 did. The following instructions set the Java Persistence Provider to 2.0, which was used in V8.5.5.

- \_\_\_ a. On the administrative console navigation window, expand **Servers > Server Types** and select **WebSphere application servers**.



- \_\_ b. On the **Application servers** pane, click **server1**.

The screenshot shows the 'Application servers' pane with the following details:

- Title bar:** Application servers
- Section title:** Application servers
- Description:** Use this page to view a list of the application servers in your environment and the status of each of these servers. You can also use this page to change the status of a specific application server.
- Preferences button:** + Preferences
- Table headers:** Name, Node, Host Name, Version
- Data row:** server1, washostNode01, washost, ND 9.0.0.0
- Total count:** Total 1

- \_\_ c. In the Application Server pane, in the **Container Settings** section, expand **Container Services**. Select **Default Java Persistence API settings**.

The screenshot shows the 'Application servers > server1' configuration pane with the following details:

- Title bar:** Application servers > server1
- Section title:** Application servers > server1
- Description:** Use this page to configure an application server. An application server is a server that provides services required to run enterprise applications.
- Runtime tab:** (selected)
- Configuration tab:**
- General Properties:**
  - Name: server1
  - Node name: washostNode01
  - Run in development mode
  - Parallel start
  - Start components as needed
  - Access to internal server classes: Allow
- Server-specific Application Settings:**
  - Classloader policy: Multiple
  - Class loading mode: Classes loaded with parent class loader first
- Container Settings:** (Expanded)
  - Session management
  - SIP Container Settings
  - Web Container Settings
  - Portlet Container Settings
  - EJB Container Settings
    - Container Services (Selected)
    - Application profiling service
    - Transaction service
    - Dynamic cache service
    - Compensation service
    - Default JAXRS provider settings
    - Internationalization service
    - Default Java Persistence API settings (Highlighted with a red box)
    - Object pool service
- Buttons:** Apply, OK, Reset, Cancel

- \_\_\_ d. On the **Default Java Persistence API settings**, in the **General Properties** section, select JPA Specification **2.0**.
- \_\_\_ e. Click **OK** and **Save** the changes.

**Application servers**

**Application servers > server1 > Default Java Persistence API settings**

The Java(TM) Persistence API (JPA) defines the management of persistence and object-relational mapping for the Java(TM) Platform, Enterprise Edition (Java(TM) EE) environment. Use this page to configure the default JPA settings for this server. These JPA settings are used for the persistence unit of an application only when the application does not define the JPA settings for that persistence unit. Application persistence settings always override the settings on this page.

**Configuration**

**General Properties**

**JPA Specification**

2.0  
2.0 (selected)  
2.1

**Default persistence provider**

The selector defines which JPA specification the application server's JPA Runtime will enable. This selection affects the default JPA Provider implementation.

**Server**

Default persistence provider  
com.ibm.websphere.persistence.PersistenceProviderImpl

Specify an alternate default persistence provider  
Default persistence provider

**Additional Properties**

Custom properties

**Default JTA data source JNDI name**  
(none)

**Default non-JTA data source JNDI name**  
(none)

Apply OK Reset Cancel

- \_\_\_ 4. Restart the WebSphere Application Server.

```
./stopServer.sh server1 -username wasadmin -password web1sphere
./startServer.sh server1
```

## Section 4: Create a JDBC provider and data sources for the application

If any resources that the application uses are not defined in the EAR file, you must define them. You can use the administrative console to define the resources. Next, you create the data sources that the PlantsByWebSphere application requires. These data sources define how the application accesses the PLANTS database. You also create the JDBC provider under which the data source exists.



## Information

In general, it is considered an excellent practice to ignore, or remove, application scoped resources from enhanced EAR files in a production environment.

- \_\_\_ 1. Create the data source.
- \_\_\_ a. From the administrative console, expand **Resources > JDBC > Data sources**.
- \_\_\_ b. Select the **Node=washostNode01** scope and click **New**. This step defines the scope at which the data source is visible.

**Data sources**

**Data sources**

Use this page to edit the settings of a datasource that is associated with your selected JDBC provider. The datasource object supplies your application with connections for accessing the database. Learn more about this task in a [guided activity](#). A guided activity provides a list of task steps and more general information about the topic.

Scope: Cell=**washostNode01Cell**, Node=**washostNode01**

Scope specifies the level at which the resource definition is visible. For detailed information on what scope is and how it works, [see the scope settings help](#).

**New...** Delete Test connection Manage state... Preferences

| Select  | Name | JNDI name | Scope | Provider | Description | Category |
|---------|------|-----------|-------|----------|-------------|----------|
| None    |      |           |       |          |             |          |
| Total 0 |      |           |       |          |             |          |

- \_\_ c. Enter Plants for the data source name. This name is just a label and can be anything that you like.

Enter jdbc/PlantsByWebSphereDataSource for the JNDI name. This name is used to look up the data source details. It must be the same name that the PlantsByWebSphere application uses. Each JNDI name must be unique within the environment.

Create a data source

**Step 1: Enter basic data source information**

Step 2: Select JDBC provider

Step 3: Enter database specific properties for the data source

Step 4: Setup security aliases

Step 5: Summary

**Enter basic data source information**

Set the basic configuration values of a datasource for association with your JDBC provider. A datasource supplies the physical connections between the application server and the database.

Requirement: Use the Datasources (WebSphere(R) Application Server V4) console pages if your applications are based on the Enterprise JavaBeans(TM) (EJB) 1.0 specification or the Java(TM) Servlet 2.2 specification.

Scope: cells:washostNode01Cell:nodes:washostNode01

\* Data source name: Plants

\* JNDI name: jdbc/PlantsByWebSphereDataSource

Next Cancel

- \_\_ d. Click **Next**.



### Note

If any JDBC providers are listed, you see the following screen at Step 2. Select **Create new JDBC provider**, and click **Next**. Otherwise, you go directly to Step 2.1, **Create new JDBC provider**, in the wizard.

Create a data source

Step 1: Enter basic data source information

**Step 2: Select JDBC provider**

Step 3: Enter database specific properties for the data source

Step 4: Setup security aliases

Step 5: Summary

**Select JDBC provider**

Specify a JDBC provider to support the datasource. If you choose to create a new JDBC provider, it will be created at the same scope as the datasource. If you are selecting an existing JDBC provider, only those providers at the current scope are available from the list.

Create new JDBC provider

Select an existing JDBC provider

Select...

Previous Next Cancel

- e. Select the values on the table in the **Create new JDBC provider** page. These parameters define the characteristics for the driver that is used to communicate with the database.

**Table 2: JDBC details**

| Field               | Value                              |
|---------------------|------------------------------------|
| Database type       | DB2                                |
| Provider type       | DB2 Universal JDBC Driver Provider |
| Implementation type | XA data source                     |

Create a data source

Step 1: Enter basic data source information

Step 2: Select JDBC provider

→ Step 2.1: Create new JDBC provider

Step 2.2: Enter database class path information

Step 3: Enter database specific properties for the data source

Step 4: Setup security aliases

Step 5: Summary

**Create new JDBC provider**

Set the basic configuration values of a JDBC provider, which encapsulates the specific vendor JDBC driver implementation classes that are required to access the database. The wizard fills in the name and the description fields, but you can type different values.

Scope  
cells:washostNode01Cell:nodes:washostNode01

\* Database type  
DB2

\* Provider type  
DB2 Universal JDBC Driver Provider

\* Implementation type  
XA data source

\* Name  
DB2 Universal JDBC Driver Provider (XA)

Description  
Two-phase commit DB2 JCC provider that supports JDBC 3.0. Data sources that use this provider support the use of XA to perform 2-phase commit processing. Use of driver type 2 on the application server for z/OS is not supported for data sources created under this provider.

Previous Next Cancel

- \_\_ f. Keep all remaining defaults and click **Next**. On the next page, define where in the file system the JDBC provider finds the JDBC drivers. In this case, the location is defined as the directory that follows.

/opt/ibm/db2/V10.5/java

Enter this value in both directory location fields.

Create a data source

**Step 1: Enter basic data source information**

**Step 2: Select JDBC provider**

**Step 2.1: Create new JDBC provider**

**→ Step 2.2: Enter database class path information**

**Step 3: Enter database specific properties for the data source**

**Step 4: Setup security aliases**

**Step 5: Summary**

**Enter database class path information**

Set the class path for the JDBC driver class files, which WebSphere(R) Application Server uses to define JDBC provider. This wizard page displays a default list of jars and allows you to set the environment variables that define the directory locations of the files. Use complete directory paths when you type the JDBC driver file locations. For example: C:\SQLLIB\java on Windows(R) or /home/db2inst1/sqllib/java on Linux(TM).

Entries are separated by using the ENTER key and must not contain path separator characters (such as ':'). If a value is specified for you, you may click Next to accept the value.

Class path:

```
 ${DB2UNIVERSAL_JDBC_DRIVER_PATH}/db2jcc.jar
 ${UNIVERSAL_JDBC_DRIVER_PATH}/db2jcc_license_cu.jar
 ${DB2UNIVERSAL_JDBC_DRIVER_PATH}/db2jcc_license_cisuz.jar
```

Directory location for "db2jcc.jar, db2jcc\_license\_cisuz.jar" which is saved as WebSphere variable  
 \${DB2UNIVERSAL\_JDBC\_DRIVER\_PATH}

/opt/ibm/db2/V10.5/java

Native library path

Directory location which is saved as WebSphere variable \${DB2UNIVERSAL\_JDBC\_DRIVER\_NATIVEPATH}

/opt/ibm/db2/V10.5/java

Previous | Next | Cancel



## Information

The wizard creates the paths that point to the JDBC drivers and puts values into the WebSphere environment variables that are named `DB2UNIVERSAL_JDBC_DRIVER_PATH` and `DB2UNIVERSAL_JDBC_DRIVER_NATIVEPATH`.

If these variables are set before this step, their values prefill the entry fields. Anything that is entered here overwrites the environment variables.

- \_\_ g. Click **Next**.

- h. Now you are back in the data source definition part of the wizard and ready to define the database properties. Enter the following parameters on the page:

**Table 3: Data source details**

| Field                                                           | Value                      |
|-----------------------------------------------------------------|----------------------------|
| Driver type                                                     | 4                          |
| Database name                                                   | PLANTS                     |
| Server name                                                     | dbhost                     |
| Port number                                                     | 50000                      |
| Use this data source<br>in container<br>managed<br>persistence. | This option is<br>checked. |

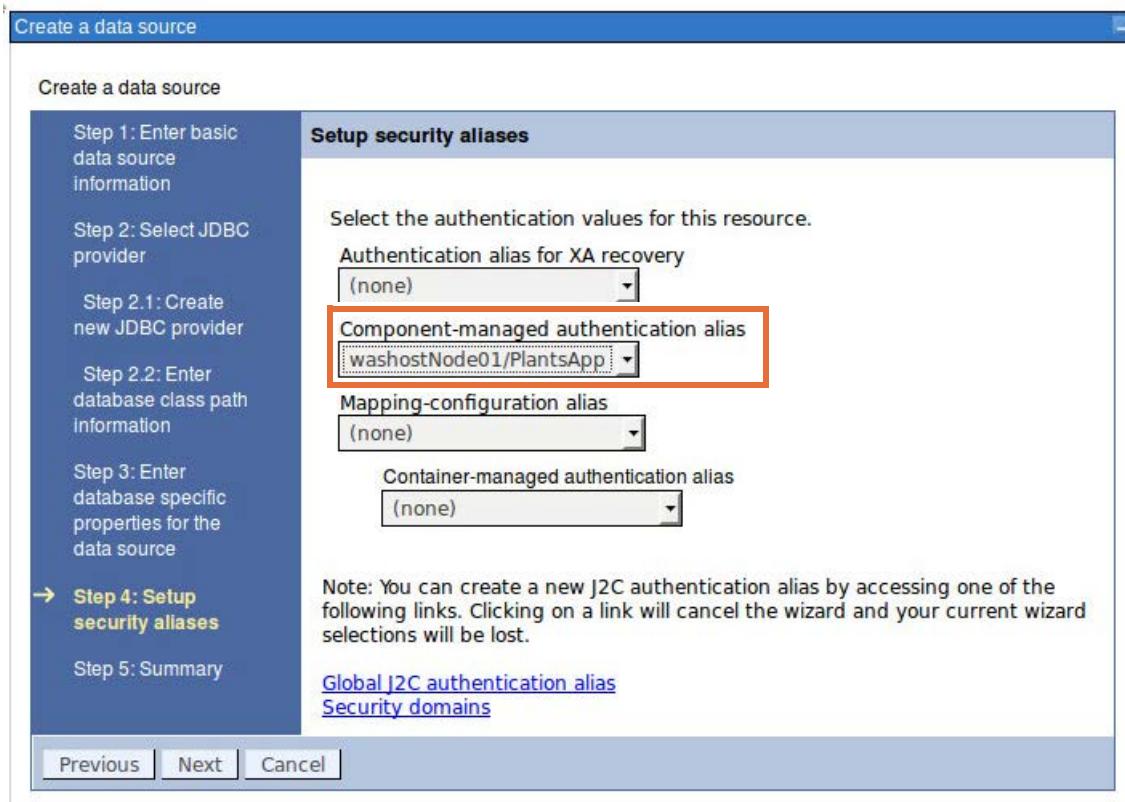
The screenshot shows the 'Create a data source' wizard in progress, specifically Step 3: Enter database specific properties for the data source. The left sidebar lists steps 1 through 5. Step 3 is highlighted with a yellow arrow pointing to it. The main panel contains a table for database-specific properties and a checked checkbox for container-managed persistence.

| Name            | Value  |
|-----------------|--------|
| * Driver type   | 4      |
| * Database name | PLANTS |
| * Server name   | dbhost |
| * Port number   | 50000  |

Use this data source in container managed persistence (CMP)

- i. Click **Next**.

- \_\_ j. On the next page, select **washostNode01/PlantsApp** for the **Component-managed authentication alias**, and click **Next**.



## Information

By specifying the PlantsApp authentication alias, when the system accesses the database, the data source uses the user name and password that were previously specified.

Separating the user name and password from the data source definition is important. This indirection allows for the password to be changed in a single place instead of on every resource that might use the same authentication.

The **Authentication alias for XA recovery** option is used to specify the authentication alias that you must use during XA recovery processing.

The **Component-managed authentication alias** involves creating a mapping from an alias name to the user name and password. This alias name is then specified administratively on the connection factory or data source. As the alias can be resolved in the application server only, the alias restricts authenticated access to applications that are running in the application server.

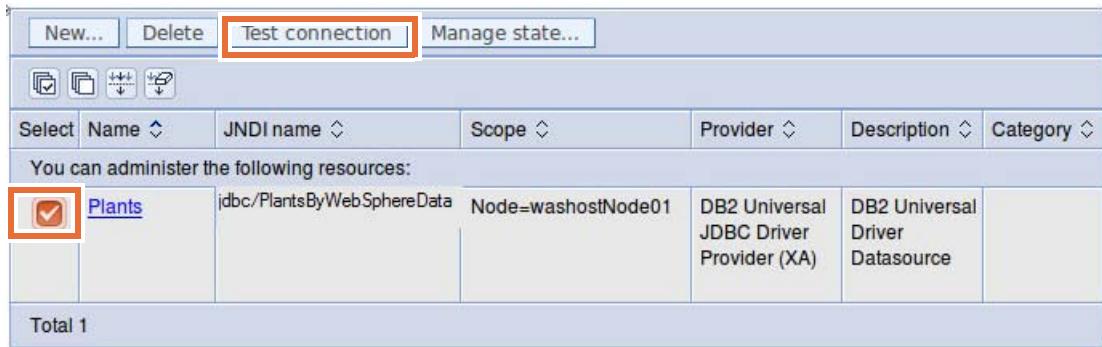
The **Container-managed authentication alias** is similar to the component-managed alias, but the connection factory or data source must be looked up by using a resource-reference that specifies a resource-auth container. As a consequence, for an application to retrieve the authenticated resource, the administrator must explicitly bind the resource-reference to the resource on deployment of the application.

- \_\_ k. On the **Summary** page, verify all the values that are entered. Click **Finish** to create the data source and JDBC provider.

Create a data source

| Create a data source                                                                                                                                                                                                                                                                                 |                                                        |                                                                                                                                                                                                                                                                  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Step 1: Enter basic data source information<br>Step 2: Select JDBC provider<br>Step 2.1: Create new JDBC provider<br>Step 2.2: Enter database class path information<br>Step 3: Enter database specific properties for the data source<br>Step 4: Setup security aliases<br><b>→ Step 5: Summary</b> | <b>Summary</b>                                         |                                                                                                                                                                                                                                                                  |
|                                                                                                                                                                                                                                                                                                      | Summary of actions:                                    |                                                                                                                                                                                                                                                                  |
|                                                                                                                                                                                                                                                                                                      | Options                                                | Values                                                                                                                                                                                                                                                           |
|                                                                                                                                                                                                                                                                                                      | Scope                                                  | cells:washostNode01Cell:nodes:washostNode01                                                                                                                                                                                                                      |
|                                                                                                                                                                                                                                                                                                      | Data source name                                       | Plants                                                                                                                                                                                                                                                           |
|                                                                                                                                                                                                                                                                                                      | JNDI name                                              | jdbc/PlantsByWebSphereDataSource                                                                                                                                                                                                                                 |
|                                                                                                                                                                                                                                                                                                      | JDBC provider name                                     | DB2 Universal JDBC Driver Provider (XA)                                                                                                                                                                                                                          |
|                                                                                                                                                                                                                                                                                                      | Description                                            | Two-phase commit DB2 JCC provider that supports JDBC 3.0 sources that use this provider support the use of XA to perform 2-phase commit processing. Use of driver type 2 on the applic server for z/OS is not supported for data sources created under provider. |
|                                                                                                                                                                                                                                                                                                      | Class path                                             | <code> \${DB2UNIVERSAL_JDBC_DRIVER_PATH}/db2jcc.jar</code><br><code> \${UNIVERSAL_JDBC_DRIVER_PATH}/db2jcc_license_cu.ja</code><br><code> \${DB2UNIVERSAL_JDBC_DRIVER_PATH}/db2jcc_license_c</code>                                                              |
|                                                                                                                                                                                                                                                                                                      | <code> \${DB2UNIVERSAL_JDBC_DRIVER_PATH}</code>        | /opt.ibm/db2/V10.5/java                                                                                                                                                                                                                                          |
| <code> \${UNIVERSAL_JDBC_DRIVER_PATH}</code>                                                                                                                                                                                                                                                         | <code> \${WAS_INSTALL_ROOT}/universalDriver/lib</code> |                                                                                                                                                                                                                                                                  |
| Native path                                                                                                                                                                                                                                                                                          | <code> \${DB2UNIVERSAL_JDBC_DRIVER_NATIVEPATH}</code>  |                                                                                                                                                                                                                                                                  |
| <code> \${DB2UNIVERSAL_JDBC_DRIVER_NATIVEPATH}</code>                                                                                                                                                                                                                                                | /opt.ibm/db2/V10.5/java                                |                                                                                                                                                                                                                                                                  |
| Implementation class name                                                                                                                                                                                                                                                                            | com.ibm.db2.jcc.DB2XADatasource                        |                                                                                                                                                                                                                                                                  |
| Driver type                                                                                                                                                                                                                                                                                          | 4                                                      |                                                                                                                                                                                                                                                                  |
| Database name                                                                                                                                                                                                                                                                                        | PLANTS                                                 |                                                                                                                                                                                                                                                                  |
| Server name                                                                                                                                                                                                                                                                                          | dbhost                                                 |                                                                                                                                                                                                                                                                  |
| Port number                                                                                                                                                                                                                                                                                          | 50000                                                  |                                                                                                                                                                                                                                                                  |
| Use this data source in container managed                                                                                                                                                                                                                                                            | true                                                   |                                                                                                                                                                                                                                                                  |

- \_\_ l. **Save** your changes.  
 \_\_ 2. Test the data source connections.  
 \_\_ a. On the data sources page, select the check box for **Plants**, and click **Test connection**.



The screenshot shows the 'Data Sources' page with the following details:

- Buttons:** New..., Delete, **Test connection** (highlighted with a red box), Manage state...
- Icons:** Filter, Sort, Refresh, Add, Edit, Delete.
- Columns:** Select, Name ▾, JNDI name ▾, Scope ▾, Provider ▾, Description ▾, Category ▾.
- Text:** You can administer the following resources:
- Data:**

|                                     |        |                                  |                    |                                         |                                 |  |
|-------------------------------------|--------|----------------------------------|--------------------|-----------------------------------------|---------------------------------|--|
| <input checked="" type="checkbox"/> | Plants | jdbc/PlantsByWebSphereDataSource | Node=washostNode01 | DB2 Universal JDBC Driver Provider (XA) | DB2 Universal Driver Datasource |  |
|-------------------------------------|--------|----------------------------------|--------------------|-----------------------------------------|---------------------------------|--|
- Total:** Total 1

- \_\_\_ b. Make sure that the connection was successful. Look for the “successful” messages at the top of the work area.

The screenshot shows a "Messages" panel with one item: "The test connection operation for data source Plants on server server1 at node washostNode01 was successful."



### Information

This test verifies that the application server is able to connect to the data source that was defined. A success means that the application server is able to connect to host `dbhost` on port 50000. It can also connect to the database PLANTS with the user name and password that are supplied in the J2C authentication alias. If any of those pieces are incorrectly defined, the test fails.

## Section 5: Install the `PlantsByWebSphere` enterprise application



### Information

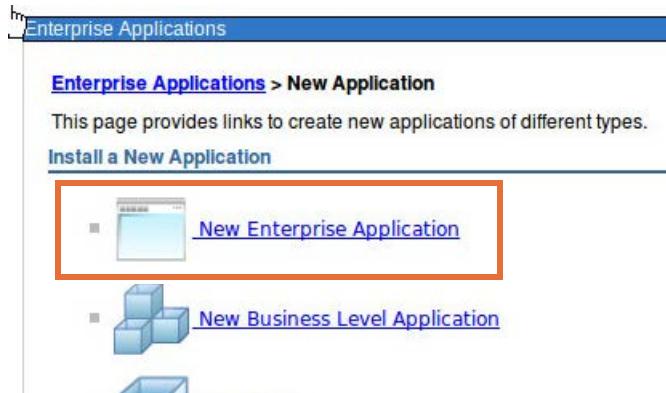
The enterprise archive file (EAR) is enhanced. The enhancement is that this EAR file contains the definition of “how to access the database.” This information is important and useful for test purposes. This EAR enhancement breaks down the “separation of concerns” barrier that is implicit within the Java EE roles. The administration role defines the resources that are required for the application. In the steps that are listed here, you ignore the enhanced part of the EAR file, and define resources from the administrative console.

- \_\_\_ 1. Install the `EnhancedPlantsByWebSphere.ear` file.  
 \_\_\_ a. From the administrative console, expand **Applications** and click **New Application**.

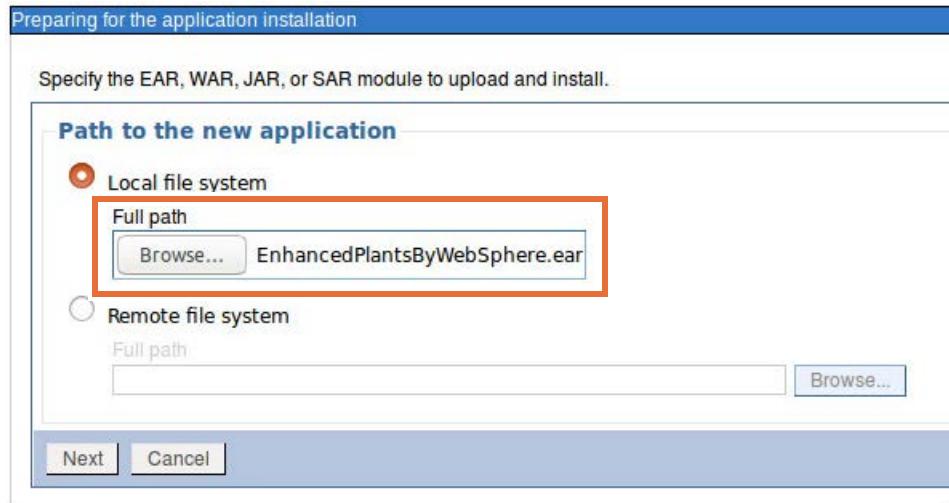
The screenshot shows the WebSphere administrative console interface. The left sidebar has the following navigation tree:

- Welcome
- + Guided Activities
- + Servers
- Applications
  - New Application
  - Application Types (highlighted)
    - WebSphere enterprise applications
    - Business-level applications
    - Assets
  - Global deployment settings

- \_\_\_ b. Click **New Enterprise Application**.



- \_\_\_ c. Select **Local file system** and click **Browse**.  
 \_\_\_ d. Go to /opt/labfiles/ears and select the **EnhancedPlantsByWebSphere.ear** file. Click **Open**. Review the local file system information and click **Next**.

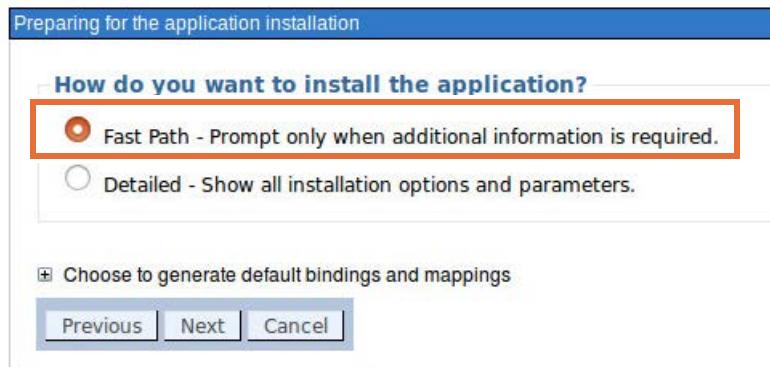


### Information

The EAR file that you are installing can be on either the client computer or the server computer. The client computer runs the browser, and the server computer is the computer to which the client is connected. If you specify an EAR file on the client computer, select **Local file system**. Then, the administrative console uploads the EAR file to the computer on which the console is running and proceeds with application installation.

If you are using a browser on a remote location, select **Remote file system** and browse through the file system where the application server is running.

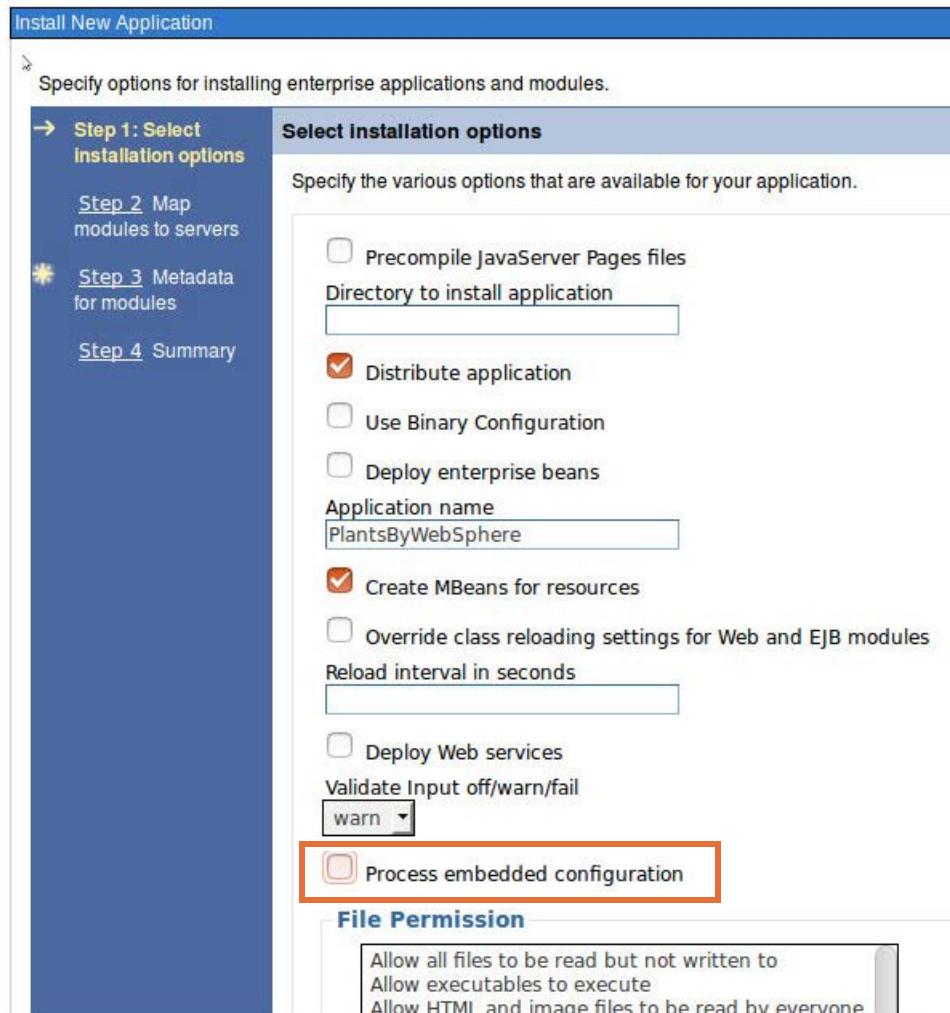
- \_\_ e. Select **Fast Path - Prompt only when additional information is required**, and click **Next**.



### Information

The **Fast Path** method limits the number of options that are shown, which simplifies the installation process. The **Detailed** method shows all the installation options, including the options with default values assigned.

- \_\_\_ f. On the next page, you can select any additional installation options. Clear the box for **Process embedded configuration**. Make sure that this option is not selected.



## Information

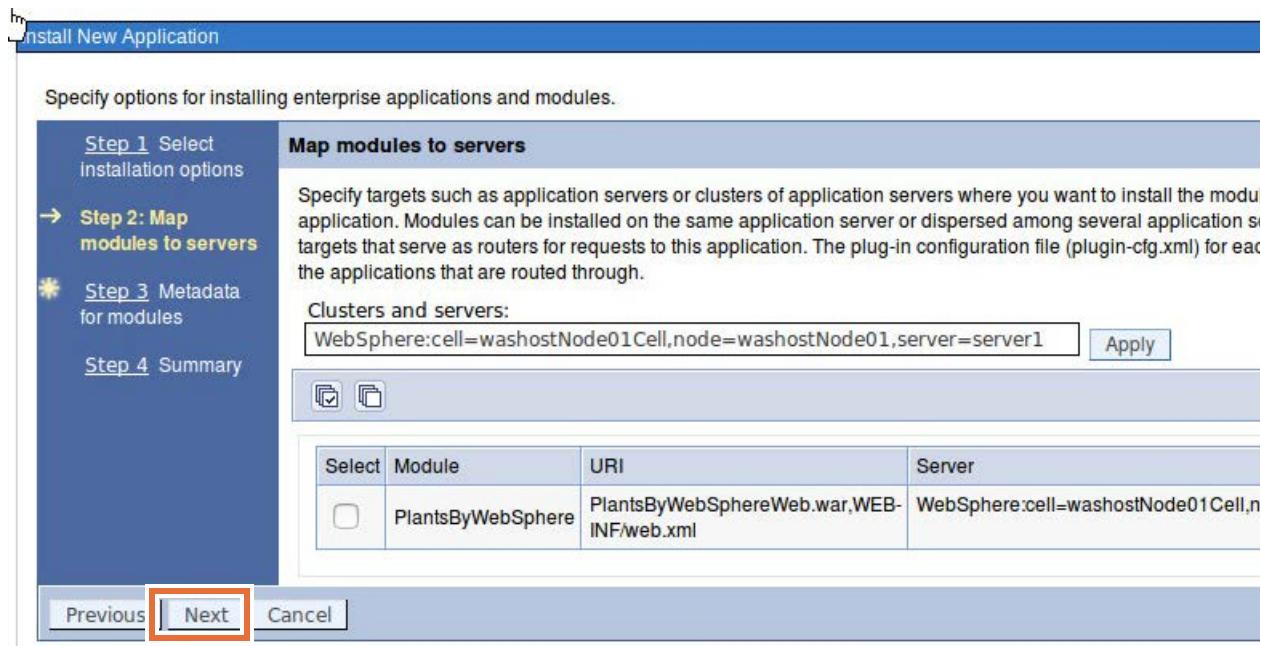
If an EAR file is enhanced, the **Process embedded configuration** check box is selected by default. To ignore the application-scoped resources, the **Process embedded configuration** option must not be selected.

If this enhanced EAR file is installed with the **Process embedded configuration** checked, then various properties are set at the application scope level. Use caution with application scoped resources because they are not as clearly visible as resources set at higher-level scopes.

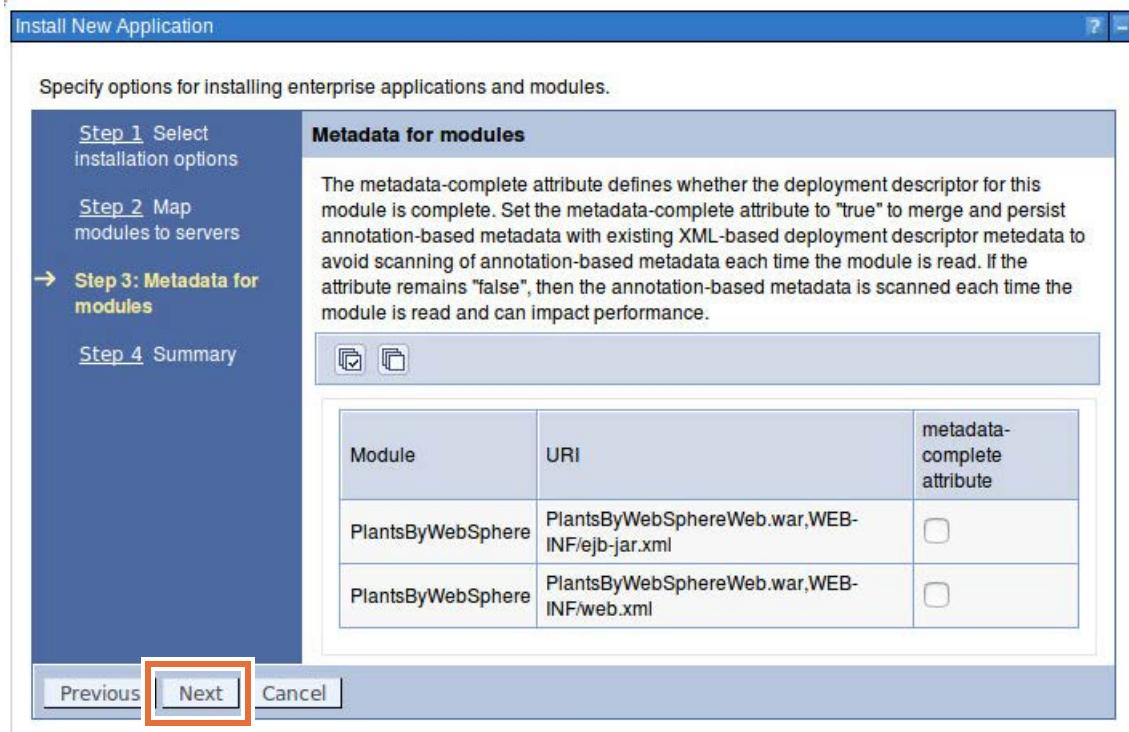
- Application scoped resources are tied to a specific application. Enhanced EAR files include application resources.
- Settings that are made at the application scope level take precedence over the same settings that are set at a higher-level scope, such as the cell or node levels.
- Application scoped resources are not available from scope selection menus.

It is problematic if an administrator is trying to troubleshoot a problem and is not aware that an application is enhanced. A setting at the application scope can cause a problem with the application. The administrator might review all the settings at the various scopes and never look at the application scope settings.

- \_\_\_ g. Click **Next**.
- \_\_\_ h. No changes are needed for Step 2. Click **Next**.



- \_\_ i. No changes are needed for Step 3. Click **Next**.



\_\_ j. Review **Step 4: Summary**.

| Summary                                                   |                                         |
|-----------------------------------------------------------|-----------------------------------------|
| Summary of installation options                           |                                         |
| Options                                                   | Values                                  |
| Precompile JavaServer Pages files                         | No                                      |
| Directory to install application                          |                                         |
| Distribute application                                    | Yes                                     |
| Use Binary Configuration                                  | No                                      |
| Deploy enterprise beans                                   | No                                      |
| Application name                                          | PlantsByWebSphere                       |
| Create MBeans for resources                               | Yes                                     |
| Override class reloading settings for Web and EJB modules | No                                      |
| Reload interval in seconds                                |                                         |
| Deploy Web services                                       | No                                      |
| Validate Input off/warn/fail                              | warn                                    |
| Process embedded configuration                            | No                                      |
| File Permission                                           | .*\dll=755#.*\so=755#.*\a=755#.*\sl=755 |
| Application Build ID                                      | Unknown                                 |
| Allow dispatching includes to remote resources            | No                                      |
| Allow servicing includes from remote resources            | No                                      |
| Business level application name                           |                                         |
| Asynchronous Request Dispatch Type                        | Disabled                                |
| Allow EJB reference targets to resolve automatically      | No                                      |

\_\_ k. Review the options and click **Finish** to complete the installation.

- \_\_\_ I. Look for the message that the application installed successfully.

ADMA5005I: The application PlantsByWebSphere is configured in the WebSphere Application Server repository.  
 SECJ0400I: Successfully updated the application PlantsByWebSphere with the appContextIDForSecurity information.  
 ADMA5005I: The application PlantsByWebSphere is configured in the WebSphere Application Server repository.  
 ADMA5005I: The application PlantsByWebSphere is configured in the WebSphere Application Server repository.  
 ADMA5113I: Activation plan created successfully.  
 ADMA5011I: The cleanup of the temp directory for application PlantsByWebSphere is complete.  
 ADMA5013I: Application PlantsByWebSphere installed successfully.

Application PlantsByWebSphere installed successfully.

To start the application, first save changes to the master configuration.  
 Changes have been made to your local configuration. You can:  
 ■ [Save](#) directly to the master configuration.  
 ■ [Review](#) changes before saving or discarding.

To work with installed applications, click the "Manage Applications" link.  
[Manage Applications](#)

- \_\_\_ m. Save the changes.
- \_\_\_ 2. Start the PlantsByWebSphere application.
- \_\_\_ a. Expand **Applications > Application Types > WebSphere enterprise applications**.
- \_\_\_ b. Verify that the **PlantsByWebSphere** application is listed.
- \_\_\_ c. Select the check box next to **PlantsByWebSphere** and click **Start**.

| Select                              | Name                               | Application Status |
|-------------------------------------|------------------------------------|--------------------|
| <input type="checkbox"/>            | <a href="#">DefaultApplication</a> |                    |
| <input checked="" type="checkbox"/> | <a href="#">PlantsByWebSphere</a>  |                    |
| <input type="checkbox"/>            | <a href="#">lvtApp</a>             |                    |
| <input type="checkbox"/>            | <a href="#">query</a>              |                    |

Total 4

- \_\_\_ d. Wait for the application to start successfully.

**Note**

If the application is not running, look at the `SystemOut.log` file in the `/opt/IBM/WebSphere/AppServer/profiles/profile1/logs/server1` directory for more information.

- 
- \_\_\_ 3. Log out of the administrative console and minimize the web browser after the application starts successfully.

## Section 6: Test the enterprise application

Test the application by accessing it with the WebSphere Application Server HTTP transport.

- \_\_\_ 1. Open the PlantsByWebSphere application and log on.
- \_\_\_ a. Open a new web browser, and access PlantsByWebSphere by entering the following address.

`http://washost:9080/PlantsByWebSphere`

The screenshot shows a web browser displaying the PlantsByWebSphere application. The URL in the address bar is `washost:9080/PlantsByWebSphere/promo.jsf`. The page has a green header with the title "PLANTS BY WEBSPHERE". Below the header is a navigation menu with four items: "Flowers", "Fruits & Vegetables", "Trees", and "Accessories". The main content area features a large, stylized text "Gardens of Summer" with a subtitle "They all start with the right flowers...". To the right of the text is a photograph of a potted plant. Below the text, there is a message "and we've got them all". At the bottom of the page, there are two sections: "Tips" and "Specials". The "Tips" section contains a tip about preserving grass seed. The "Specials" section lists a "Bonsai Tree" for \$30.00 each and a "Red Delicious Strawb" for \$3.50 (50 seeds). The footer includes an "IBM WebSphere e-business software" logo and a link to "Powered by IBM WebSphere". The footer also contains links to various site pages: Flowers, Fruits & Vegetables, Trees, Accessories, Home, Shopping Cart, My Account, Login, and Help.

- \_\_\_ b. Click **LOGIN** on the upper right menu bar. The PlantsByWebSphere login page is shown.

- \_\_\_ c. Click the link **register for your own account here.**

The screenshot shows a web page titled "PLANTS BY WEBSPHERE". At the top, there is a navigation bar with four categories: "Flowers", "Fruits & Vegetables", "Trees", and "Accessories". Below the navigation bar, the word "Home" is visible. The main content area is titled "Login or Register". It contains fields for "E-mail address" and "Password", both represented by empty input boxes. Below these fields is a "Sign in" button. A note states, "If you are a New customer you can [register for your own account here.](#)". The "register for your own account here." link is highlighted with a red rectangular border.

- \_\_ d. Create your own user information and click **Register**.

Home > Sign in

## Registration

Enter the information below to set up your account. This information will not be shared without your permission. With your permission we will only share your name and email address with our trusted business partners.

Required fields are denoted with a red asterisk (\*).

### Login Information

E-mail address \*

Password \*

Verify Password \*

### Contact Information

First Name \*

Last Name \*

Address Line 1 \*

Address Line 2

City \*

State \*

ZIP Code \*

Phone (daytime)\*

8

- \_\_ e. Click **Help** on the top or bottom menu bar. The PlantsByWebSphere help page is seen.

**PLANTS BY WEBSPHERE**

Flowers    Fruits & Vegetables    Trees    Accessories

Home >

## Help

Plants By WebSphere provides limited help support. See the sample docs directory for documentation on the design, building, and installation of the sample.

Debug mode has been tied to the JSF project stage declaration. Debug messages will be displayed when the web app's javax.faces.PROJECT\_STAGE context param is set to either Development or UnitTest. A value of SystemTest or Production will turn off debug output. The current state of debugging is indicated in the check box below.

Debug messages enabled

If the database becomes corrupted for some reason, the button below can be used to delete all data currently in the database and populate it with a fresh set of data. If this does not work, stop the server and repeat the prerequisite steps found in the docs directory to unzip the Derby database.

[Reset database](#)

[View Server Info](#)

[Admin Home](#)

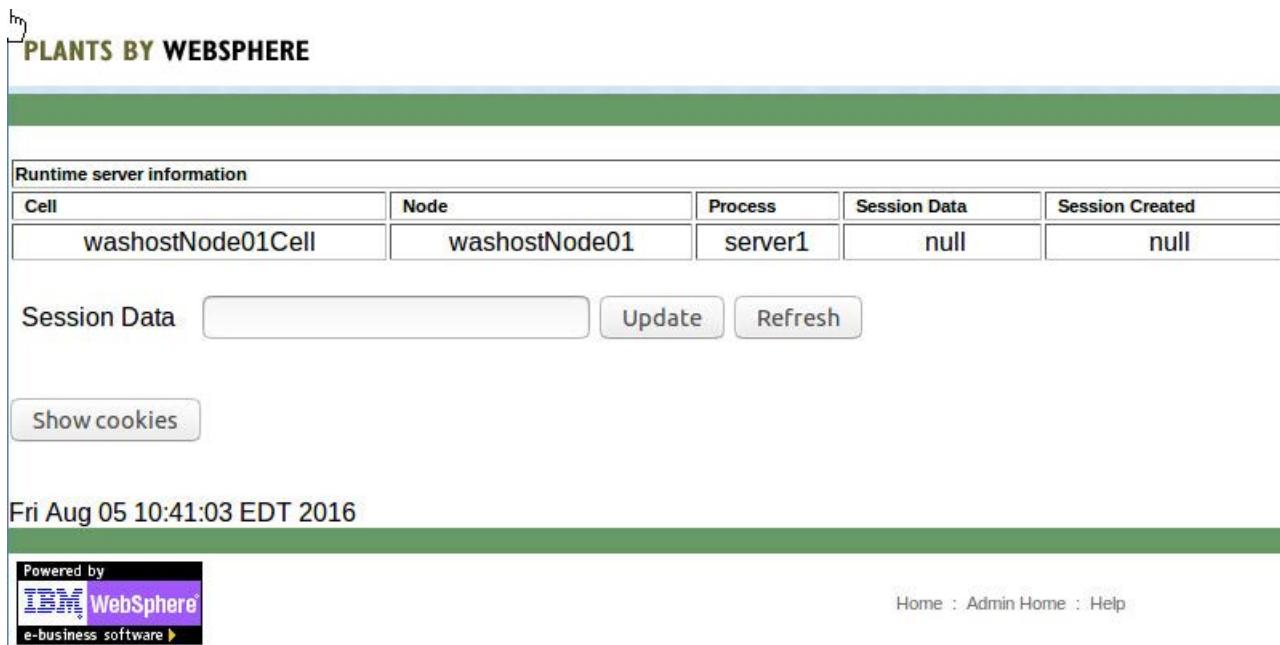
---

Powered by  
IBM WebSphere

Workspace Switcher

Flowers : Fruits & Vegetables : Trees : Accessories : Home : Shopping Cart : My Account : Login : Help

- \_\_\_ f. Click the link **View Server Info** to see information about the environment of the PlantsByWebSphere application. This information is useful in a clustered mode.



The screenshot shows a web page titled "PLANTS BY WEBSPHERE". At the top, there is a green header bar. Below it, a table titled "Runtime server information" displays the following data:

| Cell              | Node          | Process | Session Data | Session Created |
|-------------------|---------------|---------|--------------|-----------------|
| washostNode01Cell | washostNode01 | server1 | null         | null            |

Below the table, there is a "Session Data" input field with "Update" and "Refresh" buttons. A "Show cookies" button is also present. The date and time "Fri Aug 05 10:41:03 EDT 2016" are displayed. At the bottom, there is a "Powered by IBM WebSphere e-business software" logo and links to "Home", "Admin Home", and "Help".



### Note

Be sure that you understand the information that is shown on the **Server Info** page and that you understand how to update the session data. This information is useful in a clustered testing environment with multiple servers.

The **Server Info** page is not part of the PlantsByWebSphere application that comes with the WebSphere Application Server product. The **Server Info** page is created specifically for use in this course material.

- g. Enter Testing into the Session Data field and click **Update**. The columns for **Session Data** and **Session Created** are updated.

PLANTS BY WEBSHHERE

| Runtime server information |                                       |                                        |              |
|----------------------------|---------------------------------------|----------------------------------------|--------------|
| Cell                       | Node                                  | Process                                | Session Data |
| washostNode01Cell          | washostNode01                         | server1                                | Testing      |
| Session Data               |                                       |                                        |              |
| Testing                    | <input type="button" value="Update"/> | <input type="button" value="Refresh"/> |              |

Show cookies

Thu Sep 08 09:40:11 EDT 2016

Powered by  
 Home : Admin Home : Help

Clicking **Refresh** (or refreshing the page with the browser) reloads the page, and the date and time information in the lower left is updated. These steps demonstrate that the page is reloaded, but the session data remains the same.

- \_\_\_ h. Click **Home** and explore other parts of the PlantsByWebSphere application. For example, click **Flowers** and explore the flowers that are listed.



### Information

If the PlantsByWebSphere application works correctly, you are able to retrieve the flower inventory. This success means that the PlantsByWebSphere EAR was installed correctly. The browser was able to communicate with the correct port (9080) on the application server. The application server was able to find and use the correct data source and JDBC driver to communicate with the DB2 database. The application server was able to communicate with DB2 on the correct host (dbhost), with the correct user name and password as defined in the J2C authentication alias (PlantsApp).

If any of these items are configured incorrectly, the application does not work.

- \_\_\_ 2. It is not necessary to log out of the application, but close the web browser window.

## **Section 7: Use a monitored directory to deploy an enterprise application**

Next, the monitored directory feature is used to deploy an EAR file. This feature allows the deployment of an application by dragging or copying an EAR file into a monitored directory. The application is automatically installed and started.

The monitored directory feature is not enabled by default. The first step is to use the administrative console to enable the feature. This step creates the directory structure that is used by the monitored directory feature.

- \_\_\_ 1. Verify that the monitored directory does not yet exist.
  - \_\_\_ a. Open a command window.
  - \_\_\_ b. Go to the `/opt/IBM/WebSphere/AppServer/profiles/profile1` directory and use the following command to get a directory listing:  
`ls`

```
localuser@washost:/opt/IBM/WebSphere/AppServer/profiles/profile1$ ls
bin          etc        installedApps    properties  workspace
config       expandedBundles  installedConnectors servers   wstemp
configuration  firststeps  installedFilters  temp
consolepreferences  installableApps logs      tranlog
localuser@washost:/opt/IBM/WebSphere/AppServer/profiles/profile1$
```

- \_\_\_ c. Notice that a directory that is named `monitoredDeployableApps` does not exist.
- \_\_\_ 2. Use the administrative console to enable the monitored directory.
  - \_\_\_ a. Maximize the administrative console browser window.
  - \_\_\_ b. Log in with `wasadmin` as the user name and `websphere` as the password.
  - \_\_\_ c. Click **Applications > Global deployment settings**.
  - \_\_\_ d. Select the box for **Monitor directory to automatically deploy applications** and accept the defaults for the other fields.

**Global deployment settings**

Use this page to manage settings that apply to all applications. NOTE: some settings may only apply to a subset of application types.

**Configuration**

**General Properties**

**Monitored Directory Deployment**

Monitor directory to automatically deploy applications

Monitored directory  
\${USER\_INSTALL\_ROOT}/monitoredDeployableApps

Polling interval  
5 seconds

Apply Reset

- \_\_\_ e. Click **Apply**.
- \_\_\_ f. **Save** the changes.

\_\_\_ 3. Examine the log file.

- \_\_\_ a. Use the command window and go to the log directory for profile1.

```
/opt/IBM/WebSphere/AppServer/profiles/profile1/logs/server1
```

- \_\_\_ b. Use a text editor (such as gedit) to open the `SystemOut.log` file and search for the string `cwldd`

```
localuser@washost: /opt/IBM/WebSphere/AppServer/profiles/profile1/logs/server1
[8/5/16 9:06:14:233 EDT] 00000001 CSIClientRI A JSAS0007I: Client request interceptor registered.
[8/5/16 9:06:14:241 EDT] 00000001 SecurityCompo A JSAS0009I: IOR interceptor registered.
[8/5/16 9:06:15:332 EDT] 00000001 Version I HMGR0226I: The core stack configuration parameter IBM_CS_HAM_PROTOCOL_VERSION has been set to 6.0.2.9.
[8/5/16 9:06:15:365 EDT] 00000001 CoordinatorIm I HMGR0206I: The Coordinator is an Active Coordinator for core group DefaultCoreGroup. The active coordinator set is [washostNode01Cell\washostNode01\server1].
[8/5/16 9:06:15:412 EDT] 00000001 DCSPluginSing I HMGR0005I: The Single Server DCS Core Stack transport has been started for core group DefaultCoreGroup.
[8/5/16 9:06:15:445 EDT] 00000001 CoordinatorCo I HMGR0011I: The High Availabi
[8/5/16 9:06:15:474 EDT] 00000001 DragDropDeplo I CWLDD0103I: Monitored directory application deployment service has been configured to be off.
[8/5/16 9:06:15:479 EDT] 00000001 NameServerImp A NMSSV0018I: Name server avail
able on bootstrap port 2809.
[8/5/16 9:06:17:812 EDT] 00000001 UserRegistryI A SECJ0136I: Custom Registry:com.ibm.ws.wim.registry.WIMUserRegistry has been initialized
[8/5/16 9:06:17:979 EDT] 00000001 JMSRegistrati A WMSG1611I: The installed level of the WebSphere MQ messaging provider is 9.0.0.0.
[8/5/16 9:06:18:002 EDT] 00000001 JMSRegistrati I WMSG1703I: RAR implementation version 9.0.0.0-p900-L160509.1
[8/5/16 9:06:18:167 EDT] 00000001 ObjectPoolSer I OBPL0010I: The Object Pool service started successfully.
[8/5/16 9:06:20:983 EDT] 00000001 JMXSoapAdapte A ADMC0013I: The SOAP connector is available at port 8880
[8/5/16 9:06:21:038 EDT] 00000001 TCPChannel I TCPC0001I: TCP Channel TCPInboundChannel_ipcc.Default_IPC_Connector_Name is listening on host localhost (IP v4: 127.0.0.1) port 9633.
```

\_\_\_ 4. Restart server1.

- \_\_\_ a. Using a command window, go to the

```
/opt/IBM/WebSphere/AppServer/profiles/profile1/bin
```

directory and enter the following commands.

```
./stopServer.sh server1 -username wasadmin -password weblsphere
./startServer.sh server1
```

- \_\_\_ b. Again, examine the server1 SystemOut.log file. Search for the string cwldd. Notice that entries indicate that the service is started. Also, notice that the description string immediately preceding the CWLDD is DragDropDeplo.

```
[8/5/16 11:14:48:160 EDT] 00000001 SecurityCompo A JSAS0009I: IOR interceptor registered.
[8/5/16 11:14:48:860 EDT] 00000001 Version I HMGR0226I: The core stack configuration parameter IBM_CS_HAM_PROTOCOL_VERSION has been set to 6.0.2.9.
[8/5/16 11:14:48:869 EDT] 00000001 CoordinatorIm I HMGR0206I: The Coordinator is an Active Coordinator for core group DefaultCoreGroup. The active coordinator set is [washostNode01Cell\washostNode01\server1].
[8/5/16 11:14:48:880 EDT] 00000001 DCSPluginSing I HMGR0005I: The Single Server DCS Core Stack transport has been started for core group DefaultCoreGroup.
[8/5/16 11:14:48:906 EDT] 00000001 CoordinatorCo I HMGR0011I: The High Availability Manager is configured to be the bulletin board provider.
[8/5/16 11:14:48:920 EDT] 00000001 DragDropDeplo I CWLDD0001I: Starting monitored directory application deployment service...
[8/5/16 11:14:48:949 EDT] 00000001 DragDropDeplo I CWLDD0002I: Monitored directory application deployment service is started and monitoring file changes in directory: /opt/IBM/WebSphere/AppServer/profiles/profile1/monitoredDeployableApps.

[8/5/16 11:14:49:215 EDT] 00000001 NameServerImp A NMSV0018I: Name server available on bootstrap port 2809.
[8/5/16 11:14:51:148 EDT] 00000001 UserRegistryI A SECJ0136I: Custom Registry: com.ibm.ws.wim.registry.WIMUserRegistry has been initialized
[8/5/16 11:14:51:271 EDT] 00000001 JMSRegistrati A WMSG1611I: The installed level of the WebSphere MQ messaging provider is 9.0.0.0.
[8/5/16 11:14:51:279 EDT] 00000001 JMSRegistrati I WMSG1703I: RAR implementation version 9.0.0.0-p900-L160509.1
[8/5/16 11:14:51:315 EDT] 00000001 ObjectPoolSer I OBPL0010I: The Object Pool service started successfully.
[8/5/16 11:14:54:183 EDT] 00000001 JMXSoapAdapte A ADMC0013I: The SOAP connector is available at port 8880
```

- \_\_\_ c. Close the SystemOut.log file when completed.
- \_\_\_ 5. Verify that the monitoredDeployableApps directory is created.
- \_\_\_ a. Using the command line, go to the /opt/IBM/WebSphere/AppServer/profiles/profile1 directory. Use the following command to get another directory listing.

```
ls
```

```
localuser@washost:/opt/IBM/WebSphere/AppServer/profiles/profile1$ ls
bin           expandedBundles      installedFilters      temp
config        firststeps          logs                  tranlog
configuration  installableApps    monitoredDeployableApps workspace
consolepreferences  installedApps   properties
etc           installedConnectors servers
localuser@washost:/opt/IBM/WebSphere/AppServer/profiles/profile1$
```

- b. Notice that the `monitoredDeployableApps` directory is now there.  
Go to the `monitoredDeployableApps` directory and use the following command to get a directory listing:

```
ls
```

```
localuser@washost:/opt/IBM/WebSphere/AppServer/profiles/profile1/monitoredDeployableApps$ ls
deploymentProperties  servers
```

- c. Notice that by default, directories for `servers` and `deploymentProperties` exist. Only the `servers` directory is used.



### Information

In a federated environment, the directory contents are slightly different since clusters are also supported. You also manually create each server directory by using the exact name of the server.

- d. Change to the `servers` directory and use the following command to get a directory listing:

```
ls
```

Notice that a subdirectory exists and is called `server1`.

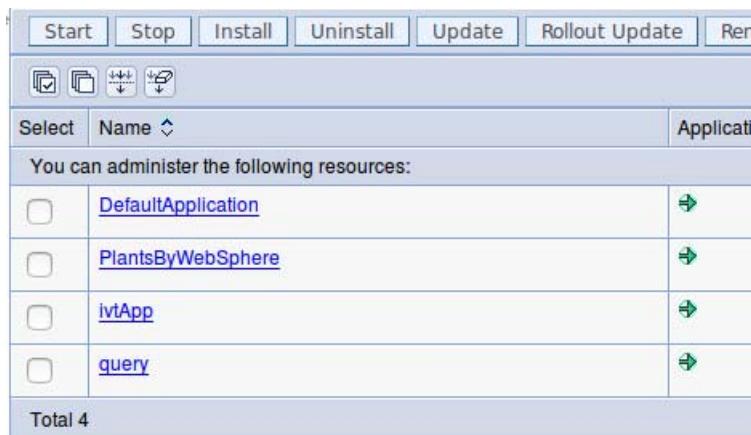
```
localuser@washost:/opt/IBM/WebSphere/AppServer/profiles/profile1/monitoredDeployableApps/servers$ ls
server1
```



### Information

The `server1` directory is used to deploy applications to `server1`. If multiple `server1` instances are within the cell, it is possible to create a directory structure of the format `nodes/<node-name>/server1`. This directory is used to specify to which `server1` an application is deployed.

- \_\_\_ 6. Use the drag-and-drop feature to install the Cache Monitor application.
- \_\_\_ a. Using the administrative console, click **Applications > Application Types > WebSphere enterprise applications**. Notice which applications are currently deployed.



- \_\_\_ b. Open two File Browser windows and copy the CacheMonitor.ear file into the monitoredDeployableApps directory. The source and destination directories follow.
- Source: /opt/IBM/WebSphere/AppServer/installableApps/CacheMonitor.ear
  - Destination: /opt/IBM/WebSphere/AppServer/profiles/profile1/monitoredDeployableApps/servers/server1/

- \_\_\_ c. Open the SystemOut.log file for server1. Search for the string cwldd  
Notice the new entries in the log file.

### Note

The messages that are shown in the screen capture are only some of the entries.

- \_\_\_ d. Close the SystemOut.log file when completed.

- \_\_\_ 7. Use the administrative console to explore the Cache Monitor application settings.
- \_\_\_ a. Using the administrative console, return to the list of deployed applications and examine the updated list of enterprise applications. If the application is not listed, refresh the administrative console.

The screenshot shows the 'Enterprise Applications' page. At the top, there's a toolbar with buttons for Start, Stop, Install, Uninstall, Update, Rollout Update, Remove File, and Export. Below the toolbar is a section for managing resources. A table lists five applications: DefaultApplication, Dynamic Cache Monitor, PlantsByWebSphere, ivtApp, and query. The 'Dynamic Cache Monitor' row is highlighted with a red box. Each row has a checkbox, the application name, and a green edit icon. At the bottom of the table, it says 'Total 5'.

- \_\_\_ b. Click **Dynamic Cache Monitor**. Feel free to examine the settings for the application.



#### Note

The application is now installed and in the started state. It can be configured, modified, and everything else that can be done with any other application. The only real difference is that if the EAR file is removed from the `monitoredDeployableApps` directory, the application would be uninstalled.

- 
- \_\_\_ 8. Uninstall the Cache Monitor application.
  - \_\_\_ a. Using a command window, go to the  
`/opt/IBM/WebSphere/AppServer/profiles/profile1/monitoredDeployableApps/servers/server1` directory.
  - \_\_\_ b. Delete the `CacheMonitor.ear` file with the following command:  
`rm CacheMonitor.ear`

- \_\_\_ c. Open the SystemOut.log file for **profile1**. Search for the string `cwldd`  
Notice the new log entries.

```

localuser@washost: /opt/IBM/WebSphere/AppServer/profiles/profile1/logs/server1
[8/5/16 12:53:54:576 EDT] 0000003d FileRepository A ADMR0017I: User defaultWIMF
ileBasedRealm/server:washostNode01Cell_washostNode01_server1 deleted document ce
lls/washostNode01Cell/applications/Dynamic Cache Monitor.ear/deployments/Dynamic
 Cache Monitor/META-INF/application.xml.
[8/5/16 12:53:54:585 EDT] 0000003d FileRepository A ADMR0017I: User defaultWIMF
ileBasedRealm/server:washostNode01Cell_washostNode01_server1 deleted document ce
lls/washostNode01Cell/applications/Dynamic Cache Monitor.ear/deployments/Dynamic
 Cache Monitor/CacheMonitor.war/WEB-INF/web.xml.
[8/5/16 12:53:54:586 EDT] 0000003d FileRepository A ADMR0017I: User defaultWIMF
ileBasedRealm/server:washostNode01Cell_washostNode01_server1 deleted document ce
lls/washostNode01Cell/cus/Dynamic Cache Monitor/cver/BASE/controlOpDefs.xml.
[8/5/16 12:53:54:590 EDT] 0000003d FileRepository A ADMR0017I: User defaultWIMF
ileBasedRealm/server:washostNode01Cell_washostNode01_server1 deleted document ce
lls/washostNode01Cell/applications/Dynamic Cache Monitor.ear/deployments/Dynamic
 Cache Monitor/META-INF/MANIFEST.MF.
[8/5/16 12:53:54:595 EDT] 0000003d FileRepository A ADMR0017I: User defaultWIMF
ileBasedRealm/server:washostNode01Cell_washostNode01_server1 deleted document ce
lls/washostNode01Cell/applications/Dynamic Cache Monitor.ear/deployments/Dynamic
 Cache Monitor/CacheMonitor.war/WEB-INF/ibm-web-ext.xmi.
[8/5/16 12:53:54:603 EDT] 0000003d FileRepository A ADMR0017I: User defaultWIMF
ileBasedRealm/server:washostNode01Cell_washostNode01_server1 deleted document ce
lls/washostNode01Cell/blas/Dynamic Cache Monitor/bver/BASE/bla.xml.
[8/5/16 12:53:54:608 EDT] 0000003d FileRepository A ADMR0017I: User defaultWIMF
ileBasedRealm/server:washostNode01Cell_washostNode01_server1 deleted document ce
lls/washostNode01Cell/cus/Dynamic Cache Monitor/cver/BASE/cu.xml
[8/5/16 12:53:54:685 EDT] 0000003d AppManagement I CWLDD0018I: Event id 637950
135-2. Application Dynamic Cache Monitor is uninstalled successfully.
[8/5/16 12:53:54:698 EDT] 0000003d WatchService I CWLDD0008I: Event id 637950
135-2. End of processing.

```

- \_\_\_ d. **Close** the SystemOut.log file when completed.  
 \_\_\_ e. Return to the administrative console and verify that the application no longer is listed in the application list.

|                          | Name                               | Application Status |
|--------------------------|------------------------------------|--------------------|
| <input type="checkbox"/> | <a href="#">DefaultApplication</a> |                    |
| <input type="checkbox"/> | <a href="#">PlantsByWebSphere</a>  |                    |
| <input type="checkbox"/> | <a href="#">iytApp</a>             |                    |
| <input type="checkbox"/> | <a href="#">query</a>              |                    |

Total 4



### Information

The drag-and-drop feature works well, but only in some cases. If anything but the default settings for an application deployment are needed, this approach does not work. Using properties file-based configurations to install helps address these additional requirements. This approach allows altering the configurations during the drag-and-drop deployments.

It is important to note that in the context of properties file-based configurations, the drag-and-drop feature is limited to application deployments. Any additional properties that are defined in the configuration files, aside from application deployments, are ignored.

---

## End of exercise

## Exercise review and wrap-up

During the first part of the exercise, you installed the PlantsByWebSphere application from the administrative console. After installation of the PlantsByWebSphere application, it was tested. Finally, the exercise explored the process of using the monitored directory function to deploy an application.

# Exercise 5. Problem determination

## Estimated time

01:45

## Overview

In this exercise, you configure and view log and trace files by using both the Basic mode of logging and tracing and the High Performance Extensible Logging (HPEL) mode. In addition to log and trace data, you learn how to gather Java virtual machine (JVM)-related dump files.

## Objectives

After completing this exercise, you should be able to:

- Use the administrative console to configure and view log data
- Enable a server to use HPEL
- Enable tracing on application server components
- Use the HPEL Log Viewer to examine log and trace data
- Enable verbose garbage collection for an application server
- Enable memory leak detection for an application server
- Describe features of IBM Support Assistant tools

## Introduction

The first step in problem determination is to collect diagnostic data. This exercise focuses on how to gather runtime and application data with the tools that WebSphere provides such as logging, tracing, and JVM memory dumps. Analyzing the diagnostic data can best be done by using specific tools. Many such tools are available from the IBM Support Assistant. Though the IBM Support Assistant tools are not used in the exercise, see the brief overview in the last section of some important tools for analyzing JVM memory dump data. This exercise also uses an example application that is called BadApp, which can demonstrate common problems that an administrator troubleshoots.

## Requirements

To complete this exercise, you must have:

- A working WebSphere Application Server named **server1**
- administrative console
- A running PlantsByWebSphere application that is installed on **profile1**

## Information

This exercise consists of the following sections:

- **Section 1:** Resetting the WebSphere environment
- **Section 2:** Working with log files of the application server
- **Section 3:** Setting up and configuring HPEL
- **Section 4:** Using the Log Viewer in the administrative console to examine log data and trace data
- **Section 5:** Enabling tracing for an application server and viewing trace data from the Log Viewer
- **Section 6:** Enabling cross-component trace (XCT)
- **Section 7:** Collecting JVM data
- **Section 8:** Cleaning up server1
- **Section 9: Read only:** Using IBM Support Assistant tools to analyze JVM data

This exercise has no impact on the remaining exercises.

# Exercise instructions

## Preface

This exercise focuses on how to gather diagnostic data for problem determination with tools that are part of the WebSphere Application Server V9 product. The last part of the exercise provides an overview of specific tools that can be used to help analyze the diagnostic data. All of the tools that are presented here are available in the IBM Support Assistant workbench.

## **Section 1: Resetting the WebSphere environment**

---



### Note

To reset your WebSphere environment, read **Appendix A** for instructions on how to complete this procedure.

## **Section 2: Working with log files of the application server**

---

Next, you examine the configuration options for logging in Basic mode.

- \_\_\_ 1. Verify that server1 is running.
  - \_\_\_ a. Using a command window, go to: `<profile_root>/profile1/bin`
  - \_\_\_ b. At the prompt, enter the following command:  
`./serverStatus.sh server1 -username wasadmin -password web1sphere`
  - \_\_\_ c. If the server is not running, enter the following command:  
`./startServer.sh server1`



### Information

If the server is already started, you are challenged to provide a user ID and password when running `serverStatus` commands. Enter `wasadmin` for the user ID and `web1sphere` for the password.

- \_\_\_ 2. You can change the location, name, and other settings of log files from the administrative console.
  - \_\_\_ a. Use a web browser to start the administrative console.
  - \_\_\_ b. If you get a security alert, click **YES** to proceed.
  - \_\_\_ c. Log in. Enter `wasadmin` for the user ID and `web1sphere` for the password.
  - \_\_\_ d. In the navigation tree, select **Troubleshooting > Logs and trace**.
  - \_\_\_ e. In the pane on the right, click **server1**.



## Information

You can also reach the configuration area for Logging and Tracing by selecting **Servers > Server Types > WebSphere application servers > server1**. Click **Logging and Tracing** under the Troubleshooting section.

- 3. Change the number of historical files and set the maximum size of the log file for System.out. The number of historical files grows from zero to the value of the **Maximum Number of Historical Log Files** field. The next rollover deletes the oldest historical file.
  - a. Select **JVM Logs**.

**Logging and tracing**

**Logging and tracing > server1**

It is recommended that you switch to High Performance Extensible Logging (HPEL) if you have no existing procedures that prevent you from taking advantage of it.

**Switch to HPEL Mode** (Advised for most installations)

Use this page to select a system log to configure, or to specify a log detail level for components and groups of components. Use log levels to control which events are processed by Java logging.

**General Properties**

- [Diagnostic Trace](#)
- **IVM Logs**
- [Process Logs](#)
- [IBM Service Logs](#)
- [Change log detail levels](#)
- [NCSA access and HTTP error logging](#)

- \_\_\_ b. You can view and modify settings from the Logging and tracing pane for `System.out` and `System.err` logs.

**Logging and tracing > server1 > JVM Logs**

Use this page to view and modify the settings for the Java virtual machine (JVM) System.out and System.err logs for a managed process. The JV are created by redirecting the System.out and System.err streams of the JVM to independent log files. The System.out log is used to monitor the the running application server. The System.err log contains exception stack trace information that is used to perform problem analysis. One set o logs exists for each application server and all of its applications. JVM logs are also created for the deployment manager and each node manage Changes on the Configuration panel apply when the server is restarted. Changes on the Runtime panel apply immediately.

**General Properties**

**System.out**

\* File Name: \${SERVER\_LOG\_ROOT}/SystemOut.log

File Formatting: Basic (Compatible)

**Log File Rotation**

File Size  
Maximum Size: 1 MB

Time  
Start Time: 24  
Repeat Time: 24 hours

Maximum Number of Historical Log Files. Number in range 1 through 200.  
5

**Installed Application Output**

Show application print statements  
 Format print statements

<https://washost:9043/ibm/console/ivmLog...>



## Information

View and modify the settings for the Java virtual machine (JVM) `System.out` and `System.err` logs for a managed process here. The JVM logs are created by redirecting the `System.out` and `System.err` streams of the JVM to independent log files. The `System.out` log is used to monitor the health of the running application server. The `System.err` log contains exception stack trace information that is used to do problem analysis. One set of JVM logs exists for each application server and all of its applications. JVM logs are also created for the deployment manager and each node manager. Changes on the Configuration pane apply when the server is restarted. Changes on the Runtime pane apply immediately.

- \_\_\_ c. Under General Properties for System.out, set the **Maximum Size** to 3 **MB** and the **Maximum Number of Historical Log Files** to 2.

The screenshot shows the 'Configuration' tab selected in the top navigation bar. Under 'General Properties' for 'System.out', the 'File Name' is set to \${SERVER\_LOG\_ROOT}/SystemOut.log and the 'File Formatting' is set to 'Basic (Compatible)'. In the 'Log File Rotation' section, the 'File Size' checkbox is checked, and the 'Maximum Size' is set to 3 MB. The 'Time' checkbox is unchecked, indicating that log files will not be rotated based on time. Below this, a note states 'Maximum Number of Historical Log Files. Number in range 1 through 200.' with the value 2 entered. Both the 'File Size' section and the note about historical log files are highlighted with orange boxes.

- \_\_\_ d. Click **OK**.
- \_\_\_ e. **Save** the changes to the master configuration.
- \_\_\_ 4. View the SystemOut.log and SystemErr.log files for server1 from the administrative console.
- \_\_\_ a. Select **Troubleshooting > Logs and trace > server1 > JVM Logs** and select the **Runtime** tab.

- \_\_\_ b. Select the **SystemOut.log** file from the list.

The screenshot shows the 'Logging and tracing' interface with the path 'Logging and tracing > server1 > JVM Logs'. The 'Configuration' tab is selected. Under 'General Properties', there is a section for 'System.out' with a 'File Name' dropdown containing the path '/opt/IBM/WebSphere/AppServer/profiles/profile1/logs/server1/SystemOut.log.owner'. To the right of this dropdown is a 'View' button. Below it is another dropdown for 'File Name' containing '/opt/IBM/WebSphere/AppServer/profiles/profile1/logs/server1/SystemOut.log', which is also highlighted with an orange box. A 'View' button is to its right. At the bottom left is a 'Back' button.

- \_\_\_ c. Click **View** to the right of the **File Name** field for **System.out**.

The screenshot shows the 'Logging and tracing' interface with the path 'Logging and tracing > server1 > JVM Logs'. The 'Configuration' tab is selected. Under 'General Properties', there is a section for 'System.out' with a 'File Name' dropdown containing the path '/opt/IBM/WebSphere/AppServer/profiles/profile1/logs/server1/SystemOut.log'. To the right of this dropdown is a 'View' button, which is highlighted with an orange box and has a cursor icon pointing at it. Below it is another dropdown for 'File Name' containing '/opt/IBM/WebSphere/AppServer/profiles/profile1/logs/server1/SystemErr.log.owner', with a 'View' button to its right. At the bottom left is a 'Back' button.

d. Review the log file.

**Logging and tracing**

**Logging and tracing > server1 > Log File**

Display the contents of the given file.

Total: 1896, Filtered total: 250

Retrieve Lines (eg. 250-600)

Refresh

**Log File**

```
***** Start Display Current Environment *****
WebSphere Platform 9.0.0.0 [ND 9.0.0.0 gm1621.04] [JAVA8 8.0.3.0 pxa6480sr3-20160428_01] running with process name washostNode0
Host Operating System is Linux, version 4.2.0-27-generic
Java version = 1.8.0, Java Runtime Version = pxa6480sr3-20160428_01 (SR3), Java Compiler = j9jit28, Java VM name = IBM J9 VM
was.install.root = /opt/IBM/WebSphere/AppServer
user.install.root = /opt/IBM/WebSphere/AppServer/profiles/profile1
Java Home = /opt/IBM/WebSphere/AppServer/java/8.0/jre
ws.ext.dirs = /opt/IBM/WebSphere/AppServer/java/8.0/lib:/opt/IBM/WebSphere/AppServer/profiles/profile1/classes:/opt/IBM/WebSphere/AppServer/lib
Classpath = /opt/IBM/WebSphere/AppServer/profiles/profile1/properties:/opt/IBM/WebSphere/AppServer/properties:/opt/IBM/WebSphere/AppServer/lib
Java Library path = /opt/IBM/WebSphere/AppServer/lib/native/linux/x86_64:/opt/IBM/WebSphere/AppServer/java/8.0/jre/lib/amd64/c
Orb Version = IBM Java ORB build orb80-20160421.02
***** End Display Current Environment *****

[8/8/16 16:28:46:358 EDT] 00000001 ManagerAdmin I TRAS0017I: The startup trace state is *=info:WAS.j2c=all:RRA=all:Transacti
[8/8/16 16:28:46:360 EDT] 00000001 ManagerAdmin I TRAS0111I: The message IDs that are in use are deprecated
[8/8/16 16:28:46:416 EDT] 00000001 ModelMgr I WSVR0800I: Initializing core configuration models
[8/8/16 16:28:46:712 EDT] 00000001 ComponentMeta I WSVR0179I: The runtime provisioning feature is disabled. All components will be managed by the component manager
[8/8/16 16:28:46:777 EDT] 00000001 ProviderTrack I com.ibm.ffdc.osgi.ProviderTracker AddingService FFDC1007I: FFDC Provider Installed
[8/8/16 16:28:46:861 EDT] 00000001 AdminInitiali A ADMN0015I: The administration service is initialized.
[8/8/16 16:28:47:409 EDT] 00000001 PluginConfigS I PLGC0057I: The plug-in configuration service started successfully.
[8/8/16 16:28:47:432 EDT] 00000001 XD I DCUT0002I: Loaded 64 bit native library: NodeDetect64
[8/8/16 16:28:47:560 EDT] 00000001 SSLComponentI I CWPKI0001I: SSL service is initializing the configuration
[8/8/16 16:28:47:569 EDT] 00000001 SSLConfigMana I CWPKI0051I: The process has the java security property jdk.certpath.disabledAlgorithms
[8/8/16 16:28:47:570 EDT] 00000001 SSLConfigMana I CWPKI0051I: The process has the java security property jdk.tls.disabledAlg
[8/8/16 16:28:47:572 EDT] 00000001 FIPSManger I CWPKI0044I: FIPS security mode is : No FIPS property found.
[8/8/16 16:28:47:575 EDT] 00000001 WSKeyStore W CWPKI0041W: One or more key stores are using the default password.
[8/8/16 16:28:47:581 EDT] 00000001 SSLConfigMana I CWPKI0027I: Disabling default hostname verification for HTTPS URL connection
[8/8/16 16:28:47:598 EDT] 00000001 SSLDiagnostic I CWPKI0014I: The SSL component's FFDC Diagnostic Module com.ibm.ws.ssl.core
[8/8/16 16:28:47:600 EDT] 00000001 SSLComponentI I CWPKI0002I: SSL service initialization completed successfully
[8/8/16 16:28:47:607 EDT] 00000001 DiagnosticCon I com.ibm.wsspi.rasdiag.DiagnosticConfigHome setStateCollectionSpec RASD0012I: Diagnostic configuration state collection specified
[8/8/16 16:28:47:609 EDT] 00000001 PMIImpl A CWPMMI1001I: PMI is enabled
[8/8/16 16:28:47:935 EDT] 00000001 GAPAgentCompo I CWLRS6000I: GAP (Grid Application Placement) Component has initialized successfully
[8/8/16 16:28:47:954 EDT] 00000001 SibMessage I [:] CWSIU0000I: Release: WAS90.SIB Level: gm1621.03
[8/8/16 16:28:47:980 EDT] 00000001 ODCManagerFac I Factory set to <null>
[8/8/16 16:28:48:009 EDT] 00000001 SecurityDM I SECJ0231I: The Security component's FFDC Diagnostic Module com.ibm.ws.sec...
```

- \_\_\_ e. The default is to retrieve 250 lines in one step. You can specify the range of lines that are retrieved at the top of the Logging and Tracing window. Retrieve lines 250 – 400 by typing 250–400 and clicking Refresh.

| Log File                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|
| Resource ref name:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | not set                                          |
| [Resource-ref non-key items]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                  |
| J2EE Name:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | not set                                          |
| isCMP:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | false (not set)                                  |
| isWar:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | false (looked-up component was not a War module) |
| [8/8/16 16:29:13:231 EDT] 0000004b webapp I com.ibm.ws.webcontainer.webapp.WebGroupImpl WebGroup SRVE0169I: Loading Web M<br>[8/8/16 16:29:13:413 EDT] 0000004b WASSessionCor I SessionContextRegistry getSessionContext SESN0176I: Will create a new session<br>[8/8/16 16:29:15:880 EDT] 0000004b ServletWrapper I com.ibm.ws.webcontainer.servlet.ServletWrapper init SRVE0242I: [isclite] [/it<br>[8/8/16 16:29:15:891 EDT] 0000004b webcontainer I com.ibm.ws.webcontainer.VirtualHostImpl addWebApplication SRVE0250I: Web Modu<br>[8/8/16 16:29:16:247 EDT] 0000004b webapp I com.ibm.ws.webcontainer.webapp.WebGroupImpl WebGroup SRVE0169I: Loading Web M<br>[8/8/16 16:29:16:352 EDT] 0000004b WASSessionCor I SessionContextRegistry getSessionContext SESN0176I: Will create a new session<br>[8/8/16 16:29:16:412 EDT] 0000004b MBeanDescriptor I ADMN1216I: One or more methods in Portlet mbean is excluded from access che<br>[8/8/16 16:29:16:438 EDT] 0000004b MBeanDescriptor I ADMN1216I: One or more methods in PortletApplication mbean is excluded from<br>[8/8/16 16:29:16:485 EDT] 0000004b webcontainer I com.ibm.ws.webcontainer.VirtualHostImpl addWebApplication SRVE0250I: Web Modu<br>[8/8/16 16:29:16:530 EDT] 0000004b webapp I com.ibm.ws.webcontainer.webapp.WebGroupImpl WebGroup SRVE0169I: Loading Web M<br>[8/8/16 16:29:16:655 EDT] 0000004b WASSessionCor I SessionContextRegistry getSessionContext SESN0176I: Will create a new session<br>[8/8/16 16:29:16:774 EDT] 0000004b webcontainer I com.ibm.ws.webcontainer.VirtualHostImpl addWebApplication SRVE0250I: Web Modu<br>[8/8/16 16:29:16:837 EDT] 0000004b webapp I com.ibm.ws.webcontainer.webapp.WebGroupImpl WebGroup SRVE0169I: Loading Web M<br>[8/8/16 16:29:16:926 EDT] 0000004b WASSessionCor I SessionContextRegistry getSessionContext SESN0176I: Will create a new session<br>[8/8/16 16:29:17:137 EDT] 0000004b webcontainer I com.ibm.ws.webcontainer.VirtualHostImpl addWebApplication SRVE0250I: Web Modu<br>[8/8/16 16:29:17:156 EDT] 0000004b ApplicationMg A WSVR0221I: Application started: isclite<br>[8/8/16 16:29:17:158 EDT] 0000004b CompositionUn A WSVR0191I: Composition unit WebSphere:cuname=isclite in BLA WebSphere:blana<br>[8/8/16 16:29:20:055 EDT] 0000004c InternalGener I DSRA8225I: DataSource JNDI name : jdbc/PlantsByWebSphereDataSource<br>[8/8/16 16:29:20:061 EDT] 0000004c InternalGener I DSRA8203I: Database product name : DB2/LINUXX8664<br>[8/8/16 16:29:20:062 EDT] 0000004c InternalGener I DSRA8204I: Database product version : SQL10053<br>[8/8/16 16:29:20:063 EDT] 0000004c InternalGener I DSRA8205I: JDBC driver name : IBM DB2 JDBC Universal Driver Architecture<br>[8/8/16 16:29:20:064 EDT] 0000004c InternalGener I DSRA8206I: JDBC driver version : 3.67.27<br>[8/8/16 16:29:20:068 EDT] 0000004c InternalGener I DSRA8218I: JDBC driver specification level : 3.0<br>[8/8/16 16:29:20:069 EDT] 0000004c InternalDB2Un I DSRA8212I: DataStoreHelper name is: com.ibm.websphere.rsadapter.DB2Universa<br>[8/8/16 16:29:20:071 EDT] 0000004c WSRdbDataSour I DSRA8208I: JDBC driver type : 4<br>[8/8/16 16:29:20:123 EDT] 0000004c jdbc JDBC I CWWJP9990I: openipa.jdbc.JDBC: Info: Using dictionary class "com.ibm.ws.per |                                                  |

- \_\_\_ f. Notice that several lines from the log file are shown. Scroll down to view the log records.  
 \_\_\_ g. Click **OK** after you are done viewing the log records.



## Information

You can also go to the `<profile_root>/profile1/logs/server1` folder to view the logs with a text editor. Using an editor is preferable since you can use the search features of your text editor.

- \_\_\_ 5. Configure the IBM service logs from the administrative console. Unlike the JVM logs, the IBM service logs cannot be viewed within the administrative console. You must use a tool such as the Log Analyzer, which is available in the IBM Support Assistant.
- \_\_\_ a. Select **Troubleshooting > Logs and trace > server1 > IBM Service Logs**.

- \_\_\_ b. Check the box for **Enable service log**.

**Logging and tracing > server1 > IBM Service Logs**

Use this page to configure the IBM service log, also known as the activation log. It contains messages written to the System.out stream and special messages that contain extended service information. One service log exists for all Java virtual machines (JVMs) on a node, including all application servers and their node agent, if present. A separate activity log is created for a deployment manager in its own logs directory. The IBM Service Log is maintained in a binary format.

**Configuration**

**General Properties**

**Enable service log**

\* File Name:  `${LOG_ROOT}/activity.log`

\* Maximum File Size: `2` MB

Enable Correlation ID

Apply OK Reset Cancel



### Note

In WebSphere Application Server Version 7 and earlier, the service log is enabled by default. In WebSphere Application Server Version 8 and later, the service log is disabled by default. If you do not intend to enable HPEL for version 8 or 9, then you can enable the IBM service log to be consistent with earlier versions.



### Information

The IBM service log contains the application server messages that are written to the `System.out` stream and special messages that contain extended service information that you can use to analyze problems. One service log exists for all Java virtual machines (JVMs) on a node, including all application servers and their node agent, if present. A separate activity log is created for a deployment manager in its own logs directory. The IBM Service log is maintained in a binary format. Use the Log Analyzer or Showlog tool to view the IBM service log.

To find the value for `$(LOG_ROOT)`, you can look to **Environment > WebSphere Variables**. The name of the service log is `activity.log`, but the name can be changed along with its location in the file system. Maximum file size can be set, and you can enable or disable a correlation ID. You can use the correlation ID to correlate an activity to a particular client request. You can also use it to correlate activities on multiple application servers, if applicable.

- \_\_\_ c. Click **OK**.

- \_\_\_ d. **Save** changes.

### Section 3: Setting up and configuring HPEL

High Performance Extensible Logging (HPEL) is another mode of logging and tracing. To take advantage of this log and trace framework, HPEL mode must be enabled. After HPEL mode is enabled, the JVM logs (typically `SystemOut.log` and `SystemErr.log`), the trace log (typically `trace.log`), and the service log (typically `activity.log`) are no longer written to. Instead, log and trace content is written to a log data or trace data repository in a proprietary binary format and, if configured, to a text log file. By disabling the text log file, you gain the largest possible performance benefit of HPEL. A log viewing tool, Log Viewer, is provided to allow for viewing, filtering, monitoring, and formatting the log and trace data in the repositories.

Next, you enable HPEL mode for **server1**. You then explore and modify the log and trace configurations.

- \_\_\_ 1. Enable HPEL for **server1**.
  - \_\_\_ a. In the administrative console, go to the Logging and tracing window for **server1** by clicking **Troubleshooting > Logs and trace > server1**.
  - \_\_\_ b. Enable HPEL by clicking **Switch to HPEL Mode**.

The screenshot shows the 'Logging and tracing' interface for 'server1'. At the top, there's a message: 'It is recommended that you switch to High Performance Extensible Logging (HPEL) if you have no existing procedures that prevent you from taking advantage of it.' Below this, a large button labeled 'Switch to HPEL Mode' is highlighted with a red box. To the right of this button, a note says '(Advised for most installations)'. Below the button, a text area says: 'Use this page to select a system log to configure, or to specify a log detail level for components and groups of components. Use log levels to control which events are processed by Java logging.' Under the heading 'General Properties', there's a list of links: Diagnostic Trace, JVM Logs, Process Logs, IBM Service Logs, Change log detail levels, and NCSA access and HTTP error logging.

- \_\_\_ c. Click **Save** to save the configuration.
- \_\_\_ 2. Log out of the administrative console.
- \_\_\_ 3. Restart **server1**. It is necessary to restart a server for the HPEL mode to become effective.
  - \_\_\_ a. Using a command window, go to `<profile_root>/profile1/bin` and enter the following command:  
`./stopServer.sh server1 -username wasadmin -password websphere`
  - \_\_\_ b. After **server1** stops, enter the following command:  
`./startServer.sh server1`

**Note****Restarting server1:**

You are asked to restart server1 several times throughout this exercise. To save time, keep this command window open, and use the keyboard up or down arrow to recall these commands.

- \_\_\_ 4. Configure HPEL for server1.

- \_\_\_ a. Use a web browser to start the administrative console and log on when you are prompted.
- \_\_\_ b. Go to the **Logging and tracing** window for server1 by clicking **Troubleshooting > Logs and trace > server1**.

The screenshot shows the 'Logging and tracing' configuration page for server1. The 'General Properties' section contains three configuration groups: 'Configure HPEL logging', 'Configure HPEL trace', and 'Configure HPEL text log'. The 'Configure HPEL text log' section is highlighted with a red box. The table below summarizes the current status for each section.

| Section                 | Current status |
|-------------------------|----------------|
| Configure HPEL logging  | Enabled        |
| Configure HPEL trace    | Enabled        |
| Configure HPEL text log | Enabled        |

- \_\_\_ c. In the general properties section, you can see the current default configuration for the three HPEL repositories. Each has a directory location, and cleanup options for age and size of log files. Notice that the HPEL text log has a status of Enabled. In the next step, you disable the text log to improve server performance.
- \_\_\_ 5. Disable the HPEL text log.
- \_\_\_ a. In the **General Properties** section, click the link **Configure HPEL text log**.

- \_\_\_ b. Clear the box for **Enable text log**.

- \_\_\_ c. Click **OK**.
- \_\_\_ d. Click **Save** to save the configuration.
- \_\_\_ e. It is necessary to restart the server for this change to take effect. However, wait until you make some other configuration changes before you restart server1.
6. Explore the configuration for HPEL logging.

- \_\_\_ a. Go to the **General Properties** tab and click the link **Configure HPEL logging**.

- \_\_\_ b. Notice the different options for configuring HPEL logging. Also, notice that log buffering is enabled. Since buffering improves performance, it is a good practice to keep it enabled.

The screenshot shows the 'Logging and tracing' interface for 'server1'. The 'HPEL Log Configuration' page is displayed. The 'Configuration' tab is selected. In the 'General Properties' section, the 'Directory path' is set to \${SERVER\_LOG\_ROOT} and 'Enable log record buffering' is checked (highlighted with a red box). Below it, 'Start new log file daily at: Time' is set to 12 AM. In the 'Log record purging policies' section, 'Begin cleanup of oldest records' is checked, set to 'when log size approaches maximum'. The 'Log record age limit' is 48 hours old, and the 'Maximum log size' is 50 Megabytes. In the 'Additional Properties' section, there are links to 'Change log detail levels' and 'View HPEL logs and trace'. At the bottom, there are 'Apply', 'OK', 'Reset', and 'Cancel' buttons.

- \_\_\_ 7. Modify the HPEL log configuration.  
\_\_\_ a. Change **Maximum Log Size** from 50 Megabytes to 20 Megabytes.

The screenshot shows the same 'HPEL Log Configuration' page after modification. The 'General Properties' section remains the same. In the 'Log record purging policies' section, the 'Maximum log size' has been changed to 20 Megabytes (highlighted with a red box). All other settings are identical to the initial state.

- \_\_\_ b. Click **OK**.

- \_\_\_ c. Click **Save** to save the configuration.
- \_\_\_ 8. Explore the configuration for HPEL tracing.
  - \_\_\_ a. Back in the General Properties tab, click the link **Configure HPEL trace**.

**Logging and tracing > server1**

Use this page to select a system log to configure, or to specify log detail levels for components and groups of components.

**General Properties**

| <u>Configure HPEL logging</u>          |                                                             |
|----------------------------------------|-------------------------------------------------------------|
| Directory                              | /opt/IBM/WebSphere/AppServer/profiles/profile1/logs/server1 |
| For cleanup, delete records older than | Disabled                                                    |
| For cleanup, maximum size of logs      | 50 Megabytes                                                |

| <u>Configure HPEL trace</u>            |                                                             |
|----------------------------------------|-------------------------------------------------------------|
| Directory                              | /opt/IBM/WebSphere/AppServer/profiles/profile1/logs/server1 |
| For cleanup, delete records older than | Disabled                                                    |
| For cleanup, maximum size of trace     | 50 Megabytes                                                |

| <u>Configure HPEL text log</u>         |                                                             |
|----------------------------------------|-------------------------------------------------------------|
| Current status:                        | Enabled                                                     |
| Directory                              | /opt/IBM/WebSphere/AppServer/profiles/profile1/logs/server1 |
| For cleanup, delete records older than | Disabled                                                    |
| For cleanup, maximum size of text log  | 50 Megabytes                                                |

- \_\_\_ b. Notice that you have options to trace to a log directory or memory buffer. The default is to trace to a log directory.
- \_\_\_ 9. Modify the HPEL Trace configuration.
  - \_\_\_ a. Under **Log record purging policies**, configure when to begin cleanup of the oldest records by using the menu to select **when oldest records reach age limit**.

- \_\_\_ b. Set **Log record age limit** to 12 hours.

**HPEL Trace Output**

- Trace to a directory
- Enable log record buffering
- Start new log file daily at: Time 12 AM

**Log record purging policies**

Begin cleanup of oldest records  
when oldest records reach age limit

Log record age limit  
12 Hours old

MAXIMUM LOG SIZE  
50 Megabytes

\* Out of space action  
Purge old records

- \_\_\_ c. Click **OK**.
- \_\_\_ d. Click **Save** to save the configuration.
- \_\_\_ e. Log out of the administrative console.
- \_\_\_ f. Restart **server1** so that the new configuration is in effect.
- \_\_\_ 10. Verify new HPEL configurations.
- \_\_\_ a. Log on to the administrative console.

- \_\_\_ b. Click Troubleshooting > Logs and trace > server1.

**Logging and tracing**

**Logging and tracing > server1**

Use this page to select a system log to configure, or to specify log detail levels for components and groups of components.

**General Properties**

**Configure HPEL logging**

|                                        |                                                             |
|----------------------------------------|-------------------------------------------------------------|
| Directory                              | /opt/IBM/WebSphere/AppServer/profiles/profile1/logs/server1 |
| For cleanup, delete records older than | Disabled                                                    |
| For cleanup, maximum size of logs      | 20 Megabytes                                                |

**Configure HPEL trace**

|                                        |                                                             |
|----------------------------------------|-------------------------------------------------------------|
| Directory                              | /opt/IBM/WebSphere/AppServer/profiles/profile1/logs/server1 |
| For cleanup, delete records older than | 12 Hours                                                    |
| For cleanup, maximum size of trace     | Disabled                                                    |

**Configure HPEL text log**

|                 |          |
|-----------------|----------|
| Current status: | Disabled |
|-----------------|----------|

**Related Items**

- [View HPEL logs and trace](#)
- [Change log detail levels](#)
- [Change log and trace mode](#)
- [Manage process logs](#)
- [NCSA access and HTTP error logging](#)

- \_\_\_ c. Verify that all the configuration changes that you made are now in effect.



### Note

#### HPEL configuration

The configuration changes you made are reasonable for the lab environment in this course. In your own testing and production environments, you must determine what configuration provides the best performance and meets your diagnostic data collection requirements.

## Section 4: Using the Log Viewer in the administrative console to examine log data and trace data

In this section, you use the Log Viewer in the administrative console to examine the log messages for an application server. You use various filtering functions to customize what log records are shown.

- \_\_\_ 1. Go to the Log Viewer for the server.
- \_\_\_ a. Click Troubleshooting > Logs and trace > server1 > View HPEL Logs and Trace.

The screenshot shows the 'Logs and tracing' configuration page for 'server1'. The page title is 'Logging and tracing > server1'. It includes sections for 'General Properties', 'Configure HPEL logging', 'Configure HPEL trace', 'Configure HPEL text log', and 'Related Items'. The 'View HPEL logs and trace' link under 'Related Items' is highlighted with a red box.

| Configure HPEL logging                 |                                                             |
|----------------------------------------|-------------------------------------------------------------|
| Directory                              | /opt/IBM/WebSphere/AppServer/profiles/profile1/logs/server1 |
| For cleanup, delete records older than | Disabled                                                    |
| For cleanup, maximum size of logs      | 20 Megabytes                                                |

| Configure HPEL trace                   |                                                             |
|----------------------------------------|-------------------------------------------------------------|
| Directory                              | /opt/IBM/WebSphere/AppServer/profiles/profile1/logs/server1 |
| For cleanup, delete records older than | 12 Hours                                                    |
| For cleanup, maximum size of trace     | Disabled                                                    |

| Configure HPEL text log |          |
|-------------------------|----------|
| Current status:         | Disabled |

**Related Items**

- [View HPEL logs and trace](#)
- [Change log detail levels](#)
- [Change log and trace mode](#)
- [Manage process logs](#)
- [NCSA access and HTTP error logging](#)

- \_\_\_ 2. Select the most recent instance of the application server.
- \_\_\_ a. Expand Content and Filtering Details.

- \_\_\_ b. Expand the **Server Instance** tree, and make sure that the most recent instance of the server is selected (highlighted).

The screenshot shows the 'Logging and tracing' interface with the 'Log Viewer' for 'server1'. The 'Content and Filtering Details' tree is expanded, showing a folder for 'August 10, 2016' which contains a log entry for '08:45:17' highlighted with a red box.



Since you recently enabled HPEL for server1, you do not see many instances of the server log repository. An instance is created for each new start of the server and designated with a time stamp. In this example, which uses the default configuration, the instances for each day are stored in a folder that is designated with the date. Any instance can be viewed by selecting it, and the log records are shown in the Log Viewer.

- \_\_\_ c. Collapse the **Content and Filtering Details** tree.  
 \_\_\_ 3. Use the Log Viewer to explore the log records.  
   \_\_\_ a. On the Log Viewer, click **Next Page** and **Last Page** to browse through the log records.  
     Click **First Page**.

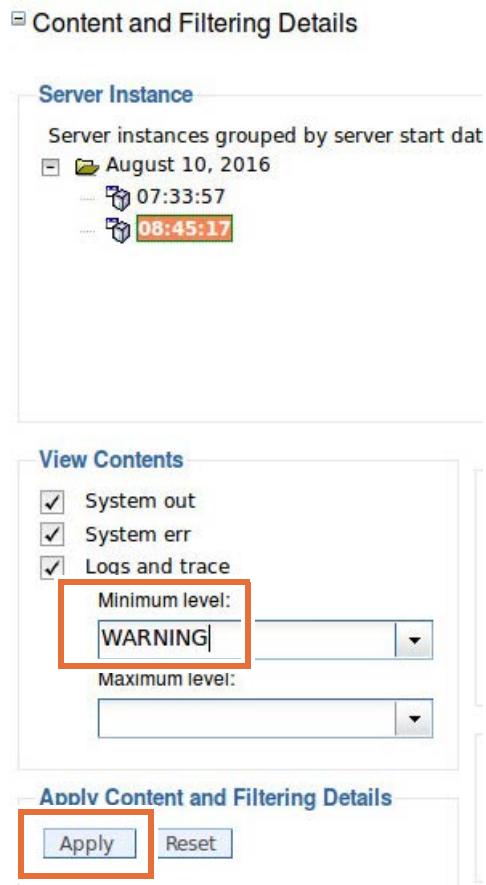
The screenshot shows the 'Logging and tracing' interface with the 'Log Viewer' for 'server1'. The 'Content and Filtering Details' tree is collapsed. The 'Number of records to show:' dropdown is set to 20. The 'First Page', 'Previous Page', 'Next Page', and 'Last Page' buttons are highlighted with a red box.

| TimeStamp             | Thread ID | Logger          | Level | Message                                                                                                                                                    |
|-----------------------|-----------|-----------------|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 8/10/16, 08:45:17.808 | 00000001  | Manager/Admin   | INFO  | <a href="#">TRAS0017I</a> : The startup trace state is *=info.                                                                                             |
| 8/10/16, 08:45:17.814 | 00000001  | Manager/Admin   | INFO  | <a href="#">TRAS0111I</a> : The message IDs that are in use are deprecated                                                                                 |
| 8/10/16, 08:45:17.824 | 00000001  | ProviderTracker | INFO  | com.ibm.ffdc.osgi.ProviderTracker AddingService <a href="#">FFDC1007I</a> : FFDC Provider installed: com.ibm.ffdc.util.provider.FfdcOnDirProvider@440422a3 |
| 8/10/16, 08:45:17.842 | 00000001  | nfig.ModelMgr   | INFO  | <a href="#">WSVR0800I</a> : Initializing core configuration models                                                                                         |
| 8/10/16, 08:45:18.098 | 00000001  | MetaDataMgr     | INFO  | <a href="#">WSVR0179I</a> : The runtime provisioning feature is disabled. All components will be started.                                                  |
| 8/10/16, 08:45:18.144 | 00000001  | ProviderTracker | INFO  | com.ibm.ffdc.osgi.ProviderTracker AddingService <a href="#">FFDC1007I</a> : FFDC Provider installed: com.ibm.ws.ffdc.impl.FfdcProvider@4e5acd10            |
| 8/10/16, 08:45:18.204 | 00000001  | dminInitializer | AUDIT | <a href="#">ADMN0015I</a> : The administration service is initialized.                                                                                     |
| 8/10/16, 08:45:18.459 | 00000001  | figServiceImpl  | INFO  | <a href="#">PLGC0057I</a> : The plug-in configuration service started successfully.                                                                        |

- \_\_\_ b. Try clicking one or more Message ID links to see more details about a message.

\_\_\_ 4. Use message levels to filter records that are shown.

\_\_\_ a. Expand **Content and Filtering Details** and select **WARNING** as the **Minimum** level in the View Contents section.



\_\_\_ b. Click **Apply**.

\_\_\_ c. View the records in the Log Viewer. Notice that the records that are shown have a minimum level of **WARNING**. Browse through the messages to see whether any are at a higher level such as **SEVERE**. Alternatively, select **SEVERE** as the Minimum level in the View Contents section, and click **Apply**.

\_\_\_ d. Clear the **Minimum** and **Maximum** level windows. Click **Apply** to see all the records again.

\_\_\_ 5. Show all records that are associated with a specific thread.

\_\_\_ a. Browse through the records and look for any message of interest at level **WARNING**, **AUDIT**, or **SEVERE**. Record the Thread ID for that record: \_\_\_\_\_

- \_\_\_ b. Highlight any record with the same Thread ID and click **Show Only Selected Threads**.

The screenshot shows the 'Logging and tracing > server1 > Log Viewer' page. At the top, there are several buttons: 'Refresh View', 'Show Only Selected Threads' (which is highlighted with a red box), 'Show All Threads', 'Select Columns ...', 'Export ...', and 'Copy to Clipboard'. Below these buttons, it says 'Viewing log records from server instance August 10, 2016 08:45:17'. There is a search bar labeled 'Number of records to show: 20' and navigation links for 'First Page' and 'Previous Page'. The main area displays a table of log records. One specific record for Thread ID 00000091 is highlighted with a red box. This record has a timestamp of 9:22:56.342, a logger of SystemErr, and a level of DETAIL. The message is 'java.lang.Throwable@null'. Other log entries for the same thread are visible below it.

- \_\_\_ c. Browse through the resulting records, and you can see that only the messages from the selected Thread ID are shown. Also, notice that those records are shown in quasi-chronological order (the order in which the server emitted them).
- \_\_\_ d. After viewing the records for the selected thread, click **Show All Threads**.

## **Section 5: Enabling tracing for an application server and viewing trace data from the Log Viewer**

In this section, you configure tracing on the session management components of server1. Use the PlantsByWebSphere application to generate trace data, and view the trace data in the Log Viewer.

- \_\_\_ 1. Configure the diagnostic trace for the session management components of server1.
  - \_\_\_ a. In the administrative console, click **Troubleshooting > Logs and trace > server1**.
  - \_\_\_ b. Click **Change log detail levels**.

The screenshot shows the 'Logs and trace' configuration page for server1. At the top, there is a 'Related Items' section with several links: 'View HPEI logs and trace', 'Change log detail levels' (which is highlighted with a red box), 'Change log and trace mode', 'Manage process logs', and 'NCSA access and HTTP error logging'.

- \_\_\_ c. Select the **Runtime** tab, and enter the following trace strings. These strings are for the components and trace levels that the IBM Support MustGather documentation suggests for session management problems.

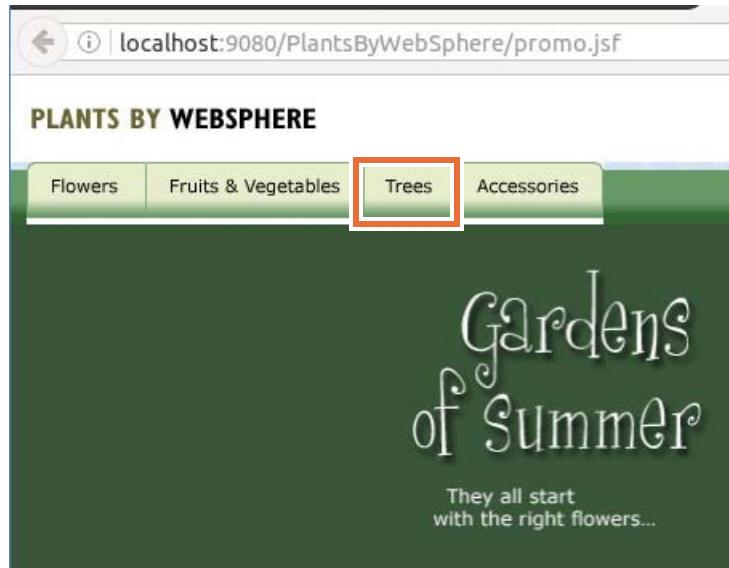
```
*=info: com.ibm.ws.session.*=all: com.ibm.ws.webcontainer.srt.*=all:  
WAS.j2c=all:
```

```
RRA=all: WAS.database=all
```

The screenshot shows the 'Logging and tracing' configuration interface for a server. The 'Runtime' tab is active. In the 'Change log detail levels' section, there is a text input field containing the trace string. This string is highlighted with a red rectangle, indicating it is the focus of the exercise.

- \_\_\_ d. Remember to add a colon (:) after the existing trace string \*=info:  
 \_\_\_ e. Click **Apply**.
- \_\_\_ 2. Access the PlantsByWebSphere application and generate some trace data.
- \_\_\_ a. Start a new browser and enter the web address:  
`http://localhost:9080/PlantsByWebSphere`

- \_\_\_ b. Click the **Trees** tab on the Welcome page.



- \_\_\_ c. Select any tree that you like, and click **Add to cart**.

[Home](#) > Trees

### Maple



**Traditional Shade Producer**  
Famous for their syrup, you will be able to tap into your own endless supply in just a few years. Not suitable for diabetics. Mature height: up to 24 feet.

---

Item Selection:

| ITEM# | DESCRIPTION        | PRICE   | QUANTITY                       |
|-------|--------------------|---------|--------------------------------|
| T0005 | 10 gallon seedling | \$45.00 | <input type="text" value="1"/> |

**Add to cart**

- \_\_\_ d. This activity is enough to generate some interesting trace data. Close the browser.
- \_\_\_ 3. Use the Log Viewer in the administrative console to examine the trace data.
- \_\_\_ a. Click **Troubleshooting > Logs and trace > server1 > View HPEL logs and trace**.
- \_\_\_ b. Expand the **Contents and Filtering Details** tree.



## Information

In the View Contents section, you can select **System out**, **System err**, or **Logs and trace**.

- Selecting **System out** shows records that are sent to the System Out stream with an API like `System.out.println(...)`
- Selecting **System err** shows records that are sent to the System Error stream from an API like `System.err.println(...)`
- Selecting **Logs and trace** specifies that log and trace records are included in the log view. Log and trace entries can be further specified to include a minimum or maximum level.

Examples of log and trace filters:

- Selecting **Logs and trace** and clearing minimum level and maximum level fields causes the log view to show records with any log or trace level (default).
- Selecting **Logs and trace** and setting minimum level to **WARNING** results in log records with levels **WARNING**, **FATAL**, or **SEVERE** in the log view.
- Selecting **Logs and trace** and setting maximum level to **FINE** results in trace records with levels **FINE**, **FINER**, or **FINEST** in the log view.
- Selecting **Logs and trace** and setting minimum level to **DETAIL** and maximum level to **AUDIT** results in log records with levels **DETAIL**, **CONFIG**, **INFO**, or **AUDIT** in the log view.

- \_\_\_ c. In the View Contents section, select **FINE** as the Minimum level and **FATAL** as the Maximum level.

**View Contents**

System out  
 System err  
 Logs and trace

Minimum level:  
**FINE**

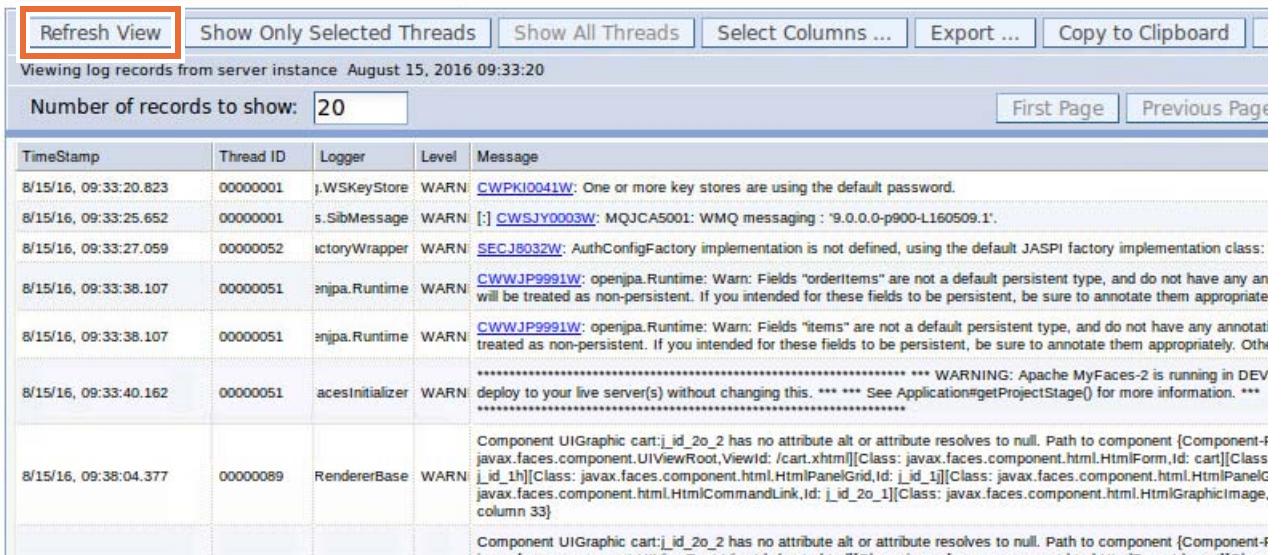
Maximum level:  
**FATAL**

Apply Content and Filtering Details

**Apply**   **Reset**

- \_\_\_ d. Click **Apply**.

- \_\_ e. Click Refresh View.



| Viewing log records from server instance August 15, 2016 09:33:20 |           |                 |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------------------------------------------------------------|-----------|-----------------|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Number of records to show: 20                                     |           |                 |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| TimeStamp                                                         | Thread ID | Logger          | Level | Message                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 8/15/16, 09:33:20.823                                             | 00000001  | j.WSKeyStore    | WARN  | CWPKI0041W: One or more key stores are using the default password.                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 8/15/16, 09:33:25.652                                             | 00000001  | s.SibMessage    | WARN  | [i] CWSJY0003W: MQJCA5001: WMQ messaging : 9.0.0.0-p900-L160509.1'.                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 8/15/16, 09:33:27.059                                             | 00000052  | factoryWrapper  | WARN  | SECJ8032W: AuthConfigFactory implementation is not defined, using the default JASPI factory implementation class: CWWJP9991W: openjpa.Runtime: Warn: Fields "orderItems" are not a default persistent type, and do not have any annotations. They will be treated as non-persistent. If you intended for these fields to be persistent, be sure to annotate them appropriately.                                                                                                                  |
| 8/15/16, 09:33:38.107                                             | 00000051  | enjpa.Runtime   | WARN  | CWWJP9991W: openjpa.Runtime: Warn: Fields "items" are not a default persistent type, and do not have any annotations. They will be treated as non-persistent. If you intended for these fields to be persistent, be sure to annotate them appropriately. Otherwise, they will be treated as non-persistent. **** WARNING: Apache MyFaces-2 is running in DEV mode. You must deploy to your live server(s) without changing this. *** See Application#getCurrentStage() for more information. *** |
| 8/15/16, 09:33:38.107                                             | 00000051  | enjpa.Runtime   | WARN  | *****                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 8/15/16, 09:33:40.162                                             | 00000051  | acesInitializer | WARN  | Component UIGraphic cart:j_id_2o_2 has no attribute alt or attribute resolves to null. Path to component {ComponentId: j_id_2o_2, ViewId: /cart.xhtml} [Class: javax.faces.component.html.HtmlImage, Id: cart:j_id_2o_2] [Class: javax.faces.component.html.HtmlPanelGrid, Id: j_id_1h] [Class: javax.faces.component.html.HtmlPanelGrid, Id: j_id_1] [Class: javax.faces.component.html.HtmlCommandLink, Id: j_id_2o_1] [Class: javax.faces.component.html.HtmlGraphicImage, Column: 33]        |
| 8/15/16, 09:38:04.377                                             | 00000089  | RendererBase    | WARN  | Component UIGraphic cart:j_id_2o_2 has no attribute alt or attribute resolves to null. Path to component {ComponentId: j_id_2o_2, ViewId: /cart.xhtml} [Class: javax.faces.component.html.HtmlImage, Id: cart:j_id_2o_2] [Class: javax.faces.component.html.HtmlPanelGrid, Id: j_id_1h] [Class: javax.faces.component.html.HtmlPanelGrid, Id: j_id_1] [Class: javax.faces.component.html.HtmlCommandLink, Id: j_id_2o_1] [Class: javax.faces.component.html.HtmlGraphicImage, Column: 33]        |

- \_\_ f. Use **Next Page** and **Previous Page** to view the trace data.

- \_\_ 4. Use the features of the Log Viewer to explore the trace data. A few suggestions that you might try are listed as follows:
- \_\_ a. Set both Minimum level and Maximum level to **FINEST**. This setting shows you only the records at the FINEST level, if there are any.
  - \_\_ b. Select (highlight) any Thread ID of interest and click **Show Only Selected Threads**. Observe the number of different loggers that stream messages in that thread.
  - \_\_ c. Try filtering on message content. Look for key words among the message details, such as `getConnection` or `JSESSIONID`. Use wildcards. Remember to click **Apply** and **Refresh View**.



Wild cards: \*, ?, % are allowed  
Separate multiple entries by a ','

Include loggers:

Exclude loggers:

Message contents:  
 \*Connection

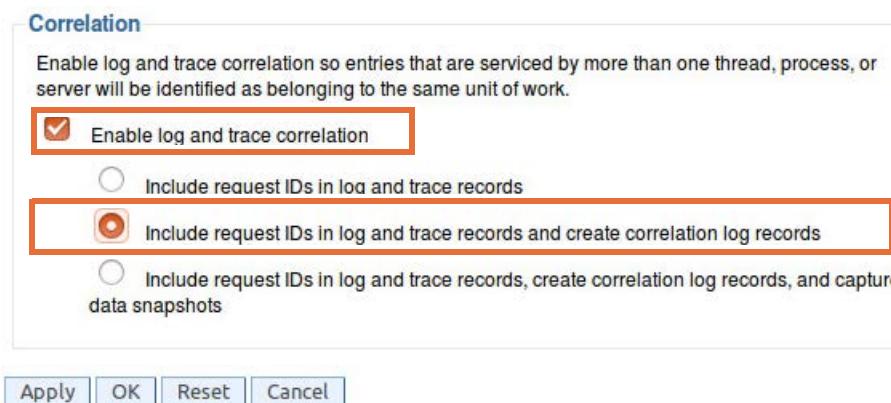
## Section 6: Enabling cross-component trace (XCT)

In this section, you learn how to enable cross-component trace (XCT) for an application server. You also examine the request IDs and other data that XCT provides in the server logs.

- \_\_ 1. Enable XCT for server1.

  - \_\_ a. In the administrative console, click **Troubleshooting > Logs and trace > server1 > Change log detail levels**.
  - \_\_ b. On the **Runtime** tab, scroll down to the **Correlation** section.

- \_\_\_ c. Check the box for **Enable log and trace correlation** and select **Include request IDs in log and trace records and create correlation log records**.



- \_\_\_ d. Click **OK**.



### Information

#### **Include request IDs in log and trace records and create correlation log records:**

This setting enables XCT to include request IDs in log and trace files when you want to see which log and trace entries, in all threads and application server processes, are related to the same request. Request IDs are recorded only when using HPEL log and trace mode and can be seen or used for filtering when using the `logViewer` command.

In addition, XCT creates correlation log records when you want to log how requests branch between threads and processes, and see extra information about each request.

**Warning:** Enabling XCT to create correlation log records might have a significant performance cost on your system, so is best suited to test and development environments.

- \_\_\_ 2. Change the trace specification to gather data for HTTP requests.

- \_\_\_ a. If you are not already there, click **Troubleshooting > Logs and trace > server1 > Change log detail levels**.

- \_\_ b. Select the **Runtime** tab. In the **Change log detail levels** box, expand **Components and Groups**. The components that you can log are shown.

**Components**

- ⊕ [All Components]
  - ⊕ BB\_STATS
  - ⊕ CLASS NAME NOT AVAILABLE
  - ⊕ ConfigError
  - ⊕ ConnCloseLogic
  - ⊕ ConnGetConnectionLogic
  - ⊕ ConnLeakLogic
  - ⊕ JaasWCCMHelper
  - ⊕ MCThreadCheck
  - ⊕ ORBRas
  - ⊕ OpenJPA
  - ⊕ SASRas
  - ⊕ SecurityDomain
  - ⊕ ServiceLoader
  - ⊕ StateControlServiceImpl
  - ⊕ SuppressBeanLevelChecks
  - ⊕ SuppressServletLevelChecks
  - ⊕ SystemErr
  - ⊕ SystemOut
  - ⊕ TRANPARTNERUSAGE
  - ⊕ TRANSUMMARY
- ⊕ WAS.\*
- ⊕ WebAttributes.\*

- \_\_ c. Right-click **com.ibm.websphere.XCT** and select **All Messages and Traces**.

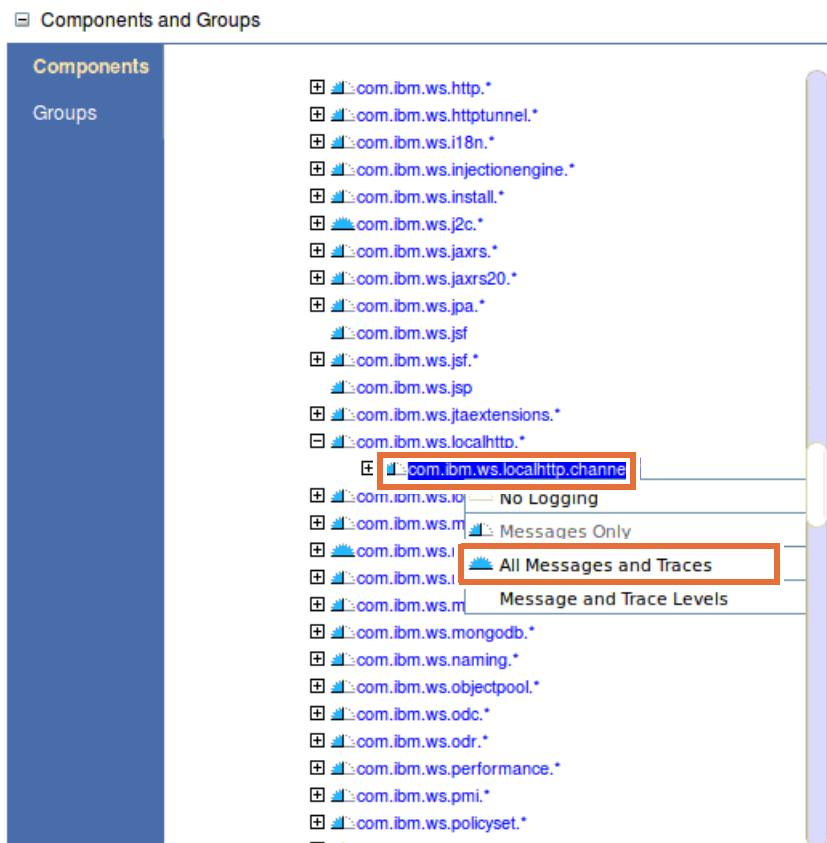
**Components**

- ⊕ com.ibm.apc.\*
- ⊕ com.ibm.config.\*
- ⊕ com.ibm.datapower.\*
- ⊕ com.ibm.debug.\*
- ⊕ com.ibm.ejs.\*
- ⊕ com.ibm.etools.\*
- ⊕ com.ibm.ffdc.\*
- ⊕ com.ibm.hpel.\*
- ⊕ com.ibm.io.\*
- ⊕ com.ibm.iselite.\*
- ⊕ com.ibm.iscportal.\*
- ⊕ com.ibm.jtc.\*
- ⊕ com.ibm.osgi.\*
- ⊕ com.ibm.portal.\*
- ⊕ com.ibm.sec.\*
- ⊕ com.ibm.son.\*
- ⊕ com.ibm.tx.\*
- ⊕ com.ibm.uddi.\*
- ⊕ com.ibm.websphere.\*

**Groups**

- ⊕ com.ibm.websphere.XCT
  - ⊕ No Logging
  - ⊕ Messages Only
  - All Messages and Traces**
  - ⊕ Message and Trace Levels
- ⊕ com.ibm.websphere.logging.\*
- ⊕ com.ibm.websphere.management.\*
- ⊕ com.ibm.websphere.models.\*
- ⊕ com.ibm.websphere.naming.\*

- \_\_ d. Expand **com.ibm.ws.\***. Expand **com.ibm.ws.localhttp.\***. Right-click **com.ibm.ws.localhttp.channel.\*** and select **All Messages and Traces**.



- \_\_\_ e. Verify that the two selections are added to the components list above the Components and Groups section. The components are:

`*=info:com.ibm.websphere.XCT=all:com.ibm.ws.localhttp.channel.*=all`

The screenshot shows the 'Change log detail levels' configuration page. In the 'Log Detail Levels' section, there is an input field containing the log entry `*=info: com.ibm.websphere.XCT=all: com.ibm.ws.localhttp.channel.*=all`. This entry is highlighted with a red border.

- \_\_\_ f. Click **OK**.

- \_\_\_ 3. Use the GUI Log Viewer to generate an HTTP request and examine the XCT data.

- \_\_\_ a. Start a new browser and enter the web address:

`http://localhost:9080/PlantsByWebSphere`

Accessing the Plants By WebSphere Welcome page generates several HTTP requests.

- \_\_\_ b. Log in to the administrative console.

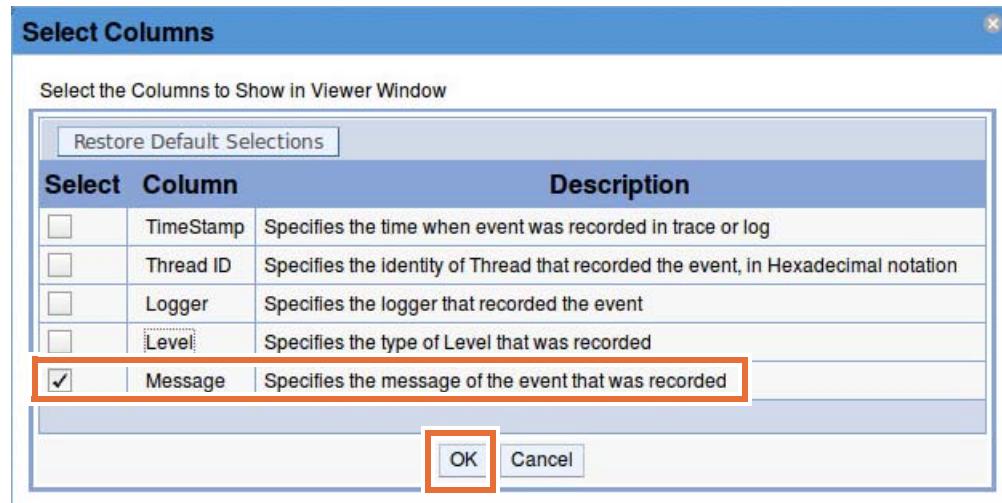
- \_\_\_ c. Click **Troubleshooting > Logs and trace > server1 > View HPEL Logs and Trace**.

- \_\_\_ d. In the **Log Viewer**, click **Last Page**.

The screenshot shows the 'Logging and tracing' interface with the 'Log Viewer' tab selected. The 'Content and Filtering Details' section includes a 'Number of records to show:' input field set to '20'. Below it is a table of log entries. At the bottom right of the table, the 'Last Page' button is highlighted with a red box.

| TimeStamp             | Thread ID | Logger           | Level | Message                                                                                                                                                    |
|-----------------------|-----------|------------------|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 8/16/16, 11:49:50.548 | 00000001  | ManagerAdmin     | INFO  | <a href="#">TRAS0017I</a> : The startup trace state is *=info.                                                                                             |
| 8/16/16, 11:49:50.554 | 00000001  | ManagerAdmin     | INFO  | <a href="#">TRAS0111I</a> : The message IDs that are in use are deprecated                                                                                 |
| 8/16/16, 11:49:50.563 | 00000001  | ProviderTracker  | INFO  | com.ibm.ffdc.osgi.ProviderTracker AddingService <a href="#">FFDC1007I</a> : FFDC Provider Installed: com.ibm.ffdc.util.provider.FfdcOnDirProvider@8816d086 |
| 8/16/16, 11:49:50.578 | 00000001  | nfig.ModelMgr    | INFO  | <a href="#">WSVR0800I</a> : Initializing core configuration models                                                                                         |
| 8/16/16, 11:49:50.790 | 00000001  | MetaDataMgr      | INFO  | <a href="#">WSVR0179I</a> : The runtime provisioning feature is disabled. All components will be started.                                                  |
| 8/16/16, 11:49:50.851 | 00000001  | ProviderTracker  | INFO  | com.ibm.ffdc.osgi.ProviderTracker AddingService <a href="#">FFDC1007I</a> : FFDC Provider Installed: com.ibm.ws.ffdc.impl.FfdcProvider@92c30634            |
| 8/16/16, 11:49:50.905 | 00000001  | AdminInitializer | AUDIT | <a href="#">ADMN0015I</a> : The administration service is initialized.                                                                                     |

- \_\_\_ e. Click **Select columns** and select only **Message**. Clear the other columns and click **OK** to see the view that is shown in the following screen capture.



- \_\_\_ f. Browse for HTTP messages.

Logging and tracing

[Logging and tracing > server1 > Log Viewer](#)

Use this page to view log data from the HPEL repository (group of common binary log files). You can also use this page to filter and search the rep customized view or full repository into a compressed file.

**Content and Filtering Details**

Refresh View Show Only Selected Threads Show All Threads Select Columns ... Export ... Copy to Clipboard

Viewing log records from server instance August 16, 2016 11:49:50

Number of records to show: 20 First Page Previous Page

| Message                                                                                                                                                                                                                                                          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| END AAB6icTN7cd-AAAAAAAAB8 0000000000-cccccccc2 HTTPCF(InboundRequest RC=200<br>RequestContext(com.ibm.ws.http.channel.inbound.impl.HttpInboundServiceContextImpl@bf46c6c9))                                                                                     |
| BEGIN AAB6icTN7cd-AAAAAAAAB9 0000000000-cccccccc2 HTTPCF(InboundRequest /ibm/console/secure/javascriptToSession.jsp RemoteAddress(127.0.0.1)<br>RequestContext(com.ibm.ws.http.channel.inbound.impl.HttpInboundServiceContextImpl@bf46c6c9))                     |
| END AAB6icTN7cd-AAAAAAAAB9 0000000000-cccccccc2 HTTPCF(InboundRequest RC=200<br>RequestContext(com.ibm.ws.http.channel.inbound.impl.HttpInboundServiceContextImpl@bf46c6c9))                                                                                     |
| BEGIN AAB6icTN7cd-AAAAAAAAB+ 0000000000-cccccccc2 HTTPCF(InboundRequest /ibm/console/com.ibm.ws.console.probdetermination.forwardCmd.do<br>RemoteAddress(127.0.0.1) RequestContext(com.ibm.ws.http.channel.inbound.impl.HttpInboundServiceContextImpl@bf46c6c9)) |
| END AAB6icTN7cd-AAAAAAAAB+ 0000000000-cccccccc2 HTTPCF(InboundRequest RC=200<br>RequestContext(com.ibm.ws.http.channel.inbound.impl.HttpInboundServiceContextImpl@bf46c6c9))                                                                                     |
| BEGIN AAB6icTN7cd-AAAAAAAAB/ 0000000000-cccccccc2 HTTPCF(InboundRequest /ibm/console/secure/javascriptToSession.jsp RemoteAddress(127.0.0.1)<br>RequestContext(com.ibm.ws.http.channel.inbound.impl.HttpInboundServiceContextImpl@bf46c6c9))                     |



## Information

When an HTTP request arrives, the server does an XCT BEGIN, which indicates that the request is starting to process. The entry in the logs shows the following information:

- Parent XCT ID
- Current XCT ID
- Type of request (InboundRequest or OutboundRequest)
- URI of request RequestContext object

- ID from HTTPChannel
- RemoteAddress from the connection from which the request originated

When the request completes processing, the server does an XCT END; this action marks the request as finished. An XCT END for an HTTP request shows the following attributes:

- Parent XCT ID
- Current XCT ID
- The type of request, which includes InboundRequest and OutboundRequest
- Return code (RC) of the response
- HTTP Channel RequestContext object ID

4. Use the command-line Log Viewer to examine the XCT data

a. From a command window, go to:

```
/opt/IBM/WebSphere/AppServer/profiles/profile1/bin
```

b. Find the instance ID of the running server by entering the following command:

```
./logViewer.sh -listInstances
```

c. Enter the last instance ID here: \_\_\_\_\_

```
localuser@washost:/opt/IBM/WebSphere/AppServer/profiles/profile1/bin$ ./logViewer.sh -listInstances
Using /opt/IBM/WebSphere/AppServer/profiles/profile1/logs/server1 as repository directory.
```

| Instance ID   | Start Date                |
|---------------|---------------------------|
| 1471273645331 | 08/15/16 11:07:25.331 EDT |
| 1471362590548 | 08/16/16 05:38:30.165 EDT |
| 1471362590548 | 08/16/16 11:49:50.548 EDT |

d. Enter the following command:

```
./logViewer.sh -includeLoggers "com.ibm.websphere.XCT" -format advanced
-instance <your_Instance_ID> -outlog
/opt/labfiles/Troubleshooting/xct_data.txt
```

- \_\_\_ e. When this command completes, the log records are written to the text file by using the advanced format. Open the `xct_data.txt` file with an editor such as gedit to explore its contents.



```

localuser@washost: /opt/IBM/WebSphere/AppServer/profiles/profile1/bin
[8/16/16 12:43:39:295 EDT] 00000087 I UOW= source=com.ibm.websphere.XCT org=nul
l prod=null component=null thread=[WebContainer : 2] requestID=[AAB6IcTN7cd-AAAA
AAAAAA]
END AAB6IcTN7cd-AAAAAAAAAA 000000000000-cccccccccc2 HTTPCF(InboundRe
quest RC=200 RequestContext(com.ibm.ws.http.channel.inbound.impl.HttpInboundServ
iceContextImpl@694327dc))
[8/16/16 12:44:22:547 EDT] 00000087 I UOW= source=com.ibm.websphere.XCT org=nul
l prod=null component=null thread=[WebContainer : 2] requestID=[AAB6IcTN7cd-AAAA
AAAAAA]
BEGIN AAB6IcTN7cd-AAAAAAAAAB 000000000000-cccccccccc2 HTTPCF(InboundR
quest /ibm/console/navigatorCmd.do RemoteAddress(127.0.0.1) RequestContext(com.
bm.ws.http.channel.inbound.impl.HttpInboundServiceContextImpl@10e7a400))
[8/16/16 12:44:22:901 EDT] 00000087 I UOW= source=com.ibm.websphere.XCT org=nul
l prod=null component=null thread=[WebContainer : 2] requestID=[AAB6IcTN7cd-AAA
AAAAAB1]
END AAB6IcTN7cd-AAAAAAAAAB 000000000000-cccccccccc2 HTTPCF(InboundRe
quest RC=200 RequestContext(com.ibm.ws.http.channel.inbound.impl.HttpInboundServ
iceContextImpl@10e7a400))
[8/16/16 12:44:25:847 EDT] 00000087 I UOW= source=com.ibm.websphere.XCT org=nul
l prod=null component=null thread=[WebContainer : 2] requestID=[AAB6IcTN7cd-AAAA
AAAAAC]
BEGIN AAB6IcTN7cd-AAAAAAAAAC 000000000000-cccccccccc2 HTTPCF(InboundRe
quest /ibm/console/logsAndTraceCollection.do RemoteAddress(127.0.0.1) RequestCon
text(com.ibm.ws.http.channel.inbound.impl.HttpInboundServiceContextImpl@10e7a400
))
[8/16/16 12:44:26:297 EDT] 00000087 I UOW= source=com.ibm.websphere.XCT org=nul
l prod=null component=null thread=[WebContainer : 2] requestID=[AAB6IcTN7cd-AAAA
AAAAAC]
END AAB6IcTN7cd-AAAAAAAAAC 000000000000-cccccccccc2 HTTPCF(InboundRe
quest RC=200 RequestContext(com.ibm.ws.http.channel.inbound.impl.HttpInboundServ
iceContextImpl@10e7a400))

```

- \_\_\_ f. Notice that the advanced format shows the unit of work (UOW), in this case the XCT logger and the requestID.
- \_\_\_ g. Close the `xct_data.txt` file when you are finished examining it.



## Information

### IBM Cross Component Trace Log Viewer

Available in the IBM Support Assistant, IBM WebSphere Cross Component Trace Log Viewer provides enhanced log file views for logs that are augmented with Cross Component Trace correlation log records. Logs can be displayed in flat or hierarchical layouts, and multiple logs can be loaded and viewed simultaneously with log entries that are related to each request and conveniently grouped.

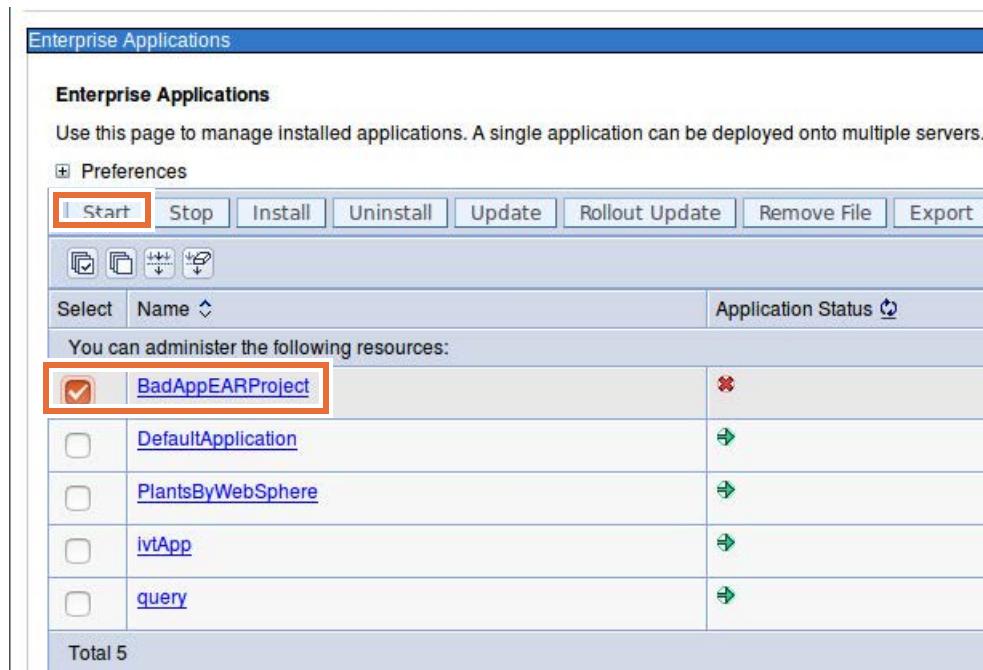
- \_\_\_ 5. Clear the HTTP trace strings and disable XCT.
- \_\_\_ a. Click **Troubleshooting > Logs and trace > server1 > Change log detail levels**.

- \_\_\_ b. On the **Runtime** tab, remove the trace string that you added earlier:  
`.com.ibm.websphere.XCT=all:com.ibm.ws.localhttp.channel.*=all`
- \_\_\_ c. Scroll down to the Correlation section and clear the box for **Enable log and trace correlation**.
- \_\_\_ d. Click **OK**.

## Section 7: Collecting JVM data

Common JVM-related problems include hung threads, memory leaks, and out-of-memory conditions. This section shows you how to collect diagnostic data to help troubleshoot these problems. First, you install an example application that is written to illustrate several JVM-related problems.

- \_\_\_ 1. Install the **badapp** application.
  - \_\_\_ a. In a command window, go to: `<profile_root>/profile1/bin`
  - \_\_\_ b. Enter the following command all on one line:  
`./wsadmin.sh -f /opt/labfiles/Troubleshooting/install_badapp_linux.py -username wasadmin -password web1sphere`
  - \_\_\_ c. Wait until you see the following message in the command window:  
`ADMA5013I: Application BadAppEARProject installed successfully.`
- \_\_\_ 2. Verify that the application is installed and start it from the administrative console.
  - \_\_\_ a. Go to the administrative console and click **Applications > Application Types > WebSphere enterprise applications**.
  - \_\_\_ b. Check the box for **BadAppEARProject**, and click **Start**.

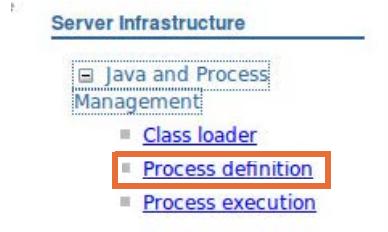


| Select                              | Name                               | Application Status |
|-------------------------------------|------------------------------------|--------------------|
| <input checked="" type="checkbox"/> | <a href="#">BadAppEARProject</a>   |                    |
| <input type="checkbox"/>            | <a href="#">DefaultApplication</a> |                    |
| <input type="checkbox"/>            | <a href="#">PlantsByWebSphere</a>  |                    |
| <input type="checkbox"/>            | <a href="#">ivtApp</a>             |                    |
| <input type="checkbox"/>            | <a href="#">query</a>              |                    |

Total 5

- \_\_\_ c. Wait for the application to start successfully. Its status changes to *started* (green arrow).

- \_\_\_ 3. Prepare server1 to log garbage collection data.
  - \_\_\_ a. Click **Servers > Server Types > WebSphere application servers > server1**.
  - \_\_\_ b. On the configuration tab, scroll down to **Server Infrastructure**, expand **Java and Process Management**, and click **Process definition**.



- \_\_\_ c. In the **Additional Properties** section, click **Java Virtual Machine**.



- \_\_\_ d. Check the box for **Verbose garbage collection**.

[Application servers > server1 > Process definition > Java Virtual Machine](#)

Use this page to configure advanced Java(TM) virtual machine settings.

|                               |                         |
|-------------------------------|-------------------------|
| <a href="#">Configuration</a> | <a href="#">Runtime</a> |
|-------------------------------|-------------------------|

**General Properties**

Classpath

Boot Classpath

Verbose class loading

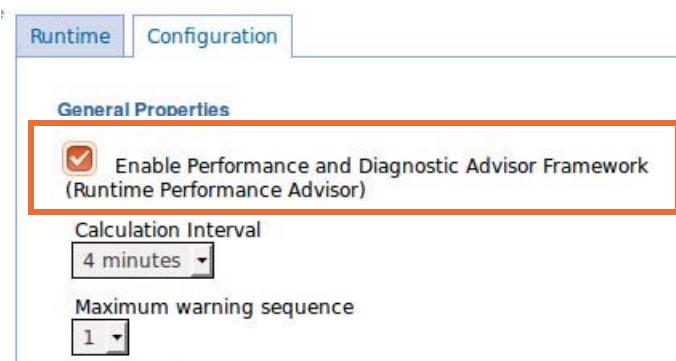
Verbose garbage collection

- \_\_\_ e. Click **OK**.
- \_\_\_ f. Click **Save** to save the configuration.

- \_\_\_ 4. Configure memory leak detection on server1.
  - \_\_\_ a. Click **server1** in the breadcrumb trail.
  - \_\_\_ b. On the configuration tab, scroll down to the **Performance** section and click **Performance and Diagnostic Advisor Configuration**.



- \_\_\_ c. Check the box for **Enable Performance and Diagnostic Advisor Framework (Runtime Performance Advisor)**.



- \_\_\_ d. Click **OK**. Click **OK** on the warning message.
- \_\_\_ e. Under **Additional Properties**, click **Performance and Diagnostic Advice configuration**.



- \_\_\_ f. Scroll down on the configuration tab to the entry for **Memory Leak Rule**. Verify that the status is started (solid green arrow).

|                          |                  |     |             |     |  |
|--------------------------|------------------|-----|-------------|-----|--|
| <input type="checkbox"/> | Memory Leak Rule | Jvm | Performance | Low |  |
|--------------------------|------------------|-----|-------------|-----|--|

- \_\_\_ g. Check the box for **Memory Leak Rule**. When this rule is checked, tuning advice is written to the JVM log files for a server when a possible memory leak is detected.

|                                     |                  |     |             |     |  |
|-------------------------------------|------------------|-----|-------------|-----|--|
| <input checked="" type="checkbox"/> | Memory Leak Rule | Jvm | Performance | Low |  |
|-------------------------------------|------------------|-----|-------------|-----|--|

- \_\_\_ h. Click **Save** to save the configuration.

- \_\_\_ i. Log out of the administrative console, and restart **server1**.
- \_\_\_ j. When you start server1 from the command window, notice the process ID and record it here: \_\_\_\_\_  
You need the PID to terminate the server process in the next section.

**Note**

You can also use the logViewer tool to monitor High Performance Extensible Logging (HPEL) log and trace repositories.

- Open a new command window, and go to: <profile\_root>/profile1/bin
- Enter the following command: ./logViewer.sh -monitor

- \_\_\_ 5. Run the application.

- \_\_\_ a. From a web browser, enter the web address:

`http://washost:9080/BadAppWebProject`

- \_\_\_ b. Enter a 5 in the **Bad Behavior Mode** window, and click **Submit**.

Bad Behavior Mode

Valid values for "Bad Behavior Mode" are:

- 1 - a particular condition you will be asked to analyze
- 2 - another condition for you to analyze
- 3 - a condition related to 2
- 4 - yet another condition you must analyze
- 5 - and another condition you must analyze

- \_\_\_ c. The browser seems to “hang” for awhile.

**Note**

The time that it takes to exhaust memory depends upon how much memory is available. In testing, it took an hour to run out of memory. Instructors can choose to lecture as the memory is exhausted. Alternatively, you can go to [Section 9, "READ ONLY: Using IBM Support Assistant tools to analyze JVM data,"](#) on page 5-43 and complete that section.

- \_\_\_ d. After some time, you see the following error message in the web browser:



## Return page for BadApp

**Request status:OutOfMemoryException was thrown (was this expected?), see WAS logs**

To run BadApp again, return to the BadApp home page.



### Information

An OutOfMemoryException is thrown. If the application was not purposely written to show the error message, you would see this symptom only if you examined the JVM logs of the **server1** process. It is likely that this OutOfMemory condition completely hung the application server so that it is unresponsive to a `stopServer` command. Before the `server1` process crashes, stop it with the following command.

- \_\_\_ a. From the command window, use the process ID that you recorded earlier, and enter:  
`kill -9 <PID>`
- ```
root@washost:/opt/IBM/WebSphere/AppServer/profiles/profile1/bin# kill -9 24668
```
- \_\_\_ 6. Examine the logs for `server1`.
    - \_\_\_ a. Start **server1**.
    - \_\_\_ b. Log in to the administrative console.
    - \_\_\_ c. Click **Troubleshooting > Logs and trace > server1 > View HPEL logs and trace**.

- \_\_ d. Expand **Content and Filtering Details**, and select the **previous** server instance.

[\*\*Logging and tracing > server1 > Log Viewer\*\*](#)

Use this page to view log data from the HPEL repository (group of common logs) or to export a customized view or full repository into a compressed file.

**Content and Filtering Details**

**Server Instance**

Server instances grouped by server start date and time:

- August 16, 2016
  - .... 05:38:30
  - .... 11:49:50
- August 17, 2016
  - .... 11:35:18
  - 11:48:12**
- August 25, 2016

- \_\_ e. In the **Filtering** section, enter `BadApp*` in the **Message contents** field.

**Filtering**

Wild cards: \*, ?, % are allowed  
Separate multiple entries by a ':'

Include loggers:	
Exclude loggers:	
Message contents:	<b>BadApp*</b>

- \_\_ f. Click **Apply**.

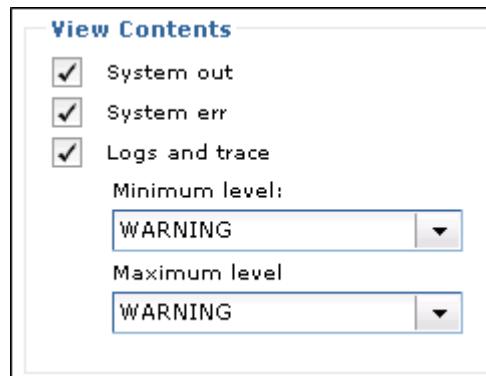
- \_\_\_ g. You now see the same messages that are shown in the command window. Select (highlight) any of these messages, and click **Show Only Selected Threads**.

TimeStamp	Thread ID	Logger	Level	Message
8/25/16, 06:51:38.609	000000B8	SystemOut	DETAIL	BadApp: Parameters passed from the user:
8/25/16, 06:51:38.609	000000B8	SystemOut	DETAIL	BadApp: Parameter 'badBehaviorMode' = 5
8/25/16, 06:52:49.448	000000B8	SystemOut	DETAIL	BadApp: Request has been running for 1 minutes.
8/25/16, 06:53:49.643	000000B8	SystemOut	DETAIL	BadApp: Request has been running for 2 minutes.
8/25/16, 06:54:50.222	000000B8	SystemOut	DETAIL	BadApp: Request has been running for 3 minutes.
8/25/16, 06:55:50.394	000000B8	SystemOut	DETAIL	BadApp: Request has been running for 4 minutes.
8/25/16, 06:56:51.029	000000B8	SystemOut	DETAIL	BadApp: Request has been running for 5 minutes.
8/25/16, 06:57:51.248	000000B8	SystemOut	DETAIL	BadApp: Request has been running for 6 minutes.
8/25/16, 06:58:51.818	000000B8	SystemOut	DETAIL	BadApp: Request has been running for 7 minutes.
8/25/16, 06:59:51.994	000000B8	SystemOut	DETAIL	BadApp: Request has been running for 8 minutes.
8/25/16, 07:00:52.553	000000B8	SystemOut	DETAIL	BadApp: Request has been running for 9 minutes.

- \_\_\_ h. You now have several pages of log records from the selected thread. Use **Next Page** on the Log Viewer to page through these records. After you reach the last BadApp message, you will see an OutOfMemoryError.

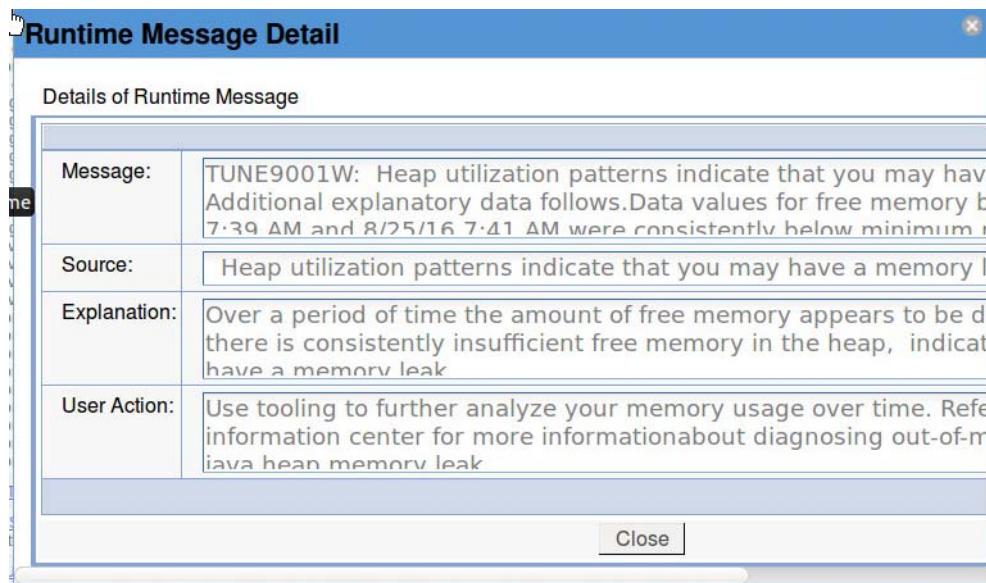
8/25/16, 07:38:03.585	000000B8	SystemOut	DETAIL	BadApp: Request has been running for 46 minutes.
8/25/16, 07:39:04.805	000000B8	SystemOut	DETAIL	BadApp: Request has been running for 47 minutes.
8/25/16, 07:40:05.747	000000B8	SystemOut	DETAIL	BadApp: Request has been running for 48 minutes.
8/25/16, 07:41:09.324	000000B8	SystemOut	DETAIL	BadApp: Request has been running for 49 minutes.
8/25/16, 07:42:30.069	000000B8	SystemOut	DFTAIL	BadApp: Request has been running for 50 minutes.
8/25/16, 07:43:37.199	000000B8	SystemOut	DETAIL	BadApp: hit an OutOfMemoryError (maybe as expected)

- \_\_\_ i. In the **View Contents** section, select **WARNING** for both Minimum and Maximum levels.



- \_\_\_ j. Clear the **Message content** field, and click **Apply**.

- \_\_\_ k. Page through the warning messages to look for a message from the Performance Advisor about memory leaks. It is possible that you might see a message with the code TUNE90001W, depending on how unresponsive your server was after the OutOfMemory exception. If you do see this message, click the **TUNE90001W** link to see details.



- \_\_\_ 7. Examine other JVM-related diagnostic memory dumps. Typically a server is configured to generate a javacore file and a heap memory dump on OutOfMemory exceptions. The default location for these files is the profile root directory.
- \_\_\_ a. Using a file system explorer, go to /opt/IBM/WebSphere/AppServer/profiles/profile1. You can see at least one system core, javacore, heap dump, and Snap file; it depends on how many OutOfMemoryError exceptions were thrown. Notice that each memory dump includes the server PID (in this example, 30397) in the file name.



## Information

### Default behavior for OutOfMemory exceptions

WebSphere Application Server Version 8 Fix Pack 2 and later includes IBM Java 6 R26 on supported operating systems. Beginning with this version, the default behavior for OutOfMemory (OOM) exceptions is changed.

By default in IBM Java 5 and later, the first four OOM exceptions for the lifetime of a Java process produce:

- A PHD-formatted heap memory dump
- A Java dump file (javacore)
- A snap dump file

By default in IBM Java 6 R26 and later, the first OOM for the lifetime of a Java process produces:

- A PHD-formatted heap memory dump
- A Java dump file
- A snap dump file
- An operating system memory dump (core file on Linux, AIX, and IBM i, user-mode minidump with full memory on Windows operating systems, and SYSTDUMP on z/OS)

The second, third, and fourth OOM exceptions produce only a PHD-formatted heap memory dump and a Java dump file. Therefore, the change in default behavior is an extra system memory dump on the first OOM exception.

### **Javacore file**

The javacore file, also known a thread dump file, is a text file and can be viewed with a text editor. An experienced administrator can analyze these files manually, but it is often better to use a tool such as the **IBM Thread and Monitor Dump Analyzer**. Using Thread and Monitor Dump Analyzer, you can import several javacores that are generated over a period during which the server is hung. Thread and Monitor Dump Analyzer can then do a comparative analysis of the threads over that period.

### **Heap dump file**

The heap dump file is a memory dump of all the Java objects on the JVM heap. It is a binary (.phd) file and must be analyzed by using a tool such as **Heap Analyzer** or **Memory Analyzer**.

### **System core file**

A system memory dump is a superset of a PHD heap memory dump. A system memory dump also includes memory contents (strings, primitives, variable names, and other objects), thread and frame local information, some native memory information, and more.

### **Snap file**

Snap trace files are binary files that contain trace point data that is held in the trace buffers at a point in time.

- \_\_\_ b. Using a file system explorer, go to:  
/opt/IBM/WebSphere/AppServer/profiles/profile1/logs/server1
- \_\_\_ c. Use a text editor to open the `native_stderr.log` file. This file is the default location for verbose GC data.

- \_\_\_ d. Search the verbose GC data for: JVMDUMP039I  
This search takes you to the GC data that is logged at the time of the OutOfMemory exception. Examine the allocation failure data just before the exception was thrown. You can see how much memory was requested (`bytesRequested`), how much heap was in use, and how much heap was free then (0 percent).
- \_\_\_ e. Close the `native_stderr.log` file when you are done examining it.



## Information

### Verbose garbage collection (GC) data

The verbose GC data is in text format, and an experienced administrator can analyze the file by hand. However, it is a good practice to use a tool such as **Garbage Collection and Memory Visualizer (GCMV)** to analyze GC data.

## **Section 8: Clean up server1**

Follow these steps to clean up server1 and uninstall the BadApp application.

- \_\_\_ 1. Disable verbose garbage collection.
  - \_\_\_ a. Click **Servers > Server Types > WebSphere application servers > server1**.
  - \_\_\_ b. On the configuration tab, scroll down to **Server Infrastructure**, expand **Java and Process Management**, and click **Process definition > Java Virtual Machine**.
  - \_\_\_ c. **Clear** the box for **Verbose garbage collection**.
  - \_\_\_ d. Click **OK**.
  - \_\_\_ e. Click **Save** to save the configuration.
- \_\_\_ 2. Disable the Runtime Performance Advisor.
  - \_\_\_ a. Click **server1** in the breadcrumb trail.
  - \_\_\_ b. On the configuration tab, scroll down to the **Performance** section and click **Performance and Diagnostic Advisor Configuration**.
  - \_\_\_ c. **Clear** the box for **Enable Performance and Diagnostic Advisor Framework**.
  - \_\_\_ d. Click **OK**.
  - \_\_\_ e. Click **Save** to save the configuration.
- \_\_\_ 3. Uninstall the BadApp application.
  - \_\_\_ a. Go to the administrative console.
  - \_\_\_ b. Click **Applications > Application Types > WebSphere enterprise applications**.
  - \_\_\_ c. Select **BadAppEarProject** and click **Uninstall**.
  - \_\_\_ d. Click **OK**.
  - \_\_\_ e. Click **Save** to save the configuration.
  - \_\_\_ f. Log out of the administrative console, and restart **server1**.

## Section 9: READ ONLY: Using IBM Support Assistant tools to analyze JVM data

Next, you can see and read about the analysis of JVM diagnostic data with various tools available in the IBM Support Assistant.



### Important

Section 9 is for **reference only**. The IBM Support Assistant workbench is **not** installed on the VMware image that is used for this course. You cannot run any of the tools that are described in the following section from the VMware image.



### Information

For more details and education resources about IBM Support Assistant Problem Determination Tools, go to the following websites:

- IBM Support Assistant website  
<http://www.ibm.com/software/support/isa/>
- The IBM Monitoring and Diagnostic Tools for Java, Memory Analyzer  
<http://www.ibm.com/developerworks/java/jdk/tools/memoryanalyzer/>
- The IBM Monitoring and Diagnostic Tools for Java, Garbage Collection, and Memory Visualizer (GCMV)  
<http://www.ibm.com/developerworks/java/jdk/tools/gcmv/>

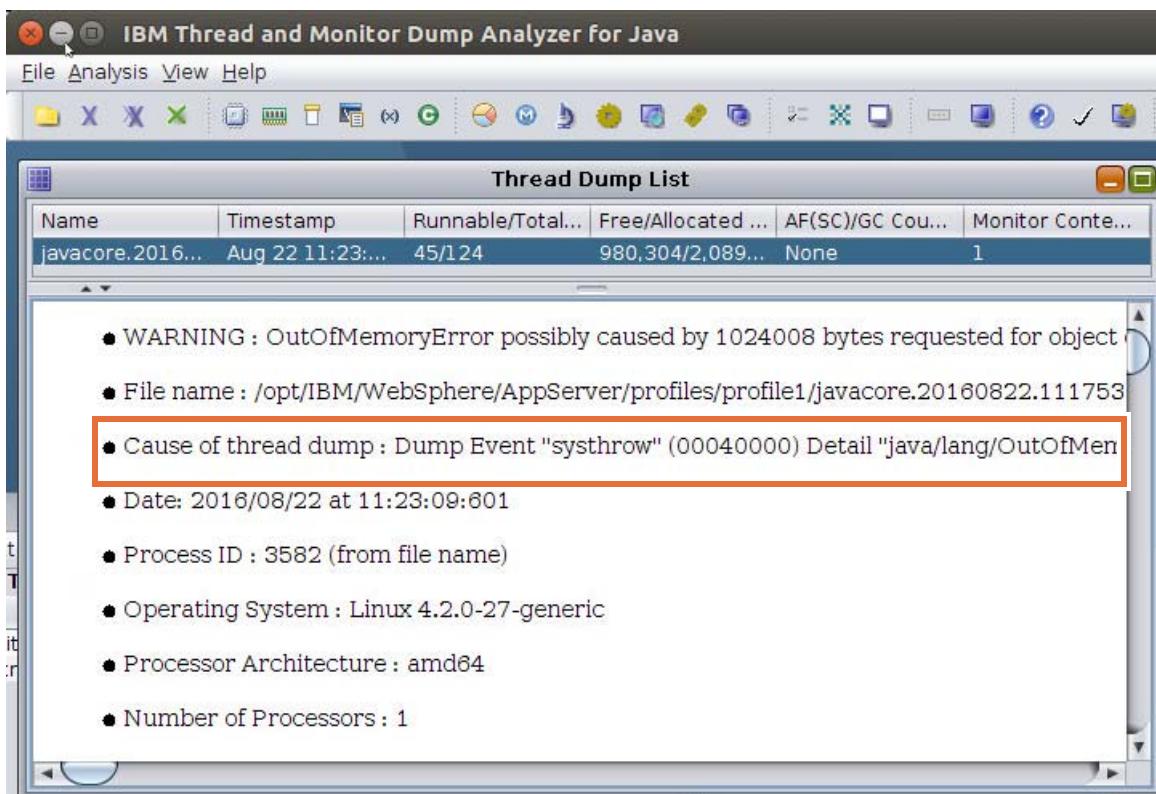
## Javacore analysis

The javacore file that is dumped during the OutOfMemory condition, which the BadApp application generated, is imported into the **IBM Thread and Monitor Dump Analyzer** tool and analyzed.

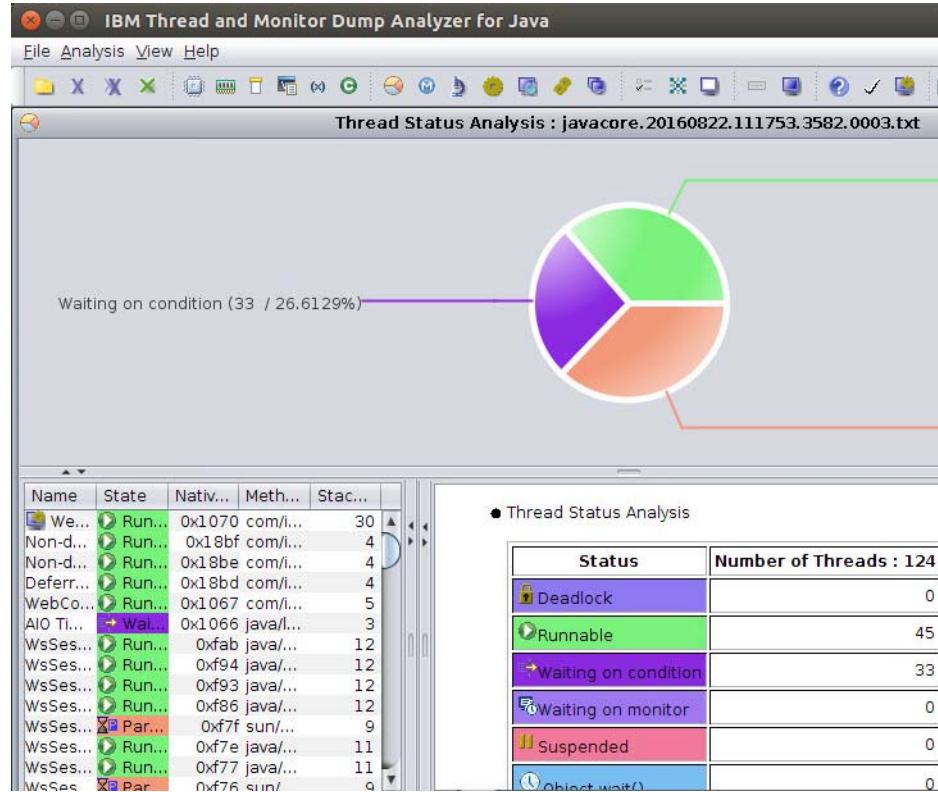
IBM Thread and Monitor Dump Analyzer for Java helps to find deadlocks, possible hung threads, and resource contention through its heuristic engine and analysis of the javacore.

Some of the features include:

- Summary of javacore
- Thread detail view
- Monitor detail view
- List of hang suspects
- Thread compare view
- Thread comparison summary
- Monitor lock compare view
- Garbage collector statistics for IBM JVM
- Comparative analysis of multiple javacores



The tool provides a brief report after it imports and analyzes a javacore. The report shows the javacore file name, the cause of the thread memory dump, and the process ID of the server instance. One or more warnings might be seen, indicating problems such as deadlocked threads or that the heap is exhausted. The warning in this screen capture shows that the Java heap is exhausted.



Right-clicking **Analysis** on the toolbar shows an analysis of the threads, monitors, or a comparative analysis of multiple javacores. This screen capture shows the thread analysis. On the left is a sortable list of all threads, their state, and the method where that thread is running. Clicking any thread name gives you a stack trace of the method and identifies what threads it is waiting on (if its state is Waiting), or what threads are possibly waiting on it. A table also summarizes the number of threads in each state.

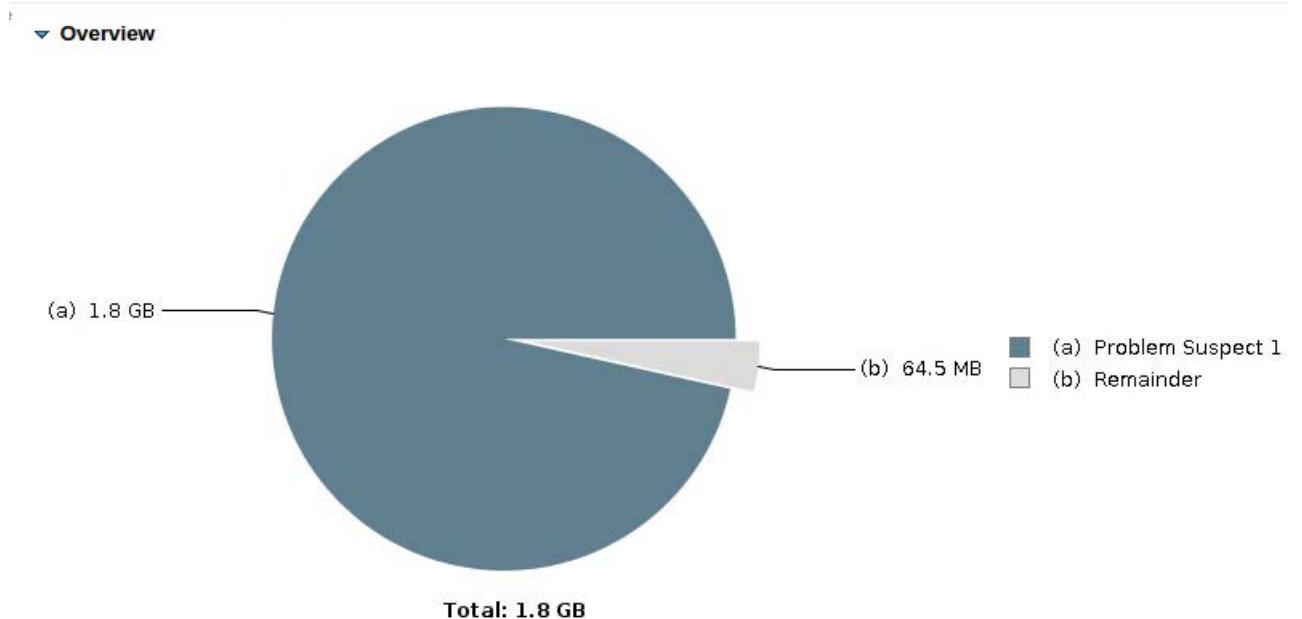
# Heap memory dump analysis

The heap dump file of the OutOfMemory condition is imported into the Memory Analyzer tool and analyzed.

The IBM Monitoring and Diagnostic Tools - Interactive Diagnostic Data Explorer is a fast and feature-rich Java heap analyzer that helps you find memory leaks and reduce memory consumption.

This tool can analyze memory dumps that contain millions of objects, providing the following information:

- The retained sizes of objects
- Processes that are preventing the garbage collector from collecting objects
- A report to automatically extract leak suspects
- Suitable memory dump types include:
  - Java heap dumps
  - IBM Portable Heap Dump (.phd) binary file
  - Oracle Java Virtual Machine (JVM) hprof binary heap dump
  - System dumps that an IBM JVM generates (processed with jextract where required)
  - z/OS SVC dumps that an IBM 1.4.2 JVM generates



[Leak Suspects](#) » [Leaks](#) » [Problem Suspect 1](#)

▼ Description

The class "com.ibm.issf.atjolin.badapp.BadAppServlet", loaded by "<system class loader>", occupies 1,879,165,056 (96.53%) bytes. The memory is accumulated in one instance of "java.lang.Object[]" loaded by "<system class loader>".

**Keywords**  
java.lang.Object[]  
com.ibm.issf.atjolin.badapp.BadAppServlet

One or more leak suspects are identified. The description of the single suspect in this analysis shows the class name and Java object, class loaders, and amount of heap occupied (96%+).

▼ Shortest Paths To the Accumulation Point 

Class Name	Shallow Heap	Retained Heap
 <a href="#">java.lang.Object[1851] @ 0x852baa30</a>	7,416	1,879,164,856
 <a href="#">java.util.ArrayList @ 0x86d54158</a>	24	1,879,164,880
 <a href="#">class com.ibm.issf.atjolin.badapp.BadAppServlet @ 0x8687f1c0 System Class</a>	128	1,879,165,056

The **shallow heap** is the amount of memory that one object requires. A **retained set** is one or more objects plus any objects that are referenced, directly or indirectly, only from those original objects. The retained set is the set of objects that garbage collection would remove when an object, or multiple objects, are collected during garbage collection. The **retained heap** is the total heap size of all the objects in the retained set. This value is the amount of memory of all the objects that are kept alive by the objects at the root of the retained set.

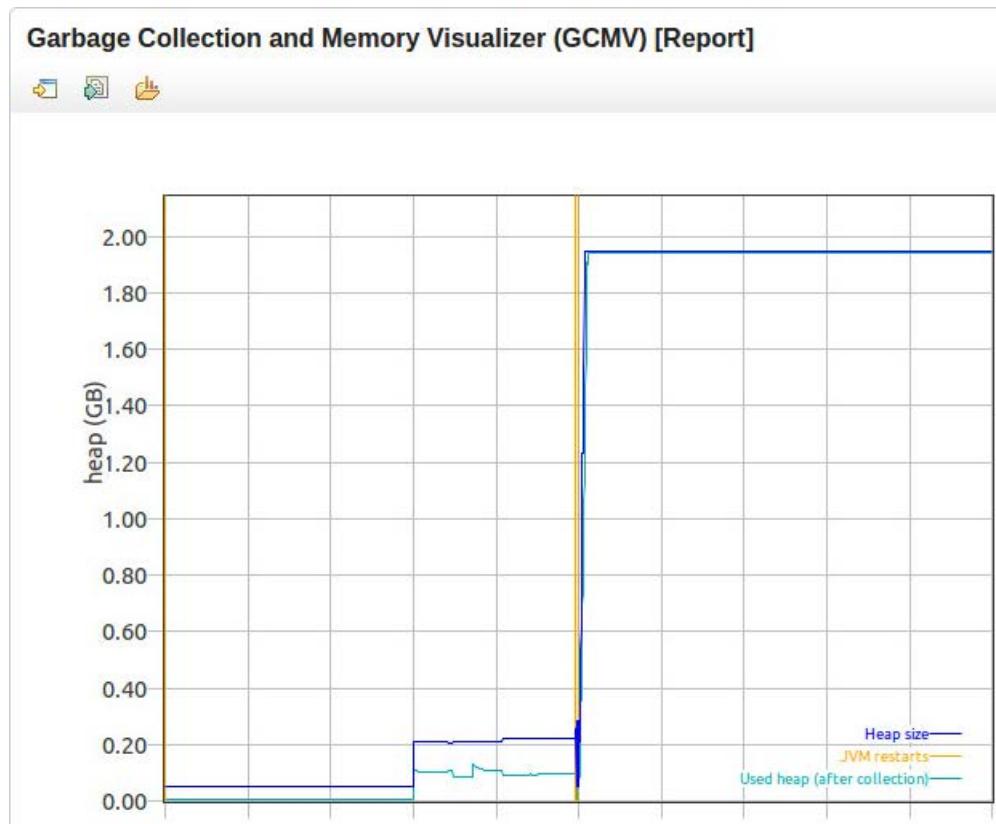
# Verbose GC data

The IBM Monitoring and Diagnostic Tools for Java – Garbage Collection and Memory Visualizer is a verbose GC data visualizer. The GC and Memory Visualizer parses and plots various log types, including verbose GC logs, `-Xtgc` output, and native memory logs (output from `ps`, `svmon`, and `perfmon`).

It provides:

- A graphical display of a wide range of verbose GC data values
- Tuning recommendations and detection of problems such as memory leaks
- Report, raw log, tabulated data, and graph views
- Saving of data to HTML reports, `.jpeg` images, or `.csv` files (for export to spreadsheets)
- Viewing and comparing multiple logs

## The line plot of the verbose GC data



The top line (blue-purple color) plots the heap size and the bottom line (aqua color) plots the used heap (after collection). The vertical line in orange-yellow color represents a restart of the JVM, so the data that is plotted here is for two instances of the application server. The left plots show a normal pattern. After the restart, the heap size expands close to the maximum heap size of 250 MB, signaling OutOfMemory exceptions.

## The report and recommendations

This screen capture is an excerpt from the report and tuning recommendations.

The screenshot shows a window titled "native\_stderr.log" with the following content:

**Source name**  
native\_stderr.log

**Tuning recommendation**

- ✖ The Java Heap has been exhausted, leading to an out of memory error. You should consider increasing the Java Heap size using -Xmx if allowed. You can analyse the usage of the Java Heap for a memory leak by using IBM Monitoring and Diagnostic Tools - Memory Analyzer.
- ✖ Compaction occurred due to extremely low heap memory. Compaction affects performance. Consider increasing the size of the heap.
- ⚠ At one point 6648 objects were queued for finalization. Using finalizers is not recommended as it can slow garbage collection and cause space in the heap. Consider reviewing your application for occurrences of the finalize() method. You can use IBM Monitoring and Diagnostic Tools - Memory Analyzer to list objects that are only retained through finalizers.
- ⚠ 32% of allocation failures were caused by large allocations. Consider using the Balanced GC policy for applications deployed on a 64-bit platform with a heap size greater than 4GB.
- ⚠ 8,836 global garbage collects took on average 660% longer than the average nursery collect. If you believe this is abnormally high and unusual, consider using the Balanced GC policy for applications deployed on a 64-bit platform with a heap size greater than 4GB.
- ⚠ The average memory occupancy of the nursery heap is 97% which is high. You may improve application performance by increasing the nursery size.

The tool provides a detailed report of object usage and recommendations for tuning garbage collection. Warnings about heap exhaustion, as shown in this example, are possible.

## Summary of GC data

### Summary

Concurrent collection count	12089
Forced collection count	6
GC Mode	gencon
Global collections - Mean garbage collection pause (ms)	215
Global collections - Mean interval between collections (ms)	29349
Global collections - Number of collections	12259
Global collections - Total amount tenured (MB)	24305260
Largest memory request (bytes)	5120008
Number of collections triggered by allocation failure	580
Nursery collections - Mean garbage collection pause (ms)	35.1
Nursery collections - Mean interval between collections (ms)	187462
Nursery collections - Number of collections	400
Nursery collections - Total amount flipped (MB)	4871
Nursery collections - Total amount tenured (MB)	1726
Proportion of time spent in garbage collection pauses (%)	0.74
Proportion of time spent unpause (%)	99.26
Rate of garbage collection (MB/minutes)	10.6

The summary of the GC data shows the GC mode, gencon in this example, and detailed statistics about the garbage collection that are helpful for tuning the performance of a JVM. In general, tuning requires minimizing pause times and maximizing time between collections. The largest memory request data might indicate a memory leak or the use of overly large objects in the application.

## End of exercise

## Exercise review and wrap-up

In this exercise, you learned how to use the administrative console to configure and view log data. You also learned how to configure a server to use HPEL and set up tracing on application server components. You used the HPEL Log Viewer to examine log and trace data. To gather diagnostic JVM-related data, you configured verbose garbage collection and memory leak detection for the application server. Finally, you saw how specific IBM Support Assistant tools can be used to analyze JVM memory dumps.

# Exercise 6. Using wsadmin

## Estimated time

01:00

## Overview

In this exercise, you learn how to use wsadmin to run administrative commands and scripts. You also learn how to write a simple script in Jython.

## Objectives

After completing this exercise, you should be able to:

- Use wsadmin to run administrative commands interactively and with scripts
- Create a simple administrative script
- Use console command assistance
- Use property file-based configuration to modify your settings

## Introduction

The WebSphere Application Server wsadmin tool can be used to run scripts for making configuration changes in the application server.

You can use the wsadmin tool to manage a WebSphere Application Server installation. This tool uses the Bean Scripting Framework (BSF), which supports various scripting languages to configure and control your WebSphere Application Server installation. The wsadmin tool supports the Jython and Jacl scripting languages. The Jython syntax for the wsadmin tool is the strategic direction for WebSphere Application Server administrative automation.

The wsadmin shell makes Java objects available through language-specific interfaces. Scripts use these objects for application management, configuration, operational control, and communication with MBeans running in the WebSphere server processes.

Scripting is a nongraphical alternative that you can use to configure and manage the WebSphere Application Server.

## Requirements

To complete this exercise, you must have WebSphere Application Server and PlantsByWebSphere installed and `profile1` defined.

## Section 1: Resetting the WebSphere environment



### Note

To reset your WebSphere environment, read **Appendix A** for instructions on how to complete this procedure.

## Section 2: wsadmin command-line arguments

The `wsadmin` utility can be used either interactively or to run scripts. This section describes some of the ways to start `wsadmin` and some of the command-line arguments that are available.

- 1. Confirm that the WebSphere Application Server is running.
- a. Enter the following commands to confirm that the application server is running (if prompted to authenticate, use `wasadmin` and `websphere`):

```
cd /opt/IBM/WebSphere/AppServer/profiles/profile1/bin
./serverStatus.sh -all
```

```
root@washost:/opt/IBM/WebSphere/AppServer/bin# ./serverStatus.sh -all
ADMU0116I: Tool information is being logged in file
/opt/IBM/WebSphere/AppServer/profiles/profile1/logs/serverStatus.log
ADMU0128I: Starting tool with the profile1 profile
ADMU0503I: Retrieving server status for all servers
ADMU0505I: Servers found in configuration:
ADMU0506I: Server name: server1
ADMU0509I: The Application Server "server1" cannot be reached. It appears to be
stopped.
```

- b. If the application server is not running, use the following command to start it:

```
./startServer.sh server1
```

```
root@washost:/opt/IBM/WebSphere/AppServer/bin# ./startServer.sh server1
ADMU0116I: Tool information is being logged in file
/opt/IBM/WebSphere/AppServer/profiles/profile1/logs/server1/startServer.log
ADMU0128I: Starting tool with the profile1 profile
ADMU3100I: Reading configuration for server: server1
ADMU3200I: Server launched. Waiting for initialization status.
ADMU3000I: Server server1 open for e-business; process id is 56849
root@washost:/opt/IBM/WebSphere/AppServer/bin#
```

\_\_ 2. Investigate the command-line arguments for wsadmin.

\_\_ a. From the bin directory, list the wsadmin command-line arguments with the following command:

```
./wsadmin.sh -help
```

```
root@washost:/opt/IBM/WebSphere/AppServer/bin# ./wsadmin.sh -help
WASX7001I: wsadmin is the executable for WebSphere scripting.

Syntax:

wsadmin
  [ -h(elp) ]
  [ -? ]
  [ -c <command> ]
  [ -p <properties_file_name> ]
  [ -profile <profile_script_name> ]
  [ -f <script_file_name> ]
  [ -javaoption java_option]
  [ -lang language]
  [ -wsadmin_classpath class_path]
  [ -profileName profile]
  [ -conntype
      SOAP
          [ -host host_name]
          [ -port port_number]
          [ -user userid]
          [ -password password] |
      RMI
          [ -host host_name]
          [ -port port_number]
          [ -user userid]
          [ -password password] |
```

\_\_ b. Notice the `-lang` argument. With this argument, you choose which interpreter to use. Start an interactive wsadmin session with the following command:

```
./wsadmin.sh
```

\_\_ c. When prompted to authenticate, use `wasadmin` for the user ID and `websphere` for the password. Depending on your environment, the prompt might open as a dialog box or in the command-line window.



## Information

Your choices for the language are the following languages:

- Jacl (a version of Java to a Tcl interpreter)
- Jython (a version of Java to a Python interpreter)

Even though the default language for wsadmin is Jacl, this lab exercise focuses on Jython. The Jacl support over the last few versions of WebSphere is limited, whereas the Jython tool and support continue to be enhanced. Customers are generally advised to use Jython instead of Jacl when possible.

- \_\_\_ d. The startup messages do not explicitly indicate which language is used.

```
root@washost:/opt/IBM/WebSphere/AppServer/bin# ./wsadmin.sh
WASX7209I: Connected to process "server1" on node washostNode01 using SOAP connector; T
WASX7031I: For help, enter: "print Help.help()"
wsadmin>■
```

- \_\_\_ e. To confirm which language is being used, type in an unknown command. For example, try the command `language` (which is not a defined term).

```
root@washost:/opt/IBM/WebSphere/AppServer/bin# ./wsadmin.sh
WASX7209I: Connected to process "server1" on node washostNode01 using SOAP connector;
WASX7031I: For help, enter: "print Help.help()"
wsadmin>language
WASX7015E: Exception running command: "language"; exception information:
com.ibm.bsf.BSFException: exception from Jython:
Traceback (most recent call last):
  File "<input>", line 1, in <module>
NameError: name 'language' is not defined
```



## Information

The first time that wsadmin is started with the Jython interpreter, you see a number of the following messages:

`processing new jar`

If you entered wsadmin commands in earlier exercises, you do not see the messages in this exercise.

- \_\_\_ f. Notice that the error message indicates an exception from Jython.

- \_\_\_ g. Use the following command to exit the wsadmin interactive mode:

`quit`

- \_\_\_ h. Start a new wsadmin session; use Jython as the language. Also, provide the user name and password directly on the command line. Use the following command:

`./wsadmin.sh -lang jacl -user wasadmin -password web1sphere`

- \_\_\_ i. Again, use the command `language` to see which interpreter is active.

```
root@washost:/opt/IBM/WebSphere/AppServer/bin# ./wsadmin.sh -lang jacl -user wasadmin -p
WASX7209I: Connected to process "server1" on node washostNode01 using SOAP connector; T
WASX7029I: For help, enter: "$Help help"
wsadmin>language
WASX7015E: Exception running command: "language"; exception information:
com.ibm.bsf.BSFException: error while eval'ing Jacl expression:
invalid command name "language"
  while executing
"language"
wsadmin>■
```

- \_\_\_ j. Notice that you are not prompted to authenticate since the user name and password are supplied on the command line.



## Information

The other command-line argument to take notice of is `-conntype` (connection type). Use this argument to specify which protocol is used when the wsadmin client communicates with the application server. The default protocol is SOAP. The other choices are RMI and NONE.

It is important to understand that the wsadmin client communicates with a running application server to retrieve information and to make configuration changes. The wsadmin process is just requesting the running application server to make configuration changes on its behalf.

The `-conntype NONE` approach means that a connection to a running application server is not made. Instead, the wsadmin process reads and writes directly to the application server configuration files, which can be useful if the application server is not starting because of a configuration problem.

```
root@washost:/opt/IBM/WebSphere/AppServer/profiles/profile1/bin# ./wsadmin.sh -conntype NONE
WASX7357I: By request, this scripting client is not connected to any server process. Certain cc
in local mode.
WASX7031I: For help, enter: "print Help.help()"
... ■ ■ ■
```

Notice that when the `-conntype NONE` is used, the wsadmin process starts with a message "this scripting client is not connected to any server process."

- \_\_\_ k. Use the following command to exit the wsadmin interactive mode:

`quit`

- \_\_\_ 3. Run wsadmin for a single command. You used wsadmin in an interactive mode, which means that you started wsadmin and are taken to an interactive prompt. This method starts wsadmin, enters a single wsadmin command, and exits out of wsadmin.
- \_\_\_ a. To enter a single command, use `-c <command>` directly on the command line. Enter the following command in the terminal window (when prompted, authenticate with wasadmin and websphere):

`./wsadmin.sh -c '$AdminApp list'`

```
localuser@washost:/opt/IBM/WebSphere/AppServer/profiles/profile1/bin$ ./wsadmin.
sh -c '$AdminApp list'
WASX7209I: Connected to process "server1" on node washostNode01 using SOAP conne
ctor; The type of process is: UnManagedProcess
DefaultApplication
PlantsByWebSphere
ivtApp
query
```

- \_\_\_ b. Next, use the following command to enter the same command in the Jython interpreter:

```
./wsadmin.sh -lang jython -c 'AdminApp.list()'
```

```
localuser@washost:/opt/IBM/WebSphere/AppServer/profiles/profile1/bin$ ./wsadmin.sh -lang jython -c 'AdminApp.list()'
WASX7209I: Connected to process "server1" on node washostNode01 using SOAP connector; The type of process is: UnManagedProcess
u'DefaultApplication\nPlantsByWebSphere\nivtApp\nquery'
localuser@washost:/opt/IBM/WebSphere/AppServer/profiles/profile1/bin$ █
```

- \_\_\_ c. Notice that the output is a little difficult to read. To make things easier, use the following command:

```
./wsadmin.sh -lang jython -c 'print AdminApp.list()'
```

```
localuser@washost:/opt/IBM/WebSphere/AppServer/profiles/profile1/bin
localuser@washost:/opt/IBM/WebSphere/AppServer/profiles/profile1/bin$ ./wsadmin.sh -lang jython -c 'print AdminApp.list()'
WASX7209I: Connected to process "server1" on node washostNode01 using SOAP connector; The type of process is: UnManagedProcess
DefaultApplication
PlantsByWebSphere
ivtApp
query
localuser@washost:/opt/IBM/WebSphere/AppServer/profiles/profile1/bin$ █
```



### Note

Use the following command to exit the wsadmin interactive mode:

```
quit
```



### Information

The wsadmin tool uses the workspace to hold configuration changes. You must save your changes to transfer the updates to the master configuration repository. If a scripting process ends and you did not save your changes, the changes are discarded. If you are using interactive mode with the wsadmin tool, you are prompted to save your changes before they are discarded. If you are using the `-c` option with the wsadmin tool, changes are automatically saved.



## Information

Using the `-c <command>` approach is not efficient since it requires starting a new wsadmin instance for each command. Another approach is to use the `-f <script-file-name>` command-line argument. Use this approach to have multiple wsadmin commands in a single file and run them as one continuous script. This approach starts a single wsadmin instance, runs all the wsadmin commands, and exits wsadmin. The load of the script approach is much less than using a number of `-c <command>` instances.

This exercise uses the `-f <script-file-name>` approach in a subsequent section.

### Section 3: Configuring the wsadmin environment

For some administrators, it can be helpful to change some of the default behaviors of the wsadmin environment.

- \_\_\_ 1. Configure your wsadmin security. In some cases, it is helpful to avoid typing in the authentication information with every startup of wsadmin.
  - \_\_\_ a. Use a text editor (for example, gedit) to open the profile's SOAP configuration file in the properties directory:

```
gedit
/opt/IBM/WebSphere/AppServer/profiles/profile1/properties/soap.client.props
```

```
localuser@washost:/opt/IBM/WebSphere/AppServer/profiles/profile1$ cd properties
localuser@washost:/opt/IBM/WebSphere/AppServer/profiles/profile1/properties$ gedit soap.client.props
```

- \_\_\_ b. Scroll down and look for the authentication information for `com.ibm.SOAP.loginUserId` and `com.ibm.SOAP.loginPassword`.

```
soap.client.props (/opt/IBM/WebSphere/AppServer/profiles/
Open Save Undo Redo Cut Copy Paste
soap.client.props x
#-----
# com.ibm.SOAP.securityEnabled=false
#
# -----
# - authenticationTarget      ( BasicAuth[default], KRB5.
#                               on a pure client for JMX
#
# -----
com.ibm.SOAP.authenticationTarget=BasicAuth
#
# -----
com.ibm.SOAP.loginUserId=
com.ibm.SOAP.loginPassword=
#-----
```

- \_\_\_ c. Enter wasadmin for **com.ibm.SOAP.loginUserId** and web1sphere for **com.ibm.SOAP.loginPassword**. These entries cause wsadmin (and other administrative scripts such as stopServer) to automatically authenticate by using these credentials.

```
*soap.client.props (/opt/IBM/WebSphere/AppServer/profiles/profile1/bin$)
#-----
# com.ibm.SOAP.securityEnabled=false
#-----
# - authenticationTarget      ( BasicAuth[def
#                               on a pure cli
#-----
com.ibm.SOAP.authenticationTarget=BasicAuth
#-----
com.ibm.SOAP.loginUserId=wasadmin
com.ibm.SOAP.loginPassword=web1sphere
#-----
```

- \_\_\_ d. **Save** the file.  
\_\_\_ e. **Close** the editor.



## Information

A separate properties file (`sas.client.props`) is used to configure RMI-based connections.

- \_\_\_ f. Start a new instance of wsadmin from the command line and notice that you are no longer prompted to authenticate.  
\_\_\_ g. Encode the password field within the properties file. This step helps obscure the password if someone happens to read the file. Enter the following command from the `bin` directory:

```
./PropFilePasswordEncoder.sh ../properties/soap.client.props <space>
com.ibm.SOAP.loginPassword
```

```
localuser@washost:/opt/IBM/WebSphere/AppServer/profiles/profile1/bin$ cd ..
localuser@washost:/opt/IBM/WebSphere/AppServer/profiles/profile1/bin$ ./PropFilePasswordEncoder.sh ../properties/soap.client.props com.ibm.SOAP.loginPassword
localuser@washost:/opt/IBM/WebSphere/AppServer/profiles/profile1/bin$
```

- \_\_\_ h. Open the properties file again.

```
localuser@washost:/opt/IBM/WebSphere/AppServer/profiles/profile1/bin$ ./PropFilePasswordEncoder.sh ../properties/soap.client.props com.ibm.SOAP.loginPassword
localuser@washost:/opt/IBM/WebSphere/AppServer/profiles/profile1/bin$ gedit ../properties/soap.client.props
```

- \_\_\_ i. Notice that the password is now encoded.

```
com.ibm.SOAP.authenticationTarget=BasicAuth
com.ibm.SOAP.loginUserId=wasadmin
com.ibm.SOAP.loginPassword={xor}KD09bjlwvNzot0g==
```

- \_\_\_ 2. Look at the wsadmin.properties file.

- \_\_\_ a. Using a text editor, open the wsadmin.properties file in the /opt/IBM/WebSphere/AppServer/profiles/profile1/properties directory. This file defines the default values for many of the wsadmin settings.
- \_\_\_ b. Scroll down and find the entry for com.ibm.ws.scripting.defaultLang. Notice that you can modify the default language wsadmin uses.

```
#-----
# The defaultLang property determines what scripting language to use.
# Supported values are jacl and jython.
# The default value is jython.
#
com.ibm.ws.scripting.defaultLang=jython
```

- \_\_\_ c. Scroll through the properties file and notice that you can also change other settings that include the default host, the default port, default protocol, and other settings.
- \_\_\_ d. **Close** the property file without saving any changes.

## **Section 4: Work with wsadmin administrative objects**

In this part of the exercise, you work within the wsadmin shell in the interactive mode. When the wsadmin shell starts, you are presented with a command prompt where you can run any valid command.

- \_\_\_ 1. Start a new wsadmin session with Jython.
- \_\_\_ a. From the terminal window, in the profile bin directory, enter the following command:  
./wsadmin.sh
- \_\_\_ 2. The five wsadmin administrative objects are:
  - **AdminControl**: Manages runtime objects
  - **AdminConfig**: Manages configuration object
  - **AdminApp**: Manages the installation of applications
  - **AdminTask**: Provides another task-oriented interface to all objects
  - **Help**: Provides help

Enter the following command to get general help:

```
print Help.help()
```



## Information

The purpose of this section is not to try to teach wsadmin syntax or how to script in Jython. Covering those topics would take much too long. The intention here is to provide a brief introduction to what some of the commands look like.

For more information, see the wsadmin scripting course. Additionally, the IBM Knowledge Center has a wealth of information.

An extra reference is a book titled *WebSphere Application Server Administration Using Jython* available through IBM Press. It can be found at:

<http://www.ibmpressbooks.com/bookstore/product.asp?isbn=0137009526>

- \_\_\_ 3. Investigate the AdminConfig object. Use the AdminConfig object to access and change the configuration information that is associated with a WebSphere Application Server environment.

- \_\_\_ a. Start by looking at the help specific to the AdminConfig object with the command:

```
print AdminConfig.help()
```

- \_\_\_ b. Notice that the help lists various commands that can be run. Investigate the AdminConfig methods by typing in the following commands:

```
print AdminConfig.list('DataSource')
print AdminConfig.attributes('DataSource')
```

- \_\_\_ 4. Investigate the AdminControl object. Use the AdminContol object to access and change the running objects within a WebSphere Application Server environment.

- \_\_\_ a. Start with looking at the help specific to the AdminControl object with the command:

```
print AdminControl.help()
```

- \_\_\_ b. Notice that the help lists various commands. Explore several of the AdminControl methods by typing in following commands:

```
print AdminControl.getHost()
print AdminControl.getPort()
```

- \_\_\_ 5. Investigate the AdminApp object. Use the AdminApp object to access and change the installed applications within a WebSphere Application Server environment.

- \_\_\_ a. Start with looking at the help specific to the AdminApp object with the command:

```
print AdminApp.help()
```

- \_\_\_ b. Notice that the help lists various commands that can be run. Enter a couple of the AdminApp methods by typing in following commands:

```
print AdminApp.list()
print AdminApp.listModules("PlantsByWebSphere")
```

- \_\_ 6. Investigate the AdminTask object. The AdminTask object is different from the previous Admin objects. AdminTask provides many task-oriented methods that make configuration and management of the WebSphere Application Server environment simpler. Instead of using numerous complex AdminConfig, AdminControl, and AdminApp steps, the AdminTask methods can accomplish the same things but in much easier ways.

- \_\_ a. Start with looking at the help specific to the AdminTask object with the command:

```
print AdminTask.help()
```

- \_\_ b. To get a list of available AdminTask commands, use the following command:

```
print AdminTask.help( '-commands' )
```



### Note

Use the following command to get a count of the number of AdminTask commands (over 1400 are listed in V9):

```
./wsadmin.sh -c "print AdminTask.help( '-commands' )" | wc -l
```

- \_\_ c. Investigate AdminTask methods by typing in following commands:

```
print AdminTask.listNodes()
print AdminTask.listServers()
print AdminTask.listKeyStores()
```



### Information

Many AdminTask functions support an interactive mode. This mode can be helpful since it prompts the user for each argument. It then creates and displays the final non-interactive command, which can be used when creating a script. For example, type in the following command:

```
AdminTask.listDatasources('[-interactive]')
```

Enter Node=washostNode01 for the scope. Choose F to complete the operation.

```
wsadmin>AdminTask.listDatasources('[-interactive]')
List the specified datasources.

List the datasources that are contained in the specified scope.

Scope string (scope): Node=washostNode01

List the specified datasources.

F (Finish)
C (Cancel)

Select [F, C]: [F]
WASX7278I: Generated command line: AdminTask.listDatasources('[-scope Node=washo
stNode01]')
u'Plants(cells/washostNode01Cell/nodes/washostNode01|resources.xml#DataSource_14
70317334244)'
wsadmin>
```

## Section 5: Creating a wsadmin script

The wsadmin syntax and interface are not intended for interactive use since they are too complex for administrators to remember all of the details. The true power comes with creating reusable scripts to complete your necessary operations.

This section of the exercise guides you through the process of creating a relatively simple script to install an application. To help make it simple, the ivtApp is used for this demonstration.

\_\_ 1. Start by uninstalling the ivtApp.

\_\_ a. From wsadmin instance with the Jython interpreter, use the following command to verify that the ivtApp is installed (feel free to copy and paste from /opt/labfiles/wsadmin/exercise-instructions.py):

```
print AdminApp.list()
```

```
wsadmin>print AdminApp.list()
DefaultApplication
PlantsByWebSphere
ivtApp
query
```

\_\_ b. Use the following command to check the AdminApp function to uninstall applications:

```
print AdminApp.help()
```

```
wsadmin>print AdminApp.help()
WASX7095I: The AdminApp object allows application objects to be manipulated
-- this includes installing, uninstalling, editing, and listing. Most
of the commands supported by AdminApp operate in two modes: the default
mode is one in which AdminApp communicates with the WebSphere server to
accomplish its tasks. A local mode is also possible, in which no
server communication takes place. The local mode operation is invoked
by bringing up the scripting client with no server connected using the
command line "-conntype NONE" option or setting the
"com.ibm.ws.scripting.connectionType=NONE" property in the
wsadmin.properties.
```

taskInfo	Shows detailed information pertaining to a given install task for a given file
<b>uninstall</b>	<b>Uninstalls an application, given an application name and an option string</b>
update	Updates an installed application
updateAccessIDs	Updates the user/group binding information with accessID from user registry for a given application
updateInteractive	Updates an installed application interactively
view	Views an application or module, given an application or module name

- \_\_\_ c. To get more information about the specific syntax, use the following command:

```
print AdminApp.help('uninstall')
```

```
wsadmin>print AdminApp.help('uninstall')
WASX7102I: Method: uninstall
```

Arguments: application name, options

Description: Uninstalls application named by "application name" using the options supplied by "options".

Method: uninstall

Arguments: application name

Description: Uninstalls the application specified by "application name" using default options.

```
wsadmin>
```

- \_\_\_ d. Notice that the only required argument is the name of the application.

- \_\_\_ e. Use the following command to uninstall the ivtApp:

```
AdminApp.uninstall('ivtApp')
```

```
wsadmin>AdminApp.uninstall('ivtApp')
```

ADMA5017I: Uninstallation of ivtApp started.  
ADMA5104I: The server index entry for WebSphere:cell=washostNode01Cell,node=washostNode01 is updated successfully.

ADMA5102I: The configuration data for ivtApp from the configuration repository is deleted successfully.  
ADMA5011I: The cleanup of the temp directory for application ivtApp is complete.

ADMA5106I: Application ivtApp uninstalled successfully.

...  
wsadmin>

- \_\_\_ f. Since the command changed a configuration file, a save is required. Use the following command to save the updates:

```
AdminConfig.save()
```



## Information

You can use the following command to see whether a save command is needed:

```
print AdminConfig.queryChanges()
```

If a save is needed, a list of changed files is listed. If no save is needed, the message There are no unsaved changes in this workspace shows.

```
wsadmin>print AdminConfig.queryChanges()
WASX7241I: There are no unsaved changes in this workspace.
wsadmin>
```

- \_\_ 2. Use the administrative console to verify that the ivtApp is no longer installed.  
 \_\_ a. Click **Applications > Application Types > WebSphere enterprise applications**.

Select	Name	Application Status
<input type="checkbox"/>	<a href="#">DefaultApplication</a>	
<input type="checkbox"/>	<a href="#">PlantsByWebSphere</a>	
<input type="checkbox"/>	<a href="#">query</a>	

- \_\_ 3. Use wsadmin to install the ivtApp manually.  
 \_\_ a. Return to the interactive wsadmin session and use the following commands to verify that the installation command exists and what arguments are needed:

```
print AdminApp.help()  
print AdminApp.help('install')
```

- \_\_ b. Now that you see only the EAR file is needed, use the following commands to install the ivtApp:

```
AdminApp.install('/opt/IBM/WebSphere/AppServer/installableApps/ivtApp.ear')
AdminConfig.save()
```

```
wsadmin>AdminApp.install('/opt/IBM/WebSphere/AppServer/installableApps/ivtApp.ea
r')
ADMA0080W: A template policy file without any permission set is included in the
1.2.x enterprise application. You can modify the Java 2 Security policy for the
enterprise application by editing the was.policy file that is located in the ${u
ser.install.root}/config/cells/(yourCellName)/applications/(yourAppName).ear/dep
loyments/(yourAppName)/META-INF directory after the application is installed.
WASX7327I: Contents of was.policy file:
//
// Template policy file for enterprise application.
// Extra permissions can be added if required by the enterprise application.
//
// NOTE: Syntax errors in the policy files will cause the enterprise application
FAIL to start.
// Extreme care should be taken when editing these policy files. It is adv
ised to use
//      the policytool provided by the JDK for editing the policy files
//      (WAS_HOME/java/jre/bin/policytool).
//

grant codeBase "file:${application}" {
};

grant codeBase "file:${jars}" {
};
```

```
ation Server repository.
ADMA5005I: The application IVT Application is configured in the WebSphere Application Server repository.
ADMA5081I: The bootstrap address for client module is configured in the WebSphere Application Server repository.
ADMA5053I: The library references for the installed optional package are created .
ADMA5005I: The application IVT Application is configured in the WebSphere Application Server repository.
ADMA5001I: The application binaries are saved in /opt/IBM/WebSphere/AppServer/pr
ofiles/profile1/wstemp/Script156ef62ba96/workspace/cells/washostNode01Cell/applic
ations/IVT Application.ear/IVT Application.ear
ADMA5005I: The application IVT Application is configured in the WebSphere Application Server repository.
SECJ0400I: Successfully updated the application IVT Application with the appCont
extIDForSecurity information.
ADMA5005I: The application IVT Application is configured in the WebSphere Application Server repository.
ADMA5005I: The application IVT Application is configured in the WebSphere Application Server repository.
ADMA5113I: Activation plan created successfully.
ADMA5011I: The cleanup of the temp directory for application IVT Application is complete.
ADMA5013I: Application IVT Application installed successfully.

wsadmin>AdminConfig.save()
wsadmin>
```

- \_\_\_ c. Confirm that the ivtApp is installed by refreshing the administrative console or by using the command:

```
print AdminApp.list()
```

```
wsadmin>print AdminApp.list()
DefaultApplication
IVT Application
PlantsByWebSphere
query
wsadmin>
```

- \_\_\_ d. Type `exit` to exit interactive mode.
- \_\_\_ 4. Automate the installation by creating a script to install the ivtApp. To create this script, use the commands that you used in the previous step and add them to a script file.
- \_\_\_ a. To save time, the script is already created for you. Using an editor such as `gedit`, open `/opt/labfiles/wsadmin/install-IVT-v1.py`.

```
# install-IVT-v1.py:
#     - script to install the ivtApp
#     - no error handling
#
#-----

print "Installing the ivtApp"
AdminApp.install( '/opt/IBM/WebSphere/AppServer/installableApps/ivtApp.ear' )
AdminConfig.save()
print "Done"
```

- \_\_\_ b. Notice that the commands that you typed in manually during the previous step are duplicated here in the script.

- \_\_\_ c. Open a new terminal window and go to the profile bin directory. Enter the following command to run the script:

```
./wsadmin.sh -f /opt/labfiles/wsadmin/install-IVT-v1.py
```

```
localuser@washost:/opt/IBM/WebSphere/AppServer/profiles/profile1/bin$ ./wsadmin.sh -f /opt/labfiles/wsadmin/install-IVT-v1.py
WASX7209I: Connected to process "server1" on node washostnode01 using SOAP connector; The type of process is: UnManagedProcess
Installing the ivtApp
ADMA0080W: A template policy file without any permission set is included in the 1.2.x enterprise application. You can modify the Java 2 Security policy for the enterprise application by editing the was.policy file that is located in the ${user.install.root}/config/cells/(yourCellName)/applications/(yourAppName).ear/deployments/(yourAppName)/META-INF directory after the application is installed.
WASX7327I: Contents of was.policy file:
// Template policy file for enterprise application.
// Extra permissions can be added if required by the enterprise application.
//
// NOTE: Syntax errors in the policy files will cause the enterprise application
FATAL ERROR
```

- \_\_\_ d. Notice the error message because the ivtApp is already installed.



#### Note

Notice that you were not required to authenticate because you entered the user name and password in the soap.client.props file.

- \_\_ 5. Upgrade the script to add some error handling. A second script (version 2) is already created, which checks to see whether the application exists.

- \_\_ a. Open /opt/labfiles/wsadmin/install-IVT-v2.py in an editor.

```
# install-IVT-v2.py:
#     - script to install the ivtApp
#     - adds some error handling to see if app is already installed
#
#-----

print "Installing the ivtApp"

if "IVT Application" not in AdminApp.list().splitlines() :
    AdminApp.install( "/opt/IBM/WebSphere/AppServer/installableApps/ivtApp.ear" )
    AdminConfig.save()
else:
    print
    print "Error: the ivtApp application is already installed"
    print

print "Done"
```

- \_\_ b. Notice the additional logic, which uses the AdminApp.list() function to see whether the ivtApp is already installed.
- \_\_ c. From the command line, use the following command to run the install-IVT-v2.py script:

```
./wsadmin.sh -f /opt/labfiles/wsadmin/install-IVT-v2.py
```

```
localuser@washost:/opt/IBM/WebSphere/AppServer/profiles/profile1/bin$ ./wsadmin.sh -f /opt/labfiles/wsadmin/install-IVT-v2.py
WASX7209I: Connected to process server1 on node WASHOSTNODE01 using SOAP connector; The type of process is: UnManagedProcess
Installing the ivtApp

Error: the ivtApp application is already installed

Done
localuser@washost:/opt/IBM/WebSphere/AppServer/profiles/profile1/bin$ █
```

- \_\_ d. Notice that the script is successful in detecting the error.

- \_\_\_ 6. If the ivtApp is installed, upgrade the script.

- \_\_\_ a. Open /opt/labfiles/wsadmin/install-IVT-v3.py in an editor.

---

```

#####
#
# install-IVT-v3.py:
#   - script to install the ivtApp
#   - adds some error handling to see if app is already installed
#   - if the app is already installed, do an update instead of an install
#
#-----

print "Installing the ivtApp"

if "IVT Application" not in AdminApp.list().splitlines() :
    AdminApp.install( "/opt/IBM/WebSphere/AppServer/installableApps/ivtApp.ear" )
    AdminConfig.save()

else :
    print
    print "WARNING: the ivtApp application is already installed"
    print "Attempting to UPDATE"
    print
    AdminApp.update( "IVT Application", "app", "[ -operation update -contents /opt/IBM/We
installableApps/ivtApp.ear ]" )
    AdminConfig.save()

print "Done"

```

- \_\_\_ b. Notice the new steps in the else block. Instead of printing an error message, a warning message is provided and the AdminApp.update function is used to update the application.

- \_\_\_ c. From the command line, use the following command to run the script install-IVT-v3.py:

```
./wsadmin.sh -f /opt/labfiles/wsadmin/install-IVT-v3.py
```

```
localuser@washost:/opt/IBM/WebSphere/AppServer/profiles/profile1/bin$ ./wsadmin.sh -f /opt/labfiles/wsadmin/install-IVT-v3.py
WASX7209I: Connected to process "server1" on node washostNode01 using SOAP connector; The type of process is: UnManagedProcess
Installing the ivtApp
WARNING: the ivtApp application is already installed
Attempting to UPDATE

ADMA0080W: A template policy file without any permission set is included in the 1.2.x enterprise application. You can modify the Java 2 Security policy for the enterprise application by editing the was.policy file that is located in the ${user.install.root}/config/cells/(yourCellName)/applications/(yourAppName).ear/deployments/(yourAppName)/META-INF directory after the application is installed.
WASX7327I: Contents of was.policy file:
// Template policy file for enterprise application.
// Extra permissions can be added if required by the enterprise application.
//
// NOTE: Syntax errors in the policy files will cause the enterprise application FAIL to start.
```

```
ADMA5005I: The application IVT Application is configured in the WebSphere Application Server repository.
ADMA5113I: Activation plan created successfully.
ADMA5011I: The cleanup of the temp directory for application IVT Application is complete.
ADMA5013I: Application IVT Application installed successfully.
Done
```

- \_\_\_ d. Notice that the script successfully updates the ivtApp.
- \_\_\_ 7. Examine the next version of the script, which supports entering arguments from the command line.
- \_\_\_ a. Open /opt/labfiles/wsadmin/install-IVT-v4.py in an editor.

- \_\_\_ b. Notice that the code now supports defining the application as a command-line argument.

```
#     - adds some error handling to see if app is already installed
#     - if the app is already installed, do an update instead of an install
#     - if present, get arguments off the command line
#
#-----

args = len( sys.argv )                                     1
if args in [ 0, 2 ] :                                     2
    if args == 0 :                                       3
        appName = "IVT Application"                      4
        earFile = "/opt/IBM/WebSphere/AppServer/installableApps/ivtApp.ear" 5
    else :
        appName, earFile = sys.argv[ :2 ]                6

print "Installing the", appName                         7

if appName not in AdminApp.list().splitlines() :          8
    AdminApp.install( earFile )                          9
    AdminConfig.save()
else :
    print                                         10
    print "WARNING: the ivtApp application is already installed" 11
    print "Attempting to UPDATE"                       12
    print                                         13
    AdminApp.update( "IVT Application", "app", "[ -operation update -contents %s ]" % earF 14
    AdminConfig.save()

print "Done"                                              15
```



### Information

Going through this process iteratively can help create automated scripts for your administrative needs. However, figuring out the specific commands and syntax for the necessary tasks can be a challenge. Helpful resources include the following examples:

- Console command assistance
- Script library examples
- AdminTask functions
- Information center
- Searching the web for examples

## Section 6: Using console command assist

Sometimes it is challenging to figure out what wsadmin commands are necessary to use. One useful tool is the console itself. The administrative console, in some cases, can show the command that it uses to effect certain configuration changes. You can then copy these commands and use them in your scripts.



## Information

Not all configuration commands are shown in the console. With each new release of the WebSphere Application Server, the number of administrative console actions that show these commands increases.

To further simplify this process, the IBM Assembly and Deploy Tools can communicate directly with the administrative console, receive the wsadmin commands, and make them available for inserting into your scripts.

In this exercise, you set up the administrative console and IBM Assembly and Deploy Tools to communicate with each other.

- \_\_\_ 1. Enable command assistance in the administrative console.
  - \_\_\_ a. Verify that server1 is running
  - \_\_\_ b. Using the administrative console, click **System administration > Console Preferences**.



- \_\_\_ c. Select both **Enable command assistance notifications** and **Log command assistance commands**.

Cell=washostNode01Cell, Profile=profile1

The screenshot shows the 'Console preferences' page with the following configuration:

- Turn on workspace automatic refresh
- No confirmation on workspace discard
- Use default scope
- Show the help portlet
- Enable command assistance notifications
- Log command assistance commands

A red box highlights the last two items: 'Enable command assistance notifications' and 'Log command assistance commands'.

- \_\_\_ d. Click **Apply**.

- \_\_\_ 2. View a simple command assist output.
- Click **Applications > Application Types > WebSphere enterprise applications**.
  - On the far right, under **Help**, click **View administrative scripting command for last action**.

The screenshot shows the 'WebSphere enterprise applications' page with the following interface elements:

- Buttons: Create, Remove File, Export, Export DDL, Export File.
- Section: Application Status with icons for status and deployment.
- Section: Command Assistance with the link [View administrative scripting command for last action](#) highlighted by a red box.

A red box highlights the 'Command Assistance' section and its link.

- \_\_\_ c. A new browser window is displayed. Notice that the `wsadmin` command for the last operation that you ran in the administrative console is listed.

Administrative Scripting Command
<a href="#">AdminApp.list()</a>

Total 1

- \_\_\_ 3. View the command assist log. In a previous step, you configured command assistance, which writes commands to a log file.
- \_\_\_ a. Using a terminal window, go to the `server1` log directory. This directory is at `/opt/IBM/WebSphere/AppServer/profiles/profile1/logs/server1`.
- \_\_\_ b. Use the `tail` command to monitor the updates to the command assist log file. Enter the following command:

```
tail -f commandAssistanceJythonCommands_wsadmin.log
```

```
localuser@washost:/opt/IBM/WebSphere/AppServer/profiles/profile1/logs/server1$ tail commandAssistanceJythonCommands_wsadmin.log
```

## Information

The `tail -f` command initially displays the last 10 lines of a file. The `-f` option causes the `tail` utility to continue displaying new entries in the log file until the user stops the `tail` (usually with a Ctrl-C).

- \_\_\_ c. Leave the command window active, and return to the administrative console. While entering the next few commands in the administrative console, make sure to watch the updates in the command window.
- \_\_\_ d. In the administrative console:
- \_\_\_ Go to **Resources > JDBC > JDBC providers**.
  - \_\_\_ Click **DB2 Universal JDBC Driver Provider (XA)**.
  - \_\_\_ From the navigation menu, click **Data sources**.
  - \_\_\_ Click **Plants**.
  - \_\_\_ Change the description of the data source to: Used by Plants application
  - \_\_\_ Click **OK**.
  - \_\_\_ Save the changes.

\_\_ e. Return to the command window and notice all of the updates that are made in tail.

```
localuser@washost:/opt/IBM/WebSphere/AppServer/profiles/profile1/logs/server1$ tail commandAssistanceJythonCommands_wasadmin.log
AdminConfig.list('DataSource', AdminConfig.getid( '/Cell:washostNode01Cell/Node:washostNode01/'))

# [9/4/16 4:42:01:683 EDT] Data sources
AdminConfig.save()

# Note that scripting list commands may generate more information than is displayed by the administrative console because the console generally filters with respect to scope, templates, and built-in entries.

# [9/4/16 4:42:02:070 FDT] DataSource
AdminConfig.list('DataSource', AdminConfig.getid( '/Cell:washostNode01Cell/Node:washostNode01/'))

localuser@washost:/opt/IBM/WebSphere/AppServer/profiles/profile1/logs/server1$
```

\_\_ f. Enter **Ctrl-C** in the tail utility to stop it.

---



### Information

Although the command assistance is not always complete, it provides the administrator a good starting point when attempting to create a wsadmin script.

The log file records all the action in the console for later viewing. The information can also be made available to various tools such as IBM Assembly and Deploy Tools.

---

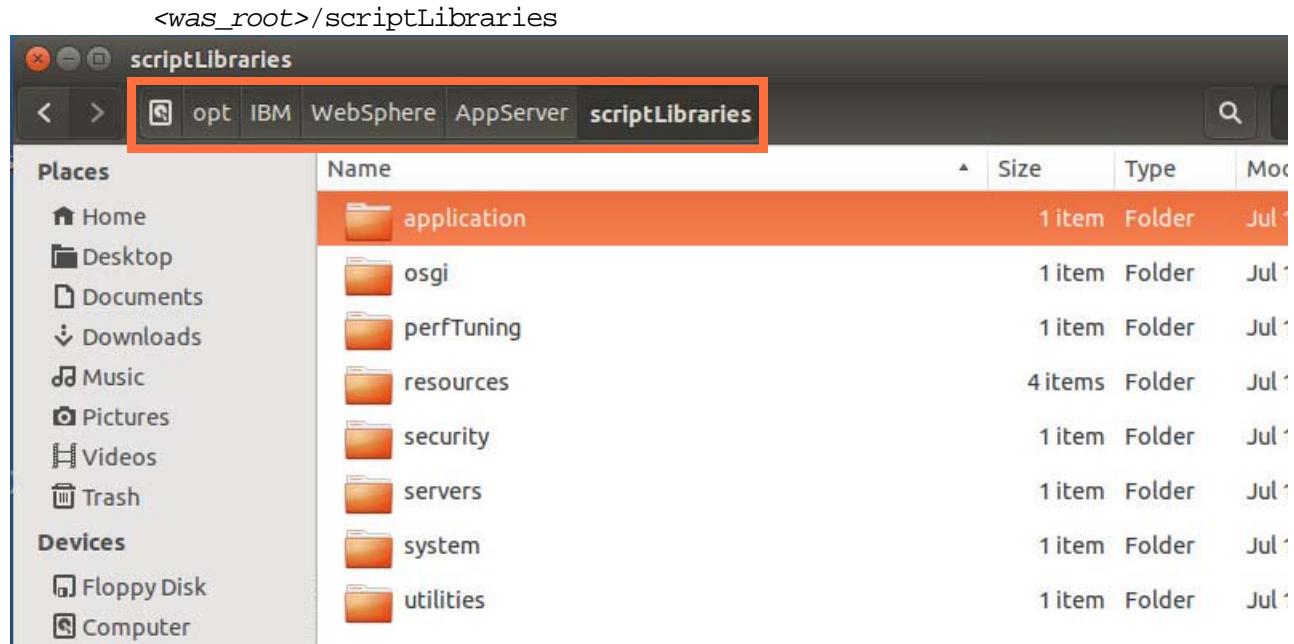
## **Section 7: Exploring the scripting libraries**

Many scripting operations are simple and straightforward. However, other operations might require a bit of investigation, reading, and trial and error. To help users overcome the complexity of scripting, WebSphere Application Server comes with a set of script libraries.

In this part of the lab, you examine the available libraries and explore what they provide.

\_\_ 1. Examine the libraries.

\_\_ a. Open File Browser and go to the following folder:



\_\_ b. Open each of the subfolders and discover the names of the libraries:

*Table 4. Scripting libraries*

Directory location	Script library
application\V70	AdminApplication AdminBLA
osgi	osgiApplicationConsole.py
perfTuning\V70	ApplyPerfTuning.py
resources\J2C\V70	AdminJ2C
resources\JDBC\V70	AdminJDBC
resources\JMS\V70	AdminJMS
resources\Provider\V70	AdminResources
security\V70	AdminAuthorizations
servers\V70	AdminClusterManagement AdminServerManagement
system\V70	AdminNodeGroupManagement AdminNodeManagement
utilities\V70	AdminLibHelp AdminUtilities

**Note**

All of these libraries are loaded when wsadmin starts and are readily available from the wsadmin command prompt, or to be used from your own scripts. Even though source code is provided, it is not meant for the user to modify this code. Users of the libraries call code in the libraries from their own scripts. You can copy parts of the library code to other files and modify the copied code to improve it or better suit your needs.

- 
- \_\_\_ c. You can open the libraries in a text editor and look at the code. This code is documented, and exceptions and other errors are handled smoothly by providing meaningful error messages to the calling scripts. Use a text editor to open the AdminJDBC script library:

```
<was_root>/scriptLibraries/resources/JDBC/V70/AdminJDBC.py
```

Each library has after the usual copyright and disclaimer statement, a list of procedure examples. The AdminJDBC library has 13 example functions:

- **Ex1:** `createJDBCProvider`  
Create a JDBC provider in your environment.  
The script returns the configuration ID of the new JDBC provider.
- **Ex2:** `createJDBCProviderUsingTemplate`  
Use a template to create a JDBC provider.
- **Ex3:** `listJDBCProviderTemplates`  
Show a list of configuration IDs for the JDBC provider templates.
- **Ex4:** `createDataSource`  
Create a data source in your configuration.  
The script returns the configuration ID of the new data source.
- **Ex5:** `createDataSourceUsingTemplate`  
Use a template to create a data source in your configuration.  
The script returns the configuration ID of the new data source.
- **Ex6:** `listDataSourceTemplates`  
Show a list of configuration IDs for the data source templates.
- **Ex7:** `listJDBCProviders`  
Show a list of configuration IDs for the JDBC providers.
- **Ex8:** `listDataSources`  
Show a list of configuration IDs for the data sources.
- **Ex9:** `help`  
Show AdminJDBC script library online help.
- **Ex10:** `createJDBCProviderAtScope`  
Create a JDBC provider at scope.
- **Ex11:** `createJDBCProviderUsingTemplateAtScope`  
Use the template at scope to create a JDBC provider.
- **Ex12:** `createDataSourceAtScope`  
Create a data source at scope.
- **Ex13:** `createDataSourceUsingTemplateAtScope`  
Use the template at scope to create a data source.

Go to **Example 7: listJDBCProviders**. These functions show operations at a higher level than the administrative objects provide. In addition, these scripts provide a better abstraction to the script writer.

---

```

Example 7 list JDBCProviders ##
# listJDBCProviders( JDBCName=AdminUtilities._BLANK_, failonerror=AdminUtilities._BLANK_
if(failonerror==AdminUtilities._BLANK_):
    failonerror=AdminUtilities._FAIL_ON_ERROR_
#endif
msgPrefix = "listJDBCProviders(" +`JDBCName` +", "+`failonerror` +")": " "
try:
    #-----
    # List JDBCProviders
    #-----
    print "-----"
    print " AdminJDBC:           listJDBCProviders"
    print " Optional parameter:"
    print " JDBC provider name:   "+JDBCName
    if (len(JDBCName) == 0):
        print " Usage: AdminJDBC.listJDBCProvider()"
    else:
        print " Usage: AdminJDBC.listJDBCProvider(\""+JDBCName+"\")"

```

---

Examine the example functions that the library provides. Close the file when you are done examining it.

- \_\_\_ d. A similar listing of functions available in a library can be obtained with the `help()` method. At the wsadmin prompt, enter:

```
print AdminJDBC.help()
```

- \_\_\_ e. As with the administrative objects, you can get help on a specific method. Enter:

```
print AdminJDBC.help("listJDBCProviders")
```

- \_\_\_ f. Not only can you use these commands in your own scripts, but you can run the commands directly. Enter:

```
print AdminJDBC.listJDBCPproviders()
```

```
wsadmin>print AdminJDBC.listJDBCPproviders()
-----
AdminJDBC:           listJDBCPproviders
Optional parameter:
JDBC provider name:
Usage: AdminJDBC.listJDBCPprovider()
Return: List the JDBC provider configuration IDs of the requested Java Database Connectivity (JDBC) name or list all of the available JDBC provider configuration IDs if a JDBC name parameter is not specified in the respective cell
-----
['"DB2 Universal JDBC Driver Provider (XA)(cells/washostNode01Cell/nodes/washostNode01/servers/server1|resources.xml#JDBCProvider_1468345632339)"', '"DB2 Universal JDBC Driver Provider (XA)(cells/washostNode01Cell/nodes/washostNode01|resources.xml#JDBCProvider_1467815995003)"', '"DB2 Universal JDBC Driver Provider (XA)(cells/washostNode01Cell/nodes/washostNode01|resources.xml#JDBCProvider_1468873818423)"', '"DB2 Universal JDBC Driver Provider (XA)(cells/washostNode01Cell/nodes/washostNode01|resources.xml#JDBCProvider_1469223558126)"', '"DB2 Universal JDBC Driver Provider (XA)(cells/washostNode01Cell/nodes/washostNode01|resources.xml#JDBCProvider_1470317333500)"', '"Derby JDBC Provider (XA)(cells/washostNode01Cell/nodes/washostNode01|resources.xml#builtin_jdbcprovider)"', '"Derby JDBC Provider (XA)(cells/washostNode01Cell|resources.xml#builtin_jdbcprovider)"', '"Derby JDBC Provider(cells/washostNode01Cell/nodes/washostNode01|server1|resources.xml#JDBCProvider_1183122153343)"']
wsadmin>
```

As with any new library system, it takes a while to become familiar and comfortable with the available functions. By combining these library functions with your own scripting logic in your Jython scripts, you can write scripts to configure your application servers.

## ***Section 8: Using properties file-based configuration***

WebSphere Application Server provides a set of utilities for working with server configurations by using properties files. You can create a properties file of human readable key-value pairs that are based on your environment. You can modify the properties files and apply the updated configurations to a server. The objective of this portion of the lab is to provide you with a basic understanding of this technique for administering your environment by using property files.

You extract the EndPoint resource for server1 that contains the list of port name-value pairs.

- \_\_\_ 1. Using wsadmin, extract the properties for server1.
  - \_\_\_ a. In a terminal window, go to the bin directory for profile1.
  - \_\_\_ b. Use the following command to start wsadmin (if prompted to authenticate, use wasadmin and websphere):
 

```
./wsadmin.sh
```

- \_\_\_ c. Enter the following command to extract the resource type EndPoint for server1 into a properties file called endpoint.props (you can copy and paste from the file /opt/labfiles/wsadmin/properties.py):

```
AdminTask.extractConfigProperties("-propertiesFileName endpoint.props  
-configData Server=server1 -filterMechanism SELECTED_SUBTYPES  
-selectedSubTypes [EndPoint]")
```

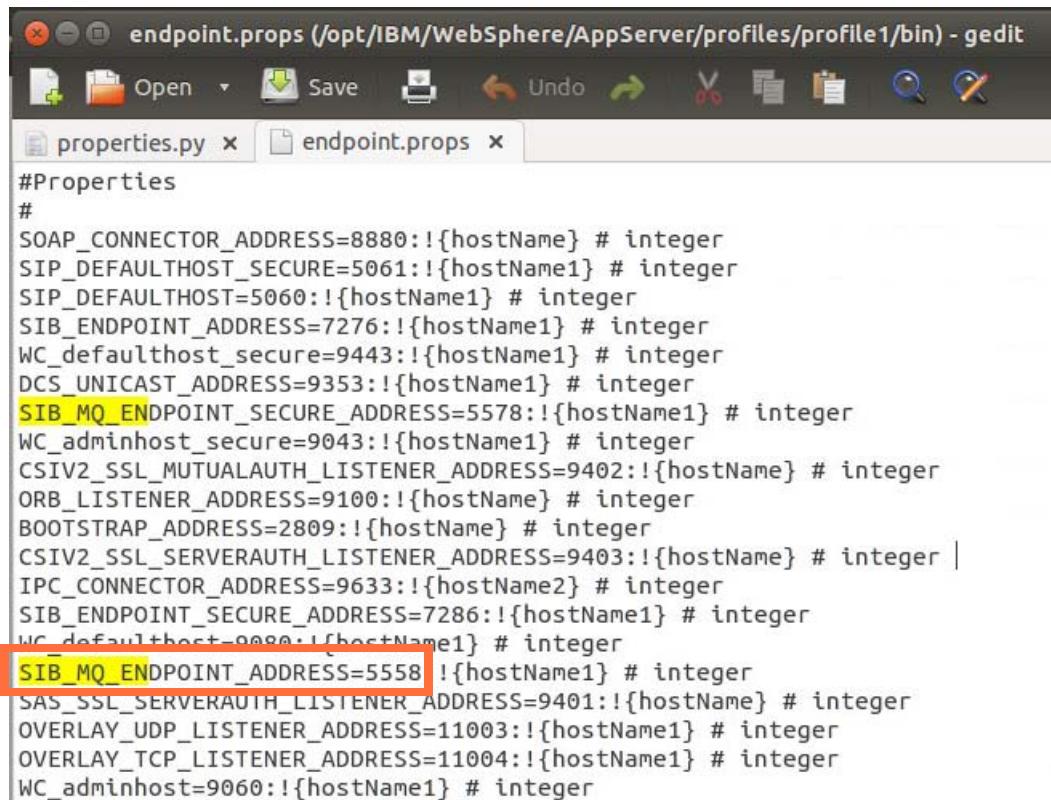
```
localuser@washost:/opt/IBM/WebSphere/AppServer/profiles/profile1/bin$ ./wsadmin.sh  
WASX7031I: Connected to process "server1" on node washostnode01 using SOAP connector;  
The type of process is: UnManagedProcess  
WASX7031T: For help, enter: "print Help help()"  
wsadmin>AdminTask.extractConfigProperties("-propertiesFileName endpoint.props -c  
onfigData Server=server1 -filterMechanism SELECTED_SUBTYPES -selectedSubTypes [E  
ndPoint]")  
u''  
wsadmin>wsadmin>
```



### Information

Properties files can be extracted for various configuration attributes at different levels: a cell, a node, a server, one container in that server, and others. If you know what type of properties you want to modify, you can extract a properties file for your server with an object type filter.

- \_\_\_ d. The properties file is in the current directory, in this case, in the `bin` directory for profile1. Open the `endpoint.props` file with gedit. Look for the entry: `SIB_MQ_ENDPOINT_ADDRESS`. Note the port number: \_\_\_\_\_



```
#Properties
#
SOAP_CONNECTOR_ADDRESS=8880:{hostName} # integer
SIP_DEFAULTHOST_SECURE=5061:{hostName1} # integer
SIP_DEFAULTHOST=5060:{hostName1} # integer
SIB_ENDPOINT_ADDRESS=7276:{hostName1} # integer
WC_defaulthost_secure=9443:{hostName1} # integer
DCS_UNICAST_ADDRESS=9353:{hostName1} # integer
SIB_MQ_ENDPOINT_SECURE_ADDRESS=5578:{hostName1} # integer
WC_adminhost_secure=9043:{hostName1} # integer
CSIV2_SSL_MUTUALAUTH_LISTENER_ADDRESS=9402:{hostName} # integer
ORB_LISTENER_ADDRESS=9100:{hostName} # integer
BOOTSTRAP_ADDRESS=2809:{hostName} # integer
CSIV2_SSL_SERVERAUTH_LISTENER_ADDRESS=9403:{hostName} # integer |
IPC_CONNECTOR_ADDRESS=9633:{hostName2} # integer
SIB_ENDPOINT_SECURE_ADDRESS=7286:{hostName1} # integer
WC_defaulthost-0000:{hostName1} # integer
SIB_MQ_ENDPOINT_ADDRESS=5558:{hostName1} # integer
SAS_SSL_SERVERAUTH_LISTENER_ADDRESS=9401:{hostName} # integer
OVERLAY_UDP_LISTENER_ADDRESS=11003:{hostName1} # integer
OVERLAY_TCP_LISTENER_ADDRESS=11004:{hostName1} # integer
WC_adminhost=9060:{hostName1} # integer
```

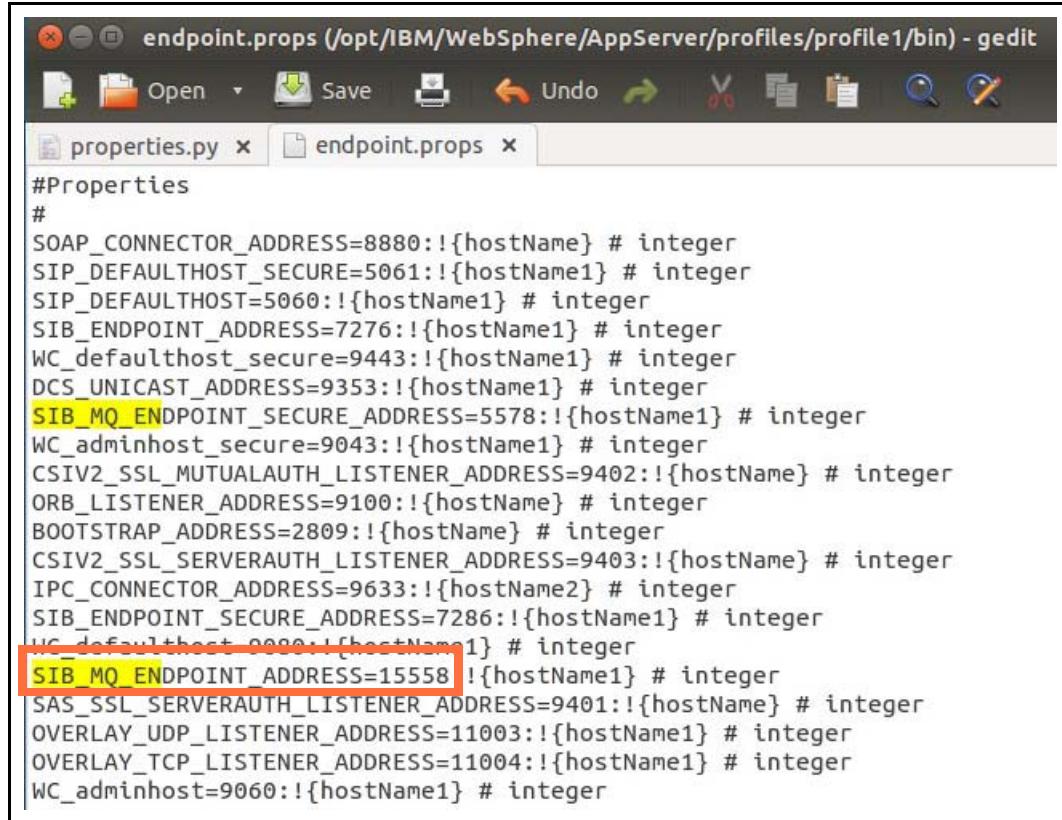
- \_\_\_ e. Open the administrative console and click **Servers > Server Types > WebSphere application servers > server1**.
- \_\_\_ f. Under **Communications**, click **Ports**. Look for the entry `SIB_MQ_ENDPOINT_ADDRESS`. Note the port number: \_\_\_\_\_

<input type="checkbox"/>	<u>SIB ENDPOINT SECURE ADDRESS</u>	*	7286	<a href="#">View associated transports</a>
<input type="checkbox"/>	<u>SIB MQ ENDPOINT ADDRESS</u>	*	5558	<a href="#">View associated transports</a>
<input type="checkbox"/>	<u>SIB MQ ENDPOINT SECURE ADDRESS</u>	*	5578	<a href="#">View associated transports</a>

- \_\_\_ g. Notice that the port numbers match because they represent the same configuration item in two different views.

\_\_ 2. Modify the endpoint.props file.

\_\_ a. Locate the port and value pair for SIB\_MQ\_ENDPOINT\_ADDRESS. Change the port value, currently 5558, to: 15558



```
#Properties
#
SOAP_CONNECTOR_ADDRESS=8880:{hostName} # integer
SIP_DEFAULTHOST_SECURE=5061:{hostName1} # integer
SIP_DEFAULTHOST=5060:{hostName1} # integer
SIB_ENDPOINT_ADDRESS=7276:{hostName1} # integer
WC_defaulthost_secure=9443:{hostName1} # integer
DCS_UNICAST_ADDRESS=9353:{hostName1} # integer
SIB_MQ_ENDPOINT_SECURE_ADDRESS=5558:{hostName1} # integer
WC_adminhost_secure=9043:{hostName1} # integer
CSIV2_SSL_MUTUALAUTH_LISTENER_ADDRESS=9402:{hostName} # integer
ORB_LISTENER_ADDRESS=9100:{hostName} # integer
BOOTSTRAP_ADDRESS=2809:{hostName} # integer
CSIV2_SSL_SERVERAUTH_LISTENER_ADDRESS=9403:{hostName} # integer
IPC_CONNECTOR_ADDRESS=9633:{hostName2} # integer
SIB_ENDPOINT_SECURE_ADDRESS=7286:{hostName1} # integer
WC_defaulthost=9080:{hostName1} # integer
SIB_MQ_ENDPOINT_ADDRESS=15558:{hostName1} # integer
SAS_SSL_SERVERAUTH_LISTENER_ADDRESS=9401:{hostName} # integer
OVERLAY_UDP_LISTENER_ADDRESS=11003:{hostName1} # integer
OVERLAY_TCP_LISTENER_ADDRESS=11004:{hostName1} # integer
WC_adminhost=9060:{hostName1} # integer
```

\_\_ b. Save the updated file.

\_\_ c. Use the following command in wsadmin to validate the updated properties file:

```
AdminTask.validateConfigProperties( "-propertiesFileName endpoint.props" )
```

```
wsadmin>AdminTask.validateConfigProperties( "-propertiesFileName endpoint.props" )
u'true'
wsadmin>
```

\_\_ d. If the file validation is successful, 'true' is shown.

\_\_ 3. Apply the updated properties file to the configuration.

\_\_ a. From the wsadmin command line, enter:

```
AdminTask.applyConfigProperties( "-propertiesFileName endpoint.props" )
```

\_\_ b. If the configuration is updated successfully, two quotation marks are shown.

\_\_\_ 4. Save the changes.

\_\_\_ a. From the wsadmin command line, enter:

```
AdminConfig.save()
```

```
wsadmin>AdminTask.applyConfigProperties("-propertiesFileName endpoint.props")
```

```
wsadmin>AdminConfig.save()
```

\_\_\_ b. Type `exit` to exit interactive mode.

\_\_\_ 5. Verify the changes.

\_\_\_ a. From the administrative console, return to the **Ports** page (a page refresh might be needed). Notice that the port value for `SIB_MQ_ENDPOINT_ADDRESS` is now 15558, reflecting the change that you made in the properties file.

Port Name	Port
BOOTSTRAP_ADDRESS	2809
SOAP_CONNECTOR_ADDRESS	8880
ORB_LISTENER_ADDRESS	9100
SAS_SSL_SERVERAUTH_LISTENER_ADDRESS	9401
CSIV2_SSL_SERVERAUTH_LISTENER_ADDRESS	9403
CSIV2_SSL_MUTUALAUTH_LISTENER_ADDRESS	9402
WC_adminhost	9060
WC_defaulthost	9080
DCS_UNICAST_ADDRESS	9353
WC_adminhost_secure	9043
WC_defaulthost_secure	9443
SIP_DEFAULTHOST	5060
SIP_DEFAULTHOST_SECURE	5061
SIB_ENDPOINT_ADDRESS	7276
SIB_ENDPOINT_SECURE_ADDRESS	7286
SIB_MQ_ENDPOINT_ADDRESS	15558

\_\_\_ 6. Using the administrative console, change the port value for `SIB_MQ_ENDPOINT_ADDRESS` back to the original value (verify that it is 5558) and save the updates.

\_\_\_ a. Click **Details**.

\_\_\_ b. Select `SIB_MQ_ENDPOINT_ADDRESS` in the list of ports.

<input type="checkbox"/>	<a href="#">SIB_MQ_ENDPOINT_ADDRESS</a>	*	15558	<a href="#">View associated transports</a>
--------------------------	---	---	-------	--

- \_\_\_ c. Enter 5558 as the **Port**.

[\*\*Application servers > server1 > Ports > SIB\\_MQ\\_ENDPOINT\\_ADDRESS\*\*](#)

Specifies the TCP/IP ports this server uses for connections.

Configuration

**General Properties**

**Port Name**

SIB\_MQ\_ENDPOINT\_ADDRESS

\* **Host**

\*

\* **Port**

5558

**Apply**

**OK**

**Reset**

**Cancel**

- \_\_\_ d. Click **Apply** and **Save** the update.

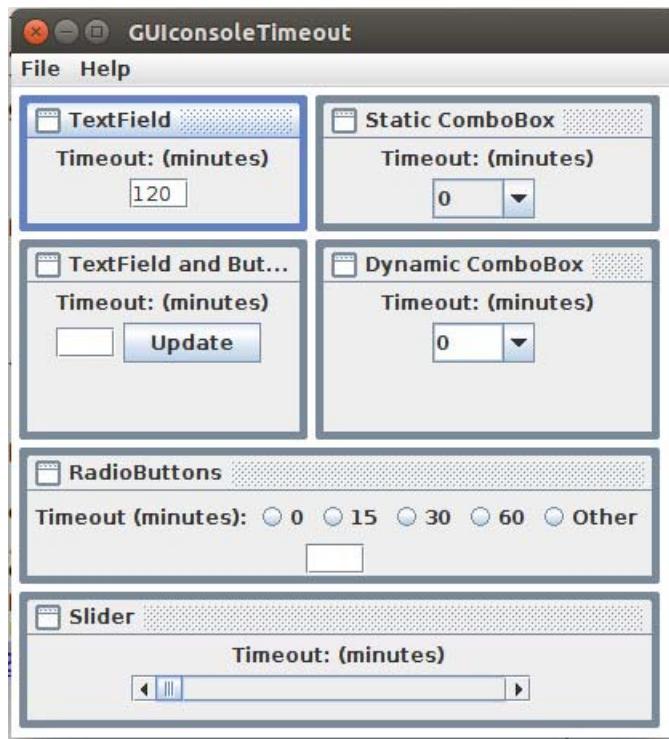
## Section 9: Using SWING with Jython (optional)

When creating wsadmin scripts, it might be useful to add a graphical interface. Doing so is not trivial, but it is possible. If you are interested in a script that uses the Java SWING libraries from within Jython to create a graphical user interface, examine the following example.

- 1. Using wsadmin, run the `GUIconsoleTimeout.py` script.
  - a. From the command line, from the `server1 bin` directory, run the following command (if prompted, use `wasadmin` and `websphere` to authenticate):

```
./wsadmin.sh -f /opt/labfiles/wsadmin/GUIconsoleTimeout.py
```

In a graphical interface, use this script to set the console timeout value for an application server or deployment manager. But in this case, it completes this function graphically.



### Note

The interface completes the same function multiple times. Each box uses a different type of graphical widget to set the console timeout value. Feel free to explore the different options.

- 
- b. If you are interested, open the script file with an editor and investigate how the graphical interface is coded.



## Information

For more information about creating graphical user interfaces for wsadmin scripts, see the following topics:

- Step into the Swing era - How to easily add a GUI to your WebSphere Application Server administrative scripts.
  - [http://www.ibm.com/developerworks/websphere/techjournal/1205\\_col\\_gibson/1205\\_col\\_gibson.html](http://www.ibm.com/developerworks/websphere/techjournal/1205_col_gibson/1205_col_gibson.html)
  - [http://www.ibm.com/developerworks/websphere/techjournal/1206\\_col\\_gibson/1206\\_col\\_gibson.html](http://www.ibm.com/developerworks/websphere/techjournal/1206_col_gibson/1206_col_gibson.html)

---

\_\_\_ c. Press Enter in the command window to end the script.

## End of exercise

## Exercise review and wrap-up

In this exercise, you learned to access wsadmin objects from the command line and from a wsadmin Jython shell. You also learned how to create a wsadmin administrative script.

You also learned how to activate command assist and reference the script libraries. Finally, you learned how to use property file-based configurations to configure your environment.

# Exercise 7. Configuring WebSphere Application Server security

## Estimated time

00:30

## Overview

In this exercise, you learn how to enable WebSphere Application Server security and configure fine-grained administrative access.

## Objectives

After completing this exercise, you should be able to:

- Enable WebSphere Application Server security
- Configure administrative security by configuring access to administrative functions
- Configure fine-grained administrative security

## Introduction

This exercise verifies that WebSphere administrative security is enabled. If administrative security is turned on (administrative security is enabled by default during profile creation), several effects are present. The effects include the fact that administrative tools such as the administrative console, wsadmin, and many of the scripts (including stopServer and serverStatus) require authentication and authorization to run. The exercise then examines the process of defining new administrative users and granting them specific access to parts of the administrative console and verifies that access is limited to certain functions. To verify, first log in to the administrative console and provide the user that was created during the profile creation. This specific user has, by default, implicit rights to the administrative console as it is the initial user that was created. This exercise creates more users and defines which rights they have within the administrative console.

Finally, the exercise configures fine-grained access for both PlantsByWebSphere and DefaultApplication. Fine-grained access is achieved by defining administrative authorization groups. These groups map specific scopes or objects to console users and roles, thus allowing those users the access of that role to those specific objects. When console users attempt to access other objects for which fine-grained access is not configured, they have only the same access.

## Requirements

This exercise requires a workstation with WebSphere Application Server V9 installed and the successful completion of the previous exercises. This exercise requires that WebSphere Application Server is installed with profile1 and includes the PlantsByWebSphere application.

# Exercise instructions

## Section 1: Resetting the WebSphere environment

---



### Note

If your WebSphere environment must be reset for any reason, see **Appendix A** for instructions to correctly reset the environment.

---

## Section 2: Verify administrative security

This exercise configures security access to the administrative tools. Before any security access takes effect, administrative security must be enabled, which happens by default during the creation of a profile.

The state of administrative security is verified.

- \_\_\_ 1. Check the state of administrative security.
    - \_\_\_ a. Log in to the administrative console with `wasadmin` for the user name and `websphere` for the password.
- 



### Information

You already know the answer to whether administrative security is enabled. The fact that you are prompted for a user name and password verifies that.

---

- \_\_\_ b. Click **Security > Global security**.

- \_\_\_ c. Verify that the **Enable administrative security** option is checked.

**Global security**

Use this panel to configure administration and the default application security policy. This security controls security policy for user applications. Security domains can be defined to override and customize the security settings.

[Security Configuration Wizard](#)    [Security Configuration Report](#)

**Administrative security**

- Enable administrative security
  - [Administrative user roles](#)
  - [Administrative group roles](#)
  - [Administrative authentication](#)

**Application security**

- Enable application security



### Information

If administrative security is not enabled, you must check the box and save your changes. Then, restart the WebSphere server.

---

## Section 3: Defining WebSphere administrative console users

When WebSphere Application Server is installed and profiles are created, administrative security is enabled by default. Initially, the only user with access to the administrative console is the primary user that is specified during the profile creation, which is the wasadmin user. Initially at the start of the labs, the only user that can access the administrative console is wasadmin. In a real environment, it is desirable to have multiple administrative users and possibly have different rights for each user.

Users are now created and they are mapped to different levels of console access.

- \_\_\_ 1. Create WebSphere users for testing purposes.
- \_\_\_ a. In the administrative console, expand **Users and Groups** and click **Manage Users**.

- \_\_\_ b. Leave the defaults and click **Search**, which provides a list of current WebSphere administrative users.

**Manage Users**

**Search for Users**

Search by \* Search for \* Maximum results  
User ID \* 100

**Search**

1 users matched the search criteria.

Select	User ID	First name	Last name	E-mail	Unique Name
<input type="checkbox"/>	<a href="#">wasadmin</a>	wasadmin	wasadmin		uid=wasadmin,o=defaultWIMFileBasedRealm

Page 1 of 1 Total: 1

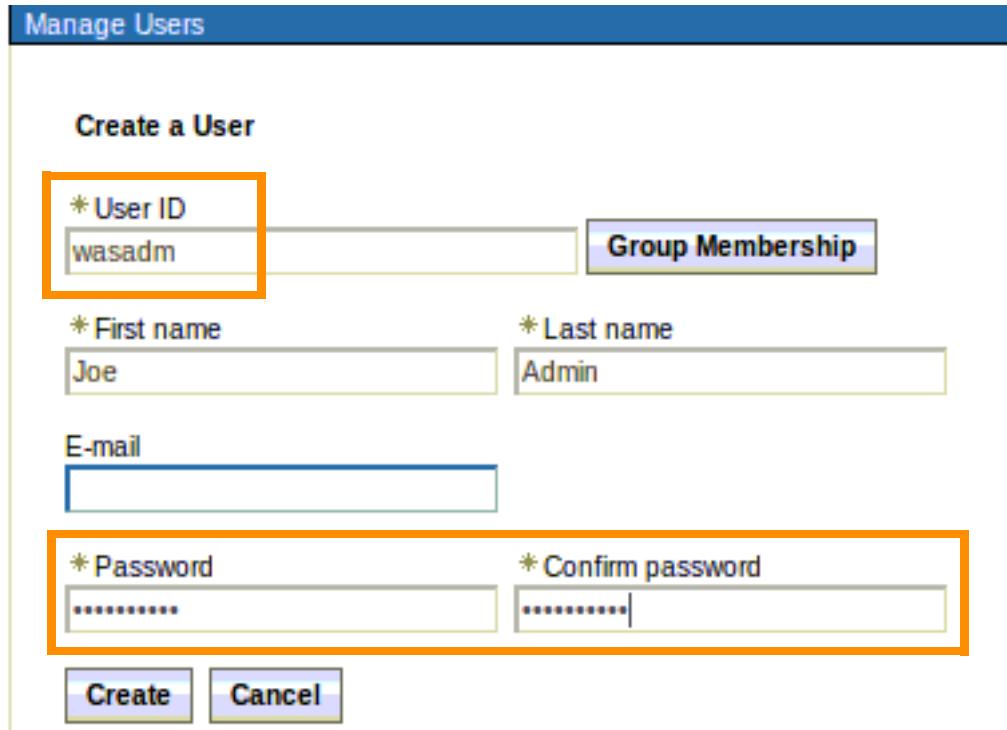
- \_\_\_ c. The `wasadmin` user was created during the profile creation (the `busUser` user is created in a previous exercise). To create more users for this lab, click **Create**.



### Information

Other users might exist, depending on which exercises you already completed.

- \_\_\_ d. Enter the User ID as: wasadm  
 Enter anything for the **First name** and **Last name**. Enter `web1sphere` for the **Password** and **Confirm password** fields.



The screenshot shows the 'Create a User' interface. At the top, there's a 'Group Membership' button. Below it, there are fields for 'User ID' (containing 'wasadm'), 'First name' (containing 'Joe'), 'Last name' (containing 'Admin'), and 'E-mail' (empty). At the bottom, there are 'Create' and 'Cancel' buttons. The 'User ID' and 'Password' fields are highlighted with an orange border.

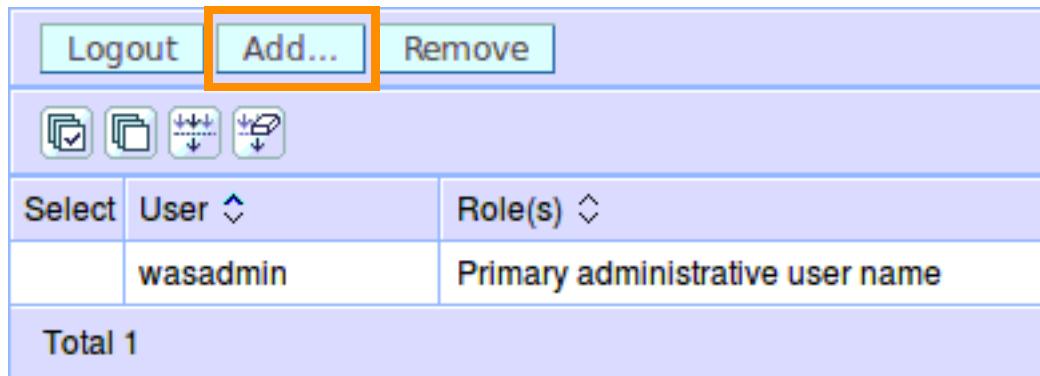
- \_\_\_ e. Click **Create**.  
 \_\_\_ f. Click **Create Like** to create more users.  
 \_\_\_ g. Repeat this process for more user IDs of `wascfg`, `wasmon`, and `wasoper`. Again, enter anything for the **First name** and **Last name** fields, but use `web1sphere` for the passwords.  
 \_\_\_ h. Click **Close** when you create the last user.

### Information

These user IDs are being created inside of the WebSphere file-based user repository, not in the local operating system user registry or in LDAP.

- \_\_\_ 2. Map these new user IDs to their appropriate administrative console roles.  
 \_\_\_ a. Under Users and Groups, select **Administrative user roles**.

- \_\_ b. Click **Add**.



### Information

Notice that the `wasadmin` entry that is listed is mapped to **Primary administrative user name**, which means the security user that is defined during the profile creation. As such, it has implicit mappings to all security roles.

- \_\_ c. Click **Search** to view the list of available users.

- \_\_\_ d. Select **wasadm** from the Available column near the bottom of the screen and click the right arrow to move it to the **Mapped to role** column. Next, select the **Administrator** role near the top of the screen. Click **OK** to create the mapping between the **wasadm** user and the **Administrator** role.

**Administrative user roles**

[Administrative user roles > User](#)

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

\* Role(s)

Admin Security Manager	↑
<b>Administrator</b>	☰
Auditor	▼
Configurator	▼

**Search and Select Users**

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

Search string: \*

Maximum results to display: 20

Available:

- wasadm**
- wascfg
- wasmon
- wasoper

Mapped to role:

- Administrator**
- Configurator

Select All   Deselect All   Select All   Deselect All

**OK**   Reset   Cancel



## Information

Depending on what components you installed, it is possible to have more roles within the list.

Depending on which labs you completed, your list of users might be different from the screen capture.

- \_\_\_ e. Repeat these last two steps for `wasoper`, `wascfg`, and `wasmon` (mapping each user to the appropriate role). Examine the various roles.

The screenshot shows a table in the administrative console for managing users and their roles. The table has three columns: 'Select' (checkbox), 'User' (dropdown), and 'Role(s)' (dropdown). There are five rows of data:

Select	User	Role(s)
<input type="checkbox"/>	<a href="#">wasadm</a>	Administrator
	wasadmin	Primary administrative user name
<input type="checkbox"/>	<a href="#">wascfg</a>	Configurator
<input type="checkbox"/>	<a href="#">wasmon</a>	Monitor
<input type="checkbox"/>	<a href="#">wasoper</a>	Operator

Total 5

- \_\_\_ f. Click **System administration > Save changes to the master repository**.
- \_\_\_ g. Click **Save**.
- \_\_\_ h. Log out of the administrative console. Close the browser window.



## Information

Changes to built-in, file-based repositories are not automatically replicated to managed nodes in a federated repositories configuration. You must use the administrative console to replicate the changes you make to a built-in, file-based repository. The full resynchronize operation resolves conflicts among configuration files and can take several minutes to complete.

Since these particular users are stored within the WebSphere configuration information, it is a good idea to do a full resynchronize with the nodes after new users are created.

- \_\_\_ 3. **Optional:** Go back and add a console user that is called `wassecmgr` and map it to the Admin Security Manager role.

This user can now be used to map security roles for console users. The only user that has this ability is `wasadmin` because it is the primary user. As such, `wasadmin` implicitly has this ability.

## **Section 4: Authenticate to the WebSphere administrative console and test mapped users**

In this part of the exercise, access to the administrative console is granted only to correctly mapped users. Depending on the role to which they are mapped, the administrative console allows those users to complete only certain functions.



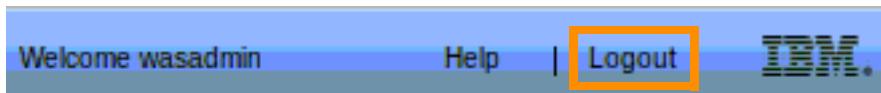
### Information

By default, the user that is used to define the authentication mechanism has implicit access as an administrator role.

- \_\_\_ 1. Start a new browser and log in to the administrative console.
  - \_\_\_ a. Log in as: `wasadm`
- \_\_\_ 2. Verify that full access to administrative functions is available.
  - \_\_\_ a. Click **Applications > Application Types > WebSphere enterprise applications**.
  - \_\_\_ b. Notice that all standard functions are available.

Start	Stop	Install	Uninstall	Update	Rollout Update	Remove File	Export	Export DDL	Export File
Select	Name	Application Status							
You can administer the following resources:									
<input type="checkbox"/>	<a href="#">DefaultApplication</a>								
<input type="checkbox"/>	<a href="#">PlantsByWebSphere</a>								
<input type="checkbox"/>	<a href="#">ivtApp</a>								
<input type="checkbox"/>	<a href="#">query</a>								
Total 4									

- \_\_\_ 3. Now verify the available functions for other users.
  - \_\_\_ a. Log out of the administrative console.



- \_\_\_ b. Log back in to the administrative console as: `wasoper`

- \_\_\_ c. Click **Applications > Application Types > WebSphere enterprise applications** and notice what functions are available on the page for the role.

Select	Name	Application Status
<input type="checkbox"/>	<a href="#">DefaultApplication</a>	
<input type="checkbox"/>	<a href="#">PlantsByWebSphere</a>	
<input type="checkbox"/>	<a href="#">ivtApp</a>	
<input type="checkbox"/>	<a href="#">query</a>	
<b>Total 4</b>		

- \_\_\_ d. Notice that not all the same functions are available. Now Start, Stop, and Rollout Update are the only available functions.
- \_\_\_ 4. Log out of the administrative console.
  - \_\_\_ 5. Log in as `wascfg` and `wasmon` and examine what functions are available.
  - \_\_\_ 6. **Close** all web browser windows. This action ensures that no existing session cookies exist when the next section of the exercise is started.

## Section 5: Enabling fine-grained control

Now that users with different types of access to the administrative console exist, it might be interesting to control the access more specifically. In the following example, you create two new administrative users. The first user, `PlantsAppAdmin`, is configured to have rights only on the `PlantsByWebSphere` application. The second user, `DefaultAppAdmin`, is configured to have rights only on the `DefaultApplication`.

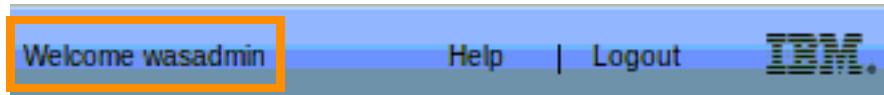
By creating this setup, you demonstrate how fine-grained access controls can be granted to administrative users. These types of controls can be granted on many different types of objects, not just applications.

The fine-grained access is defined by mapping administrative authorization groups to administrative console users. The administrative authorization groups point at specific scopes or objects. When an administrative user attempts to access an object and does not have global access, the access that the administrative authorization groups define for the object is checked.

The user with fine-grained administrative access requires a minimum of global monitor access.

- \_\_\_ 1. Create more users in the repository. As done in the previous section of this exercise, create two new users: `PlantsAppAdmin` and `DefaultAppAdmin`. Map these two new users to the monitor role.

- \_\_\_ a. Make sure that you are logged in to the administrative console with a user that gives you **Admin Security Manager** role access like `wasadmin`. The role provides permission to map console roles for console users and groups. Since `wasadmin` is the primary user, it has Admin Security Manager access implicitly.



- \_\_\_ b. In the administrative console, expand **Users and Groups** in the left navigation menu and select **Manage Users**.
- \_\_\_ c. Leave the defaults and click **Search**. The list of current WebSphere administrative users is displayed.
- \_\_\_ d. Click **Create**.
- \_\_\_ e. Enter the User ID: `PlantsAppAdmin`  
Enter anything for the **First name** and **Last name**. Enter `websphere` for the **Password** and **Confirm password**. Click **Create**.
- \_\_\_ f. Repeat this process to create the `DefaultAppAdmin` user.
- \_\_\_ 2. Map the two new users to the global monitor role. Any console user or group that is used for fine-grained access requires a minimum role mapping of Monitor.
- \_\_\_ a. Under **Users and Groups** in the administrative console, select **Administrative user roles**. Click **Add**.
- \_\_\_ b. Click **Search** to view the list of available users. Select both `PlantsAppAdmin` and `DefaultAppAdmin` (hold down the Ctrl key to multi-select) from the Available column and click the **right arrow** to move them to the **Mapped to role** column. Select the **Monitor** role near the top of the screen and click **OK**.

Logout	Add...	Remove
Select	User	Role(s)
<input type="checkbox"/>	<a href="#">DefaultAppAdmin</a>	Monitor
<input type="checkbox"/>	<a href="#">PlantsAppAdmin</a>	Monitor
<input type="checkbox"/>	<a href="#">wasadm</a>	Administrator
	<a href="#">wasadmin</a>	Primary administrative user name

- \_\_\_ c. **Save** the changes.

- \_\_\_ 3. Create the administrative authorization groups for the PlantsAppGroup and DefaultAppGroup.
  - \_\_\_ a. In the administrative console, click **Security > Administrative Authorization Groups**.



- \_\_\_ b. Click **New** to create the authorization group.

The screenshot shows the 'Administrative authorization groups' page. At the top, there is a header bar with the title 'Administrative authorization groups'. Below it, a sub-header says 'Use this page to create, update, or remove administrative authorization groups.' There is a 'Preferences' button with a plus sign. A row of buttons includes 'New...' (which is highlighted with an orange box) and 'Delete'. Below these are icons for selecting, creating, updating, and deleting. A search bar has 'Select' and 'Name' dropdowns. The results table shows one entry: 'None' in the first column and 'Total 0' in the second. The entire interface has a light blue background.

- \_\_\_ c. Enter `PlantsAppGroup` for the **Name**.

- \_\_\_ d. Under Resources, expand all the entries and the subentries. Take note of all of the different levels that can be defined in an administrative authorization group. Expand **Applications** and select **PlantsByWebSphere**.

**Administrative authorization groups**

**Administrative authorization groups > New...**

Use this page to set up an administrative authorization group and to

**Configuration**

**General Properties**

\* Name

**Resources**

Show:

- + Business-level applications
- + Node groups
- + Clusters
- + Applications
  - PlantsByWebSphere
  - ivtApp
  - DefaultApplication
  - query
- + Nodes
- + Assets

**Apply** **OK** **Reset** **Cancel**

- \_\_\_ e. Click **Apply**.  
 \_\_\_ f. On the right, under Additional Properties, click **Administrative user roles**.

**Additional Properties**

- [Administrative group roles](#)
- [Administrative user roles](#)



## Information

In some cases, the Additional Properties are not rendered, and a browser refresh does not seem to solve the problem. In such cases, try the following steps:

- Save the changes, and go back through **Security > Administrative Authorization Groups**, and click **PlantsAppGroup**.
- **Close** the console browser and start a new console window in a new browser.

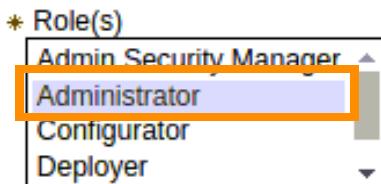
---

\_\_\_ g. Click **Add** to map the administrative console `PlantsAppAdmin` user.

- \_\_ h. Select the **Administrator** role and then click **Search** to show all known users. Select `PlantsAppAdmin` and then click the **right arrow** to move the user from the **Available** column to the **Mapped to role** column.

[Administrative authorization groups > PlantsAppGroup > Administrative user roles > User](#)

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



#### Search and Select Users

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

Search string  
\*

Maximum results to display 20

Search

Available

- DefaultAppAdmin
- PlantsAppAdmin**
- wasadm
- wascfg
- wasmon
- wasoper
- wassecmgr

Select All Deselect All

Mapped to role

Select All Deselect All

OK Reset Cancel

- \_\_ i. Click **OK**.
- \_\_ j. **Save** the changes.
- \_\_ k. Repeat these steps to create the `DefaultAppGroup`, scoped to the `DefaultApplication`, and map `DefaultAppAdmin`. To begin the process again for `DefaultApp Group`, click **Security > Administrative Authorization Groups** and click **New**.

\_\_ I. **Save** the changes. Click **OK**. The final list looks like the following screen capture:

Select	Name
<input type="checkbox"/>	<a href="#">DefaultAppGroup</a>
<input type="checkbox"/>	<a href="#">PlantsAppGroup</a>

Total 2



### Information

Two new administrative users are called `PlantsAppAdmin` and `DefaultAppAdmin`. Both have Monitor access to the cell. This access means they can view the contents of the cell, but they cannot modify anything from the console.

Additionally, two new administrative authorization groups are called `PlantsAppGroup` and `DefaultAppGroup`, scoped at the `PlantsByWebSphere` and `DefaultApplication` applications. The groups define what administrative rights might be available for those two applications.

Finally, the `PlantsAppAdmin` user is mapped to `PlantsAppGroup`, and the `DefaultAppAdmin` user is mapped to `DefaultAppGroup`.

The result is that these two new users have Monitor access to everything in the cell. Additionally, they also have administrative rights, but only to their specific applications.

---

## Section 6: Test the fine-grained access

Now that the new administrative console users are created, and the administrative authorization groups are added and mapped to the applications, access by the users to the applications must be verified.

1. Open a new administrative console window and log in as: PlantsAppAdmin



2. After you log in, browse through various parts of the console. Notice that the PlantsAppAdmin user has **Monitor** rights to most areas. But also notice that the PlantsAppAdmin user has complete **Administrator** rights only to the PlantsByWebSphere enterprise application.

Cell=washostNode01Cell, Profile=profile1

## Enterprise Applications

Enterprise Applications

Use this page to manage installed applications

**Preferences**

**Start** **Stop** **Update** **Rollout Update**

**Select** **Name** ▾

You can administer the following resources:

<input type="checkbox"/>	<a href="#">PlantsByWebSphere</a>
--------------------------	-----------------------------------

You can monitor the following resources:

	<a href="#">DefaultApplication</a>
	<a href="#">ivtApp</a>
	<a href="#">query</a>

Total 4

3. Log out of the administrative console, and log in again as: DefaultAppAdmin

- 4. Again, browse through various parts of the administrative console and notice that this user has **Monitor** access only. Go to the enterprise application list and notice that this user has administrative access to the DefaultApplication, but not to anything else.

**Enterprise Applications**

Use this page to manage installed applications

**Preferences**

Start Stop Update Rollout Update

Select Name ▾

You can administer the following resources:

<input type="checkbox"/>	<a href="#">DefaultApplication</a>
--------------------------	------------------------------------

You can monitor the following resources:

<input type="checkbox"/>	<a href="#">PlantsByWebSphere</a>
<input type="checkbox"/>	<a href="#">ivtApp</a>
<input type="checkbox"/>	<a href="#">query</a>

Total 4

**End of exercise**

## Exercise review and wrap-up

The exercise looked at setting up security for accessing the administrative console, which is done by creating new administrative console users and mapping them to global access roles. Then, two new console users are mapped to administrative authorization groups to create fine-grained access to the PlantsByWebSphere application and the DefaultApplication.

# Exercise 8. Configuring application security

## Estimated time

00:30

## Overview

In this exercise, you learn how to configure access to application resources and administrative functions.

## Objectives

After completing this exercise, you should be able to:

- Define Java EE security roles
- Define access for resources in an application
- Enable and verify application security

## Introduction

This lab describes configuring application security for the PlantsByWebSphere application by using the administrative console and the WebSphere Developer Tools for Eclipse.

## Requirements

This exercise requires a workstation with WebSphere Application Server V9 installed and completion of previous exercises. This exercise requires that WebSphere Application Server is installed with profile1 and includes the PlantsByWebSphere application.

# Exercise instructions

## Section 1: Resetting the WebSphere environment

---



### Note

If your WebSphere environment must be reset for any reason, see **Appendix A** for instructions to correctly reset the environment.

---

## Section 2: Enabling application security

In a previous exercise, administrative security was configured. This exercise enables and configures application security. The application security allows WebSphere to provide authentication and authorization for the enterprise applications. Unlike administrative security, which secures the administrative interfaces, application security controls who has access to which parts of the enterprise applications that are run within the application servers.

WebSphere application security is enabled through the administrative console.

- \_\_\_ 1. Configure the application security setting.
  - \_\_\_ a. Make sure that you are logged in to the administrative console with a user that gives you administrator privileges, such as: `wasadmin` or `wasadm`
  - \_\_\_ b. Click **Security > Global security**.

- \_\_\_ c. Check **Enable application security** and click **Apply**.

The screenshot shows the 'Global security' configuration panel. At the top, there are two tabs: 'Security Configuration Wizard' and 'Security Configuration Report'. Below the tabs, there are three main sections: 'Administrative security', 'Application security', and 'Java 2 security'. In the 'Application security' section, the checkbox for 'Enable application security' is checked and highlighted with an orange border. The other sections contain various configuration options with checkboxes.



## Information

WebSphere administration security is already enabled during profile creation. All that is being done is the enabling of application security. As such, it is not necessary to define user registries or authentication mechanisms.

- \_\_\_ d. **Save** the changes.
- \_\_\_ 2. Stop and start the server.
- \_\_\_ a. Using the command line, change to the `bin` directory for profile1.
  - \_\_\_ b. Stop the server with the command: `./stopServer.sh server1`

- \_\_\_ c. Start the server with the command: ./startServer.sh server1

```
localuser@washost:/opt/IBM/WebSphere/AppServer/profiles/profile1/bin$ ./stopServer.sh server1
ADMU0116I: Tool information is being logged in file
            /opt/IBM/WebSphere/AppServer/profiles/profile1/logs/server1/stopServer.log
ADMU0128I: Starting tool with the profile1 profile
ADMU3100I: Reading configuration for server: server1
ADMU3201I: Server stop request issued. Waiting for stop status.
ADMU4000I: Server server1 stop completed.

localuser@washost:/opt/IBM/WebSphere/AppServer/profiles/profile1/bin$ ./startServer.sh server1
ADMU0116I: Tool information is being logged in file
            /opt/IBM/WebSphere/AppServer/profiles/profile1/logs/server1/startServer.log
ADMU0128I: Starting tool with the profile1 profile
ADMU3100I: Reading configuration for server: server1
ADMU3200I: Server launched. Waiting for initialization status.
ADMU3000I: Server server1 open for e-business; process id is 34530
localuser@washost:/opt/IBM/WebSphere/AppServer/profiles/profile1/bin$
```

### **Section 3: Securing the PlantsByWebSphere application**

When application security is enabled, enterprise applications can take advantage of role-based application security to restrict access to servlet and EJB resources. The PlantsByWebSphere application administration module is already configured to take advantage of application security by having a security role that is called SampAdmin and mapping to the administration module. All that the administrator is still required to do is to map the SampAdmin security role to the users or groups that exist in the runtime environment.

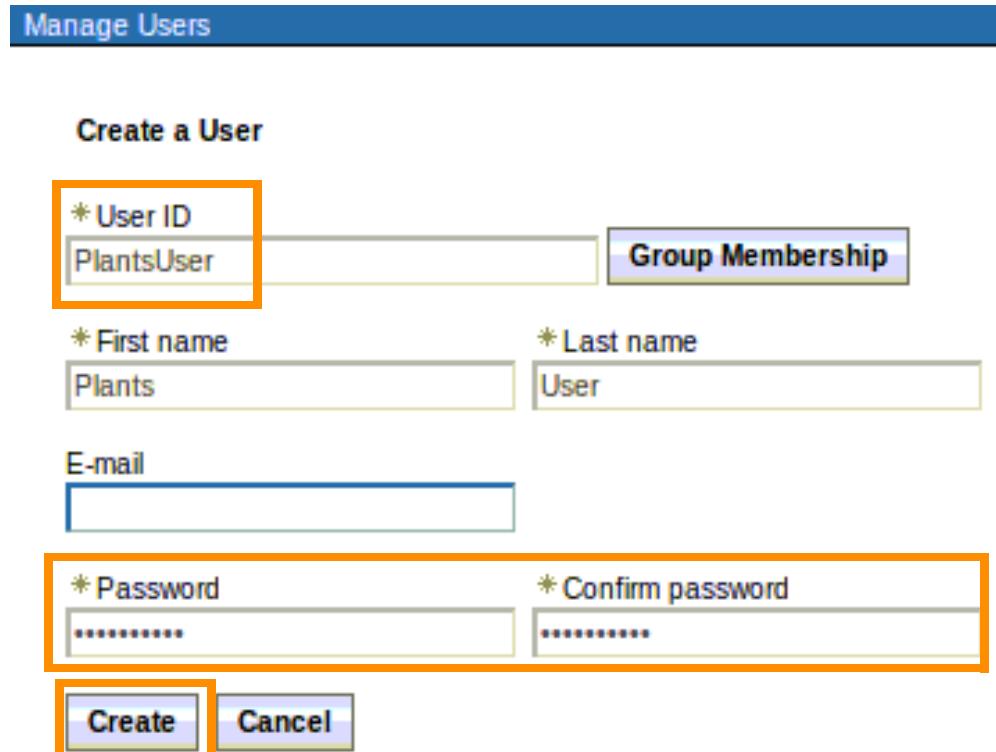


#### **Information**

**Java 2 security** can also be used to provide fine-grained access to system resources, such as ports or sockets. Java 2 security is orthogonal to Java Platform, Enterprise Edition or Java EE security and does not require the enforcement of administrative security. In this exercise, you do not use Java 2 security.

- 
- \_\_\_ 1. Create a user who is named PlantsUser to use for application authentication.
- \_\_\_ a. Click **Users and Groups** and click **Manage Users**.
- \_\_\_ b. Leave the defaults and click **Search**, which displays the list of current administrative users.
- \_\_\_ c. Click **Create**.

- \_\_ d. Enter the User ID: PlantsUser  
 Enter anything for the **First name** and **Last name**. Enter web1sphere for the **Password** and **Confirm password** fields and click **Create**.



The screenshot shows a 'Create a User' form. At the top, there's a 'Group Membership' section. Below it, there are fields for 'First name' (Plants) and 'Last name' (User). An 'E-mail' field is present but empty. At the bottom, there are two password fields, both containing '\*\*\*\*\*', and a 'Create' button which is highlighted with an orange border.

- \_\_ e. Click **Close**.
- \_\_ 2. Before you map the roles to users and groups, test the application.
- Log out of the administrative console and close all of your current browser windows.
  - With the server up and running, use a new browser to access the admin servlet by going to the following address:  
<http://washost:9080/PlantsByWebSphere/admin.html>

- \_\_\_ c. You can also access this servlet by going to the PlantsByWebSphere home page and clicking the **Help** link. From there, click **Admin Home**.

The screenshot shows the Plants By WebSphere homepage. The top navigation bar has links for Flowers, Fruits & Vegetables, Trees, Accessories, HOME, SHOPPING CART, LOGIN, and HELP. The HELP link is highlighted with an orange box. Below the navigation is a banner with the text "Gardens of Summer" and a photo of a garden. A green sidebar on the left contains links for View Server Info and Admin Home, with Admin Home also highlighted with an orange box. At the bottom, there's a "Powered by IBM WebSphere e-business software" logo and a footer with links for Flowers, Fruits & Vegetables, Trees, Accessories, Home, Shopping Cart, Account, Login, and Help.

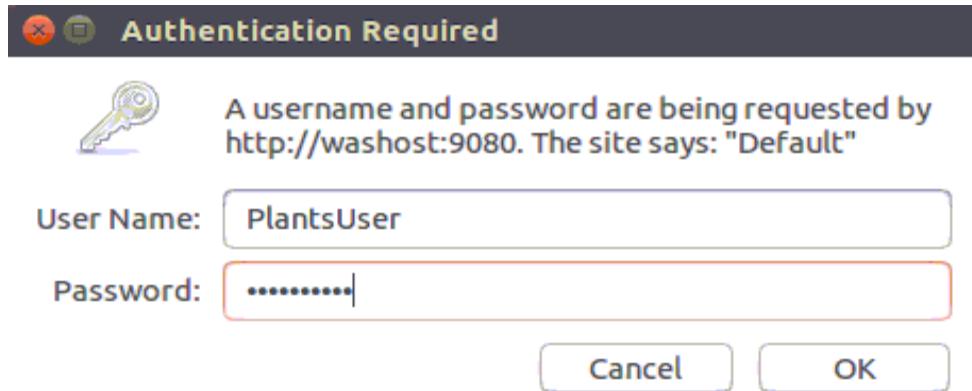
### Important

Existing browsers might already have authentication information for connection to the administrative console, which can interfere with attempts to log in to the PlantsByWebSphere application.

To solve this problem, either close all current browser windows or clear the current browser information. To clear any authentication in a Firefox window, click **Tools > Clear Recent History** and click **Clear Now**.

Other solutions include the use of a second browser type or configuring Firefox profiles.

- \_\_\_ d. Attempt to log in by using `PlantsUser` with `websphere` as the password.



- \_\_\_ e. Notice that you are not authorized to access the page because the user `PlantsUser` is not granted access to the `PlantsByWebSphere` application. If authorization fails, some browsers repeat the authentication request.



### Information

Only the administration part of the application is enabled for security. The rest of the application can be accessed just as before application security was enabled.

- \_\_\_ 3. Create a registry group and user that can be mapped to the `PlantsByWebSphere` application.



### Information

It would be easiest to map the application security role to a list of users. But it is a much better practice to use a group instead.

- \_\_\_ a. Log back in to a new administrative console window and expand **Users and Groups**.  
 \_\_\_ b. Click **Manage Groups**.

- \_\_\_ c. Click **Search**, which displays the list of current WebSphere administrative groups.

Manage Groups

**Search for Groups**

Search by \* Search for \* Maximum results

Group name \* 100

**Search**

0 groups matched the search criteria.



Page 1 of 1 Total: 0

- \_\_\_ d. Click **Create**.
- \_\_\_ e. Enter `PlantsGroup` for the **Group name** and anything for the **Description**. Click **Create**.

Manage Groups

**Create a Group**

\* Group name  
PlantsGroup

Description

**Create** **Cancel**

- \_\_\_ f. Click **Close**.

\_\_ g. Click **PlantsGroup**.

<b>Select</b>	<b>Group name</b>	<b>Description</b>	<b>Unique Name</b>
<input type="checkbox"/>	<a href="#"><b>PlantsGroup</b></a>		cn=PlantsGroup,o=defaultWIMFileBasedRealm
<b>Page 1 of 1</b>		<b>Total: 1</b>	

\_\_ h. Click the **Members** tab.

**Manage Groups**

**Group Properties**

**General** **Members** **Groups**

\* **Group name**  
PlantsGroup

**Description**

**OK** **Apply** **Cancel**

\_\_ i. Click **Add Users**.

\_\_ j. On the next page, click **Search**. The result shows the list of known users.

- \_\_ k. Select **PlantsUser** and click **Add**.

Manage Groups

Add Users to a Group

Group name  
PlantsGroup

Search for users that will be members of this group.

Search by \* Search for \* Maximum results

User ID \* 100

Search

9 users matched the search criteria.

DefaultAppAdmin  
PlantsAppAdmin  
**PlantsUser** (highlighted)  
Wasadmin  
wasadmin  
wascfg  
wasmon  
wasoper  
wassecmgr

Add Close

- \_\_ I. Click **Close** to verify that the `PlantsUser` is added to `PlantsGroup`.

Select	ID	Type	Unique Name
<input type="checkbox"/>	PlantsUser		uid=PlantsUser,o=defaultWIMFileBasedRealm



### Information

You created a user that is called `PlantsUser`, and this user is added to the newly created `PlantsGroup`. Next, you map the `PlantsGroup` to the `PlantsByWebSphere` application, thus granting any members of the `PlantsGroup` access to the restricted parts of the `Plants` application.

- 
- \_\_ 4. Map users and groups to Java EE security roles defined within the enterprise application.  
 The `SampleAdmin` role exists inside of `PlantsByWebSphere`, along with mappings to various methods.
- \_\_ a. Click **Applications > Application Types > WebSphere enterprise applications**.
  - \_\_ b. Click the **PlantsByWebSphere** application link.

- \_\_\_ c. Under **Detail Properties**, click **Security role to user/group mapping**. No users or groups are mapped to the SampAdmin security role.

## Enterprise Applications

### [Enterprise Applications](#) > [PlantsByWebSphere](#) > Security role to user/group mapping

#### Security role to user/group mapping

Each role that is defined in the application or module must map to a user or group from the domain user registry. **accessIds:** The accessIds are required only when using cross realm communication in a multi domain scenario. For all other scenarios the accessId will be determined during the application start based on the user or group name. The accessIds represent the user and group information that is used for Java Platform, Enterprise Edition authorization when using the WebSphere default authorization engine. The format for the accessIds is user:realm/uniqueUserID, group:realm/uniqueGroupID. Entering wrong information in these fields will cause authorization to fail. **AllAuthenticatedInTrustedRealms:** This indicates that any valid user in the trusted realms be given the access. **AllAuthenticated:** This indicates that any valid user in the current realm be given the access.

Select	Role	Special subjects	Mapped users	Mapped groups
<input type="checkbox"/>	SampAdmin	None		



#### Information

Four types of users exist: Everyone, All authenticated, Mapped users, and Mapped groups. The first two do not apply to this exercise as you do not want Everyone to access the administration module. Since no previous opportunity to authenticate was available, that rules out All authenticated.

The mapped entries point to users and groups in the current user registry.

- \_\_\_ d. Select the box next to the **SampAdmin** role and click **Map Groups**.

The screenshot shows a user interface for mapping groups. At the top, there are three buttons: 'Map Users...', 'Map Groups...', and 'Map Special Subjects...'. The 'Map Groups...' button is highlighted with an orange border. Below the buttons are two small icons: a checkbox and a folder. The main area contains a table with five columns: 'Select', 'Role', 'Special subjects', 'Mapped users', and 'Mapped groups'. A row in the table shows 'SampAdmin' with a checked checkbox in the 'Select' column. The 'Role' column shows 'SampAdmin' and the 'Special subjects' column shows 'None'. Both 'Mapped users' and 'Mapped groups' columns are empty.

Select	Role	Special subjects	Mapped users	Mapped groups
<input checked="" type="checkbox"/>	SampAdmin	None		

- \_\_\_ e. Make sure that the Search String is \* and click **Search**. The Available list fills up with the group that is defined within the WebSphere user registry.  
 \_\_\_ f. Select **PlantsGroup** and click the right arrow to move the entry to the Selected list.

**Enterprise Applications**

[Enterprise Applications](#) > [PlantsByWebSphere](#) > [Security role to user/group](#)

Use this page to search for users or groups and add them to the selected role.

- SampAdmin

**Search and Select Groups**

Decide how many results to display, enter a search string (use \* for wildcard) and click the search button to add them to the Mapped to role list.

Display a maximum of  results

Search string

**Search**

Available:

PlantsGroup

Selected:

**OK** **Cancel**

- \_\_ g. Click **OK**.

The screenshot shows a user mapping interface. At the top, there are three buttons: 'Map Users...', 'Map Groups...', and 'Map Special Subjects...'. Below these are two small icons. The main area is a table with five columns: 'Select', 'Role', 'Special subjects', 'Mapped users', and 'Mapped groups'. A row in the table contains a checkbox (unchecked), the role 'SampAdmin' (highlighted with an orange border), 'None' for special subjects, an empty field for mapped users, and the group 'PlantsGroup' (highlighted with an orange border). There are also two large blue checkmarks at the bottom left.

Select	Role	Special subjects	Mapped users	Mapped groups
<input type="checkbox"/>	SampAdmin	None		PlantsGroup

- \_\_ h. Click **OK** again. The changes do not get set until the second OK.  
 \_\_ i. **Save** the changes.  
 \_\_ 5. Log out of the administrative console and close all web browser windows. Open a new web browser to access the admin servlet.  
   \_\_ a. Log out of the administrative console and close the existing browsers.  
   \_\_ b. Open a new browser (or clear all state information for the existing browser).



### Information

It is also possible to clear any authentication in the browser. In a Firefox window, click **Tools > Clear Recent History > Clear Now**.

- \_\_ c. Access the PlantsByWebSphere admin servlet page through the **Help > Admin Home** link or though the following URL:

`http://washost:9080/PlantsByWebSphere/admin.html`

- \_\_ d. Log in with `PlantsUser` as the user name and `websphere` as the password.

A screenshot of a Java 'Authentication Required' dialog box. It features a key icon and the text 'A username and password are being requested by http://washost:9080. The site says: "Default"'. Below this are two input fields: 'User Name:' containing 'PlantsUser' and 'Password:' containing a series of asterisks ('\*\*\*\*\*'). At the bottom are 'Cancel' and 'OK' buttons.

**Attention**

By default, the application server has a 10-minute authentication cache timeout. Therefore, if information is still cached, it might not time out for up to 10 minutes. If the timeout is a problem, you can either wait until the timeout happens or restart the application server.

To view your security authentication timeout settings, click **Security > Global security > Authentication cache settings** (which is under Authentication mechanisms).

- 
- \_\_\_ e. This time, you are authenticated properly and allowed access.

## PLANTS BY WEBSHnERE



[Manage BackOrders](#) - View backorder inventory, order

[Supplier Configuration](#) - Configure the Supplier.



- \_\_\_ f. Click **Supplier Configuration** to explore further.

## PLANTS BY WEBSPHERE

[Admin Home](#)

# Supplier Configuration

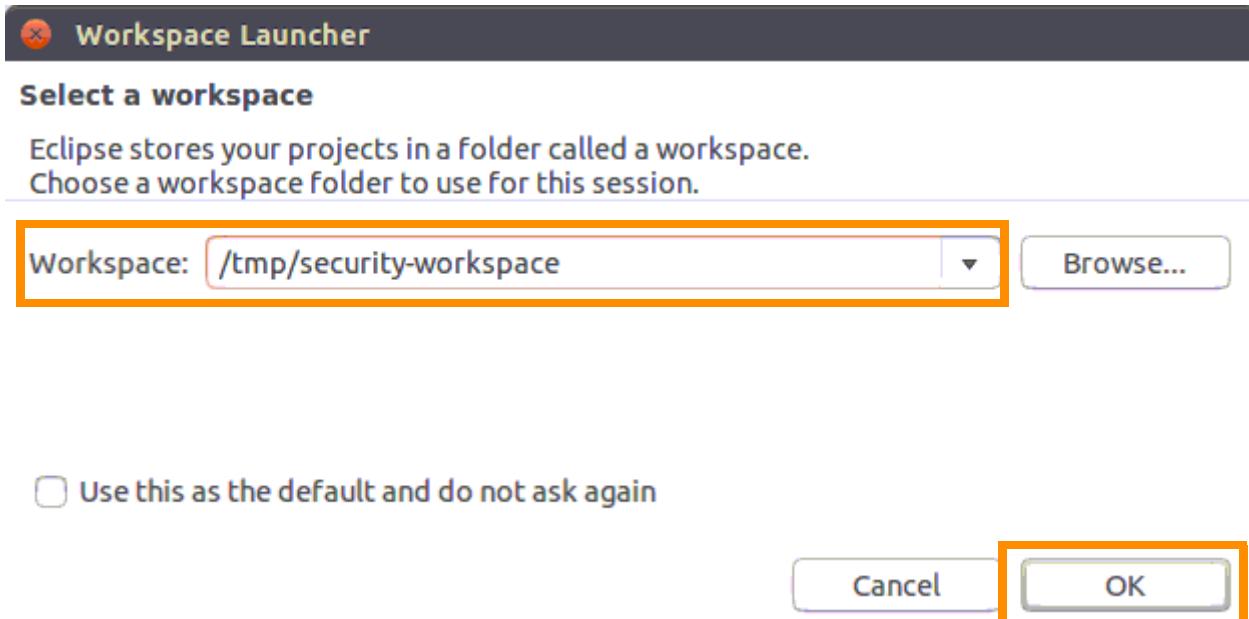
Full Name	Greenhouse By WebSphere
Street Address	4205 Miami Blvd.
City	Durham
State	NC
Zip	27709
Phone	919-555-1212

- \_\_\_ g. Click **Home** to return to the main part of the PlantsByWebSphere application.
- \_\_\_ 6. Disable application security.
- \_\_\_ a. Return to the global security screen in the administrative console and clear the box next to **Enable application security**.
  - \_\_\_ b. Click **Apply** and **Save** the changes.
  - \_\_\_ c. Stop and start the server.

## Section 4: Exploring the details (optional)

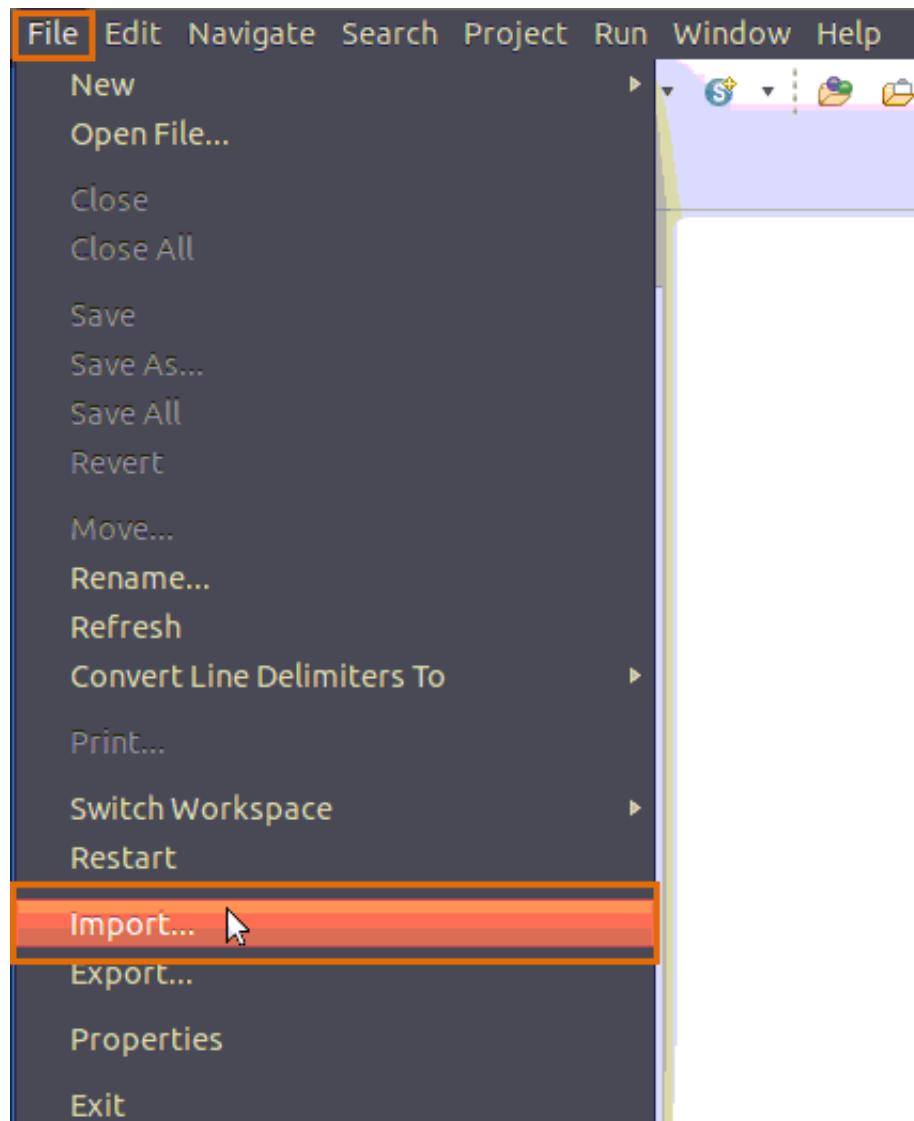
To complete this part of the exercise, you must start the WebSphere Developer Tools for Eclipse to the workspace you created earlier in this class. WebSphere Developer Tools for Eclipse is used to explore the EAR file to discover how security is configured.

- \_\_\_ 1. Instructions on using WebSphere Developer Tools for Eclipse itself are short and to the point; you are already familiar with the WebSphere Developer Tools from previous exercises.
- \_\_\_ a. Start the WebSphere Developer Tools for Eclipse and point it to a workspace where you explore the security attributes. To start WebSphere Developer Tools for Eclipse, enter the following command in a console window:  
`/opt/eclipse/jee-mars/eclipse`
- \_\_\_ b. Start Eclipse with the command: `./eclipse`
- \_\_\_ c. When prompted for a workspace, enter:  
`/tmp/security-workspace`



- \_\_\_ d. Click **OK**.

- \_\_\_ 2. Import the PlantsByWebSphere EAR.
  - \_\_\_ a. Click **File > Import > Java EE > EAR file**. If you do not see the menu options that are listed, roll the cursor over the top of the Eclipse window.



- \_\_\_ b. Click **Next**.
- \_\_\_ c. Browse to: /opt/labfiles/ears/EnhancedPlantsByWebSphere.ear
- \_\_\_ d. Click **OK**.
- \_\_\_ e. Click **Finish**.

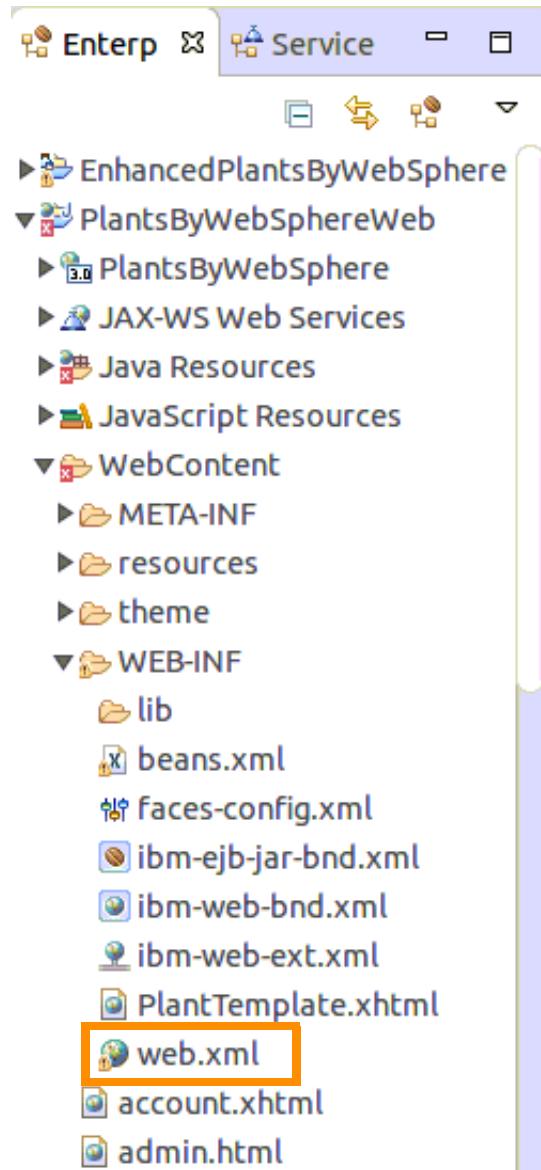
- \_\_\_ f. Switch to the **Java EE perspective**, if it is not already set.



- \_\_\_ 3. Explore the details.

- \_\_\_ a. If warnings and errors exist, do not worry as you are exploring the contents of the EAR.
- \_\_\_ b. In the Enterprise Explorer, expand **PlantsByWebSphereWeb > WebContent > WEB-INF**.

- \_\_\_ c. Double-click **web.xml**, which represents the deployment descriptor. The Web Application Deployment Descriptor Editor for this module opens on the editor pane in the upper right corner of the window.



- \_\_ d. Double-click the **web.xml** tab to maximize the Web Application Deployment Descriptor Editor. The editor allows you to view the Web Application structure more easily. Click **Login Configuration** in the Web Application structure.

The screenshot shows the 'Web Application 3.0 Deployment Descriptor Editor' interface. On the left, there is an 'Overview' panel with a 'type filter text' input field and a tree view of deployment descriptor components. The 'Login Configuration (Default)' node is highlighted with a red box. On the right, there is a 'Properties for the login configuration' panel. The 'Authentication Method' is set to 'BASIC' and the 'Realm Name' is 'Default'. Below this, there is a section for 'Form Login Configuration (optional)' with fields for 'Form Login Page\*' and 'Form Error Page\*'. The entire properties panel is also highlighted with a red box.

You might see detected errors at the top of the page, which can be ignored.



### Note

The Authentication Method is set to `BASIC`. This setting means that when authentication is needed for a page, the browser is sent a message to challenge the user with a basic authentication dialog box. Perhaps a better alternative would be to use a form-based challenge, which would allow the developer to specify a specific form-based login page that would be used to challenge the user.

When a non-authenticated user accesses a protected resource, WebSphere Application Server presents the login challenge instead of the requested resource. After successful authentication, the originally requested resource is served.

- \_\_ 4. Explore the resources.
- \_\_ a. Click **Security Constraint ()** in the Web Application structure of the editor. Notice the role name SampAdmin in the Authorization Constraint area.

**Overview**

type filter text

- Web Application (PlantsByWebSphere)
  - Context Parameter (javax.faces.PROJECT\_STAGE)
  - Context Parameter (javax.faces.VALIDATE\_EMPTY\_FIELDS)
  - Error Page (/error.jsp)
  - Error Page (/viewExpired.xhtml)
  - Login Configuration (Default)
  - Security Constraint ()** (highlighted)
  - Security Role (SampAdmin)
  - Servlet (FacesServlet)
  - Servlet Mapping (FacesServlet)

**Details**

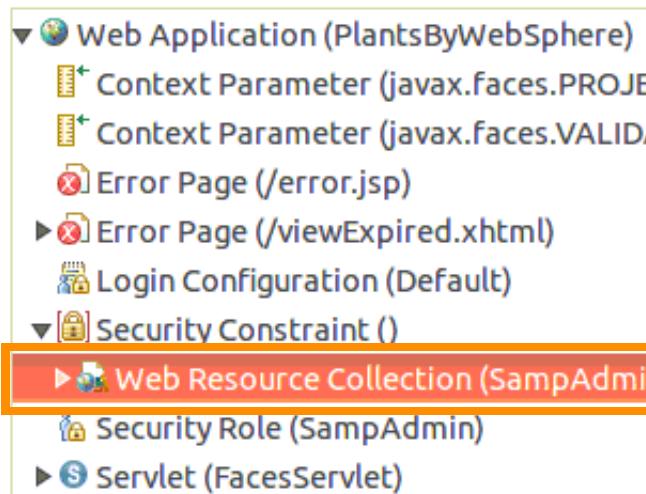
Display Name:

**Authorization Constraint (optional)**

Role Name: **SampAdmin** (highlighted)

Description: Samples Administrator

- \_\_ b. Click the **Web Resource Collection** (under Security Constraint) in the Web Application structure of the editor.



In the Details section of the Web Resource Collection, you see a set of HTTP access methods and URL patterns, which can be assigned to an authorized role.

**Details**

Web Resource Name*:	SampAdmin
URL Pattern*:	<ul style="list-style-type: none"> <li>/adminactions.html</li> <li>/adminbanner.html</li> <li>/backorderadmin.jsp</li> <li>/servlet/AdminServle</li> <li>/supplierconfig.jsp</li> </ul>
Description:	Sample Admin

Buttons on the right side of the URL pattern list: Add, Remove, Up, Down.

In this case, you see that one of the URL patterns is /adminactions.html.



## Information

The `/adminactions.html` URL pattern is associated with both a web module (`PlantsByWebSphereWeb`) and a security role (`SampAdmin`). You also see that a basic login type is associated with the web module.

When a user attempts to access a protected URL, the runtime interrupts the process to verify that the user has the required authority to proceed. In this case, the user (`PlantsUser`) would be required to be authenticated, and the user's user ID must be mapped to the security role (`SampAdmin`). In this case, the user `PlantsUser` is part of the `PlantsGroup`, which in turn is mapped to the `SampAdmin` role.

If initial authentication is unsuccessful, the user does not gain access to the URL and is instead returned a message. The message indicates that the user was unable to authenticate.

If the authentication is successful, but the user is not mapped to the security role (either directly or through a group), the user again does not gain access to the URL. Instead, the user is returned a message. The message indicates that the user is not authorized to access the URL.

Both `adminactions.html` and `adminbanner.html` are fragments of the `admin.html` page that the browser requests.

- 
- \_\_\_ 5. Log out and close the WebSphere Developer Tools for Eclipse when you finish exploring.

## End of exercise

## Exercise review and wrap-up

The first part of the exercise explored setting up security for accessing the WebSphere administrative console. Then, application security was enabled and access to the PlantsByWebSphere application was tested.

Finally, an explanation of how Java EE security is configured in the assembly and deploy tool was presented.

# Exercise 9. Using the performance monitoring tools

## Estimated time

00:30

## Overview

In this exercise, you use the performance tools that are available in WebSphere Application Server to monitor various application and server resources, and generate performance-tuning advice.

## Objectives

After completing this exercise, you should be able to:

- Enable various levels of Performance Monitoring Infrastructure (PMI) statistics for an application server
- Monitor an application server by using Tivoli Performance Viewer
- Configure user settings for Tivoli Performance Viewer
- Examine summary reports and performance modules in Tivoli Performance Viewer
- View performance messages from the Tivoli Performance Viewer Advisor
- Enable and configure the Request Metrics tool
- View Request Metrics messages in the standard logs of an application server

## Introduction

WebSphere Application Server offers a collection of tools to monitor and help tune the runtime environment, including Tivoli Performance Viewer, the Tivoli Performance Viewer advisor, and Request Metrics.

The Tivoli Performance Viewer is the user interface for monitoring the performance of application servers, servlets, and other resources in the environment. It is integrated into the administrative console and can be used for a number of tasks, including viewing performance data, gauging the load on servers over time, and evaluating the efficiency of resource allocations.

The Tivoli Performance Viewer advisor provides advice to help tune systems for optimal performance and recommendations to remedy inefficient server resource settings. It generates advice that is based on data that the Performance Monitoring Infrastructure (PMI) collects.

You can use request metrics to track the response time of the individual components that a transaction traverses, providing you with an in-depth understanding of the application flow that satisfies the user request.

## Requirements

This exercise requires at least one application server that runs the PlantsByWebSphere application and the Default application.

# Exercise instructions

## Preface

In the first part of this exercise, you use Tivoli Performance Viewer to monitor applications that run on WebSphere Application Server.

When the Performance Viewer is running in a Network Deployment environment, the data is collected at each of the nodes and stored in memory at the node agent. Data is then viewed from the deployment manager. With this architecture, the monitoring is distributed among the nodes.

### ***Section 1: Resetting the WebSphere environment***

---



#### Note

To reset your WebSphere environment, read **Appendix A** for instructions on how to complete this procedure.

---

## Section 2: Enabling performance monitoring and setting user preferences

Before the Tivoli Performance Viewer can begin monitoring data, the performance monitoring service must be started. The monitoring service is turned on by default on the application server.

- \_\_\_ 1. Verify that the Performance Monitoring Infrastructure (PMI) is turned on for server1.
  - \_\_\_ a. In the administrative console navigation tree, click **Monitoring and Tuning > Performance Monitoring Infrastructure (PMI)**.



- \_\_\_ b. In the workspace area on the right pane of the administrative console, click **server1**.

- \_\_\_ c. On the Configuration tab, make sure that **Enable Performance Monitoring Infrastructure (PMI)** is already selected.

Performance Monitoring Infrastructure (PMI)

**Performance Monitoring Infrastructure (PMI) > server1**

Use this page to configure Performance Monitoring Infrastructure (PMI)

Runtime || Configuration

**General Properties**

Enable Performance Monitoring Infrastructure

- \_\_\_ d. In the **Currently monitored statistic set** area, notice that the **Basic** level is selected. Basic is the default monitoring level setting.
- \_\_\_ e. Click the **Runtime** tab and verify that **Basic** is selected (default statistic set).

Runtime | Configuration

**General Properties**

Use sequential counter updates  
 Persist my changes

**Currently monitored statistic set**

- None  
No statistics are enabled
- Basic
  - + Provides basic monitoring, including Java EE and the top 38 statistics.
- Extended
  - + Provides extended monitoring, including the basic level of monitoring plus workload monitor, performance advisor, and Tivoli resource models.
- All
  - + All statistics are enabled.
- Custom
  - Provides fine-grained control to selectively enable statistics.

- \_\_\_ f. Click **Cancel**.



## Information

You can use the **Runtime** tab to change the monitoring settings without restarting the server. The new settings are applied immediately after clicking **OK**. If the **Persist my changes** check box is selected, the runtime settings are saved and are shown in the **Configuration** tab. You can use this option to change the PMI settings, and persist these changes for the next time the server is started.

- \_\_\_ 2. To get more frequent data collections in the Tivoli Performance Viewer, change the **Monitoring Refresh Rate** to 20 seconds.
  - \_\_\_ a. In the administrative console, under Monitoring and Tuning, expand **Performance Viewer** and click **Current activity**.



- \_\_\_ b. On the right pane, select the check box for **server1** and start the monitoring process for this server by clicking **Start Monitoring**.

**Tivoli Performance Viewer**

**Tivoli Performance Viewer**

Specifies the server to monitor with Tivoli Performance Viewer. Select the check box for the servers that you want to monitor, and click Start Monitoring. Click the name of the server to display the activity page.

Tivoli Performance Viewer					
Preferences		Start Monitoring		Stop Monitoring	
<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>		   		<input type="button" value="Start Monitoring"/> <input type="button" value="Stop Monitoring"/>	
Select	Server	Node	Host Name	Version	Collection Status
<input checked="" type="checkbox"/>	server1	washostNode01	washost	ND 9.0.0.0	Available
Total 1					

- \_\_\_ c. Click the **server1** link to view its current activity. If the tree for server1 is collapsed, click [+] next to server1 to expand it. Expand **Settings** and click **User**.

The screenshot shows the Tivoli Performance Viewer interface. At the top, there's a blue header bar with the title "Tivoli Performance Viewer". Below the header, the main content area has a title "Tivoli Performance Viewer > server1" and a descriptive text: "Use this page to view and refresh performance information on specific performance". There are two buttons at the top: "Refresh" and "View Module(s)". The main feature is a hierarchical navigation tree on the left. The root node is "server1", which is expanded. Under "server1", there are four nodes: "Advisor", "Settings", "User", and "Log". The "User" node is highlighted with a red rectangular box. Below the tree, there are two more buttons: "Summary Reports" and "Performance Modules". At the bottom of the tree area, there's a button labeled "Deselect All".

- \_\_\_ d. In the User Settings pane, change the Data Collection **Refresh Rate** to 20 seconds. Click **Apply**.

User Settings

[More information about this page](#)

Data Collection

Refresh Rate  
20 seconds

Buffer Size  
40 Data points

View Data As

Raw

Change In Value

Rate Of Change

**Apply** **Cancel**

### Section 3: Viewing servlet and web applications module data

In this section, you use the Tivoli Performance Viewer to generate and view performance metrics.

- \_\_\_ 1. Open a new tab in the browser and start the **Snoop** servlet by entering the web address:

`http://washost:9080/snoop`

If application security is on, you are prompted for a user ID and password. Log in as `wasadmin` if necessary.

This URL runs the Snoop servlet, which is part of the Default application, and shows a page with various information about the servlet. A servlet must be loaded in order for data

collection to take place. Leave the browser window open, as you are going to return here soon.

**Snoop Servlet - Request/Client Information**

**Requested URL:**

[http://washost:9080/snoop]

- \_\_\_ 2. Using the administrative console, go to the Tivoli Performance Viewer and monitor server1.
  - \_\_\_ a. Click **Monitoring and Tuning > Performance Viewer > Current activity > server1**.
  - \_\_\_ b. Expand **Summary Reports** and select **Servlets**.

Tivoli Performance Viewer

**Tivoli Performance Viewer > server1**

Use this page to view and refresh performance and information on specific performance metrics

**Refresh** **View Module(s)**

- server1
  - Advisor
  - + Settings
  - Summary Reports
    - **Servlets** (highlighted with a red box)
    - EJBs
    - EJB Methods
    - Connection Pool
    - Thread Pool
  - + Performance Modules

- \_\_\_ c. In the Servlets Summary Report pane, locate the entry for the **Snoop servlet**, which is part of the `DefaultWebApplication.war` file.



## Information

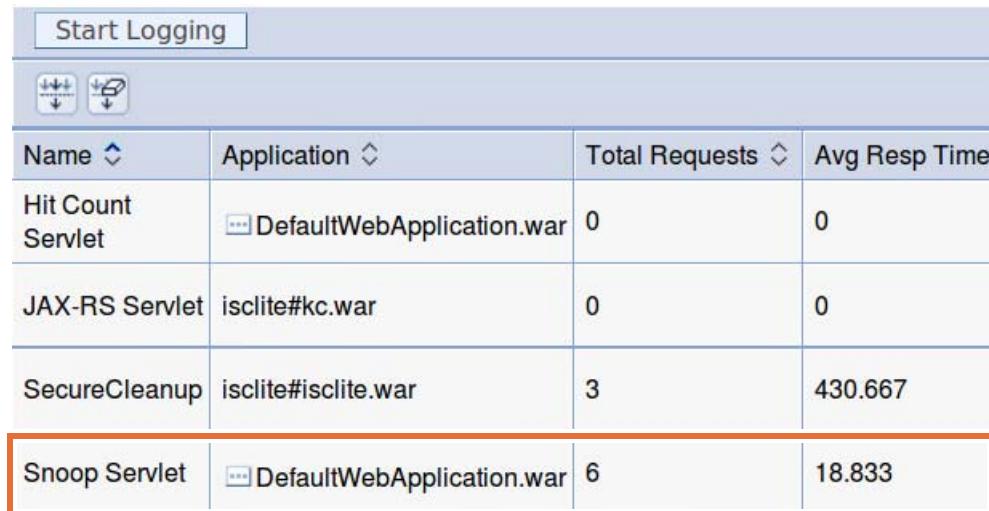
You might need to go to the next page of the report to find the listing for the Snoop servlet. Use the arrows at the bottom of the page to go to the different pages of the report. As an alternative, you can use filters to reduce the amount of information that is shown, or sort by application name or another attribute.

Name	Application	Total Requests	Avg Resp Time
Hit Count Servlet	DefaultWebApplication.war	0	0
JAX-RS Servlet	isclite#kc.war	0	0
SecureCleanup	isclite#isclite.war	3	430.667
Snoop Servlet	DefaultWebApplication.war	1	63
action	isclite#isclite.war	155	425.169
rsp servlet	ibmasyncrsp.war	0	0
transfer	filetransfer.war	0	0

Page: 4 of 4 Total 97

- \_\_\_ d. Notice the request for the Snoop servlet and an average response time in milliseconds. Record the average response time here: \_\_\_\_\_
- \_\_\_ e. Go back to the browser and reload the page several times.

- \_\_\_ f. Under the **Summary Reports**, click **Servlets** again to refresh the view. Look at the Servlets report again. What is the average response time now? \_\_\_\_\_  
 Is the response time longer or shorter after several requests are processed? (The response time is now shorter because of caching.)

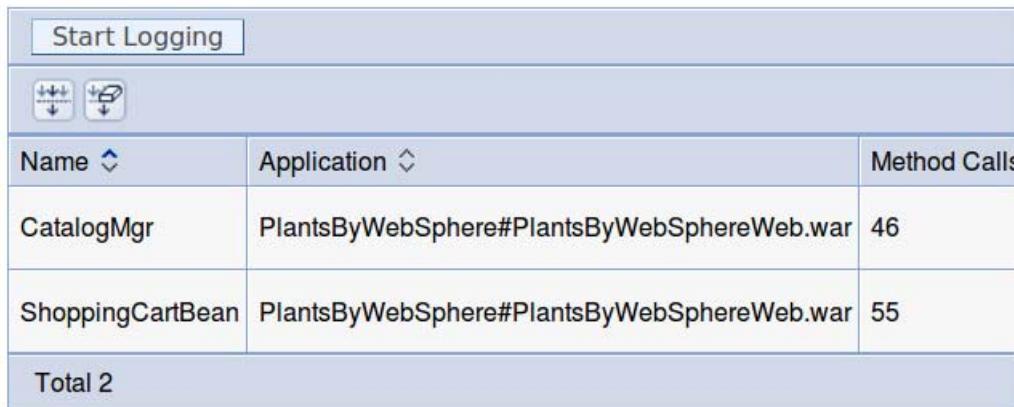


Name	Application	Total Requests	Avg Resp Time
Hit Count Servlet	DefaultWebApplication.war	0	0
JAX-RS Servlet	isclite#kc.war	0	0
SecureCleanup	isclite#isclite.war	3	430.667
Snoop Servlet	DefaultWebApplication.war	6	18.833

- \_\_\_ 3. Explore more summary reports:
- \_\_\_ a. Open a new browser and enter the web address for PlantsByWebSphere:  
`http://washost:9080/PlantsByWebSphere`
  - \_\_\_ b. Click the **Flowers** tab and the link for **Lily**.
  - \_\_\_ c. Are Enterprise JavaBeans being monitored? Click **EJBs** under **Summary Reports**. The EJBs Summary Report lists all enterprise beans that are currently running on this server. It also shows the amount of time that is spent in their methods, the number of EJB invocations, and the total time that is spent in each enterprise bean.

### EJBs Summary Report

[More information about this page](#)



Name	Application	Method Calls
CatalogMgr	PlantsByWebSphere#PlantsByWebSphereWeb.war	46
ShoppingCartBean	PlantsByWebSphere#PlantsByWebSphereWeb.war	55
<b>Total 2</b>		



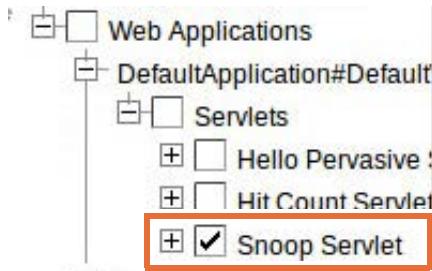
## Information

Expect reports to vary depending upon activity.

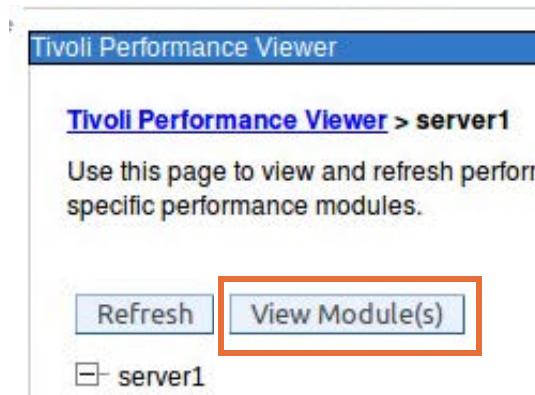
- \_\_\_ d. Click **Connection Pool**. The Connection Pool Summary Report lists all data source connections that are defined in the application server and shows their usage over time. The performance data is shown in graph form.
  - \_\_\_ e. Click **Thread Pool**. The Thread Pool Summary Report shows the usage of all thread pools in the application server over time.
- \_\_\_ 4. Inside Tivoli Performance Viewer, view the available performance counters for the Snoop servlet and the JVM Runtime module.
- \_\_\_ a. In Tivoli Performance Viewer, expand **Performance Modules** and select the **JVM Runtime** check box.

The screenshot shows the Tivoli Performance Viewer interface. At the top, there's a header bar with the title "Tivoli Performance Viewer" and a sub-header "Tivoli Performance Viewer > server1". Below the header, a message says "Use this page to view and refresh performance information on specific performance module". There are two buttons at the top right: "Refresh" and "View Module(s)". The main content area is a tree view of performance modules. The "server1" node is expanded, showing its children: Advisor, Settings, Summary Reports, and Performance Modules. The "Performance Modules" node is also expanded, showing its children: ExtensionRegistryStats.name, Security Authentication, Security Authorization, Dynamic Caching, JDBC Connection Pools, HAManager, ICA Connection Pools, Object Pool, ORB, pmiWebServiceModule, Servlet Session Manager, System Data, Thread Pools, Transaction Manager, and Web Applications. The "JVM Runtime" module under "Performance Modules" has a checked checkbox next to it, and this checkbox is highlighted with a red border.

- \_\_\_ b. Still in the Tivoli Performance Viewer navigation tree, expand **Web Applications > DefaultApplication#DefaultWebApplication.war > Servlets** and select **Snoop Servlet**.

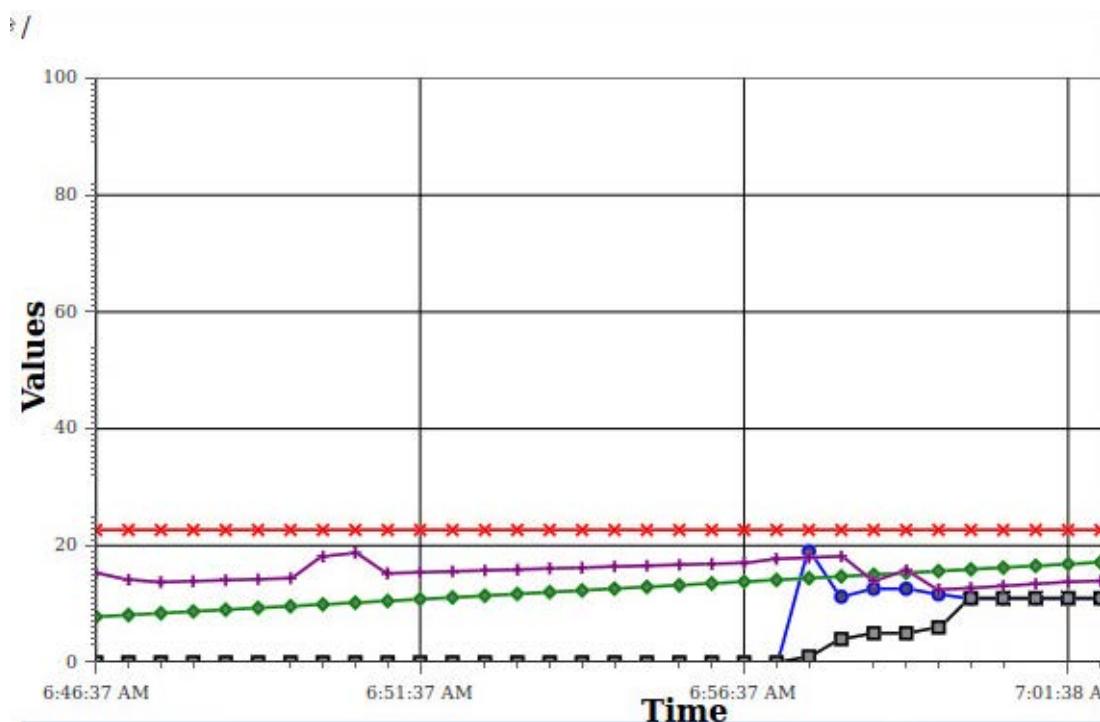


- \_\_\_ c. Click **View Module** at the top of the viewer (if necessary, scroll in your browser to see this screen). You see a table or a graph that shows the monitored data.



- \_\_\_ d. Open a new browser and start the **Snoop** servlet by entering the web address:  
`http://washost:9080/snoop`

- \_\_\_ e. Use the browser to **reload the Snoop servlet** several times by clicking the browser refresh button. Review the changes in the console.



<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Reset To Zero	Clear Buffer	View Table	Show Legend	
Select	Marker	Name	Value	Scale	Update		Sc
<b>JVM Runtime</b>							
<input checked="" type="checkbox"/>		HeapSize <a href="#">(?)</a>	226688.0	<input type="text"/> 1.0E-4			22
<input checked="" type="checkbox"/>		UsedMemory <a href="#">(?)</a>	151250.0	<input type="text"/> 1.0E-4			15
<input checked="" type="checkbox"/>		UpTime <a href="#">(?)</a>	1923.0	<input type="text"/> 0.01			19
<input type="checkbox"/>		ProcessCpuUsage <a href="#">(?)</a>	0.0	<input type="text"/> 1.0			0.0
<b>Snoop Servlet</b>							
<input checked="" type="checkbox"/>		RequestCount <a href="#">(?)</a>	11.0	<input type="text"/> 1.0			11
<input checked="" type="checkbox"/>		ServiceTime <a href="#">(?)</a>	10.909091	<input type="text"/> 1.0			10
If you see more or fewer available statistics than expected, check that your PMI level setting appropriately. <a href="#">Performance Monitoring Infrastructure settings</a>							



### Information

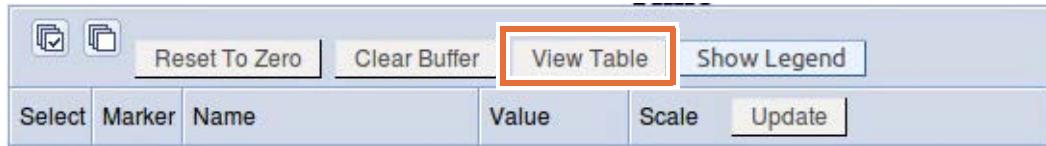
You see changes in the metrics for the Snoop servlet. The request count increases, and the service time changes. Keep in mind that the JVM runtime counters change too. Notice in the screen capture, the FreeMemory metric was cleared and it therefore is not plotted on the graph.



### Attention

When viewing graphs and comparing lines, take note of the Scale value. The Performance viewer scales values such that all data points can fit on the graph.

- \_\_\_ f. In the Performance viewer, click **View Table** to switch to a tabular view of the performance data. You can toggle back and forth between the table and graph views by selecting **View Table** or **View Graph**.

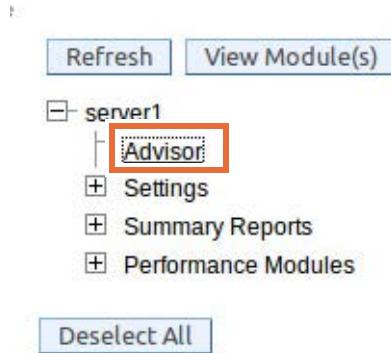


- \_\_\_ g. Reload the Snoop servlet several times and observe the servlet metrics.

## **Section 4: Using the Tivoli Performance Viewer performance advisor**

WebSphere Application Server includes a performance advisor, the Tivoli Performance Viewer advisor, which is accessed from inside Tivoli Performance Viewer. The Tivoli Performance Viewer advisor provides helpful tuning advice for various resources, cache size, JVM heap size, and more. The Tivoli Performance Viewer advisor also provides recommendations to address inefficient settings.

- 1. To access Tivoli Performance Viewer advisor messages in the administrative console, select **Monitoring and Tuning > Performance Viewer > Current Activity > server1**. In the Tivoli Performance Viewer navigation pane, click **Advisor** under **server1**.



- a. In the pane on the right, read the provided advice messages.  
 Are there some Alert messages? \_\_\_\_\_  
 Is there a configuration advice message? \_\_\_\_\_  
 If more than one page is available, view the messages on subsequent pages.

The screenshot shows a table-based interface for viewing advisor messages. At the top are two buttons: 'Refresh All Advice' and 'Remove Selected Advice'. Below the buttons is a toolbar with icons for filtering and sorting. The main area is a table with columns: 'Select', 'Severity', 'Message', and 'Status'. The table contains five rows of data:

Select	Severity	Message	Status
<input type="checkbox"/>	Config	<a href="#">TUNE5003W: The JVM maximum heap siz...</a>	Unread
<input type="checkbox"/>	Config	<a href="#">TUNE5012W: The size of the minimum ...</a>	Unread
<input type="checkbox"/>	Config	<a href="#">TUNE5042W: Enable servlet caching f...</a>	Unread
<input type="checkbox"/>	Warning	<a href="#">TUNE0303W: Number of threads workin...</a>	Unread
<input type="checkbox"/>	Warning	<a href="#">TUNE0303W: Number of threads workin...</a>	Unread

At the bottom, there is a pagination control: 'Page: 1 of 3' and 'Total 13'.

- \_\_\_ b. Click the link for the **TUNE5042W: Enable servlet caching for better performance** message to see the advice details.

**General Properties**

---

<b>Message</b>	TUNE5042W: Enable servlet caching for better performance.
<b>Severity</b>	Config
<b>Description</b>	Servlet caching is not enabled.
<b>User Action</b>	To enable servlet caching in the administrative console, click Servers > Application servers > server_name > Web container settings > Web container and select Enable servlet caching under the Configuration tab. Click Apply or OK. You must restart your Application Server.
<b>Detail</b>	Currently, servlet caching is disabled.

**Back**



### Information

In your lab environment, typically the processor utilization is low, and so you do not see much relevant performance advice. However, you see the configuration advice to turn on servlet caching with descriptions as to how to use the console to turn on this feature.

It is a good practice to run a representative workload against your application. Look at the performance advisor after the workload is run.

You can use the IBM Rational Performance Tester to create load tests and run them against your applications. You can read more about Rational Performance Tester and download a trial version at the following website: <http://www.ibm.com/software/awdtools/tester/performance>

---

## Section 5: Using request metrics

Request metrics log the time that is spent at major components of the application server, such as the web server plug-in, web container, EJB container, and more.

The request metric architecture differs from the Performance Monitoring Infrastructure (PMI). PMI provides information about average system resource usage, with no correlation between the data across different WebSphere components.

The request metrics tool tracks each individual transaction within WebSphere Application Server, recording the response time of the major components. Some of these response times include time in the web server or in the Enterprise JavaBeans (EJB) container. The collected information can be saved to log files or forwarded to an Application Response Measurement (ARM) agent.

- 1. Using the administrative console, turn on request metrics by selecting **Monitoring and Tuning > Request metrics**.
    - a. Under **General Properties**, select **Prepare Servers for request metrics collection**.
    - b. Under **Components to be instrumented**, select **ALL**.
    - c. Set **Trace level** to **Debug**.
- 



### Information

Setting the trace level to **Debug** provides detailed instrumentation data, including response times for all intra-process servlet and Enterprise JavaBeans (EJB) calls. This trace level provides a fine level of detail on each method call.

Setting the trace level to **Hops** generates instrumentation information about process boundaries only (for example, a servlet request that comes from a browser or a web server, and a JDBC request that goes to a database).

You can also filter requests so that only specific incoming requests result in request metrics that are logged. Such filtering can keep the logs from being overloaded with request metrics for every request.

---

- \_\_\_ d. Under **Request Metrics Destination**, select **Standard Logs**.

The screenshot shows the 'Request Metrics' configuration page. The 'Configuration' tab is active. In the 'General Properties' section, the checkbox 'Prepare Servers for Request metrics collection' is checked and highlighted with a red box. In the 'Components to be instrumented' section, the radio button 'All' is selected and highlighted with a red box. Below it, there is a list of components: AsyncBeans, EJB, JCA, and JDBC. In the 'Trace level' section, the dropdown menu is open and shows 'Debug' as the selected option, which is also highlighted with a red box. At the bottom, under 'Request Metrics Destination', the checkbox 'Standard Logs' is checked and highlighted with a red box.

- \_\_\_ e. Click **OK**.
- \_\_\_ f. **Save** directly to the master configuration and log out of the administrative console.
- \_\_\_ g. Restart **server1**.
- \_\_\_ 2. Open a web browser and run the PlantsByWebSphere application by entering the following address:  
 http://washost:9080/PlantsByWebSphere
- \_\_\_ a. Go through the site, look at some plants, buy something, and check out.

- \_\_\_ 3. Now view the standard JVM logs for server1. If HPEL is not turned on for server1, you can go to the Problem determination lab exercise for the steps on how to turn on HPEL. Alternatively, you can open the `SystemOut.log` file with a text editor and search for the PMRM codes. The remaining steps assume that HPEL is turned on for server1.
- \_\_\_ a. In the administrative console, go to **Troubleshooting > Logs and trace > server1**.
  - \_\_\_ b. On the Logging and tracing panel, scroll down and click the link **View HPEL logs and trace**.

**Related Items**

- [View HPEL logs and trace](#) (highlighted by a red box)
- [Change log detail levels](#)
- [Change log and trace mode](#)
- [Manage process logs](#)
- [NCSA access and HTTP error logging](#)

- \_\_\_ c. You are now in the Log Viewer. Expand the **Content and Filtering Details** section.

**Logging and tracing**

**Logging and tracing > server1 > Log Viewer**

Use this page to view log data from the HPEL repo customized view or full repository into a compressed file.

**Content and Filtering Details** (highlighted by a red box)

- \_\_\_ d. Scroll down to the **Filtering** box and type `PMRM*` in the **Message contents** field.

**View Contents**

System out  
 System err  
 Logs and trace

Minimum level:

Maximum level:

**Filtering**

Wild cards: \*?,% are allowed  
 Separate multiple entries by a ;  
 Include loggers:  
  
 Exclude loggers:  
  
**Message contents:**  (highlighted by a red box)

**Event Timing**

From:  On:   
 Until:  On:

**Apply Content and Filtering Details**

**Apply** (highlighted by a red box)   **Reset**

- \_\_\_ e. Click **Apply**.

- \_\_\_ f. Now only the request metrics messages are shown in the log view. Click any of the **PMRM0003I** codes to view details of the message.

Level	Message
INFO	PMRM0003I: parent:ver=1,ip=127.0.1.1,time=1473257948488,pid=14659,reqid=12288,event=1 - current:ver=1,ip=127.0.1.1,time=1473257948488,pid=14659,reqid=12288,event=1 type=Servlet Filter detail=WSCurFilter elapsed=
INFO	PMRM0003I: parent:ver=1,ip=127.0.1.1,time=1473257948488,pid=14659,reqid=4098,event=1 - p=127.0.1.1,time=1473257948488,pid=14659,reqid=4099,event=1 type=URI detail=/ibm/console/logon.jsp elapsed=
INFO	PMRM0003I: parent:ver=1,ip=127.0.1.1,time=1473257948488,pid=14659,reqid=3,event=1 - current:ver=1,ip=127.0.1.1,time=14732 type=URI detail=/ibm/console/logon.jsp elapsed=102
INFO	PMRM0003I: parent:ver=1,ip=127.0.1.1,time=1473257948488,pid=14659,reqid=8194,event=1 - current:ver=1,ip=127.0.1.1,time=1473257948488,pid=14659,reqid=8195,event=1 type=URI detail=/ibm/console/logon.jsp elapsed=
INFO	PMRM0003I: parent:ver=1,ip=127.0.1.1,time=1473257948488,pid=14659,reqid=4097,event=1 - current:ver=1,ip=127.0.1.1,time=1473257948488,pid=14659,reqid=4098,event=1 type=URI detail=/ibm/console/securecleanup elap
INFO	PMRM0003I: parent:ver=1,ip=127.0.1.1,time=1473257948488,pid=14659,reqid=2,event=1 - current:ver=1,ip=127.0.1.1,time=14732 type=URI detail=/ibm/console/securecleanup elapsed=283
INFO	PMRM0003I: parent:ver=1,ip=127.0.1.1,time=1473257948488,pid=14659,reqid=4096,event=1 - current:ver=1,ip=127.0.1.1,time=1473257948488,pid=14659,reqid=4097,event=1 type=URI detail=/ibm/console/logsAndTraceColle
INFO	PMRM0003I: parent:ver=1,ip=127.0.1.1,time=1473257948488,pid=14659,reqid=4096,event=1 - current:ver=1,ip=127.0.1.1,time=1473257948488,pid=14659,reqid=4097,event=1 type=Servlet Filter detail=WSCurFilter elapsed=2
INFO	PMRM0003I: parent:ver=1,ip=127.0.1.1,time=1473257948488,pid=14659,reqid=8193,event=1 - current:ver=1,ip=127.0.1.1,time=1473257948488,pid=14659,reqid=8194,event=1 type=URI detail=/ibm/console/securecleanup elap
INFO	PMRM0003I: parent:ver=1,ip=127.0.1.1,time=1473257948488,pid=14659,reqid=1,event=1 - current:ver=1,ip=127.0.1.1,time=14732 type=URI detail=/ibm/console/logsAndTraceCollection.do elapsed=2106

- \_\_\_ g. Scroll through the request metrics records. In addition to the Shopping Cart bean, you also see metrics for PlantsByWebSphere (PBW) servlets and JSP pages. Look at the different event types. You see `type=URI`, `type=EJB`, `type=JDBC`, and more, reflecting the request flow.



## Information

The **time** and **pid** fields are the start time and ID of the application server process. **Type** and **detail** are the description of the type of operation that is timed and its name. Most important is the measured **elapsed** time in milliseconds, which includes all suboperations that this operation calls. The **reqid** is a unique ID assigned to the request by request metrics.

Two correlators are shown, a parent correlator and a current correlator, representing the upstream request and the current operation. A correlator consists of the comma-separated fields that follow the “parent” or “current” keyword. If the parent and current correlators are the same, as in this case where all field values are the same (including `reqid=1`), then the record represents an operation that occurs as it enters WebSphere Application Server.

- 
- \_\_\_ 4. Disable Request Metrics.
- \_\_\_ a. Select **Monitoring and Tuning > Request metrics**.
- \_\_\_ b. Clear **Prepare Servers for Request metrics collection**.
- \_\_\_ c. Click **OK**.
- \_\_\_ d. **Save** directly to the master configuration and log out of the administrative console.

\_\_ e. Restart **server1**.

## End of exercise

## Exercise review and wrap-up

In this exercise, you learned how to turn on different levels of PMI statistics for an application server, monitor an application server with Tivoli Performance Viewer, and configure user settings. You generated some load on applications and examined summary reports and performance modules in Tivoli Performance Viewer. Additionally, you viewed performance messages from the Tivoli Performance Viewer advisor.

You learned how to turn on and configure the Request Metrics tool, and viewed Request Metrics messages in the standard logs of an application server.

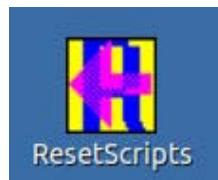
# Appendix A. Resetting the WebSphere environment

To complete some lab exercises, specific lab exercises must first be completed. If problems occur or you want to skip labs, reset scripts are useful. For these cases, a reset function is provided to set your environment to an appropriate state.

The reset scripts are initiated from a desktop icon and allow users to choose which state they want to restore. The reset scripts can take some time to run, depending on what software is already installed on the lab computer. For example, if none of the exercises are completed, it might be necessary for the reset scripts to install numerous pieces of software; this action would take 5 – 10 minutes. However, if all of the software installation is completed, it might be necessary for the reset scripts to restore only the profiles directories, and this action would take only 1 – 2 minutes.

— 1. Run the reset script.

— a. From the desktop, locate and click the **ResetScripts** icon.



— b. The reset script interface lists the available states that are available.



The following reset scripts are available:

- 1) 1\_Initial-state
- 2) 2\_IIM-installed
- 3) 3\_WAS-installed
- 4) 4\_IHS-installed
- 5) 5\_WAS-installed\_with\_profile1
- 6) 6\_WAS-installed\_with\_profile1\_plus\_PlantsByWebSphere
- 7) 7\_WAS-Federated\_dmgr-profile1-profile2
- 8) 8\_WAS-Federated\_plus\_PlantsCluster
- 9) X\_Reset\_Plants-DB

To execute a script, enter the script number <#>. To view details for a reset script, enter d<#>.

Which exercise reset do you wish to execute (1-9, d1-d9, q) [q]:

— c. Multiple reset scripts are available. Locate the name of the exercise that directed you here and select the associated reset script state. Running the script that is listed resets the lab machine to a state usable to start that exercise. For example, if you wanted to start the exercise **Installing an application**, you would select the reset script **5\_WAS-installed\_with\_profile1**.

- **Reset script: 4 IHS-installed**

- Exercise (WA590): Profile creation
- Reset script: 5 WAS-installed with profile1
  - Exercise (WA590): Exploring the administrative console
  - Exercise (WA590): Assembling an application
  - Exercise (WA590): Installing an application
- Reset script: 6 WAS-installed with profile1 plus PlantsByWebSphere
  - Exercise (WA590): Problem determination
  - Exercise (WA590): Using wsadmin
  - Exercise (WA590): Configuring WebSphere security
  - Exercise (WA590): Configuring application security
  - Exercise (WA590): Using the performance monitoring tools
- Reset script: 6 WAS-installed with profile1 plus PlantsByWebSphere
  - Exercise (WA599): Creating a federated cell
- Reset script: 7 WAS-Federated dmgr-profile1-profile2
  - Exercise (WA599): Clustering and workload management
- Reset script: 7 WAS-Federated plus PlantsCluster
  - Exercise (WA599): Configuring SSL for WebSphere
- Reset script: X Reset\_Plants-DB
  - This script rebuilds the Plants database.



## Information

If you would like more information about the specific reset scripts, type the letter `d` followed by the number for the reset script.

```
Terminal
To execute a script, enter the script number <#>. To view details for a reset
script, enter d<#>.

Which exercise reset do you wish to execute (1-9, d1-d9, q) [q]: d5

Details for: /opt/labfiles/reset/reset_scripts/reset_5_WAS-installed_with_profil
e1_details.txt

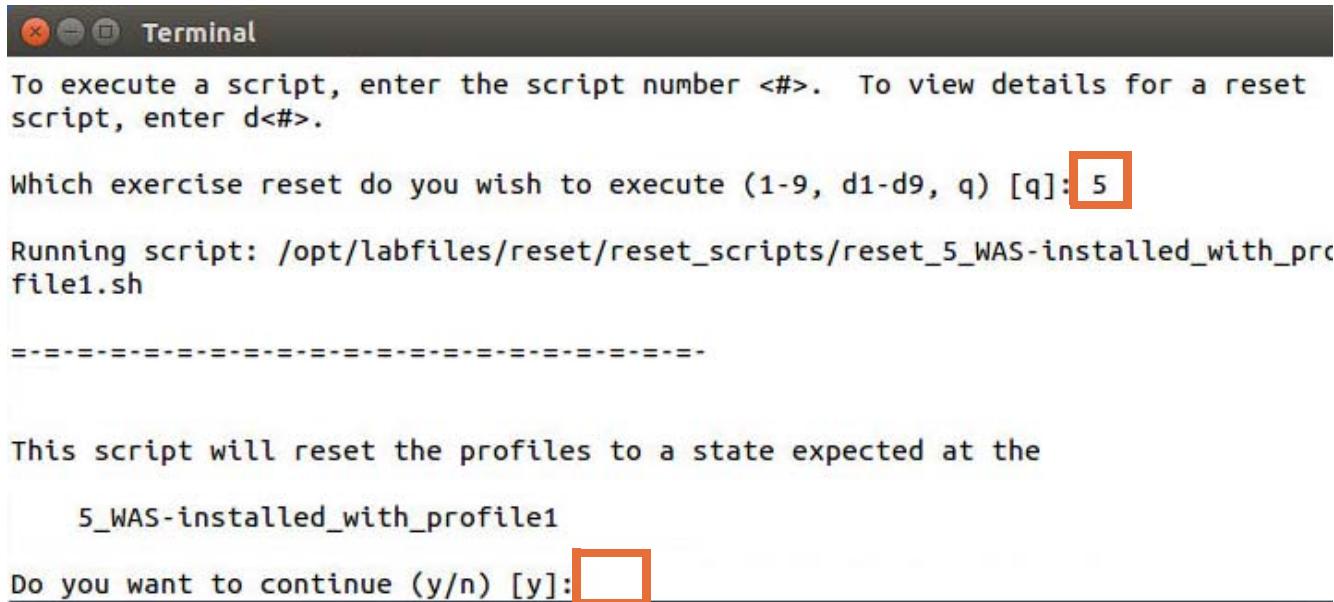
=====
This reset script ensures that the image has IIM, WAS, IHS, WCT, and the
IHS Plugin installed. It also ensure that the working profile1 is restored
from archive.

The script stops first stops all java processes. It then does a silent
install of IIM, WAS, IHS, WCT, and the IHS Plugin. For each product, the
script first checks to see if the install root already exists. If the
directory already exists, the product is not installed (since it appears as
though the product already exists on the machine).

Finally, the script restores a known working profile1 directory. This is done
by renaming any existing profiles (profile1 -> profile1_<time>-<random#>) and
creating a new profile1 from an archive.

=====
Press Enter to continue..
```

- \_\_\_ d. Depending on how much work the reset script must do, the wait can be several minutes. When the script is finished, press **Enter** to close the window.



The screenshot shows a terminal window titled "Terminal". The window contains the following text:

```
To execute a script, enter the script number <#>. To view details for a reset script, enter d<#>.

Which exercise reset do you wish to execute (1-9, d1-d9, q) [q]: 5

Running script: /opt/labfiles/reset/reset_scripts/reset_5_WAS-installed_with_profile1.sh

=====
This script will reset the profiles to a state expected at the
5_WAS-installed_with_profile1

Do you want to continue (y/n) [y]:
```

A red box highlights the number "5" in the command line. Another red box highlights the input field for the confirmation question "Do you want to continue (y/n) [y]:".



IBM Training



© Copyright International Business Machines Corporation 2016.