

Student Exercises

IBM Workload Scheduler 9.4 Administration

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About these exercises

IBM Workload Scheduler is part of the IBM Workload Automation suite of products. With IBM Workload Scheduler, you can automate and control your entire enterprise production workload. IBM Workload Scheduler is a middleware product that is commonly known as a batch job scheduler, or job scheduler. Job schedulers automatically drive work in mainframe and non-mainframe environments.

Workload Scheduler maintains a database of production scheduling objects such as workstations, jobs, resources, and calendars, and assembles them into a plan. The plan contains the “to do” list of the workload to complete within the planned production period. When all conditions and prerequisites are satisfied, the agent runs the workload components and reports the outcome.

In the lab exercises, you learn how to configure and maintain IBM Workload Scheduler. You use the Dynamic Workload Console to create workstation, security, and change tracking justification definitions. You create and alter production plans. You also configure security settings to authorize new users.

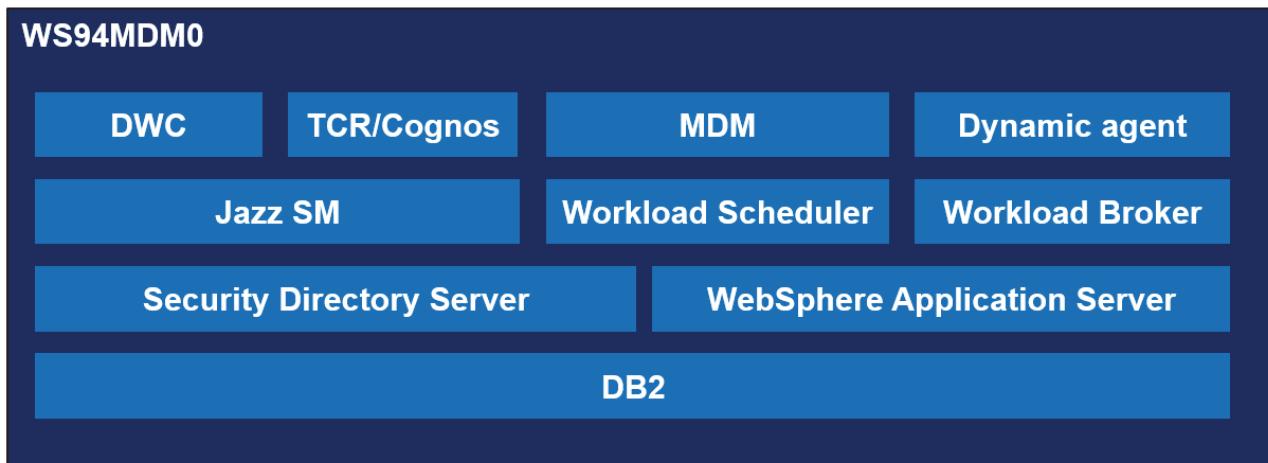
The Workload Scheduler network in your lab

In the exercises for this class, you log in to the system by using the parameters listed in the following table.

Table 1 IBM Workload Scheduler learning environment

Parameter	Default value
Master workstation	MDM0
Host name	ws94mdm0
User IDs	wsuser , virtuser, root
Password	object00
Dynamic Workload Console URL	https://ws94mdm0:16311/ibm/console

Your learning station contains a virtual computer that runs on a virtual network. The computer contains Workload Scheduler components, as shown. A Master Domain Manager controls a network of dynamic agents. The dynamic agents are collected into pool and dynamic pool workstations.



Docker containers provide extra dynamic agents that you use to learn about monitoring and creating dynamic pool workstations.

Login names that you use during the exercises in this class are **wsuser**, **smadmin**, and **Administrator**. The password for each user is **object00**.

Other login names that you can use, and the groups to which they belong, are listed in [Table 2](#).

Table 2 User names in the directory

User name	UID	tws Administrators	tws Operators	tws Schedulers	tws Analysts	tip users
Adeline Durling	adurling	Y	Y	Y	Y	Y
Ariana Braman	abraman			Y		Y
Bart Winebarger	bwinebarger		Y	Y		Y
Dick Selan	dselan		Y		Y	Y
Earline Ange	eange	Y	Y	Y		Y
Else Zegarelli	ezegarelli				Y	Y
Emelda Lotempio	elotempio		Y			Y
Gerald Baillio	gbaillio		Y	Y		Y
Houston Dold	hdold	Y	Y	Y	Y	Y
Jaime Vasso	jvasso		Y			Y
Jasper Guglielmo	jguglielmo					Y
Jorge Mulberry	jmulberry	Y	Y		Y	Y
Karine Kingsolver	kkingsolver				Y	Y
Keesha Holzheimer	kholzheimer		Y	Y	Y	Y
Kory Sweetland	ksweetland		Y			Y
Maxima Lamendola	mlamendola	Y	Y	Y	Y	Y
Melvin Harthorne	mharthorne		Y			Y
Thanh Engbretson	tengbretson	Y	Y			Y
Tinisha Fowble	tfowble		Y	Y		Y
Zackary Iverslie	ziverslie		Y	Y		Y
tipuser1	tipuser1		Y	Y	Y	Y
tipuser2	tipuser2		Y	Y	Y	Y
tcruser1	tcruser1				Y	
tcruser2	tcruser2				Y	
Administrator	Administrator					

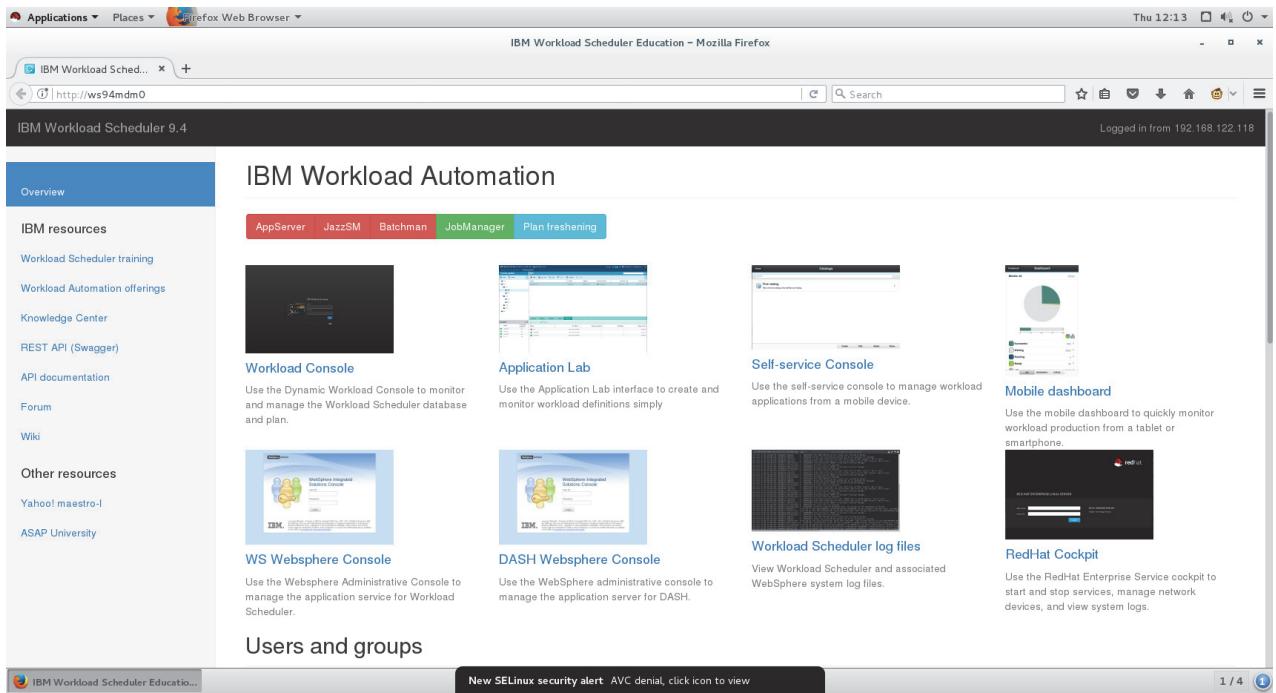
Unit 1 Introduction exercises

In the exercises for this unit, you prepare the environment for practice, and configure the Dynamic Workload Console for connections to Workload Scheduler environments.

Exercise 1 Preparing the computer environment

You must start Workload Scheduler lab environment, if it is not running, and log in. The exact steps to start the environment are different depending on the classroom that is hosting the training.

1. Open the provided link in your browser. You might have to allow provisioning of plug-ins to your browser.
2. Start the lab environment by clicking **Power On** for the virtual machine. Booting can take several minutes.
3. When the computer starts, the **wsuser** is automatically logged in, and the browser is automatically started.
4. If any services are not running, you see red icons. Do not continue until you see that all of the services are running. The web page automatically refreshes, but you can refresh the web page by pressing F5.



Note: If the screen saver locks the desktop, in the **Password** field, enter **object00** to unlock the desktop.

Exercise 1 Preparing the computer environment

5. Click the link that has the label **Workload Console**. A new tab opens with the IBM Workload Scheduler page.
6. Log on to the console with user ID **smadmin** and password **object00**. When you log in to the Dynamic Workload Console, you see a start page that shows links to commonly used tasks in the three web-based Workload Scheduler interfaces.

Exercise 2 Connecting through the Dynamic Workload Console

In this exercise, you create your own engine connection, and share it with other users.

In the following exercises, the default engine designation is sufficient. In a production environment, you can create your own engine definition. Follow these steps to create your own engine definition.

1. On the **IBM Workload Scheduler** menu page, click **OK**.

The screenshot shows the IBM Workload Scheduler menu page. At the top, there is a navigation bar with a search icon and a user profile icon. Below the bar, the title "IBM Workload Scheduler" is displayed next to a gear icon. The page features three main sections:

- Dynamic Workload Console**: This section includes a thumbnail of a computer monitor displaying the Dynamic Workload Console interface, a "Go" button, and a brief description: "Access the Dynamic Workload Console to manage your IBM Workload Scheduler environments." A blue call-to-action button labeled "Connect your engines" is highlighted. Below it are links for "Design your workload", "Monitor your workload", and "Dashboard".
- Self Service UIs**: This section includes a thumbnail of a computer monitor displaying the Self Service UIs interface, a "Go" button, and a brief description: "Access the Self-service UIs to easily and quickly interact with your IBM Workload Scheduler environment from mobile devices." It features a QR code and links for "Self Service Catalog" and "Self Service Dashboards".
- Application Lab**: This section includes a thumbnail of a computer monitor displaying the Application Lab interface, a "Go" button, and a brief description: "Access the Application Lab to manage a set of simple business processes." A message states: "You don't have any saved configuration for Application Lab. Please add." A "Add" button is located at the bottom right of this section.

At the bottom of the page, a note reads: "To skip this page and access to Dynamic Workload Console directly, go to Dynamic Workload Console, click on the "Page Actions" icon on the right and select "Add to My Startup Pages"."

2. From the menu, select **System Configuration > Manage Engines**.
3. Click **New** in the work area to create an engine connection.
4. Type **WS94_1** as the engine name. Leave the **Host Name** and **Port Number** fields set to **localhost** and **31117**. Required fields have an asterisk (*) prefix and display a highlight color.
5. Leave the **Connection Credentials** fields and **Database Configuration for Reporting** section clear.
6. Clear the **Show in Dashboard** check box.
7. Click **Test Connection** to verify that the engine is reachable. Click **OK** to exit the window when the connection is verified.

Exercise 2 Connecting through the Dynamic Workload Console

- Click **OK** to save the connection and **OK** at the message that the connection is created successfully.

The screenshot shows the 'Engine Connection Properties' dialog box. At the top, it says 'MANAGE ENGINES'. The main section is titled 'Engine Connection Properties' with a sub-section 'Connection Data'. It contains fields for 'Engine Name' (set to 'WS94_1'), 'Engine Type' (set to 'Distributed'), 'Host Name' (set to 'localhost'), 'Port Number' (set to '31116'), and 'Remote Server Name'. Below this is a 'Connection Credentials' section with fields for 'User ID' and 'Password', and a checkbox for 'Share credentials'. A 'Plan' section follows, showing 'Default Plan' set to 'Current Plan' with a 'Select...' button. Under 'Database Configuration for Reporting', there is a checkbox for 'Enable Reporting', a 'Database User ID' field, and a 'Password' field. Finally, a 'Dashboard' section with a 'Show in dashboard' checkbox.

- If **WS94_1** is not displayed in the **Manage Engines** work area, click **Refresh**.
- Select the **WS94_1** check box in the list of Engines. Click **Share**.
- In the **Edit share list** pane, select **Selected**. A list of groups is shown in the **Available Groups** list.
- Select **twsSchedulers** from the **Available Groups**, and click **Add** to add users to the **Groups Selected for Sharing** list.
- Select **twsOperators** in the **Available Groups**, and click **Add** to add users to the **Groups Selected for Sharing** list.
- Click **OK** to return to the **Manage Engines** pane.
- Close the **Manage Engines** pane.

Exercise 3 Using the Workload Scheduler command lines

In this exercise, you use the `composer` and `conman` command line interfaces.

Task 1 Running composer

Complete the following steps to open a terminal and run `composer`.

1. From the Linux desktop menu, select **Applications > Utilities > Terminal** to open a new terminal window. You see a terminal window with a shell prompt.
2. Enter the following command to source the Workload Scheduler environment.
`. /opt/IBM/TWA/TWS/tws_env.sh`
3. With the Workload Scheduler environment ready, you can run `composer` in interactive mode without specifying its path. To start `composer`, enter `composer` at the shell prompt. You see a banner and the hyphen prompt.



Example: Running composer

```
[wsuser@ws94mdm0 ~]$ composer
IBM Workload Scheduler(UNIX) /COMPOSER 9.4.0.01 (20170626)
Licensed Materials - Property of IBM* and HCL**
5698-WSH
(C) Copyright IBM Corp. 1998, 2016 All rights reserved.
(C) Copyright HCL Technologies Ltd. 2016, 2017 All rights reserved.
* Trademark of International Business Machines
** Trademark of HCL Technologies Limited
Installed for user "wsuser".
Locale LANG set to the following: "en"
User: wsuser, Host:127.0.0.1, Port:31116
User: wsuser, Host:ws94mdm0, Port:31116
```

4. Display the list of `composer` commands by typing `help commands` at the “-” prompt.
5. End the `composer` program by entering `exit` at the prompt.

Exercise 3 Using the Workload Scheduler command lines

6. You can also run composer in script mode. To display a list of workstations in the database, run the following command.

```
composer list ws=@
```

Task 2 Running conman

Complete the following steps to open a terminal and run composer.

1. If a terminal window is not open, from the Linux desktop menu, select **Applications > Utilities > Terminal** to open a new terminal window. You see a terminal window with a shell prompt.
2. Enter the following command to source the Workload Scheduler environment.

```
. /opt/IBM/TWA/TWS/tws_env.sh
```

Note: If you previously sourced the Workload Scheduler environment in the same terminal window and shell account, you are not required to source the environment again.

3. With the Workload Scheduler environment ready, you can run `conman` in interactive mode without specifying its path. To start composer, enter `conman` at the shell prompt. You see a banner and the hyphen prompt.

Example: Running conman

```
[wsuser@ws94mdm0 ~]$ conman
IBM Workload Scheduler(UNIX) /CONMAN 9.4.0.01 (20170626)
Licensed Materials - Property of IBM* and HCL**
5698-WSH
(C) Copyright IBM Corp. 1998, 2016 All rights reserved.
(C) Copyright HCL Technologies Ltd. 2016, 2017 All rights reserved.
* Trademark of International Business Machines
** Trademark of HCL Technologies Limited
Installed for user "wsuser".
Locale LANG set to the following: "en"
Scheduled for (Exp) 07/10/17 (#79) on MDM0. Batchman LIVES. Limit: 11, Fence:
GO, Audit Level: 1
%
```

4. Display the list of conman commands by typing `help commands` at the “-” prompt.
5. End the conman program by entering `exit` at the “%” prompt.
6. You can also run conman in script mode. To display a list of workstations in the plan, run the following command:

```
conman showcpus
```

Exercise 3 Using the Workload Scheduler command lines

Unit 2 Planning the Workload Scheduler implementation exercises

In the exercises for this unit, you perform the following tasks:

- Create a workstation definition by using the Dynamic Workload Console
- Create a workstation definition by using the `composer` command.
- Monitor workload broker computers by using the Dynamic Workload Console and the `resource` command.
- Inspect TCP ports to understand to which port an agent listens.
- Add dynamic agents to the workload broker database, and review the database objects that are automatically created.
- Create a pool workstation to distribute work to the new agents.
- Create database scripts and commands that you can use to install a new Workload Scheduler database.
- Identify hardware, operating system, and software prerequisites

Exercise 1 Defining workstations

In this exercise, you edit and create workstation definitions.

Task 1 Creating a workstation by using the Dynamic Workload Console

Complete the following steps to create a workstation definition.

1. Change to the browser window that runs the Dynamic Workload Console.
2. Select **Create Workstations** from the **Administration** menu.
3. On the Create Workstations page, select **WS94d** from the **Engine name** menu, and click **Create Workstation**.

Exercise 1 Defining workstations

4. Complete the fields as shown in the following table.

Table 1 Workstation definition

Field	Value
Name	DELTA
Domain	MASTERDM
Description	System fault-tolerant agent
Workstation type	Fault-Tolerant Agent
Full status	Cleared
Operating system	UNIX
Time zone	Europe/Rome
Ignore during plan generation	Selected
Variable table	None (blank)
Node name	ws94agent0
TCP/IP port	31111
SSL communication	Disabled
Mailman server	None (blank)
Behind firewall	Cleared
Auto link	Selected

Workstation properties**General Information**

*Name	<input type="text" value="DELTA"/>
Domain	<input type="text" value="MASTERDM"/> <input type="button" value="Assign to domain"/> <input type="button" value="Use Master"/>
Description	<input type="text" value="System fault-tolerant agent"/>
Workstation type	<input type="button" value="Fault-Tolerant Agent"/> <input type="checkbox"/> Full status
Operating system	<input type="button" value="UNIX"/>
Time zone	<input type="button" value="Europe/Rome - Central European Time (GMT+1:00)"/>
<input checked="" type="checkbox"/> Ignore during plan generation	
Variable table	<input type="text"/> <input type="button" value="..."/>

Communication Options

*Node name	<input type="text" value="ws94agent0"/>	*TCP/IP port	<input type="text" value="31111"/>
SSL communication	<input type="button" value="Disabled"/>	SSL port	<input type="text" value="0"/>
Mailman server	<input type="button" value="▼"/>		
<input type="checkbox"/> Behind firewall		<input checked="" type="checkbox"/> Auto link	
<input type="button" value="Save"/> <input type="button" value="Cancel"/>			

5. Click **Save** to store the workstation definition.
6. In the “Insert justification” window, choose **New application** from the **Category** menu. Enter **1021** in the **Ticket number** field, and type “**Preparing for new server.**” in the **Description** field.
7. Click **OK** to complete the justification and permanently save the workstation definition. You see the message, *The following workstation was definition was added: DELTA*.
8. Close the **Create Workstations** tab.
9. From the menu, select **Administration > List Workstations**.

Exercise 1 Defining workstations

10. On the List Workstations page, select **WS94d (Distributed)** from the **Engine name** menu, and click **Display**. You see the list of workstations, including the new workstation that you created earlier.

List Workstations												
List Workstations												
Engine Name: WS94d (Distributed)												
Close View												
New Edit Assign to domain Domains view More Actions ▾												
Name	^ Type	^ Domain	^ Ignore	^ Description	^ OS	^ Time Zone	^ Node Name	^ SSL Communicati	^ Behind Firewall	^ SSL Port	^ TCP/IP Port	^ Updated by
AGENT0	Agent	No	This workstation	UNIX	America/New_Yows94mdm0	No	31114	ResourceAdvisor	7/13/17 1:40 PM			
ALPHA	Dynamic Pool	No		UNIX	America/New_Yo	No			wuser	3/10/17 2:54 AM		
BRAVO	Dynamic Pool	No		UNIX	America/New_Yo	No			wuser	3/10/17 2:54 AM		
BROKER0	Workload Broker	MASTERDM	No	This workstation	localhost	Disabled	No	41114	wuser	3/10/17 2:54 AM		
CHARLIE	Dynamic Pool	No		UNIX	America/New_Yo	No			wuser	3/10/17 2:54 AM		
DELTA	Fault-Tolerant Ag	MASTERDM	Yes	System fault-toler	UNIX	Europe/Rome	ws94agent0	Disabled	No	31111	wuser	7/13/17 4:02 PM
ECHO	Dynamic Pool	No		UNIX	America/New_Yo	No			wuser	3/10/17 2:54 AM		
MASTERAGENTS	Pool	No	This workstation	Other		No				ResourceAdvisor	7/3/17 4:31 PM E	
MDM0	Domain Manager	MASTERDM	No	MASTER CPU	UNIX	ws94mdm0	Disabled	No	31111	wuser	3/10/17 2:54 AM	
Lines per page: 25 ▾												
1 << [1] >> 1 Total: 9 Selected: 1												

Task 2 Creating a workstation definition by using the composer command

Complete the following steps to create a workstation definition.

1. Switch to the terminal window, or open a new one.
2. Enter `composer` to run the composer program.



Example: Running composer

```
[wsuser@ws94mdm0 ~] $ composer
IBM Workload Scheduler(UNIX) /COMPOSER 9.4.0.01 (20170626)
Licensed Materials - Property of IBM* and HCL**
5698-WSH
(C) Copyright IBM Corp. 1998, 2016 All rights reserved.
(C) Copyright HCL Technologies Ltd. 2016, 2017 All rights reserved.
* Trademark of International Business Machines
** Trademark of HCL Technologies Limited
Installed for user "wsuser".
Locale LANG set to the following: "en"
User: wsuser, Host:127.0.0.1, Port:31116
User: wsuser, Host:ws94mdm0, Port:31116
```

3. At the hyphen prompt, enter `new workstation` (you can instead enter `new ws`). You see a new text file that contains several types of workstation definitions.
4. Delete all of the workstations from the template except for the first one, and edit the workstation definition to match the following example.



Example: Workstation definition

```
CPUNAME FOXTROT
DESCRIPTION "Fault-Tolerant Agent"
OS UNIX
NODE ws94agent2 TCPADDR 31111
TIMEZONE America/Chicago
DOMAIN MASTERDM
FOR MAESTRO
TYPE FTA
IGNORE
AUTOLINK ON
FULLSTATUS OFF
END
```

5. Save the text file. You see a message that confirms the object is saved, similar to the following text.



Example: Saving workstation definitions

```
AWSBIA300I The scheduling language syntax has been successfully validated for
object "FOXTROT".
AWSJCL003I The command "add" completed successfully on object "ws=FOXTROT".
AWSBIA302I No errors in /opt/IBM/TWA/TWS/tmp/TWSBoUZbu.
AWSBIA292I Total objects added: 1
```

6. List the workstations in the database by entering the following command at the hyphen prompt.
`list ws=@`
7. Exit the composer program by typing `exit` at the prompt.

Exercise 2 Monitoring workload broker computers

In this exercise, you start four new dynamic agents, and add them to the database.

Task 1 Querying the workload broker database from the Dynamic Workload Console

Perform the following steps to query the workload broker database from the Dynamic Workload Console.

1. In the browser that shows the Dynamic Workload Console, select **System Status and Health > Monitor Computers on Broker**.
2. On the Computer Search Criteria page, click **Search**. You see a table on the Computer Search Results page that lists the dynamic agent, AGENT0.

The screenshot shows the Dynamic Workload Console interface. At the top, there is a navigation bar with links for Default, Administration, Planning, Reporting, Samples, System Configuration, System Status and Health, and Help. Below the navigation bar, a header bar displays 'WELCOME TO DWC', 'LIST WORKSTATIONS', and 'MONITOR COMPUTERS ON BROKER'. The main content area is titled 'Computer Search Results' and contains a table with the following data:

Select	Display Name	Status	Availability	Operating System	Active Jobs	Processors	CPU Usage	File Systems
<input type="checkbox"/>	AGENT0	Online	Available	OpenStack	0	2	<div style="width: 13%;">13%</div>	<div style="width: 1%;">1</div>

Below the table, there is a 'Cancel' button.

3. Click **AGENT0** in the **Display Name** column to see details about the agent that is running.
4. In the **Computer Details** section, review the agent's characteristics. Review the agent's file systems and network systems by clicking the related links to the left.
5. Scroll to the bottom of the page, and click **Hide Details**.

Task 2 Querying the workload broker database from the command line

Complete the following steps to query the workload broker database.

1. Switch to the terminal window, or open a new one.
2. Enter the following command to source the workload broker environment.
 - `./opt/IBM/TWA/TDWB/bin/tdwb_env.sh`



Hint: Verify that a space is after the period. You see the following message: *Setting CLI environment variables.*

3. Enter the following command to list agents in the broker database.

```
resource.sh -usr wsuser -pwd object00 -query -computer \*
```



Example: Running the resource command

```
[wsuser@ws94mdm0 ~]$ resource.sh -usr wsuser -pwd object00 -query -computer \*
Setting CLI environment variables.....
AWKCLI171I Calling the resource repository to perform a query on resources.
AWKCLI178I Last active broker server is "ws94mdm0".
AWKCLI182I Contacting broker server "ws94mdm0".
AWKCLI174I "1" computers were found for your query.
Details are as follows:
```

```
Computer Name:AGENT0
Computer ID:9B39D106E8B911E6BE0A290EE18867B0
Computer OS Name:OpenStack
Computer OS Type:LINUX
Computer OS Version:3.10.0-514.26.2.el7.x86_64
Computer Status:Online
Computer Availability Status:Available
```

Exercise 3 Adding agents and pools

In this exercise, you start four new agents, and add them to the database.

Task 1 Starting agents

Complete the following steps to start containers that run Workload Scheduler agents, and confirm that they automatically register with the workload broker.

1. Enter the following command to list the docker containers that are available to start.

```
docker ps -a
```

2. Start four of the containers by entering the following commands:

```
docker start ibmwaagent_AGENT1_1  
docker start ibmwaagent_AGENT2_1  
docker start ibmwaagent_AGENT3_1  
docker start ibmwaagent_AGENT4_1
```

You can instead start four containers by entering a single command (on one line):

```
docker start ibmwaagent_AGENT1_1 ibmwaagent_AGENT2_1 ibmwaagent_AGENT3_1  
ibmwaagent_AGENT4_1
```

3. Confirm that the containers and agents are running by entering the following command:

```
docker ps
```

4. Repeat the resource query to confirm that the agents are added to the workload broker database.

```
resource.sh -usr wsuser -pwd object00 -query -computer \*
```



Example: Running the resource command to query computers in the database

```
[wsuser@ws94mdm0 ~]$ resource.sh -usr wsuser -pwd object00 -query -computer \*
Setting CLI environment variables....
Setting CLI environment variables....
AWKCLI171I Calling the resource repository to perform a query on resources.
AWKCLI178I Last active broker server is "ws94mdm0".
AWKCLI182I Contacting broker server "ws94mdm0".
AWKCLI174I "5" computers were found for your query.
```

Details are as follows:

```
Computer Name:AGENT2
Computer ID:97A0331C2C5411E7BF091D1FFE3E478D
Computer OS Name:Ubuntu 16.10
Computer OS Type:LINUX
Computer OS Version:3.10.0-514.26.2.el7.x86_64
Computer Status:Online
Computer Availability Status:Available
```

```
Computer Name:AGENT0
Computer ID:9B39D106E8B911E6BE0A290EE18867B0
Computer OS Name:OpenStack
Computer OS Type:LINUX
Computer OS Version:3.10.0-514.26.2.el7.x86_64
Computer Status:Online
Computer Availability Status:Available
```

```
Computer Name:AGENT4
Computer ID:BF21C05C238711E7BD367D6349C41F70
Computer OS Name:Ubuntu 16.10
Computer OS Type:LINUX
Computer OS Version:3.10.0-514.26.2.el7.x86_64
Computer Status:Online
Computer Availability Status:Available
```

```
Computer Name:AGENT3
Computer ID:C0814A94238711E79C22CF7CB5E59E5E
Computer OS Name:Ubuntu 16.10
Computer OS Type:LINUX
Computer OS Version:3.10.0-514.26.2.el7.x86_64
Computer Status:Online
Computer Availability Status:Available
```

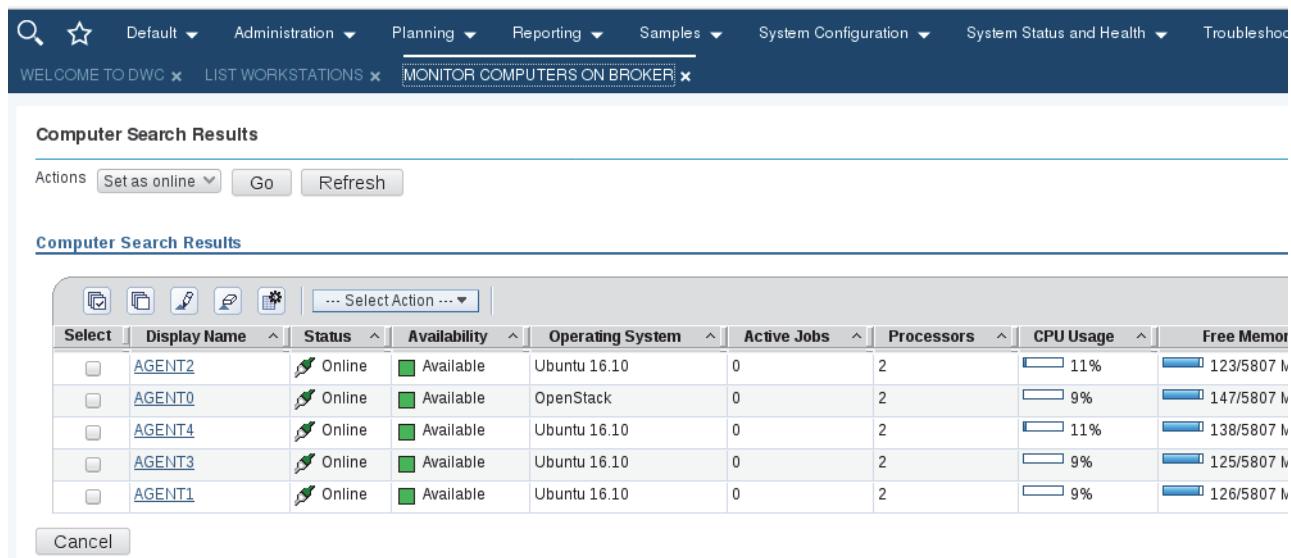
```
Computer Name:AGENT1
```

Computer ID:C0C04D8E238711E78E0F99F382CAA104
 Computer OS Name:Ubuntu 16.10
 Computer OS Type:LINUX
 Computer OS Version:3.10.0-514.26.2.el7.x86_64
 Computer Status:Online
 Computer Availability Status:Available

- Review the Workload Scheduler database objects that were automatically created when the new agents joined the broker database by running the following `composer` command.

`composer display ws=AGENT@`

- Switch to the browser that shows the Dynamic Workload Console. Refresh the **Monitor Computers on Broker** tab that shows the Computer Search Results by clicking **Refresh**.



The screenshot shows the Dynamic Workload Console interface. The top navigation bar includes links for Default, Administration, Planning, Reporting, Samples, System Configuration, System Status and Health, and Troubleshooting. Below the navigation bar, the title 'WELCOME TO DWC' is followed by tabs for 'LIST WORKSTATIONS' and 'MONITOR COMPUTERS ON BROKER'. The 'MONITOR COMPUTERS ON BROKER' tab is active and displays the 'Computer Search Results'.

Actions: Set as online, Go, Refresh

Computer Search Results

Select	Display Name	Status	Availability	Operating System	Active Jobs	Processors	CPU Usage	Free Memory
<input type="checkbox"/>	AGENT2	Online	Available	Ubuntu 16.10	0	2	11%	123/5807 Mb
<input type="checkbox"/>	AGENT0	Online	Available	OpenStack	0	2	9%	147/5807 Mb
<input type="checkbox"/>	AGENT4	Online	Available	Ubuntu 16.10	0	2	11%	138/5807 Mb
<input type="checkbox"/>	AGENT3	Online	Available	Ubuntu 16.10	0	2	9%	125/5807 Mb
<input type="checkbox"/>	AGENT1	Online	Available	Ubuntu 16.10	0	2	9%	126/5807 Mb

Cancel

Task 2 Creating pool workstations

Complete the following steps to create a pool that contains some of the new agents.

1. In the Dynamic Workload Console, from the **Administration** menu, select **Create Workstations**.
2. On the Create Workstations page, select **WS94d (Distributed)** from the **Engine name** menu, and click **Create Workstation**.

3. Complete the following fields before you add members to the pool.

Table 2 Pool workstation definition

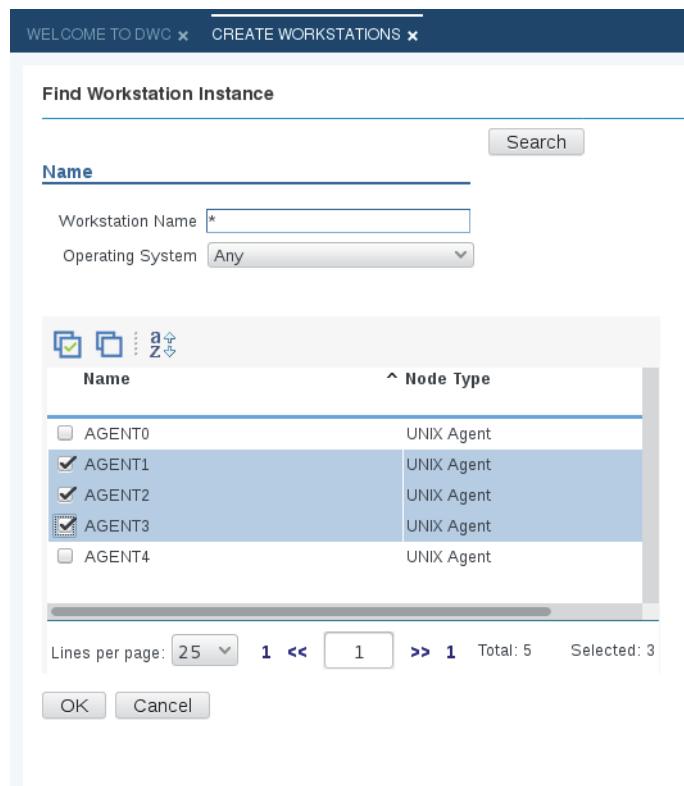
Field	Value
Name	MY-POOL
Domain	MASTERDM
Description	My pool workstation
Workstation type	Pool
Operating system	UNIX
Time zone	America/New_York
Ignore during plan generation	Cleared
Variable table	DYNPOOL
Workload broker	BROKER0

The screenshot shows the 'CREATE WORKSTATIONS' interface. In the 'General Information' tab, the 'Name' field is set to 'MY-POOL'. The 'Description' field is empty. The 'Workstation type' is set to 'Pool', and the 'Operating system' is set to 'UNIX'. The 'Time zone' is set to 'America/New_York - Eastern Standard Time (GMT-5:00)'. The 'Ignore during plan generation' checkbox is unchecked. The 'Variable table' is set to 'DYNPOOL', and the 'Workload broker' is set to 'BROKER0'. At the bottom of the screen, there is a 'Members' section with 'Add' and 'Remove' buttons.

Complete the following steps to add members to the pool.

- In the **Members** section, click **Add**. You see the "Find workstation instance" page.
- Click **Search** to see a list of agents you can add to the pool.
- In the list of agents, select **AGENT1**, **AGENT2** and **AGENT3**, and click **OK**.

Exercise 3 Adding agents and pools



7. In the “Workstation properties” window, click **Save**.
8. In the “Insert justification” window, select **New application** from the **Category** menu, enter **1021** in the **Ticket number** field, and **Pool supporting new application** in the **Description** field.
9. Click **OK** to save the justification and add the new workstation. You see a message that confirms MY-POOL was added. Click **OK** to return to the Create Workstations window.
10. Close the **Create Workstations** tab.

Exercise 4 Getting network port information

In this exercise, you determine which ports are in use by Workload Scheduler components, and find configuration options to change them.

Task 1 Inspecting the TCP ports that listen

1. To see which ports are in use, open a terminal window, and enter the following command.

```
sudo netstat -tnlp | less
```

You see the ports in use by services that run on the computer. To highlight which ports the Workload Scheduler dynamic agent uses, type the following command at the colon (:).

```
/agent
```

You see that the agent occupies port 31114. Also, note which ports the `netman` and `db2sysc` commands use. Type `q` to leave the `less` command and return to the shell prompt.



Hint: For more information about the `less` command, see [Using the less program](#) on [page 1](#) of Appendix A: [Useful commands](#).

2. Stop the local dynamic agent by entering the following command at the shell prompt.

```
/opt/IBM/TWA/TWS/ShutDownLwa
```



Example: Ending the dynamic agent

```
[wsuser@ws94mdm0 ~] $ /opt/IBM/TWA/TWS/ShutDownLwa
Stopping tebctl-tws_cpa_agent_wsuser Agent (1798) : .....OK
```

3. Repeat the `sudo netstat -tnlp | less` command to see that the agent port is no longer occupied.



Hint: The `sudo` command is not required to run `netstat`. However, by using `sudo`, you see the names of programs that open the ports, in addition to the port number.

4. To start the agent, enter the following command.

```
/opt/IBM/TWA/TWS/StartUpLwa
```

Exercise 5 Retrieving database information

In this exercise, you investigate the Workload Scheduler databases, and the relevant DB2 settings.

Task 1 Completing the database information template

1. Open a terminal window (or switch to one that is open).
2. Create a subdirectory that is named `/tmp/WSDB`. You use the **WSDB** directory to contain your completed database scripts.

```
mkdir -p /tmp/WSDB
```

3. Change to the `/opt/TX318/dbtools` directory.

```
cd /opt/TX318/dbtools
```

In the `dbtools` directory, you see database configuration tools and properties files that were copied from the Workload Scheduler installation media.

4. By using the editor of your choice, edit the `customizeUnixDB2Sql.properties` file so that it contains the following settings.



Attention: The settings and values in the properties are case-sensitive.

Table 3 UNIX DB2 SQL properties

Setting	Value
TWSTEMPDIR	/tmp/WSDB
DB_USER	db2inst1
TWS_USER	wsuser
TWS_DB	TWS
TWS_TS_NAME	TWS_DATA
TWS_DATA_TS_PATH	TWS_DATA
TWS_LOG_TS_NAME	TWS_LOG
TWS_LOG_TS_PATH	TWS_LOG
TWS_PLAN_TS_NAME	TWS_PLAN
TWS_PLAN_TS_PATH	TWS_PLAN
COMPANY_NAME	IBM
EIF_PORT	31131
HOST_NAME	ws94mdm0
WAS_SEC_PORT	31116
DB2LOCALADMINUSER	db2inst1
DB2DIR	/home/db2inst1/sqlib

- Run the customize script to create the SQL files that can be used to create databases.

```
./customize -propertyFile /opt/TX318/dbtools/customizeUnixDB2Sql.properties
```



Example: Editing the properties file

```
[wsuser]$ vi customizeUnixDB2Sql.properties
[wsuser]$ ./customizeSQL.sh -propertyFile customizeUnixDB2Sql.properties
Load property file: /opt/TX318/dbtools/customizeUnixDB2Sql.properties
```

All database scripts have been copied in /opt/TX318/WSDB

All database scripts have been customized and are ready to use.

Exited successfully

6. Change to the new sql directory that was created by the customizer by running the following command.

```
cd /tmp/WSDB/TWS/dbtools/db2/sql
```

7. In the directory, you can list the SQL files that the customizer created, and view their content. For example, to see the tables that would be created in the database, view the `create_tables.sql` file.

```
less create_tables.sql
```

You see that the SQL files contain the values that you set in the properties file in step 3.

8. Change to the directory that contains the scripts by running the following command.

```
cd ../scripts
```

9. The scripts directory contains shell scripts that a database administrator would use to create and upgrade the databases for Workload Scheduler to use. Run the `createdb_root.sh` script to see an example.

```
./createdb_root.sh
```

You see an error message that explains which arguments to pass to the script. Since your environment already contains a working database, do not run the script with arguments.



Example: Creating the Workload Scheduler database

```
[wsuser@ws94mdm0 scripts]$ ./createdb_root.sh
```

Invalid arguments supplied

Arguments: dbName isClientInst nodeName hostName db2PortNumber db2AdminUser
db2AdminPwd db2Instance agentType

dbName:	name of the DB2 database
isClientInst:	FALSE installation on server, TRUE client (remote) installation
nodeName:	name of the DB2 node
hostName:	host name where DB2 is to be installed
db2PortNumber:	port number used to communicate with the DB2 server, for default db2 instance set it to 50000
db2AdminUser:	user name of the DB2 administrator
db2AdminPwd:	password for DB2 administrator
db2Instance:	if not need to install in a specific (manually created) instance, set it to db2
agentType:	MDM, BKM



Attention: When you are installing a Workload Scheduler database, the `createdb_root.sh` script must be run by the `root` user.

Exercise 6 Checking computer prerequisites

In this exercise, you check the computer's operating system and software to determine whether they meet the requirements for installing Workload Scheduler.

Task 1 Checking Workload Scheduler prerequisites

1. Open a terminal window (or switch to one that is open) and change to the /opt/TX318 directory.

```
cd /opt/TX318
```

2. Run the *checkPrereq* script to report whether the computer meets the standard requirements.

```
./checkPrereq.sh
```

You see that the computer passes the tests.



Example: Checking prerequisites

```
[wsuser@ws94mdm0 TX318]$ ./checkPrereq.sh
```

```
Setting Prerequisite Scanner output directory to user defined directory:  
/tmp/TWA/tws/checkPrereq
```

PRS execution is in progress, it may take some time ...

```
IIM - IBM Installation Manager [version 01080500] :
```

```
PASS
```

Detailed results are also available in /tmp/TWA/tws/checkPrereq/result.txt

3. View the details results that are available by reading the *result.txt* file.

```
cat /tmp/TWA/TWS/checkPrereq/result.txt
```

4. Run the *dwcPrereqCheck* script to report whether the computer meets the standard requirements for installing the Dynamic Workload Console.

```
./dwcPrereqCheck.sh -instdir /opt/IBM/TWAUI -jazzdir /opt/IBM/JazzSM -tmpdir /tmp
```

You see that the computer passes the tests.



Example: Checking Dynamic Workload Broker prerequisites

```
./dwcPrereqCheck.sh -instdir /opt/IBM/TWAUI -jazzdir /opt/IBM/JazzSM -tmpdir /tmp
```

Overall result: PASS (TWA 09000000: PASS)

Detailed results are also available in /opt/TX318/result.txt

5. View the details results that are available by reading the `result.txt` file.

```
cat result.txt
```

Unit 3 Installing and configuring Workload Scheduler exercises

In the exercises for this unit, you perform the following tasks.

- Check the information that is in the installation registries
- Use the Installation Manager to see what is installed
- Run the `twsinst` script
- Review and set global options

Exercise 1 Checking installation information

In this exercise, you review the installation that is running on your classroom station environment.

Task 1 Reviewing the Workload Automation registries

1. Open a terminal window (or switch to one that is open) and display the `TWSRegistry.dat` file

```
cat /etc/TWS/TWSRegistry.dat
```



Example: Viewing the registry

```
[wsuser@ws94mdm0 ~]$ cat /etc/TWS/TWSRegistry.dat
/Tivoli/Workload_Scheduler/wsuser_DN_objectClass=OU
/Tivoli/Workload_Scheduler/wsuser_DN_PackageName=FP_TWS_LINUX_X86_64_wsuser.9.4.0.
01
/Tivoli/Workload_Scheduler/wsuser_DN_MajorVersion=9
/Tivoli/Workload_Scheduler/wsuser_DN_MinorVersion=4
/Tivoli/Workload_Scheduler/wsuser_DN_PatchVersion=1
/Tivoli/Workload_Scheduler/wsuser_DN_FeatureList=
/Tivoli/Workload_Scheduler/wsuser_DN_ProductID=TWS_ENGINE
/Tivoli/Workload_Scheduler/wsuser_DN_ou=wsuser
/Tivoli/Workload_Scheduler/wsuser_DN_InstallationPath=/opt/IBM/TWA/TWS
/Tivoli/Workload_Scheduler/wsuser_DN_UserOwner=wsuser
/Tivoli/Workload_Scheduler/wsuser_DN_MaintenanceVersion=0
/Tivoli/Workload_Scheduler/wsuser_DN_Agent=MDM
```

From the registry, you see that Workload Scheduler version 9.4 with patch version 1 is installed in the `/opt/IBM/TWA/TWS` directory.

2. View the instance repository information about the Workload Scheduler instance by displaying the `twainstance0` properties file.

```
sort /etc/TWA/twainstance0.TWA.properties
```

3. View the instance repository information about the Dynamic Workload Console instance by displaying the `twainstance1` properties file.

```
sort /etc/TWA/twainstance1.TWA.properties
```

Exercise 1 Checking installation information

Exercise 2 Using the installation programs

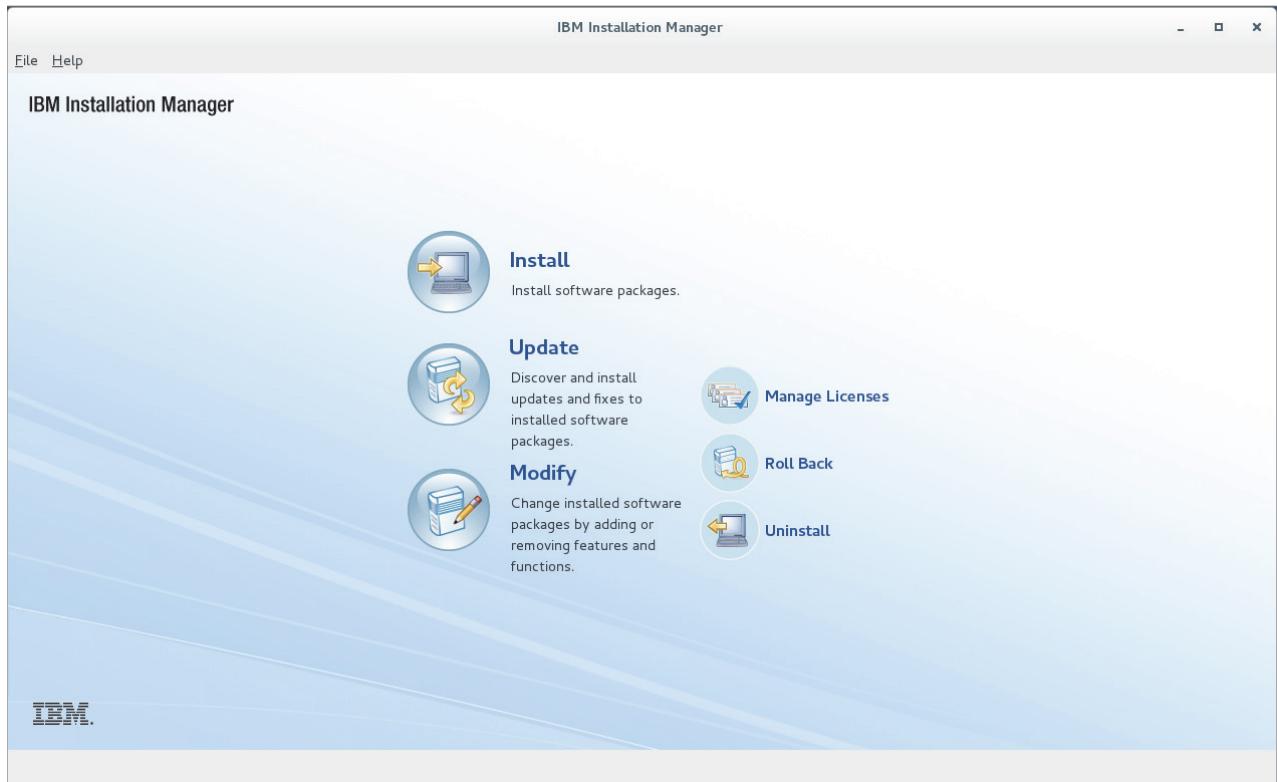
In this exercise, you use IBM Installation Manager to review the Workload Scheduler installation, and run the `twsinst` script to review its options.

Task 1 Running Installation Manager

1. Open a terminal window (or switch to one that is open) and run the installation manager as root.

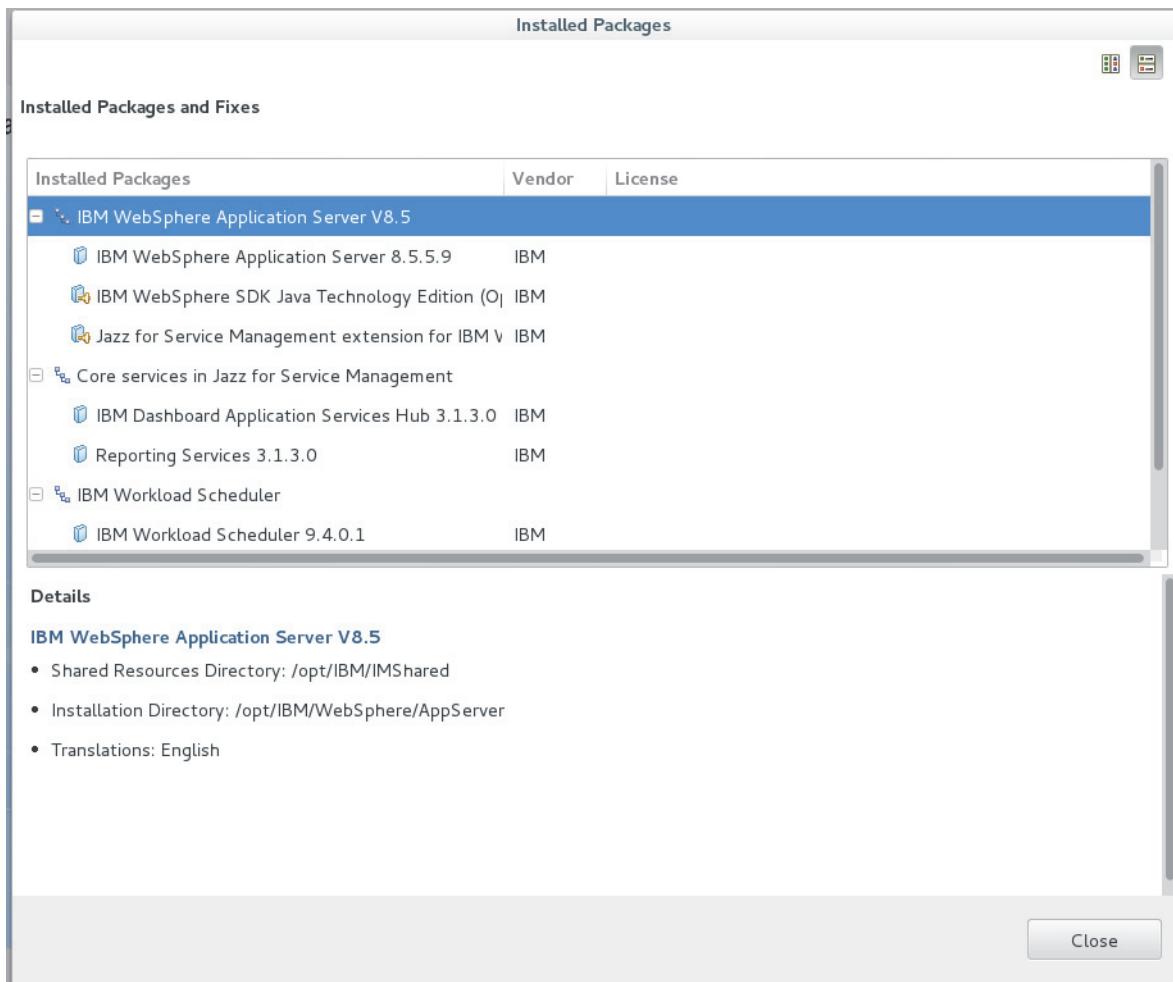
```
sudo /opt/IBM/InstallationManager/eclipse/IBMIM
```

You see the IBM Installation Manager main window.



Exercise 2 Using the installation programs

2. Select **File > View Installed Packages** from the menu. Scroll through the list of installed packages, and view their properties.



3. Click **Close** to close the Installed Packages window.
4. Select **File > Installation History** to see details about the IBM software components that are installed on the system.
5. Select an item from the installation history, and click **View Log**. In the Installation Log window, you can review the history of previous installations.
6. Click **Close** to close the Installation Log window. Click **Close** to close the Installation History window.
7. Exit the Installation Manager by selecting **File > Exit** from the menu.

Task 2 Running the twsinst script

1. Open a terminal window (or switch to one that is open) and run a root shell.

```
sudo /bin/bash --login
```

2. Change to the Workload Scheduler home directory, that contains the twsinst script.

```
cd /opt/IBM/TWA/TWS
```

3. Run the twsinst script with the -u argument so that you can see its available options.

```
./twsinst -u | less
```

Press Space to page through the instructions. Enter **q** to leave the **less** program.

4. Exit the root shell by typing **exit**.

Exercise 2 Using the installation programs

Exercise 3 Setting global options

In this exercise, you review and edit global options.

To display and set global settings by using optman, perform the following steps.

1. Open a terminal window (or switch to one that is open).
2. Run the optman command to show the current global options settings.

```
optman ls
```



Note: Many of the options are customized for the classroom learning environment, and are not at their default settings.

3. Check the setting for auditing by filtering the optman ls command through the grep command.

```
optman ls | grep [Aa]udit
```



Example: Using the optman command with grep.

```
[wsuser@ws94mdm0 ~]$ optman ls | grep [Aa]udit
auditHistory / ah = 400
auditStore / as = BOTH
enDbAudit / da = 1
enPlanAudit / pa = 1
```

4. Show the help for the “until days” setting by running the following command:

```
optman show ud
```

5. Change the untilDays setting to 5 days by running the following command.

```
optman chg ud=5
```



Hint: You learn more about “until days” in unit 5.

Exercise 3 Setting global options

Unit 4 Upgrading Workload Scheduler exercises

In the exercises for this unit, you search for software compatibility, and find any fixes that are needed for Workload Scheduler, if internet access is available. You perform the following tasks.

- Check for computer compatibility with Workload Scheduler releases
- Automate agent updates
- Create a centralized agent update job
- Search and download fixes
- Find and verify the file system where Workload Scheduler is installed
- Run the pull info script

Exercise 1 Checking computer compatibility

In this exercise, you check whether the Workload Scheduler release runs on specified systems.



Attention: This exercise requires an internet connection. You can use a browser that is not in the learning environment to complete the exercise.

1. Open a web browser and go to the following address.

<https://www.ibm.com/software/reports/compatibility/clarity/index.html>

The screenshot shows the IBM Software Product Compatibility Reports landing page. The left sidebar includes links for Operating systems, Related software, Hypervisors, Translations, Detailed system requirements, Hardware requirements, and End of service. The main content area features a colorful graphic of overlapping squares and the text "Over 200,000 reports per month." Below this are three main sections: "High-level reports about products related to [blue asterisk]", "Select a product. Get the list of the operating systems that it supports.", and "Select an operating system. Get the list of products that run on it.". The third section has a red box around the "Create a report" button. At the bottom, there are sections for "In-depth reports", "Detailed system requirements", "Hardware requirements", and "End of service".

2. In the section titled **Select a product**, click **Create a report**.
3. On the “Operating systems for a specific product” page, type **Workload Scheduler** in the **Full or partial product name** field, and click **Search product**. ()
4. In the **Search results** list, click **IBM Workload Scheduler**.
5. Select **Show fix packs**, and from the **Version** menu, select **9.4.0**.

Exercise 1 Checking computer compatibility

6. Click **Submit**. The **Software Product Compatibility Report** opens in a new browser window.

The screenshot shows the 'Operating systems for a specific product' section of the IBM Software Product Compatibility Reports. The left sidebar includes links for Operating systems, Related software, Hypervisors, Translations, Detailed system requirements, Hardware requirements, and End of service. The main content area has a heading 'Operating systems for a specific product'. It includes a note about supported operating systems for a specific business, instructions to select a product from a search results list, and a note about maintenance levels. A search bar contains 'Workload Scheduler' and a magnifying glass icon. Below it is a scrollable list of search results: 'IBM Workload Scheduler', 'IBM Workload Scheduler for z/OS', 'Tivoli Workload Scheduler', 'Tivoli Workload Scheduler distributed - Agent for z/OS', 'Tivoli Workload Scheduler for Applications', 'Tivoli Workload Scheduler for z/OS', 'Tivoli Workload Scheduler for z/OS Agent', and 'Tivoli Workload Scheduler LoadLeveler for AIX'. A 'Version:' dropdown menu is set to '9.4.0' with a 'Show fix packs' checkbox checked. A 'Filters' section contains links for 'Operating system platforms' and 'Product components'. A 'Submit' button is at the bottom.

- In the Software Compatibility Reports window, scroll down to the **Linux** section, and click **Detailed system requirements**.

Product Compatibility Reports

Product
IBM Workload Scheduler 9.4.0

Operating Systems

Report filters

Available Reports

9.4.0 initial version

Detailed system requirements

Legend

- Component Support
 - Full
 - Partial
 - None
- Utilities
 - Regenerate Anytime
 - Print
 - Download PDF
- Notes
 - Data as of 2017-07-26 01:21:05 CDT
 - Disclaimers
 - New Design!
 - View new features

Show notes | Hide notes

↓ AIX ↓ IBM i ↓ Solaris ↓ Windows ↓ z/OS

↓ HP ↓ Linux

Operating System	Operating System Minimum	Hardware	Bitness	Product Minimum	Components	Notes	Details
AIX 7.1	Base	POWER System - Big Endian	64-Exploit	9.4.0	Full	No	View
AIX 7.2	Base	POWER System - Big Endian	64-Exploit	9.4.0	Full	No	View

↑ AIX ↓ IBM i ↓ Solaris ↓ Windows ↓ z/OS [Back to top](#)

[Filter](#) [View new features](#)

- Click **Proceed** to generate a detailed system requirements report. A new window opens to show the report.
- In the IBM Workload Scheduler 9.4.0 Detailed System Requirements window, review the report results in each of the following tabs.
 - Operating Systems
 - Hypervisors
 - Prerequisites
 - Supported Software
 - Hardware

Exercise 1 Checking computer compatibility

The screenshot shows the IBM Software Product Compatibility Reports interface for the IBM Workload Scheduler 9.4.0 product. The top navigation bar includes the IBM logo and the title "Software Product Compatibility Reports". Below the title, the product name "IBM Workload Scheduler 9.4.0" is displayed. A section titled "Detailed System Requirements" contains a "Report filters" button. The main content area is divided into sections: "Available Reports" (listing "9.4.0 initial version"), "Utilities" (with links to "Regenerate Anytime", "Download PDF", and "Print"), and "Notes" (displaying "Data as of 2017-07-26 01:21:05 CDT", "Disclaimers", and "New Design!"). A navigation bar at the bottom includes tabs for "Operating Systems" (selected), "Hypervisors", "Prerequisites", "Supported Software", "Hardware", and "Packaging List". A note indicates "Show notes" or "Hide notes". The "Linux" section is expanded, showing a table with the following data:

Operating System	Operating System Minimum	Hardware	Bitness	Product Minimum	Components	Notes	Details
CentOS 7	Base	x86-64	64-Exploit	9.4.0	● ●	No	View
Oracle Enterprise Linux 7	Base	x86-64	64-Exploit	9.4.0	● ●	(1)	View
Red Hat Enterprise Linux (RHEL) Server 6	6.1	IBM z Systems	64-Exploit	9.4.0	● ●	No	View

10. Close the browser windows.

Exercise 2 Automating agent updates

In this exercise, you update an agent, and create a Workload Scheduler job that updates agent software.

Task 1 Updating AGENT2

Complete the following steps to update AGENT2.

1. In a terminal window, verify that an update package exists in the depot directory:

```
ls -l /opt/IBM/TWA/TWS/depot/agent
```

2. Change to the browser window that runs the Dynamic Workload Console, and log in to the Workload Console with user name **hdold** and password **object00**.
3. From the **System Status and Health** menu, select **All Configured Tasks**.

Exercise 2 Automating agent updates

- On the All Configured Tasks page, click **All Workstations in plan (Distributed)**.

The screenshot shows the 'All Configured Tasks' page in a web-based interface. At the top, there is a navigation bar with links for Default, Administration, Planning, Reporting, Samples, System Configuration, and System Status and Health. Below the navigation bar, the title 'WELCOME TO DWC' and 'ALL CONFIGURED TASKS' are displayed. The main content area is titled 'All Configured Tasks' and contains a list of tasks. The tasks are listed in a table with columns: Task Name, Task Type, Engine Name, Engine Type, Plan, Task Owner, Shared, and a checkbox column. One task, 'All Workstations in plan (Distributed)', is highlighted with a red box around its checkbox and row.

	Task Name	Task Type	Engine Name	Engine Type	Plan	Task Owner	Shared
<input type="checkbox"/>	All Job Streams in plan (zOS)	Monitor Job Stream	Ask when needed	z/OS		smadmin	None
<input type="checkbox"/>	All Job Streams in plan in Error or W	Monitor Job Stream	Ask when needed	Distributed		smadmin	None
<input type="checkbox"/>	All Job Streams in plan in Error or W	Monitor Job Stream	Ask when needed	z/OS		smadmin	None
<input type="checkbox"/>	All Jobs in plan (Distributed)	Monitor Jobs	Ask when needed	Distributed		smadmin	None
<input type="checkbox"/>	All Jobs in plan (zOS)	Monitor Jobs	Ask when needed	z/OS		smadmin	None
<input type="checkbox"/>	All Jobs in plan in Error or Waitin	Monitor Jobs	Ask when needed	Distributed		smadmin	None
<input type="checkbox"/>	All Jobs in plan in Error or Waitin	Monitor Jobs	Ask when needed	z/OS		smadmin	None
<input type="checkbox"/>	All Operator Messages	Monitor Operator M	Ask when needed	Distributed		smadmin	None
<input type="checkbox"/>	All Prompts in plan	Monitor Prompts	Ask when needed	Distributed		smadmin	None
<input type="checkbox"/>	All Resources in plan (Distribut	Monitor Resources	Ask when needed	Distributed		smadmin	None
<input type="checkbox"/>	All Resources in plan (zOS)	Monitor Resources	Ask when needed	z/OS		smadmin	None
<input type="checkbox"/>	All Triggered Actions	Monitor Triggered A	Ask when needed	Distributed		smadmin	None
<input type="checkbox"/>	All Workstations in plan (Distribut	Monitor Workstation	Ask when needed	Distributed		smadmin	None
<input type="checkbox"/>	All Workstations in plan (zOS)	Monitor Workstation	Ask when needed	z/OS		smadmin	None

- On the Choose Engine page, click **OK**.

6. Select **AGENT2**, and choose **Update Agent** from the **More Actions** menu.

The screenshot shows the 'All Workstations in plan (Distributed)' page. The 'More Actions' menu for AGENT2 is open, displaying options like 'Raise Event...', 'Table Criteria...', 'Jobs...', 'Job Streams...', 'Resources...', 'Files...', 'Become Master Domain Manager', 'Become Event Processor', 'Start Event Processor', 'Stop Event Processor', 'Start Event Monitoring', 'Stop Event Monitoring', 'Monitoring Configuration...', 'Properties...', 'Check Health Status...', 'Collect Agent Logs', 'Update Agent', and 'Recent Activity'. The 'Update Agent' option is highlighted.

Running	Start Time	Run Number	Limit	Domain
	8/29/17 9:34 AM E 107	11	MASTERDM	
	8/29/17 9:34 AM E 107	11	MASTERDM	
	8/29/17 9:34 AM E 107	97	MASTERDM	
	8/29/17 9:34 AM E 107	97	MASTERDM	
	8/29/17 9:34 AM E 107	97	MASTERDM	
	8/29/17 9:34 AM E 107	11	MASTERDM	
	8/29/17 9:34 AM E 107	11	MASTERDM	
	8/29/17 9:34 AM E 107	11	MASTERDM	
	8/29/17 9:34 AM E 107	11	MASTERDM	
	8/29/17 9:34 AM E 107	11	MASTERDM	
	8/29/17 9:34 AM E 107	11	MASTERDM	
	8/29/17 9:34 AM E 107	11	MASTERDM	

7. On the All Configured Tasks page, click **Accept** to accept the terms of the License Agreement.

Exercise 2 Automating agent updates

8. On the Monitor Workstations page, you see the message “The update was started on workstation **AGENT2**”. Click **Yes**. You see the All Operator Messages page, which displays messages about the update.

The screenshot shows the IBM Workload Scheduler interface with the following details:

- Header:** Default ▾, Administration ▾, Planning ▾, Reporting ▾, System Configuration ▾, System Status and Health ▾, Troubleshooting and Monitoring ▾.
- Left Navigation:** MONITOR WORKLOAD x, MONITOR WORKSTATIONS x.
- Title:** All Operator Messages (Owner: smadmin; Engine: WS94d,Distributed)
- Buttons:** Close, Plan Name: Current Plan.
- Toolbar:** Filter icons (refresh, search, sort, etc.) and columns headers: Severity, Time Stamp, Message Text.
- Table:** A list of operator messages. Each message includes a severity icon (blue info icon), timestamp, and message text. The messages describe the backup and update process for Agent3 on various dates.
- Page Control:** Lines per page dropdown set to 25, navigation buttons (1 <<, 1, >>, 10).

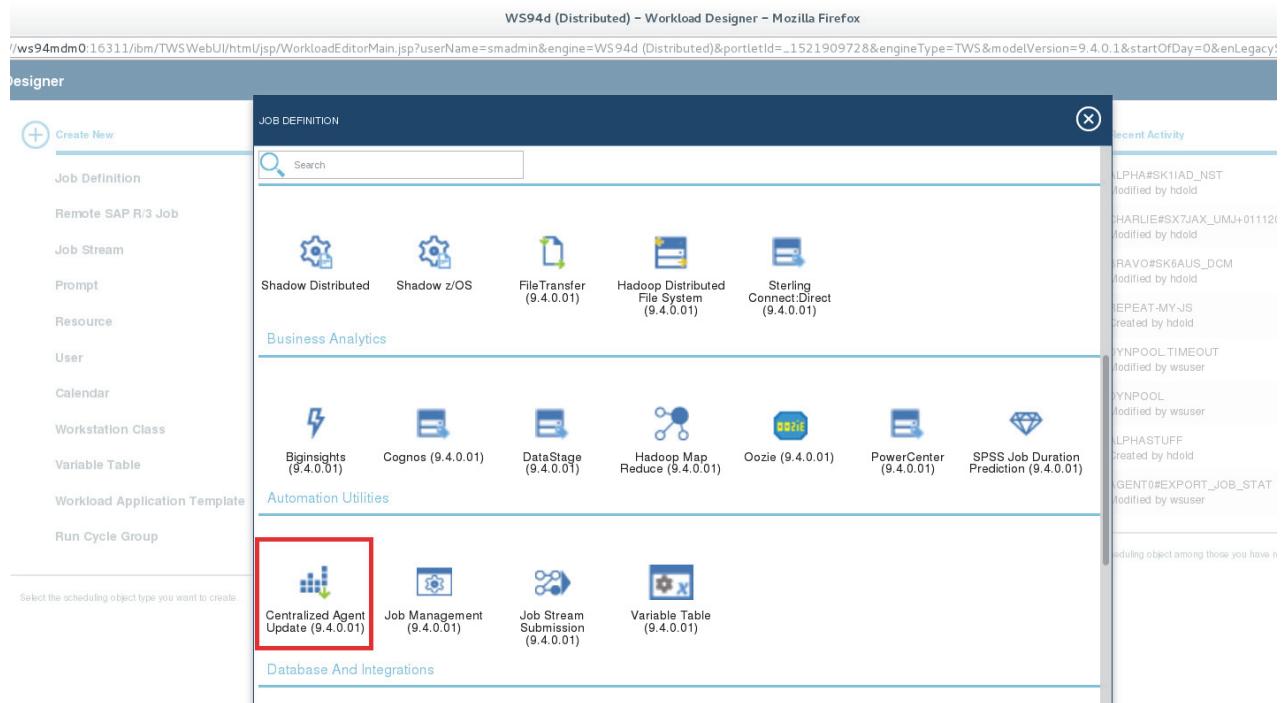
Severity	Time Stamp	Message Text
Information	8/29/17 5:05 PM	E Update agent AGENT3: Performing a backup.
Information	8/29/17 5:05 PM	E Update agent AGENT3: The job to run backup and update has been submitted.
Information	8/29/17 5:05 PM	E Update agent AGENT3: The agent package extraction operation is complete in /home/wauser/TWA/TWS/stdlist/JM/download.
Information	8/29/17 5:04 PM	E Update agent AGENT3: Extracting LINUX_X86_64-X86_64 agent package.
Information	8/29/17 5:04 PM	E Update agent AGENT3: The agent package download is complete (483223888 bytes): /home/wauser/TWA/TWS/stdlist/JM/downl
Information	8/29/17 5:03 PM	E Update agent AGENT3: Checking and downloading LINUX_X86_64-X86_64 agent package.
Information	8/29/17 5:03 PM	E Update agent AGENT3: Sufficient disk space is available in the /home/wauser/TWA/TWS/stdlist/JM/download directory.
Information	8/29/17 5:03 PM	E Update agent AGENT3: Verifying if enough disk space is available to download and extract the LINUX_X86_64-X86_64 agent in th
Information	8/17/17 5:10 PM	E JOB=ALPHA#SK1DFW_TMK.J1DFW_CHEER_33560 STATE=ABEND
Information	8/8/17 12:02 AM	E JOB=ECHO#SE5LGA_PHH.J5LGA_GEODE_35063 STATE=ABEND
Information	8/8/17 12:02 AM	E JOB=ECHO#SM5BWI_MSR.J5BWI_GUILDE_28976 STATE=ABEND
Information	8/8/17 12:02 AM	E JOB=BRAVO#SE6BWI_SML.J6BWI_SPACE_33493 STATE=ABEND
Information	8/8/17 12:02 AM	E JOB=ALPHA#SK1DFW_TMK.J1DFW_AROMA_32530 STATE=ABEND
Information	8/8/17 12:02 AM	E JOB=CHARLIE#SM2MCO_KBC.J2MCO_IGLOO_33638 STATE=ABEND
Information	8/7/17 10:54 PM	E JOB=CHARLIE#USERJOBS.J2MCO_LOFTY_33606 STATE=ABEND

9. Click **Close**.

Task 2 Creating a Centralized Agent Update job

Complete the following steps to create a job definition that updates workstation AGENT1.

1. Select **Manage Workload Definitions** from the **Administration** menu. The **Workload Designer** opens in a new browser window.
2. In the Workload Designer, in the **Create New** column, click **Job Definition**.
3. In the Job Definition window, scroll down to the **Automation Utilities** section, and click **Centralized Agent Update (9.4.0.1)**.



4. Complete the following fields in the **Centralized Agent Update** job definition, as shown in the following table.

Table 1 Centralized Agent Update job details

Tab	Field	Value
General	Name	UPDAGENT1
	Workstation	AGENT0
Connection	Hostname	ws94mdm0
	Port	31116
	Protocol	https
	User name	wsuser
	Password	object00
Action	Value	AGENT1

Exercise 2 Automating agent updates

- a. On the **Connection** tab, click **Test connection** to verify the connectivity options.
 - b. On the **Action** tab, you can click **Select** to choose the workstations to update.
5. Click **Save** to store the job definition.

By using the Centralized Agent Update job, you can schedule agents to happen by adding your job to a job stream.

Exercise 3 Downloading fixes

In this exercise, you find any fixes that are needed for Workload Scheduler, if internet access is available. If internet access is unavailable, you can skip this exercise and proceed to the next exercise.

Perform the following steps to find and download fixes for Workload Scheduler.

1. Open a browser tab, and go to the following address. <http://www.ibm.com/support/fixcentral>
2. Type **Workload Scheduler** in the **Product selector** field. Click **Tivoli Workload Scheduler** in the list of products.

The screenshot shows the IBM Fix Central homepage. The URL in the address bar is https://www-945.ibm.com/support/fixcentral. The page title is "Fix Central". The navigation menu includes "IBM Support", "My support", "Downloads", "Documents", and "Tickets". Below the menu, a breadcrumb trail shows "IBM Support > Fix Central >". A large blue header bar contains the "Fix Central" title. The main content area has a sub-header "Fix Central provides fixes and updates for your system's software, hardware, and operating system. Not looking for fixes or updates? Please visit Passport Advantage to download most purchased software products, or My Entitled Systems Support to download system software." It also includes a link "Getting started with Fix Central" and two buttons: "Find product" and "Select product".

Fix Central provides fixes and updates for your system's software, hardware, and operating system. Not looking for fixes or updates? Please visit [Passport Advantage](#) to download most purchased software products, or [My Entitled Systems Support](#) to download system software.

For additional information, click on the following link.

[Getting started with Fix Central](#)

The screenshot shows a dropdown menu for "Product selector*" with the input field containing "Workload Scheduler". The dropdown list includes "Tivoli Workload Scheduler" (which is highlighted), "Tivoli Workload Scheduler for Applications", "Tivoli Workload Scheduler for z/OS", and "LoadLeveler".

3. Select **9.4.0** from the **Installed Version** menu.
4. Select **Linux** from the **Platform** menu.
5. Click **Continue**.

Exercise 3 Downloading fixes

6. On the “Identify fixes” page, select **Browse for fixes**, and click **Continue**.

Identify fixes

Tivoli, Tivoli Workload Scheduler (9.4.0, Linux)

Search for fixes for your specific product, type, and platform or search for a fix by ID.

<input checked="" type="radio"/> Browse for fixes	Browse for all fixes for your specific product, release, and platform.
<input type="radio"/> APAR or SPR	Search for fixes by entering one or more APAR or SPR numbers each separated by a comma. (e.g. PK10998). <input type="text"/>
<input type="radio"/> Individual fix IDs	Search for updates by entering one or more fix IDs each separated by a comma. (e.g., ibm_fw_aacraid_8kl-5.2.0-15411_linux_32-64). <input type="text"/>
<input type="radio"/> Text	Search for fixes containing all the entered key words, such as problem area, exception, or message ID, in any order. <input type="text"/>

Additional query options

7. On the “Select fixes” page, you can see the fixes that are available for Workload Scheduler 9.4 that runs on Linux.

Exercise 4 Maintaining the file systems

In this exercise, you check the computer file systems and run the `tws_inst_pull_info` script.

Task 1 Checking the file system

Perform the following steps to check the file system where Workload Scheduler is installed.

1. Open a terminal window (or switch to one that is open).
2. Search the Workload Scheduler registry to find the installation path.
`grep InstallationPath /etc/TWS/TWSRegistry.dat`
3. Use the `df` command to check the free space on the file system that contains Workload Scheduler.
`df -h /opt/IBM/TWA/TWS`

Task 2 Running the pull info script

Perform the following steps to run the pull info script.

1. Open a terminal window (or switch to one that is open).
2. Run the pull info script with no arguments so that you see the usage message.
`tws_inst_pull_info.sh`
3. Run the script again, passing arguments as shown in the following example.



Example: Running `tws_inst_pull_info`

```
[wsuser@ws94mdm0 ~]$ tws_inst_pull_info.sh -twsuser wsuser -twsdir  
/opt/IBM/TWA/TWS -log_dir_base /var/tmp -nodbdefs -nowas  
Valid directory name for -twsdir specified TWS  
*****Gathering Workstation specific information.*****  
*****Gathering TWS specific information.*****  
*****Gathering select DB2 information.*****  
*****Gathering TWA install information .*****  
/opt/IBM/TWA/TWS/bin/tws_inst_pull_info.sh: line 3401: [: /tmp/TWA: binary  
operator expected  
*****Gathering ALL TWA instance information .*****
```

**Note: `/var/tmp/tws_info/TWS_20170830_164308` may contain root owned files.

Send `/var/tmp/tws_info/TWS_20170830_164308.tar.gz` to L2 support see below:

Datagather file is greater than 10 MB.

Please send using ftp, SR, or through the upload URL.

For upload details, latest script and datagather usage:

<http://www.ibm.com/support/docview.wss?uid=swg21295038>

4. Change to the `/var/tmp/tws_info` directory, where the script created a directory and a compressed file.
5. View the contents of the directory by running the `find` command as shown in the following example.

`find | less`

Unit 5 Managing the production plan exercises

In the exercises for this unit, you practice resetting the plan and generating a new one. You learn the effects of resetting the plan and scratching it. After you create a new plan, you allow new workloads to run, then reset the plan, and observe the results. Then, you scratch the plan and observe the results of the same actions as before so that you see the difference between resetting and scratching plan with the same workload plans.

Exercise 1 Checking the production plan

In this exercise, you get plan information and extend the plan for 1 minute.

To view plan information and extend the plan for 1 minute, perform the following steps.

1. Open a Terminal window, or switch to one that is already open.
2. Run `planman showinfo` to see the status of the plan. Note the settings:

– Plan creation start time:

– Production plan end time:

– Preproduction plan end time:

– Run number:

3. Run the following command to list the last job streams that completed successfully:

```
conman 'ss @##+state=succ'
```

4. Extend the plan for 1 minute, by running the following commands:

```
cd /opt/IBM/TWA/TWS  
./JnextPlan -for 0001
```

5. Review the last job streams that completed successfully:

```
conman 'ss @##+state=succ'
```

6. Run `planman showinfo` to see the status of the plan. Note the settings, and compare them with the results from [Step 2](#):

– Plan creation start time:

– Production plan end time:

– Preproduction plan end time:

– Run number:

Exercise 1 Checking the production plan

Exercise 2 Resetting the plan

In this exercise, you reset the plan and verify the results.

To scratch the production plan, and create a new one, perform the following steps.

1. Open a Terminal window, or switch to one that is already open.
2. Scratch the plan and create a plan by entering these commands (confirming the reset by answering **y**):

```
cd /opt/IBM/TWA/TWS
./ResetPlan -scratch
./JnextPlan
```
3. Start the **conman** program, and enter these commands at the percent prompt (%):

Table 1 Complete a job stream

Command	Function
lc @;11;noask	Set the workstation limit to 11 so that jobs can start
sj agent0#@	View the status of jobs that run on workstation AGENT0
sj agent0#@	Repeat the previous command until jobs in the ELAB_JOB_STAT_JS job stream complete
exit	Leave the conman command, and return to the shell

4. In [Step 3](#), you saw that the ELAB_JOB_STAT_JS job stream was selected to run, and completed successfully. If the plan is reset, should the ELAB_JOB_STAT_JS job stream be run again? To learn the outcome, apply the following commands. Do not use the scratch option, and confirm the reset by answering 'y' at the request.

```
./ResetPlan
./JnextPlan
```

5. Perform the tasks in [Table 2](#) to see the result of the ELAB_JOB_STAT_JS job stream. Run **conman**, and at the percent prompt (%), enter these commands:

Table 2 Checking the status of jobs in the plan

Command	Function
lc @;11;noask	Set the workstation limit to 11 so jobs can start
sj agent0#@	View the status of jobs that run on workstation AGENT0
exit	Leave the conman program, and return to the shell

Exercise 2 Resetting the plan

6. Because the ELAB_JOB_STAT_JS job stream was marked complete, it is not selected again, even though the plan was reset. Because the ELAB_JOB_STAT_JS is the only job stream that runs on AGENT0, no objects are displayed.
7. Scratch the plan and repeat the same steps to observe the result. Reset and scratch the plan, and create a plan by running the following commands. This time, use the *scratch* option:

```
./ResetPlan -scratch  
./JnextPlan
```
8. Check the results by viewing the ELAB_JOB_STAT_JS job stream that completed successfully before. Start the **conman** program, and enter these commands at the percent prompt (%):

Table 3 Complete a job stream

Command	Function
lc @;11;noask	Set the workstation limit to 11 so that jobs can start
sj agent0#@	View the status of jobs that run on workstation AGENT0
sj agent0#@	Repeat the previous command until jobs in the ELAB_JOB_STAT_JS job stream complete
exit	Leave the conman command, and return to the shell

Exercise 3 Extending the plan

In this exercise, you extend the plan for two working days and observe the results.

1. Switch to the Terminal window to see the shell prompt.

2. Enter the following command (all one line) to extend the plan for two work days:

```
./JnextPlan -to $(datecalc today +2 workdays pic mm/dd/yyyy) 1000 TZ  
America/New_York
```

3. Run the following command to see the occurrences of the ELAB_JOB_STAT_JS job stream.
You see that multiple copies exist.

```
conman 'ss AGENT0#@'
```

4. You can check the **Scheduled time** column to see the dates of the job stream occurrences.

Exercise 3 Extending the plan

Exercise 4 Automating the production cycle

In this exercise, you customize the FINAL job stream template, and add it to the database.

To customize the FINAL job stream, perform the following steps.

1. Open a Terminal window, or switch to one that is already open.

2. Change to the Workload Scheduler home directory.

```
cd /opt/IBM/TWA/TWS
```

3. Edit the file that is named **Sfinal**, and make the following changes.

- On line 3, change AT 2359 to **AT 0959**.
- On line 42, change SCHEDTIME 2359 to **SCHEDTIME 0959**.

4. Add the jobs and job streams that are defined in **Sfinal** to the database by running `composer add Sfinal`, as shown in the following example.



Example: Running composer

```
[wsuser@ws94mdm0 TWS]$ composer add Sfinal
IBM Workload Scheduler(UNIX) /COMPOSER 9.4.0.01 (20170626)
Licensed Materials - Property of IBM* and HCL**
5698-WSH
(C) Copyright IBM Corp. 1998, 2016 All rights reserved.
(C) Copyright HCL Technologies Ltd. 2016, 2017 All rights reserved.
* Trademark of International Business Machines
** Trademark of HCL Technologies Limited
Installed for user "wsuser".
Locale LANG set to the following: "en"
User: wsuser, Host:127.0.0.1, Port:31116
User: wsuser, Host:ws94mdm0, Port:31116
-add Sfinal
AWSJCL003I The command "add" completed successfully on object
"jd=MDM0#STARTAPPSERVER".
AWSJCL003I The command "add" completed successfully on object "jd=MDM0#MAKEPLAN".
AWSJCL003I The command "add" completed successfully on object "jd=MDM0#SWITCHPLAN".
AWSJCL003I The command "add" completed successfully on object "js=MDM0#FINAL".
AWSJCL003I The command "add" completed successfully on object "jd=MDM0#CHECKSYNC".
AWSJCL003I The command "add" completed successfully on object
"jd=MDM0#CREATEPOSTREPORTS".
AWSJCL003I The command "add" completed successfully on object
"jd=MDM0#UPDATESTATS".
AWSJCL003I The command "add" completed successfully on object
"js=MDM0#FINALPOSTREPORTS".
AWSBIA288I Total objects updated: 8
```

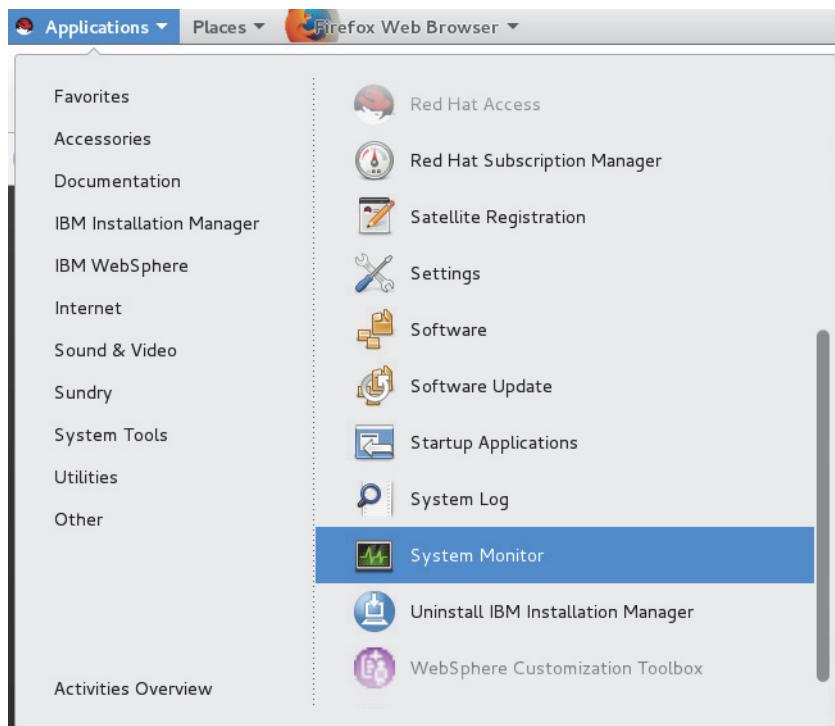
Unit 6 Running agent processes exercises

In the exercises for this unit, you explore the computer system and find which processes are affected by Workload Scheduler. You also customize a user's job environment.

Exercise 1 Inspecting processes

In this exercise, you view the operating system process table and find the relationships between the Workload Scheduler agent processes.

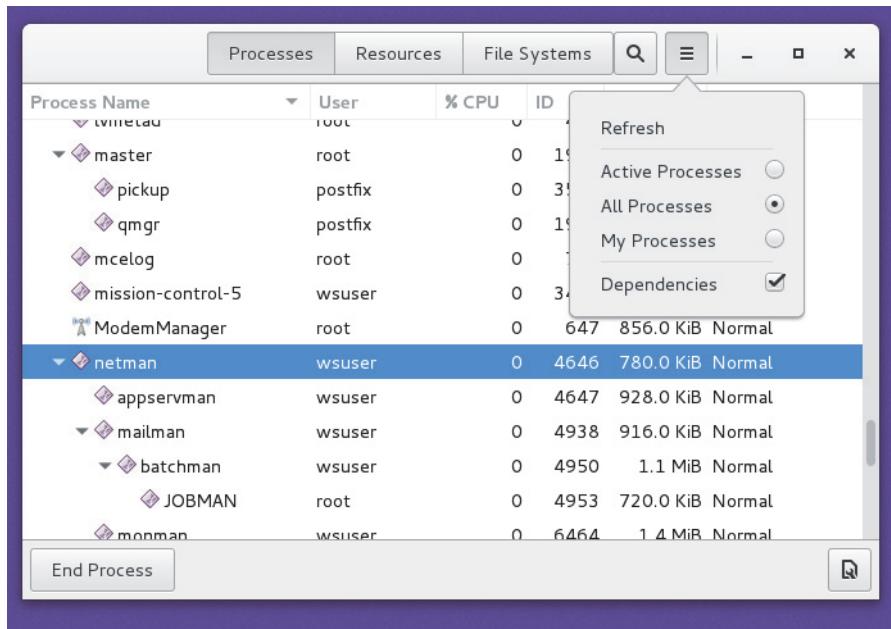
1. From the taskbar at the top of the desktop, click **Applications** to show the desktop system menu.
2. Select **System Tools > System Monitor** from the **Applications** menu.



3. In the System Monitor, click the **Processes** tab. You see a list of some system processes.
4. Select any process in the list.
5. From the **View** menu, select **All processes**.

Exercise 1 Inspecting processes

- From the **View** menu, select **Dependencies**.



Now you can view the processes on the system and see their relationships to each other and the computer.

- Scroll down the list of processes to see the **netman** process that is owned by **wsuser**.
- Switch to a terminal window.
- Start the **conman** interface.



Hint: For the next exercises, you use the **conman** command-line interface. You see a percent prompt (%) instead of the shell prompt. The percent sign (%) that you see in the exercise instructions signify that the command you run is a **conman** command.

- Submit a long running job by using the following console manager command:
% sbd "ping -c 199 localhost"
- Minimize the terminal window so that you can see the list of processes in the System Monitor.
- Find the **ping** process. On the **jobmanrc** process that is the parent of ping, right-click, and click **Open Files** from the menu. You see a list of files held open by the job that is running.
- Click **Close** after you review the list.
- Check the list of files that are opened by the **mailman** process. Notice the files with names that end in **msg**.
- Close the list after your review.

16. Scroll to the top of the process list to see the processes that are used by the dynamic **agent**. If you watch carefully, you can see the hardware scanner processes starting and stopping.
17. Optionally, submit a long running job to the AGENT0 workstation to see the process tree that is created by jobs that run on dynamic agents.

```
% sbd AGENT0#"ping -c 199 localhost"
```

Exercise 1 Inspecting processes

Exercise 2 Starting and stopping Workload Scheduler components

In this exercise, you stop some of the Workload Scheduler processes and start them again by using the console manager.

1. Switch to the terminal window, where conman is running. Start conman if it is not running.

2. Run the following command to stop the processing on the master domain manager:

```
% stop MDM0;wait
```

3. Switch to the System Monitor and see that several processes that are owned by wsuser stopped, but others remain. List them here:
-

4. Switch to the terminal window and run the following conman command to shut down the other processes.

```
% shutdown;wait
```

5. Check in the System Monitor that no netman or monman process that is owned by wsuser remains.

6. Start the agents by entering the following command:

```
% start @;noask
```

7. Exit the conman program.

8. Exit the System Monitor.

Exercise 2 Starting and stopping Workload Scheduler components

Exercise 3 Configuring jobs

In this exercise, you customize the job environment of the **wsuser**.

1. Open a terminal window, or switch to one that is open.
2. Change to the home directory, by running the **cd** command.
3. Look at the value of the **MACHTYPE** environment variable by running the following command:
`echo $MACHTYPE`
4. Write its value here: _____
5. Submit a job to Workload Scheduler that displays the user environment by using the following command:
`conman 'sbd "env|sort"'`
6. Read the output of the job by running the following command:
`conman 'SJ JOBS.ENV;STDL'`
7. Notice that variable MACHTYPE does not exist in the environment for the job.
8. Create a file that is named **.jobmanrc** in the **wsuser** home directory:
`gedit .jobmanrc`
9. Inside the file, type the following content:
`#!/bin/bash
export MACHTYPE=x86_64-redhat-linux-gnu
eval $UNISON_JCL`
10. Save the file, and exit the **gedit** program.



Hint: The variable **\$UNISON_JCL** contains the command that is defined in the Workload Scheduler job definition. If you create a **.jobmanrc** script, you must in some way run the command that is held in the **\$UNISON_JCL** variable. Otherwise, the job runs, but the defined script or command does not run.

11. Set the **.jobmanrc** file to be an executable file by running the following command:
`chmod +x .jobmanrc`
12. Rerun the job by running the following command:
`conman 'rr jobs.env'`

Exercise 3 Configuring jobs

13. Check that the **MACHTYPE** environment variable was added to the job:

```
conman 'SJ JOBS.ENV;STDL'
```

14. Close the System Monitor window by selecting **Quit** from the **System Monitor** menu in the desktop taskbar.

Unit 7 Securing Workload Scheduler exercises

In the exercises for this unit, you set security and console roles for extra users. You configure WebSphere Application Server to disable the automatic generation of LTPA tokens.

Exercise 1 Getting and setting security properties

In this exercise, you review the security properties of the application server.

Task 1 Checking security properties with shell commands

1. Open a terminal window, or switch to the terminal window that is running.

2. Become the `root` user by running the `sudo` command.

```
sudo su -
```

3. Switch to the directory that contains the tools.

```
cd /opt/IBM/TWA/wastools
```

4. List the contents of the directory's shell scripts by running the `ls` command.



Example: Listing shell scripts

```
[root@ws94mdm0 wastools]# ls *sh
backupConfig.sh changeSecurityProperties.sh manage_ltpa.sh showHostProperties.sh
updateWas.sh brokerApplicationStatus.sh changeTraceProperties.sh
modifyThreadPool.sh showSecurityProperties.sh wasstart.sh
changeBrokerSecurityProperties.sh createCustomRegistryforPAM.sh restoreConfig.sh
startBrokerApplication.sh changeDataSourceProperties.sh DB2AlternateServer.sh
setEnv.sh startWas.sh changeHostProperties.sh encryptProfileProperties.sh
showBrokerSecurityProperties.sh stopBrokerApplication.sh changePassword.sh
InstallOracleDataSource.sh showDataSourceProperties.sh stopWas.sh
```

5. Before you change any configuration, preserve the current settings in a backup. To back up the settings, run the `backupConfig.sh` script.

```
./backupConfig.sh
```

You see that a file, named **WebSphereConfig_yyyy-mm-dd.zip**, is created.

6. Run the `showSecurityProperties.sh` command, and direct its output into a text file.

```
./showSecurityProperties.sh > security.props
```

Exercise 1 Getting and setting security properties

7. Display the contents of the file that was created in [Step 6](#).

```
less security.props
```

You see that the properties file contains basic configuration and authentication properties. However, because your learning environment uses federated repositories, the properties file does not contain relevant LDAP information.

Task 2 Checking security properties in the WebSphere Administrative Console

Complete the following steps to check the application security properties.

1. Change to the browser window.
2. From the browser home page, click the **WS WebSphere Console** link, or open the link at the following address.
<https://ws94mdm0:31124/ibm/console/logon.jsp>
3. Log in to the console with user name **wsuser** and password **object00**. You see the WebSphere Integrated Solutions Console main page.
4. From the **Security** menu, select **Global Security**. You see the Global Security page.
5. Select **Federated repositories** from the **Available realm definitions** menu and click **Configure**.

Select	Base Entry	Repository Identifier	Repository Type
<input type="checkbox"/>	o=defaultWIMFileBasedRealm	InternalFileRepository	File
<input type="checkbox"/>	o=tirealm	LDAP1	LDAP:IDS
<input type="checkbox"/>	o=twaPAM	twaPAM	Custom

6. Click the link that is labeled **LDAP1** in the **Repositories in the Realm** table.
7. On the **Global security > Federated repositories > LDAP1** page, you see the configuration that accesses the Lightweight Directory Access Protocol (LDAP) directory.
8. Click **Cancel** to return to the **Global security > Federated repositories** page without changing any settings.
9. Click **Cancel** to return to the “Global security” page.

Task 3 Listing available users and groups

To list groups that you can use to define authorization roles, perform the following steps.

1. From the **Users and Groups** menu, select **Manage Groups**. You see the **Manage Groups** page.
2. Scroll through the list of groups. You see groups that are defined to the operating system, and the groups that are defined in the LDAP directory.
3. In the **Search for** field, enter **tws*** and click **Search**. You see four groups in the directory that match the search.
4. Click **twsAdministrators**. You see the Group Properties page for the **twsAdministrators** group.
5. Click the **Members** tab. You see the users that are members of the **twsAdministrators** group.
6. From the **Users and Groups** menu, select **Manage Users**.
7. Scroll through the list of users. You see users that are defined to the operating system, and the users that are defined in the LDAP directory.
8. In the **Search for** field, enter ***dola** and click **Search**. You see one user that matches.
9. Click **mlamendola**. You see the User Properties page.
10. Click the **Groups** tab. You see the list of groups of which **mlamendola** is a member.

Exercise 2 Managing LTPA keys

In this exercise, you configure the use of the same Lightweight Third-Part Authentication (LTPA) token keys between the Dynamic Workload Console and the engine.

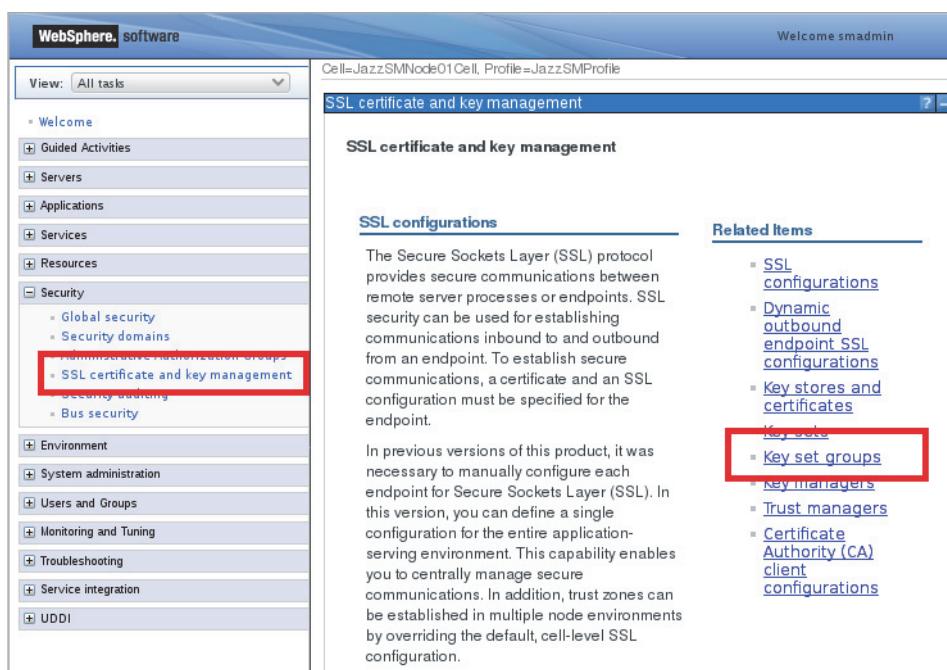
The WebSphere Application Server uses the Lightweight Third-Part Authentication (LTPA) mechanism to propagate user credentials. If you are configuring Single Sign-On between the Dynamic Workload Console and the Workload Scheduler engine, you must configure all instances of WebSphere Application Server that are involved to use the same LTPA token keys.

You must also disable the automatic generation of LTPA token keys at both ends of the communication.

Task 1 Disabling automatic key generation in the WebSphere Administrative Console

Complete the following steps to disable the automatic generation of LTPA token keys at both ends of the communication.

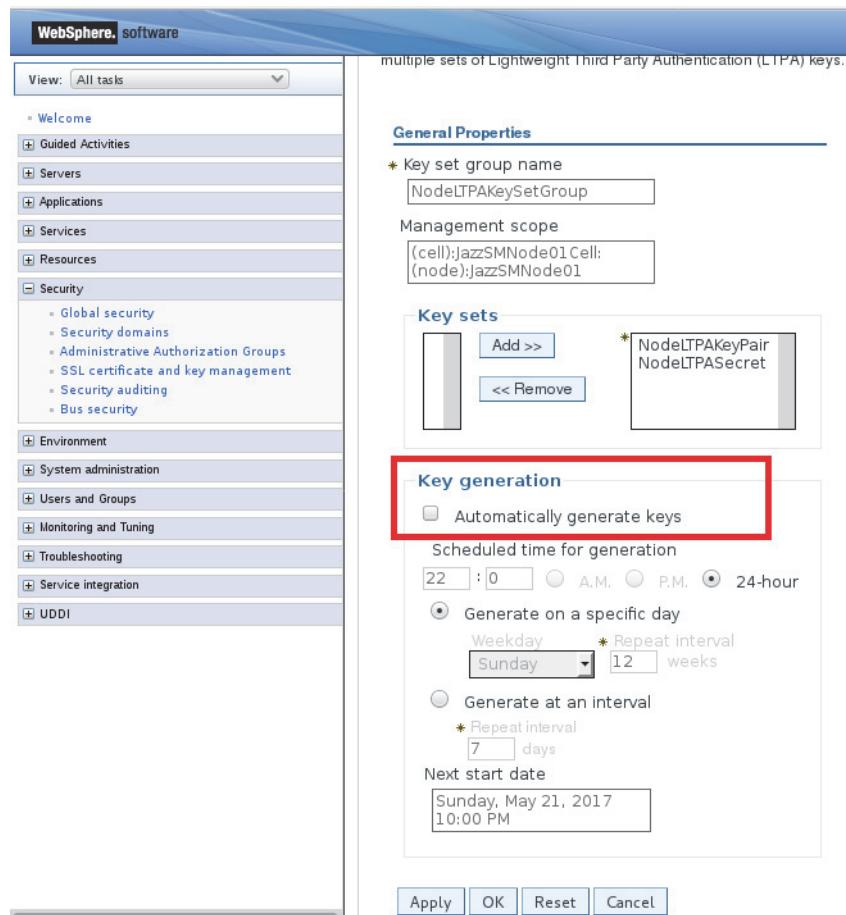
1. Change to the browser window.
2. From the browser home page, click the **DASH WebSphere Console** link, or open the link at the following address.
<https://ws94mdm0:16316/ibm/console/logon.jsp>
3. Log in to the console with user name **smadmin** and password **object00**. You see the WebSphere Integrated Solutions Console main page.
4. From the **Security** menu, select **SSL certificate and key management**. You see the “SSL certificate and key management” page.
5. Click the **Key set groups** link in the **Related items** section.



The screenshot shows the WebSphere Integrated Solutions Console interface. The left sidebar lists various administrative tasks under 'View: All tasks'. The 'Security' section is expanded, and 'SSL certificate and key management' is selected, also highlighted with a red box. The main content area displays the 'SSL certificate and key management' page. On the right, a 'Related items' sidebar lists several configuration links, with 'Key set groups' also highlighted with a red box.

6. Click the name of the key set group (usually **NodeLTPAKeySetGroup**) that is displayed in the list.

7. Clear the **Automatically generate keys** check box, and click **OK**.



8. On the **SSL certificate and key management > Key set groups** page, click **Save**.



Attention: Automatic key generation is already disabled in the learning environment. In your environment, you must perform the preceding task in all instances of WebSphere Application Server that are involved in Single Sign-On.

Task 2 Exporting and importing LTPA keys by using the WebSphere Administration console

To export LTPA keys from the Jazz for Service Management profile, and import them into the Workload Scheduler profile, perform the following steps.

1. From the **Security** menu, click **Global Security**.
2. On the Global Security page, click **LTPA** in the Authentication section.

The screenshot shows the 'Global security' configuration page. The 'Authentication' section is expanded, showing the 'LTPA' radio button selected. Other options like 'Kerberos and LTPA' and 'SWAM (deprecated)' are also listed. Below the authentication section, there are links for 'Security domains', 'External authorization providers', 'Programmatic session cookie configuration', and 'Custom properties'. At the bottom left, there are 'Apply' and 'Reset' buttons.

3. On the **Global Security > LTPA** page, perform the following steps.
 - a. Enter the password **object00** in the **Password** and **Confirm password** fields.
 - b. Enter **/tmp/ltpa.key** in the **Fully qualified key file name** field.
 - c. Click **Export keys**. You see the message, "The keys were successfully exported to the file /tmp/ltpa.key."

Global security

Global security > LTPA

Encrypts authentication information so that the application server can send the data from c encryption of authentication information that is exchanged between servers involves the L

Key generation

Authentication data is encrypted and decrypted by using keys that are kept in one or more key sets.

Key set group: NodeLTPAKeySetGroup ▾ [Generate keys](#)

[Key set groups](#)

LTPA timeout

LTPA timeout value for forwarded credentials between servers: 1440 minutes

Cross-cell single sign-on

Single sign-on across cells can be provided by sharing keys and passwords. To share a key file, and click Export keys. Then, log on to the other cell, specify the key file, and click Import keys.

* Password: (redacted)

* Confirm password: (redacted)

Fully qualified key file name: /tmp/ltpa.key

[Import keys](#) [Export keys](#) (red box)

[Apply](#) [OK](#) [Reset](#) [Cancel](#)

4. Click **OK** to return to the Global Security page.
5. On the **Global Security** page, click **Save** to store changes.
6. Click **Logout** to log out of the Jazz for Service Management WebSphere Application Server Administration console.

Complete the following steps to import the LTPA keys.

1. From the browser home page, click the **WS WebSphere Console** link, or open the link at the following address.
<https://ws94mdm0:31124/ibm/console/logon.jsp>



Hint: You can change the port number in the address field to 31124 to log in.

2. Log in to the console with user name **wsuser** and password **object00**. You see the WebSphere Integrated Solutions Console main page.

Exercise 2 Managing LTPA keys

3. From the **Security** menu, select **Global Security**. You see the Global Security page.
4. On the Global Security page, click **LTPA** in the Authentication section.
5. On the **Global Security > LTPA** page, perform the following steps.
 - a. Enter the password **object00** in the **Password** and **Confirm password** fields.
 - b. Enter **/tmp/ltpa.key** in the **Fully qualified key file name** field.
 - c. Click **Import keys**. You see the message, “The keys were successfully imported from the file /tmp/ltpa.key. Changes have been made to your local configuration.”
 - d. Click **Save** to store the changes.
6. Click **Logout** to log out of the Workload Scheduler WebSphere Application Server Administration console.

Task 3 Exporting and importing LTPA keys by using the manage_ltpa command

To export LTPA keys from the Jazz for Service Management profile, and import them into the Workload Scheduler profile, perform the following steps.

1. Open a terminal window, or switch to one that is already open.
2. Become the effective **root** user by running the following command:

```
sudo su -
```

3. Change to the Dynamic Workload Console tools directory.

```
cd /opt/IBM/TWAUI/wastools
```

4. Run the `manage_ltpa.sh` command with no arguments to see the help display.



Example: Running the manage LTPA script

```
[root@ws94mdm0 wastools]# ./manage_ltpa.sh
Usage: manage_ltpa.sh -operation <import|export> -profilepath <Profile Path>
-ltpafilename <LTPA File Path and Name> -ltpapassword <LTPA File password> [-user
<username> -password <password>] -port <SOAP port> [-server <Server Name>]
```

5. Run the `manage_ltpa.sh` command to export the LTPA keys to a file, as shown in the following example.



Example: Running the manage LTPA script to export keys

```
[root@ws94mdm0 wastools]# ./manage_ltpa.sh -operation export -profilepath
/opt/IBM/JazzSM/profile -ltpafilename /tmp/ltpa2.key -ltpapassword object00 -user
smadmin -password object00 -server server1 -port 16313
WASX7209I: Connected to process "server1" on node JazzSMNode01 using SOAP
connector; The type of process is: UnManagedProcess
Debug log: /tmp/securityConfig3609899453240089939.log
```

6. Change to the Workload Scheduler tools directory.

```
cd /opt/IBM/TWA/wastools
```

7. Run the `manage_ltpa.sh` command to import the LTPA keys from the file you created, as shown in the following example.



Example: Running the manage LTPA script to import keys

```
[root@ws94mdm0 wastools]# ./manage_ltpa.sh -operation import -profilepath  
/opt/IBM/TWA/WAS/TWSProfile -ltpafilename /tmp/ltpa2.key -ltpapassword object00 -user  
wsuser -password object00 -server server1 -port 31118
```

```
WASX7209I: Connected to process "server1" on node TWSNode using SOAP connector;  
The type of process is: UnManagedProcess
```

```
WASX7303I: The following options are passed to the scripting environment and are  
available as arguments that are stored in the argv variable: "[ -import,  
-serverName, server1, -fileLTPA, /tmp/ltpa2.key, -pwdLTPA, object00 ]"
```

```
Debug log: /tmp/securityConfig5181766222532614214.log
```

8. Type **exit** to return to the shell prompt.

Global security

Global security > LTPA

Encrypts authentication information so that the application server can send the data from c encryption of authentication information that is exchanged between servers involves the L

Key generation

Authentication data is encrypted and decrypted by using keys that are kept in one or more key sets.

Key set group

[Key set groups](#)

LTPA timeout

LTPA timeout value for forwarded credentials between servers
1440 minutes

Cross-cell single sign-on

Single sign-on across cells can be provided by sharing keys and passwords. To share a key file, and click Export keys. Then, log on to the other cell, specify the key file, and click Import keys.

* Password

* Confirm password

Fully qualified key file name

9. Click **OK** to return to the Global Security page.
10. On the Global Security page, click **Save** to store changes.
11. Click **Logout** to log out of the Jazz for Service Management WebSphere Application Server Administration console.
12. Select **Federated repositories** from the **Available realm definitions** menu and click **Configure**.

Exercise 2 Managing LTPA keys

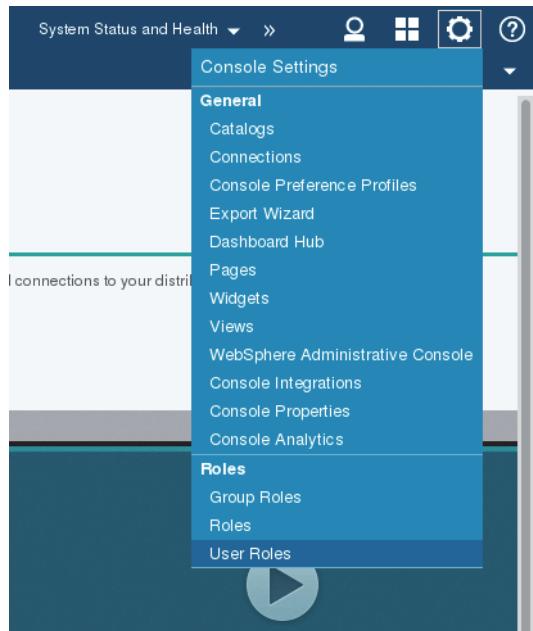
Exercise 3 Setting up a new user

In this exercise, you grant roles to a user that did not previously have access, and update security access to allow a user to submit work.

Task 1 Granting user roles

In this task, you grant user roles to a new user.

1. Switch to the browser window, and log in to the Dynamic Workload Console with user name **smadmin** and password **object00**.
2. Click **Go** to proceed to the Dynamic Workload Console.
3. From the configuration menu, go to **User Roles**.



Exercise 3 Setting up a new user

4. In the **User ID** field, enter **Administrator** and click **Search**. The user **Administrator** is in the list.

The screenshot shows the 'User Roles' page in the DWC (Data Workload Console) interface. At the top, there are navigation links for Default, Administration, Planning, Reporting, Samples, System Configuration, System Status and Health, and a user icon. Below the header, the title 'WELCOME TO DWC' and 'USER ROLES' are displayed. On the right side, there is a 'Related Tasks' dropdown menu. The main content area is titled 'User Roles' and contains a message: 'Use this page to manage roles for users. You can search users and add/remove roles for a selected user.' Under the heading 'Available Users', there is a note: 'Assign roles to a selected user.' A checkbox labeled 'Active users only' is checked. Below this are fields for 'First name:' and 'Last name:', both empty. Further down are fields for 'User ID:' containing 'Administrator' and 'E-mail:', also empty. A dropdown menu for 'Number of results to display:' is set to '20'. A large 'Search' button is present. At the bottom, there is a table with columns: Select, User ID, Active, First Name, Last Name, Roles, and E-mail. The table shows one row for 'Administrator' with 'Not Active' under 'Active', and 'Administrator' listed under all other columns. A 'Logout' link is visible on the left, and a 'Filter' input field is at the top right. A 'Total: 1' message is at the bottom right of the table.

5. Click the link for the User ID **Administrator**. You see the list of available roles.
6. On the User Roles page, select **TWSWEBUIOperator** from the **Available Roles**, and click **Save**.
7. Log out of the console by clicking **Log out** in the user menu.

Task 2 Logging in as a new user

In this exercise, you perform tasks as a different user.

1. Log in to the workload console as **Administrator** with password **object00**. Notice that the menus for the user are limited.
2. Click **GO** in the **Dynamic Workload Console** section to proceed to the Workload Console Welcome page.
3. Go to **System Status and Health > Monitor Workload**.
4. On the Monitor Workload page, select **Job Stream** from the **Object type** menu, and click **Run** to show a list of job streams.
5. From the main menu, go to **Administration > Submit Ad Hoc Jobs**.
6. On the Submit Ad Hoc Jobs page, click **Go**.

Exercise 3 Setting up a new user

7. On the Submit Ad Hoc Job into Plan page, on the **General** tab, enter the following information:

Table 1 Submit Ad Hoc Job into Plan

Field	Data
Task Type	UNIX
Login	wauser
Job Workstation	MDM0
Job Stream	JOBS
Workstation	MDM0

Submit Ad Hoc Job into Plan

***General**

Engine
Engine Name: **WS94d**

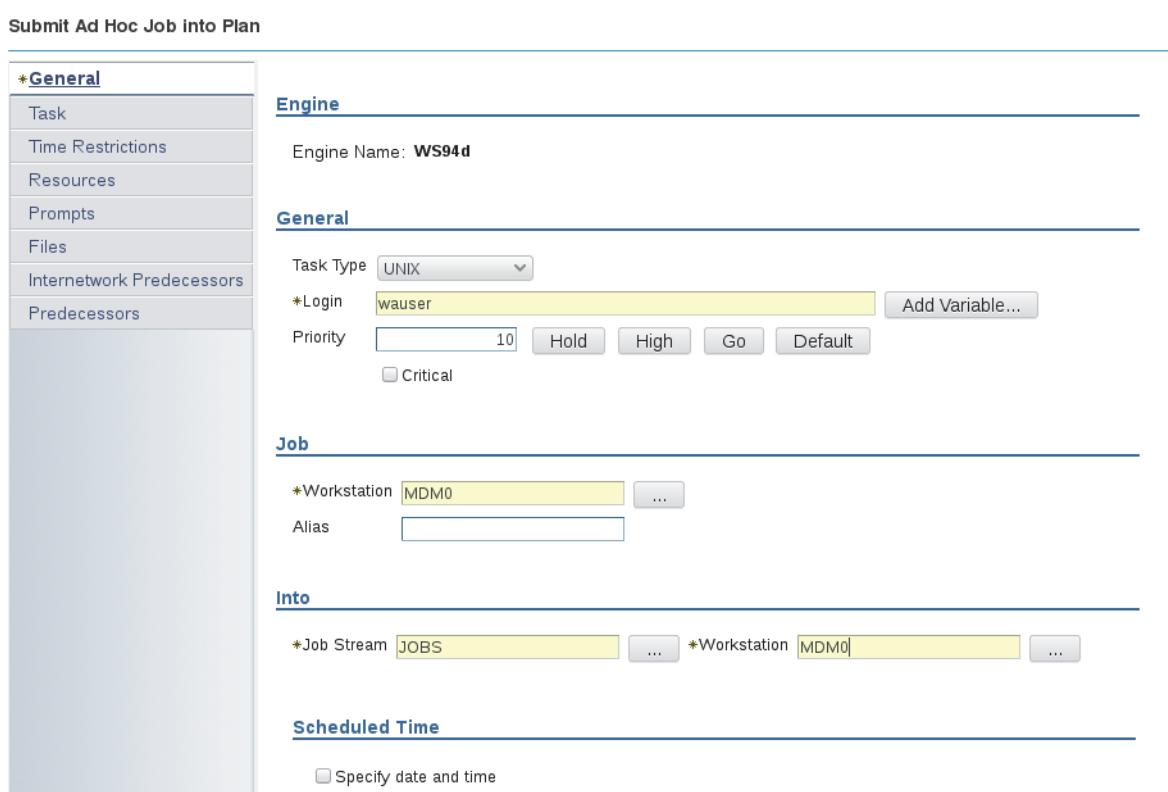
General

Task Type: **UNIX**
*Login: **wauser**
Priority: **10**
 Critical

Job
*Workstation: **MDM0**
Alias:

Into
*Job Stream: **JOBS** *Workstation: **MDM0**

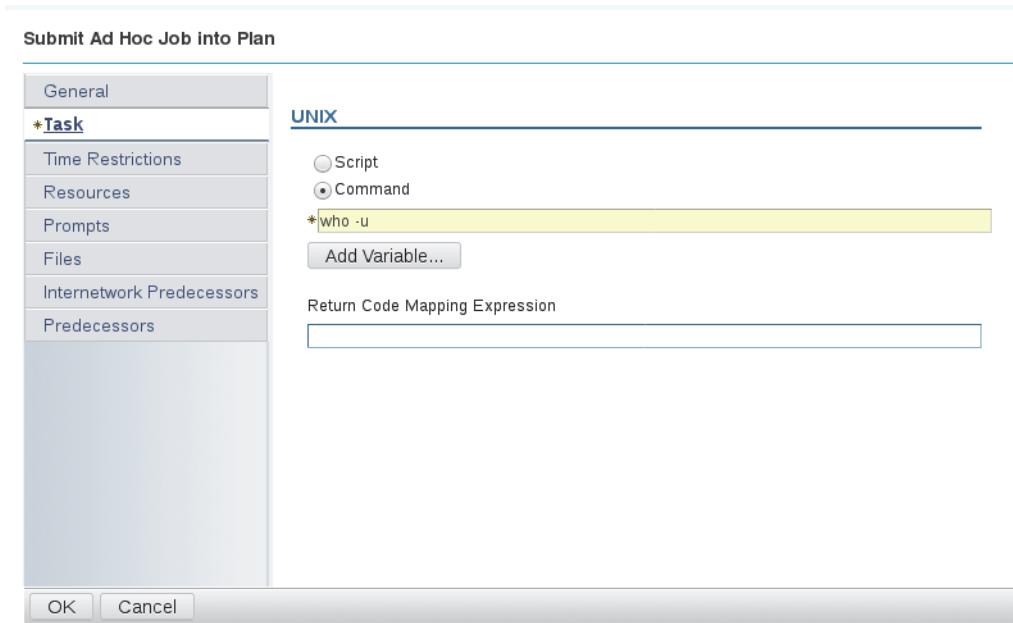
Scheduled Time
 Specify date and time



8. On the Submit Ad Hoc Job Into Plan page, go to the **Task** tab.

9. Select **Command**, and enter the following command into the field.

```
who -u
```



10. Click **OK**. You receive a message that the action cannot be performed.

11. Click **OK**.

Exercise 3 Setting up a new user

Exercise 4 Granting access to new users

In this exercise, you modify the Workload Scheduler security profile to allow the Administrator user to submit and monitor certain commands.

1. Open a terminal window, or switch to one that is already open.
2. Change to the `wsuser` home directory by running the `cd` command.
3. Extract the security definitions from the Security database by running the following command:
`dumpsec > Security.conf`
4. Edit the security definitions by editing the `Security.conf` file. Run the following command:
`gedit Security.conf`
5. Modify the following section of the `Security.conf` file so that the user **Administrator** can submit the `who` command. You insert a stanza into the Security file. The inserted stanza can be at the beginning, or near the end, before the `USER DEFAULT` stanza. The changes are like the following example:

```
USER ADMIN
CPU=@+LOGON=Administrator
BEGIN
JOB CPU=@+JCL="who@"
ACCESS=ALTPRI,CANCEL,CONFIRM,DISPLAY,KILL,RELEASE,REPLY,RERUN,LIST,SUBMIT
JOB CPU=@ ACCESS=ALTPRI,CANCEL,CONFIRM,KILL,RELEASE,REPLY,RERUN,LIST,SUBMITDB
SCHEDULE CPU=@ ACCESS=DISPLAY,LIST
END
```

6. Compile the text file by running the following command:
`makesec Security.conf`
7. Switch to the browser window.
8. Retry submitting the `who` command by repeating the steps from [Step 5](#) on page 17.
9. Go to **System Status and Health > Monitor Workload**.
10. Select **Job** from the **Object Type** menu.
11. In the **Query** field, enter `@##.WHO`, and click **Run**.

Exercise 4 Granting access to new users

12. Select the check box beside the job, and click **Job Log**. View the output of the job.
13. Close the job log window.
14. Log out of the Dynamic Workload Console by selecting **Log out** from the user menu.

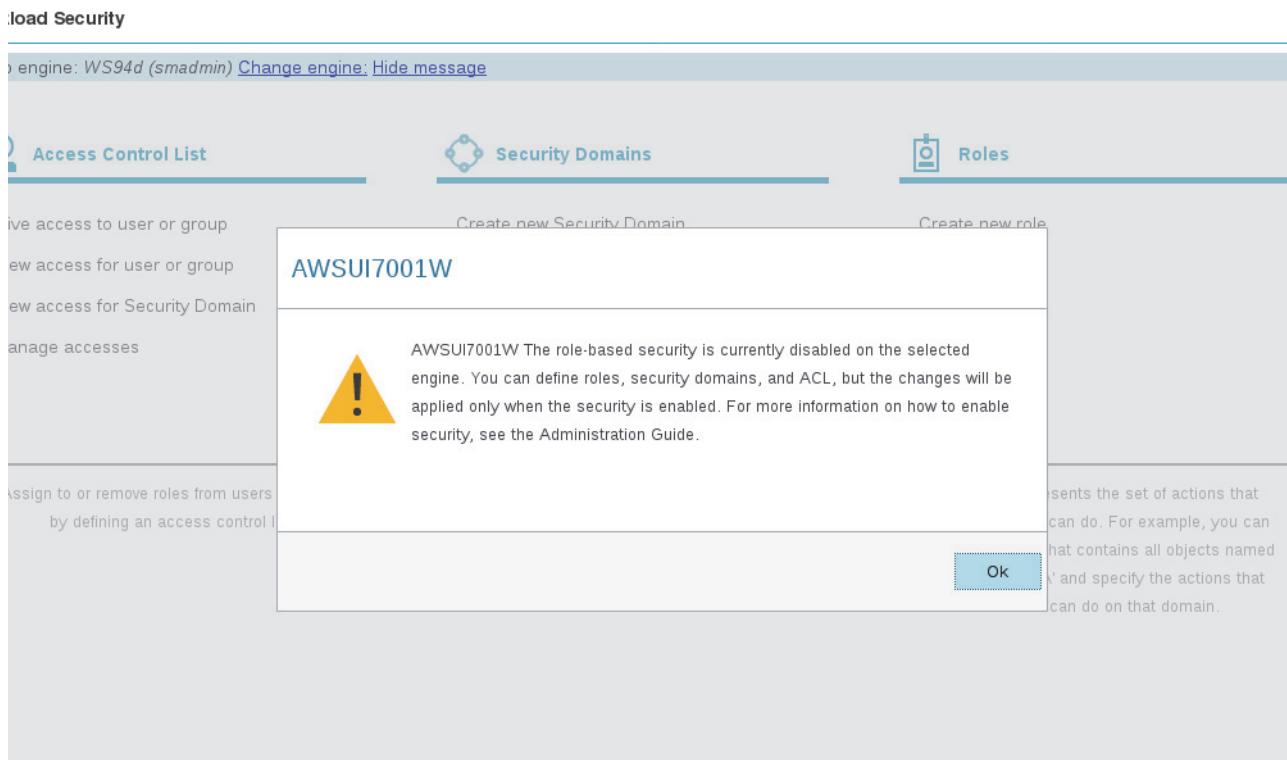
Exercise 5 Setting role-based security

In this exercise, you use the Dynamic Workload Console to create roles, security domains, and access control lists.

Task 1 Managing workload security

To manage workload security, perform the following steps.

1. Switch to the browser that is open, or open a new one.
2. From the browser home page, click **Workload Console**, or open the following address:
<https://ws94mdm0:16311/ibm/console>
3. Log on to the Workload Console with the user name **smadmin** and password **object00**.
4. In the **Dynamic Workload Console** section, click **GO**.
5. Select **Manage Workload Security** from the **Administration** menu. You see a message that informs you that role-based security is disabled.



6. Click **Ok** to close the warning.

Task 2 Creating security roles

To create a security role, perform the following steps.

1. In the **Roles** section, click **Create new role**.
2. On the Create Role page, complete the fields as shown in the following table.

Table 2 Create role fields

Field	Value
Role name:	Operations
Role description:	Access that is required to perform operator functions
Design and Monitor Workload	Select Read-only
Modify current plan	Select Yes
Submit Workload	Select Only existing definitions
Manage Workload Environment	Select Custom , then choose the following options: <ul style="list-style-type: none"> • List workstations • Display workstation details • Start a workstation • Change limit • Change fence • Link • Unlink
Manage event rules	Select Read-only
Administrative tasks	Select No
Generate Workload Reports	Select No
Access IBM Application Lab	Select No

3. Click **Save and Exit** to finish creating the role.

The screenshot shows the 'Manage Workload Security' page. At the top, there are tabs for 'WELCOME TO DWC x' and 'MANAGE WORKLOAD SECURITY x'. On the right, there are icons for a file, a plus sign, and a search bar. Below the tabs, the title 'Manage Workload Security' is displayed. A sub-instruction says 'Assign the level of access for performing operations on workstations, domains, and workstation classes.' There are four radio buttons for access levels: 'No access' (selected), 'Read-only', 'Full access', and 'Custom'. A 'Show Details' button is present. Under 'Show Details', several checkboxes are listed, with most being checked. The checked items include: 'List workstations (cpu - list)', 'Display workstation details (cpu - display)', 'Start a workstation (cpu - start)', 'Stop a workstation (cpu - stop)', 'Change limit (cpu - limit)', 'Change fence (cpu - fence)', 'Shutdown (cpu - shutdown)', 'Reset FTA (cpu - resetfta)', 'Link (cpu - link)', and 'Unlink (cpu - unlink)'. Below this section, there is another header 'Manage event rules' with a sub-instruction 'Assign the level of access for creating, editing, and monitoring event rules.' At the bottom right, there are buttons for 'View', 'Save', 'Save and Exit' (which is highlighted in blue), and 'Cancel'.

4. On the Insert Justification page, select **New application** from the **Category** menu. Enter **1103** in the **Ticket number** field, and **Created operator role** in the **Description** field.
5. Click **Save**.

Task 3 Creating security domains

To create a security domain, perform the following steps.

1. In the **Security Domains** section, click **Create new Security Domain**.
2. On the Security Domain Details page, complete the following fields:
 - a. Enter **ExceptMaster** in the **Security domain name** field.
 - b. Enter **All workstations except the master** in the **Description** field.
 - c. Select **Simple** from the **Type** menu.
3. In the **Rule 1** section, perform the following steps to create filters.
 - a. Click **Add filter** to add an **include** filter.
 - b. Select **Workstations** from the **must match** menu.
 - c. Enter ***** in the filter field, and press Enter.
 - d. Click **Add filter** to add an **exclude** filter.
 - e. Select **Workstations** from the **must match** menu.
 - f. Select **\$MASTER** from the menu of available workstations.

The screenshot shows the 'Manage Workload Security' interface. In the 'Security Domain Details' section, the 'Security domain name' is set to 'ExceptMaster', the 'Description' is 'All workstations except the master', and the 'Type' is 'Simple'. The 'Rule 1' section contains two filter rules. The first rule is an 'Include' rule for 'Workstations' with a 'must match' condition, containing the value '*'. The second rule is an 'Exclude' rule for 'Workstations' with a 'must match' condition, containing the value '\$MASTER'. There are 'Add filter' buttons next to each rule.

4. Click **View** to review a text-based version of the domain definition.
5. Click **OK** to close the text view.
6. Click **Save and Exit** to finish creating the security domain.

7. On the Insert Justification page, select **New application** from the **Category** menu. Enter **1103** in the **Ticket number** field, and **Created operator role** in the **Description** field.
8. Click **Save**.

Task 4 Creating access control lists

To create an access control list, perform the following steps.

1. In the **Access Control List** section, click **Give access to user or group**.
2. On the Create Access Control List page, complete the following fields:
 - a. Select **Group name**, and choose **twsOperators** from the groups menu.
 - b. In the **Role** field, select **OPERATIONS** from the list of roles.
 - c. In the **Domain** field, select **EXCEPTMASTER** from the list of security domains.
3. Click **Save and Exit** to finish creating an access control list.

The screenshot shows the 'Create Access Control List' page. It has fields for User name (empty), Group name (set to 'twsOperators'), Role (set to 'OPERATIONS'), and Domain (set to 'EXCEPTMASTER'). Below the form, a note says 'This user needs the following roles on Dynamic Workload Console:' followed by a list: TWSWEBUIConfigurator, TWSWEBUIOperator, TWSWEBUIDeveloper, and a link to 'Launch Roles Portlet'. At the bottom right are buttons for Save, Save and Create New, Save and Exit, and Cancel.

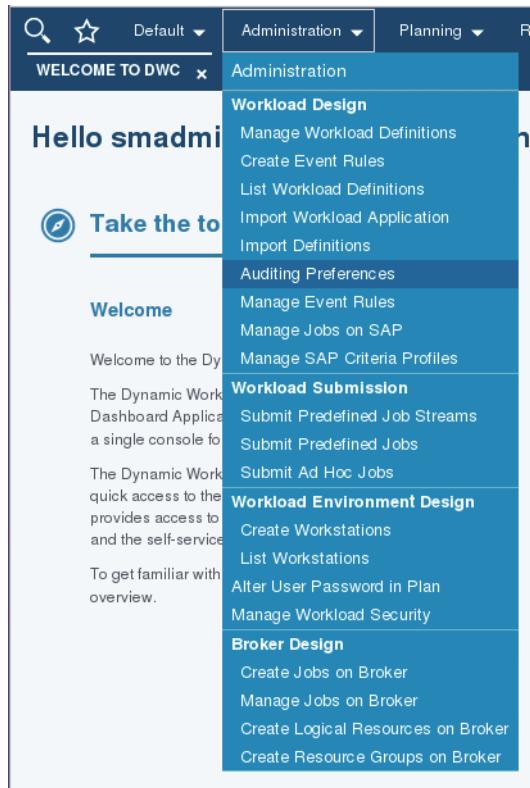
4. On the Insert Justification page, select **New application** from the **Category** menu. Enter **1103** in the **Ticket number** field, and **Created operator role** in the **Description** field.
5. Click **Save**.
6. Close the Manage Workload Security page.

Exercise 6 Configuring justification

In this exercise, you change the auditing and justification preferences.

To change the auditing justification and reporting, perform the following steps.

1. Switch to the browser that is open, or open a new one.
2. From the browser home page, click **Workload Console**, or open the following address:
<https://ws94mdm0:16311/ibm/console>
3. Log on to the Workload Console with the user name **smadmin** and password **object00**.
4. In the **Dynamic Workload Console** section, click **GO**.
5. Choose **Auditing Preferences** from the **Administration** menu.



6. On the Auditing Preferences page, select **Enable Justification**, **Category Required**, **Ticket Required**, and **Description Required** for **WS94d**.

Exercise 6 Configuring justification

The screenshot shows the 'Auditing Preferences' page. At the top, there are tabs for Default, Administration, Planning, Reporting, Samples, System Configuration, and System Status and Health. Below the tabs, it says 'WELCOME TO DWC' and 'AUDITING PREFERENCES'. The main content area is titled 'Auditing Preferences' with a note: 'The data you entered has not been saved. Click Save to save your changes.' A sub-section titled 'Engines' lists one engine named 'WS94d' with 'Enable Justification' checked. Below this is a section for 'Justification Categories' with buttons for Create, Remove, and Filter.

7. Scroll to the bottom of the page, and click **Create** to add a justification category. A new row is created at the top of the justification categories.
8. In the **Name** field, replace the word **Name** with **Peak demand**.
9. In the **Description** field, replace the word **Description** with **Change to meet priority peak demand requirements**.
10. Click **Save**. You see a message that the preferences are stored.

The screenshot shows the 'Justification Categories' page. It has buttons for Create, Remove, and Filter. A table lists categories with their descriptions. The first category is 'Peak demand' with the description 'Change to meet priority peak demand requirements'. Other categories listed are Change request, Trouble ticket, New application, Optimization, and Emergency change.

Name	Description
Peak demand	Change to meet priority peak demand requirements
Change request	Request for a change
Trouble ticket	Change associated with a ticket
New application	Change that introduces a new application
Optimization	Rework that does not affect the application behavior
Emergency change	Change that must be done urgently

11. Click **OK**.
12. Close the Auditing preferences page.

Unit 8 Finding and repairing problems exercises

In the exercises for this unit, you check the status of workstations by using the console manage command line.

Exercise 1 Checking workstation status

In this exercise, you determine the status of workstations.

To check the status of workstations, perform the following steps.

1. Open a terminal window, or switch to one that is open.
2. Enter the console by running the `conman` command. What is the status of **Batchman**?



Hint: For the next steps, you sue the `conman` command-line interface. You see a percent (%) prompt instead of the shell prompt. The percent sign (%) that you see in the exercise instructions signify that the command you run is a `conman` command.

3. List the status of workstations by entering the following `conman` command:

```
% showcpus @!@
```

4. What is the status of the **MDM0** workstation? What does it mean?

5. List the flags and port numbers of workstations by entering this command:

```
% sc @!@;link
```

6. List the time zone and operating system information for workstations by entering this command:

```
% sc @!@;info
```

7. Remain in the `conman` interface for the next exercise.

Exercise 1 Checking workstation status

Exercise 2 Using the console log

In this exercise, you view the console log to see workstation changes as they occur.

1. Bring the Workload Scheduler console log to your session by entering the following `conman` command.

```
% console session;L=4
```

2. Unlink the BROKER0 workstation to see its messages. What happens to the AGENT and POOL workstations when you unlink the broker workstation?

```
% unlink BROKER0
```

3. Link the BROKER0 workstation.

```
% link BROKER0
```

4. Submit a job to run on the dynamic pool workstation BRAVO.

```
% sbd BRAVO#"hostname";logon=wauser
```

5. Review the output of the previous job.

```
% sj BRAVO#JOBS.HOSTNAME;stdl
```

On which computer did the `hostname` command run?

6. Exit the `conman` command to return to the shell prompt.

```
exit
```

Exercise 2 Using the console log

Exercise 3 Finding log files

In this exercise, you find and review log files that Workload Scheduler creates.

Perform the following steps.

1. Open a terminal window, or switch to one that is open.
2. For each directory and file or files in the following table, use the `cd` command to change to the directory that is shown and view the specified log files by using the `less` command.

Table 1 Workload Scheduler related log files

Description	Directory	Files
WebSphere Application Server logs for Jazz for Service Management	/opt/IBM/JazzSM/profile/logs/server1	SystemOut.log
WebSphere Application Server logs for Workload Scheduler	/opt/IBM/TWA/WAS/TWSPProfile/logs/server1	<ul style="list-style-type: none">• SystemOut.log• SystemErr.log• startServer.log• PlanEventMonitor.log.0
Workload Scheduler merged processes log	/opt/IBM/TWA/TWS/stdlist/logs	YYYYMMDD_TWSMERGE.log YYYYMMDD represents today's date
Workload Scheduler dynamic agent logs	/opt/IBM/TWA/TWS/stdlist/JM	<ul style="list-style-type: none">• JobManager_message.log• JobManager_trace.log

Exercise 3 Finding log files

Appendix A Useful commands

In this appendix, you find more information about using the **less** program to browse log files on your learning environment.

Using the **less** program

Less is a screen paging program similar to **more**, which allows backward and forward movement in the file. Less commands are based on both **more** and **vi**. Commands can be preceded by a decimal number, called **N** in the following descriptions. The number is used by some commands, as indicated.

Table 1 Less commands

Command	Description
{space}	Scroll forward one page.
d	Scroll forward N lines, by default one half of the screen size. If N is specified, it becomes the new default for subsequent d and u commands.
b	Scroll backward N lines, default one page. If N is more than the screen size, only the final screen is displayed.
y	Scroll backward N lines, by default 1. The entire N lines are displayed, even if N is more than the screen size.
u	Scroll backward N lines, by default one half of the screen size. If N is specified, it becomes the new default for subsequent d and u commands.
g	Go to line N in the file, default 1 (the beginning of file). This might be slow if N is large.
G	Go to line N in the file, by default the end of the file. This might be slow if N is large, or if N is not specified and standard input, rather than a file, is being read.
/pattern	Search forward in the file for the N th line that contains the pattern. N defaults to 1. The pattern is a regular expression. The search starts at the first line that is displayed.
?pattern	Search backward in the file for the N th line that contains the pattern. The search starts at the line immediately before the top line displayed.
q or Q or :q or :Q or ZZ	Exits less .



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