IBM Software
WebSphere

WebSphere Lab Jam

Application Infrastructure

WebSphere Application Server V8 Administration

Lab Exercise

IBM

Contents

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Lab 1 WebSphere Application Server V8 Installation and Configuration

The objective of this lab is to provide you with an understanding of the basic WebSphere Application Server and WebSphere Application Server – Network Deployment infrastructure. Within the constraints of the machine image available for the exercise you'll configure a typical WAS environment comprised of an HTTP server, WebSphere Application Server, DB2 database server and LDAP server for application use. You'll then add a WAS-ND Deployment Manager and federate the application server environment into WAS-ND to adding scalability, failover, and centralized management to your environment.

This lab is provided **AS-IS**, with no formal IBM support.

1.1 Lab requirements

WebSphere Application Server – Network Deployment Version 8.0

1.2 What you should be able to do

At the end of this lab you should be able to

- Install WebSphere Application Server using IBM Installation Manager and configure WebSphere Application Server for a departmental deployment on a single server
- Configure a WebSphere Application Server – Network Deployment cluster for a departmental deployment on a single server
- Configure WAS and WAS –ND to use DB2 for application data
- Configure a Federated Repository for WAS and WAS-ND to use an LDAP server for user authentication.

1.3 Introduction

This lab is intended as a primer on the basic configuration of WebSphere Application Server for those not already familiar with it, or a refresher for those already skilled in WebSphere Application Server.

The aim of the lab is to walk though the steps that a systems administration would perform for a typical WebSphere Application Server (and WAS-ND) deployment, using the information typically provided or dictated by organizational standards; e.g. installation location, database configuration, LDAP configuration.

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1.4 Exercise instructions

Some instructions in this lab may be Linux ® operating-system specific. If you plan on running the lab on an operating-system other than Linux®, you will need to execute the appropriate commands, and use appropriate files (.sh vs. .bat) for your operating system. The directory locations are specified in the lab instructions using symbolic references, as follows:

Reference variable	Windows® location	Linux® or UNIX® locations
<WAS_HOME>	C:\IBM\WebSphere\AppServer	/usr/WebSphere/AppServer /opt/WebSphere/AppServer
<PROFILE_HOME>	C:\IBM\WebSphere\AppServer\profiles\AppSrv01	/usr/WebSphere/AppServer/profiles/AppSrv01 /opt/WebSphere/AppServer/profiles/AppSrv01
<RAD_HOME>	C:\Program Files\IBM\SDP	/opt/IBM/SDP
<LAB_FILES>	C:\Labfiles80	/Labfiles80
<TEMP>	C:\temp	/tmp

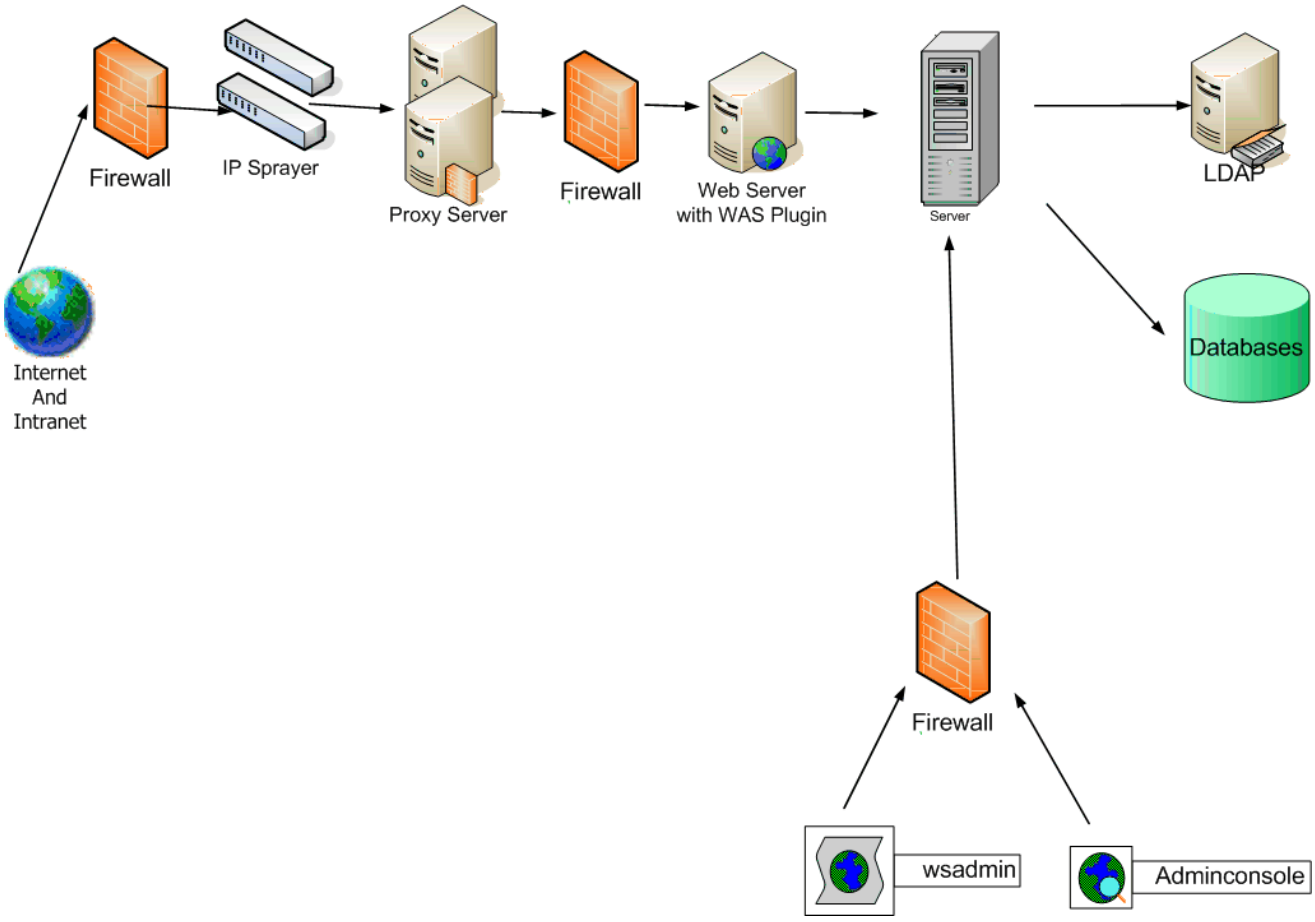
Note for Windows users: When directory locations are passed as parameters to a Java program such as EJBdeploy or wsadmin, it is necessary to replace the backslashes with forward slashes to follow the Java convention. For example, C:\Labfiles80\ would be replaced by C:/Labfiles80/

1.5 Deploying a WebSphere Application Server Departmental Solution.

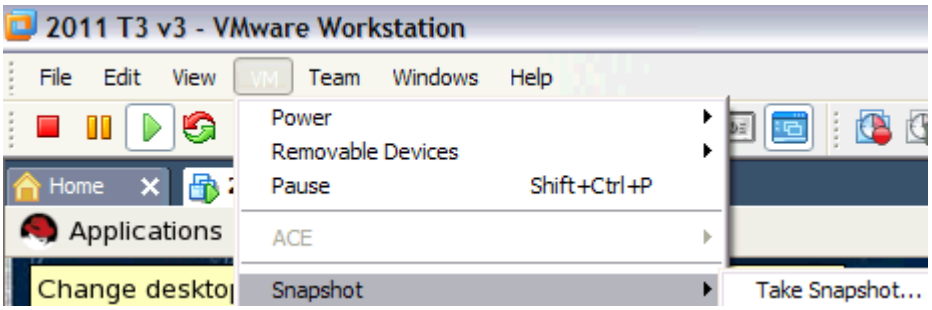
This lab will assume that an departmental application infrastructure; consisting of an HTTP Server and WebSphere Application Server instance, needs to be deployed and configured to use LDAP, and a DB2 database, needs to be deployed in an environment as depicted below.

Since the enterprise is providing a proxy server in the DMZ in order to provide for security we will be configuring the HTTP server to run on the same server as the application server and will thus be able to safely and securely leverage the WebSphere Application Server capability to manage IBM HTTP Server.

As is often the case in many enterprises, much of the infrastructure is outside the domain of the application server administration team. While most often the LDAP server and Database server are located on external servers, for the purposes of this lab both will be located on the same server as the application server, though the actual administration of LDAP and DB2 performed by others, while the WAS configuration to use these services will be part of this exercise.



____ 1. Take a VM snapshot (to insure you have a recovery point) , provide a meaningful same such as “starting image”



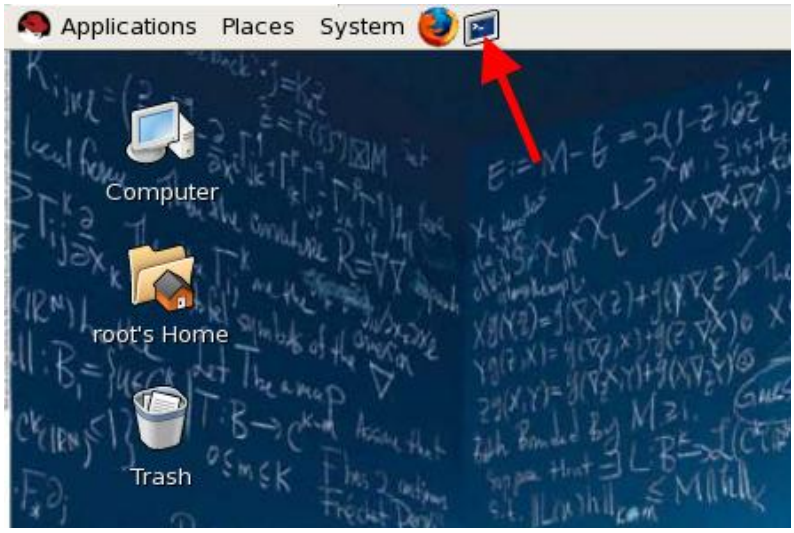
____ 2. Start the Virtual Machine image

__ a. Log in using “root” with the password “password”

Typically you wouldn't log in using "root." Since most of the lab is administrative activities, it makes sense to log in as "root" in this environment. Please don't use root for regular access on your servers.

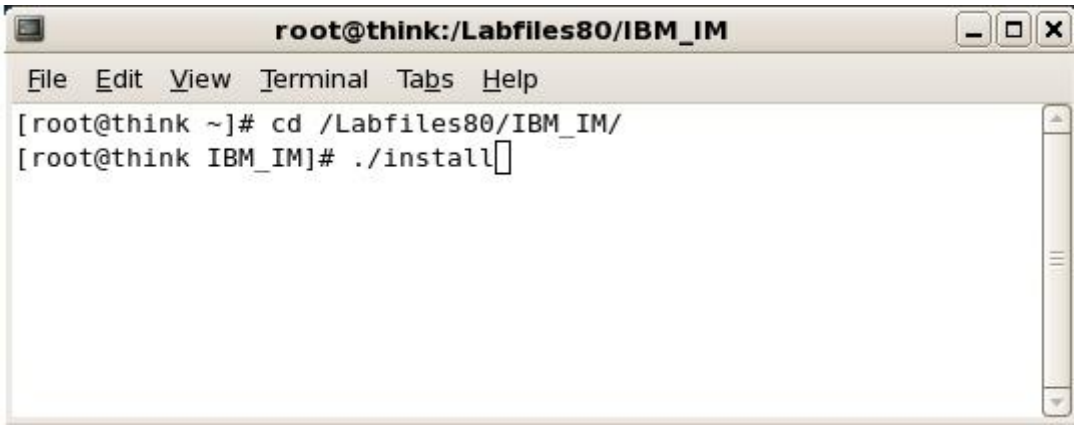
____ 3. WAS V8 has a new installer, called the "IBM Install Manager". The Install Manager must first be installed, before installing WAS itself. The following instructions will show you how to install the IBM Install Manager.

__ b. Open a command window

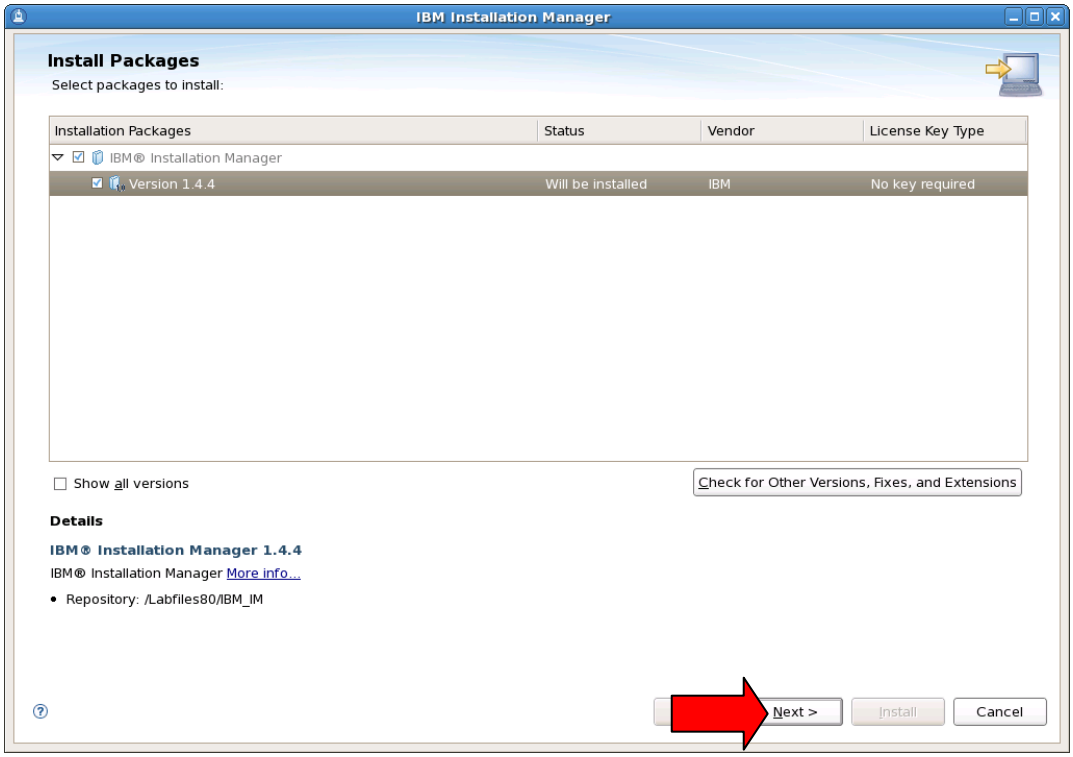


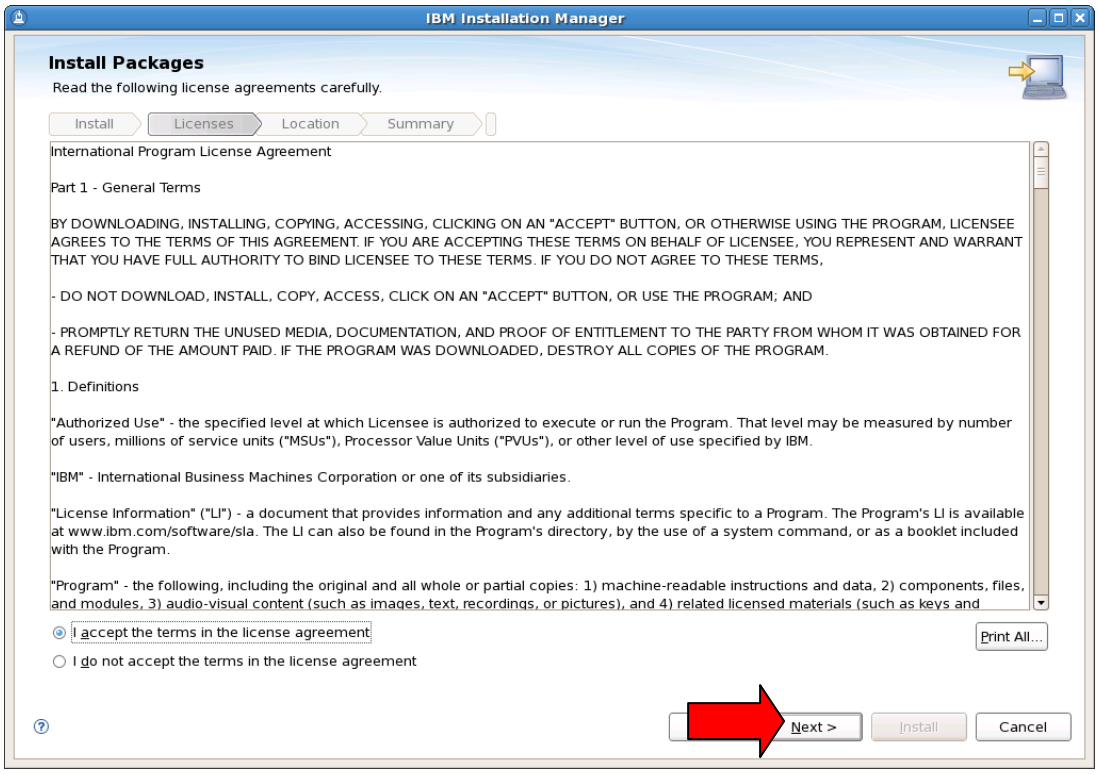
__ c. Navigate to the directory with the install image of Install Manager # **cd /Labfiles80/IBM_IM**

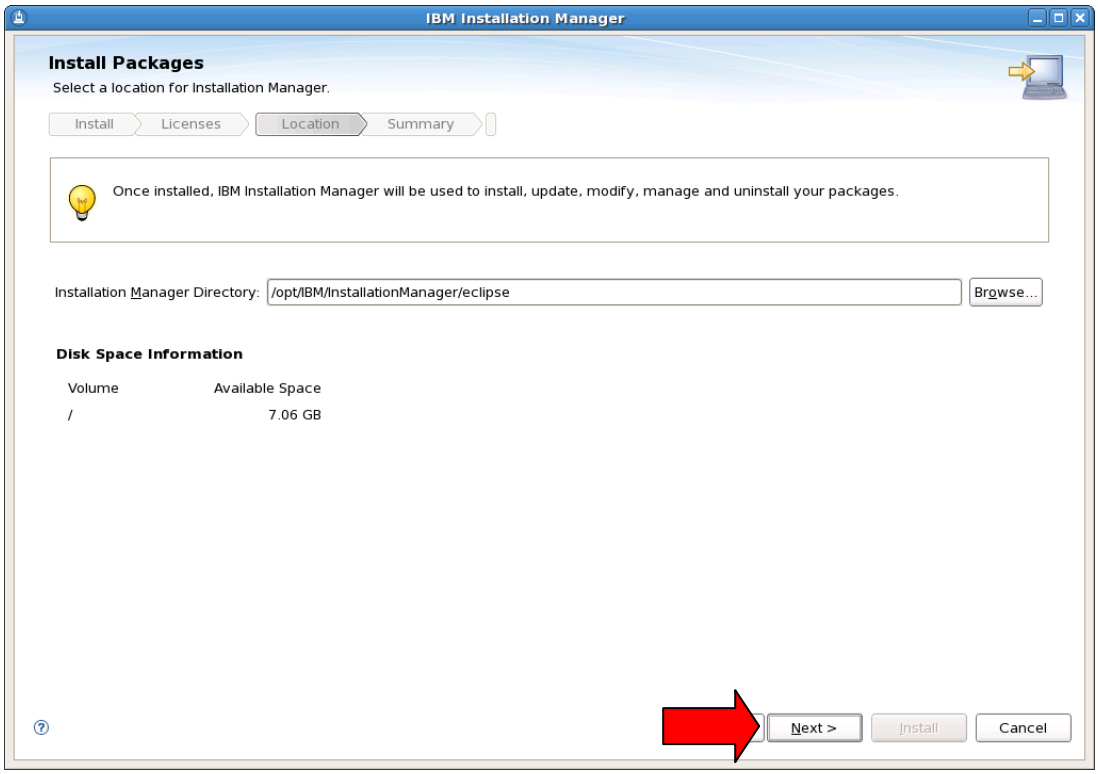
__ d. Run the Install Manager install # **./install**

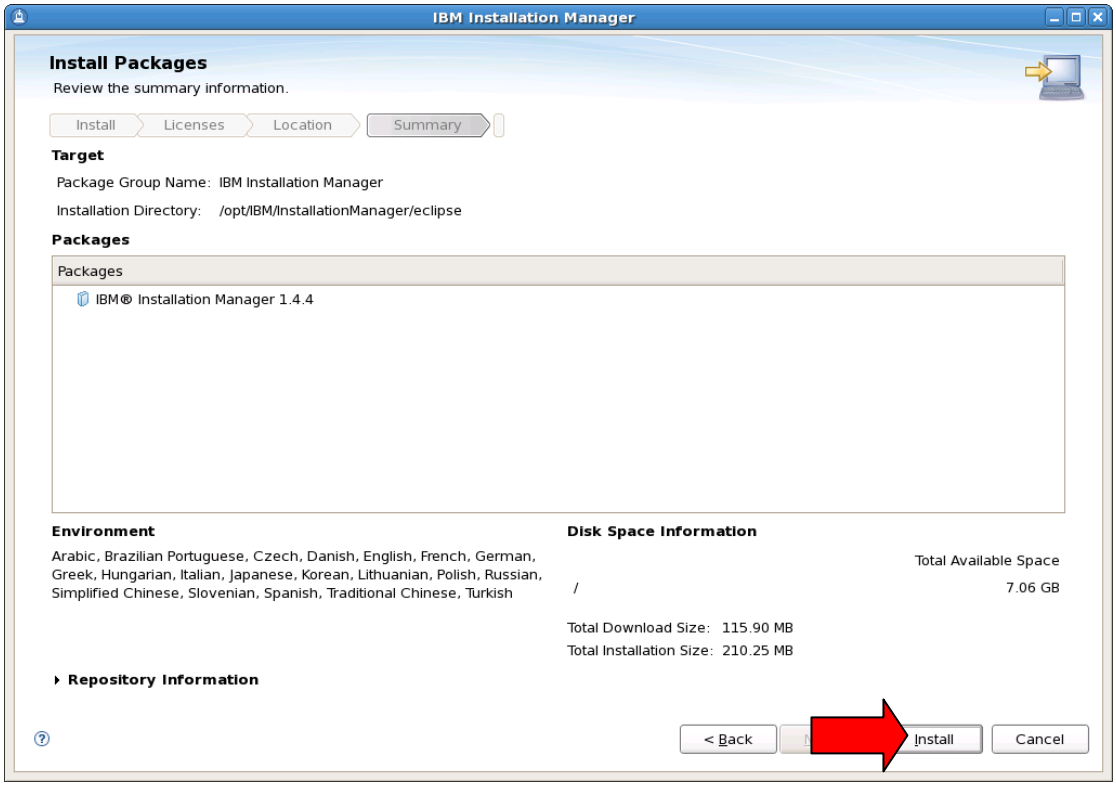


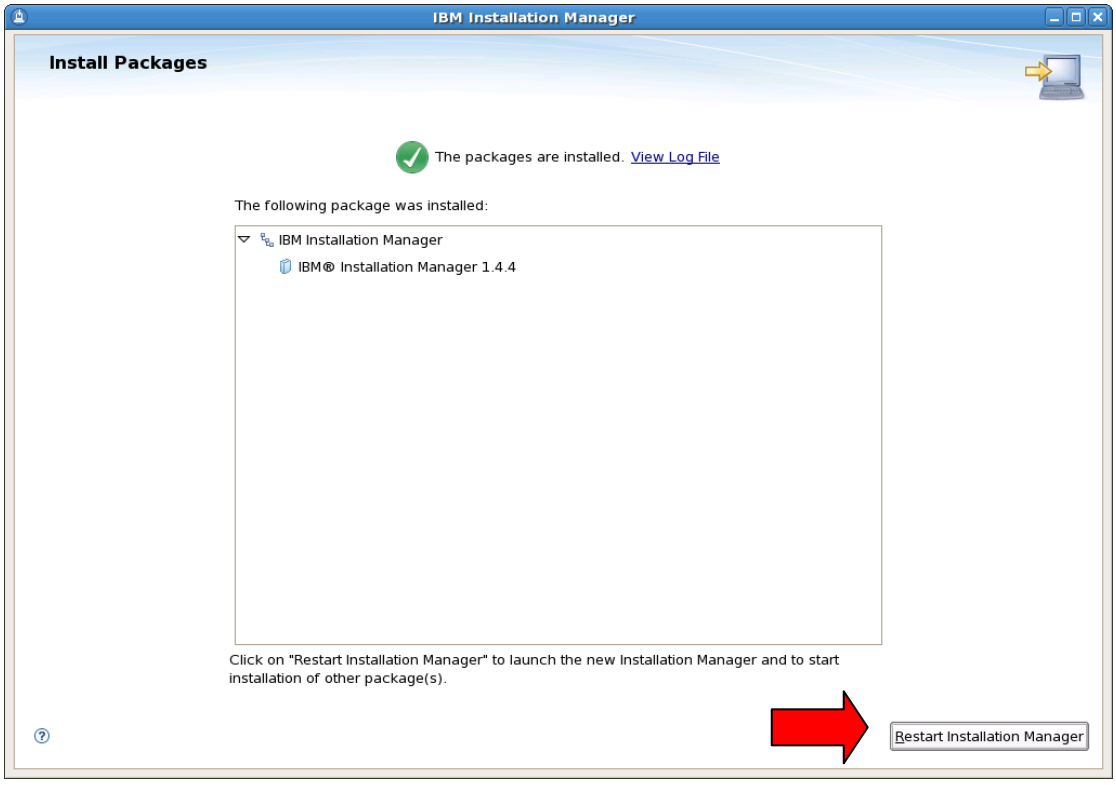
You'll see the following screens. Take the defaults as illustrated in the images below

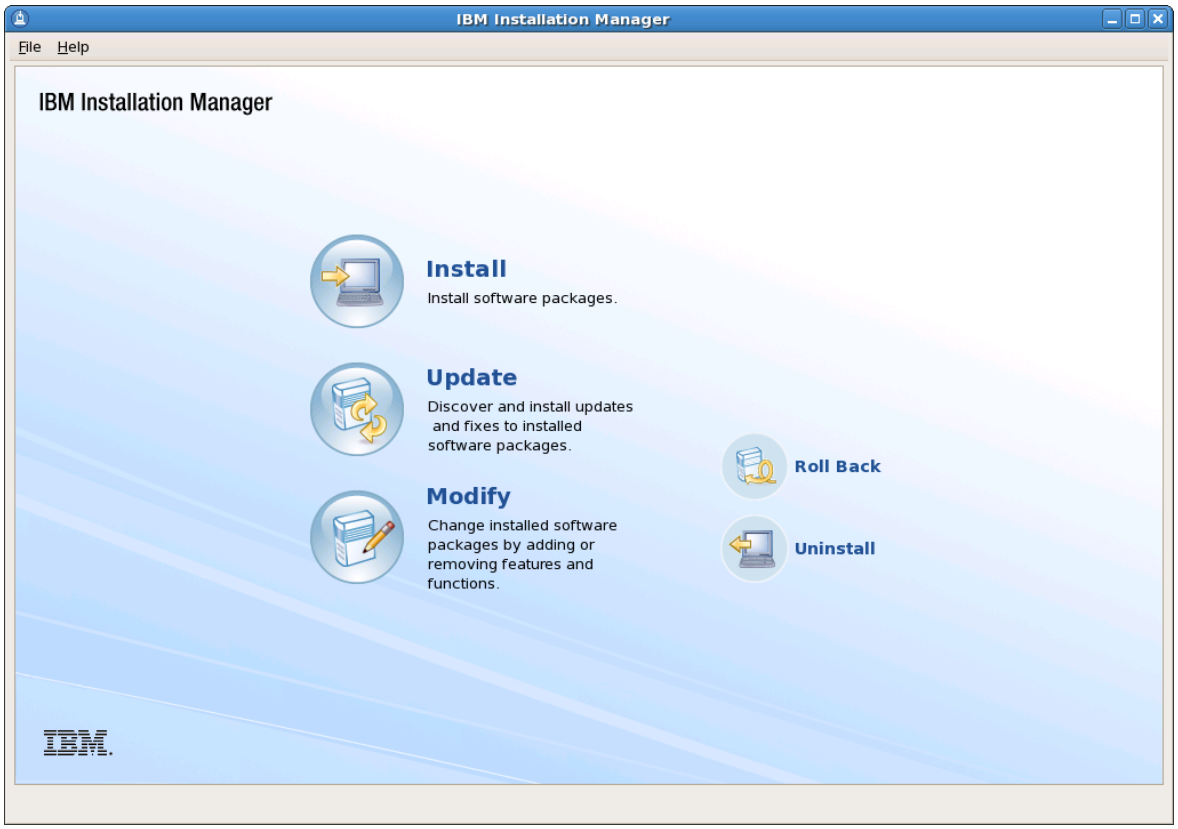



IBM Installation Manager
Install Packages
Read the following license agreements carefully.
Install
Licenses
Location
Summary
International Program License Agreement
Part 1 - General Terms
BY DOWNLOADING, INSTALLING, COPYING, ACCESSING, CLICKING ON AN "ACCEPT" BUTTON, OR OTHERWISE USING THE PROGRAM, LICENSEE AGREES TO THE TERMS OF THIS AGREEMENT. IF YOU ARE ACCEPTING THESE TERMS ON BEHALF OF LICENSEE, YOU REPRESENT AND WARRANT THAT YOU HAVE FULL AUTHORITY TO BIND LICENSEE TO THESE TERMS. IF YOU DO NOT AGREE TO THESE TERMS,
- DO NOT DOWNLOAD, INSTALL, COPY, ACCESS, CLICK ON AN "ACCEPT" BUTTON, OR USE THE PROGRAM; AND
- PROMPTLY RETURN THE UNUSED MEDIA, DOCUMENTATION, AND PROOF OF ENTITLEMENT TO THE PARTY FROM WHOM IT WAS OBTAINED FOR A REFUND OF THE AMOUNT PAID. IF THE PROGRAM WAS DOWNLOADED, DESTROY ALL COPIES OF THE PROGRAM.
1. Definitions
"Authorized Use" - the specified level at which Licensee is authorized to execute or run the Program. That level may be measured by number of users, millions of service units ("MSUs"), Processor Value Units ("PVUs"), or other level of use specified by IBM.
"IBM" - International Business Machines Corporation or one of its subsidiaries.
"License Information" ("LI") - a document that provides information and any additional terms specific to a Program. The Program's LI is available at www.ibm.com/software/sla. The LI can also be found in the Program's directory, by the use of a system command, or as a booklet included with the Program.
"Program" - the following, including the original and all whole or partial copies: 1) machine-readable instructions and data, 2) components, files, and modules, 3) audio-visual content (such as images, text, recordings, or pictures), and 4) related licensed materials (such as keys and
I accept the terms in the license agreement
I do not accept the terms in the license agreement
Print All...
Next >
Install
Cancel

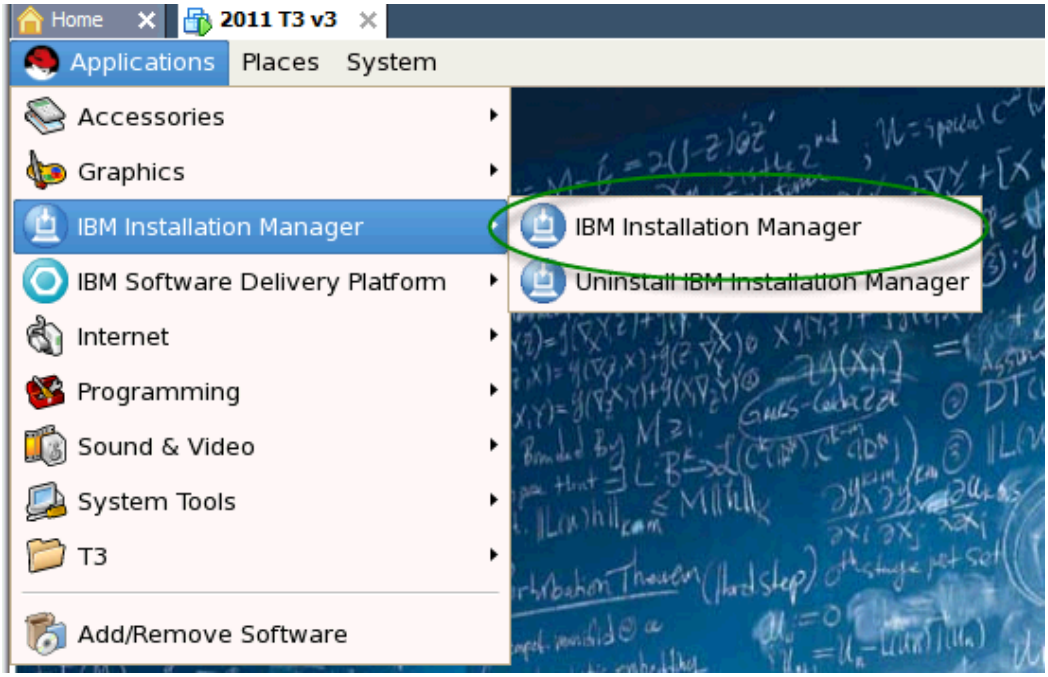

IBM Installation Manager
Install Packages
Select a location for Installation Manager.
Install
Licenses
Location
Summary
Once installed, IBM Installation Manager will be used to install, update, modify, manage and uninstall your packages.
Installation Manager Directory:
/opt/IBM/InstallationManager/eclipse
Browse...
Disk Space Information
Volume
Available Space
/
7.06 GB
Next >
Install
Cancel


IBM Installation Manager
Install Packages
Review the summary information.
Install
Licenses
Location
Summary
Target
Package Group Name: IBM Installation Manager
Installation Directory: /opt/IBM/InstallationManager/eclipse
Packages
Packages
IBM® Installation Manager 1.4.4
Environment
Arabic, Brazilian Portuguese, Czech, Danish, English, French, German, Greek, Hungarian, Italian, Japanese, Korean, Lithuanian, Polish, Russian, Simplified Chinese, Slovenian, Spanish, Traditional Chinese, Turkish
Disk Space Information
Total Available Space
/
7.06 GB
Total Download Size: 115.90 MB
Total Installation Size: 210.25 MB
Repository Information
< Back
Install
Cancel


IBM Installation Manager
Install Packages
The packages are installed. View Log File
The following package was installed:
IBM Installation Manager
IBM® Installation Manager 1.4.4
Click on "Restart Installation Manager" to launch the new Installation Manager and to start installation of other package(s).
Restart Installation Manager



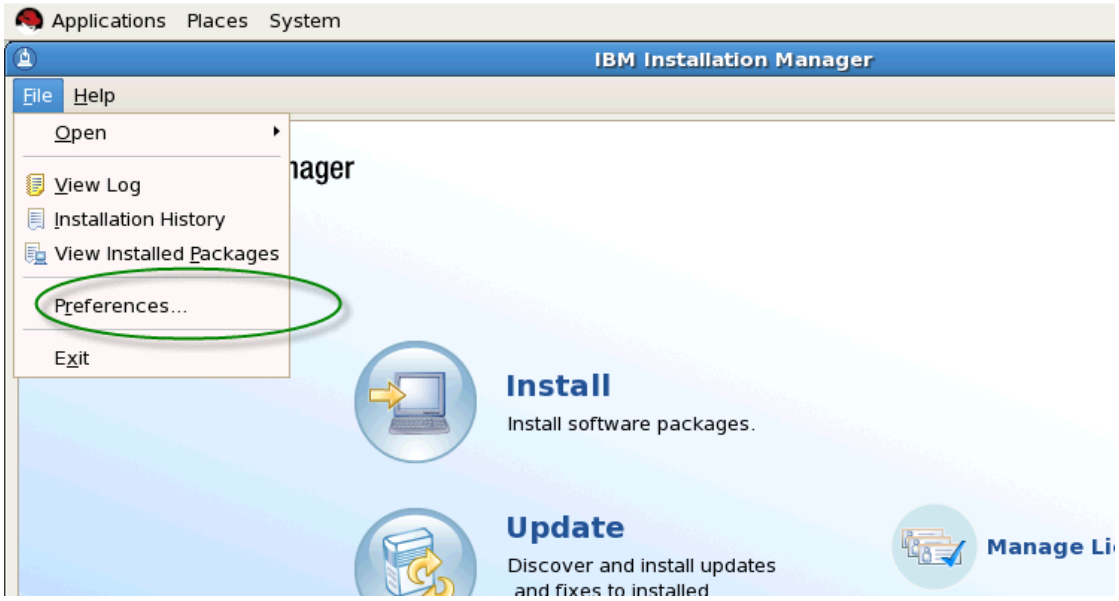
After it is installed you can also launch Install Manager as shown below:



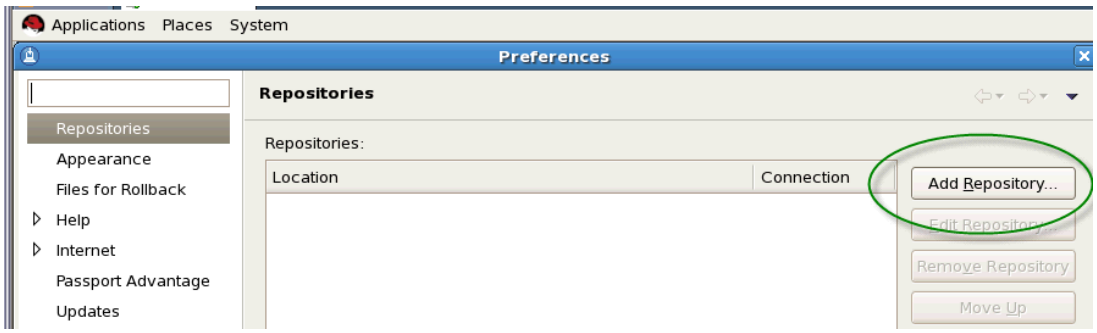
Now that Install Manager is in place you can start installing a wide range of IBM products. Install manager does need to know where to find the install images. The images are

stored in a repository. The next steps will show how to configure Install Manger to access a repository that has been built for you for this lab.

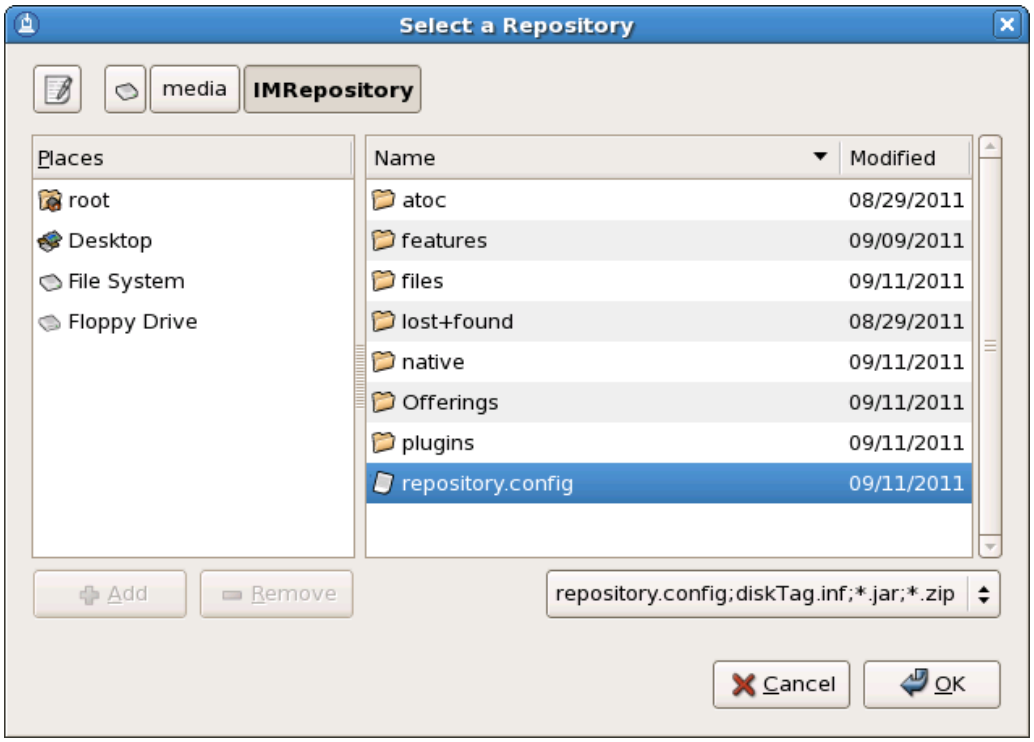
__ e. Click **File -> Preferences** for the IBM Installation Manager Preferences as shown below



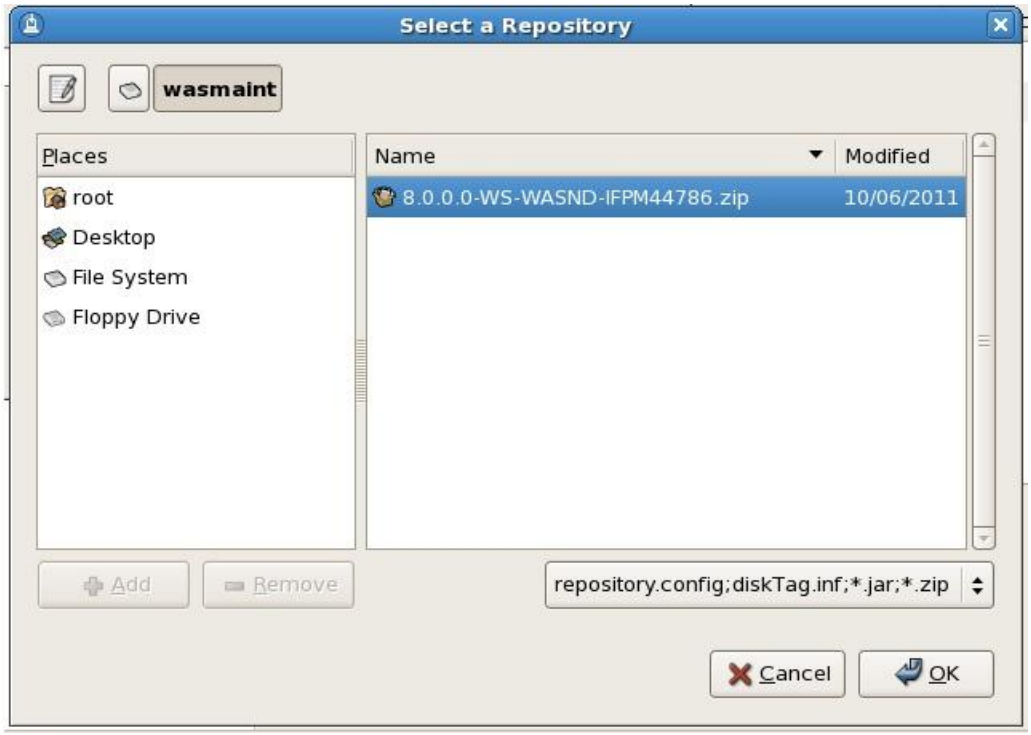
__ f. Click " **Add Repository** "



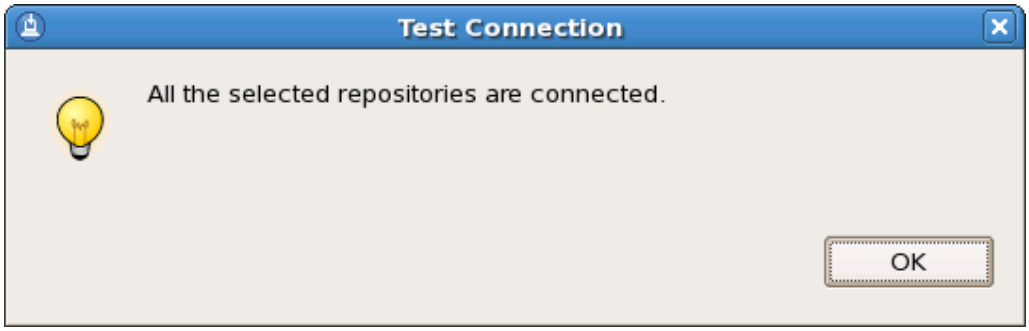
__ g. Browse to the **/opt/media/IMRepository** directory, and select the **repository.config** file, and click **"OK"**



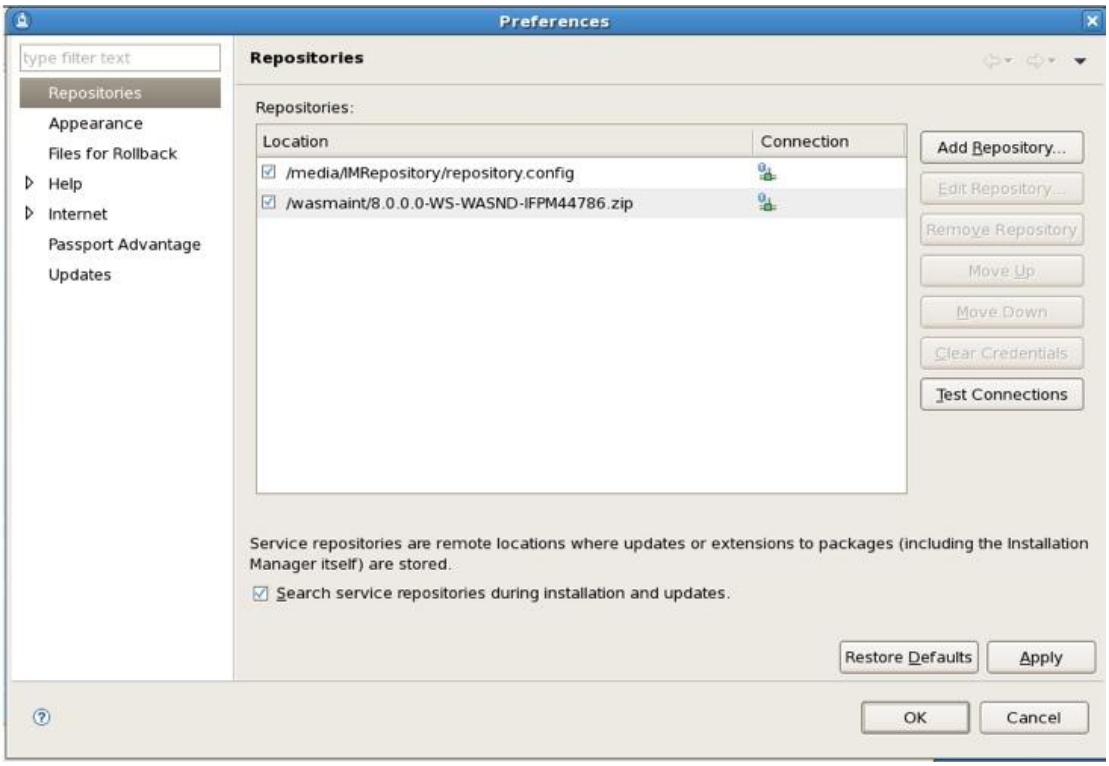
__ h. Repeat the previous step to add a repository for iFix. Browse to the **/wasmaint** directory, select the **8.0.0.0-WS-WASND-IFPM44786.zip** file, and click **OK**



__ i. Test the connection to the repository with the "**Test Connection**" button



__ j. Your Installation Manager screen should now look like the image below. At this point we are ready to start installing software that exists in the repository.

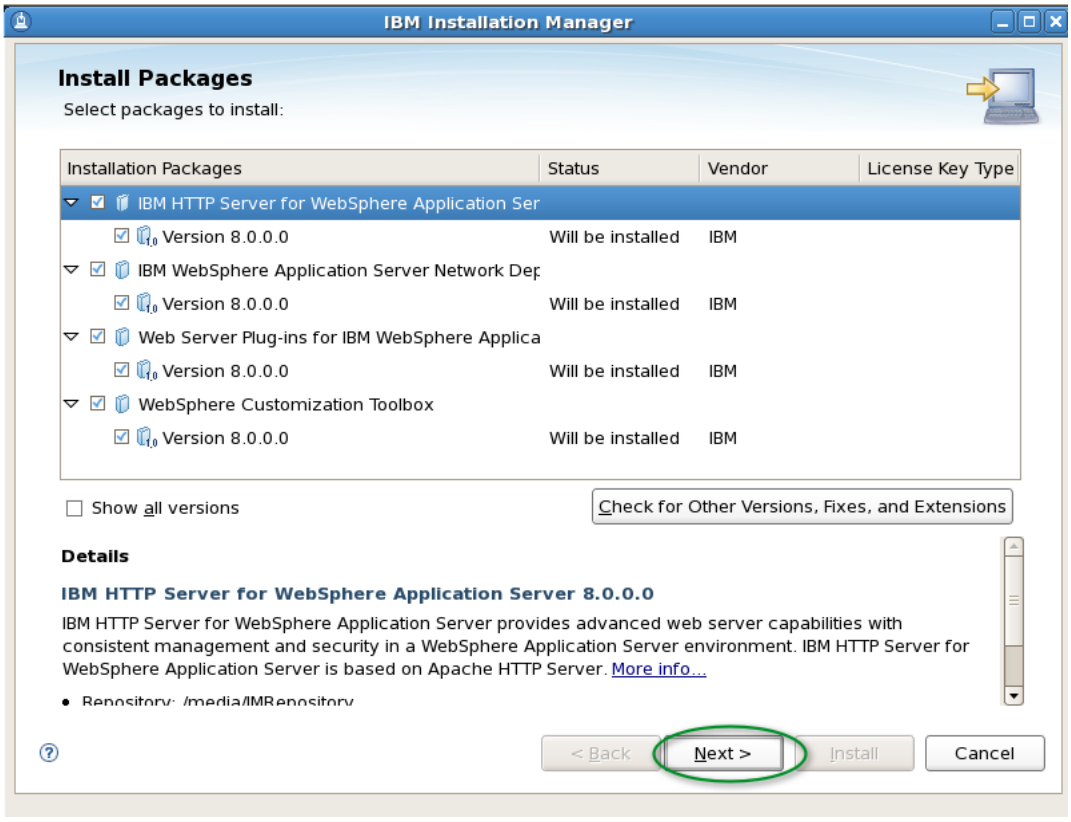


__ k. Click "**OK**" to return to the Install Manager home.

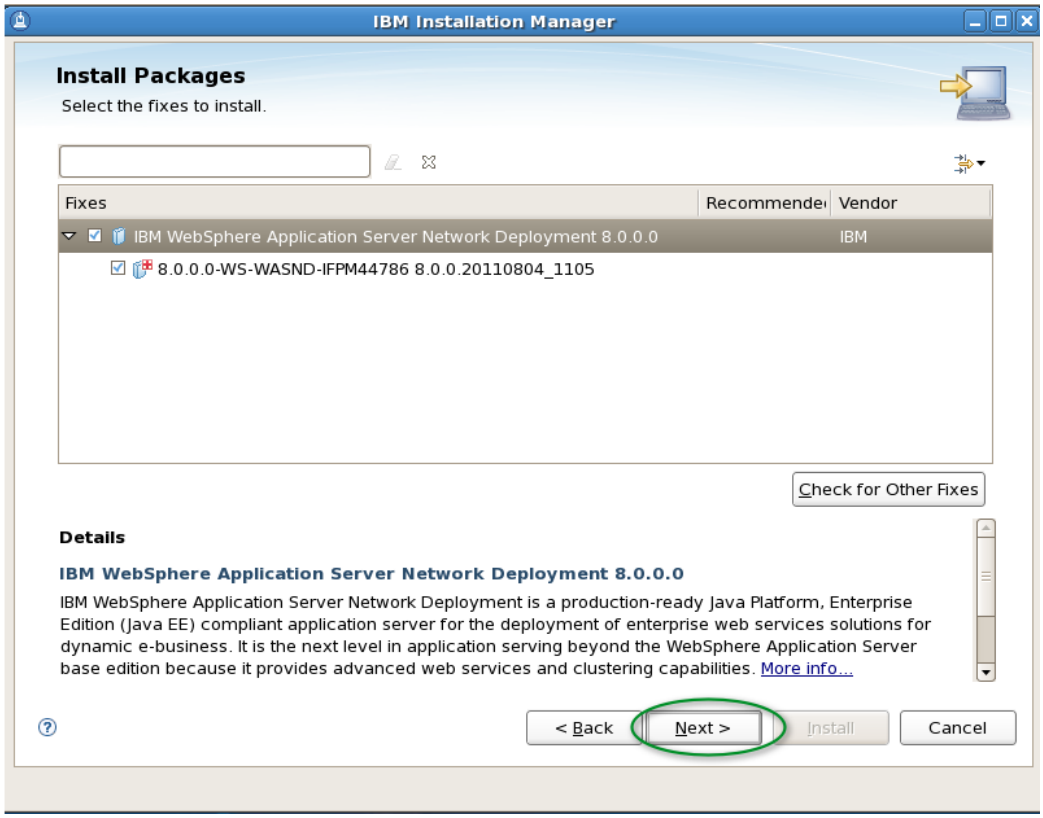
____ 4. Install WebSphere Application Server

__ l. Click **Install** from the Installation Manager

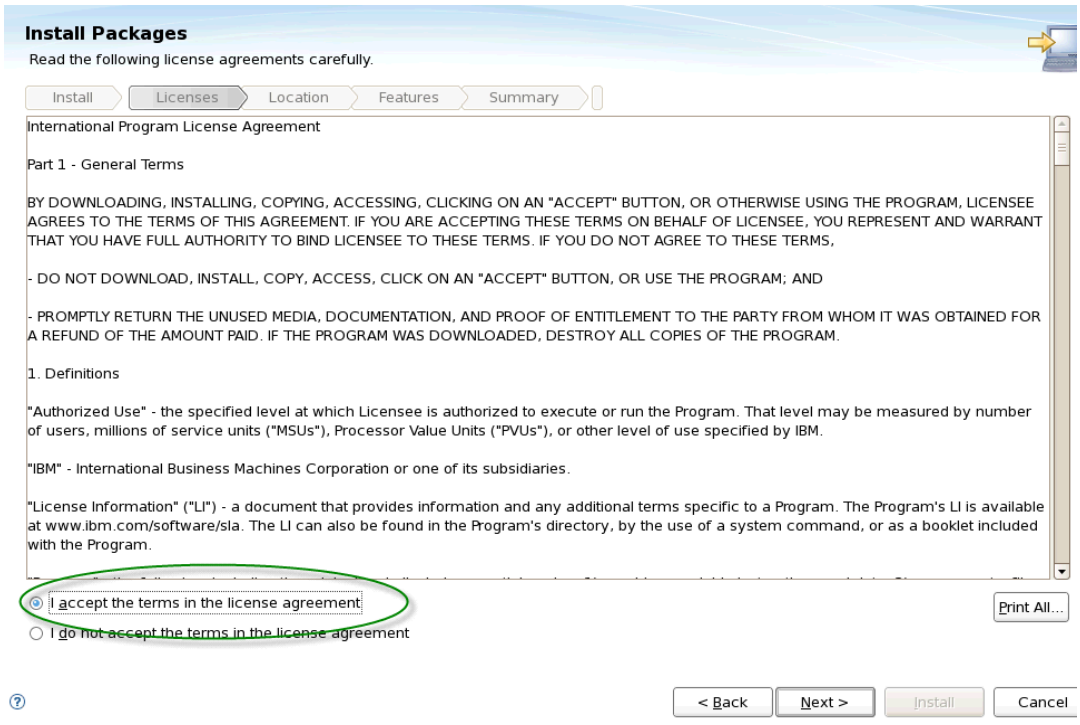
__ m. Select the software to install as show below then click **Next**.



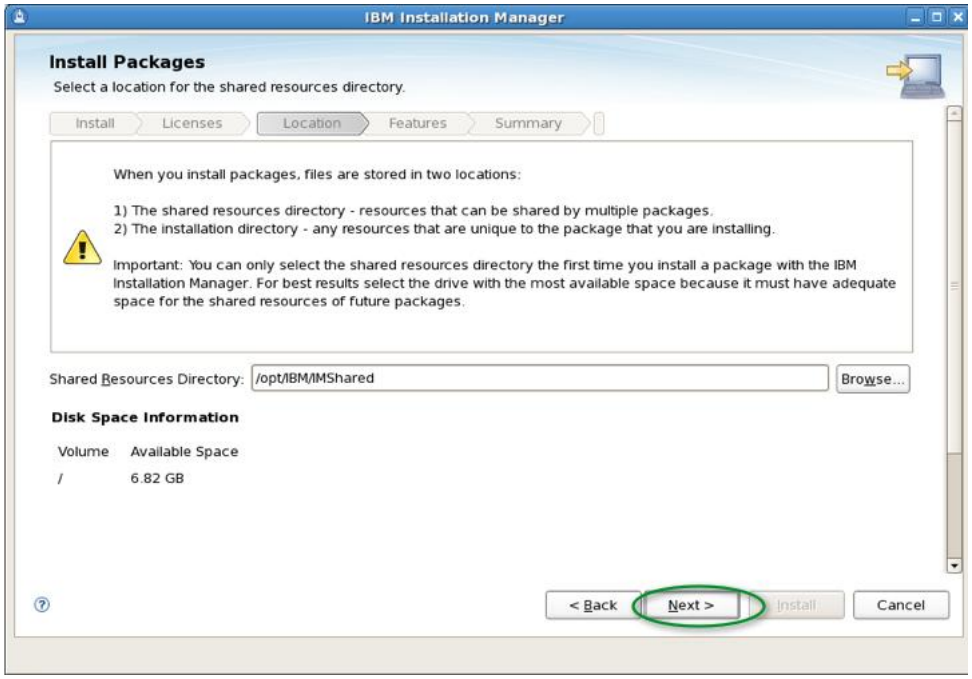
__ n. Select the fix and click **OK**.



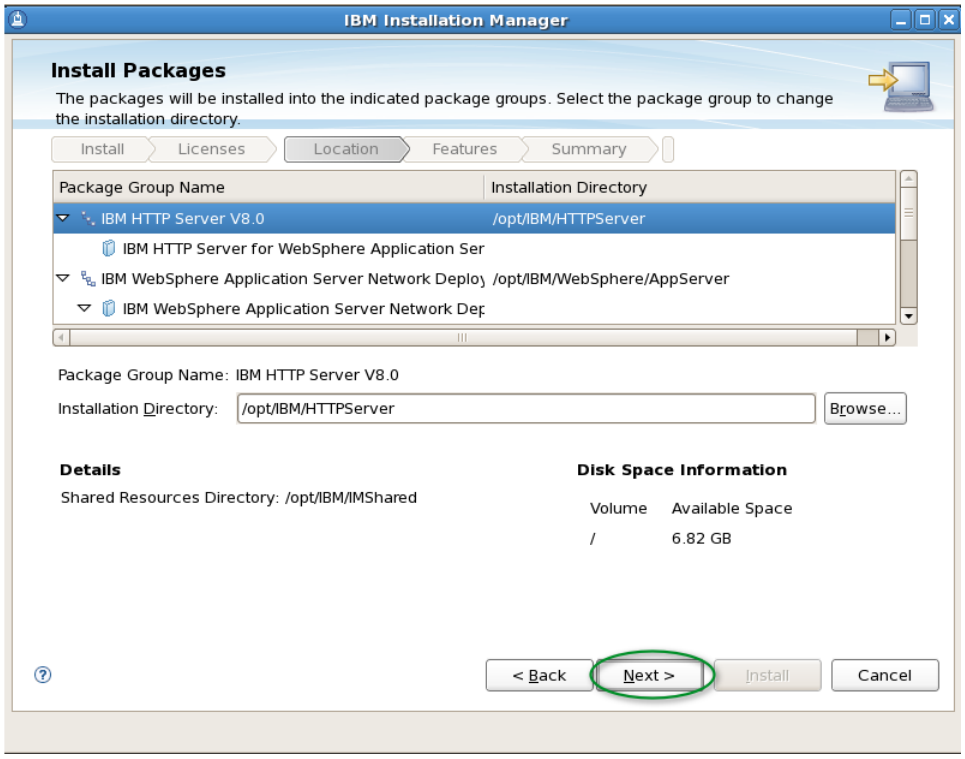
__ o. **Select** Accept the License and Click **Next**



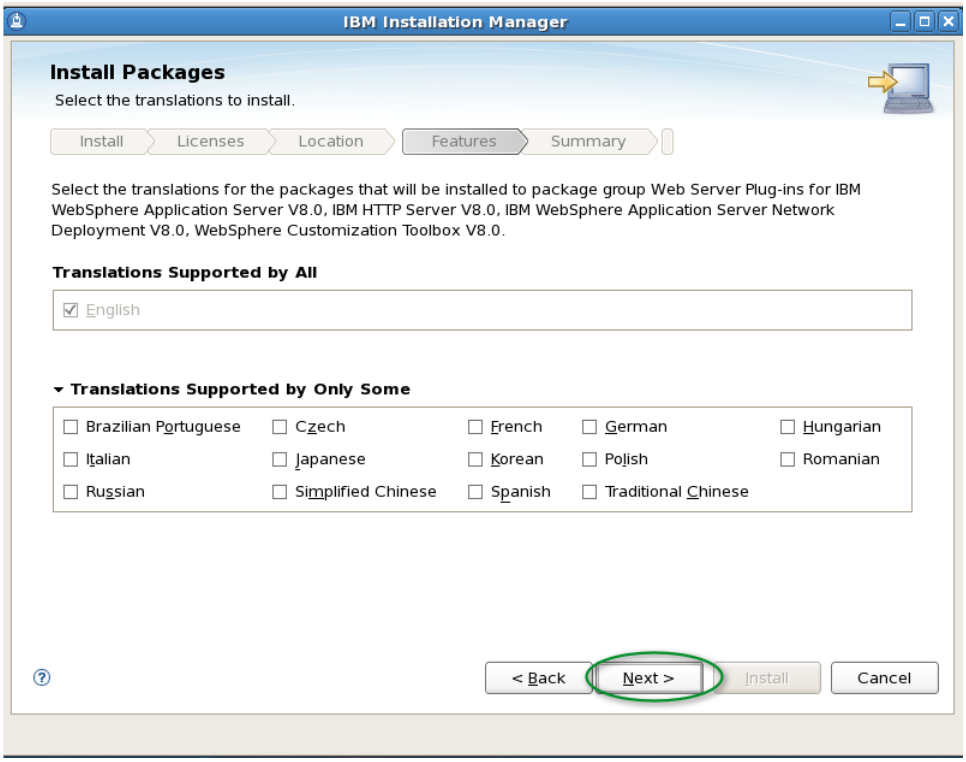
__ p. Select Shared Resources Directory **/opt/IBM/IMShared** and click **Next**.



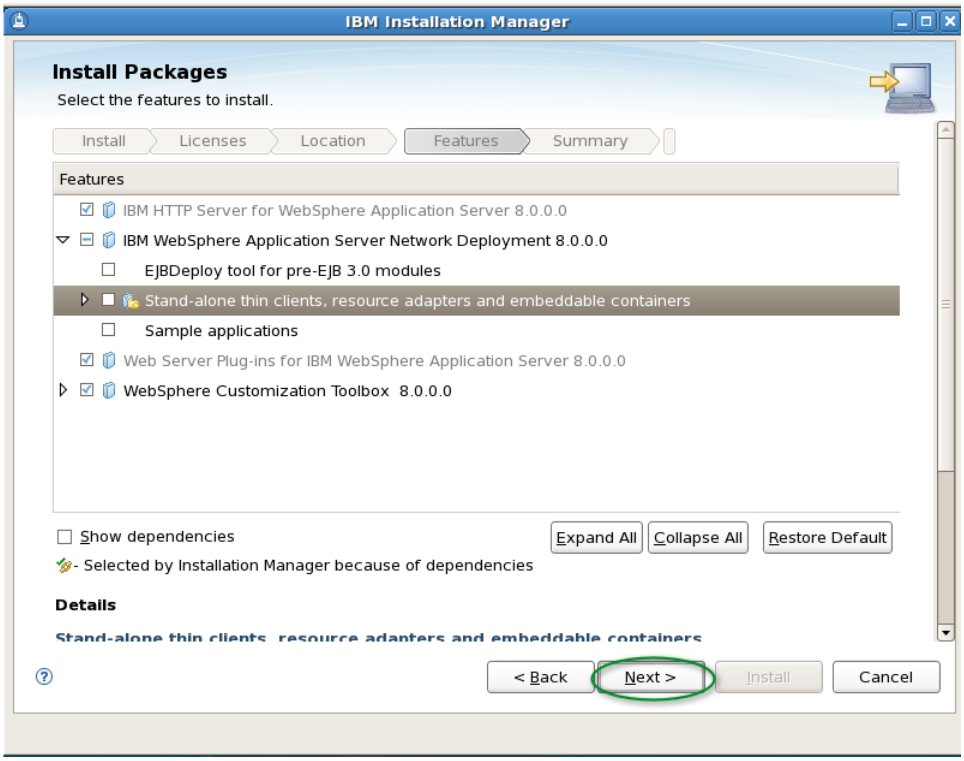
__ q. Accept the default for the package group installation and directory. Click **Next**.



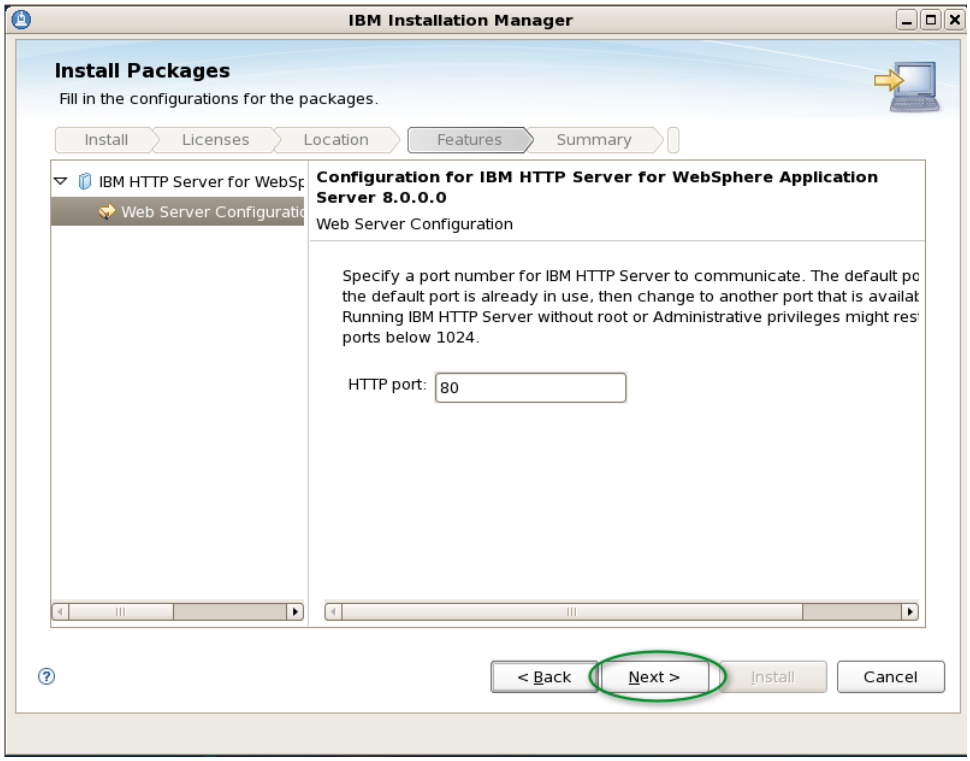
__ r. Accept the default for Language and click **Next.**



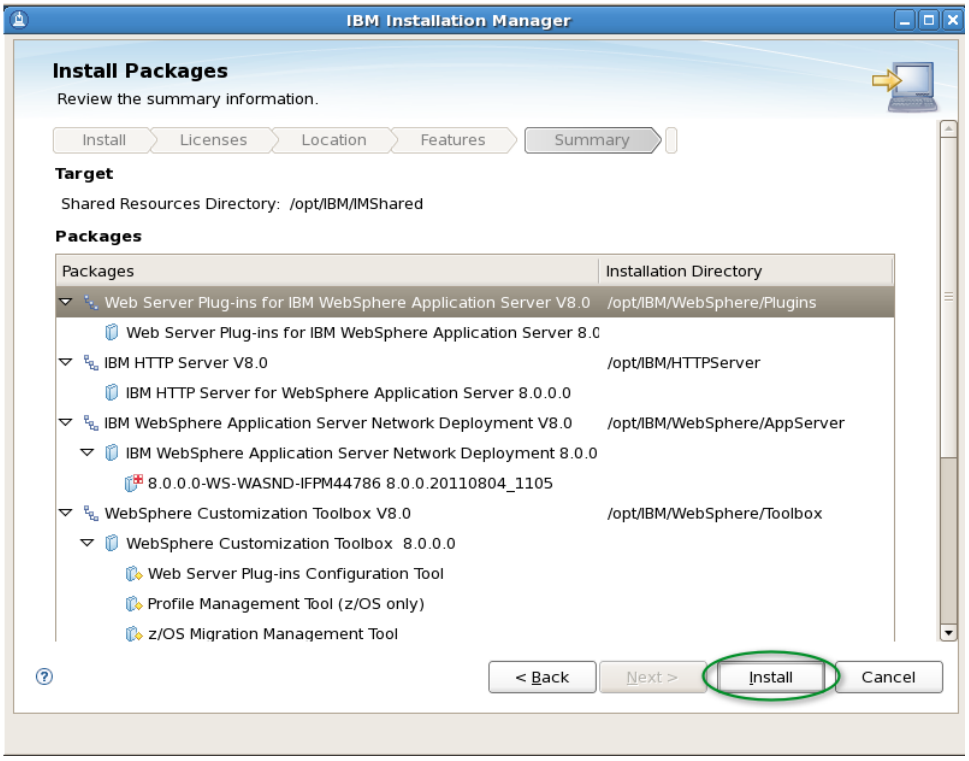
__ s. Select the packages to install as shown below and click **Next**.



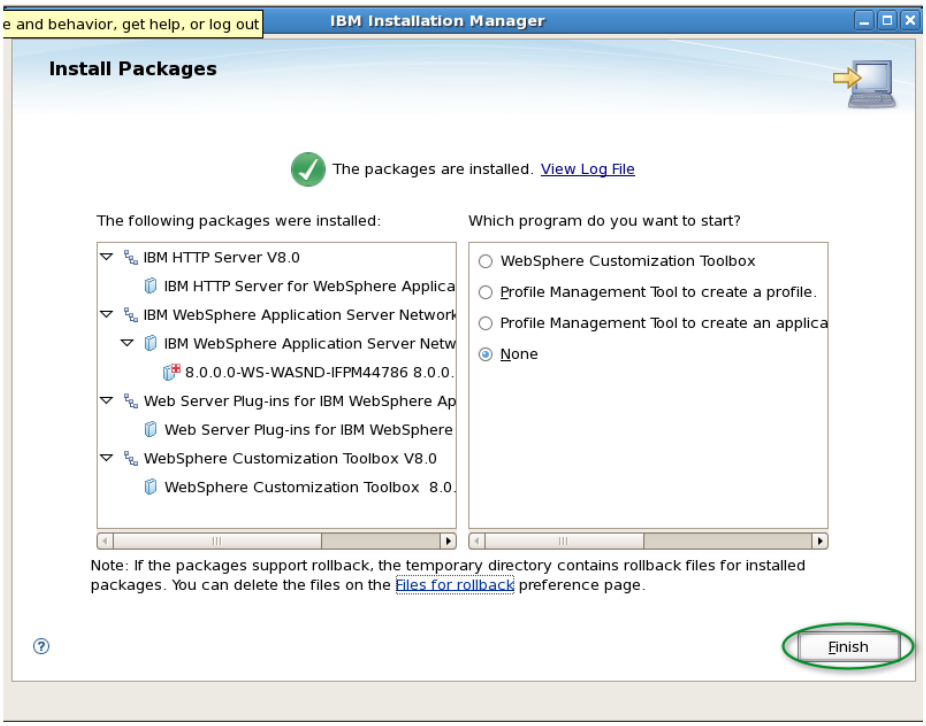
__ t. Select port 80 for the Web Server



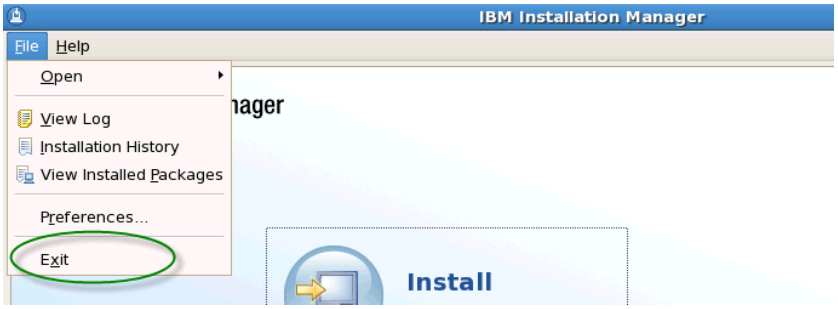
__ u. Review the install package list, which shows both WAS and the ifix and click **Install**



__ v. Once the install has completed you should see the dialog below. Select **“None”** for the “Which Program do you want to strart?” Option (**Do Not** Start the Profile Management Tool) and Click **Finish**



__ w. Exit the Installation Manager using **File -> Exit**

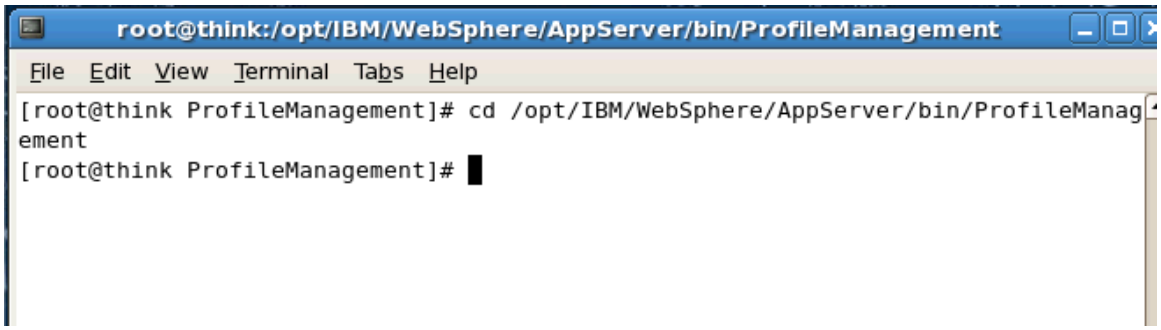


Note: You installed WAS, HIS, and an ifix, demonstrating a “one pass install”.

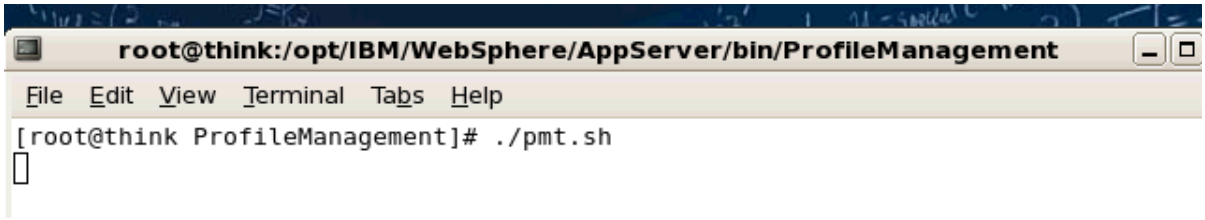
____ 5. Create an application server profile

__ a. In a terminal window change directories to **/opt/IBM/WebSphere/AppServer/bin/ProfileManagement** using the command

cd /opt/IBM/WebSphere/AppServer/bin/ProfileManagement as shown below

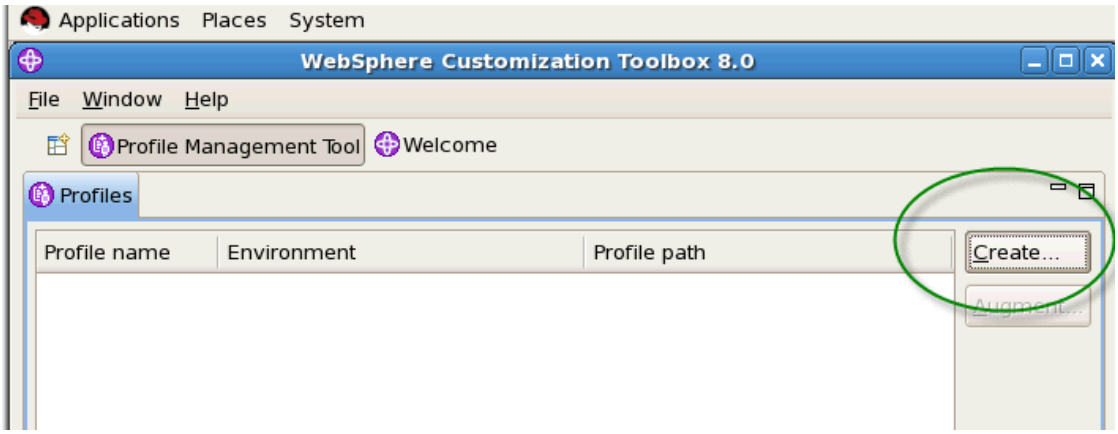


__ b. Launch the WebSphere Customization Toolkit (formerly the Profile Management Tool) using the command **./pmt.sh**

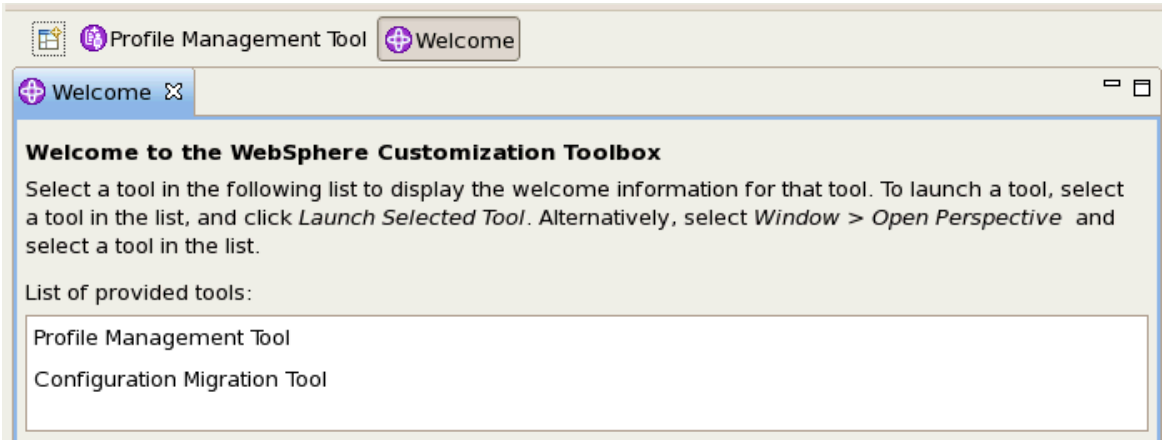


____ **6.** Create a WebSphere Application Server Profile, installing the adminconsole and sample application, configuring administrative security with the user “wasadmin” and password “wasadmin”.

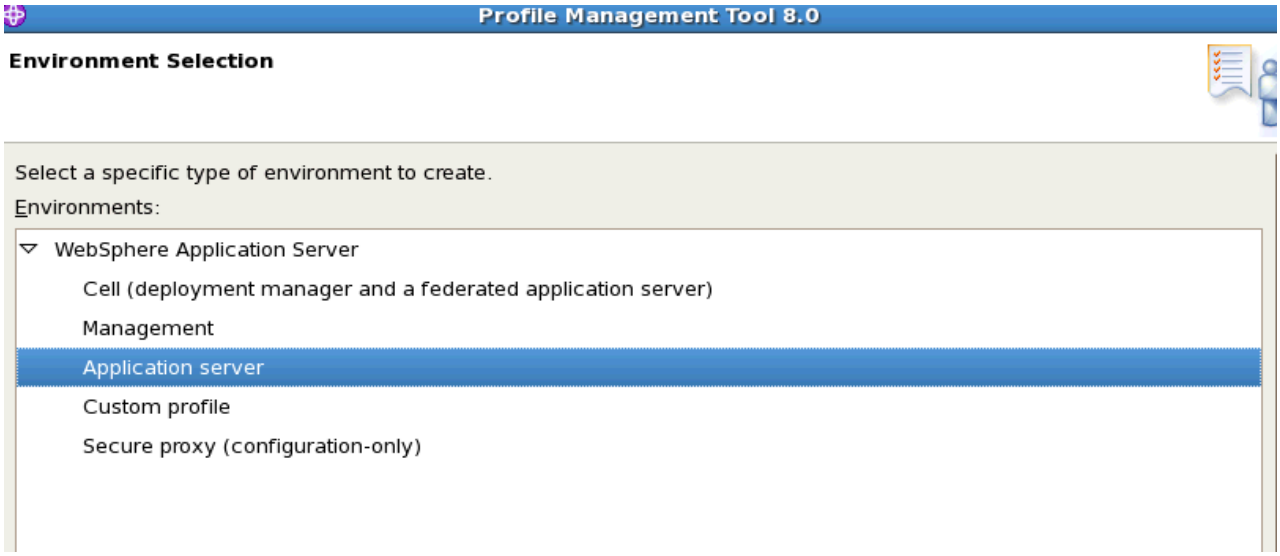
__ a. Select “**Create**” to start the profile creation process



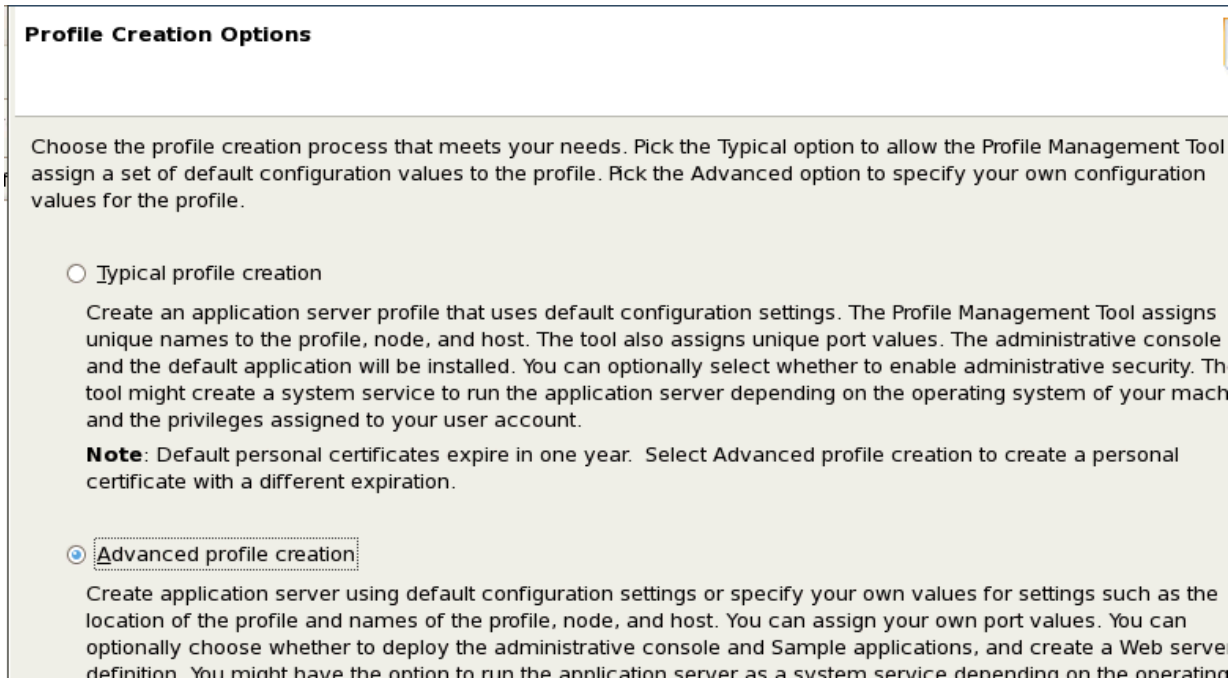
Note: Even though you launched the Profile Management Tool with the command ./pmt.sh, you'll notice that the WebSphere Customization Toollbox launched. A subset of this new toolbox is installed with WAS which includes the Profile Management Tool and the Configuration Migration Tool.



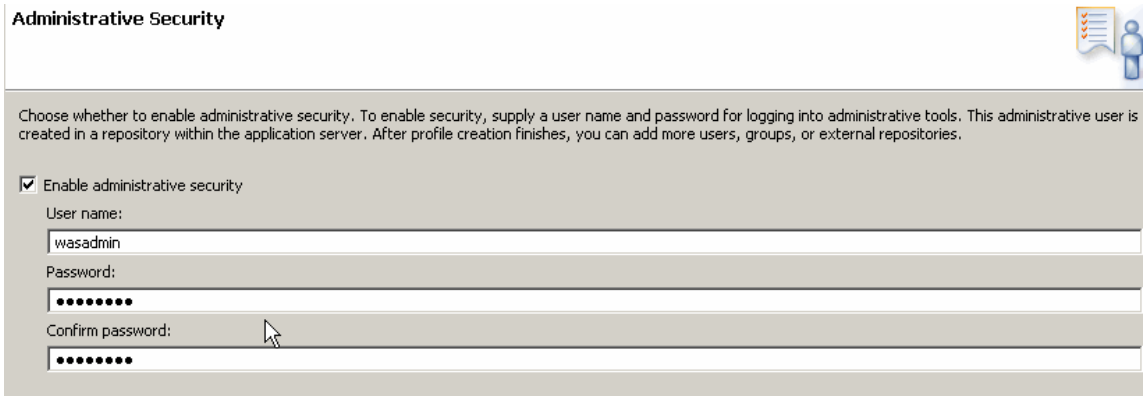
__ b. Highlight "**Application Server**" and click "**Next**" as shown below.



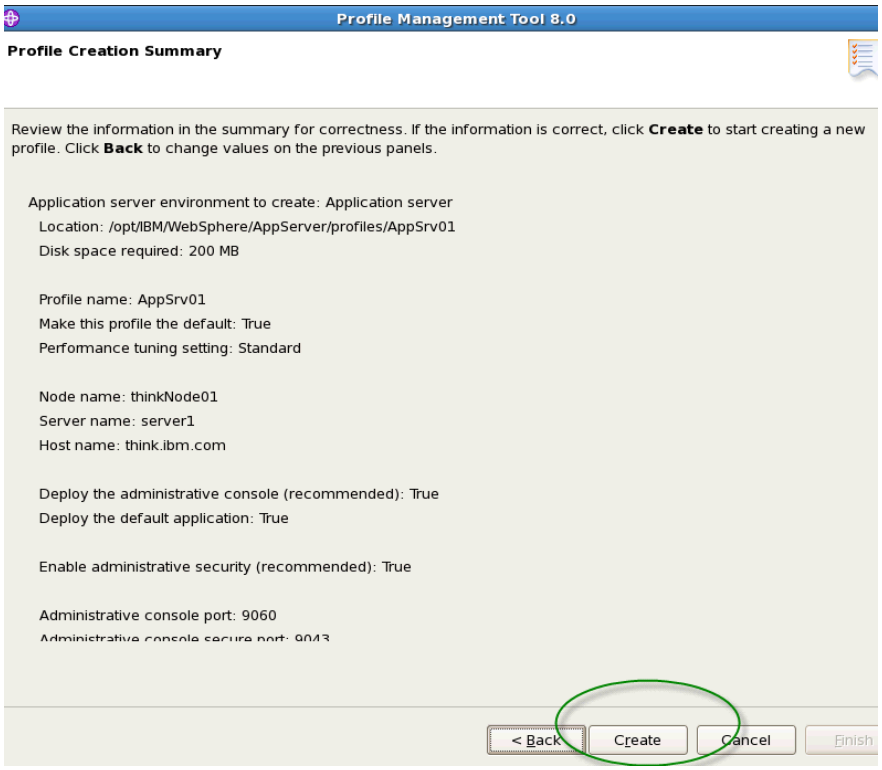
__ c. Select "**Advanced Profile Creation**"



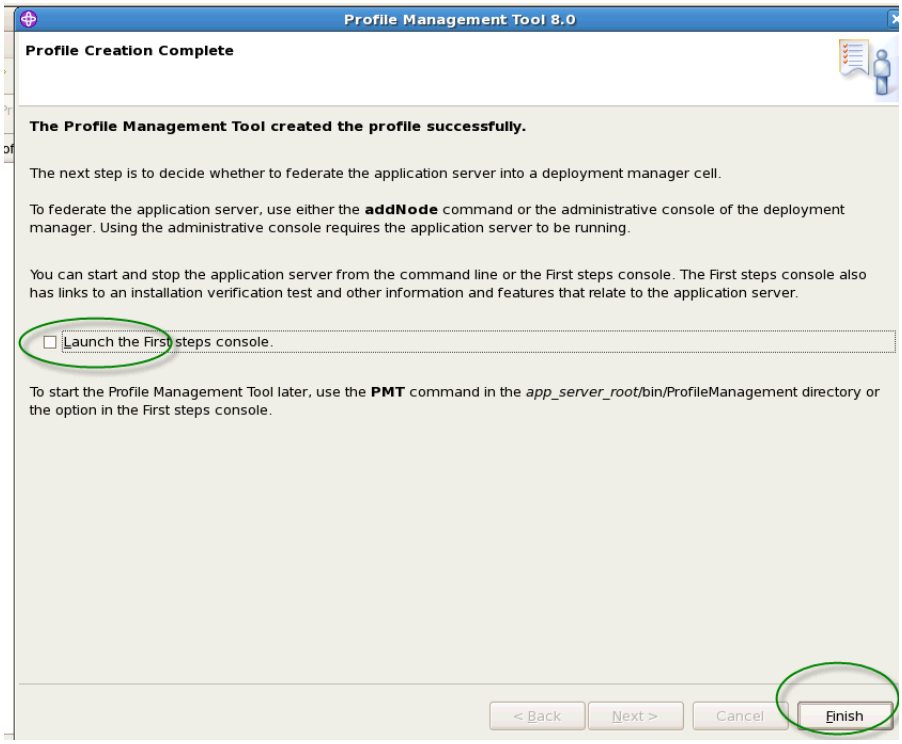
__ d. Continue through the panels accepting all the defaults by clicking on **"Next**" until you reach the "Administrative Security" panel, then specify "**wasadmin**" for the user and "**wasadmin**" for the password .



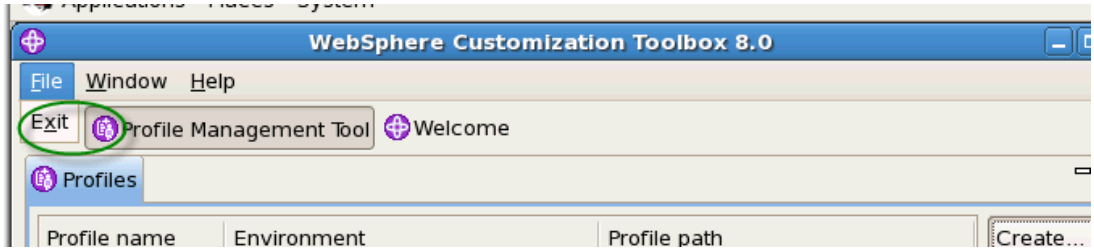
__ e. Again continue though all the panels accepting all the defaults by clicking "**Next**" until you reach the panel shown below. Create the profile by clicking "**Create**"



__ f. Unselect the "**First Steps**" dialog, click "**Finish**"

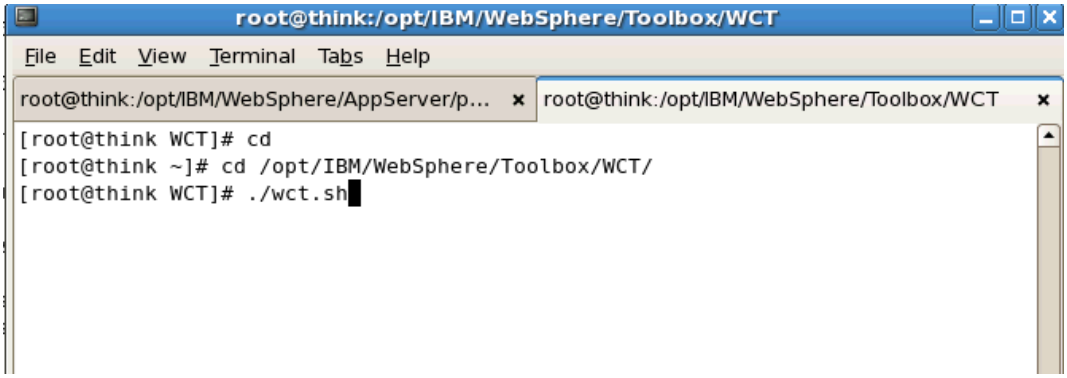


__ g. Exit the WCT (WebSphere Customization Toolbox) by clicking **File ->Exit**

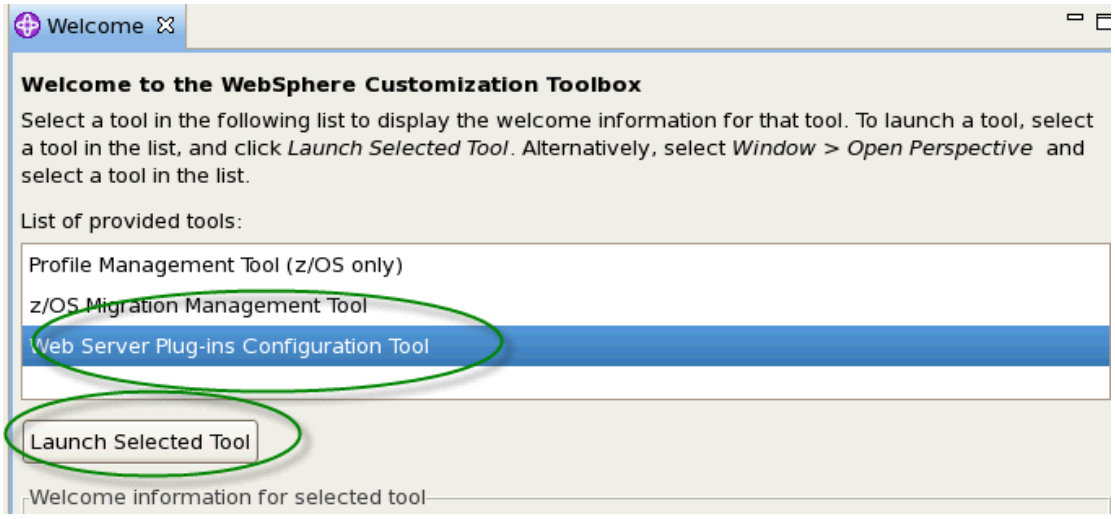


____ 7. Launch WebSphere Customization Toolbox (WCT) to Configure the HTTP Server Plugin

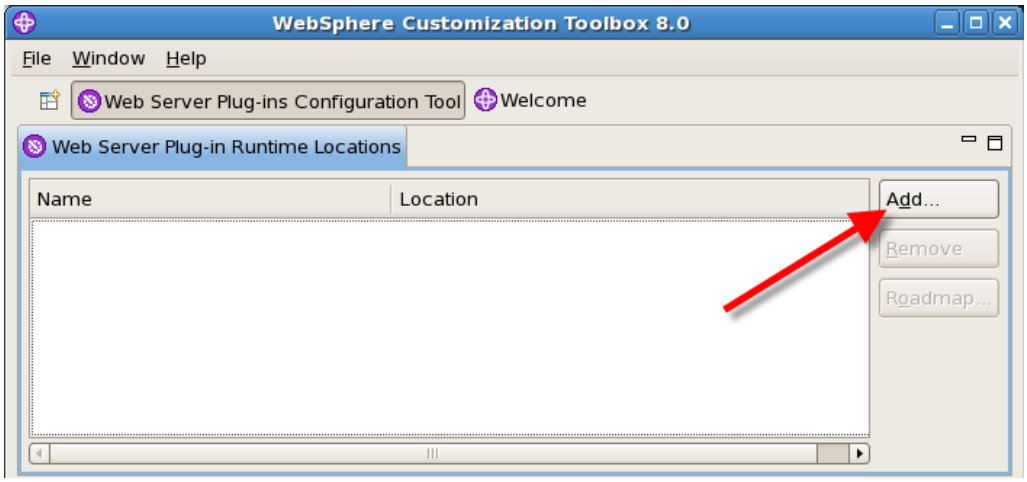
__ a. As shown below change directories to **/opt/IBM/WebSphere/Toolbox/WCT/** then enter **./wct.sh**



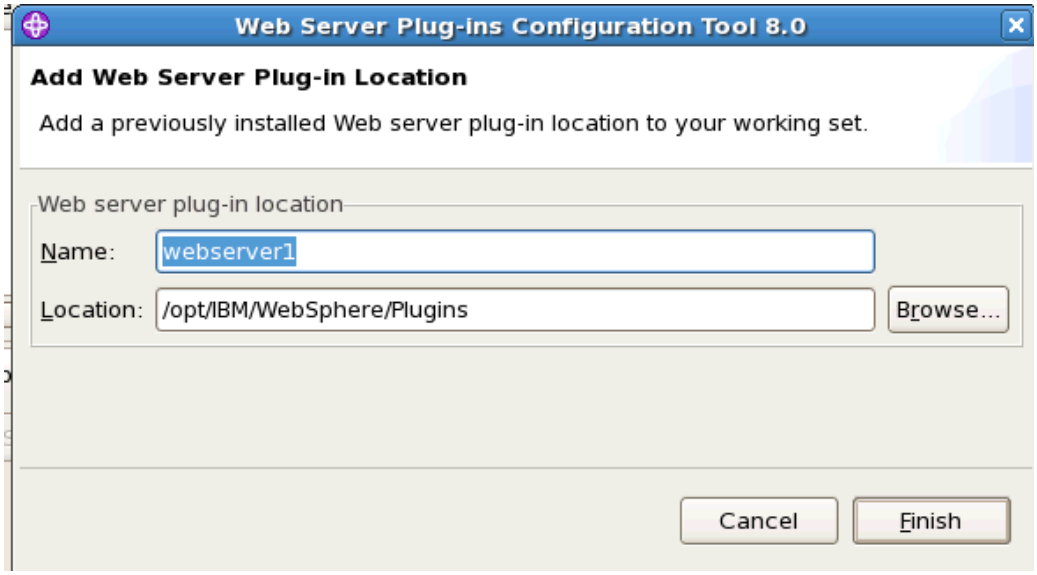
__ b. Specify **Web Server Plug-ins Configuration Tool** and Click **Launch Selected Tool**



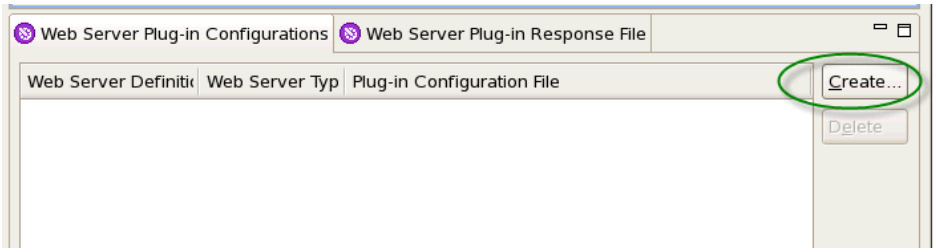
__ c. Click the **Add** button



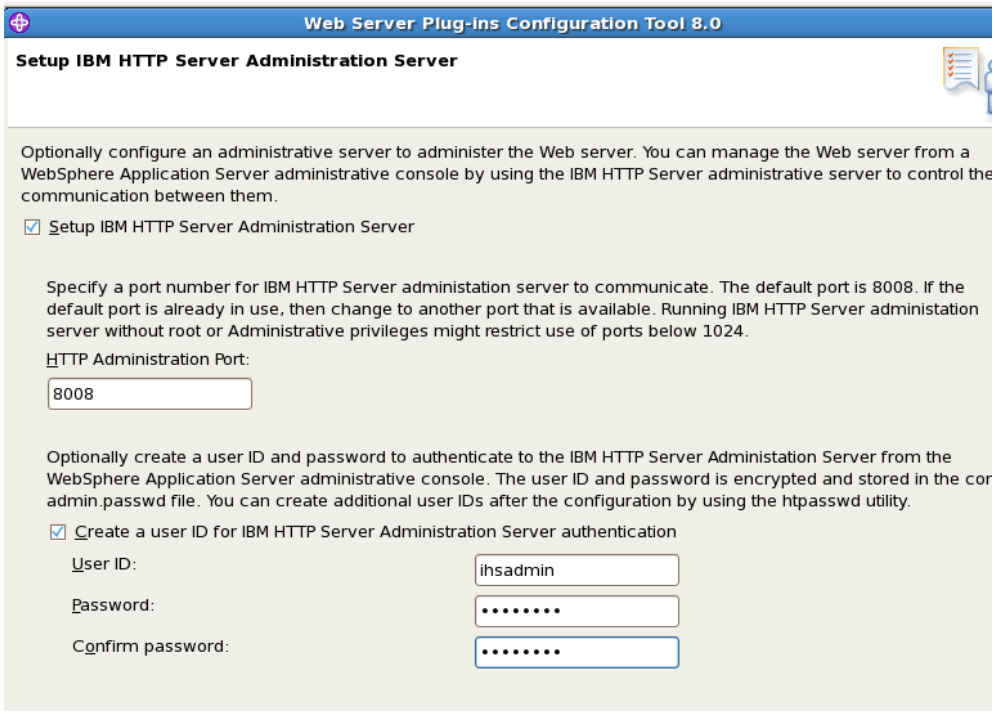
__ d. Enter **webserver1** and **/opt/IBM/WebSphere/Plugins** as shown below, and click **Finish**



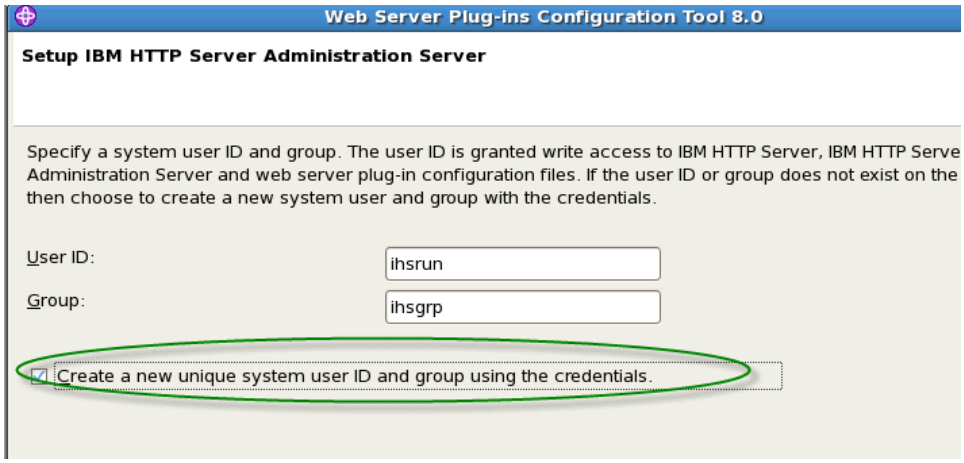
__ e. Click Create



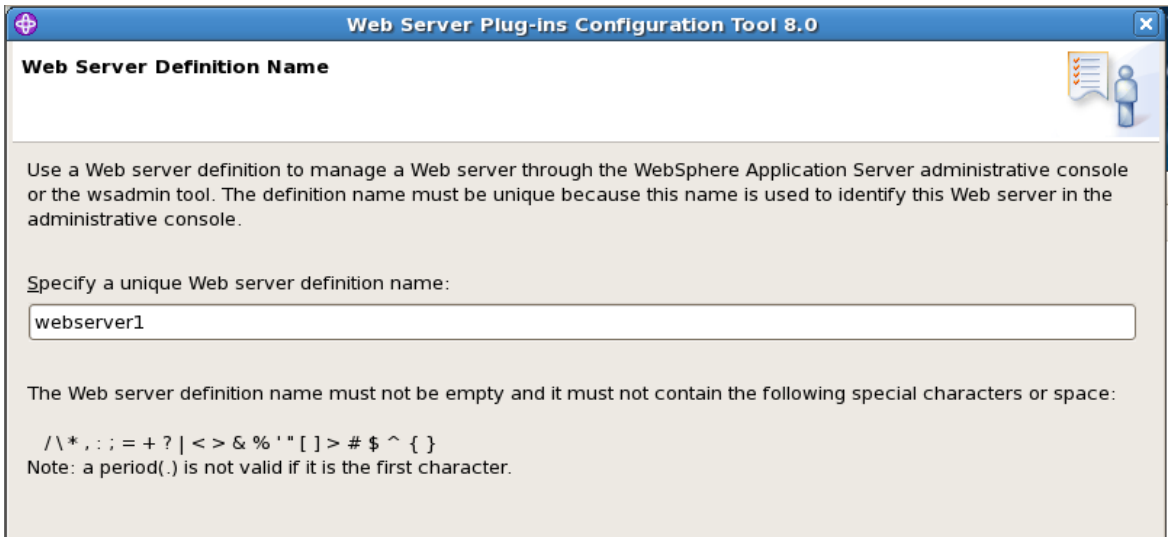
__ f. Select **IBM HTTP Server V8** and click **Next**
__ g. Enter /**opt/IBM/HTTPServer/conf/httpd.conf** and click **Next**
__ h. Create an userid **ihsadmin**, with a password of **ihsadmin**, as shown and click **Next**



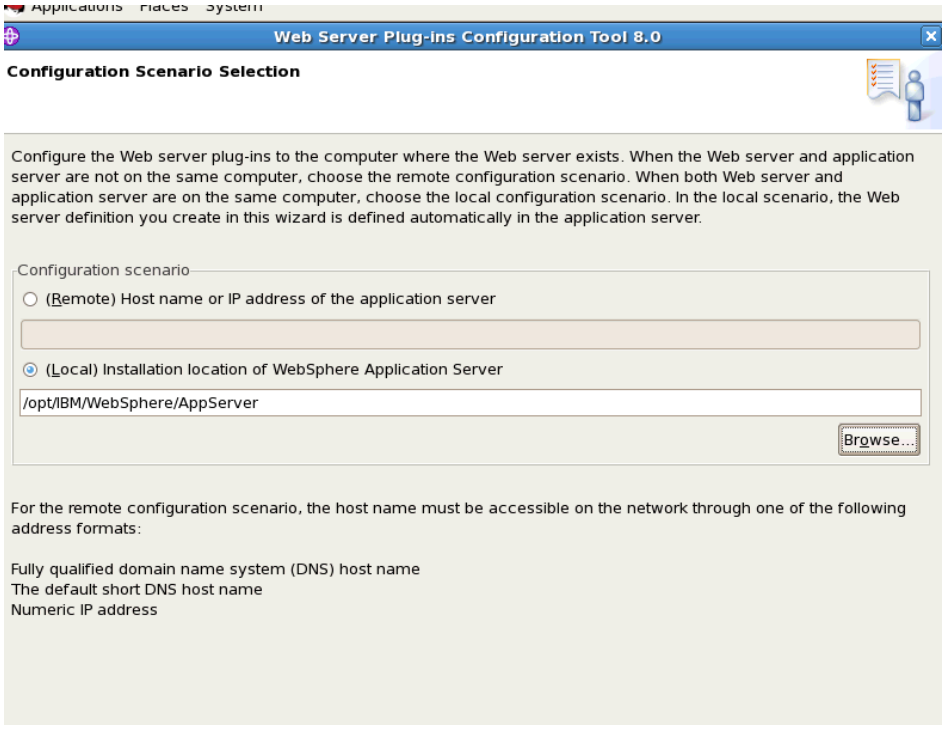
__ i. Enter **ihsrun** and **ihsgrp** as shown and select "**Create a new system user ID…….",** as shown below then click **Next**



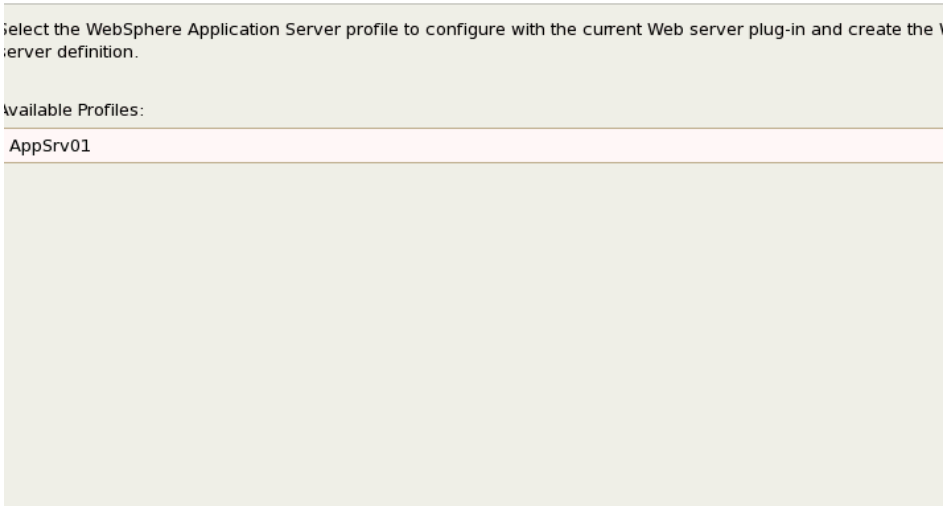
__ j. Specify **webserver1** for the web server name and click **Next**



__ k. Check **local** and enter /**opt/IBM/WebSphere/AppServer** then click **Next**

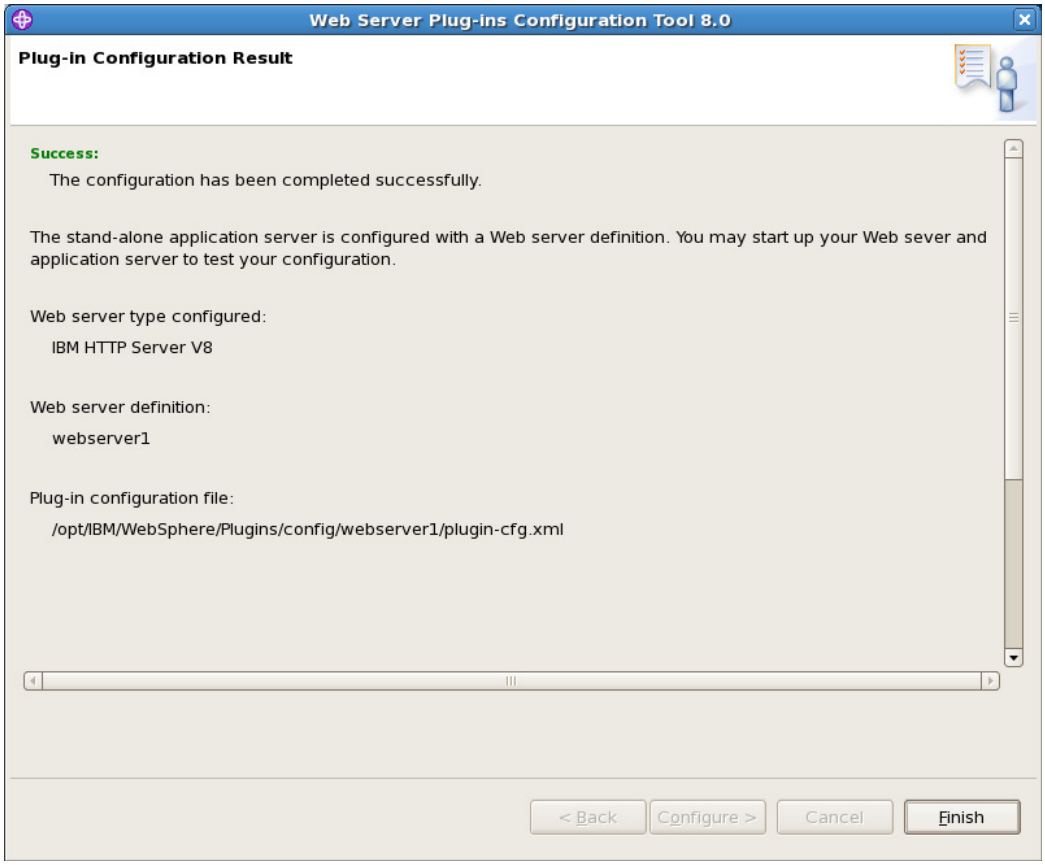


__ l. Select the **AppSrv0**1 profile and click **Next**



__ m. Click **Configure**

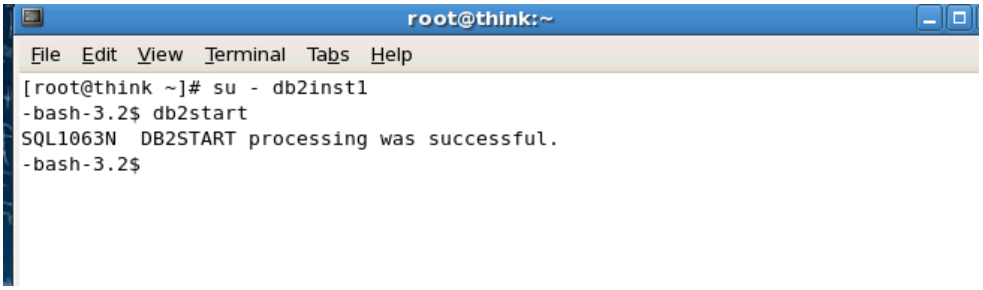
__ n. Click **Finish**



__ o. Exit the WCT when plugin configuration is complete

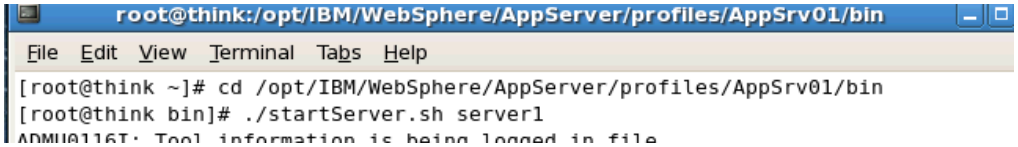
____ 8. Configure WebSphere Application Server to use DB2.

__ a. DB2 is not running as a service, so you will need to start DB2 by opening a terminal window and entering "**su – db2inst1"** which will change you from the user root to db2inst1 then enter the command **db2start** as and wait for the message "**SQL1063N DB2START processing was successful**" as shown below.



__ b. Open a terminal window and change to the directory **opt/IBM/WebSphere/AppServer/profiles/AppSrv01/bin**

__ c. Start the server with the command "./startServer server1" as shown below



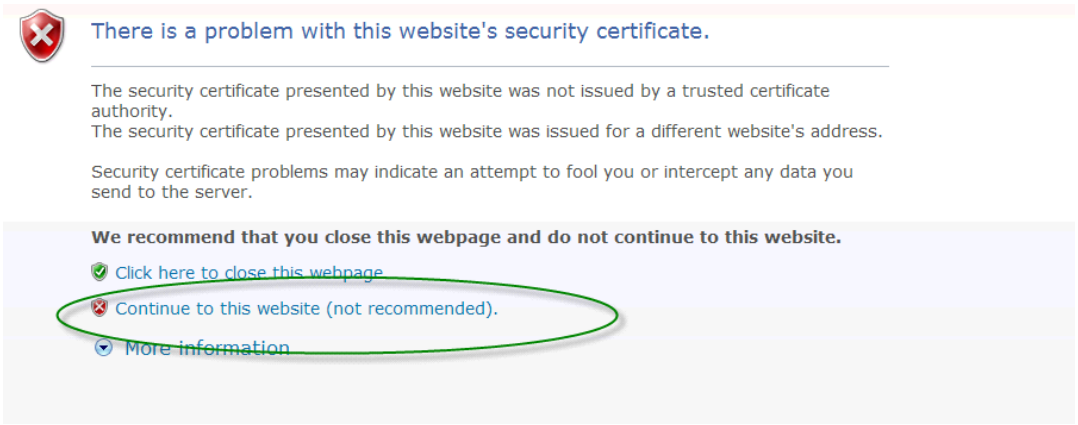
__ d. Wait until you see the message

ADMU3000I: Server server1 open for e-business; process id is xxx

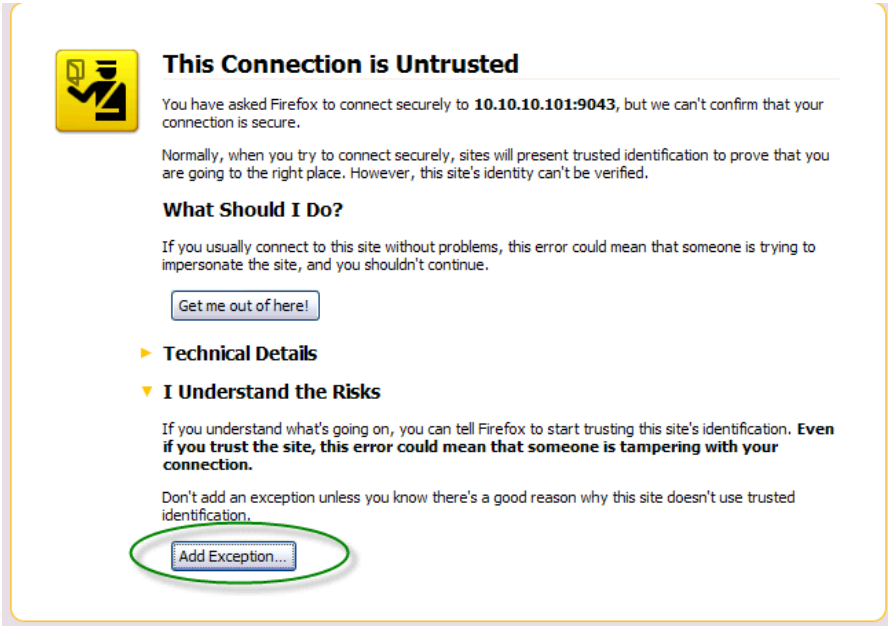
__ e. Open a browser on your host machine and enter the URL **http://localhost:9060/ibm/console/**

Note: If you receive a warning about the SSL certificate being presented click "Continue to the website "to accept the certificate. This occurs because you are using a self-signed certificate from WAS for which a certificate does not already exist in the browser

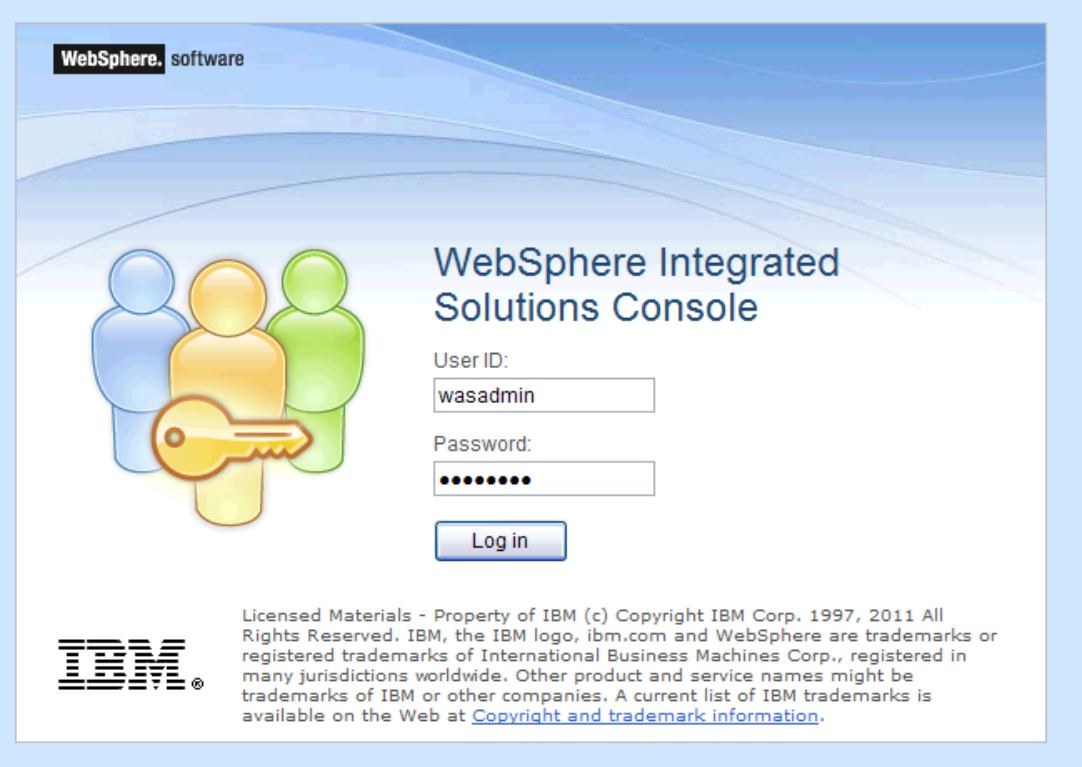
The warning below is from Internet Explorer.



The warning from Firefox is shown below

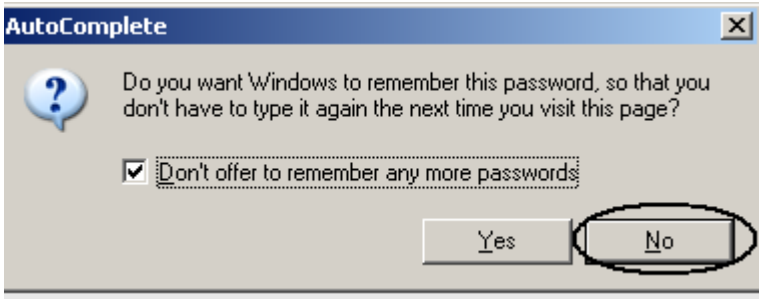


__ f. Since WAS administrative security is enabled this will redirect to https://localhost:9043/ibm/console/login.do?action=secure Enter **wasadmin** for user ID and **wasadmin** for the password



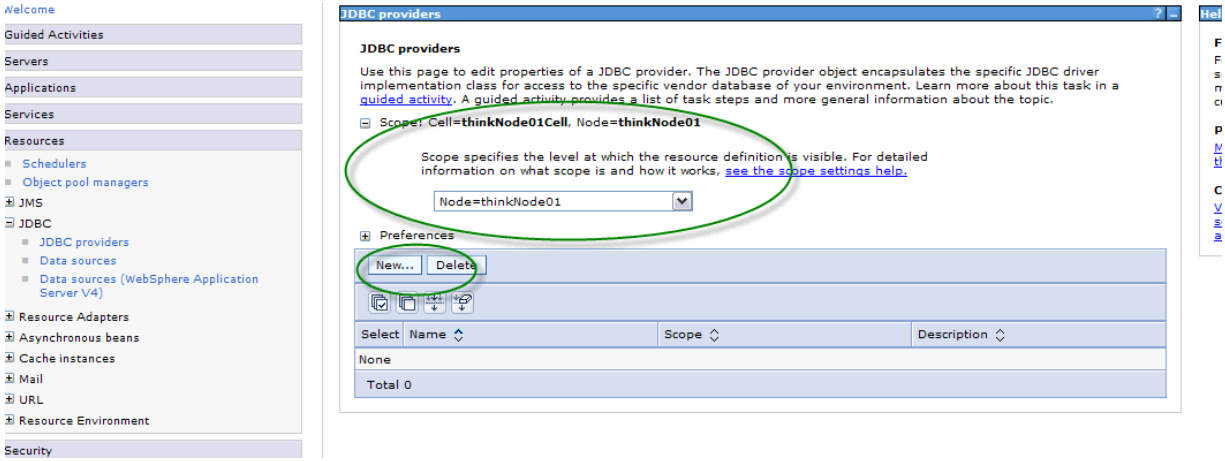
Note: When you open the browser you will receive one or two security alerts.

If prompted to remember passwords, DISABLE this function as shown below.

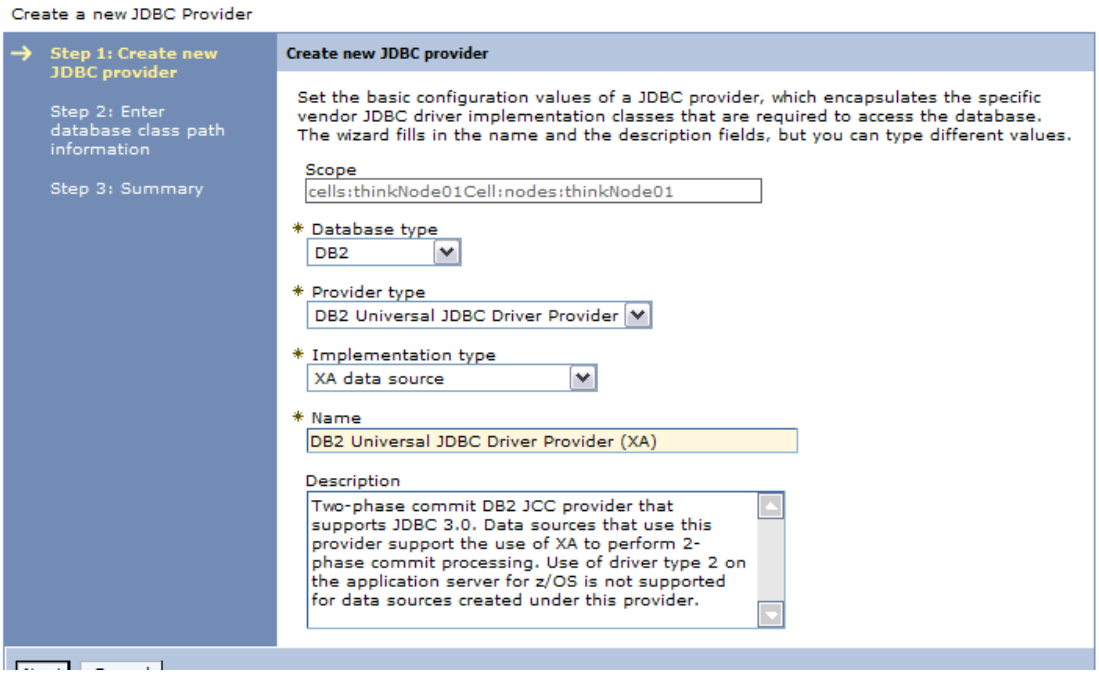


Password remembering functions can compromise security, so this function should not be used.

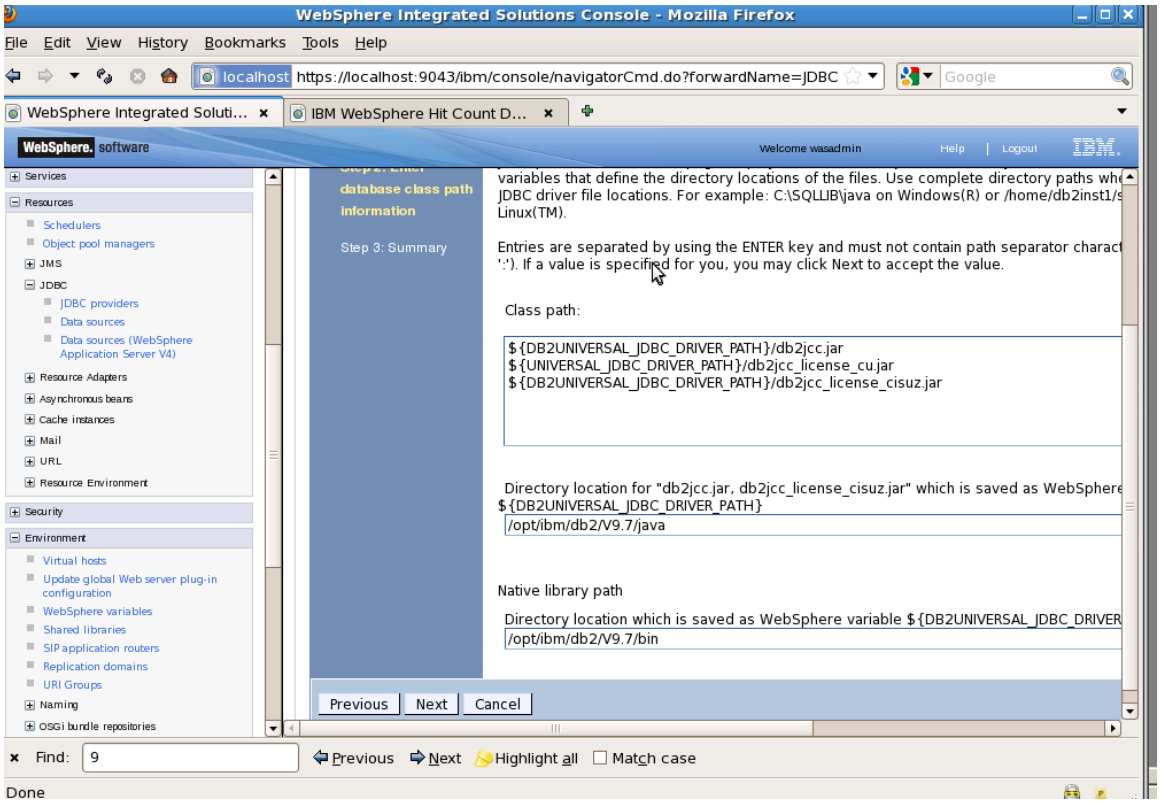
__ g. Once inside the console Navigate to **Resources -> JDBC Providers** ,Change the scope to **Node=thinkNode01** then select **New**



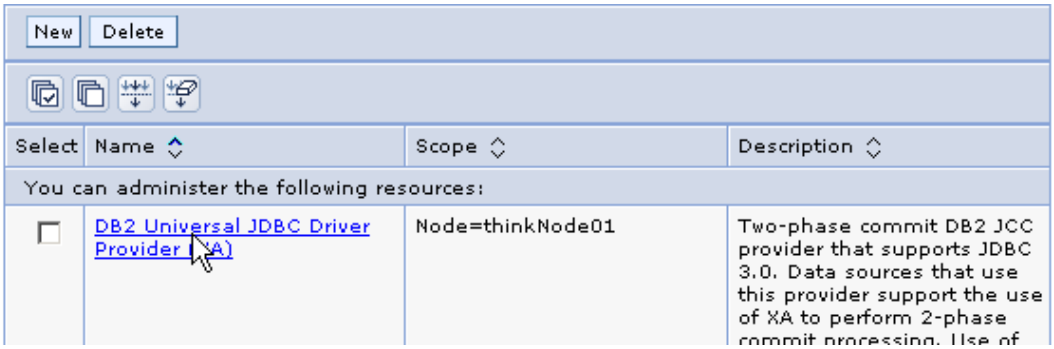
__ h. Click on **JDBC Providers** to start the dialog to create a DB2 JDBC Provider with the settings shown below (note the resource scope of “thinkNode01”) . Then click **Next**



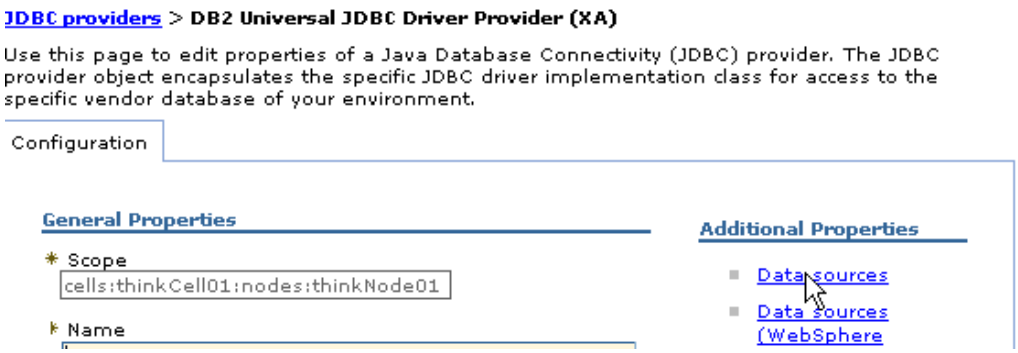
__ i. Configure the classpath to **/opt/ibm/db2/V9.7/java** and a native library path to **/opt/ibm/db2/V9.7/bin**



__ j. Click **Next**, Review the Summary Panel Then click **Finish.**
__ k. **Save** your changes.
__ l. Click on the **DB2 Universal JDBC Driver Provider (XA).**



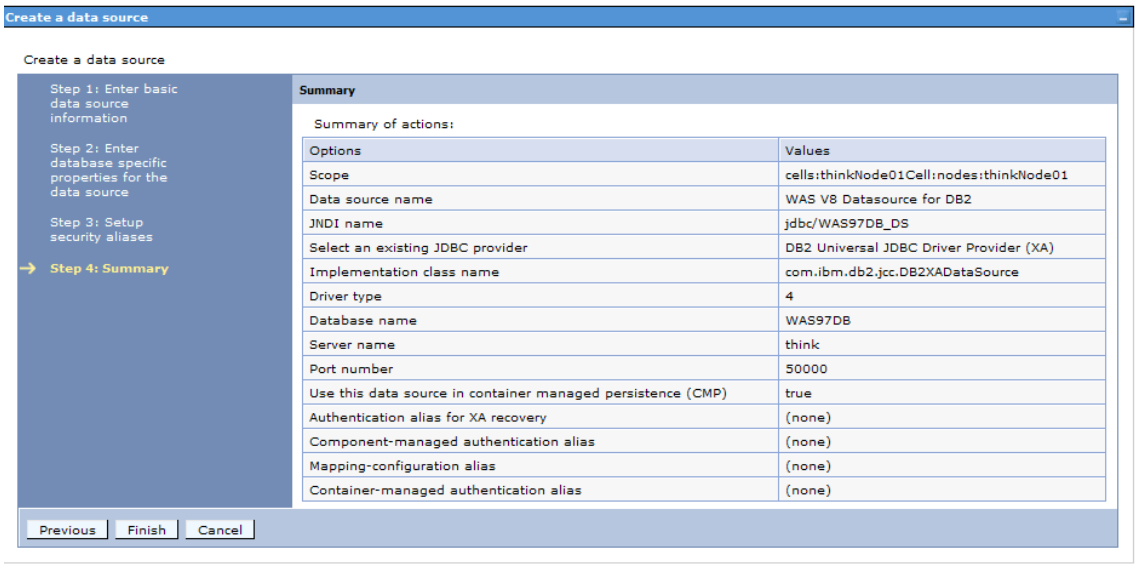
__ m. Click on **Data sources**



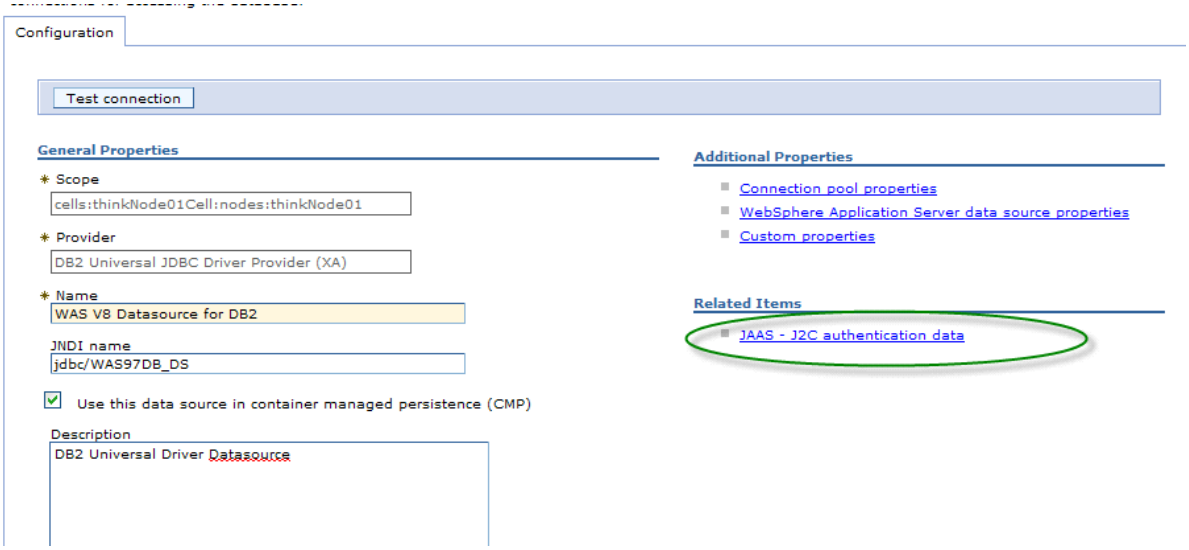
__ n. Click **New**

__ o. Configure a Data source with following settings

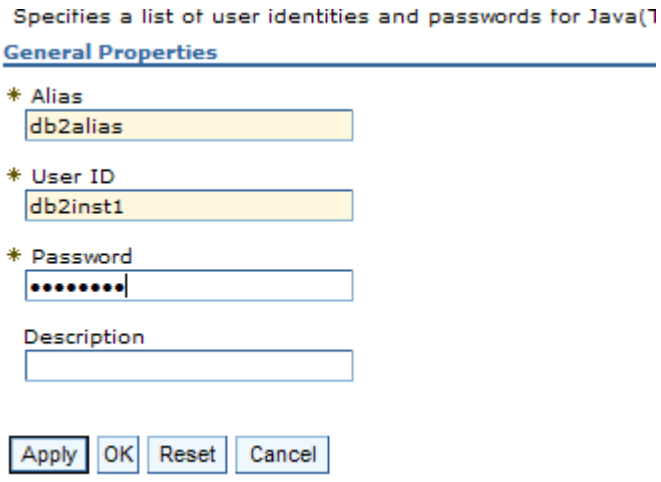
1) DataSource Name **WAS V8 Datasource for DB2**
2) JNDI Name **jdbc/WAS97DB_DS**
3) Database Name **WAS97DB**
4) Server name **think**
5) Port **50000**
6) the settings shown below, and **Save**



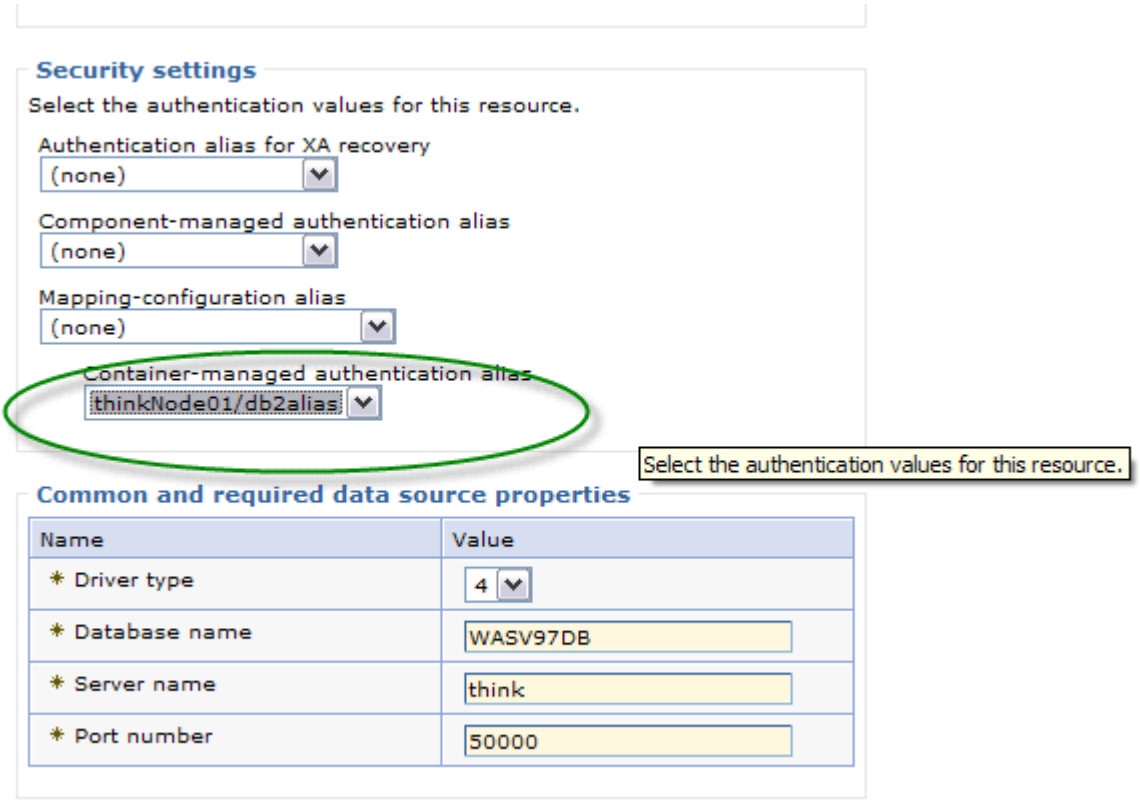
__ p. After configuring the Data source you will need to create a JAAS–J2C Authentication Alias. Select the data source you just configured, then click the link **JAAS-J2C authentication data** as shown below.



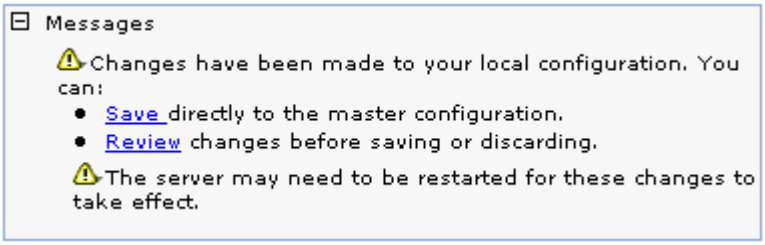
__ q. Select **New** and create an alias with the name **db2alias**, the user ID of **db2inst1** and password of **password. Cl**ick **OK.** Then **Save** the changes.



__ r. Navigate to the data source, and change the security settings to use a container-managed authentication alias, using the alias you just created. Select **db2alias** from the drop-down list



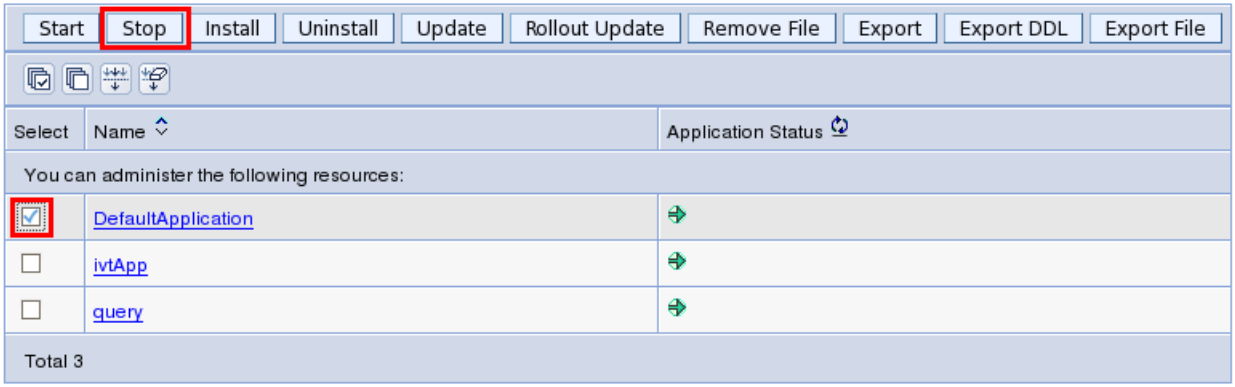
__ s. Select **OK**. Save your configuration by clicking **Save**



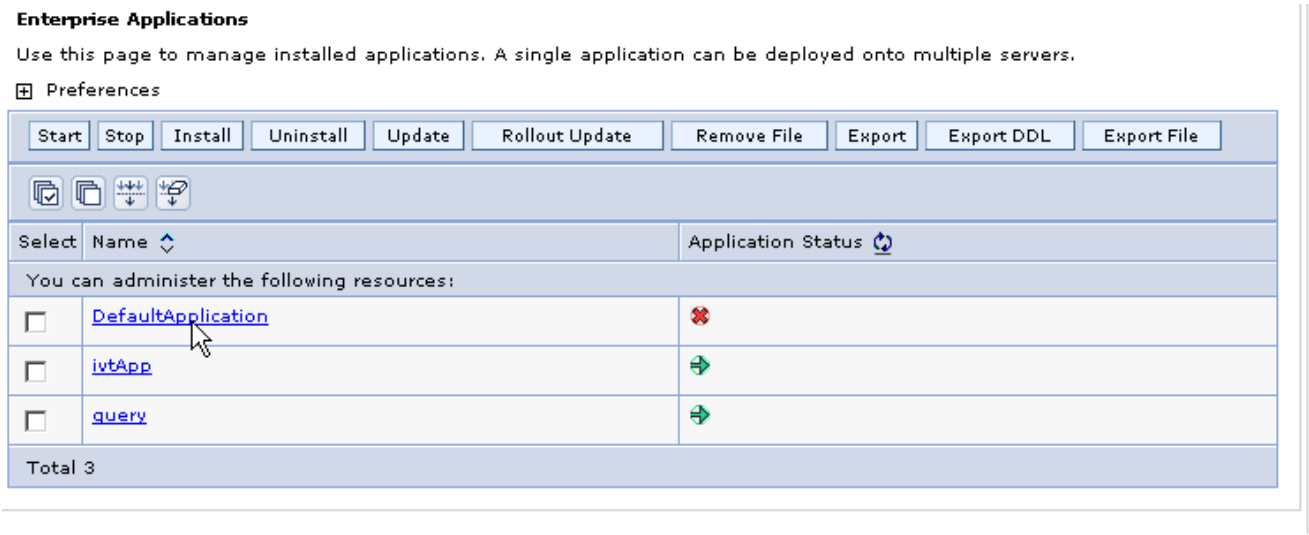
____ 9. Change the data source mapping for the Default Application

__ a. Navigate to **Applications -> Application Types -> WebSphere Enterprise Applications**

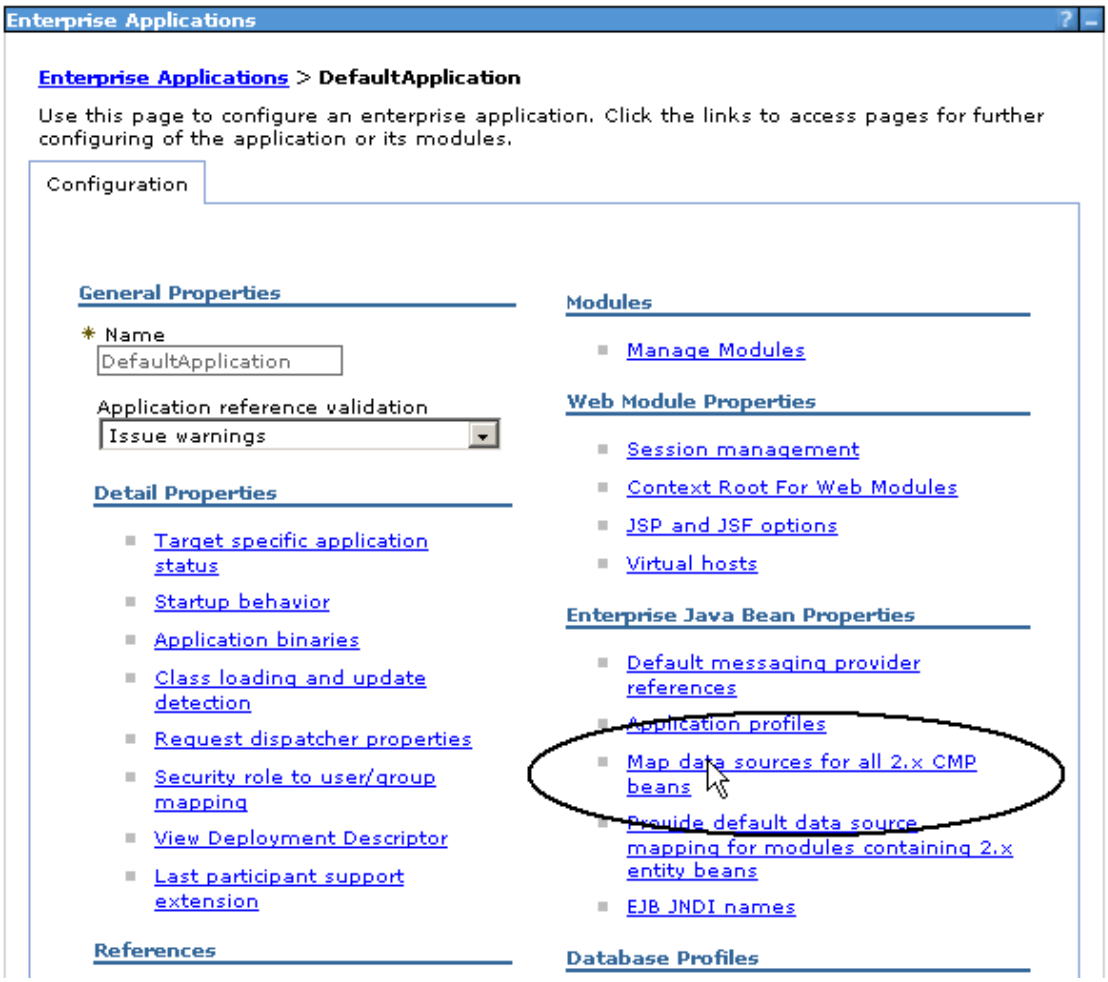
__ b. Stop the **Default Application**



__ c. Click on the application **DefaultApplication** to drill down into the application settings

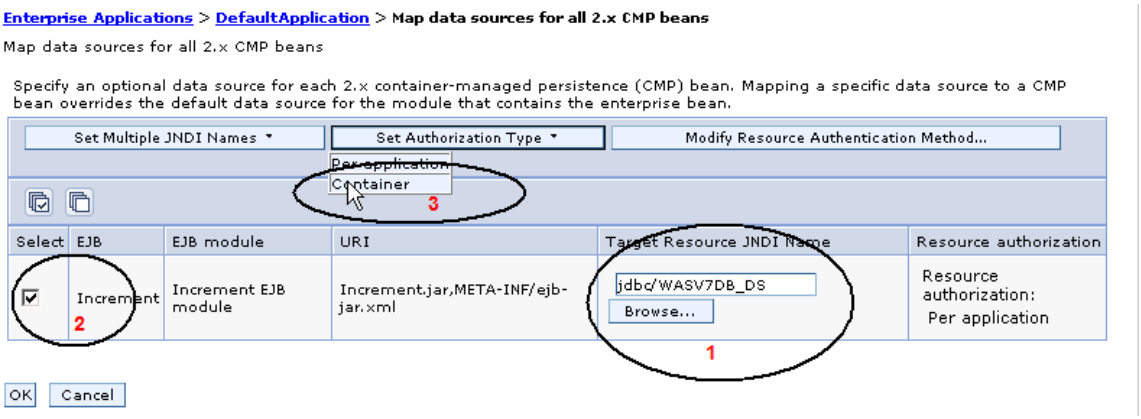


__ d. Click on "**Map data sources for all 2.x CMP beans**"

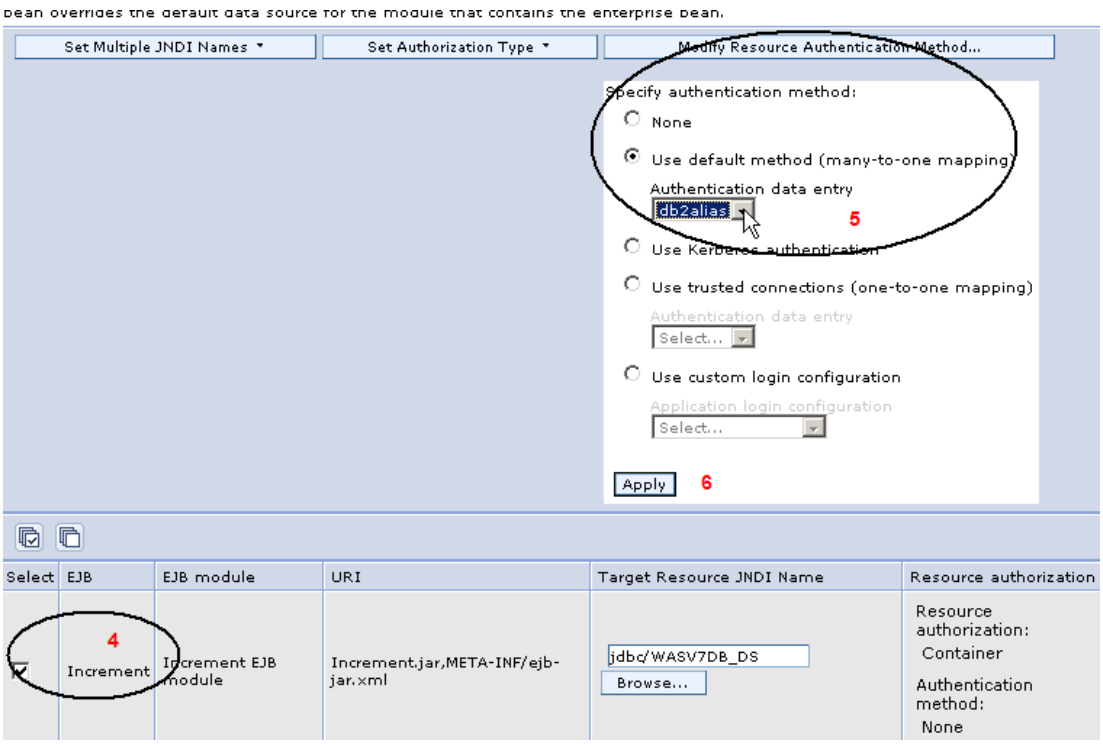


__ e. Change the Data Source settings as described below

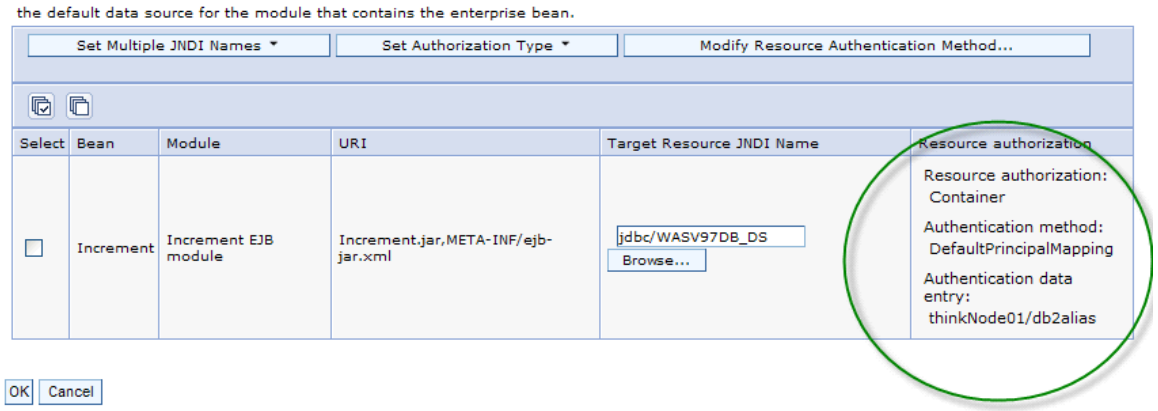
1) Browse to **jdbc/WAS97DB_DS** as the target resource JNDI name, and select **Apply**
2) Select the Increment EJB and click **Set Authorization Type,** specify **Container** for the Authorization Type
3) Click **OK**



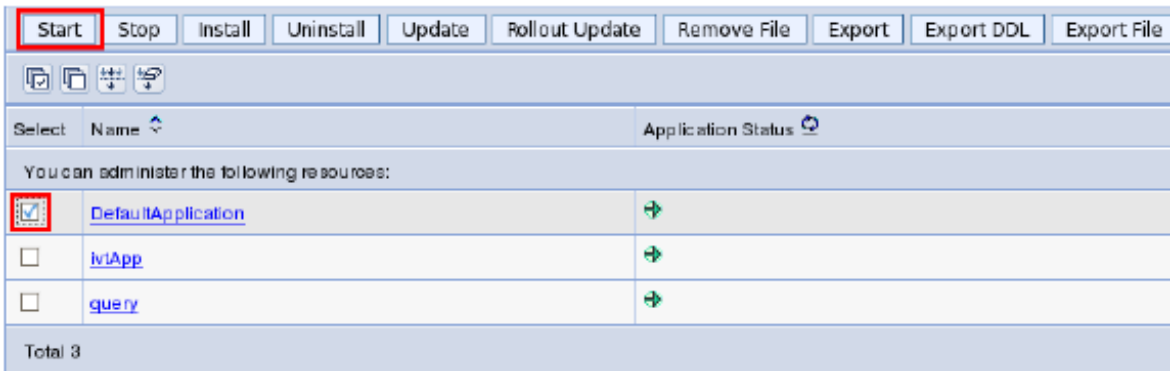
4) Select the Increment EJB and click **Modify Resource Authentication Method**
5) Select **Use default method** and browse to **db2alias** as the Authentication data entry
6) Click **Apply**



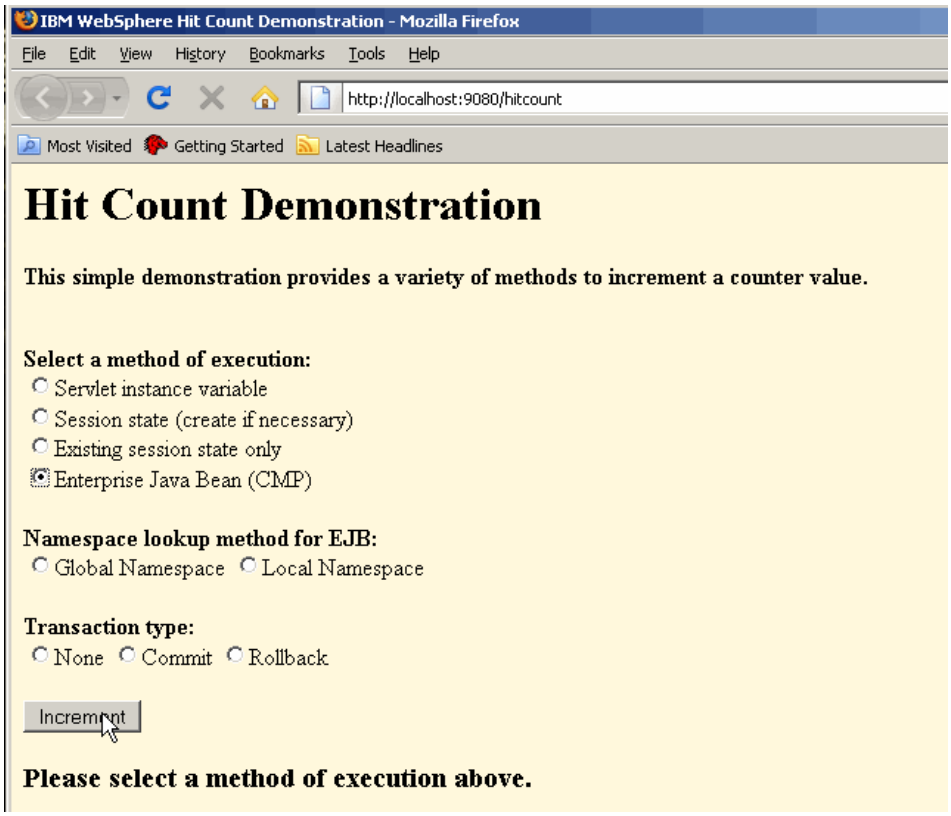
__ f. Verify the settings indicated below and click **OK**



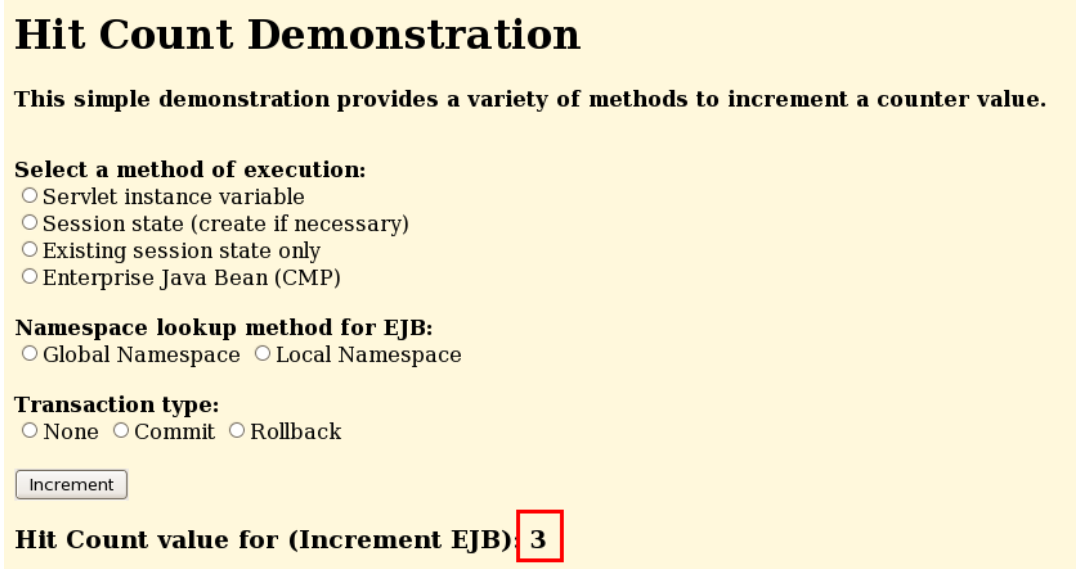
__ g. **Save** your changes.
__ h. Start the **DefaultApplication**



__ i. Open Firefox with the url http://localhost:9080/hitcount and select "**Enterprise Bean**" as the execution method and click on "**Increment**" as shown below



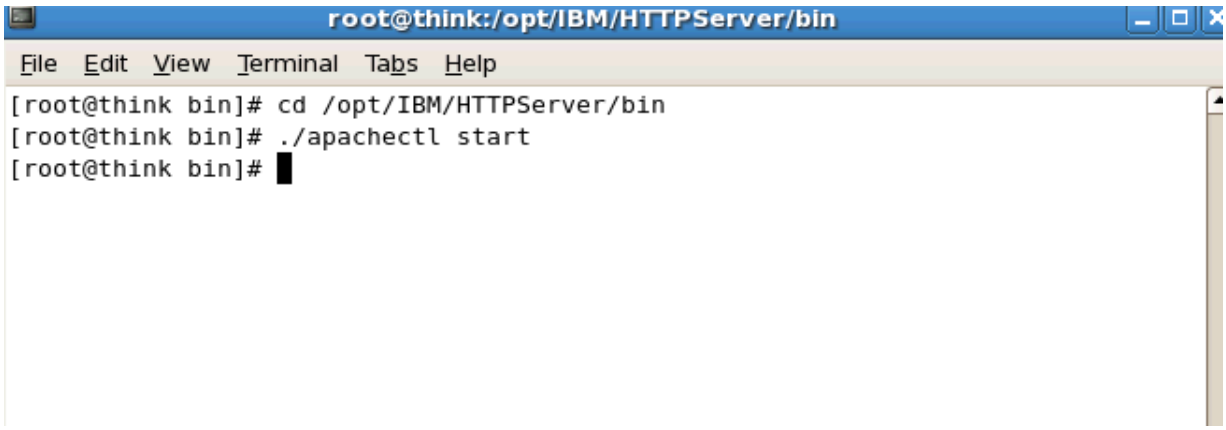
__ j. If you have successfully configured the datasource to use DB2 you'll see the value increment each time you click the **Increment** button (remember to set the "Enterprise Java Bean" radio button).



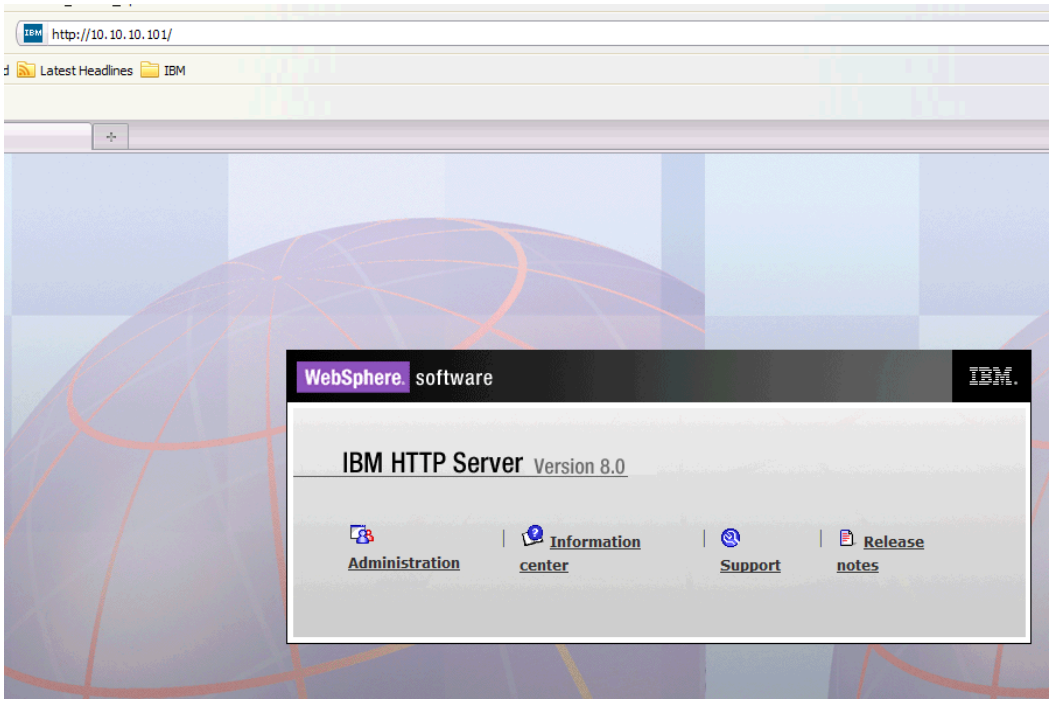
____ 10.Configure IBM HTTP Server for use with WAS

__ a. Start both **IBM HTTP Server**

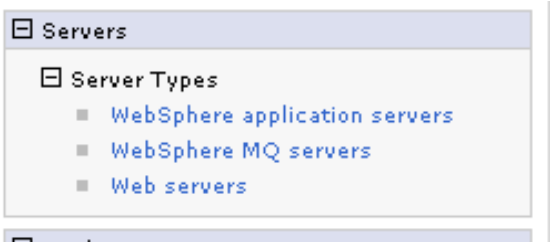
1) In a command window, cd to **/opt/IBM/HTTPServer/bin**
2) run **./apachectl start**



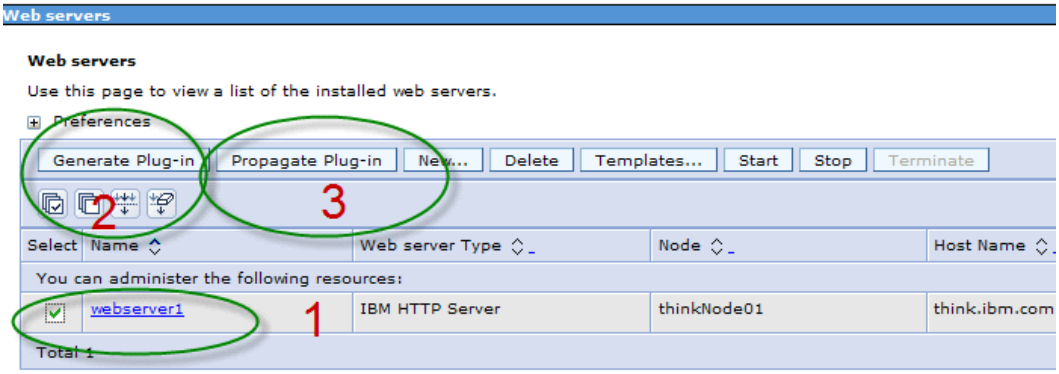
__ b. Test that IHS is running by entering http:/localhost You should see the following



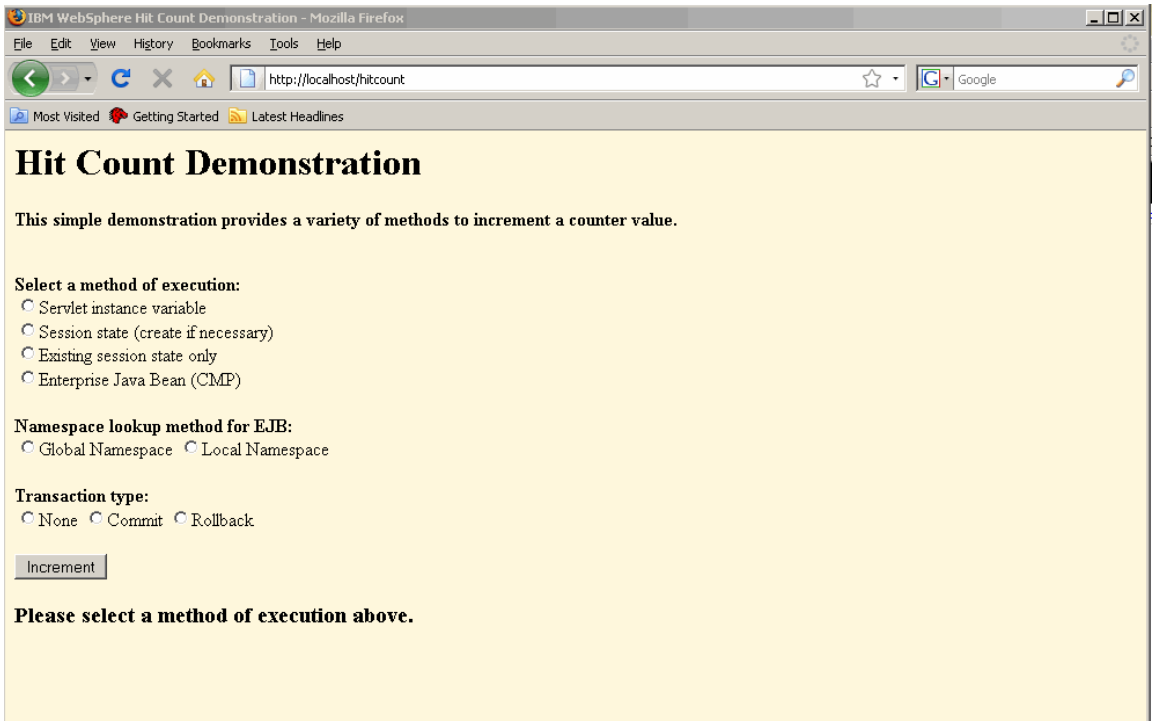
__ c. In the WAS admin console navigate to **Server Types -> Web Servers**



__ d. Note that webserver1 was created using the WebSphere Customization Toolkit earlier. Now that the webserver is created generate and propagate the plugin configuration file as shown below
1) **Select** the web server (1), and then click **Generate Plug-in** (2),
2) **Select** the web server (1), and then click **Propagate Plug-in** (3).



__ e. Go to Firefox and enter http://localhost/hitcount. Exercise the application as before selecting "**Enterprise Java Bean"** and clicking **Increment**

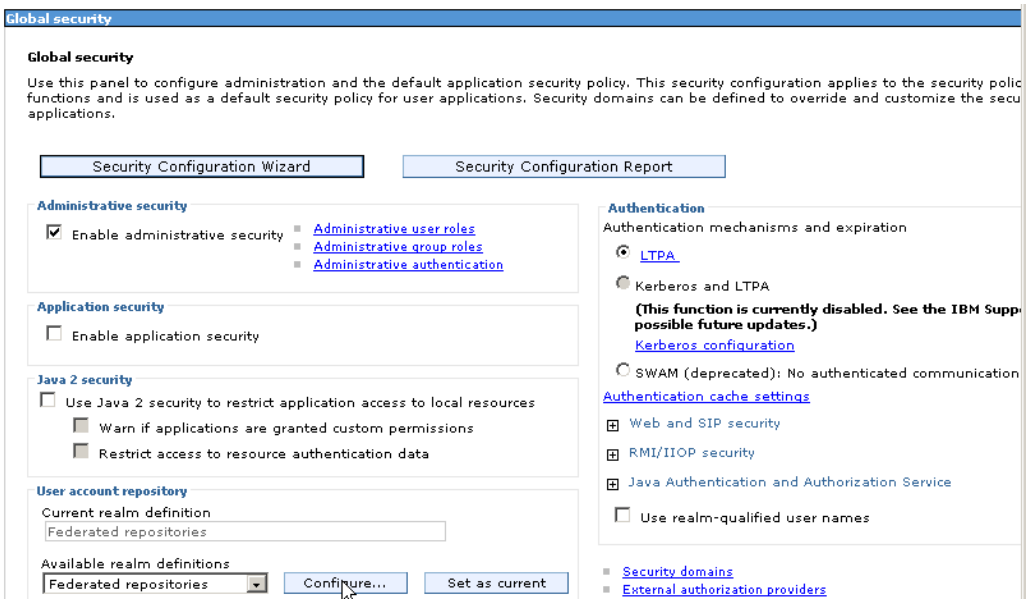


__ f. You may also want to invoke http://localhost/snoop and examine the results. You can see that the HTTP server is being used as well as theWAS server's embedded HTTP server (on port 9080).

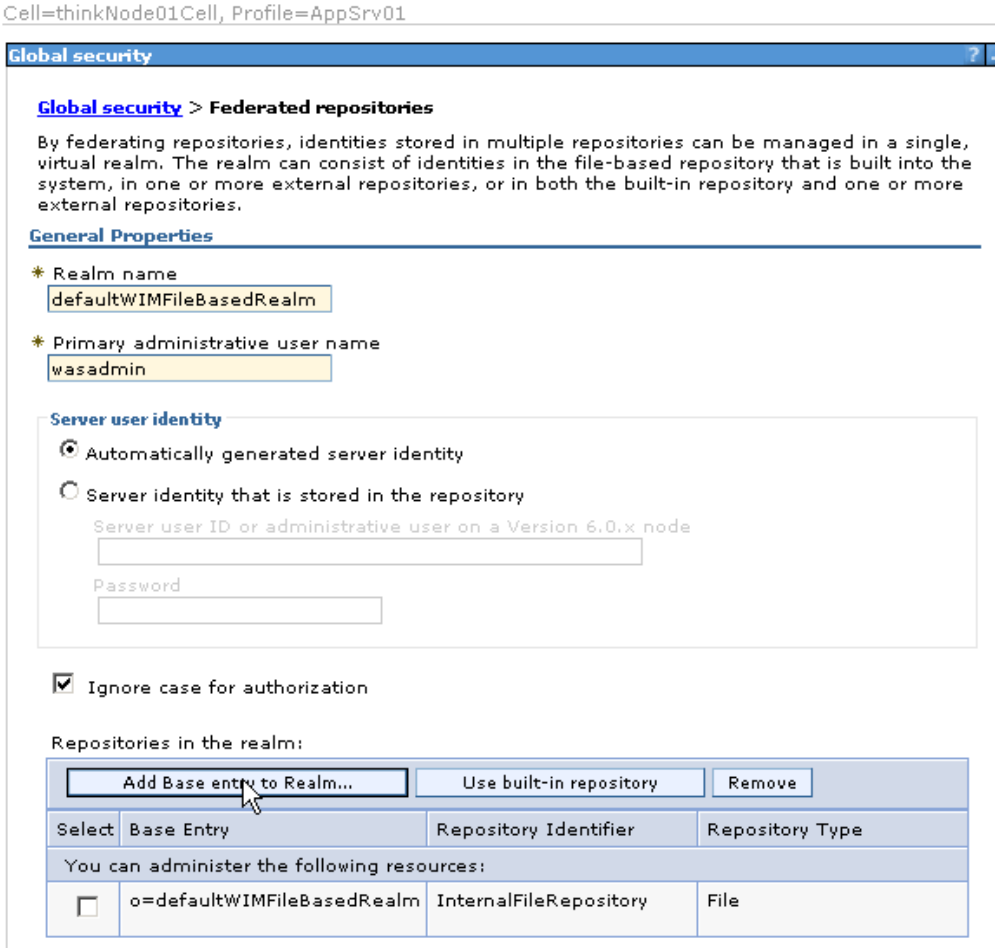
____ 11. Configure WebSphere Application Server to use an LDAP as a user registry. OpenLDAP has been installed and configured with a small user user population on the lab image.

__ a. Navigate to **Security** in the WAS admin console, and click **Global Security**.

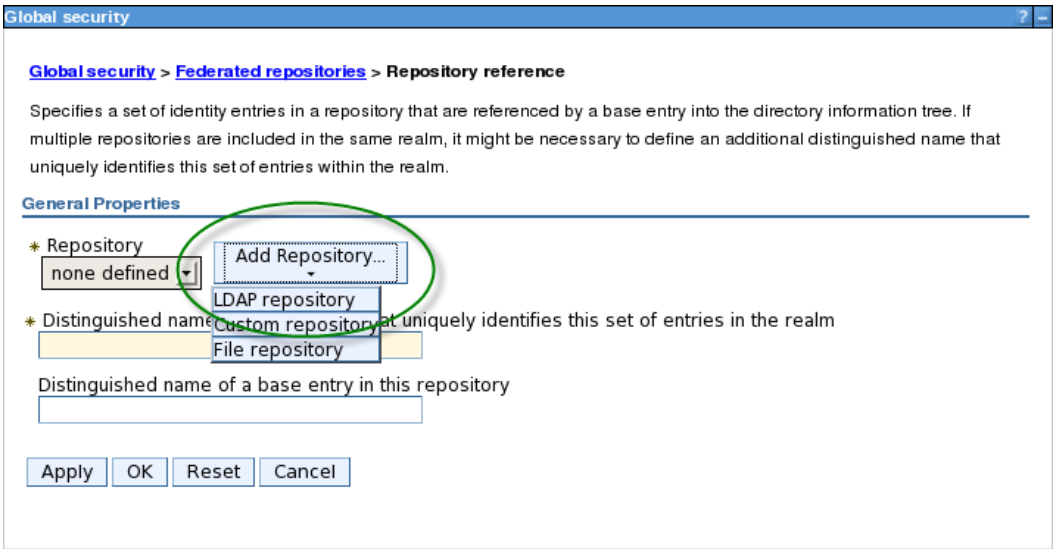
__ b. On the Global Security dialog, click **Configure**



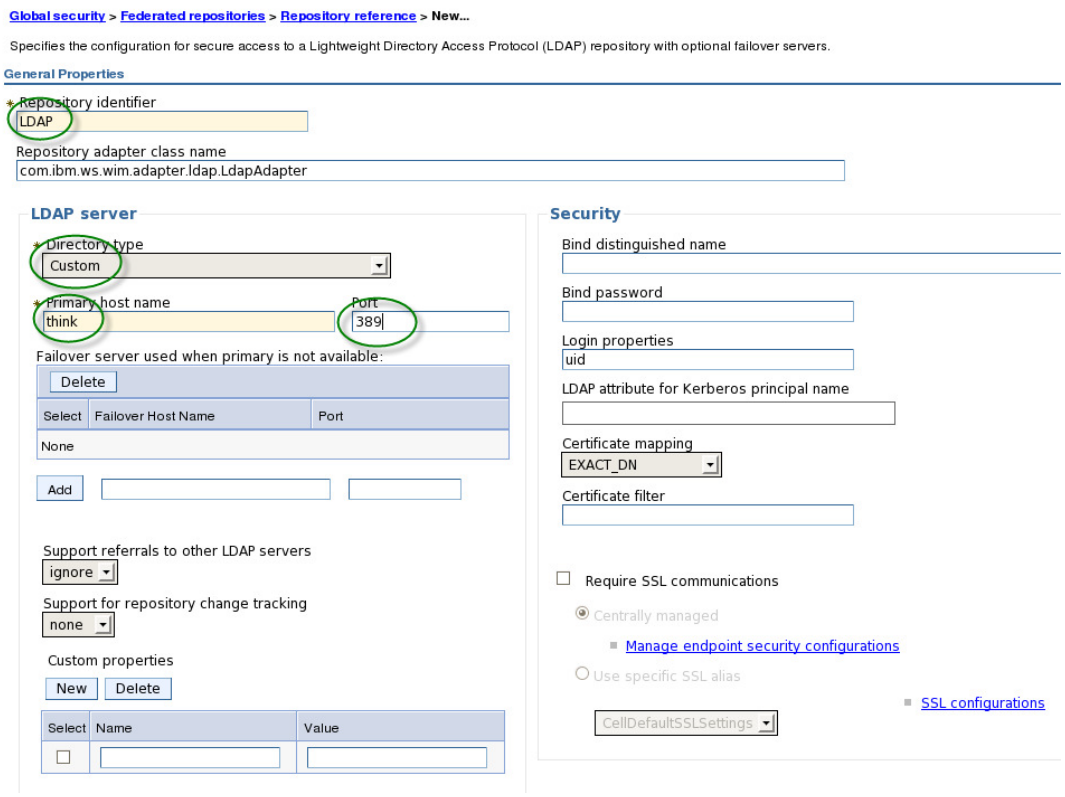
__ c. Click **Add Base Entry to Realm**



__ d. Click **Add Repository,** and select **LDAP repository** form the drop-down list



__ e. Enter **LDAP** for the Repository Identifier, **Custom** for the Directory Type and **think** for the Primary Host Name, and **389** for the port. Then, click **Apply**.



__ f. Click on **Group attribute definition**, under Additional Properties

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Note: Until you click **Apply** the **Group Attribute Definition** is not accessible. If you accidentally click **OK** instead of Apply, you end up on the **Manage Repositories** panel. To return panel shown below simply "drill down" into **LDAP** repository from the **Manage Repositories** panel

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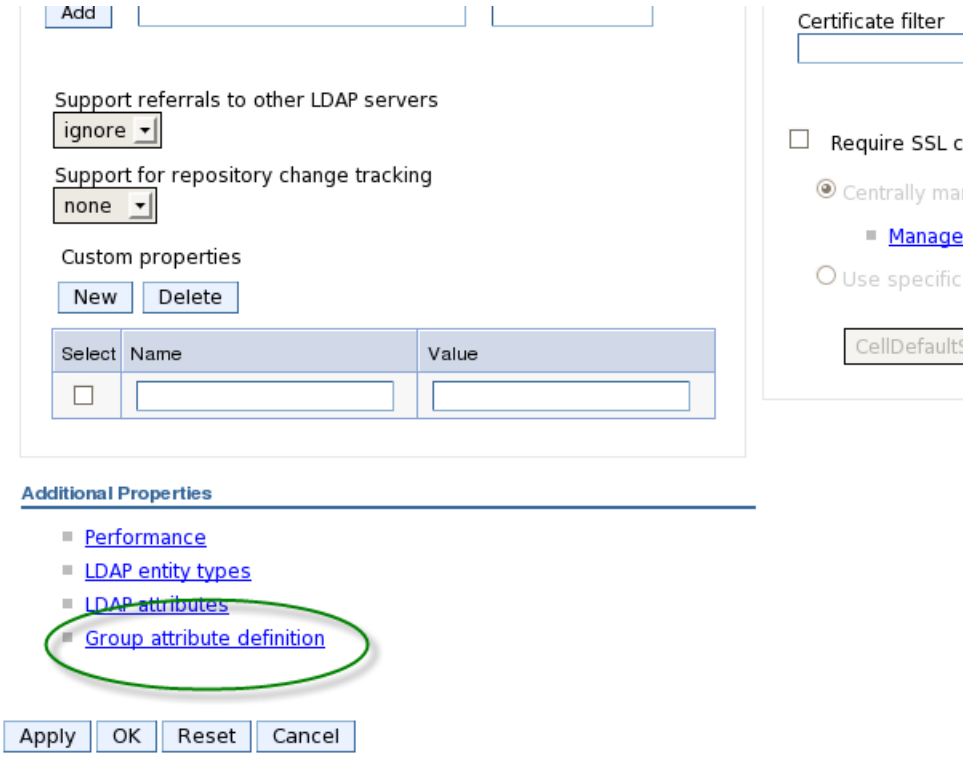
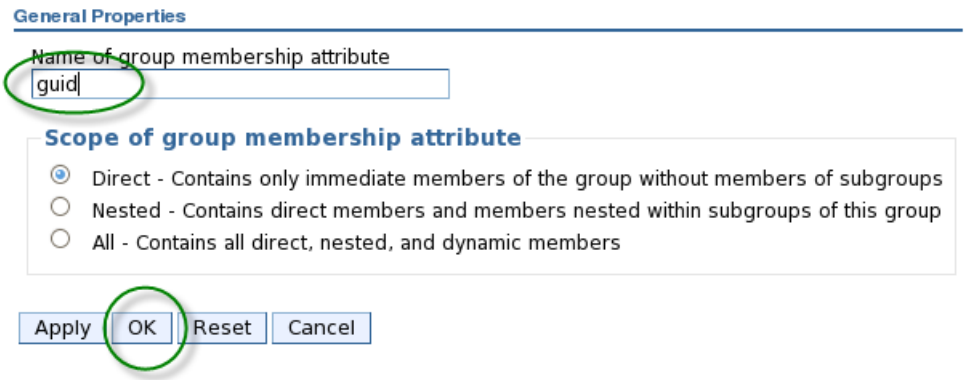
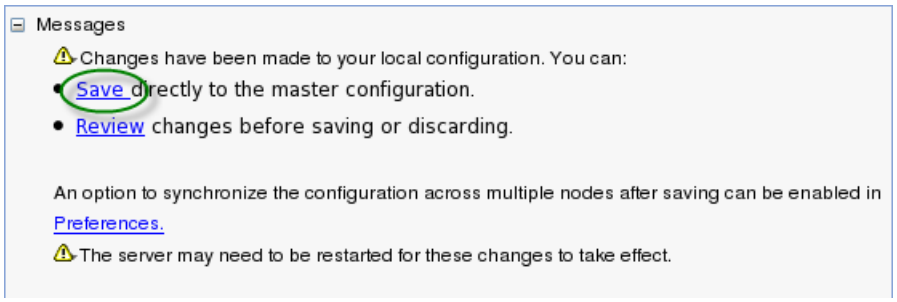


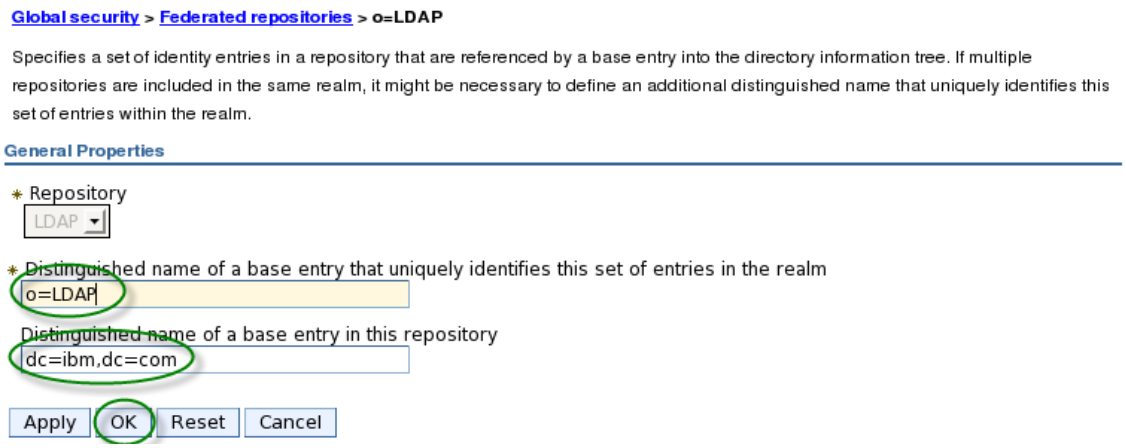
__ g. Enter **guid** for the **Name of the group membership attribute** as shown below and click **OK.** Then, **Save** your changes



__ h. Click **Save,** to save you changes



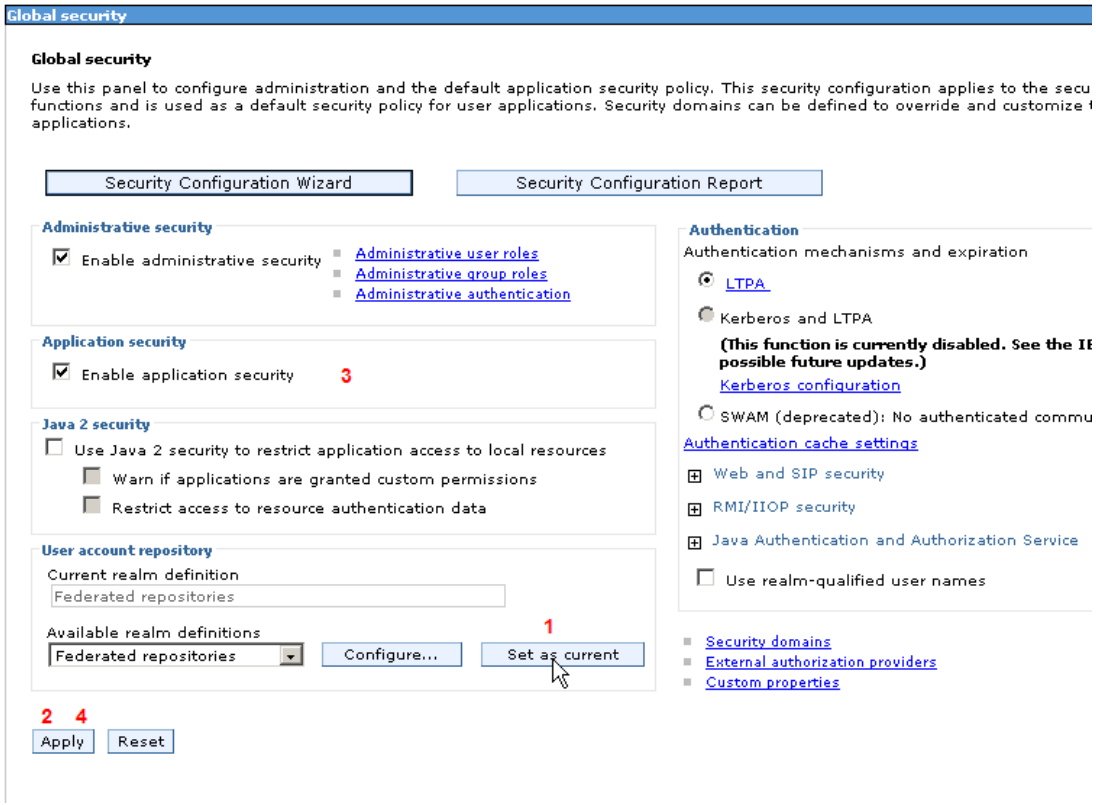
__ i. Enter **o=LDAP** for Distinguished name of the base entry for the realm and **dc=ibm,dc=com** for the Distinguished name of the base entry for this repository. Click **OK .** Then **Save** your changes



__ j. Navigate to **Security** in the WAS admin console, and click **Global Security**

__ k. As shown below on the Global Security Panel

1) Click **Set as current**,
2) Click **Apply**
3) Select **Enable Application Security**
4) Click **Apply**
5) Then **Save your changes**



__ l. In order for the changes to be reflected you will need to stop and start the server.

1) Logout from the admin console

2) Stop the server from the terminal window you started it in with the command:

./stopServer.sh server1 –username wasadmin –password wasadmin

3) Wait until you see the message

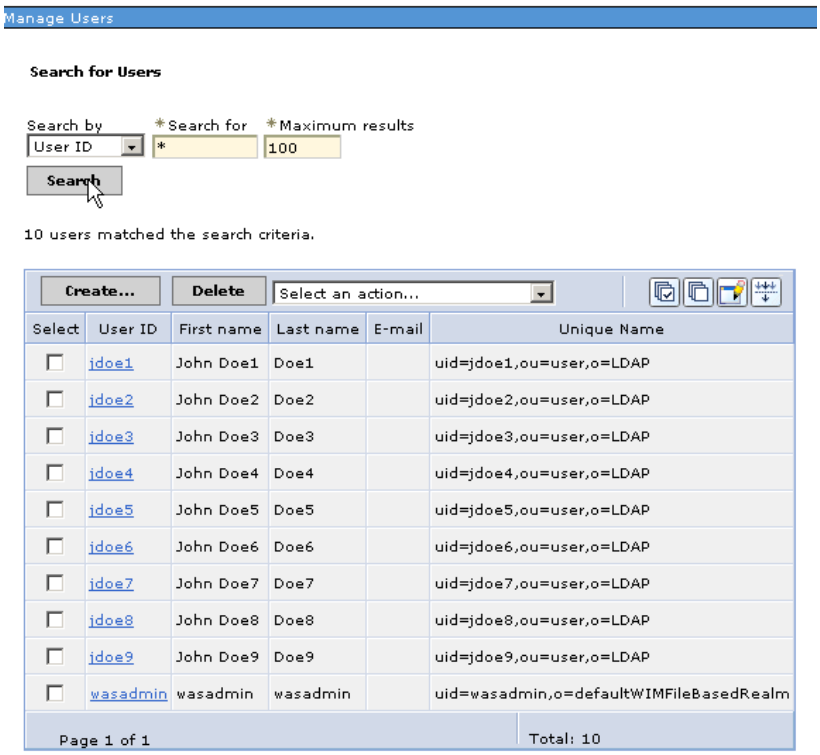
ADMU4000I: Server server1 stop completed.

4) Start the server from the LINUX shell with the command:

./startServer server1

__ m. Once the server has started, log back into the WAS admin console. Navigate to **Users and Groups** and click **Manage Users**

__ n. In the **Seach for Users** dialog click **Search.** You should see the user entries from LDAP as well as for wasadmin user, in the file based registry.

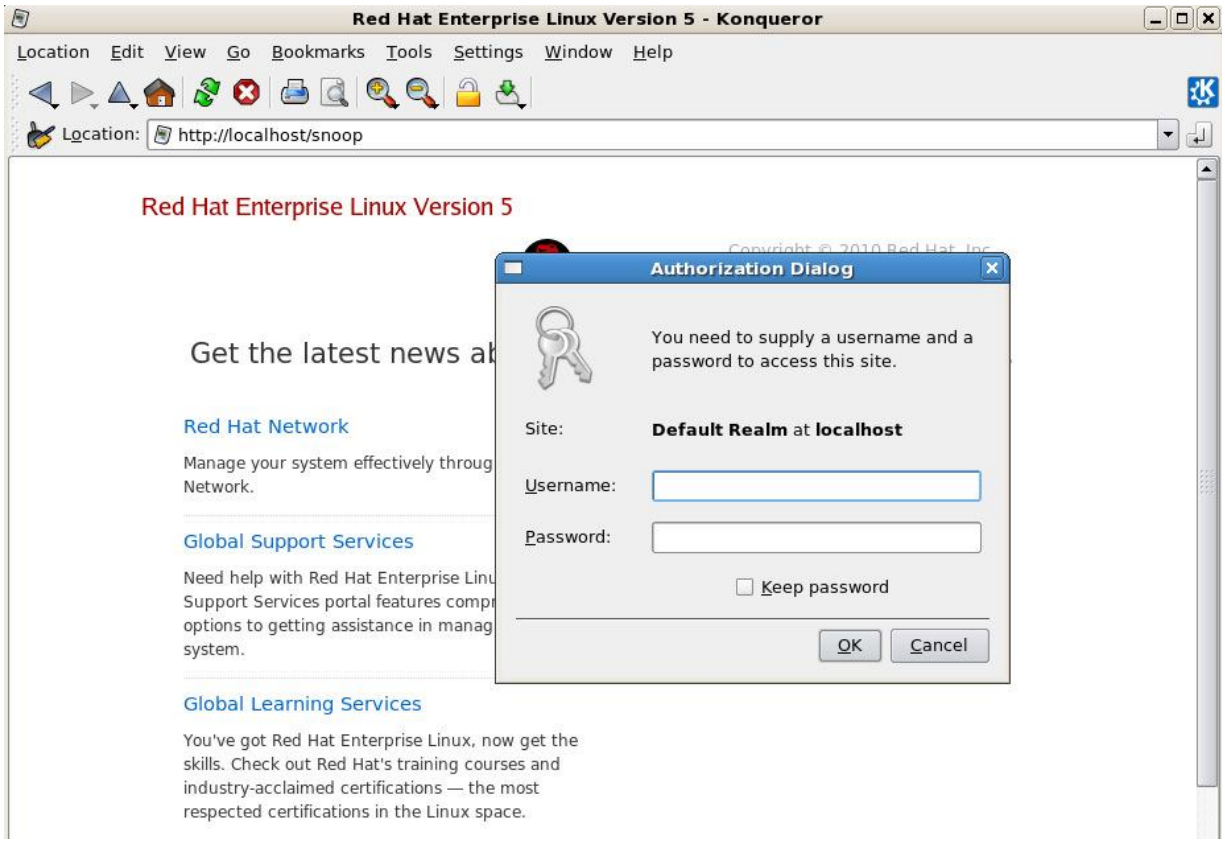


__ o. Open a Konqueror browser (Applications -> Internet -> Konqueror) and enter the URL http://localhost/snoop. You should be prompted for a Username and Password, as shown below. Enter **jdoe1** for the Username and **jdoe1** for the password

---

Note: You need to use Konqueror because Firefox is already open for the admin console, and as a result, Firefox has a valid LTPA token (cookie). Thus if you simply open another Firefox instance you will not be prompted to login since the LTPA cookie used to authenticate wasadmin to the admin console, will be present in the browser. So, no authentication prompt will occur

---



Congratulations, your application infrastructure is now ready to serve applications through the
HTTP server -> HTTP server plug-in -> WebSphere Application Server -> DB2.

Before starting the next part of the lab, do the following;

1) Log out of the admin console

2) Stop WebSphere Application Server by entering the following command from the LINUX command

window where you started the application server.

./stopServer.sh server1 –username wasadmin –password wasadmin

Once you see the message;

ADMU4000I: Server server1 stop completed.
You're ready to proceed to part 1.6

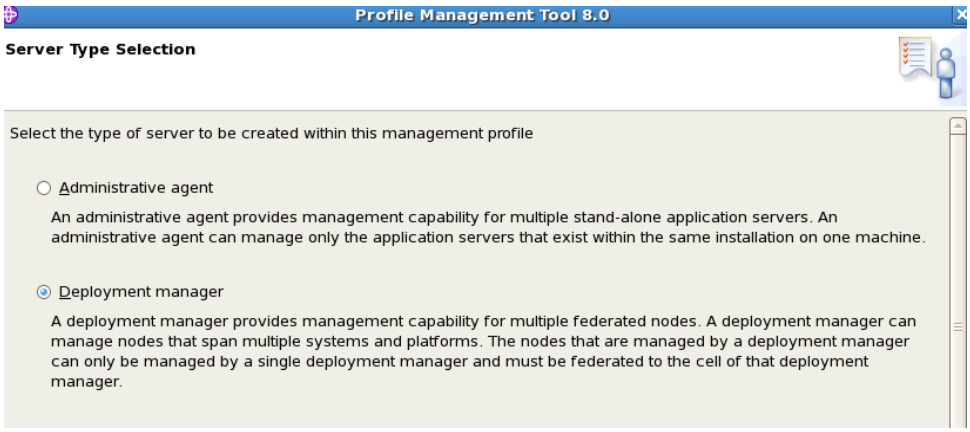
1.6 Adding Clustering to the Departmental Deployment

____ 1. Create the Deployment Manager profile

__ p. Start the graphical Profile Management Tool (PMT) with the command **./pmt.sh** from a terminal shell in the directory **/opt/IBM/WebSphere/AppServer/bin/ProfileManagement**

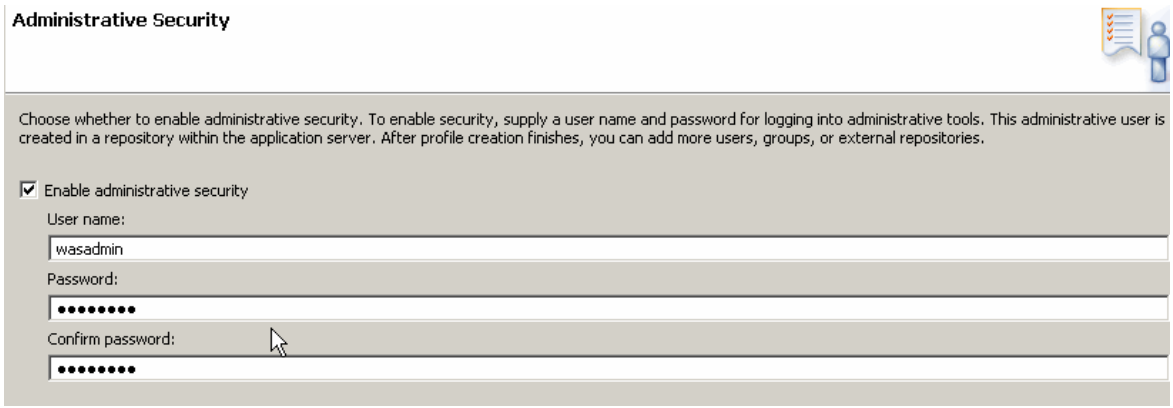
__ q. Click **Create**
__ r. Highlight **Management** as the Environment Selection as shown below, then click **Next**

__ s. Select **Deployment Manager**, then click **Next**

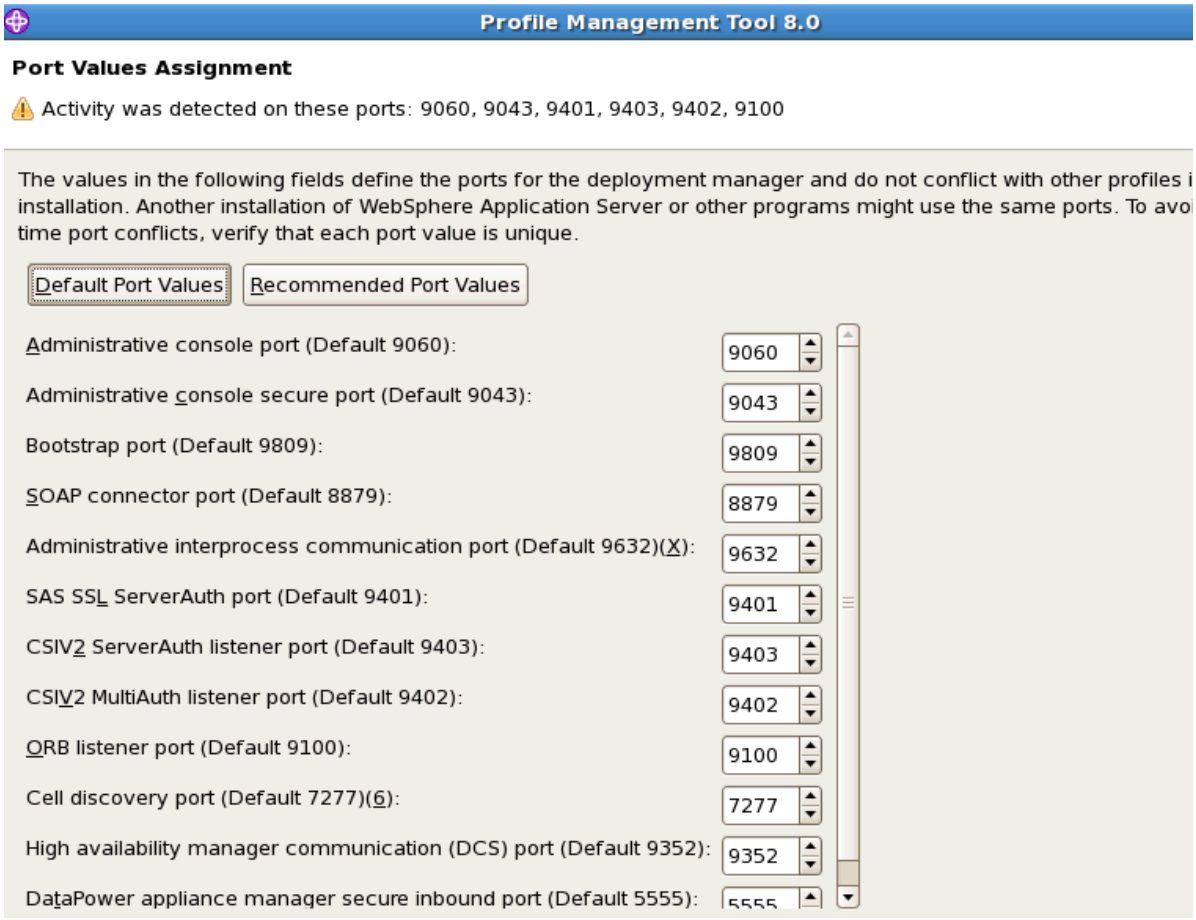


__ t. As you did in part 1, select **Advanced Profile Creation** on the next panel, then click **Next**

__ u. Accept the defaults, clicking **Next**, until you get to the Administrative Security Panel. Then enter "**wasadmin**" for the user ID and "**wasadmin"** for the password.



__ v. Continue to accept the PMT provide defaults until you reach the Port Value Assignment. Select **Default Port Values** as shown below (we'll take steps to insure no conflicts exist)



__ w. As before in Part 1 when configuring the application server do NOT select "**Run the deployment manager process as a Linux service**" , and click **Next**
__ x. Click **Create** to create the profile,
__ y. **Unselect** "First Steps" then click **Finish** .
__ z. Exit the PMT as you did in part 1 by selecting **File -> Exit** in the upper left corner of the PMT

____ 12.Start the Deployment Manager

__ a. Open a LINUX command shell and navigate to **/opt/IBM/WebSphere/AppServer/profiles/Dmgr01/bin**

__ b. Enter the command ./**startManager.sh** and wait until you see the message;

ADMU3000I: Server dmgr open for e-business; process id is xxxx

____ 13.Federate the Application Server

__ a. Return to the LINUX command shell that you used to start and stop the Application Server (if you closed the shell the directory is **/opt/IBM/WebSphere/AppServer/profiles/AppSrv01/bin**)

__ b. Enter the command

./**addNode localhost –includeapps –username wasadmin –password wasadmin**

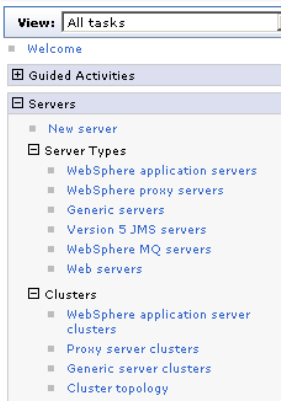
This tells WAS to add a node by connecting to the deployment manager running on the localhost, to include the existing applications that are deployed on the application server and to use wasadmin as the administrative userid and password.

__ c. Wait for the message **ADMU0003I: Node thinkNode01 has been successfully federated**

____ 14.Configure a WAS-ND Cluster

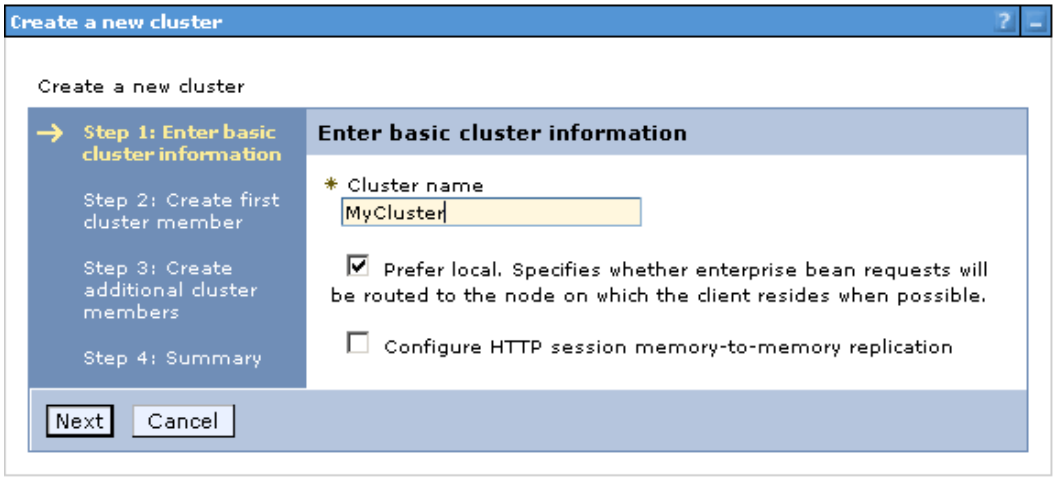
__ a. Log into the admin console using Internet Explorer, with the URL **http://localhost:9060/ibm/console/** Since WAS administrative security is enabled this will redirect to https://localhost:9043/ibm/console/login.do?action=secure Enter **"wasadmin**" for user ID and password as you did before.

__ b. Navigate to **Servers -> Clusters** and click **WebSphere Application Server clusters** in the console as shown below.

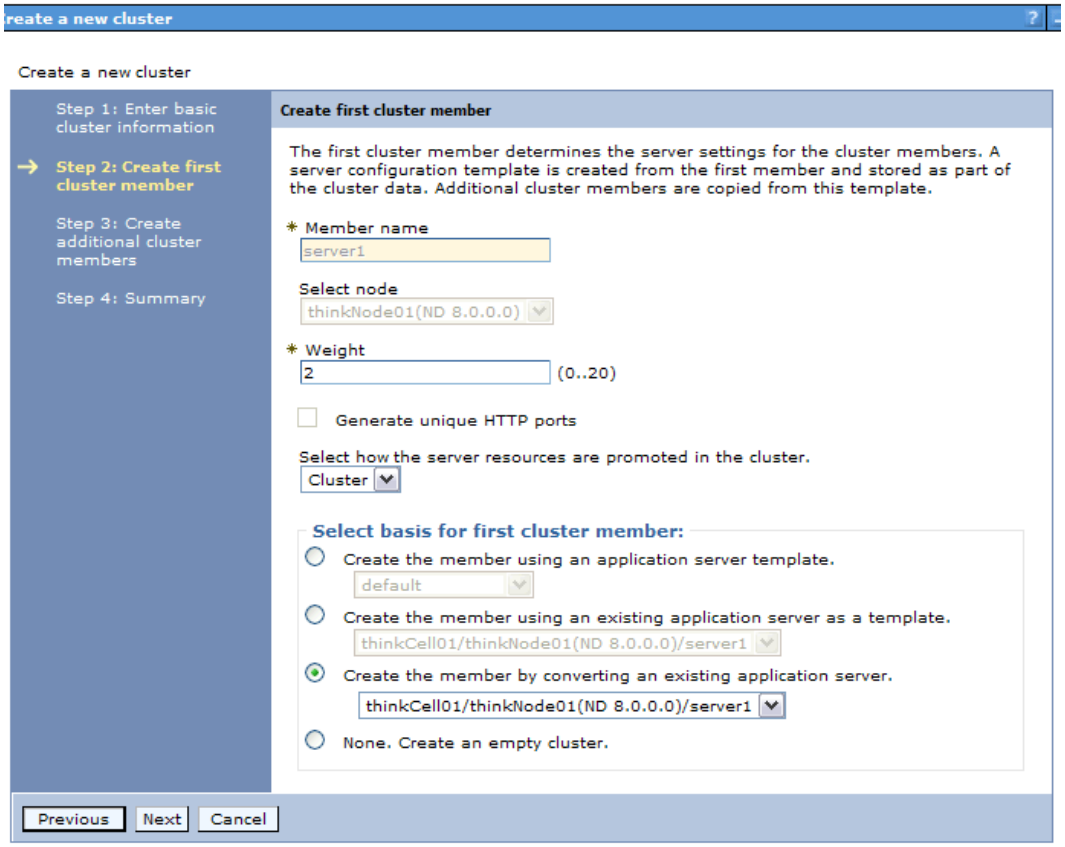


__ c. Click **New** to create a new cluster

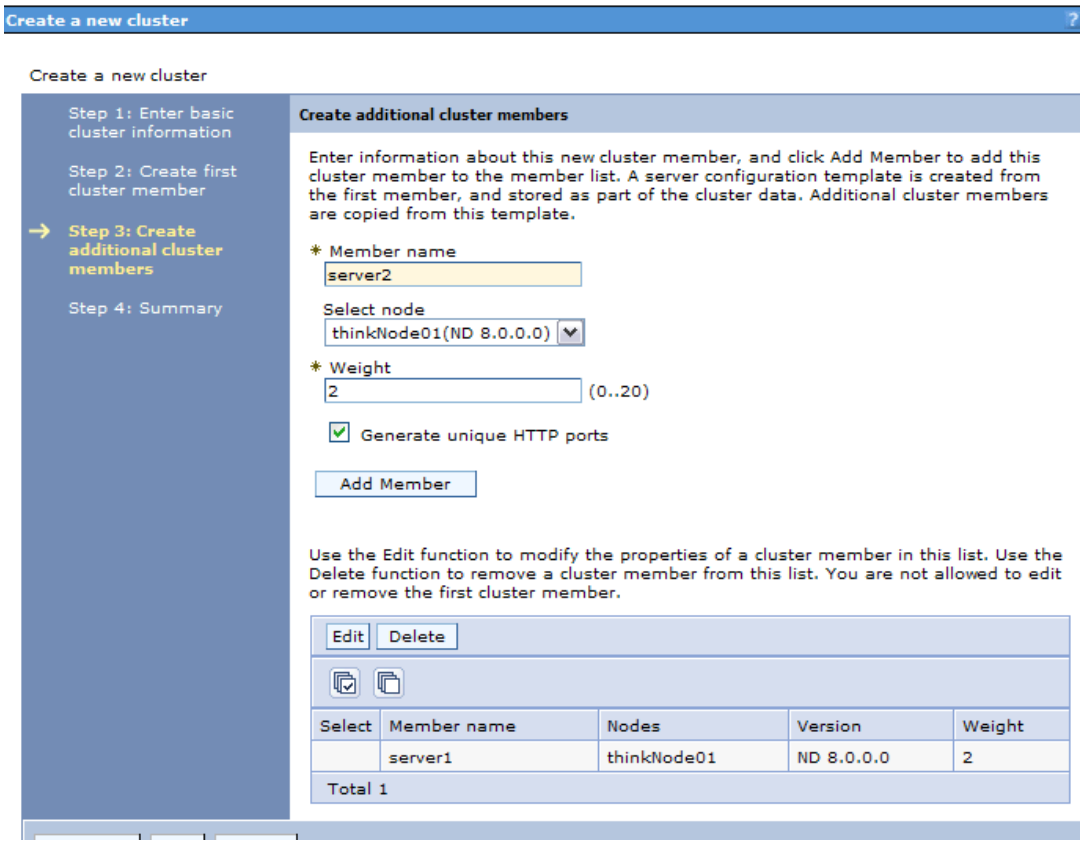
__ d. Enter **MyCluster** for a Cluster name as shown below, then click **Next**



__ e. In order to use our existing server configuration and application we are going to select **create the cluster member by converting an existing application server.** Then click **Next**



__ f. Enter **server2** as the server name for the next cluster member. Click **Add Member**. Then, enter **server3** as a server name and click **Add Member**. At this point, you should have 3 servers in the cluster; server1, server2 and server3. Once you do, click **Next**

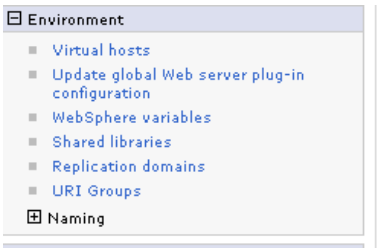


__ g. Review the settings, then click **Finish** to create the cluster members

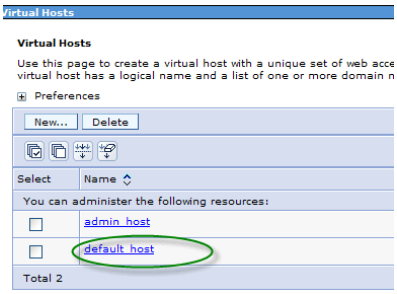
__ h. Now navigate to **Servers -> Server Types _> WebSphere Application Servers**, select server1 and click **delete**

Note: Server1 is being deleted to remove the port conflicts were mentioned previously during profile creation. Alternatively one could have changed the port number settings for server1, but simply removing the server from our configuration is the quickest means remove the conflicts.

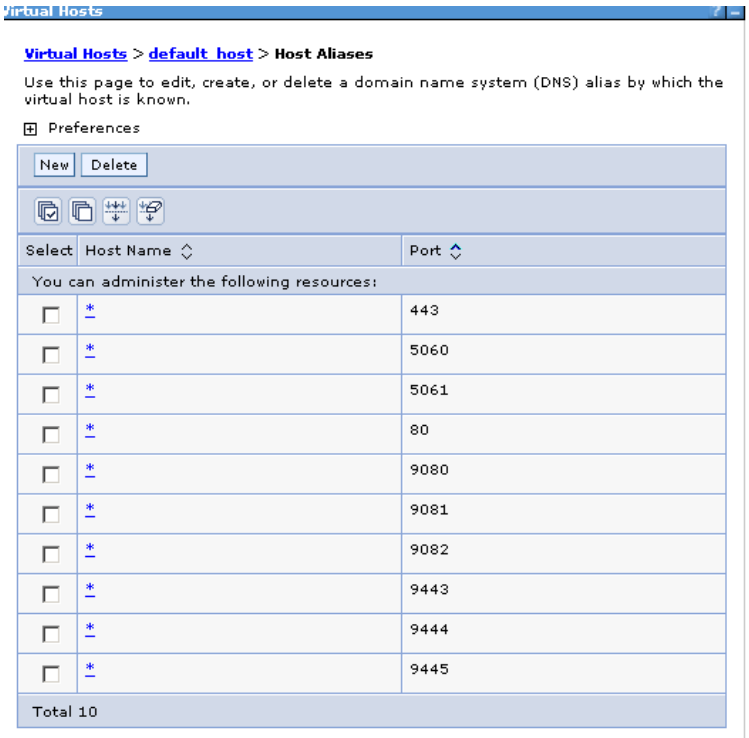
__ i. You can choose to save your changes at this time if you wish. But we have one more configuration change to make. Navigate to **Environment -> Virtual Hosts**



__ j. Click **default_host**

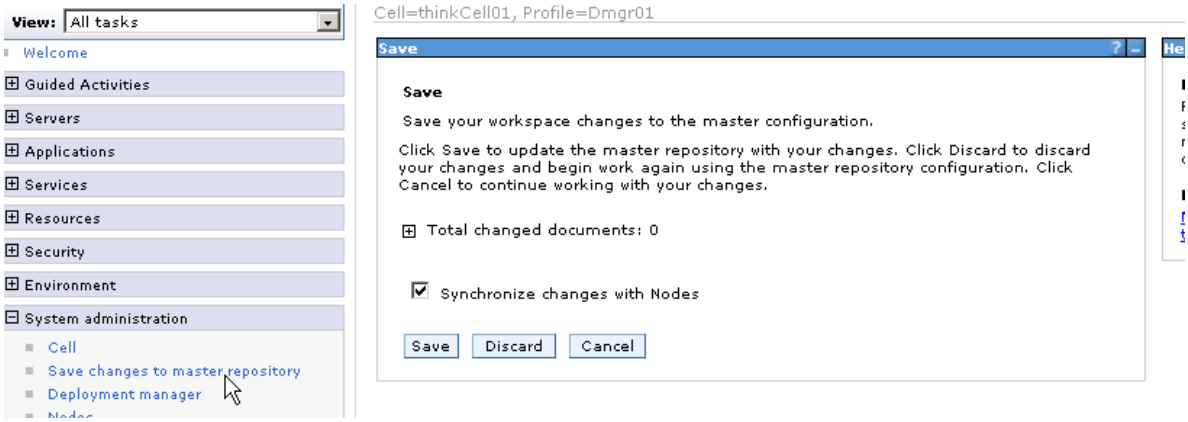


__ k. Check to make sure that port numbers **9081** and **9444** (for server 2), and port numbers **9082** and **9445** (for server3), are defined. Add them if needed (they should already be listed).



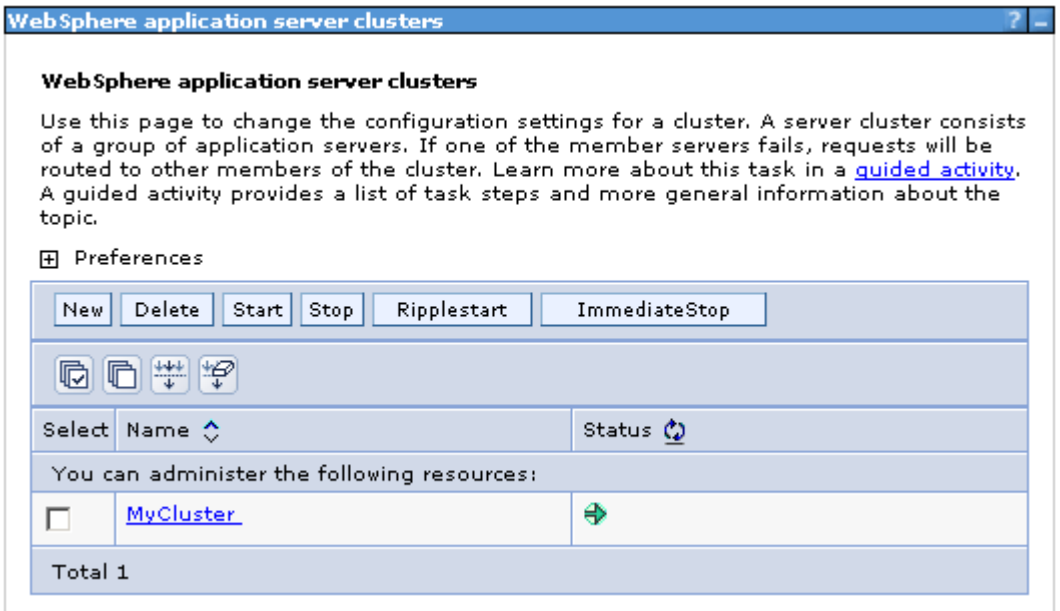
__ l. **Save** your changes if you've not already done so

__ m. Just to make sure all our changes have been pushed out to the node agent, we're going to save and synchronize as shown below.



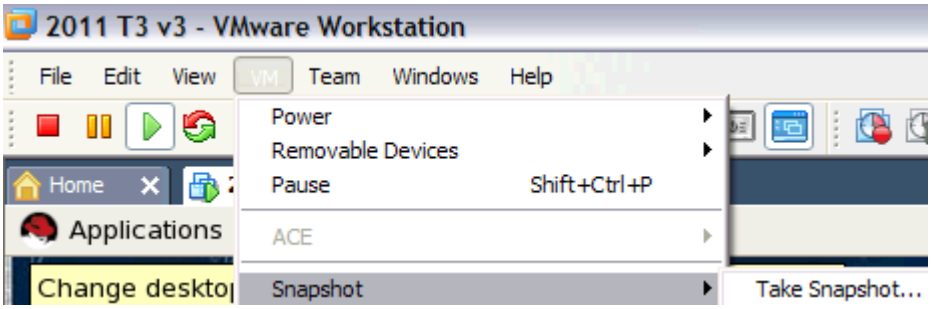
__ n. Once the synchronization is complete, you will need to regenerate and propagate the HTTP server plug-in. Navigate to Servers –> Web Servers, selecting webserver1 and clicking Generate Plug-in.

__ o. You can now start your application server cluster by navigating to **; Servers -> Clusters -> WebSphere Application Server Clusters ,** selecting **MyCluster** and clicking **star**t. Once the cluster can now start your application server cluster by navigating to**Servers -> Clusters -> WebSphere Application Server Clusters.** Select **MyCluster** and click **Start**. Once the cluster is started, you can enter http://localhost/snoop in a Firefox browser instance, and if you examine it's output, you'll see that some requests are served from port 9081 (server2) and some from port 9082 (server3).



Note: You may have noticed that you were not prompted to login when you accessed the application, this is because the Global Security settings a standalone WAS instance is not migrated during federation into a WAS-ND cell. While we could repeat step 6 from part 1 (above) we're not going to do so. A later lab will introduce WAS multiple security realm support and we'll use that feature for configuring application security.

____ 15. Take a VM snapshot (to insure you have a recovery point). Provide a meaningful name such as " Lab 1 End"



Lab 2 Administering an OSGi Application

2.1 Before you begin

This exercise guides you through the administration of a modular application using a strategic technologies: OSGi, the modular system for Java.

You will use the IBM® WebSphere® Application Server (WAS) version 8.0 cluster you configured in Lab 1.

Upon completing this exercise you should have gained a basic understanding of the value and basic concepts of OSGi,

You should possess basic knowledge of the IBM® WebSphere® Application Server (WAS) version 8.0 administration console.

To follow this exercise, you will require:

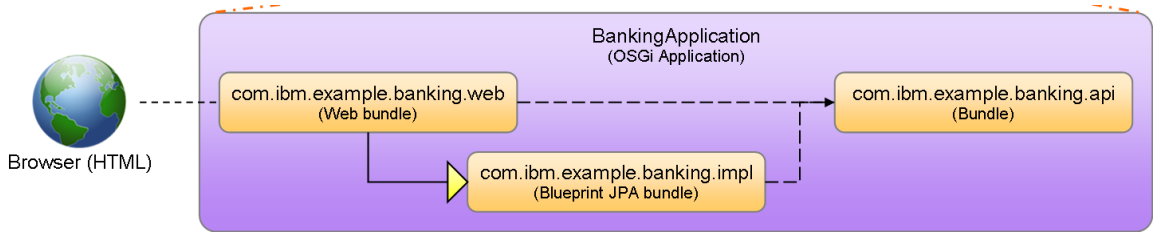
- This document.
- The OSGi bundle files that accompany this exercise.
- IBM® WebSphere® Application Server Version 8.0 Environment (henceforth “WAS”) installed and configured with a cluster defined as in Lab 1.

2.2 About the application you will deploy

You will deploy a web application that manages bank accounts. The web application consists of a single OSGi composition which consists of three OSGi bundles.

1. The **BankingApplication** OSGi application provides operations to open, close, deposit to, withdraw from and access bank accounts. It also provides operations to work with bank account owners. It includes a front-end JSP Web application for working with bank accounts and their owners.

This diagram depicts the overall design of the OSGi web application:



2.3 A closer look at the OSGi application

The “BankingApplication” OSGi application is a deployable unit containing three bundles that work together to provide banking services including management of accounts and account owners.

- The API bundle, com.ibm.example.banking.api, contains a Java interface and two data classes that together define the public API of the banking application. There is no business logic within the bundle.
- The implementation bundle, com.ibm.example.banking.impl, contains the main Java implementation class that implements the Java interface in the API bundle, and has the business logic that does all the internal work of creating, storing, accessing, updating and deleting bank accounts and bank account owners.

  The bundle also defines the implementation class as an OSGi Blueprint bean, and defines an OSGi Blueprint service based upon the bean and described by the implementation's parent interface from the API bundle.
- The Web bundle, com.ibm.example.banking.web, contains a JSP Web application for working with the bank accounts and account owners. The Web application consults the WAS JNDI service to locate the Blueprint service registered by the implementation bundle so that it can invoke operations without requiring a direct dependency on the implementation bundle or the implementation class within it.

2.4 Conventions

The **bold typeface** is used for text you need to enter or controls or objects such as push buttons and tree nodes that you need to interact with.

The *italic typeface* is used for dialog titles, control labels and other information displayed by the tools.

A few “variables” are used in this exercise to represent host names, port numbers and other configurable aspects of WAS. The values shown here match the configuration of the VMware images accompanying the exercise. If you are following this exercise on your own installation, you may need to substitute different values.

Variable	Value	Explanation
<FILES>	/Labfiles80	The directory containing files needed to complete the exercise.
<HOST>	Think	The local host name.
<HTTP-PORT>	9080	The WAS HTTP port number. This is used in the URLs of the OSGi application's JSP Web front end in the com.ibm.example.banking.web bundle.

2.5 Part 1: Start the WAS Environment

In this part of the exercise you will start the WAS Environment if it is not already started and import and deploy the BankingApplication OSGi application. If the WAS Environment is already started, skip to Part 2.

____ 1. Start WAS.

__ p. Start the Deployment Manager

1) Select **Applications → IBM Websphere → IBM WebSphere Application Server Network Deployment → Profiles → Dmgr01 → Start the deployment manager**
2) Wait for the start process to complete

__ q. Start the nodeagent

1) Start a terminal window by right clicking anywhere on the open desktop and select **Open Terminal.**
2) Change directory to the AppSrv01 profile bin directory by entering the command "**cd /opt/IBM/WebSphere/AppServer/profiles/AppSrv01/bin**
3) Start the nodeagent by entering the command "**./startNode.sh**" Be sure to note the "**./**" which prefaces the command. This signals to the OS command processor that this command is in the local directory.
4) Wait for the messages that indicate that the nodeagent has successfully been started. You should see output that looks like the following example. The process id will vary

ADMU0116I: Tool information is being logged in file

/opt/IBM/WebSphere/AppServer/profiles/AppSrv01/logs/nodeagent/startServer.log
ADMU0128I: Starting tool with the AppSrv01 profile
ADMU3100I: Reading configuration for server: nodeagent
ADMU3200I: Server launched. Waiting for initialization status.
ADMU3000I: Server nodeagent open for e-business; process id is 5615

__ r. Start the MyCluster cluster using one of the following methods. Option 1 is to use the wsadmin command line administration tool. The other option is to use the web browser based Admin Console GUI. Use one of the two options below.

1) Invoke the wsadmin command from a terminal window(enter exactly as shown including the quotes on a single command line)

/opt/IBM/WebSphere/AppServer/profiles/Dmgr01/bin/wsadmin.sh -lang jython -C "AdminClusterManagement.startSingleCluster('MyCluster')"

The system will display a prompt window requesting your credentials. Login with User and Password values of **"wasadmin"** You will see the following output in the terminal screen, indicating that the cluster was successfully started:

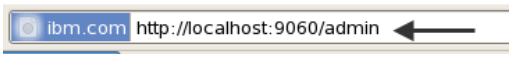
```
WASX7209I: Connected to process "dmgr" on node thinkCellManager01 using
SOAP connector;  The type of process is: DeploymentManager
------------------------------------------------------------
 AdminClusterManagement:        Start a cluster
 Cluster name:                  MyCluster
 Usage: AdminClusterManagement.startSingleCluster("MyCluster")
 Return: If the command is successful, a value of 1 is returned.
------------------------------------------------------------


Start cluster:
WebSphere:name=MyCluster,process=dmgr,platform=common,node=thinkCellMan
ager01,version=8.0.0.0,type=Cluster,mbeanIdentifier=MyCluster,cell=thinkCell01,sp
ec=1.0
OK: startSingleCluster('MyCluster', 'false'):
```

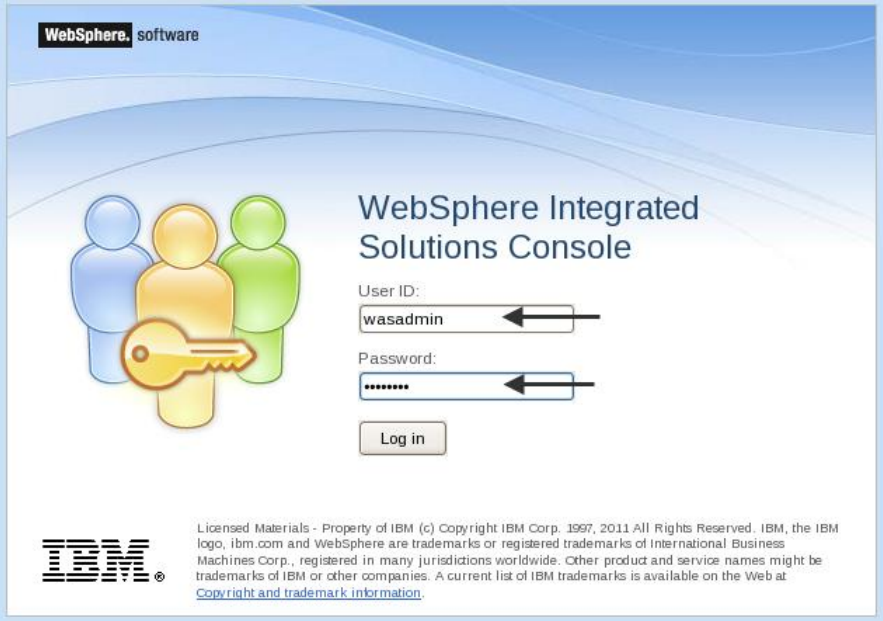
____ 16.Close the terminal window by entering the command “exit”.

__ s. OR use the Admin Console

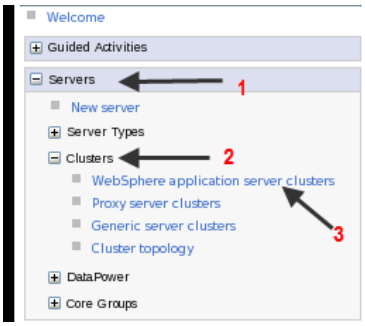
1. Open a Mozilla Firefox web browser window
2. Open a session with the Deployment Manager admin interface
3. enter the URL http://localhost:9060/admin



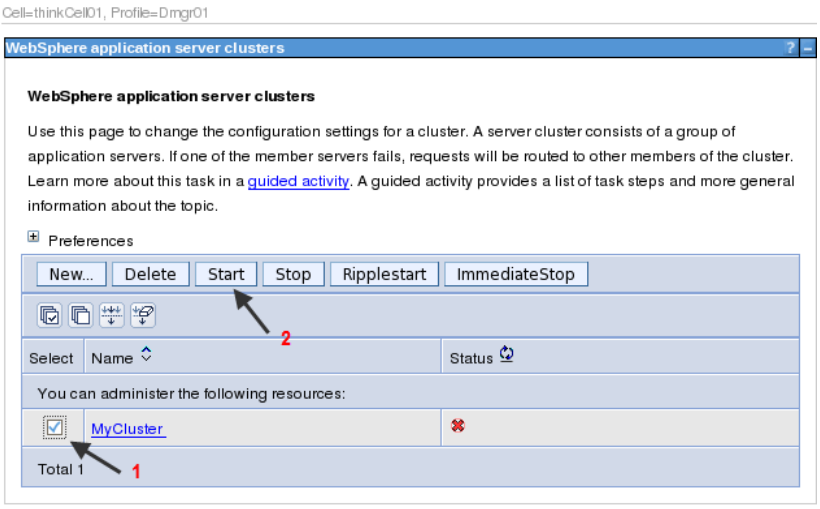
4. Login with UserID and Password of “**wasadmin**”



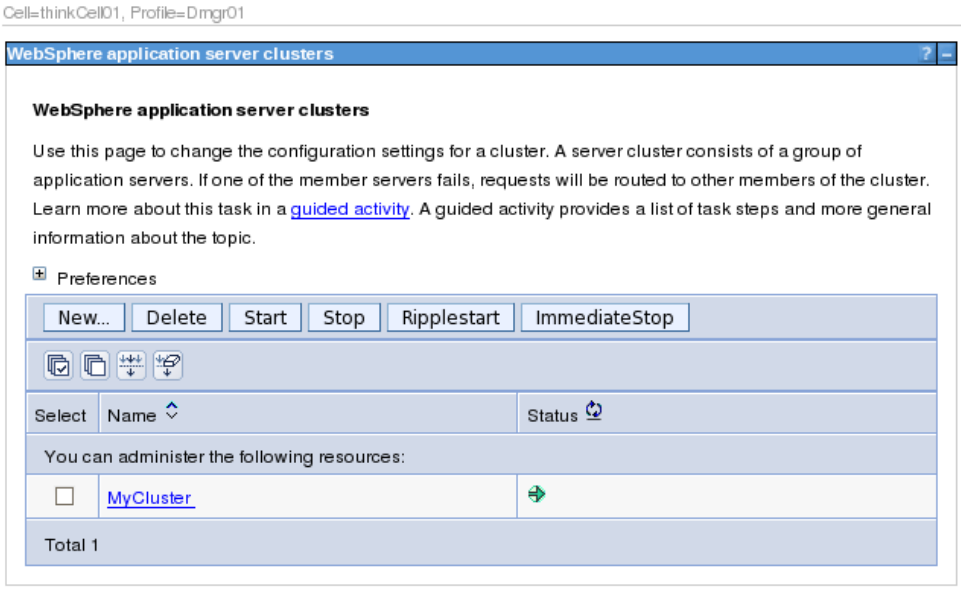
5. Expand **Servers → Clusters**
6. Select **WebSphere application server clusters**



7. Select the **MyCluster** entry and click on the **Start** button



After a short time, the Status will turn into a green arrow to indicate that it successfully started.



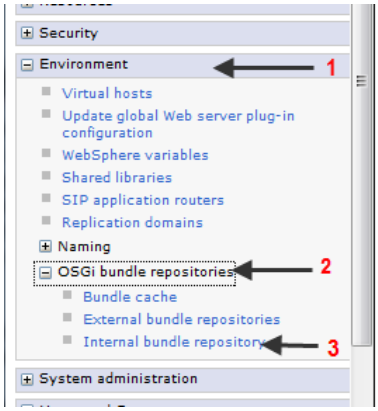
8. Continue to the next section.

2.6 Part 2: Deploy the OSGi BankingApplication Web app

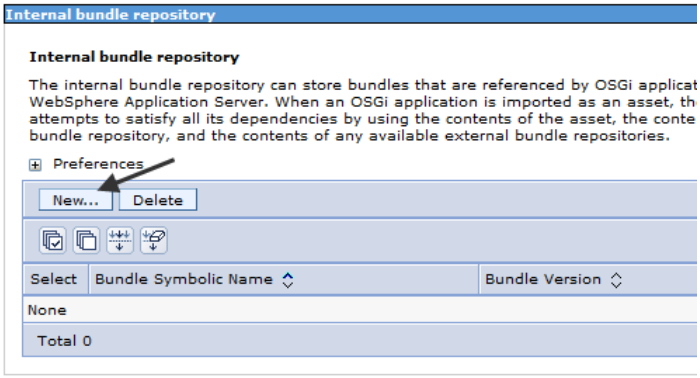
In this part of the exercise, you will take several java archive files which are packaged as OSGi bundles. You will import them into the WAS internal bundle repository from where they can be made accessible to an OSGi application. The repository may contain multiple versions of a bundle and each OSGi application can utilize the desired version based. This mechanism allows for multiple versions of the same java class to be loaded in the WAS jvm and be used at the appropriate version by the requesting application.

____ 1. Import the BankingApplication OSGi bundles.

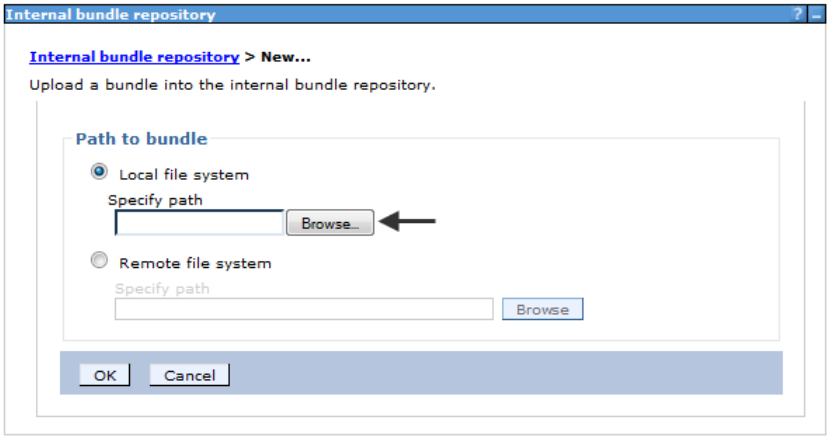
a) Log on to the WAS Admin Console.
b) Expand **Environment**
c) Expand **OSGi bundle repositories**
d) Select Internal bundle repository



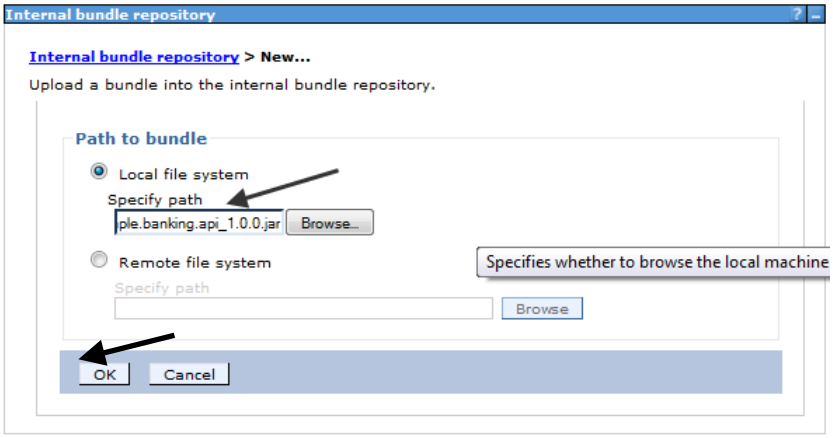
e) Click on the **New…** button



f) Click on the **Browse…** button



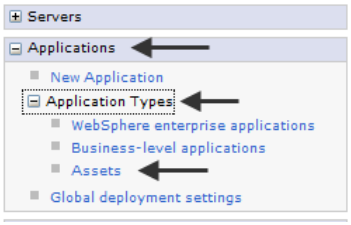
g) Navigate to the **/Labfiles80/OSGiApplication** folder and select the **com.ibm.example.banking.api_1.0.0.jar** file and click the **OK** button.



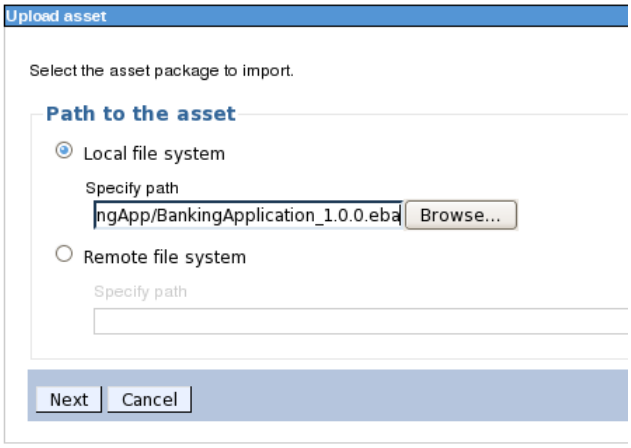
h) Repeat steps (f) and (g) for the following two additional jar files
   1. **com.ibm.example.banking.impl_1.0.0.jar**
   2. **com.ibm.example.banking.web_1.0.0.jar**

____ 2. Import the BankingApplication enterprise bundle application (EBA)

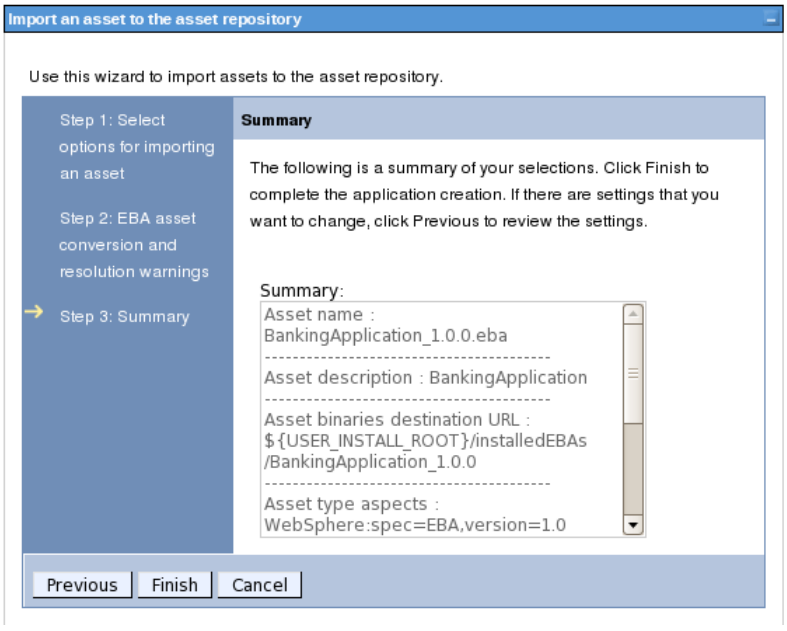
a) Within the Navigation frame on the left side, expand **Applications**
b) Expand **Application Types**
c) Select **Assets**



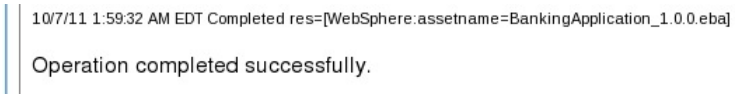
d) Click on the **Import** button
e) Click on the Browse… button
f) Navigate to the **/Labfiles80/OSGiApplication** folder and select the **BankingApplication_1.0.0.eba** file.



i) Click on the **Next** button.
j) Click on Next through Steps 1 and 2. Ignore any warnings that might appear.
k) On Step 3: Summary, Click on the **Finish** button.

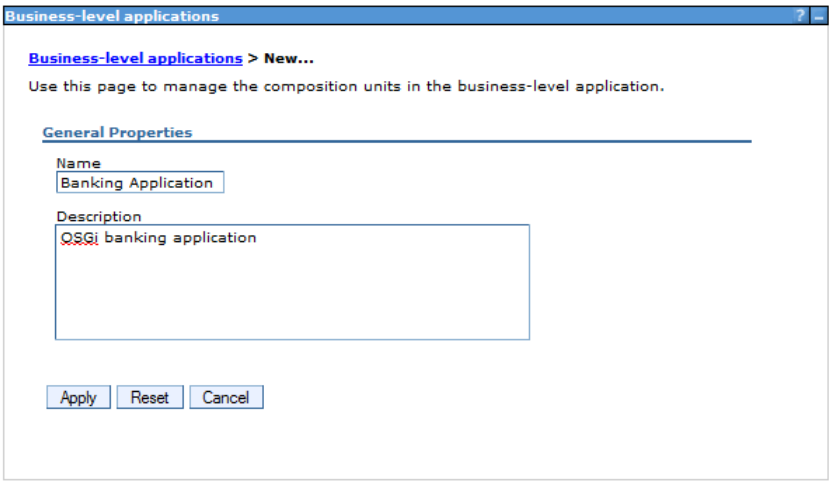


You should soon see the result that the asset has been successfully added.

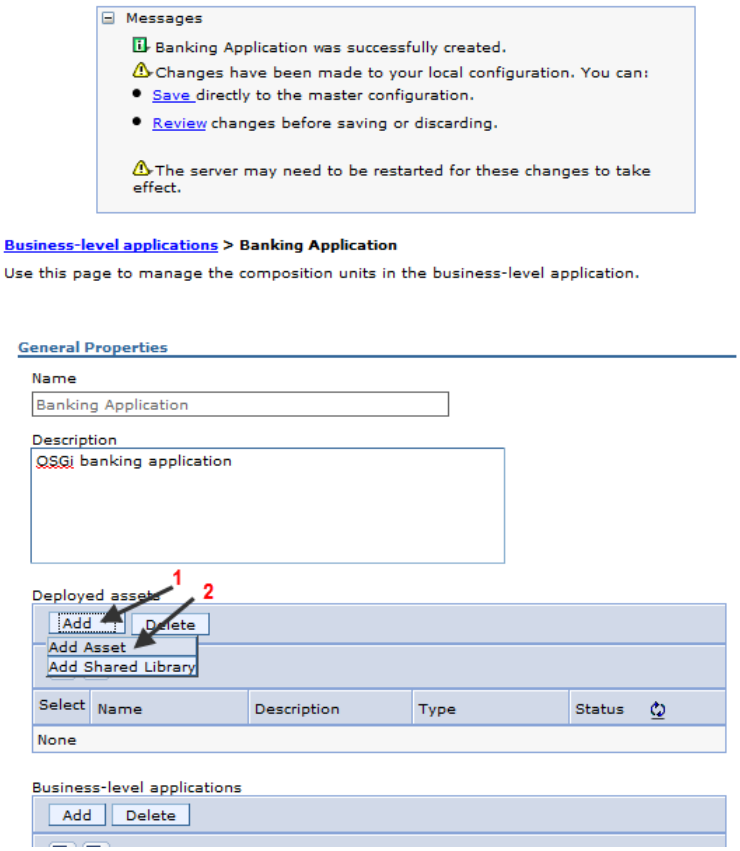


____ 3. Create the BankingApplication business level application (BLA)

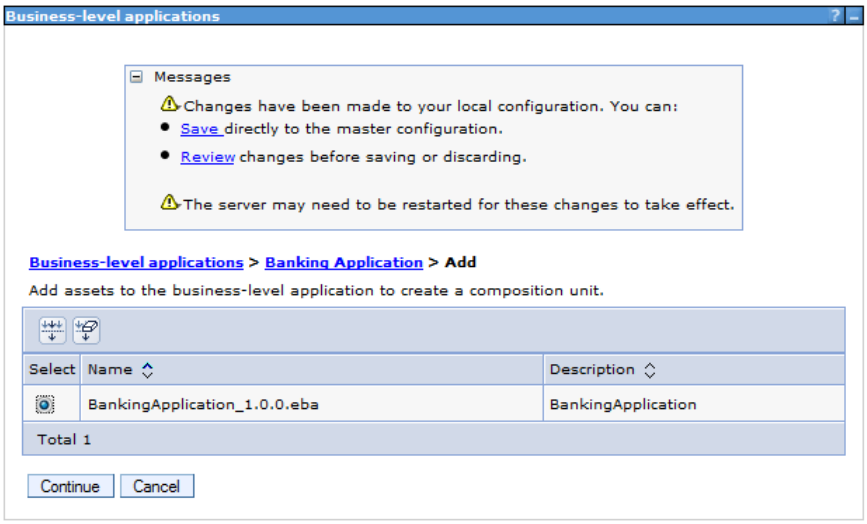
a) Within the Navigation frame on the left side, Select **Business-level applications**
b) Click on the **New…** button
c) Type "**Banking Application**" in the Name field. Also type a suitable description such as "**OSGi banking application**" into the Description field and click on the **Apply** button



d) Click on the **Add** button in the "Deployed Assets" section
e) Click on the **Add Asset** selection

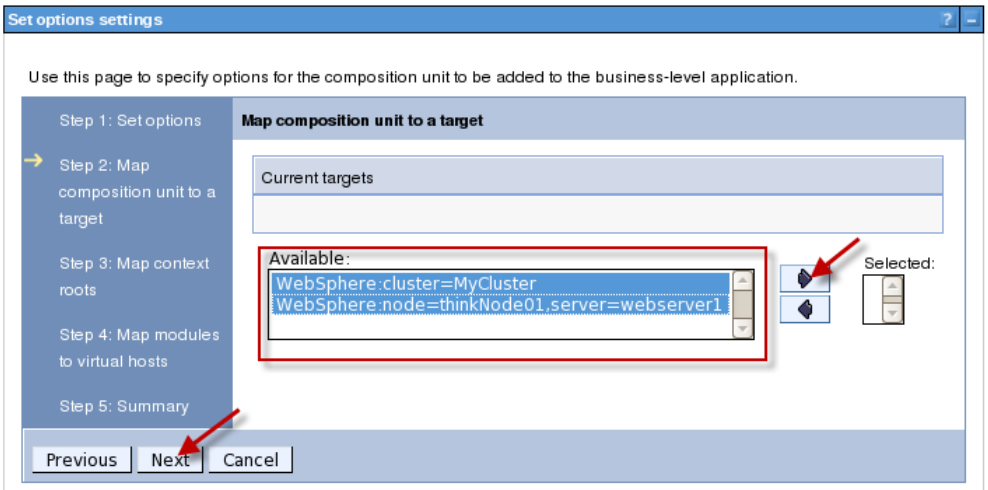


f) Select the **BankingApplication_1.0.0.eba** asset and click on the **Continue** button

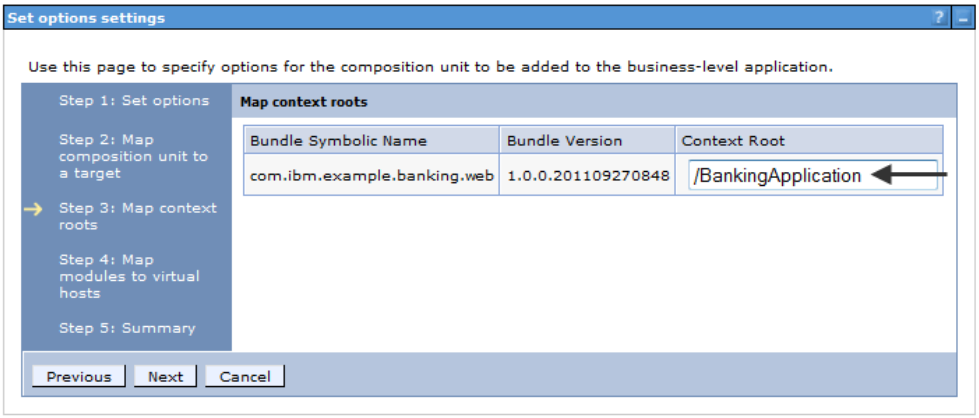


g) Accept the defaults for Step 1 by clicking on the **Next** button.

h) For Step 2: Map composition unit to a target, be sure to select both the MyCluster cluster and the webserver1 and click on the arrow pointing to the right. This will deploy the application to both the cluster and instruct WAS to configure the webserver plugin correctly. Click on the **Next** button to continue.

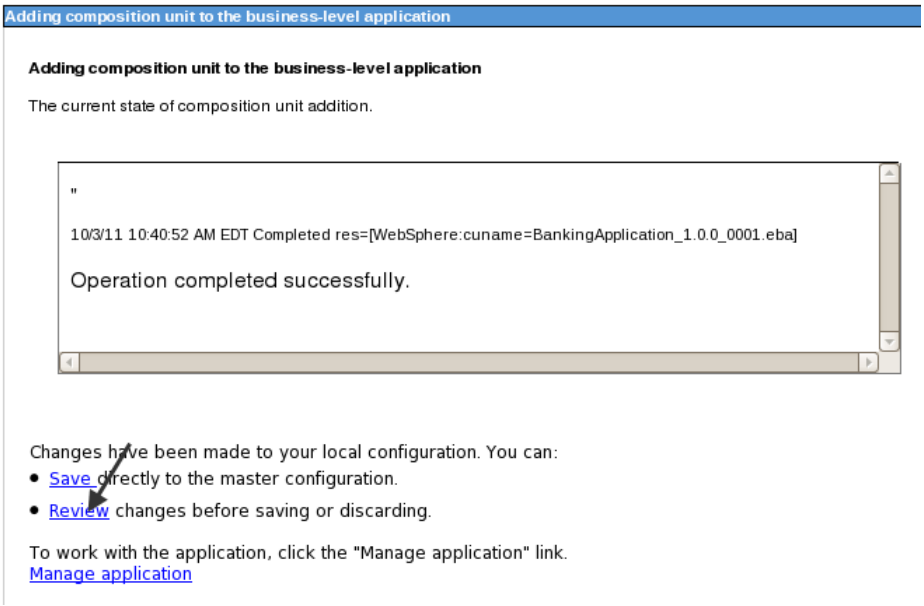


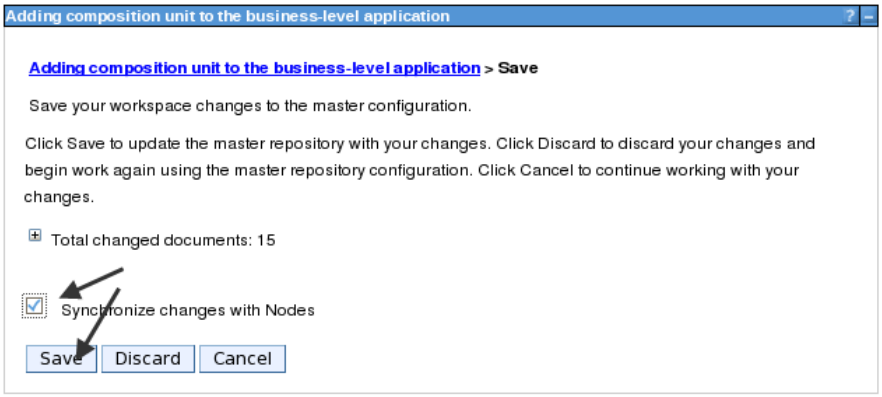
i) Enter "**/BankingApplication**" into the Context Root field and click on the **Next** button.



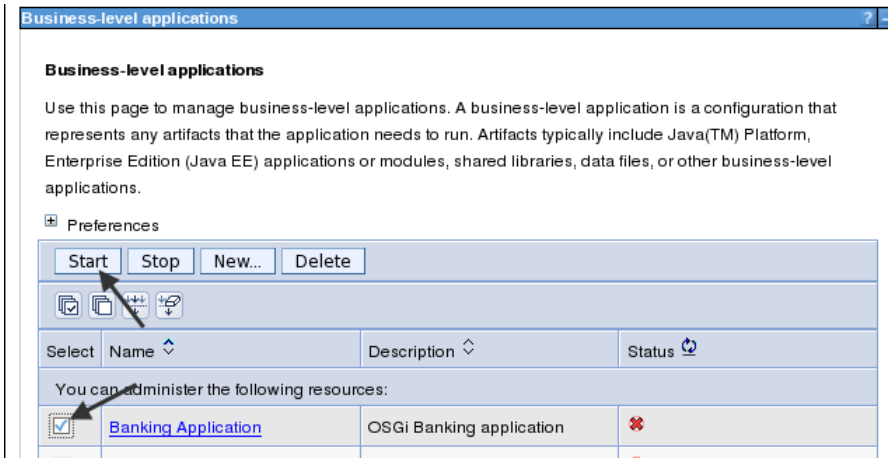
j) On Step 4: Map modules to virtual hosts, click on the **Next** and then the **Finish** button to complete the definition.

k) Be sure to review and save the changes to the configuration and synchronize the changes to the cell.

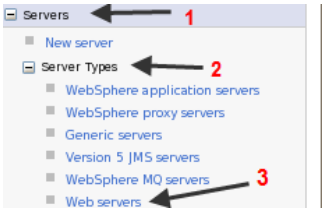




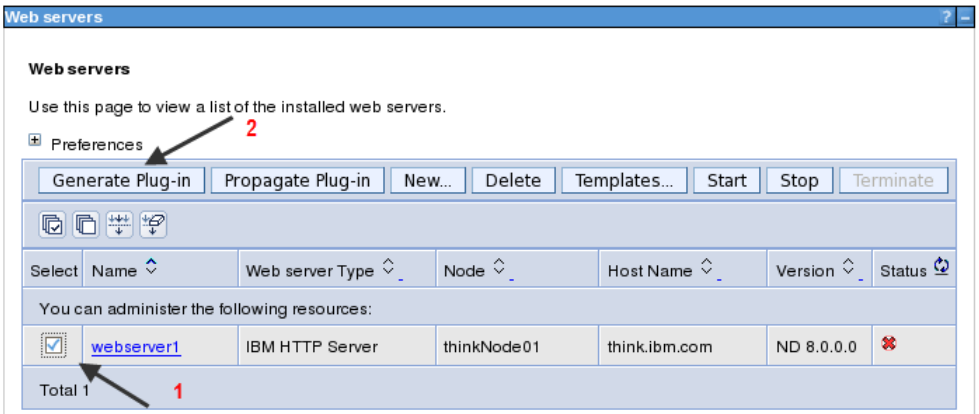
l) Since the default is to not start the application upon distribution, you will need to manually start the application. Select the **Banking Application** which you just created and click on the **Start** button.



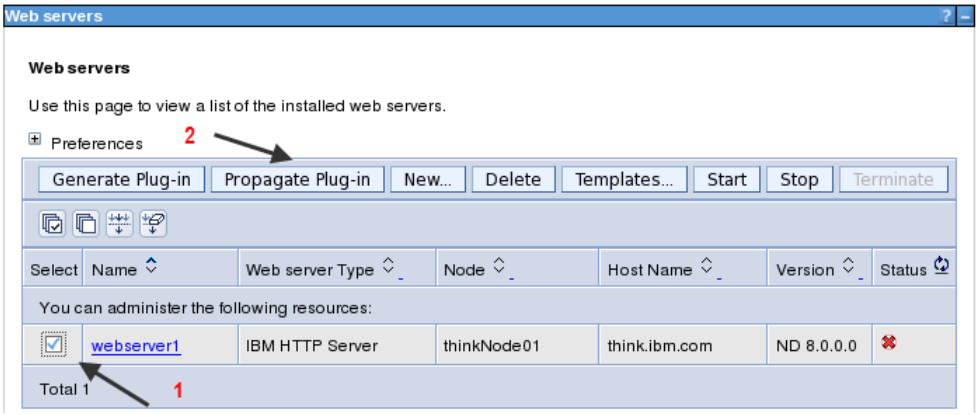
____ 4. Configure the webserver so it can route requests to the newly deployed application. Expand the Servers then Server Types in the navigation panel. Then click on the Web servers link



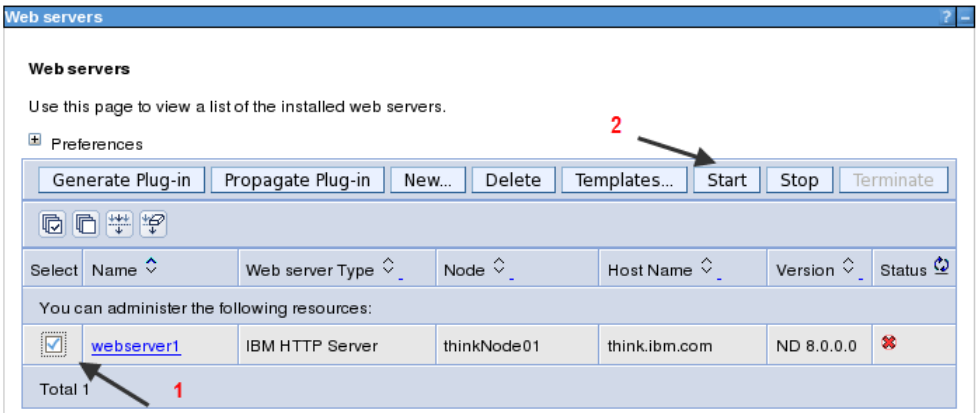
____ 5. Select **webserver1** and click on the **Generate Plug-in** button.



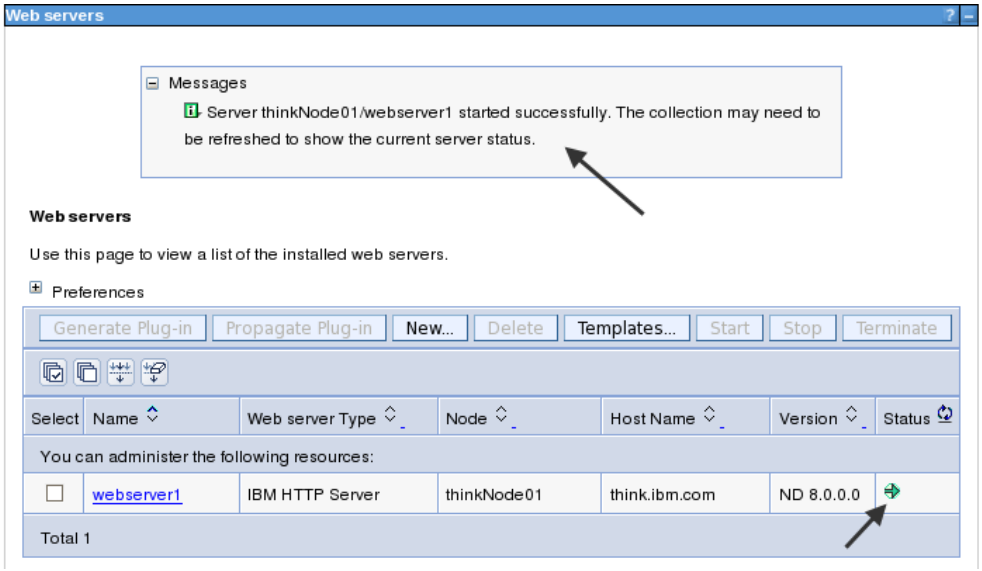
____ 6. Reselect **webserver1** and click on the **Propagate Plug-in** button



____ 7. Lastly, start the Web server by reselecting **webserver1** and click on the **Start** button.



____ 8. Ensure that the Status for webserver1 turns green to indicate that it has successfully started. You may also notice a message in the top of the panel.



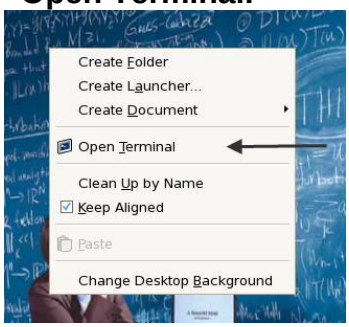
In this part of the exercise you started the WAS Environment, imported, deployed, and started the Java EE "BankingApplication" OSGi application. You also generated an updated webserver plugin configuration to support the new application.

2.7 Part 3: Use the OSGi BankingApplication Web app

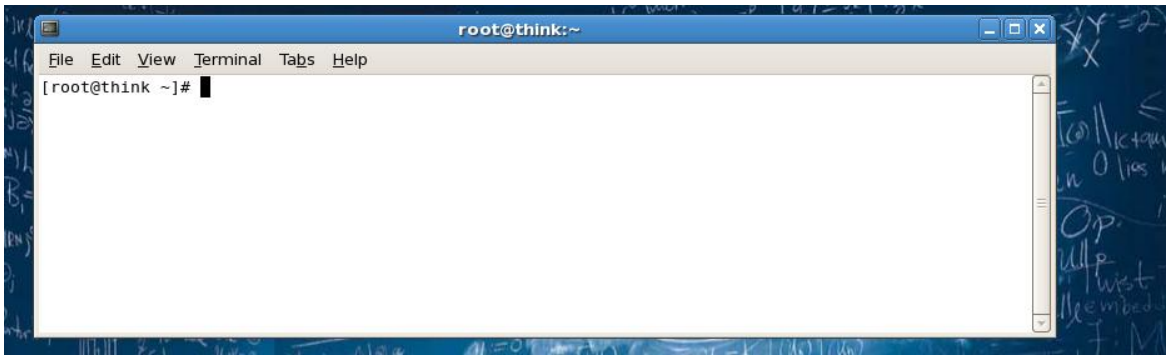
In this part of the exercise you will use the Web front-end of the OSGi application to create an account owner, open a bank account and deposit some funds. You will also monitor the WAS **SystemOut.log** files for both servers in the cluster to validate that the application is working as desired.

____ 1. Monitor the **SystemOut.log** file

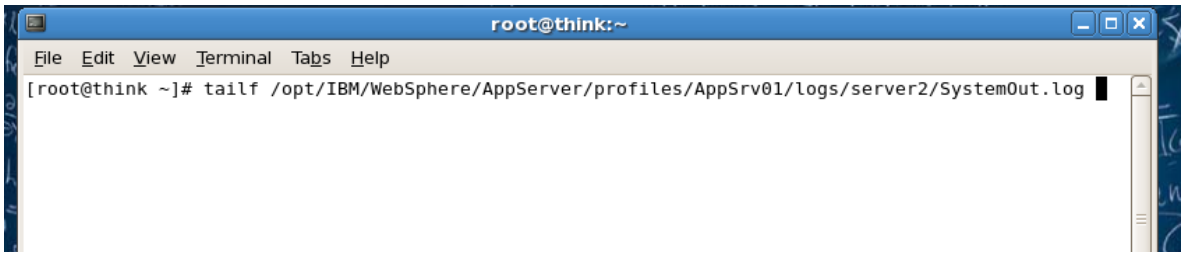
a) Start a terminal window by right clicking anywhere on the open desktop and select **Open Terminal.**



b) Resize the window by dragging a corner so that it covers most of the width of the screen, but only about ¼ of the height of the screen.



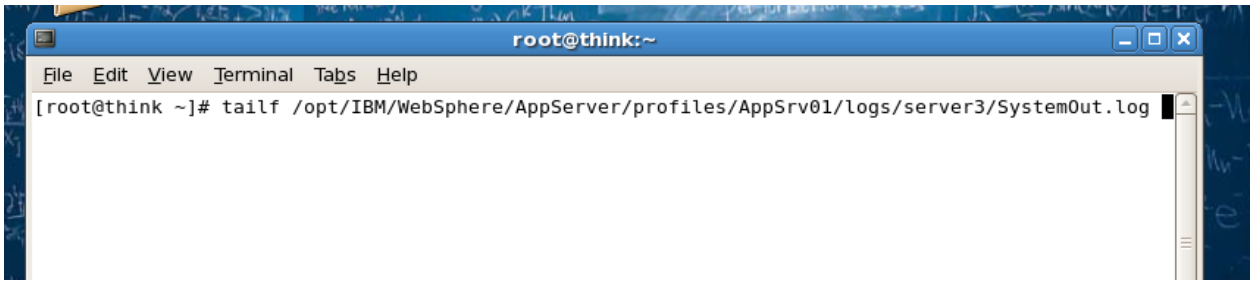
c) Enter the command "**tailf /opt/IBM/WebSphere/AppServer/profiles/AppSrv01/logs/server2/SystemOut.log**"



d) Start another terminal window by right clicking anywhere on the open desktop and select **Open Terminal.**

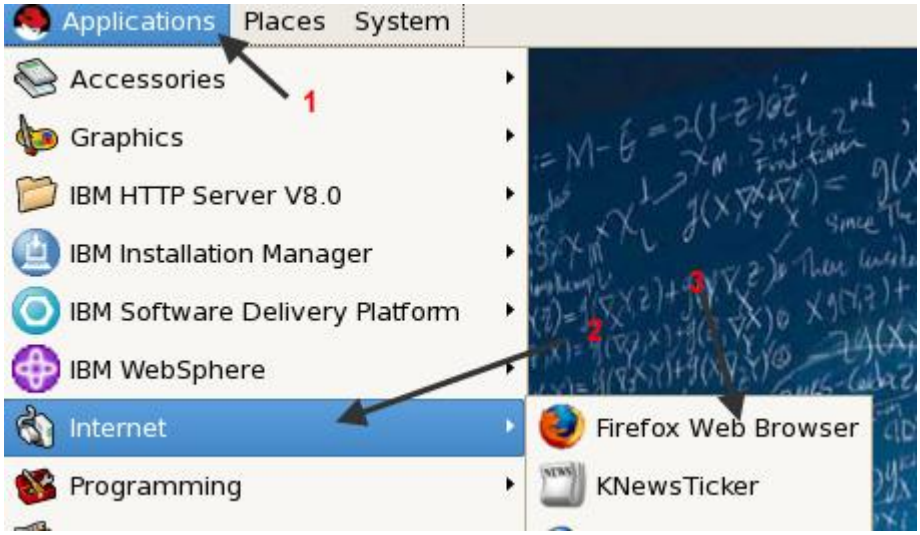
e) Resize the window by dragging a corner so that it covers most of the width of the screen, but only about ¼ of the height of the screen.

f) Enter the command "**tailf /opt/IBM/WebSphere/AppServer/profiles/AppSrv01/logs/server3/SystemOut.log**"



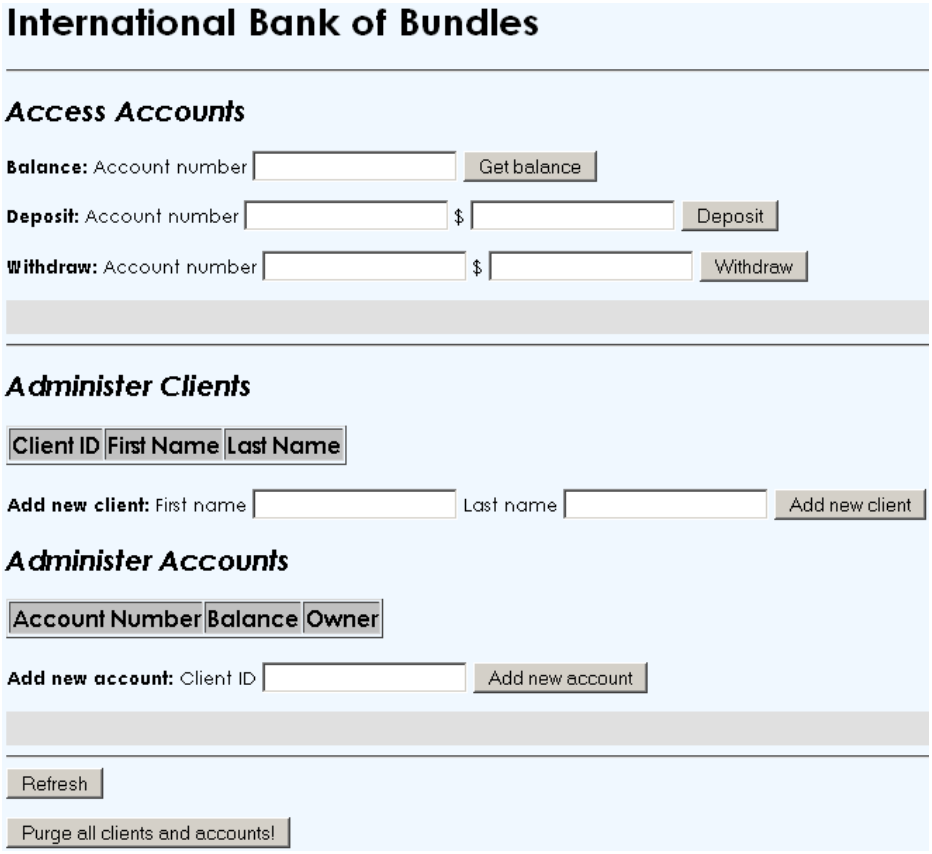
____ 17.Launch the Web application in the Mozilla Firefox browser.

a) Select **Applications → Internet → FireFox web browser**



b) Open http://localhost/BankingApplication/index.jsp

c) You should see the ***International Bank of Bundles Web*** application page like below.



____ 18.Create an account owner.

a) In the *Administer Clients* section of the Web application, enter the following names into the **First name** and **Last name** fields, then press **Add new client**.

   1. First name = John
   2. Last name = Doe

b) The status message "*Owner 100 added successfully*" should appear in the grey status area.

c) Inspect both of the **SystemOut.log** tails. In one of the windows, you should see several lines of output produced by System.out.println(...) calls that are instrumented throughout the Java implementation classes of the application. For instance, after step [a] above, the last few lines of the console should read as follows:

```
com.ibm.ws.webcontainer.servlet.ServletWrapper init SRVE0242I:...
[OSGi] AccountManagerImpl.getOwners() = []
[OSGi] AccountManagerImpl.getAccounts() = []
[JSP] index.jsp: owners = []
[JSP] index.jsp: accounts = []
com.ibm.ws.webcontainer.servlet.ServletWrapper init SRVE0242I:...
[Servlet] AddAOwnerServlet(...
[Servlet] AddAccountServlet(...) firstName=John
[Servlet] AddAccountServlet(...) lastName=Doe
[OSGi] AccountManagerImpl.createOwner(Doe,John) = 100
[OSGi] AccountManagerImpl.getOwners() =
  [Owner{id=100,firstName=John,lastName=Doe}]
[OSGi] AccountManagerImpl.getAccounts() = []
[JSP] index.jsp: owners =
  [Owner{id=100,firstName=John,lastName=Doe}]
[JSP] index.jsp: accounts = []
```

____ **19.Create an account.**

a) In the *Administer Accounts* section of the Web application, enter the client number **100** into the Client ID field, then press **Add new account**.

b) The status message "*Account 1000 opened successfully*" should appear in the grey status area.

c) Again, inspect the two **SystemOut.log** displays.

____ 20.Deposit funds into the account.

a) In the *Access Accounts* section of the Web application, enter account number **1000** into the **Deposit: Account number** field, enter **10000** into the **$** field, then press **Deposit**.

b) The status message "*Funds in the amount $10,000.00 deposited to account 1000. The new balance s $10,000.00.*" should appear in the grey status area.

c) Again, inspect the two **SystemOut.log** displays.

____ 21.Keep both of the terminal windows open and maintain the tailf commands.

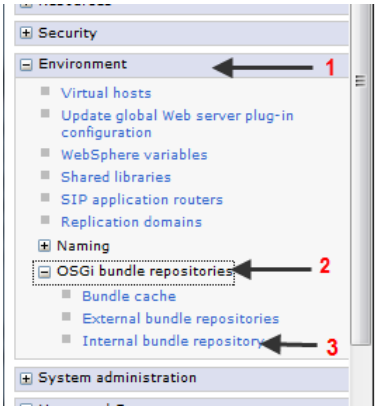
In this part of the exercise you used the OSGi Web application to create a new account owner (or client) and a new bank account. You deposited funds into the bank account which will be important if you are going to buy any stock in the next part of the exercise. You also monitored the SystemOut.log files to determine which server instance handled the request.

2.8 Part 4: Deploy an update to the OSGi BankingApplication Web app

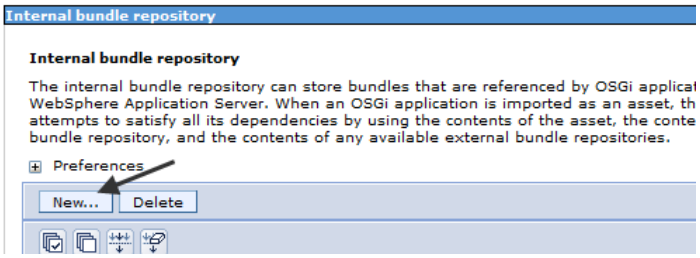
In this part of the exercise, you will be provided an update OSGi bundle file which is provided as a java archive file. During the initial testing of the application, it was discovered that the starting value for clientIDs and account numbers was wrong. Instead of 100, the starting value for client IDs is supposed to be 200. The starting account number is also supposed to be 2000 instead of 1000. As a result, the development team has generated an updated implementation bundle and you need to import and activate this update for the next round of testing. You will import this bundle into the WAS internal repository from where it can be made be used to update the deployed OSGi BankingApplication. As you will see, the repository may contain multiple versions of a bundle. As long as the OSGi Composition permits, the System Administrator will determine which version will be the desired version based. This allows a System Administrator to be able to load and test updates (or roll back changes) quickly and efficiently.

____ 1. Import the updated BankingApplication OSGi bundle.

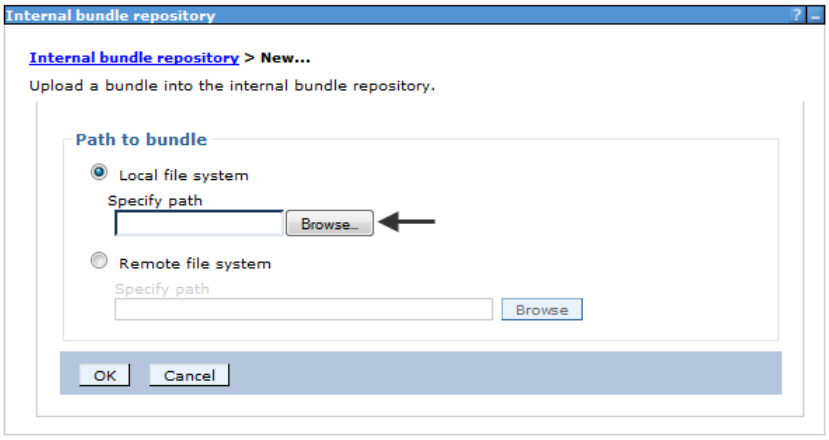
a) Log on to the WAS Admin Console.
b) Expand **Environment**
c) Expand **OSGi bundle repositories**
d) Select Internal bundle repository



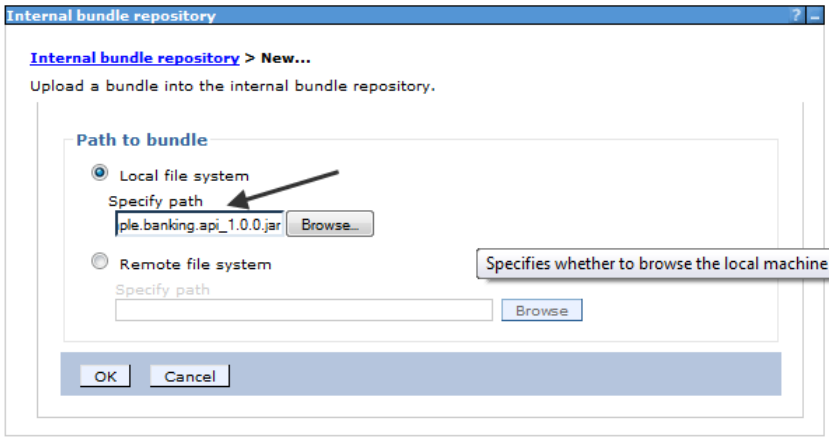
e) Click on the **New…** button



f) Click on the **Browse…** button



g) Navigate to the **/Labfiles80/OSGiApplication/Updates** folder and select the **com.ibm.example.banking.impl_1.0.1.jar** file.

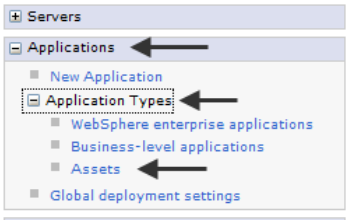


h) Save and synchronize changes.

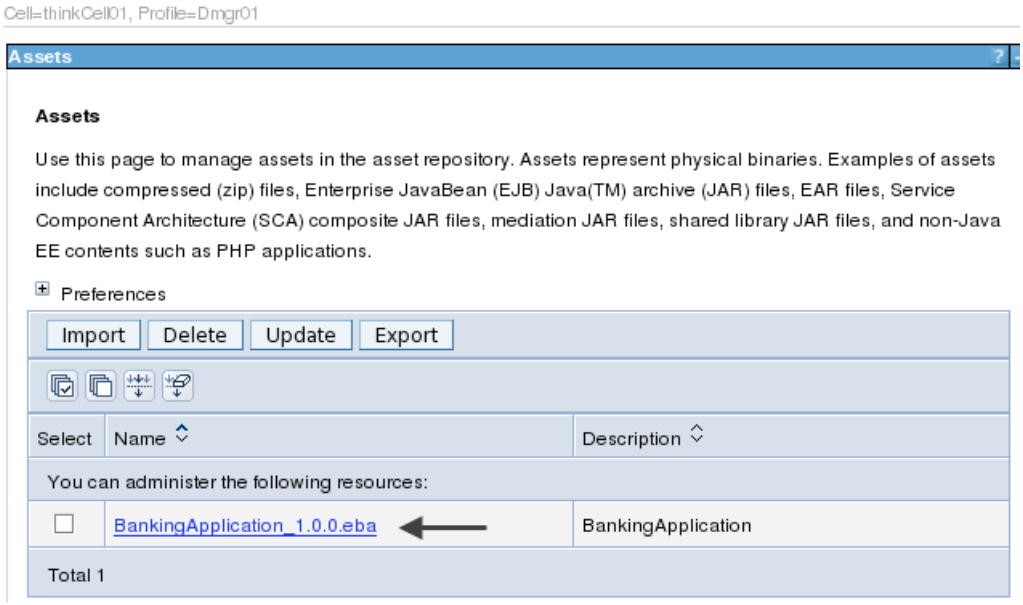
____ 1. Update the BankingApplication enterprise bundle application (EBA)

a) Within the Navigation frame on the left side, expand **Applications**

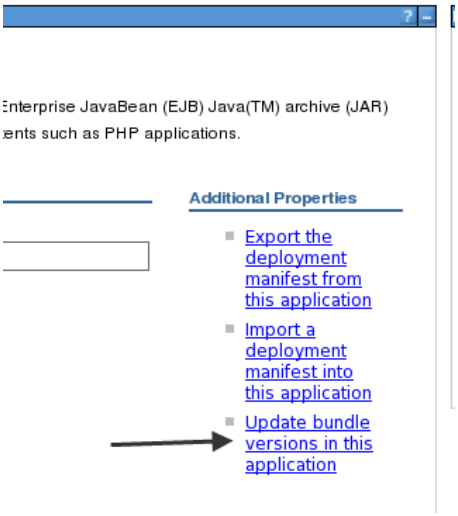
b) Expand **Application Types**
c) Select **Assets**



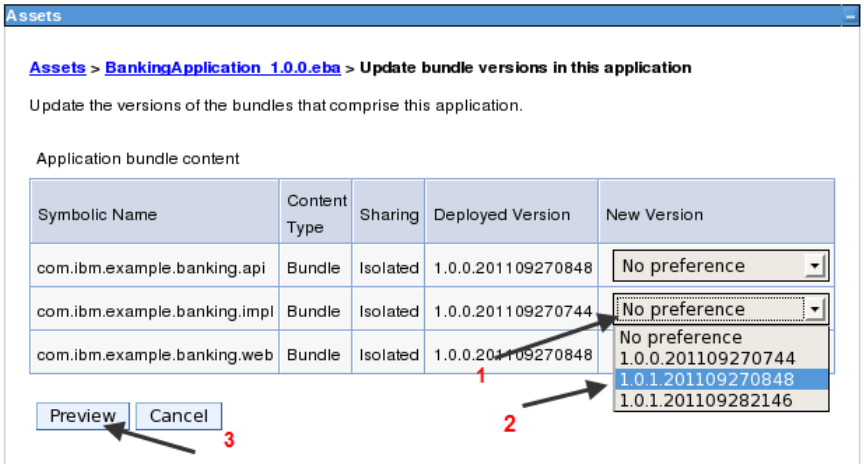
d) Select the **BankingApplication_1.0.0.eba** asset.



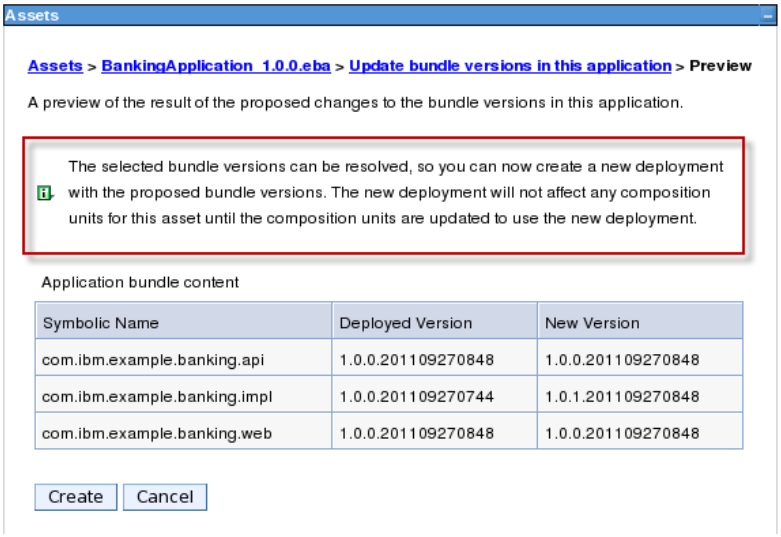
e) On the far right hand section of the primary panel, under Additional Properties, select **Update bundle versions in this application**



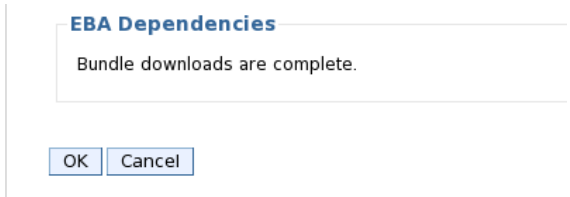
f) Click on the pulldown for the **com.ibm.example.banking.impl** bundle and select the **1.0.1.201109270848** version. Then click on the **Preview** button



g) Notice the informational message. Although the application definition has been updated, it will not take effect until the BLA is updated to use the new deployment. This will occur the next time the application is restarted, or when an Administrative action to perform the update has been performed. Click on the **Create** button to generate the updated deployment.



h) Click on the OK button to complete processing of the **BankingApplication** asset.

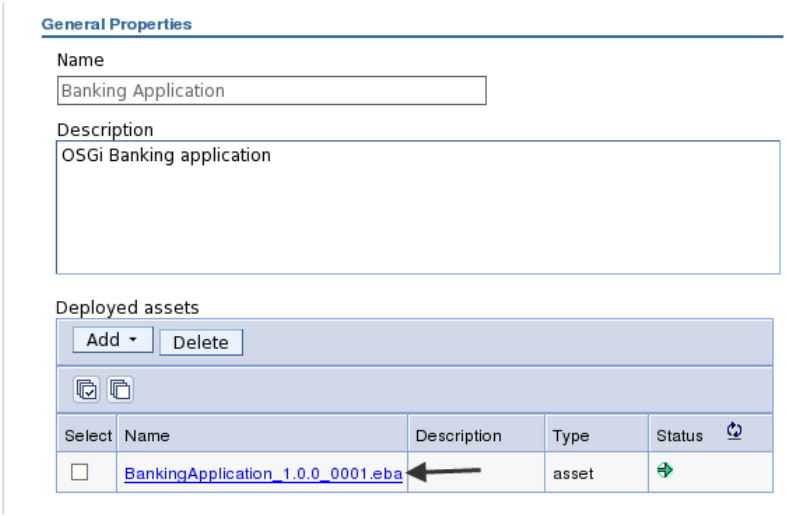


i) Save and synchronize changes.

____ 2. Update the BankingApplication business level application (BLA)

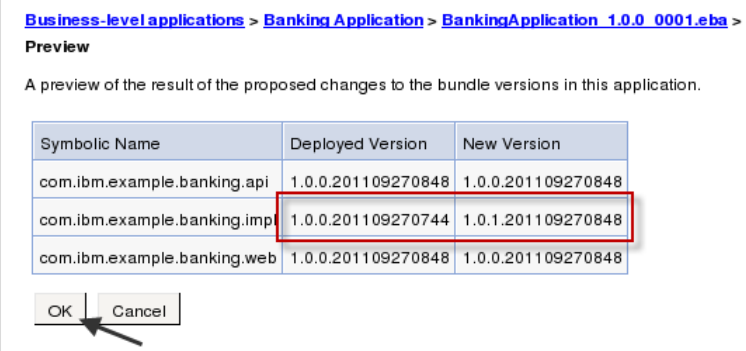
a) Within the Navigation frame on the left side, Select **Business-level applications**
b) Within the main frame, select the **Banking Application** BLA.

c) Click on the **BankingApplication_1.0.0_0001.eba** asset link

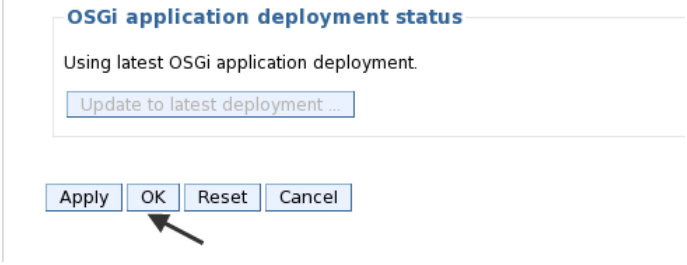


d) Click on the **Update to latest deployment …** button

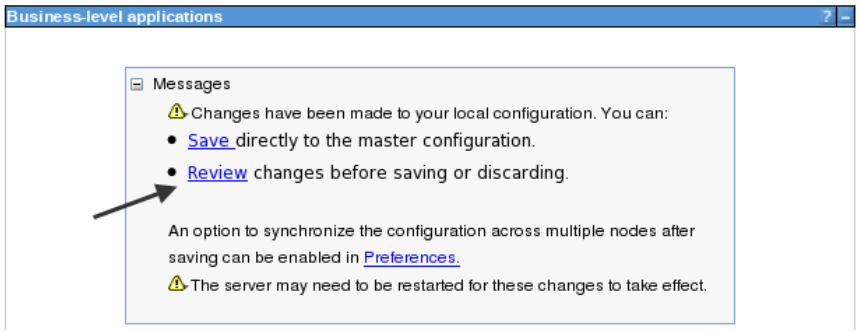
e) Review the differences between the currently Deployed Version and the New Version to be sure that they are correct. Then click on the **OK** button

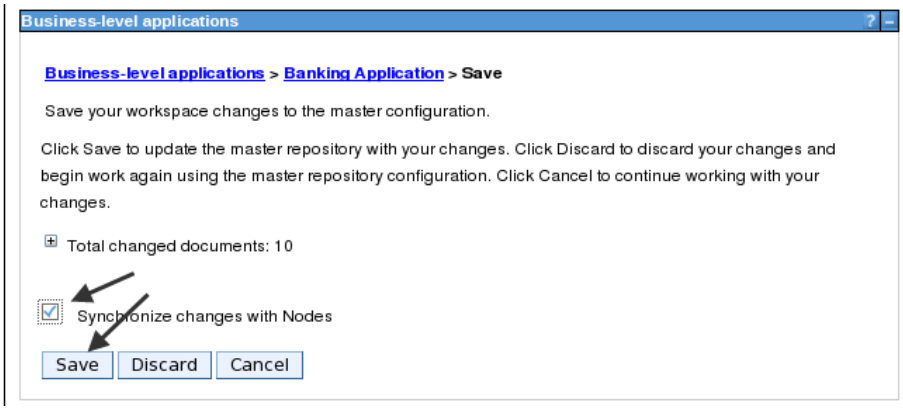


f) Click on the **OK** button.



g) Be sure to review and save the changes to the configuration and synchronize the changes to the cell.



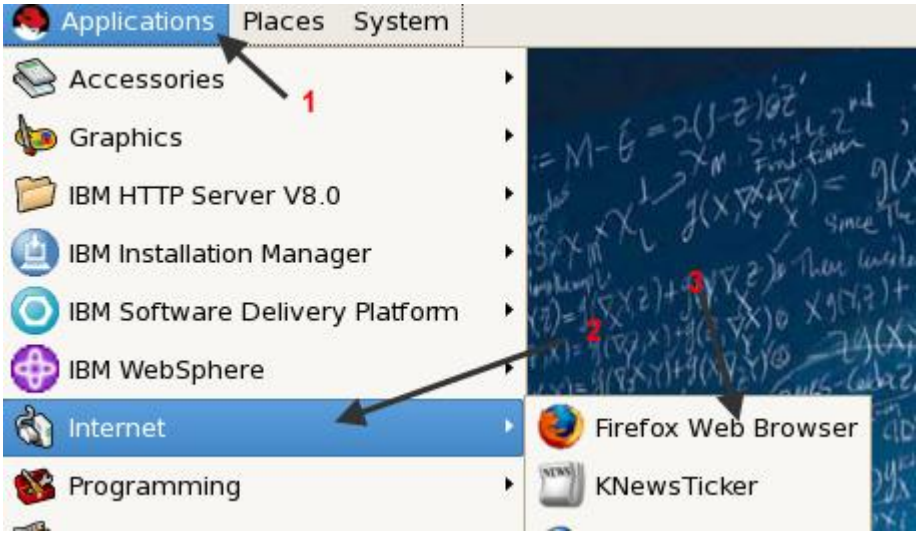


2.9 Part 5: Validate the updated OSGi BankingApplication Web app

As before you will use the Web front-end of the OSGi application to create an account owner, open a bank account and deposit some funds.

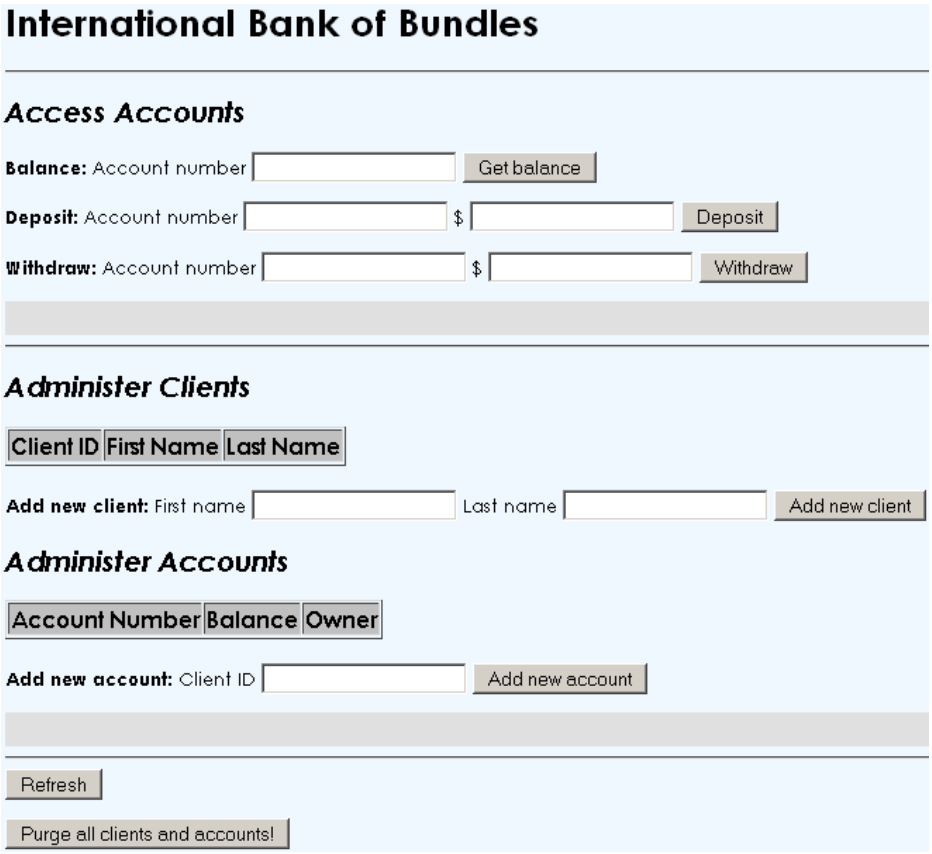
____ 1. Launch the Web application in the Mozilla Firefox browser.

a) Select **Applications → Internet → FireFox web browser**



b) Open http://localhost/BankingApplication/index.jsp

c) You should see the ***International Bank of Bundles Web*** application page like below.



____ 2. Create an account owner.

a) In the *Administer Clients* section of the Web application, enter the following names into the **First name** and **Last name** fields, then press **Add new client**.

   1. First name = Jane
   2. Last name = Doe

b) The status message "*Owner 200 added successfully*" should appear in the grey status area. ***This verifies that the updated implementation bundle is being used***.

c) Inspect both of the **SystemOut.log** tails. In one of the windows, you should see several lines of output produced by System.out.println(...) calls that are instrumented throughout the Java implementation classes of the application. For instance, after step [a] above, the last few lines of the console should read as follows:

```
com.ibm.ws.webcontainer.servlet.ServletWrapper init SRVE0242I:...
[OSGi] AccountManagerImpl.getOwners() = []
[OSGi] AccountManagerImpl.getAccounts() = []
[JSP] index.jsp: owners = []
[JSP] index.jsp: accounts = []
```

```
com.ibm.ws.webcontainer.servlet.ServletWrapper init SRVE0242I:...
[Servlet] AddAOwnerServlet(...
[Servlet] AddAccountServlet(...) firstName=Jane
[Servlet] AddAccountServlet(...) lastName=Doe
[OSGi] AccountManagerImpl.createOwner(Doe,Jane) = 200
[OSGi] AccountManagerImpl.getOwners() =
  [Owner{id=200,firstName=Jane,lastName=Doe}]
[OSGi] AccountManagerImpl.getAccounts() = []
[JSP] index.jsp: owners =
  [Owner{id=200,firstName=Jane,lastName=Doe}]
[JSP] index.jsp: accounts = []
```

____ 3. Create an account.

d) In the *Administer Accounts* section of the Web application, enter the client number **200** in the Client ID field, then press **Add new account**.

e) The status message "*Account 2000 opened successfully*" should appear in the grey status area. ***This verifies that the updated implementation bundle is being used***.

f) Again, inspect the two **SystemOut.log** displays.

____ 4. Deposit funds into the account.

g) In the *Access Accounts* section of the Web application, enter account number **2000** into the **Deposit: Account number** field, enter **10000** into the **$** field, then press **Deposit**.

h) The status message "*Funds in the amount $10,000.00 deposited to account 2000. The new balance s $10,000.00.*" should appear in the grey status area.

i) Again, inspect the two **SystemOut.log** displays.

____ 5. Press **Ctrl+C** in each of the command windows where you have been monitoring the SystemOut.log files. This will terminate the tailf command.

____ 6. Enter the "**exit**" command in each of the command windows. This will close out the terminal windows.

In this part of the exercise you used the updated OSGi Web application to create a new account owner (or client) and a new bank account. You verified that the updated module was used to create client IDs and account numbers using the new ranges.

Congratulations!

You have reached the end of the exercise!

2.10 Conclusions

In this exercise, you the WebSphere Application Server Runtime Environment to import, deploy, run and test a java application packaged using the OSGi models.

You explored the various WAS Admin GUI capabilities for OSGi bundle and application management, including how to import bundles to the local repository and update a running OSGi application.

Optionally, you were able to explore wsadmin scripting equivalents to the administrative tasks you performed through the interactive console.

Lab 3 High Performance Extensible Logging

High Performance Extensible Logging (HPEL) is a new log and trace facility. It provides a convenient mechanism for storing and accessing log, trace, System.err, and System.out information produced by the application server or applications. It is an alternative to the basic log and trace facility, which provides the JVM logs, diagnostic trace, and service log files commonly named SystemOut.log/SystemErr.log, trace.log, and activity.log. HPEL provides a log data repository, a trace data repository, and a text log file.

For more information about HPEL, see the following WebSphere Application Server V8.0 information center topic: **Using HPEL to troubleshoot applications**

This lab is provided **AS-IS**, with no formal IBM support.

3.1 Lab requirements

Lab 1 WebSphere Application Server V8 Network Deployment Installation and Configuration completed.

3.2 What you should be able to do

At the end of this lab you should be able to

- Enable and configure HPEL.
- Use the HPEL command line log viewer.
- Use the HPEL log viewer included in the WebSphere administrative console.

3.3 Introduction

This lab is intended as a short primer new High Performance Extensible Logging capability in WAS V8.

The aim of the lab is to walk though the steps that a systems administrator would perform to enable and use HPEL from a command and the WAS V8 administrative console.

3.4 Exercise instructions

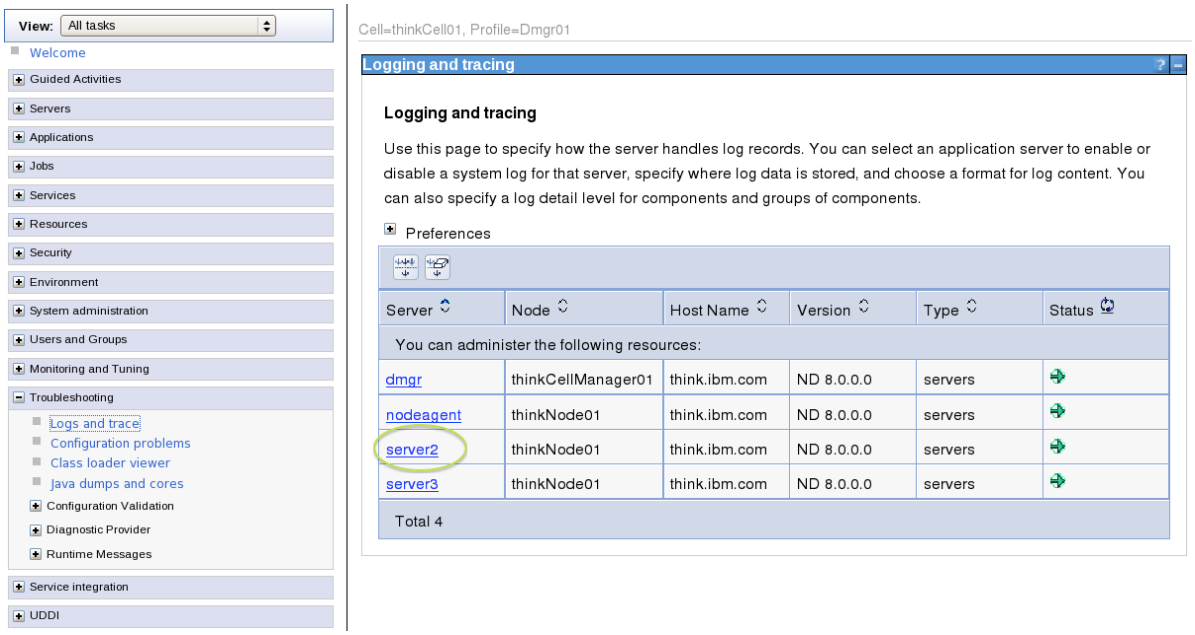
Some instructions in this lab may be Linux ® operating-system specific. If you plan on running the lab on an operating-system other than Linux®, you will need to execute the appropriate commands, and use appropriate files (.sh vs. .bat) for your operating system. The directory locations are specified in the lab instructions using symbolic references, as follows:

Reference variable	Windows® location	Linux® or UNIX® locations
<WAS_HOME>	C:\IBM\WebSphere\AppServer	/usr/WebSphere/AppServer /opt/WebSphere/AppServer
<PROFILE_HOME>	C:\IBM\WebSphere\AppServer\profiles\AppSrv01	/usr/WebSphere/AppServer/profiles/AppSrv01 /opt/WebSphere/AppServer/profiles/AppSrv01
<LAB_FILES>	C:\Labfiles80	/Labfiles80
<TEMP>	C:\temp	/tmp

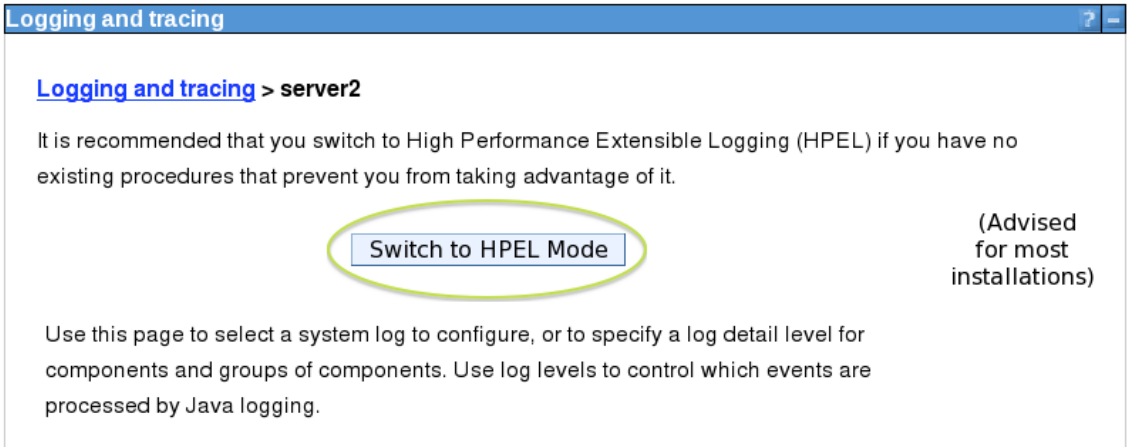
Note for Windows users: When directory locations are passed as parameters to a Java program such as EJBdeploy or wsadmin, it is necessary to replace the backslashes with forward slashes to follow the Java convention. For example, C:\Labfiles80\ would be replaced by C:/Labfiles80/

3.5 Enable and Configure HPEL.

____ 1. Log into the Admin console and inside the console navigate to **Troubleshooting -> Logs and Trace – server2**

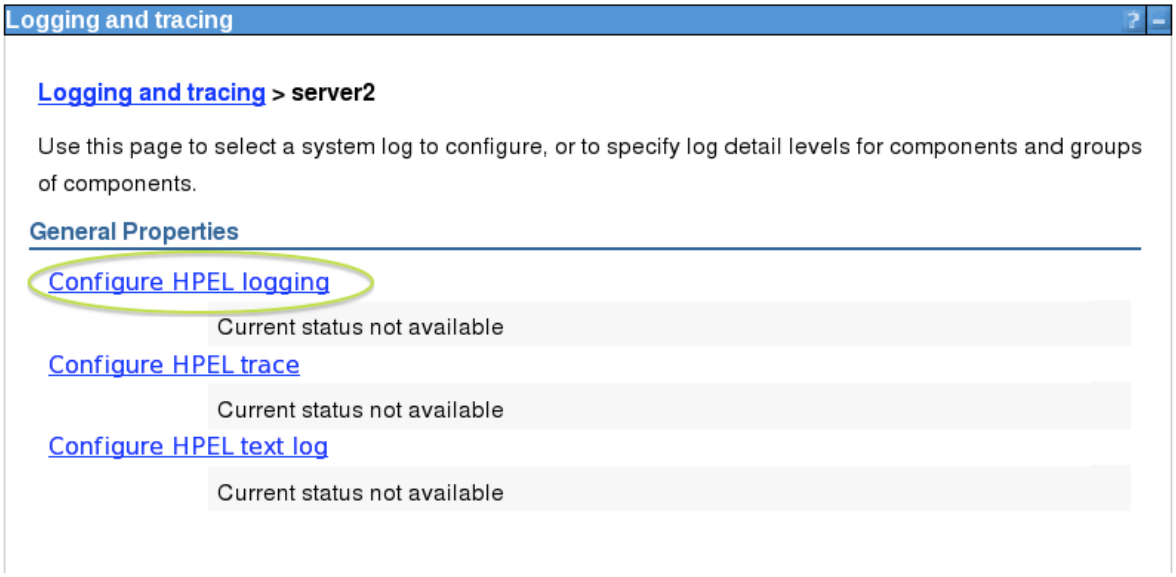


____ 2. Click the **Switch to HPEL Mode** button and **Save** this configuration change. Note enabling HPEL is made to one server at a time. You will need to restart the server for HPEL to take affect. We will restart the server in a later step.

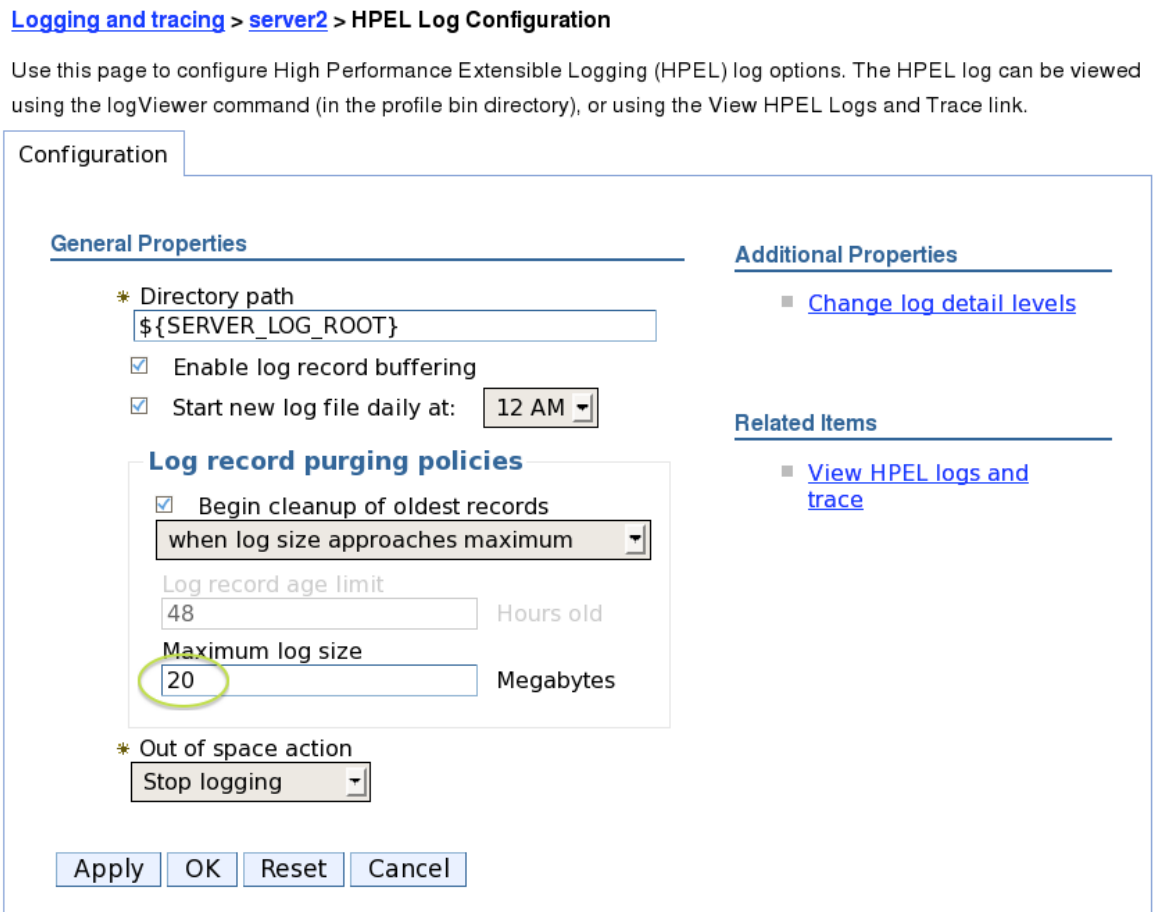


____ 3. Click the **OK** button. You will return to the Logging and tracing screen. Chose **server 2** to review and configure the HPEL settings.

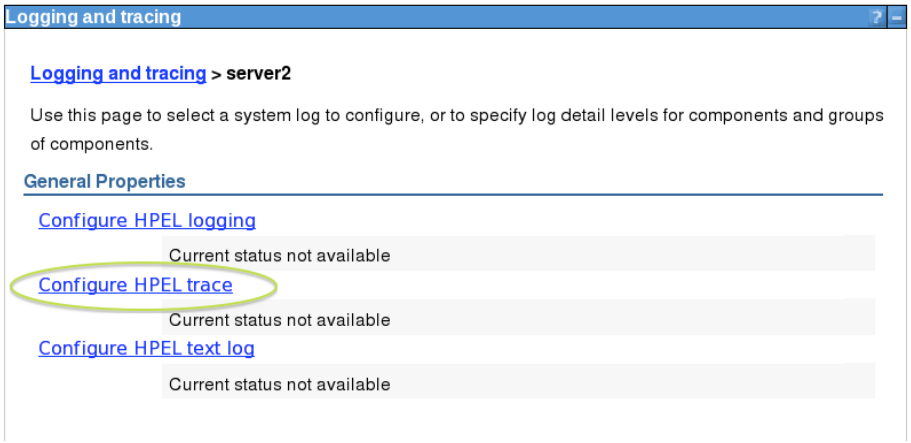
____ 4. Select **Configure HPEL Logging.**



__ a. On the **HPEL Log Configuration** page we can customize a variety of logging properties. Review the different logging configuration options on this page. Note the drop down options under **Begin cleanup of oldest records** checkbox option and the **Out of space** action drop down. Change the **Maximum log size** to **20** and the click the **OK** button. Do not **Save** yet.

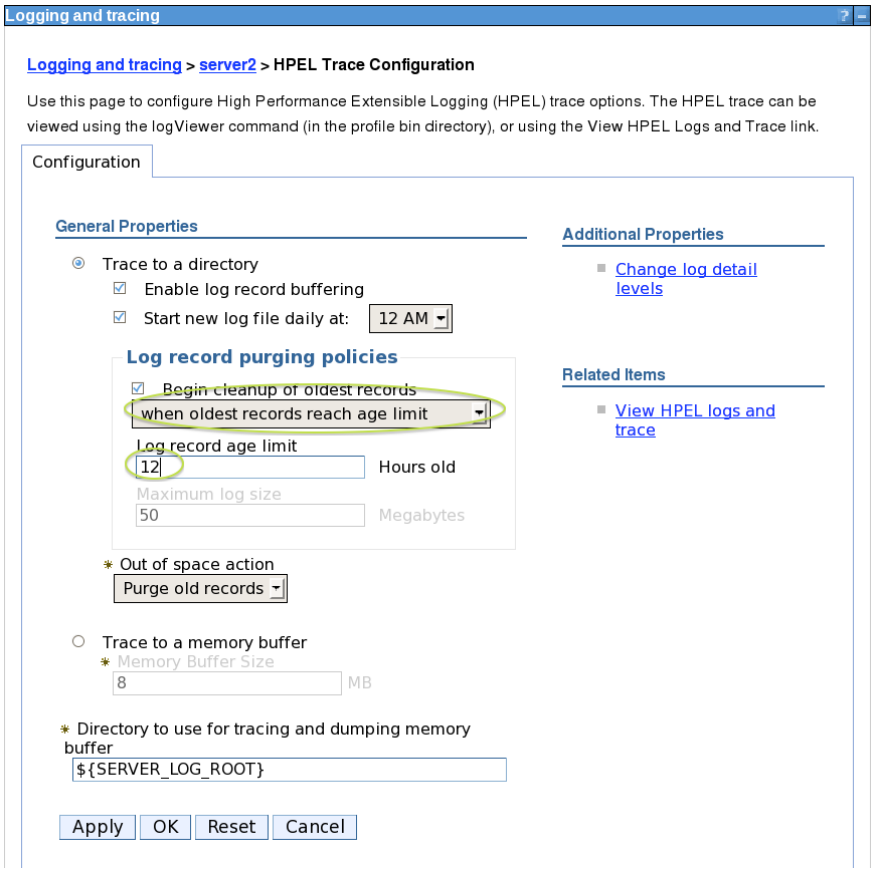

Logging and tracing > server2 > HPEL Log Configuration
Use this page to configure High Performance Extensible Logging (HPEL) log options. The HPEL log can be viewed using the logViewer command (in the profile bin directory), or using the View HPEL Logs and Trace link.
Configuration
General Properties
Directory path
${SERVER_LOG_ROOT}
Enable log record buffering
Start new log file daily at:
12 AM
Log record purging policies
Begin cleanup of oldest records
when log size approaches maximum
Log record age limit
48
Hours old
Maximum log size
20
Megabytes
Out of space action
Stop logging
Apply
OK
Reset
Cancel
Additional Properties
Change log detail levels
Related Items
View HPEL logs and trace

____ 5. Next, chose the **Configure HPEL trace** from the **Logging and tracing > server 2**

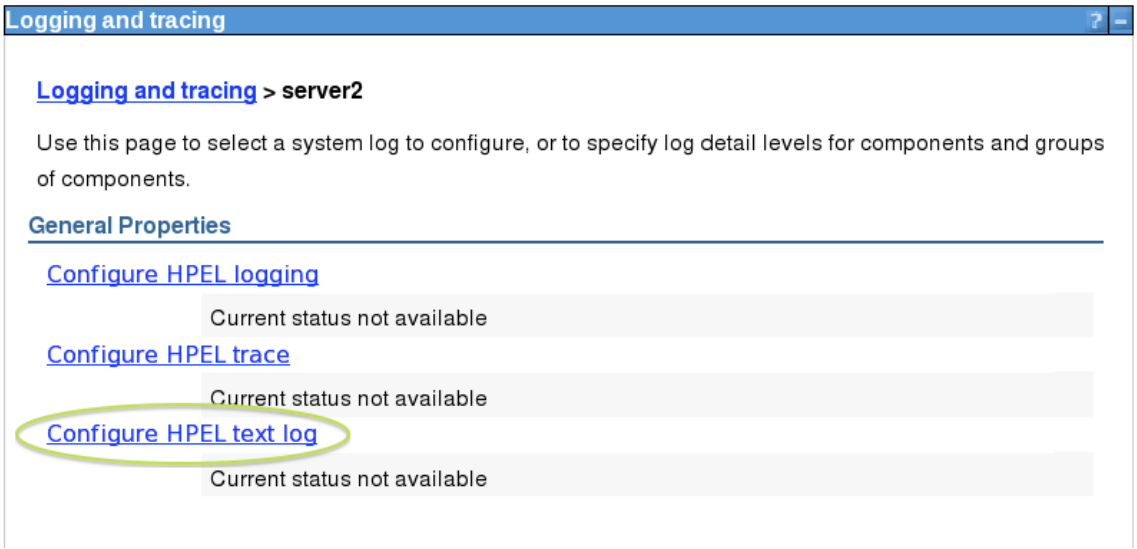


page.

____ 6. On the **HPEL Trace Configuration** page we can customize a variety of trace properties. Review the different logging configuration options. Note that we see the same options as on the **HPEL Log configuration page** with one new option, **Trace to a memory buffer**. Also note that the directory for the HPEL traces is also used to dump the memory buffer if **Trace to a memory buffer** is selected**.** Under the check box **Begin cleanup of oldest** records, chose **when oldest records reach age** limit from the drop down box and the change the **Log record age limit** to **12.** Click the **OK** button. Do not **Save** yet.



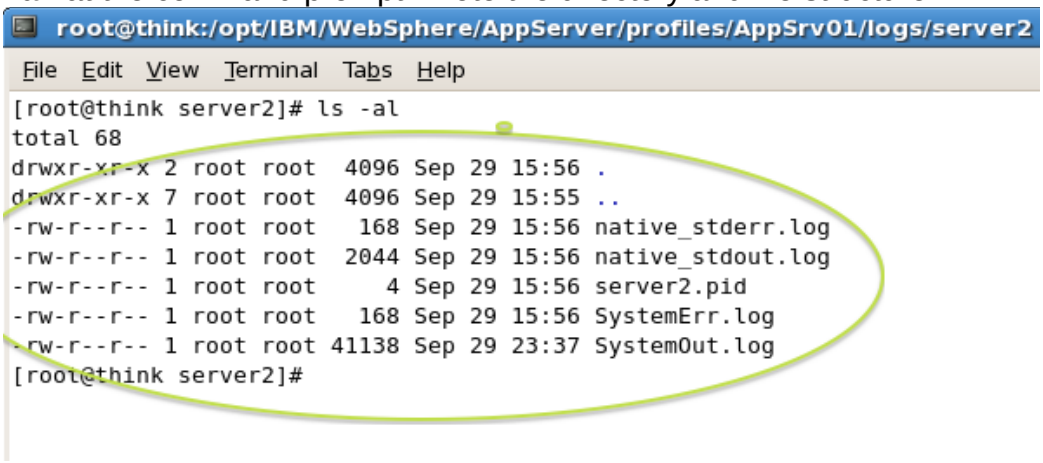
____ 7. . Next chose the **Configure HPEL text log** from the **Logging and tracing > server 2** page.



__ a. On the **HPEL Text Log Configuration** page we can customize a variety of text logging properties. The HPEL text log option allows you to output a traditional text

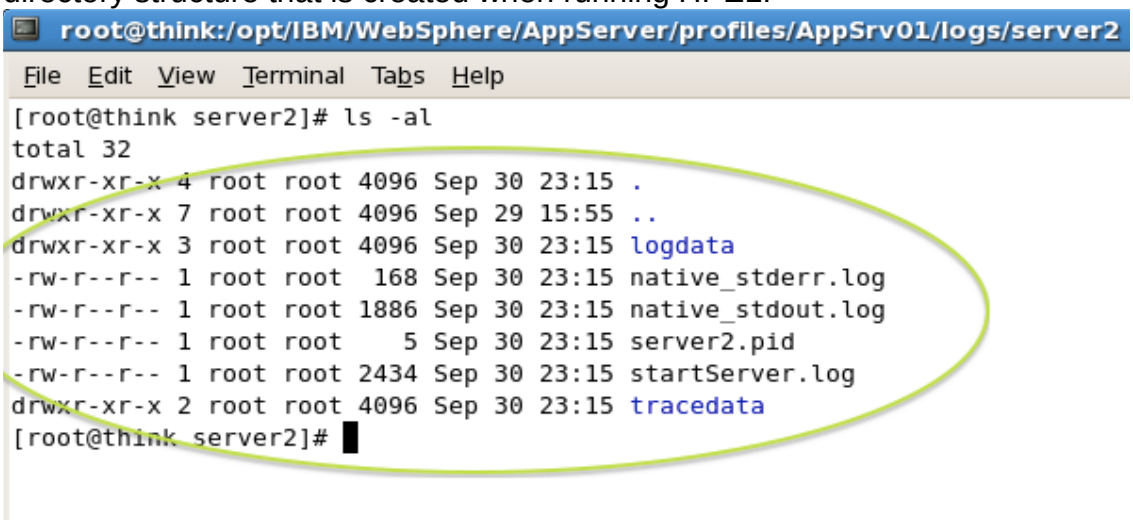
log file along with the binary HPEL files. For production use, you would want turn off the text logging capability by unchecking the **Enable text log** check box. Review the different logging configuration options. Note we see many of the same options that are found on the **HPEL Log configuration page** with two additional options for choosing the **Text output format** and the option to **Include trace records.** Turn off text logging by unchecking the **Enable text** log check box. Click the **OK** button and **Save** these configuration changes. Click the **OK** button on the **Synchronize Changes with Nodes** screen.

____ **8.** Go to terminal window and navigate to the **/opt/IBM/WebSphere/AppServer/profiles/AppSrv01/logs/server2** directory. Type **ls –al** at the command prompt. Note the directory and file structure.

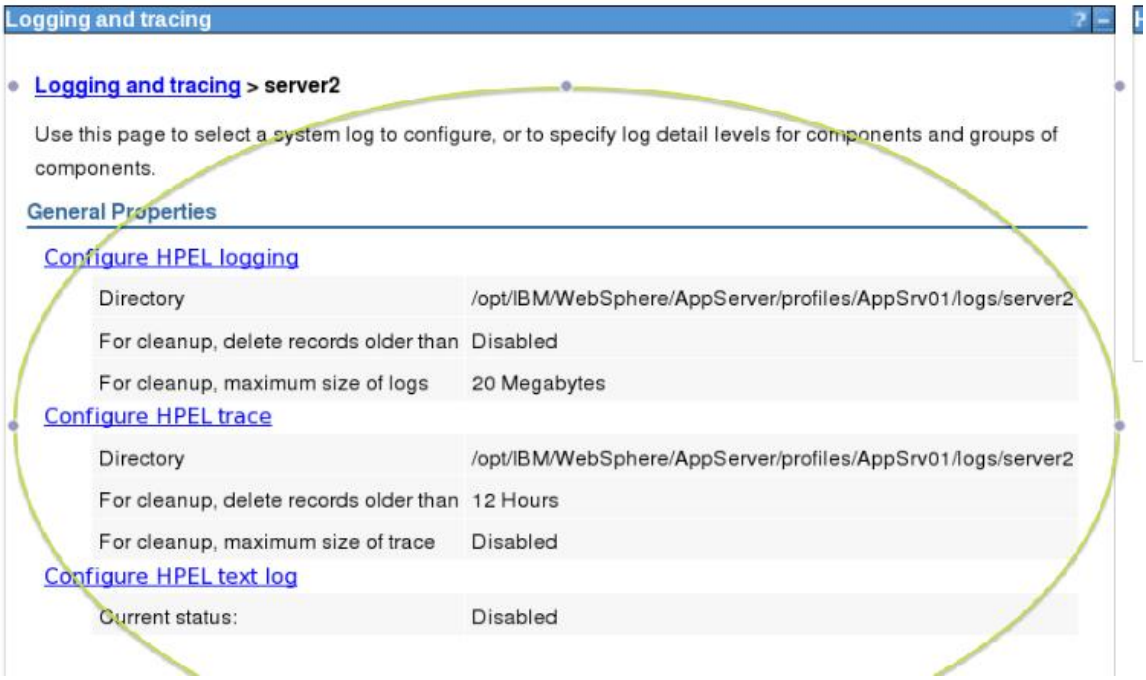


____ **9.** Stop **server2.** Delete all the files in the **/opt/IBM/WebSphere/AppServer/profiles/AppSrv01/server2** directory using **rm * -**f. Start **server2** for the new HPEL settings to take affect. Note the new log file and

directory structure that is created when running HPEL.



____ **10.** In the Admin Console, navigate to **Troubleshooting -> Logs and Trace –> server2** and note the screen **Logging and tracing > server2** screen now shows the current custom HPEL settings for **server2**.



You're ready to proceed to part 1.6

3.6 Use the HPEL command line log viewer

____ 1. Since you enabled HPEL and restarted the server, the legacy WebSphere Application Server logging information is no longer available. The command line HPEL log viewer provides a powerful, yet simple solution for viewing logging information.

The following WebSphere Application Server V8.0 Information Center topic includes a detailed reference of the command line viewer options: **LogViewer command-line tool**

____ 2. Open a terminal window and navigate to the **/opt/IBM/WebSphere/AppServer/bin** directory to launch the HPEL log viewer.

____ 3. At the command prompt, type **./logViewer.sh –help | more** to view the HPEL log viewer command line options.

____ 4. Create a legacy format log file and compare its contents to the output of several HPEL log viewer commands. Run the following command to create a legacy format log file (legacyFormat.log) that contains only log records (INFO, WARNING, and SEVERE):

./logViewer.sh -outLog ../logs/legacyFormat.log -minLevel INFO -maxLevel SEVERE

```
[root@think bin]# ./logViewer.sh -outLog ../logs/legacyFormat.log -minLevel INFO -maxLevel SEVERE
Using /opt/IBM/WebSphere/AppServer/profiles/AppSrv01/logs/server2 as repository directory.
Operation Complete
Processed 227 records in 0.07 seconds (3,242.857 records per second).
[root@think bin]#
```

____ 5. Type **cat ../logs/legacyFormat.log | more** to view the log file.

```
[root@think bin]# cat ../logs/legacyFormat.log | more
************ Start Display Current Environment ************
WebSphere Platform 8.0.0.0 [ND 8.0.0.0 n1118.03] running with process name thinkCell01\thinkNode01\server2 and process id
10620
Host Operating System is Linux, version 2.6.18-238.12.1.el5
Java version = 1.6.0, Java Compiler = j9jit26, Java VM name = IBM J9 VM
was.install.root = /opt/IBM/WebSphere/AppServer
user.install.root = /opt/IBM/WebSphere/AppServer/profiles/AppSrv01
Java Home = /opt/IBM/WebSphere/AppServer/java/jre
ws.ext.dirs = /opt/IBM/WebSphere/AppServer/java/lib:/opt/IBM/WebSphere/AppServer/profiles/AppSrv01/classes:/opt/IBM/WebSph
ere/AppServer/classes:/opt/IBM/WebSphere/AppServer/lib:/opt/IBM/WebSphere/AppServer/installedChannels:/opt/IBM/WebSphere/A
ppServer/lib/ext:/opt/IBM/WebSphere/AppServer/web/help:/opt/IBM/WebSphere/AppServer/deploytool/itp/plugins/com.ibm.etools.
ejbdeploy/runtime
Classpath = /opt/IBM/WebSphere/AppServer/profiles/AppSrv01/properties:/opt/IBM/WebSphere/AppServer/properties:/opt/IBM/Web
Sphere/AppServer/lib/startup.jar:/opt/IBM/WebSphere/AppServer/lib/bootstrap.jar:/opt/IBM/WebSphere/AppServer/lib/jsf-nls.j
ar:/opt/IBM/WebSphere/AppServer/lib/lmproxy.jar:/opt/IBM/WebSphere/AppServer/lib/urlprotocols.jar:/opt/IBM/WebSphere/AppSe
rver/deploytool/itp/batchboot.jar:/opt/IBM/WebSphere/AppServer/deploytool/itp/batch2.jar:/opt/IBM/WebSphere/AppServer/java
/lib/tools.jar
Java Library path = /opt/IBM/WebSphere/AppServer/lib/native/linux/x86_32/:/opt/IBM/WebSphere/AppServer/java/jre/lib/i386/d
efault:/opt/IBM/WebSphere/AppServer/java/jre/lib/i386:/opt/IBM/WebSphere/AppServer/lib/native/linux/x86_32/:/opt/IBM/WebSp
here/AppServer/bin::/usr/lib:
Orb Version = IBM Java ORB build orb626fp1-20110419.00
************* End Display Current Environment *************
[9/30/11 23:15:11:116 EDT] 00000000 ManagerAdmin  I   TRAS0017I: The startup trace state is *=info.
[9/30/11 23:15:11:120 EDT] 00000000 ManagerAdmin  I   TRAS0111I: The message IDs that are in use are deprecated
[9/30/11 23:15:11:155 EDT] 00000000 ModelMgr      I   WSVR0800I: Initializing core configuration models
[9/30/11 23:15:11:438 EDT] 00000000 ComponentMeta I   WSVR0179I: The runtime provisioning feature is disabled. All compone
nts will be started.
[9/30/11 23:15:11:488 EDT] 00000000 ProviderTrack I com.ibm.ffdc.osgi.ProviderTracker AddingService FFDC1007I: FFDC Provid
er Installed: com.ibm.ffdc.util.provider.FfdcOnDirProvider@16db5643
[9/30/11 23:15:11:494 EDT] 00000000 ProviderTrack I com.ibm.ffdc.osgi.ProviderTracker AddingService FFDC1007I: FFDC Provid
er Installed: com.ibm.ws.ffdc.impl.FfdcProvider@16dbcb11
[9/30/11 23:15:11:615 EDT] 00000000 AdminInitiali A   ADMN0015I: The administration service is initialized.
[9/30/11 23:15:11:820 EDT] 00000000 PluginConfigS I   PLGC0057I: The plug-in configuration service started successfully.
[9/30/11 23:15:11:833 EDT] 00000000 SSLComponentI I   CWPKI0001I: SSL service is initializing the configuration
[9/30/11 23:15:11:837 EDT] 00000000 WSKeyStore    W   CWPKI0041W: One or more key stores are using the default password.
[9/30/11 23:15:11:842 EDT] 00000000 SSLConfigMana I   CWPKI0027I: Disabling default hostname verification for HTTPS URL co
nnections.
[9/30/11 23:15:11:848 EDT] 00000000 SSLDiagnostic I   CWPKI0014I: The SSL component's FFDC Diagnostic Module com.ibm.ws.ss
l.core.SSLDiagnosticModule registered successfully: true.
[9/30/11 23:15:11:848 EDT] 00000000 SSLComponentI I   CWPKI0002I: SSL service initialization completed successfully
[9/30/11 23:15:11:850 EDT] 00000000 DiagnosticCon I com.ibm.wsspi.rasdiag.DiagnosticConfigHome setStateCollectionSpec RASD
0012I: Updating State Collection Spec from Uninitialized Value to .*:.*=0
[9/30/11 23:15:11:852 EDT] 00000000 PMIImpl       A   CWPMI1001I: PMI is enabled
[9/30/11 23:15:11:925 EDT] 00000000 WSChannelFram A   CHFW0021I: Inbound chain WCInboundAdmin has been marked disabled.
[9/30/11 23:15:11:927 EDT] 00000000 WSChannelFram A   CHFW0021I: Inbound chain WCInboundAdminSecure has been marked disabl
ed.
[9/30/11 23:15:12:024 EDT] 00000000 GAPAgentCompo I   CWLRS6000I: GAP (Grid Application Placement) Component has initializ
ed successfully on process ManagedProcess.
[9/30/11 23:15:12:047 EDT] 00000000 SibMessage    I   [:] CWSIU0000I: Release: WAS80.SIB Level: d1115.28
[9/30/11 23:15:12:086 EDT] 00000000 SecurityDM    I   SECJ0231I: The Security component's FFDC Diagnostic Module com.ibm.w
--More--
```

____ 6. Run the following command to view only the log records for thread 0: **./logViewer.sh -thread 0** We will only see the log file output for thread 0. We can send the output of the log view thread 0 command to a text file with the addition of the –outLog <filename> switch:

./logViewer.sh -outLog myThread0.log –thread 0.

View the output with the cat or the more command .

```
[root@think bin]# ./logViewer.sh -thread 0
Using /opt/IBM/WebSphere/AppServer/profiles/AppSrv01/logs/server2 as repository directory.
************ Start Display Current Environment ************
WebSphere Platform 8.0.0.0 [ND 8.0.0.0 n1118.03] running with process name thinkCell01\thinkNode01\server2 and process id
10620
Host Operating System is Linux, version 2.6.18-238.12.1.el5
Java version = 1.6.0, Java Compiler = j9jit26, Java VM name = IBM J9 VM
was.install.root = /opt/IBM/WebSphere/AppServer
user.install.root = /opt/IBM/WebSphere/AppServer/profiles/AppSrv01
Java Home = /opt/IBM/WebSphere/AppServer/java/jre
ws.ext.dirs = /opt/IBM/WebSphere/AppServer/java/lib:/opt/IBM/WebSphere/AppServer/profiles/AppSrv01/classes:/opt/IBM/WebSph
ere/AppServer/classes:/opt/IBM/WebSphere/AppServer/lib:/opt/IBM/WebSphere/AppServer/installedChannels:/opt/IBM/WebSphere/A
ppServer/lib/ext:/opt/IBM/WebSphere/AppServer/web/help:/opt/IBM/WebSphere/AppServer/deploytool/itp/plugins/com.ibm.etools.
ejbdeploy/runtime
Classpath = /opt/IBM/WebSphere/AppServer/profiles/AppSrv01/properties:/opt/IBM/WebSphere/AppServer/properties:/opt/IBM/Web
Sphere/AppServer/lib/startup.jar:/opt/IBM/WebSphere/AppServer/lib/bootstrap.jar:/opt/IBM/WebSphere/AppServer/lib/jsf-nls.j
ar:/opt/IBM/WebSphere/AppServer/lib/lmproxy.jar:/opt/IBM/WebSphere/AppServer/lib/urlprotocols.jar:/opt/IBM/WebSphere/AppSe
rver/deploytool/itp/batchboot.jar:/opt/IBM/WebSphere/AppServer/deploytool/itp/batch2.jar:/opt/IBM/WebSphere/AppServer/java
/lib/tools.jar
Java Library path = /opt/IBM/WebSphere/AppServer/lib/native/linux/x86_32/:/opt/IBM/WebSphere/AppServer/java/jre/lib/i386/d
efault:/opt/IBM/WebSphere/AppServer/java/jre/lib/i386:/opt/IBM/WebSphere/AppServer/lib/native/linux/x86_32/:/opt/IBM/WebSp
here/AppServer/bin::/usr/lib:
Orb Version = IBM Java ORB build orb626fp1-20110419.00
************ End Display Current Environment ************
[9/30/11 23:15:11:116 EDT] 00000000 ManagerAdmin  I   TRAS0017I: The startup trace state is *=info.
[9/30/11 23:15:11:120 EDT] 00000000 ManagerAdmin  I   TRAS0111I: The message IDs that are in use are deprecated
[9/30/11 23:15:11:155 EDT] 00000000 ModelMgr      I   WSVR0800I: Initializing core configuration models
[9/30/11 23:15:11:438 EDT] 00000000 ComponentMeta I   WSVR0179I: The runtime provisioning feature is disabled. All compone
nts will be started.
[9/30/11 23:15:11:488 EDT] 00000000 ProviderTrack I com.ibm.ffdc.osgi.ProviderTracker AddingService FFDC1007I: FFDC Provid
er Installed: com.ibm.ffdc.util.provider.FfdcOnDirProvider@16db5643
[9/30/11 23:15:11:494 EDT] 00000000 ProviderTrack I com.ibm.ffdc.osgi.ProviderTracker AddingService FFDC1007I: FFDC Provid
```

____ 7. Run the following command to view only WARNING messages:

./logViewer.sh -level WARNING

We can send the output of the log viewer WARNING command to text file like we did in the previous step.

```
[root@think bin]# ./logViewer.sh -level WARNING
Using /opt/IBM/WebSphere/AppServer/profiles/AppSrv01/logs/server2 as repository directory.
************ Start Display Current Environment ************
WebSphere Platform 8.0.0.0 [ND 8.0.0.0 n1118.03] running with process name thinkCell01\thinkNode01\server2 and process id
10620
Host Operating System is Linux, version 2.6.18-238.12.1.el5
Java version = 1.6.0, Java Compiler = j9jit26, Java VM name = IBM J9 VM
was.install.root = /opt/IBM/WebSphere/AppServer
user.install.root = /opt/IBM/WebSphere/AppServer/profiles/AppSrv01
Java Home = /opt/IBM/WebSphere/AppServer/java/jre
ws.ext.dirs = /opt/IBM/WebSphere/AppServer/java/lib:/opt/IBM/WebSphere/AppServer/profiles/AppSrv01/classes:/opt/IBM/WebSph
ere/AppServer/classes:/opt/IBM/WebSphere/AppServer/lib:/opt/IBM/WebSphere/AppServer/installedChannels:/opt/IBM/WebSphere/A
ppServer/lib/ext:/opt/IBM/WebSphere/AppServer/web/help:/opt/IBM/WebSphere/AppServer/deploytool/itp/plugins/com.ibm.etools.
ejbdeploy/runtime
Classpath = /opt/IBM/WebSphere/AppServer/profiles/AppSrv01/properties:/opt/IBM/WebSphere/AppServer/properties:/opt/IBM/Web
Sphere/AppServer/lib/startup.jar:/opt/IBM/WebSphere/AppServer/lib/bootstrap.jar:/opt/IBM/WebSphere/AppServer/lib/jsf-nls.j
ar:/opt/IBM/WebSphere/AppServer/lib/lmproxy.jar:/opt/IBM/WebSphere/AppServer/lib/urlprotocols.jar:/opt/IBM/WebSphere/AppSe
rver/deploytool/itp/batchboot.jar:/opt/IBM/WebSphere/AppServer/deploytool/itp/batch2.jar:/opt/IBM/WebSphere/AppServer/java
/lib/tools.jar
Java Library path = /opt/IBM/WebSphere/AppServer/lib/native/linux/x86_32/:/opt/IBM/WebSphere/AppServer/java/jre/lib/i386/d
efault:/opt/IBM/WebSphere/AppServer/java/jre/lib/i386:/opt/IBM/WebSphere/AppServer/lib/native/linux/x86_32/:/opt/IBM/WebSp
here/AppServer/bin::/usr/lib:
Orb Version = IBM Java ORB build orb626fp1-20110419.00
************* End Display Current Environment *************
[9/30/11 23:15:11:837 EDT] 00000000 WSKeyStore    W   CWPKI0041W: One or more key stores are using the default password.
[9/30/11 23:15:12:657 EDT] 00000000 ThreadPoolMgr W   WSVR0626W: The ThreadPool setting on the ObjectRequestBroker service
 is deprecated.
Operation Complete
Processed 2 records in 0.053 seconds (37.736 records per second).
[root@think bin]#
```

____ 8. Extract a specified set of log records to a new repository and a text file. Run the following command to extract a repository of just WARNING and SEVERE messages and save the resulting file in a new directory

: **./logViewer.sh -minLevel WARNING**

-maxLevel SEVERE -extractToNewRepository ../logs/newHPELRepository

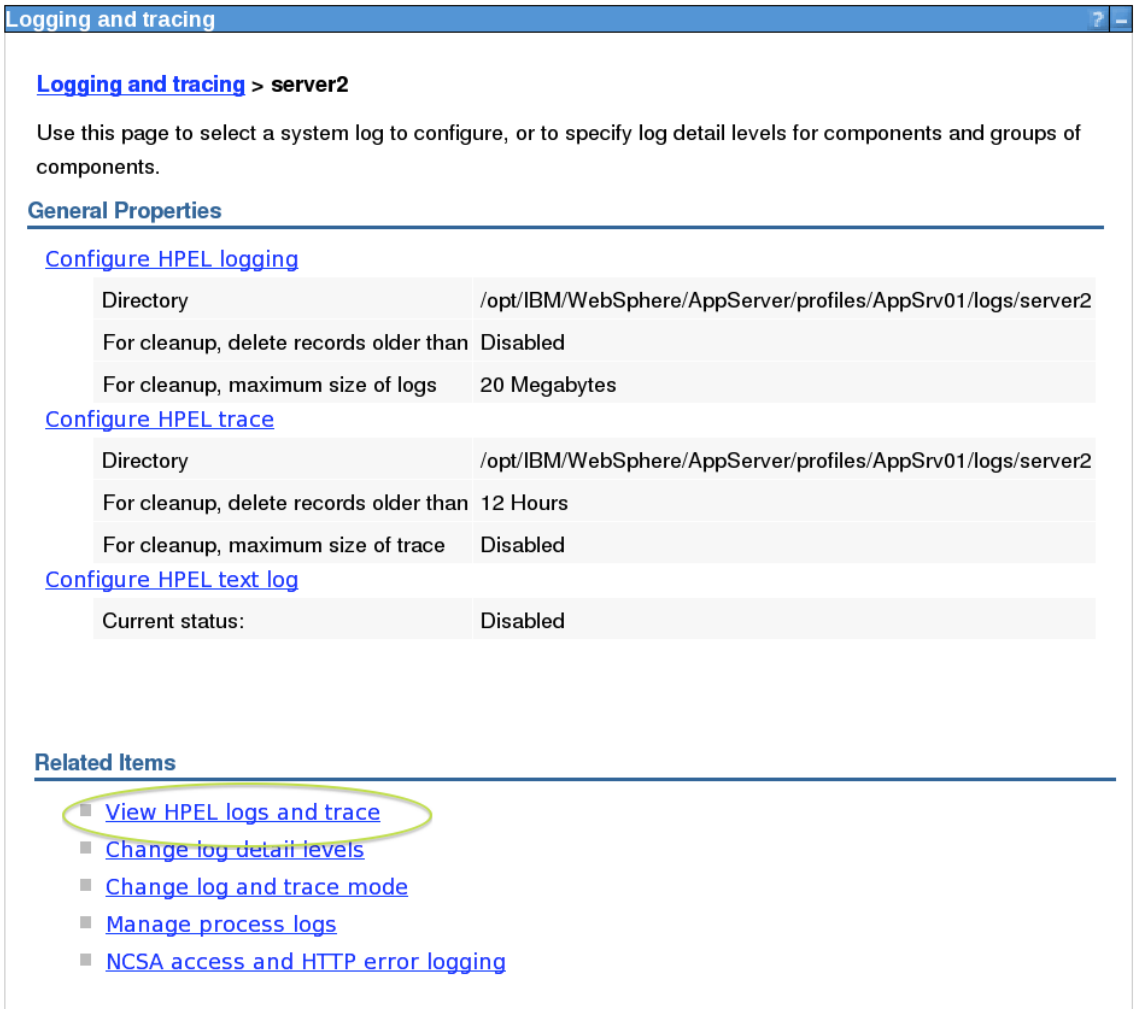
__ a. .Run the following command to export the contents of the resulting repository to a text format log file

: **./logViewer.sh -repositoryDir ../logs/newHPELRepository -outLog ../logs/newFormat.log**

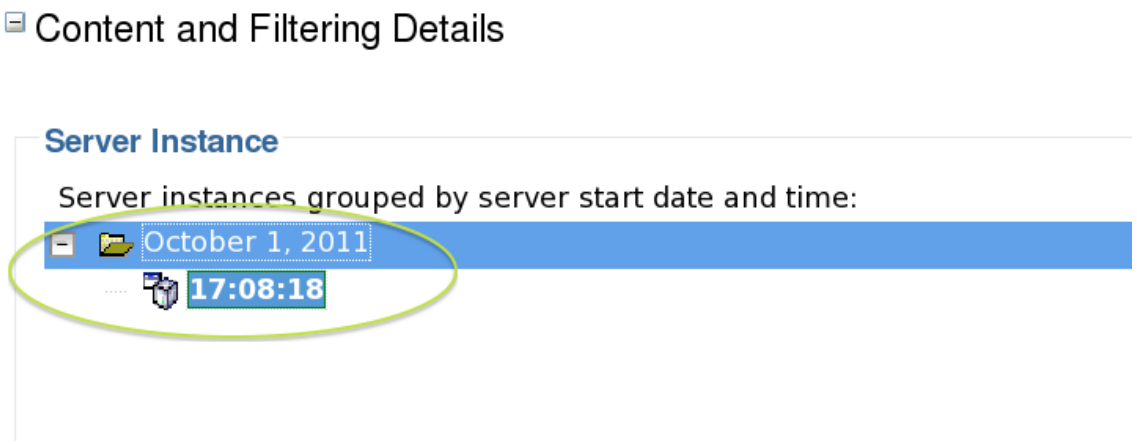
__ b. Use cat, tail, vi, or a text editor to view the resulting log file, for example: **cat ../logs/newFormat.log**

3.7 Use the HPEL log viewer included in the WebSphere administrative console

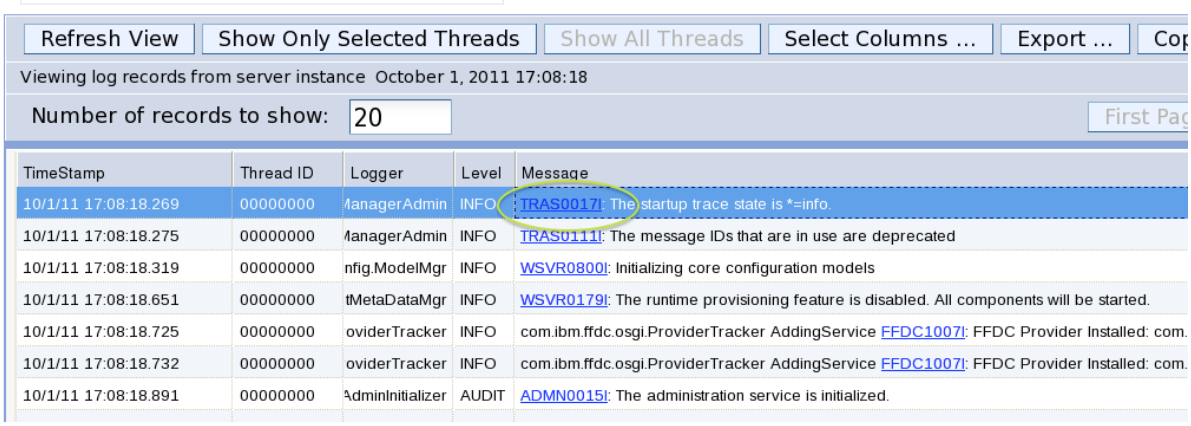
____ 1. Log in to the administrative console, specifying an appropriate user ID and password if administrative security is enabled. Next, click ***TroubleShooting > Logs and Trace > server2***. Then click **View HPEL logs and trace.**



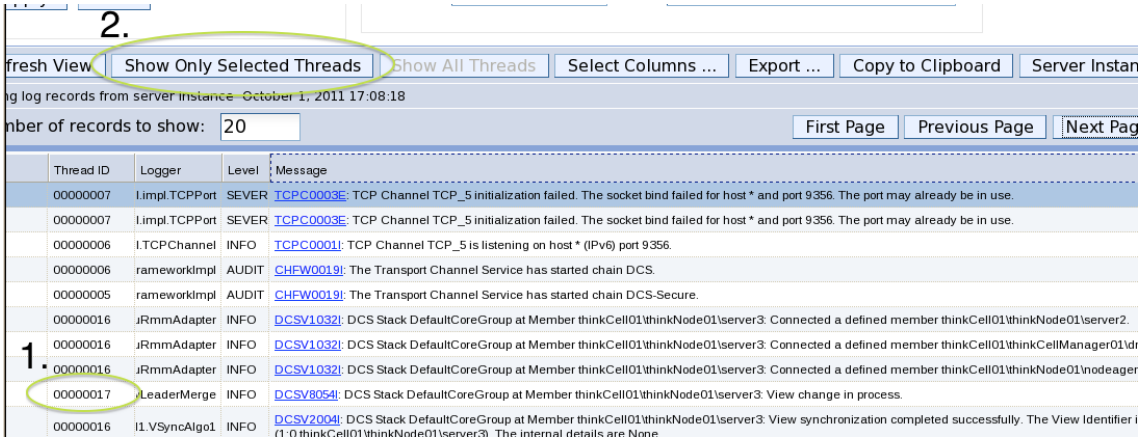
____ 2. Expand the ***Content and Filtering Details*** area of the page. Click each server instance (start time) to view the corresponding log messages. Then collapse the ***Content and Filtering Details*** area. Since we have only stopped and started the server one time after enabling HPEL, you will probably only see server instance.

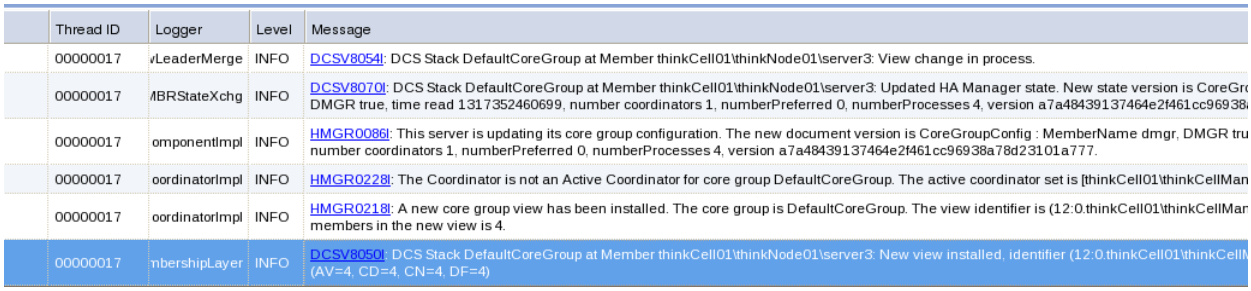


____ 3. Click the (early) log message **TRAS0017I** to view explanations, user actions, and so on. Then click **Close** to remove the pop-up window.



____ 4. Locate a log entry, indicating activity on a thread other than 00000000. Select the entry, and click **ShowOnly Selected Threads,** to filter the list to include only records generated by the same thread. Finally,click **Show All Threads** to display messages generated by all threads, once again. Note: You may need to scroll through a few pages of the log file to find threads other than 0000000.





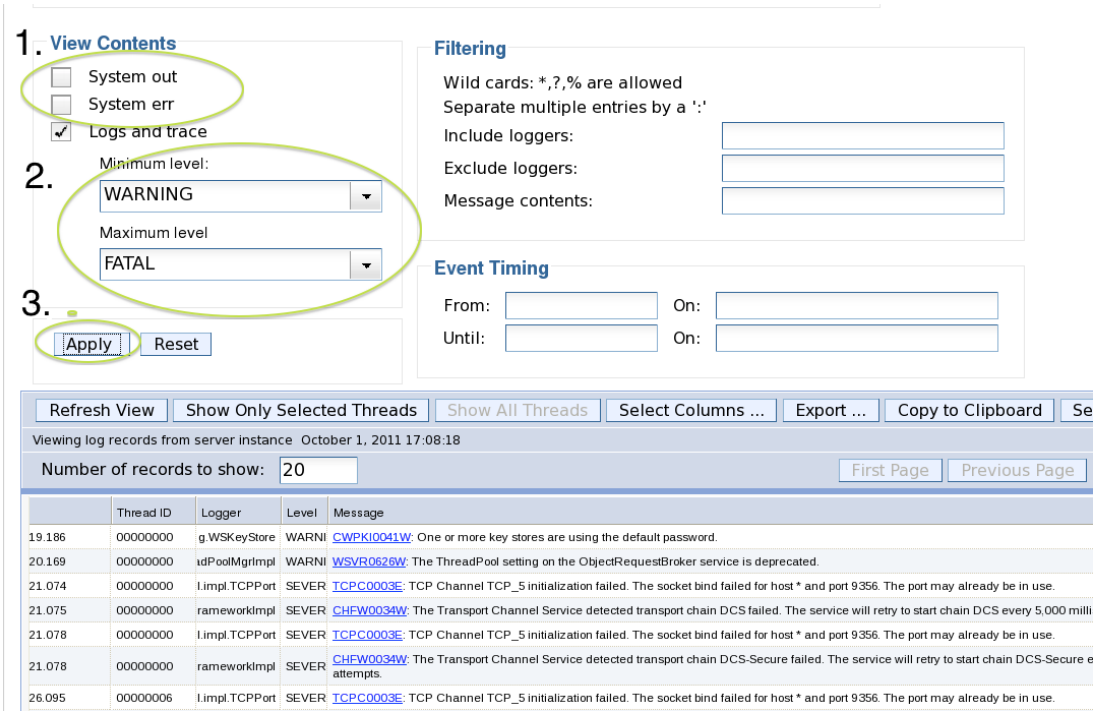
____ 5. Show only WARNING and higher level messages.

__ a. Expand the Content and Filtering Details area of the page.

__ b. Uncheck System out and System err.

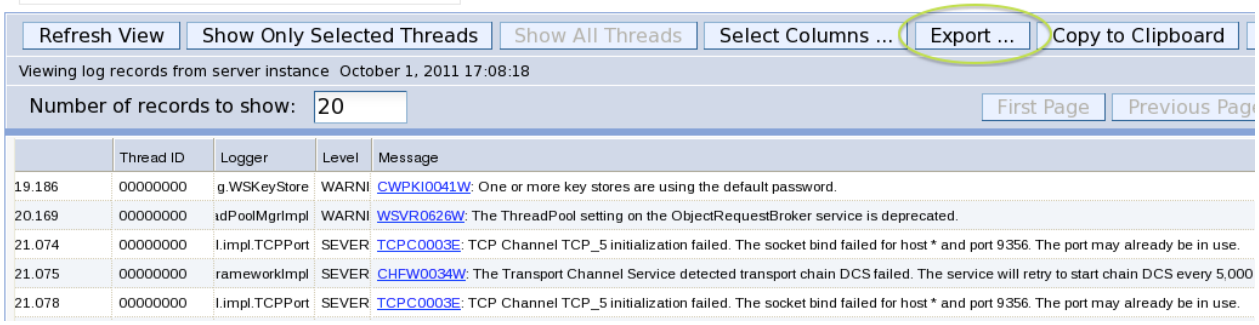
__ c. U nder **Logs and trace**, set **Minimum level** to **WARNING** and **Maximum level** to **FATA**L.

__ d. Click **Apply** to filter the list. (It may take several seconds for the filtering to be applied). Then, collapse the ***Content and Filtering Details*** area of the page, and view the resulting messages.

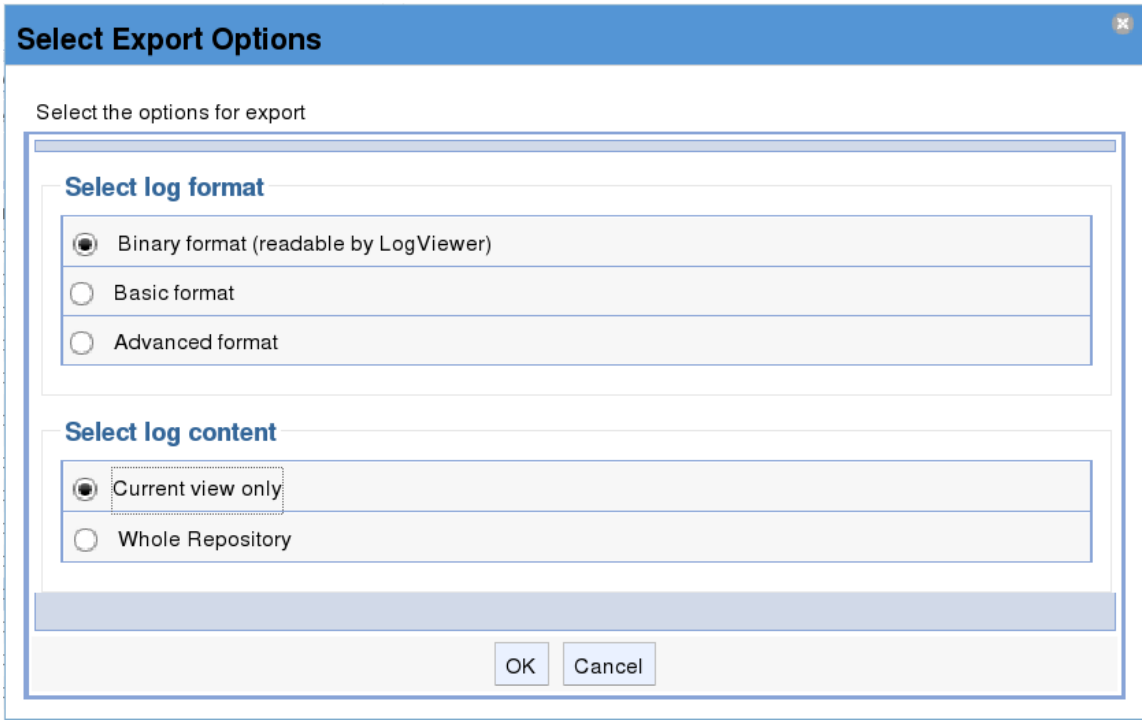


____ 6. Export the filtered view to a binary repository and use the command line log viewer to display the records.

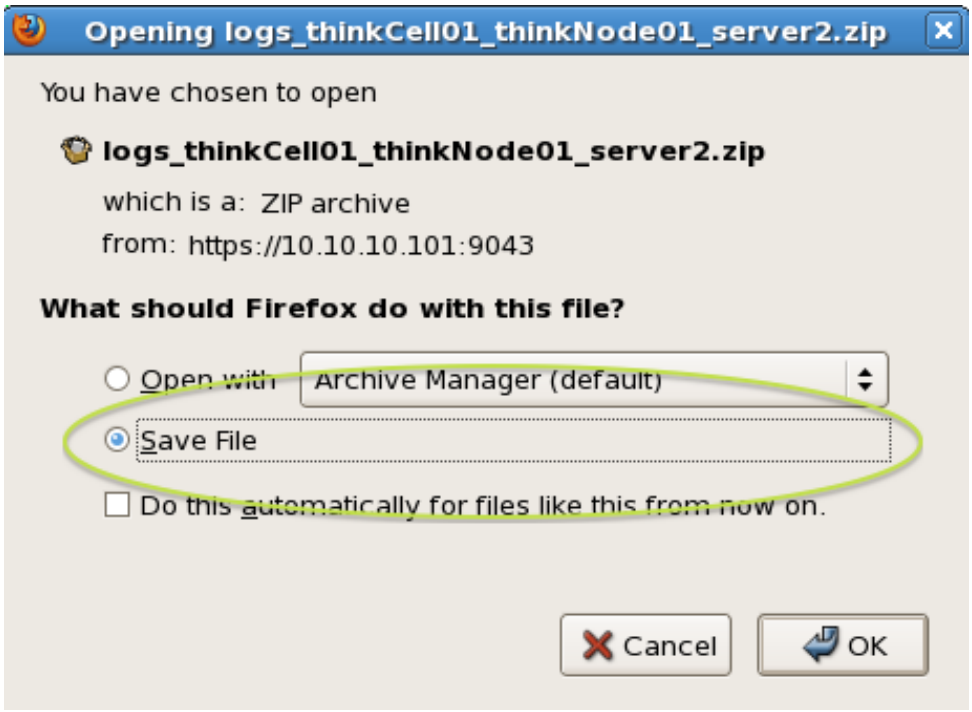
__ a. Click **Export**.



__ b. Within the **Select Export Options** window, set the log format to **Binary format** and the log content to **Current view only**. Then click **OK**.



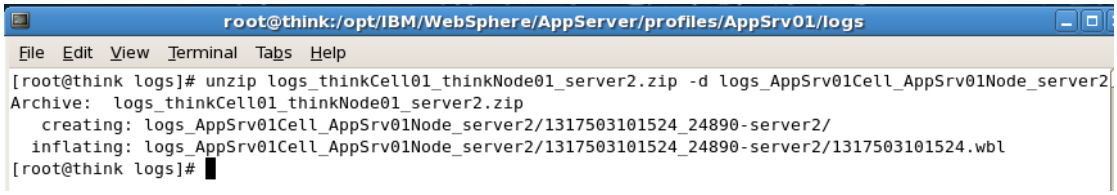
__ c. In the File Download window, select **Save File** then click **OK**.



__ d. d. In the Save As window, select the application server profile logs directory, for example,

cd /opt/IBM/WebSphere/AppServer/profiles/AppSrv01/logs/server2

unzip ~/Downloads/logs_thinkCell01_thinkNode01_server2.zip

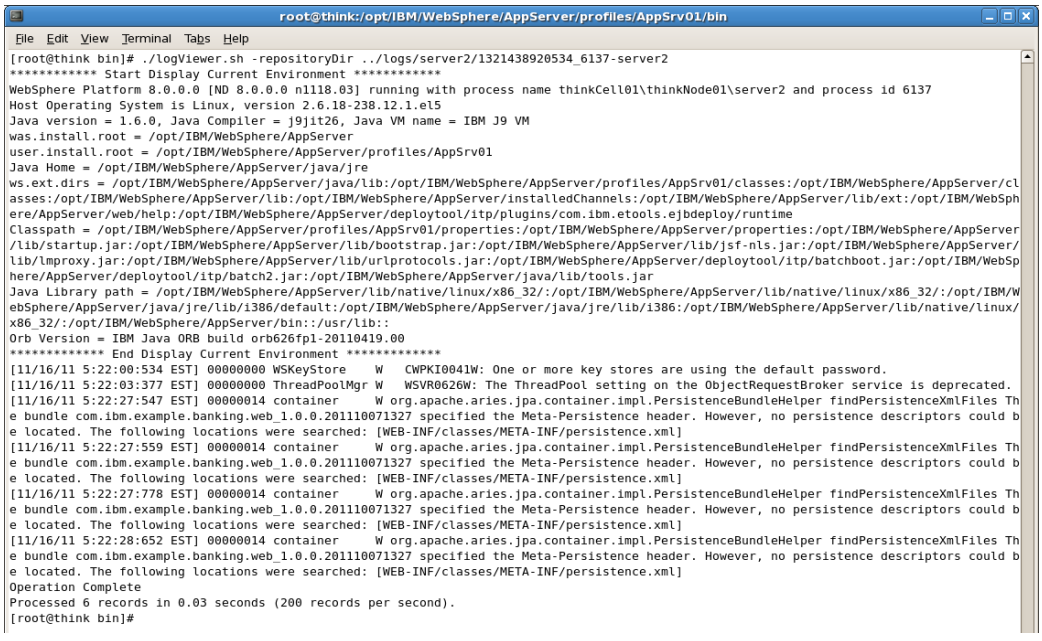


__ e. Make note of the new subdirectory name, that was just created, as a result of the unzip command, above. For example, looking at the unzip command above, you can see that a new subdirectory name of **1321438920534_6137-server2** was created.

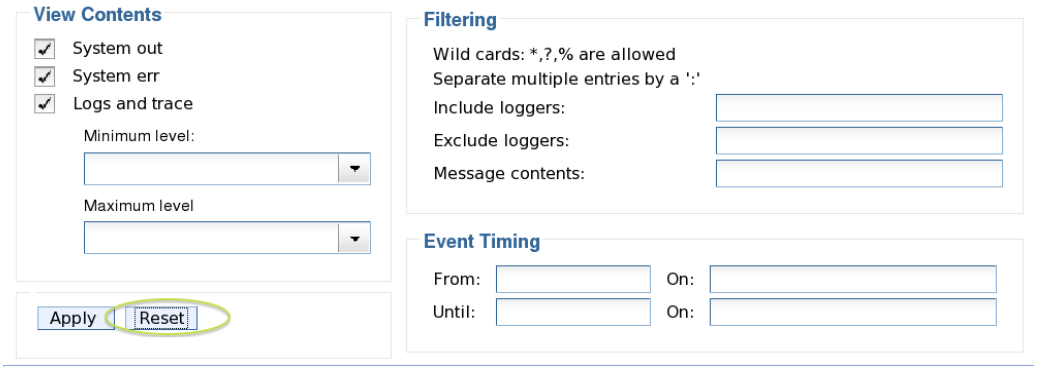
__ f. Run the logViewer command, with the –repositoryDir option, to view the log messages present in the exported repository. Note: substitute the new subdirectory name for <NEWSUBDIR> below. For example;

cd /opt/IBM/WebSphere/AppServer/profiles/AppSrv01/bin

./logViewer.sh repositoryDir./logs/server2/<NEWSUBDIR>



____ 7. Return to the administrative console. Then click **Reset**, followed by **Apply** to remove all filtering.



____ 8. Log out of the administrative console.
____ 9. This completes the lab.

Appendix A. Common Tasks

Below are some common tasks that you may need to perform several times during this lab

____ 1. Starting a WAS (standalone) application server ./startServer <servername>

e.g from the /opt/IBM/WebSphere/AppServer/profiles/AppSrv01/bin directory

./startServer server1

____ 10.Stopping a WAS (standalone) application server ./stopServer <servername>

e.g from the /opt/IBM/WebSphere/AppServer/profiles/AppSrv01/bin directory

./stopServer server1

____ 11.Starting a WAS-ND Node Agent startNode

e.g from the /opt/IBM/WebSphere/AppServer/profiles/AppSrv01/bin directory

startNode

____ 12.Stopping WAS-ND Node Agent stopNode

e.g from the /opt/IBM/WebSphere/AppServer/profiles/AppSrv01/bin directory

stopNode

____ 13.Starting a WAS-ND Deployment Manager startManager

e.g from the /opt/IBM/WebSphere/AppServer/profiles/Dmgr01/bin directory

startManager

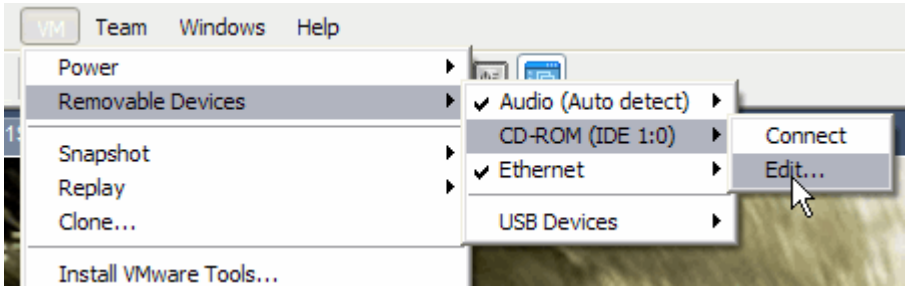
____ 14.Starting a WAS-ND Deployment Manager stopManager

e.g from the /opt/IBM/WebSphere/AppServer/profiles/Dmgr01/bin directory

stopManager

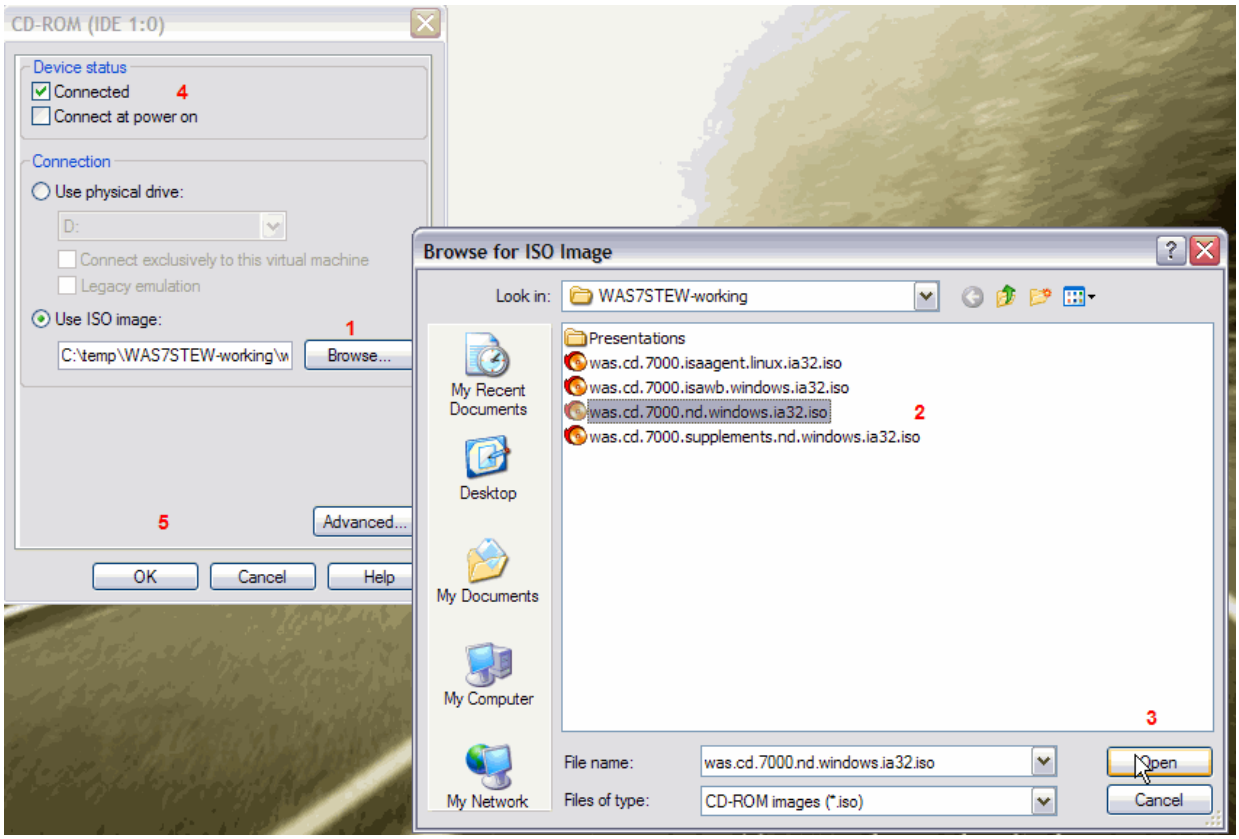
____ 15.Mounting CDs in VMware

__ t. As shown below navigate to **VM -> Removable Devices -> CD-ROM (IDE1:0) -> Edit**



__ c. As shown below in In the CD-ROM (IDE:1.0) panel

1) Click **Browse**
2) Select the ISO image desired
3) Click **Open**
4) Check **Connected**
5) Click **OK**



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