

# **VMware vSphere: Install, Configure, Manage**

Lab Manual  
ESXi 5.5 and vCenter Server 5.5



VMware® Education Services  
VMware, Inc.  
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## **VMware vSphere:**

### **Install, Configure, Manage**

ESXi 5.5 and vCenter Server 5.5

Part Number EDU-EN-ICM55-LAB

Lab Manual

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Course development: Steve Schwarze, John Tuffin, Mike Sutton

Technical review: Undealeb Din, John Krueger, Fabrizio de Luca, Raminder Singh, Asif Rafiq, Andy Cary, Roy Freeman, Garth Miller

Technical editing: PJ Shemenaur, Shalini Pallat

Production and publishing: Ron Morton, Regina About

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# **Lab 1**

## **Installing VMware vSphere GUIs**

### **Objective: Install student desktop components**

1. Access Your Student Desktop System
2. Install the vSphere Client

### **Task 1: Access Your Student Desktop System**

You must access your student desktop system as Administrator.

Use the following information from the class configuration handout:

- Student desktop password
1. Ask your instructor how to access your student desktop system.  
For example, your instructor might ask you to use Remote Desktop Connection.
  2. Log in to your student desktop system as Administrator, with the student desktop password.

## Task 2: Install the vSphere Client

VMware vSphere® Client™ is a Windows program that you can use to configure the host and operate its virtual machines.

Students should do the steps in this task individually.

Use the following information from the class configuration handout:

- Location of the installation software
  - Setup language
  - Your VMware ESXi™ host name
  - ESXi host user name
  - ESXi host root password
1. Go to the location of the installation software.
  2. Double-click **autorun.exe** and click **Run**.
  3. If Security Warning dialog boxes appear, click **Run** to continue.
  4. In the VMware vCenter Installer window, click **VMware vSphere Client**.
  5. Click **Install** to start the installation wizard.
  6. If Security Warning dialog boxes appear, click **Run** to continue.
  7. When prompted by the install wizard, perform the following actions.

<b>Option</b>	<b>Action</b>
Setup Language	Select the setup language and click <b>OK</b> .
Welcome page	Click <b>Next</b> .
License Agreement	Select <b>I agree to the terms in the license agreement</b> and click <b>Next</b> .
Destination Folder	Accept the default and click <b>Next</b> .
Ready to Install the Program	Click <b>Install</b> .

8. When the installation is complete, click **Finish**.
9. Click **Exit** to close the VMware vCenter Installer window.

10. Log in to your ESXi host with the vSphere Client.
  - a. Double-click the **vSphere Client** icon on your student desktop system.



- b. Read all the text on the vSphere Client login window.
    - c. Type the IP address or host name of your ESXi host in the **IP Address/Name** text box.
    - d. Type the user name **root** and the ESXi host root password.
    - e. Click **Login**.
    - f. Select **Install this certificate and do not display security warnings for "<host\_name>"** to prevent this warning from being displayed in the future.
    - g. Click **Ignore** to proceed with the connection.
    - h. Click **OK** when the VMware Evaluation Notice dialog box is displayed.
  11. In the navigation bar at the top of the vSphere Client, verify that **Home > Inventory > Inventory** is displayed.
  12. Verify that your host is listed as the root in the Inventory view on the left side of the window.
  13. In the vSphere Client menu bar, select **File > Exit** to close the vSphere Client.





## **Lab 2**

# Configuring VMware ESXi

### **Objective: Configure an ESXi host**

In this lab, you will perform the following tasks:

1. Connect to an ESXi Host with the vSphere Client
2. View the Host Hardware Configuration
3. Configure the DNS and Routing Information for an ESXi Host
4. Configure an ESXi Host as an NTP Client
5. Configure an ESXi Host to Use Directory Services

### **Task 1: Connect to an ESXi Host with the vSphere Client**

Use the VMware vSphere® Client™ to log in to a VMware ESXi™ host.

Students should do the steps in this task individually.

Use the following information from the class configuration handout:

- Your ESXi host name
  - ESXi host root password
1. Log in to the system you used earlier.

The instructor provides you with login procedures for your specific lab environment.

2. Double-click the **vSphere Client** icon on the system's desktop.



3. Type the host name of your ESXi host.
4. Type the user name **root** and the ESXi host root password.
5. Click **Login**.
6. If a certificate warning is displayed, click **Ignore**.
7. In the VMware Evaluation Notice window that states when your evaluation license expires, click **OK**.

Your host must be displayed in the inventory panel.

8. If your host is not displayed, click **Home** and click the **Inventory** icon in the menu bar.

## Task 2: View the Host Hardware Configuration

View the health of the host hardware, as well as processor and memory information.

Students should do the steps in this task individually.

Use the following information from the class configuration handout:

- Your ESXi host name
  - ESXi host root password
1. Select your ESXi host in the inventory and click the **Configuration** tab.  
The hardware health status view is displayed.
  2. View the status by expanding objects in the **Sensor** list.
  3. In the **Hardware** list, click **Processors**.
  4. View the processor model, processor speed, and other information about your ESXi host processors.
  5. In the **Hardware** list, select **Memory**.
  6. View the total physical memory, the memory used by the system, and the memory available for use by the virtual machines.

## Task 3: Configure the DNS and Routing Information for an ESXi Host

Verify the DNS and routing information for your ESXi host.

Students should do the steps in this task individually.

Use the following information from the class configuration handout:

- Preferred DNS server
  - VMkernel default gateway
  - Domain name
1. Select your ESXi host in the inventory and click the **Configuration** tab.
  2. In the **Software** panel, click the **DNS and Routing** link.
  3. Click the **Properties** link.
  4. In the **DNS Configuration** panel, perform the following actions.

Option	Action
Domain	Verify that the AD domain name matches the value in the class configuration handout.  If the domain name does not match, type the domain name.
Use the following DNS server address	If this text box is populated, verify that the setting matches the preferred DNS server in the class configuration handout.  If this text box is blank or incorrect, type the preferred DNS server.
Look for hosts in the following domains	Leave the default.
Default Gateway	Click the <b>Routing</b> tab.  Verify that the IP address is for the VMkernel default gateway in the class configuration handout.  If the default gateway is not defined or is incorrect, type the IP address for the VMkernel default gateway.

5. Click **OK** to close the DNS and Routing Configuration dialog box.
6. If you receive an IPv6 warning, click **Yes** to continue.

## Task 4: Configure an ESXi Host as an NTP Client

System time is important for many computer applications.

Students should do the steps in this task individually.

Use the following information from the class configuration handout:

- Network Time Protocol (NTP) server
1. Select your ESXi host in the inventory and click the **Configuration** tab.
  2. In the **Software** panel, click **Time Configuration**.
  3. View the current settings, which show that the NTP client is stopped and that no NTP server is defined.
  4. Click **Properties**.
  5. In the Time Configuration dialog box, perform the following actions.

<b>Option</b>	<b>Action</b>
Date and Time	Record the date and time. _____
NTP Configuration	Select the <b>NTP Client Enabled</b> check box and click <b>Options</b> .
General	Select the <b>Start and stop with host</b> check box and click <b>NTP Settings</b> .
NTP Settings	In the NTP Daemon Options dialog box, click <b>Add</b> .  Type the NTP server name or IP address from the class configuration handout.  Click <b>OK</b> to close the Add NTP Server window.  Select the <b>Restart NTP service to apply changes</b> check box and click <b>OK</b> .

6. Click **OK** to exit the Time Configuration dialog box.
7. Verify that the **Time Configuration** pane lists the NTP server that you added and that the NTP Client is listed as Running.

### **NOTE**

If the status of the NTP Client has not changed to Running, go back to the Properties dialog box and click **Options**. In the **General** panel, click **Start** to start the NTP service.

## Task 5: Configure an ESXi Host to Use Directory Services

The ESXi host can be configured to use a directory service, such as Active Directory (AD) to manage users.

Students should do the steps in this task individually.

Use the following information from the class configuration handout:

- Domain administrator user name
  - Domain administrator password
  - Domain name
1. Select your ESXi host in the inventory and click the **Configuration** tab.
  2. Under **Software**, click the **Authentication Services** link.
  3. Click the **Properties** link.
  4. In the Directory Services Configuration dialog box, perform the following actions.

Option	Action
User Directory Service	Select <b>Active Directory</b> .
Domain Settings	Type the domain name from the class configuration handout and click <b>Join Domain</b> .
Join Domain	Type your domain administrator user name (without the domain name) and the domain administrator password. Leave the <b>vSphere Authentication Proxy</b> check box deselected.  Click <b>Join Domain</b> .

5. Click **OK** to close the Directory Services Configuration dialog box.
6. Verify the entries in **Authentication Services Settings**.
7. Leave the vSphere Client open for the next lab.



## Lab 3

# Working with Virtual Machines

### Objective: Create and prepare virtual machines for use

In this lab, you will perform the following tasks:

1. Create a Virtual Machine
2. Install a Guest Operating System in a Virtual Machine
3. Identify a Virtual Machine Disk Format and Usage Statistics
4. Install Tools on a Virtual Machine Installed with a Windows OS
5. Prepare Your Virtual Machine for Upcoming Labs

### Task 1: Create a Virtual Machine

You can create a single virtual machine if no other virtual machines in your environment have the requirements you are looking for, such as a particular operating system or hardware configuration.

Both students should perform this task.

Use the following information from the class configuration handout:

- Your VMware ESXi™ host name
- ESXi host root password
- Virtual machine datastore
- Guest operating system version
- ISO images location
- Guest installation ISO

1. If the VMware vSphere® Client™ is not already active, log in to your ESXi host by typing the user name `root` and the ESXi host root password.
2. In the navigation bar of the vSphere Client, click **Home** and click the **Inventory** icon.
3. Right-click your ESXi host in the inventory and select **New Virtual Machine**.
4. When prompted by the Create New Virtual Machine wizard, perform the following actions.

<b>Option</b>	<b>Action</b>
Configuration	Click <b>Custom</b> and click <b>Next</b> .
Name (of virtual machine)	Name the new virtual machine with your first name, followed by the number of your ESXi host and a sequence number, starting with 1. For example, Mike has an ESXi host named goose06. The name of his virtual machine is Mike06-1.  Click <b>Next</b> .
Datastore	Select the name of the virtual machine datastore and click <b>Next</b> .
Virtual Machine Version	Keep the default and click <b>Next</b> .
Guest Operating System	Select the guest operating system and click <b>Next</b> .
Number of virtual processors	Keep the default and click <b>Next</b> .
Memory	To ensure that you are configuring 384MB of memory (not GB), select <b>MB</b> from the drop-down menu and type <b>384</b> in the space provided. Click <b>Next</b> .
How many NICs do you want to connect	Keep the default value of 1.
NIC 1 Network	Keep the default.
NIC 1 Adapter	Keep the default.
Connect at Power On	Leave selected and click <b>Next</b> .
SCSI Controller	Keep the default and click <b>Next</b> .
Disk	Keep the default and click <b>Next</b> .



<b>Option</b>	<b>Action</b>
Disk Size	Type <b>2GB</b> .
Disk Provisioning	Click <b>Thin Provision</b> .
Location	Keep the default (store with the virtual machine) and click <b>Next</b> .
Virtual Device Node	Keep the default.
Mode – Independent	Leave deselected and click <b>Next</b> .
Ready to Complete	Select the <b>Edit the virtual machine settings before completion</b> check box and click <b>Continue</b> . The Virtual Machine Properties dialog box is displayed.

5. In the Hardware list, click **New CD/DVD (adding)**.
6. Click **Datastore ISO file**.
7. Click **Browse** and go to the ISO images location.
8. Click **Open**.
9. Select the guest installation ISO image and click **OK**.
10. In the Virtual Machine Properties dialog box, select the **Connect at power on** check box.
11. Click **Finish** to save the changes.
12. Expand the inventory and verify that the new virtual machine is displayed in the inventory panel.
13. In the inventory panel, select the virtual machine that you created.
14. Click the **Summary** tab and record the following information.
  - Provisioned Storage \_\_\_\_\_
  - Not Shared Storage \_\_\_\_\_
  - Used Storage \_\_\_\_\_

## Task 2: Install a Guest Operating System in a Virtual Machine

After a new virtual machine is created, an unattended installation of a Windows guest operating system is performed.

Students should do the steps in this task individually.

1. On the **Summary** tab, click **Power On** in the Commands panel.
2. Click the **Open Console** link and monitor installation progress.

The Windows guest operating system should perform an unattended installation. After your virtual machine powers on, it begins to install the guest operating system. The installation might take up to 25 minutes.

3. After the installation is complete, click **Connect/disconnect the CD/DVD devices of the virtual machine** (the right-most active icon) in the icon bar of the virtual machine console window.
4. Select **CD/DVD Drive 1 > Disconnect from datastore image**.
5. Click **Yes** to disconnect the device.
6. Leave the virtual machine console open.

## Task 3: Identify a Virtual Machine Disk Format and Usage Statistics

Identify the virtual machine disk (VMDK) type.

Students should do the steps in this task individually.

1. Right-click the *your\_name###-1* virtual machine in the inventory and select **Edit Settings**.
2. In the **Hardware** list, select **Hard disk 1**.
3. Under **Disk Provisioning**, identify the VMDK type.

**Q1. What type of VMDK has been provisioned?**

4. Click **Cancel** to close the Virtual Machines Properties dialog box.
5. Click the *your\_name###-1* virtual machine and click the **Summary** tab.
6. In the **Resources** panel, click the **Refresh Storage Usage** link to update the Provisioned Storage and Used Storage metrics.
7. Record the updated information.
  - Provisioned Storage \_\_\_\_\_
  - Not Shared Storage \_\_\_\_\_
  - Used Storage \_\_\_\_\_

8. Compare these values to the values listed in task 1, step 14.

The values should be different. Although a 2GB virtual VMDK has been configured for this virtual machine, the storage space consumed by the VMDK is lower than the total allocated disk space. The used storage space increases dynamically as the virtual machine is used.

## Task 4: Install Tools on a Virtual Machine Installed with a Windows OS

VMware® Tools™ is a suite of utilities that enhances the performance of the virtual machine's guest operating system and improves management of the virtual machine.

Students should do the steps in this task individually.

Use the following information from the class configuration handout:

- Virtual machine administrator password
1. From the virtual machine console, log in to the guest operating system.
    - a. In the menu bar of the virtual machine console, select **VM > Guest > Send Ctrl+Alt+Del**.
    - b. In the Windows login screen, log in as user Administrator with the virtual machine administrator password.
  2. Install VMware Tools into the Windows guest operating system.
    - a. In the menu bar of the virtual machine console, select **VM > Guest > Install/Upgrade VMware Tools**.

### NOTE

If you are unable to move the pointer to the menu bar, press Ctrl+Alt to release the pointer from the virtual machine console.

- b. Read the warning message that is displayed and click **OK**.
- c. Click anywhere in the virtual machine console window to select your virtual machine.
- d. The VMware Tools installation wizard starts.
- e. On the welcome page, click **Next**.
- f. On the Setup Type page, leave **Typical** selected and click **Next**.
- g. Click **Install** to start the installation.

Over the span of several seconds, several windows are displayed.

3. If you see a pop-up window informing you that hardware acceleration is not enabled, click **Yes**.
  - a. In the Display Properties dialog box, click the **Settings** tab and click the **Advanced** button.  
You might have to move the VMware Tools Installation wizard to the side so that you can see the Display Properties dialog box.
  - b. Click the **Troubleshoot** tab.
  - c. Drag the **Hardware Acceleration** bar from **None** to **Full**.
  - d. Click **OK**.
  - e. Click **OK** to exit the Display Properties dialog box.

If you do not see a pop-up window, hardware acceleration is already enabled.

4. Click **Finish** to exit the VMware Tools Installation wizard.
5. When prompted to restart the virtual machine, click **Yes**.
6. After the virtual machine finishes rebooting, log in as user Administrator.
7. Leave the virtual machine console open.

## Task 5: Prepare Your Virtual Machine for Upcoming Labs

To prepare for later labs, you mount the `ClassFiles-vSphere.iso` image file and copy programs to your virtual machine's desktop. This ISO image contains files needed for future labs. You must also turn off automatic updates to prevent your virtual disk from filling up with unnecessary files.

Students should do the steps in this task individually.

Use the following information from the class configuration handout:

- ISO images location
1. Connect `ClassFiles-vSphere.iso` to your virtual machine's CD-ROM drive.
    - a. In the icon bar of the virtual machine console window, click the **Connect/disconnect the CD/DVD devices of the virtual machine** icon (the right-most active icon).
    - b. Select **CD/DVD Drive 1 > Connect to ISO image on a datastore**.
    - c. In the Look in drop-down menu, select **Datastores**.
    - d. Select the ISO images location.
    - e. Select `Classfiles-vSphere.iso` and click **OK**.
  2. If autorun does not open the CD-ROM, use Windows Explorer and go to the CD-ROM drive (D:).

3. Copy `cpubusy.vbs` and `iometer.exe` from the CD-ROM drive (D:) to the virtual machine's desktop to be used in a later lab.
  - a. Right-click the file on the CD-ROM and select **Copy**.
  - b. Right-click the desktop and select **Paste**.
4. Extract the files to be used in a later lab from the executable `extpart.exe`.
  - a. On the CD-ROM, double-click the `extpart.exe` file.
  - b. In the WinZip Self-Extractor dialog box, click **Unzip**.  
Two files are unzipped to the path `C:\dell\ExtPart`.
  - c. Click **OK**.
  - d. Click **Close** to close the WinZip Self-Extractor dialog box.
5. Disconnect from `Classfiles-vSphere.iso` on the CD-ROM drive.
  - a. Right-click the virtual machine in the inventory and select **Edit Settings**.
  - b. In the **Hardware** list, select **CD/DVD Drive 1**.
  - c. Deselect the **Connected** check box.
  - d. Click **OK**.
6. Turn off automatic updates in your Windows guest operating system.

**NOTE**

The following steps apply to the Windows 2003 operating system. These steps help prevent the virtual machine's disk from filling up with unnecessary files. A virtual machine with insufficient disk space can affect future lab exercises.

- a. From the virtual machine's desktop, select **Start > Settings > Control Panel**.
  - b. Double-click **System**.
  - c. Click the **Automatic Updates** tab.
  - d. Select **Turn Off Automatic Updates** and click **OK**.
  - e. Close the virtual machine console.
7. Select **File > Exit** to log out of your vSphere Client session.



## **Lab 4**

# Configuring VMware vCenter Server Appliance

### **Objective: Configure vCenter Server Appliance for first use**

In this lab, you will perform the following tasks:

1. Configure vCenter Server Appliance for First Use
2. Install vSphere License Keys
3. Create a vCenter Server Inventory Data Center Object
4. Add Your ESXi Host to the vCenter Server Inventory

### **Task 1: Configure vCenter Server Appliance for First Use**

The VMware® vCenter™ Server Appliance™ is a preconfigured Linux-based virtual machine that is optimized for running VMware® vCenter Server™ and associated services. vCenter Server Appliance must be configured before first use.

#### **NOTE**

The Google Chrome Web browser is recommended for all Web-based labs in this course. Students should do the steps in this task as a team from a single student desktop.

Use the following information from the class configuration handout:

- vCenter Server Appliance name
  - vCenter Server root password
  - Preferred DNS server
1. Open a Web browser and connect to the vCenter Server Appliance management page at [https://vCenter\\_Server\\_Appliance\\_name:5480/](https://vCenter_Server_Appliance_name:5480/).
  2. If you get a warning that the site security certificate is not trusted, proceed anyway to the administration page.
  3. On the vCenter Server Setup page, click **Accept license Agreement** and click **Next**.
  4. On the Configure Options page, click **Configure with default settings** and click **Next**.
  5. On the Review configuration page, click **Start**.

#### **NOTE**

This step might take several minutes to complete.

6. After the setup is complete, click **Close**.
7. Click the **Network** tab.
8. Click the **Address** button.
9. Verify that the Preferred DNS server matches the value in the class configuration handout.
10. If the value is blank, type the Preferred DNS server and click **Save Settings**.

## **Task 2: Install vSphere License Keys**

License keys unlock advanced features of VMware vSphere® 5.5.

Students should do the steps in this task as a team from a single student desktop

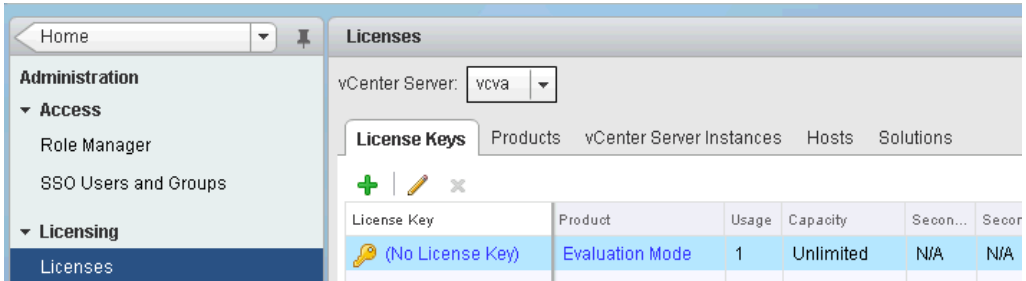
Use the following information from the class configuration handout:

- vCenter Server Appliance name
  - vCenter Server root password
  - vCenter Server license key
1. Browse to the VMware vSphere® Web Client and log in to your vCenter Server Appliance at [https://vCenter\\_Server\\_Appliance\\_name:9443/vsphere-client/](https://vCenter_Server_Appliance_name:9443/vsphere-client/).
  2. On the vCenter Server Appliance Login page, log in as root with the vCenter Server root password and click **Login**.



- On the home page, select **Administration > Licensing > Licenses**.

The **Licensing** pane is displayed.



- Click **vCenter Server Systems**.
- Click **Assign License Key** at the upper-left corner of the pane.
- From the Assign an existing license key drop-down menu, select **Assign a new license key**.  
The Assign License Key dialog box is displayed.
- Type the following information in the Assign License Key dialog box.

Option	Action
--------	--------

Enter License Keys	In <b>License key</b> , type the vCenter Server license key.
--------------------	--

**NOTE**

Include the hyphens: XXXXX-XXXXX-XXXXX-XXXXX-XXXXX.  
(The text box forces you to type a hyphen every five characters.)

In **Label**, type **VMware Training Licenses**. Click **Decode**.

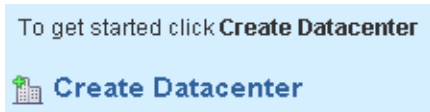
- Click **OK**.

### Task 3: Create a vCenter Server Inventory Data Center Object

A virtual data center is a container for all the inventory objects required to complete a fully functional environment for operating virtual machines.

Students should do the steps in this task as a team from a single student desktop.

1. Select **Home > vCenter > Hosts and Clusters**.
2. In the Getting Started tab, click the **Create Datacenter** icon.



3. In the data center name text box, type **Training**.
4. Click **OK**.

### Task 4: Add Your ESXi Host to the vCenter Server Inventory

To create a vSphere virtual environment and use vSphere features, add VMware ESXi™ hosts to the vCenter Server inventory.

Students should do the steps in this task individually. Student 2 should log in to the vCenter Server Appliance with the vSphere Web Client for this lab exercise.

Use the following information from the class configuration handout:

- Your ESXi host name
  - ESXi host root password
  - VMware vSphere® Enterprise Plus Edition™ license key
1. On the home page, select **Home > vCenter > Hosts and Clusters**.
  2. In the navigation panel, right-click **Training** and click **Add Host**.

3. Type the following information in the Add Host wizard.

<b>Option</b>	<b>Action</b>
Host	Type the fully qualified domain name of your ESXi host and click <b>Next</b> .
Username	Type <b>root</b> .
Password	Type the ESXi host root password and click <b>Next</b> .  A security alert is displayed, stating that vCenter Server is unable to verify the authenticity of the specified host. Click <b>Yes</b> to proceed.
Host Summary	Verify the information and click <b>Next</b> .
Assign License	From the Assign an existing license key drop-down menu, select <b>Assign a new license key</b> .  In the <b>License Key</b> box, type the vSphere Enterprise Plus Edition license key.  Click <b>Decode</b> .  Ignore license warnings that might be displayed and click <b>Next</b> .
Lockdown Mode	Do not enable lockdown mode. Click <b>Next</b> .
Virtual Machine Location	Select the data center and click <b>Next</b> .
Ready to Complete	Review the configuration summary and click <b>Finish</b> .

4. In the **Recent Tasks** pane at the right of the vSphere Web Client, monitor the progress of the task.
5. Expand the Training object and select your ESXi host.
6. Click the **Summary** tab and view the information about the ESXi host, such as its datastores, networks, number of NICs and CPUs, and memory usage.
7. Log out of the vSphere Web Client.



## Lab 5

# Using the VMware vSphere Web Client

### Objective: Demonstrate the ability to navigate and customize the vSphere Web Client

In this lab, you will perform the following tasks:

1. Install the Client Integration Plug-In
2. Navigate the vSphere Web Client
3. Pin and Unpin Panes
4. Hide the Getting Started Tabs
5. Upgrade Virtual Machine Hardware

### Task 1: Install the Client Integration Plug-In

The Client Integration plug-in provides access to a virtual machine's console in the VMware vSphere® Web Client, and provides access to other VMware vSphere® infrastructure features.

Students should do the steps in this task individually.

1. Open a Web browser and connect to the VMware® vCenter™ Server Appliance™ management page at [https://vCenter\\_Server\\_Virtual\\_Appliance:9443/](https://vCenter_Server_Virtual_Appliance:9443/).
2. Click the **Download the Client Integration Plug-in** link at the bottom of the vSphere Web Client login page.

3. Click the file in the download bar to run the installation program and wait for the security warning to appear.
4. Close the Web browser.
5. In the Open File - Security Warning dialog box, click **Run**.
6. On the Welcome page, click **Next**.
7. Select **I accept the terms in the License Agreement** and click **Next**.
8. Accept the default destination folder and click **Next**.
9. Click **Install**.
10. After the installation completes, click **Finish**.

## Task 2: Navigate the vSphere Web Client

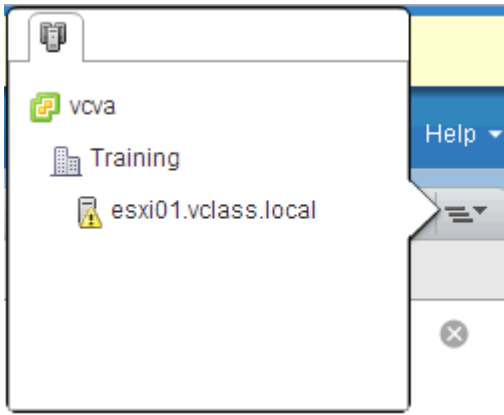
The vSphere Web Client displays perspectives and actions for objects in the navigator in a consistent manner.

Students should do the steps in this task individually.

Use the following information from the class configuration handout:

- VMware® vCenter Server™ root password
  - Local datastore name
1. Open a Web browser and connect to the vCenter Server Appliance management page at [https://vCenter\\_Server\\_Virtual\\_Appliance:9443/](https://vCenter_Server_Virtual_Appliance:9443/).
  2. On the vSphere Web Client login page, log in as root and type the vCenter Server root password.
  3. Click **Login**.
  4. Select **vCenter > Hosts and Clusters**.
  5. Expand the data center object and double-click your host.

6. Navigate to the top-level object by clicking the quick navigation menu in the content area.



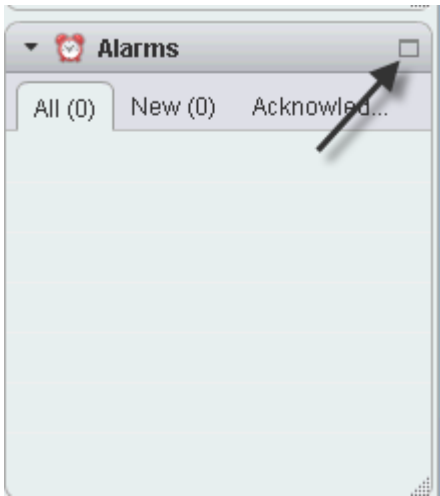
7. Click **vcva01** to return to the top of the navigation tree.
8. In the Search dialog box, type the name of your local datastore and press Enter. Information about the local datastore is displayed.
9. Click the **Summary** tab of the datastore to view the datastore details.
10. Use the **Home** icon to return to the vSphere Web Client Home page.

### Task 3: Pin and Unpin Panes

The vSphere Web Client panes can be adjusted to provide more space for the content area. Students should do the steps in this task individually.

1. Select **vCenter > Hosts and Clusters**.
2. Expand the data center object and double-click your host.
3. In the navigator pane, click the pin icon.
4. Click in the content pane.
5. Record what happens to the navigator pane. \_\_\_\_\_
6. Click in the navigator pane.
7. Record what happens to the navigator pane. \_\_\_\_\_
8. Click the pin icon in the navigator pane to re-pin the window.

9. In the Alarms window, click the **Maximize** icon to maximize the Alarms window.



10. To restore the Alarms window, click the **Restore Down** icon in the Alarms pane.

#### **Task 4: Hide the Getting Started Tabs**

Most inventory objects have Getting Started tabs. These tabs can be hidden.

Students should do the steps in this task individually.

1. In the vSphere Web Client, click the **Home** icon.
2. From the Help drop-down menu, above the content pane, select **Hide All Getting Started Pages**.
3. Select **Home > vCenter > Hosts and Clusters**.
4. Expand the data center object and select your host.
5. Record the first tab you see in the content pane. \_\_\_\_\_
6. Click the Home icon to return to the home page.
7. From the Help drop-down menu, select **Show All Getting Started Pages**.



## Task 5: Upgrade Virtual Machine Hardware

The latest version of the virtual machine hardware is only available through the vSphere Web Client. Students should do the steps in this task individually.

Use the following information from the class configuration handout:

- Your VMware ESXi™ host name
1. Select **Home > vCenter > Hosts and Clusters > Training**.
  2. Expand your ESXi host to display your virtual machine.
  3. Right-click the *yourname##-1* virtual machine and click **Shutdown Guest OS**.
  4. Click **Yes** to confirm the shutdown.
  5. When the virtual machine is shut down, click the *yourname##-1* virtual machine **Summary** tab.
  6. Locate the Compatibility value for the virtual machine and record the hardware version that is displayed. \_\_\_\_\_
  7. Right-click the *yourname##-1* and click **Edit Settings**.
  8. Click the arrow next to **Upgrade** to expand the upgrade properties.
  9. Select **Schedule VM Compatibility Upgrade**.
  10. Ensure that Compatible with reads **ESXi 5.5 and later**.
  11. Click **OK**.
  12. Right-click the *yourname##-1* virtual machine and click **Power on**.
  13. Click the *yourname##-1* virtual machine **Summary** tab.
  14. Under the virtual machine name at the top of the tab, verify that Compatibility reads **ESX 5.5 and later** as shown in the graphic.

```
John01-1
Guest OS:      Microsoft Windows Server 2003 (32-bit)
Compatibility: ESXi 5.5 and later (VM version 10)
VMware Tools: Running, version:9344 (Current)
DNS Name:      vmware-c4fb29d7
IP Addresses:  172.20.11.100
Host:          esxi01.vclass.local
```

15. Log out of the vSphere Web Client.



## **Lab 6**

# Configuring VMware vCenter Single Sign-On

### **Objective: Configure an identity source for vCenter Single Sign-On**

In this lab, you will perform the following tasks:

1. Use the Web Console to Configure vCenter Server Appliance to Use Directory Services
2. Use the vSphere Web Client to Add the Domain Admins Group to Administrators

### **Task 1: Use the Web Console to Configure vCenter Server Appliance to Use Directory Services**

Configure the VMware® vCenter™ Server Appliance™ device to use directory services.

Students should do the steps in this task as a team from a single student desktop.

Use the following information from the class configuration handout:

- vCenter Server Appliance name
- vCenter Server Appliance root password
- Windows Domain administrator user name
- Windows Domain administrator password
- Windows domain

1. On the desktop of the Desktop system, open a Web browser and go to [https://vCenter\\_Server\\_Appliance\\_name:5480](https://vCenter_Server_Appliance_name:5480) to open the vCenter Server Appliance management interface.
2. Log in to your vCenter Server Appliance with the root user name and password.
3. On the **vCenter Server** tab, click **Authentication**.
4. On the **Authentication** page, select the **Active Directory Enabled** check box.
5. In the **Domain** text box, type the Windows domain name.
6. In the user and password text boxes, type the Windows Domain administrator user name and password.
7. Click **Save Settings**.
8. At the top of the Google Chrome browser, click the **System** tab.
9. Click **Reboot**.
10. On the **System Reboot** confirmation page, click **Reboot**.

#### **NOTE**

The appliance takes several minutes to reboot. The **System Reboot** dialog box closes after the reboot is near completion.

11. Log in to the vCenter Server Appliance administration page, [https://vCenter\\_Server\\_Appliance\\_name:5480](https://vCenter_Server_Appliance_name:5480) with the user name and password.
12. On the **Summary** page, in the **Services** window, monitor the services listed until four of the five services are listed as Running.

#### **NOTE**

The VMware vSphere® Auto Deploy™ service is not started in this lab.

13. Click **Logout user root**.
14. Leave the browser open for the next task.

## **Task 2: Use the vSphere Web Client to Add the Domain Admins Group to Administrators**

Allow the ESX Admins group to log in to VMware® vCenter Server™ as administrators.

Students should do the steps in this task as a team from a single student desktop.

Use the following information from the class configuration handout:

- Windows domain

- vCenter Server Appliance single sign-on (SSO) administrator user name
  - vCenter Server Appliance SSO administrator password
  - Base DN for users
  - Base DN for groups
  - Fully qualified domain name (FQDN)
  - Windows domain administrator user name
  - Windows domain administrator password
  - Primary server URL
1. In the browser, go to [https://vCenter\\_Server\\_Appliance\\_name:9443/vsphere-client/](https://vCenter_Server_Appliance_name:9443/vsphere-client/).
  2. Log in to your vCenter Server Appliance with the vCenter Server Appliance SSO administrator user name and password.
  3. In the navigation bar on the left, click **Administration**.
  4. Under Single Sign-On, select **Configuration**.
  5. Click the **Identity Sources** tab.
  6. Click the **Add Identity Source** (green plus sign) icon.
  7. In the Add identity source dialog box, add the following information.

<b>Option</b>	<b>Action</b>
Identity source type	Select <b>Active Directory as a LDAP Server</b> .
Name	Type the Windows domain name.
Base DN for users	Type the Base DN for users.
Domain Name	Type the FQDN.
Domain alias	Type the Windows domain name.
Base DN for groups	Type the Base DN for groups.
Primary server URL	Type the primary server URL.
User name	Type the domain administrator user name.
Password	Type the domain administrator password.

8. Click **Test Connection**.

A dialog box appears indicating that the connection has been established.

9. Click **OK**.

10. Click **OK** to close the Add identity source dialog box.

11. In the left pane under Single-Sign-On, select **Users and Groups**.

12. Click the **Groups** tab.

13. Click **Administrators** under Group Name.

14. In the bottom Group Members pane, click the **Add member** (blue person with green plus sign) icon.

15. Select the Windows domain specified in the class configuration handout.

16. Select **ESX Admins** and click **Add**.

17. Click **OK**.

18. Log out of the VMware vSphere® Web Client.

19. Log in to the vSphere Web Client using the Windows domain administrator user name and password.

20. Select **vCenter > Hosts and Clusters**.

**Q1. Do you see your host in the inventory?**

21. Log out of the vSphere Web Client.

## Lab 7

# Creating Folders in VMware vCenter Server

### Objective: Create vCenter Server inventory objects

In this lab, you will perform the following tasks:

1. Create a Host Folder Object
2. Create Two Virtual Machine Folders

### Task 1: Create a Host Folder Object

You can use folders to group objects of the same type for easier management.

Students should do the steps in this task as a team from a single student desktop.

Use the following information from the class configuration handout:

VMware® vCenter™ Server Appliance™ root password

1. If the VMware vSphere® Web Client is not already active, open a Web browser and connect to the vCenter Server Appliance page at [https://vCenter\\_Server\\_Virtual\\_Appliance:9443/](https://vCenter_Server_Virtual_Appliance:9443/).
2. On the vCenter Server Appliance Login page, log in as root and type the administrator password.
3. Click **Login**.
4. Select **vCenter > Hosts and Clusters**.
5. Right-click the **Training** data center and click **All vCenter Action**.
6. Click **New Host and Cluster Folder**.

7. Type **Lab Servers** for the folder name and click **OK**.

#### **NOTE**

It might be necessary to refresh the vSphere Web Client to see the new folder.

8. Drag both the VMware ESXi™ hosts into the **Lab Servers** folder.

## **Task 2: Create Two Virtual Machine Folders**

Virtual machine folders help you to group virtual machines.

Students should do the steps in this task as a team from a single student desktop.

1. Select **Home > vCenter > VMs and Templates**.
2. Right-click the **Training** data center and click **All vCenter Actions**.
3. Click **New VM and Templates Folder**.
4. Type **LabVMs** for the folder name and click **OK**.
5. Drag all the virtual machines into the new folder.
6. To create a second virtual machine folder, right-click the **Training** data center and click **All vCenter Actions**.
7. Click **New VM and Templates Folder**.
8. Type **Templates** for the name of this second folder and click **OK**.
9. To view the created folders, double-click the **Training** data center object and click **Top Level Objects**.
10. Right-click each of the three folders that you created.

**Q1. How do the menus differ between the Hosts and Clusters folder and the VMs and Templates folder?**



# Lab 8

## Standard Switches

### Objective: Create a standard switch and port group

In this lab, you will perform the following tasks:

1. View the Current Standard Switch Configuration
2. Create a Standard Switch with a Virtual Machine Port Group
3. Attach Your Virtual Machine to a New Virtual Machine Port Group

### Task 1: View the Current Standard Switch Configuration

Use the VMware vSphere® Web Client to ensure the proper configuration of a VMware vSphere® standard switch.

Students should do the steps in this task individually.

Use the following information from the class configuration handout:

- VMware® vCenter™ Server Appliance™ name
  - VMware® vCenter Server™ root password
  - Your VMware ESXi™ host name
1. If the vSphere Web Client is not already active, open a Web browser and connect to the vCenter Server Appliance home page at [https://vCenter\\_Server\\_Virtual\\_appliance\\_name:9443/](https://vCenter_Server_Virtual_appliance_name:9443/).
  2. On the vCenter Server Appliance Login page, log in as root with the password and click **Login**.
  3. Select **vCenter > Hosts and Clusters > Lab Servers > Your\_ESXi\_host\_name**.

- Click **Manage** and select **Networking**.
- Click **Virtual Switches**.

The virtual switch is named vSwitch0. vSwitch0 is connected to the physical adapter vmnic0. vSwitch0 contains a VMkernel port named Management Network and a virtual machine port group named VM Network. A virtual machine is connected to VM Network.

## Task 2: Create a Standard Switch with a Virtual Machine Port Group

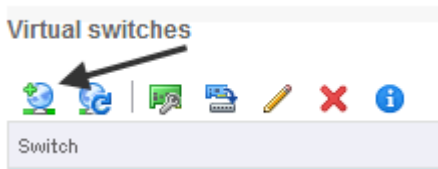
Standard switches handle network traffic at the host level in a vSphere environment.

Students should do the steps in this task individually.

Use the following information from the class configuration handout:

- vmnics to use for the Production virtual switch

- Click the **Add host networking** icon (the first icon on the left).



- When prompted by the Add Networking wizard, perform the following actions.

Option	Action
Connection Type	Select <b>Virtual Machine Port Group for a Standard Switch</b> and click <b>Next</b> .
Select target device	Select <b>New standard switch</b> . Click <b>Next</b> .
Create a Standard Switch	Click the + icon under Assigned adapters. Select the vmnics listed in the class configuration handout. Press the Ctrl key to select multiple adapters. Click <b>OK</b> . Click <b>Next</b> .

Option	Action
Connection Settings	In the Network label text box, type <b>Production</b> . Keep the default setting for VLAN ID and click <b>Next</b> .
Ready to Complete	Click <b>Finish</b> .

- Under Virtual Switches, click **vSwitch1**.
- Verify that the Production port group is displayed in the **Networking** pane.

### Task 3: Attach Your Virtual Machine to a New Virtual Machine Port Group

Virtual machine port groups provide networking for virtual machines.

Students should do the steps in this task individually.

Use the following information from the class configuration handout:

- Virtual machine administrator password
- Select **Home > vCenter > VMs and Templates**.
  - Click **Training** and then click **Lab VMs**.
  - Right-click your named virtual machine in the inventory and select **Edit Settings**.
  - To expand the network adapter properties, click the arrow next to **Network Adapter 1**.
  - From the **Network Connection** drop-down menu, select **Production**.
  - Verify that both the **Connected** and the **Connect at power on** check boxes are selected.
  - Click **OK** to close the Edit Settings window.
  - To verify that the virtual machine can access the Web, renew the virtual machine IP address.
    - Right-click the virtual machine in the vCenter Server inventory and select **Open Console**.

#### NOTE

Ensure that your Web browser is configured to allow pop-ups. In Google Chrome the pop-up blocker can be configured in the address bar in the right corner.

- Click the **Send CTRL ALT Del** button in the top-right corner of the virtual machine console.
- Log in as Administrator and use the virtual machine administrator password.
- To open a Command Prompt window, select **Start > Run**.

- e. Type `cmd`.
  - f. At the command prompt, type `ipconfig /release` and press Enter.
  - g. Type `ipconfig /renew` and press Enter.
9. In Internet Explorer, go to <http://www.vmware.com>.
  10. Exit Internet Explorer.
  11. Close the virtual machine's console.
  12. Leave the vSphere Web Client open for the next lab.

# Lab 9

## Accessing iSCSI Storage

### Objective: Configure access to an iSCSI datastore

In this lab, you will perform the following tasks:

1. Add a VMkernel Port Group to a Standard Switch
2. Configure the iSCSI Software Adapter

### Task 1: Add a VMkernel Port Group to a Standard Switch

A VMkernel networking interface provides network connectivity for the host and handles VMware vSphere® vMotion®, IP storage, and VMware vSphere® Fault Tolerance.

Students should do the steps in this task individually.

Use the following information from the class configuration handout:

- VMware® vCenter™ Server Appliance™ name
  - vCenter Server root password
  - VMkernel port IP address or subnet mask
  - VMkernel default gateway
1. If the VMware vSphere® Web Client is not already active, open a Web browser and connect to the vCenter Server Appliance Login page at [https://vCenter\\_Server\\_Virtual\\_Appliance\\_name:9443/](https://vCenter_Server_Virtual_Appliance_name:9443/).
  2. On the vCenter Server Appliance Login page, log in as root with the password and click **Login**.
  3. Select **Home > Hosts and Clusters > Training > Lab Servers > Your\_ESXi\_host\_name**.
  4. Click **Manage** and click **Networking**.

5. Click **Virtual Switches** and select **vSwitch0** from the list of virtual switches.
6. Click the **Add host networking** icon (the left-most icon).
7. When the Add Network wizard starts, perform the following actions.

<b>Option</b>	<b>Action</b>
Connection Type	Select <b>VMkernel Network Adapter</b> and click <b>Next</b> .
Select target device	Ensure that <b>Select an existing standard switch</b> is selected and click <b>Next</b> .
Port properties	Type <b>IP Storage</b> for the Network Label. Keep the default for all other settings and click <b>Next</b> .
IPv4 settings	Select <b>Use static IPv4 settings</b> .  Type the VMkernel port IP address and subnet mask.  Verify that the VMkernel default gateway IP address is correct.  Click <b>Next</b> .
Ready to complete	Click <b>Finish</b> .

## Task 2: Configure the iSCSI Software Adapter

With the software-based iSCSI implementation, you can use standard NICs to connect your host to a remote iSCSI target on the IP network. The software iSCSI adapter that is built into VMware ESXi™ enables this connection by communicating with the physical NICs through the network stack.

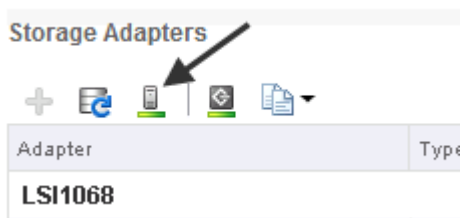
Students should do the steps in this task individually.

Use the following information from the class configuration handout:

- Your ESXi iSCSI qualified name (IQN)
  - Name of the iSCSI target
1. On the **Manage** tab, click **Storage**.
  2. Click **Storage Adapters**.
  3. Click the **Add new storage adapter** icon.
  4. Select **Software iSCSI adapter**.
  5. In the Add Software iSCSI Adapter dialog box, click **OK**.

6. Select the newly created iSCSI software adapter.
7. On the **Properties** tab, in Adapter Details, verify that the Adapter Status reads Enabled.
8. On the **Properties** tab, in the General section under Adapter Details, click **Edit**.
9. Verify that the dialog box displays the iSCSI initiator name.  
If the IQN does not match your ESXi iSCSI IQN, change the IQN to match the value.
10. In the Adapter Details section, click the **Network Port Binding** tab.
11. Click the + icon.
12. Select the VMKernel adapter you created in task 1 and click **OK**.
13. Click **OK**.
14. In the Adapter Details section, click the **Targets** tab.
15. Ensure that **Dynamic Discovery** is selected and click **Add**.
16. Type the name or IP address of the iSCSI target.
17. Leave the port set to **3260** and click **OK**.
18. Monitor the **Recent Tasks** pane and wait for the task to complete.
19. Click the **Rescan adapter** icon (the third icon from the left), and click **OK** to rescan the adapters.

Wait for the rescan task to complete.



20. From the **Storage Adapters** list, select the iSCSI software adapter and view the **Paths** tab.
21. Record the following values to verify that a logical unit number (LUN) and multiple LUNs were found.
  - Target \_\_\_\_\_
  - Runtime names \_\_\_\_\_
  - LUNs \_\_\_\_\_





# Lab 10

## Accessing NFS Storage

### Objective: Configure access to an NFS datastore

In this lab, you will perform the following tasks:

1. Configure Access to NFS Datastores
2. View NFS Storage Information

### Task 1: Configure Access to NFS Datastores

You can use the Add Storage wizard to mount an NFS volume and use it as a datastore.

Students should do the steps in this task individually.

Use the following information from the class configuration handout:

- VMware® vCenter™ Server Appliance™ name
  - VMware® vCenter Server™ root password
  - NFS server host name
  - Your NFS logical unit number
1. If the VMware vSphere® Web Client is not already active, open a Web browser and connect to the vCenter Server Appliance home page at [https://vCenter\\_Server\\_Virtual\\_Appliance\\_name:9443/](https://vCenter_Server_Virtual_Appliance_name:9443/).
  2. On the Login page, log in as root with the password and click **Login**.
  3. Select **vCenter > Storage > Training**.
  4. Click **Related Objects** and select **Datastores**.

5. In the **Datastores** pane, click the **Create a new datastore** icon.
6. When prompted by the New Datastore wizard, perform the following actions.

<b>Option</b>	<b>Action</b>
Location	Select the <b>Training</b> data center and click <b>Next</b> .
Type	Select <b>NFS</b> and click <b>Next</b> .
Datastore name	Type <b>NFS-<i>your_name</i></b> . For example, NFS-Mike.
Server	Type the NFS server host name or IP address.
Folder	Type the path to the NFS datastore.
Mount NFS read only	Leave the check box deselected. Mount the NFS datastore as read/write.  Click <b>Next</b> .
Host accessibility	Select your VMware ESXi™ host from the list and click <b>Next</b> .
Ready to Complete	Click <b>Finish</b> .

## Task 2: View NFS Storage Information

You can view information about your NFS storage and the contents of the NFS datastore.

Students should do the steps in this task individually.

1. Expand the **Training** data center and select the NFS datastore you created in task 1.
2. Click the **Monitor** tab and click the **Storage Reports** button.
3. From the **Report On** drop-down menu, select **NAS Mounts**.
4. If you see a yellow warning message indicating that the report is not up to date, close the warning.
5. Click the **Rescan vCenter Server for new inventory and storage devices** icon.
6. In the Rescan Confirmation dialog box, click **Yes**.

The information about the NAS datastore is displayed in the report.

## **Lab 11**

# Managing VMware vSphere VMFS

### **Objective: Create and manage VMFS datastores**

In this lab, you will perform the following tasks:

1. Change the Name of a VMFS Datastore
2. Review the Shared Storage Configuration
3. Create a VMFS Datastore
4. Expand a VMFS Datastore to Consume Unused Space on a LUN
5. Remove a VMFS Datastore
6. Extend a VMFS Datastore

### **Task 1: Change the Name of a VMFS Datastore**

You can change the name of an existing VMware vSphere® VMFS datastore.

Students should do the steps in this task individually.

Use the following information from the class configuration handout:

- VMware® vCenter™ Server Appliance™ name
- VMware® vCenter Server™ root password
- Your VMware ESXi™ host name
- Local datastore name

1. If the VMware vSphere® Web Client is not already active, open a Web browser and connect to the vCenter Server Appliance home page at [https://vCenter\\_Server\\_Virtual\\_Appliance\\_name:9443/](https://vCenter_Server_Virtual_Appliance_name:9443/).
2. On the Login page, log in as root with the password and click **Login**.
3. Click the **Home** icon.
4. Select **vCenter > Datastores**.
5. Right-click the local datastore and select **Rename**.
6. Type **Local-ESXi##**, where ## is the number of your ESXi host.  
For example, for an ESXi host that ends in 02, the new name of the datastore is Local-ESXi02.
7. Click **OK**.
8. Verify that the new datastore name is displayed in the inventory.

## Task 2: Review the Shared Storage Configuration

Display information about the shared storage in your lab environment.

Students should do the steps in this task individually.

1. Select **vCenter > Hosts and Clusters > Lab Servers > Your\_ESXi\_host\_name**.
2. Click the **Manage** tab and click **Storage**.
3. Click **Storage Adapters** and select the **iSCSI Software Adapter**.
4. In the Adapter Details section, select the **Paths** tab and note the SCSI logical unit numbers (LUNs) that are available to your host.

You use these LUNs to create datastores.

## Task 3: Create a VMFS Datastore

VMFS datastores serve as repositories for virtual machines. You can set up VMFS datastores on any SCSI-based storage devices that the host discovers, including Fibre Channel, iSCSI, and local storage devices.

Students should do the steps in this task individually.

Use the following information from the class configuration handout:

- First assigned LUN ID
- Second assigned LUN ID

1. Select **Home** > **vCenter** > **Hosts and Clusters** > **Lab Servers** > *ESXi\_host\_name*.
2. Right-click the ESXi host and select **New Datastore**.
3. When prompted by the New Datastore wizard, perform the following actions.

<b>Option</b>	<b>Action</b>
Location	Ensure that your ESXi host is listed and click <b>Next</b> .
Type	Select <b>VMFS</b> and click <b>Next</b> .
Datastore name	Type <b>PrivateVMFS-##</b> , where <b>##</b> is the LUN number of your first assigned LUN listed in the class configuration handout. For example, if the LUN number of your assigned LUN ID is 1, the datastore name would be PrivateVMFS-01.
Select Disk/LUN	Click your first assigned target/LUN number.  Click <b>Next</b> .
File System Version	Keep the default of VMFS-5 and click <b>Next</b> .
Partition configuration	Click the <b>Datastore Size</b> slider and reduce the LUN size by 1GB. For example, if the current disk size is 10GB, change the size to 9GB. (You increase this VMFS datastore to its maximum size in task 4.)  Click <b>Next</b> .
Ready to Complete	Click <b>Finish</b> .

4. Monitor the progress in the **Recent Tasks** pane and wait for the task to complete.
5. Right-click your ESXi host and select **New Datastore**.
6. When prompted by the Add Storage wizard, perform the following actions.

<b>Option</b>	<b>Action</b>
Location	Ensure that your ESXi host is listed and click <b>Next</b> .
Type	Select <b>VMFS</b> and click <b>Next</b> .

<b>Option</b>	<b>Action</b>
Datstore name	Type <b>PrivateVMFS-##</b> , where ## is the LUN number of your second assigned LUN listed in the class configuration handout. For example, if the LUN number of your assigned LUN ID is 2, the datastore name would be PrivateVMFS-02.
Select Disk/LUN	Click your second assigned target/LUN number. Click <b>Next</b> .
File System Version	Keep the default of VMFS-5 and click <b>Next</b> .
Partition configuration	Keep the default size and partition configuration. Click <b>Next</b> .
Ready to Complete	Click <b>Finish</b> .

7. Monitor the progress in the **Recent Tasks** pane and wait for the task to complete.
8. Select **Home > vCenter > Storage > Training**.
9. Select **Related Objects > Datastores**.
10. Verify that each new VMFS datastore is displayed in the datastore inventory.
11. In the datastore inventory, click the first PrivateVMFS-## datastore that you created.
12. Click the **Summary** tab and record the value for Capacity. \_\_\_\_\_

## **Task 4: Expand a VMFS Datastore to Consume Unused Space on a LUN**

When you need to create virtual machines on a datastore, or when the virtual machines running on a datastore require more space, you can dynamically increase the capacity of a VMFS datastore.

Students should do the steps in this task individually.

Use the following information from the class configuration handout:

- First assigned LUN ID

1. Click the **Manage** tab of the first PrivateVMFS-## datastore that you created in task 3.
2. Click the **Settings** button.
3. Click **Increase** next to Capacity.

- When prompted by the Increase Datastore Capacity wizard, perform the following actions.

Option	Action
Select Device	Select the first assigned LUN. This LUN should read <b>Yes</b> in the Expandable column.  Click <b>Next</b> .
Specify Configuration	From the Partition Configuration drop-down menu, select <b>Use Free Space 1 GB to expand the datastore</b> .  <b>NOTE</b> The free space listed in the drop-down menu might be different in your environment.  Click <b>Next</b> .
Ready to Complete	Review the information for accuracy and click <b>Finish</b> .

- After the task is completed, review the datastore **Summary** tab and verify that the datastore size was increased to the maximum capacity (less space for system overhead).

## Task 5: Remove a VMFS Datastore

You can delete any type of VMFS datastore, including copies that you have mounted without resignaturing. When you delete a datastore, it is destroyed and disappears from all hosts that have access to the datastore.

Students should do the steps in this task individually.

- In the inventory, right-click the PrivateVMFS-## datastore, where ## is the second LUN ID that is assigned to you.
- Select **All vCenter Actions > Delete Datastore**.
- Click **Yes** to confirm datastore deletion.
- Verify that the datastore was removed from the inventory.

## Task 6: Extend a VMFS Datastore

A datastore can span over up to 32 extents (and can be called a multi-extent datastore). The size of each extent can be up to 64TB. The overall datastore size can be 64TB, but the datastore appears as a single datastore object.

Students should do the steps in this task individually.

Use the following information from the class configuration handout:

- First assigned LUN ID
  - Second assigned LUN ID
1. In the Datastore inventory, click the PrivateVMFS-## datastore, where ## is the number of your first assigned LUN ID.
  2. Click the **Manage** tab.
  3. Under the **Settings** tab, click **Increase** next to Capacity.
  4. When prompted by the Increase Datastore Capacity wizard, perform the following actions.

Option	Action
Select Device	Select your second assigned LUN. Click <b>Next</b> .
Specify Configuration	From the Partition Configuration drop-down menu, select <b>Use all available partitions</b> . Click <b>Next</b> .
Ready to Complete	Review the information for accuracy and click <b>Finish</b> .

5. When the task completes, click **Device Backing** and verify that two extents are displayed in the Extent Name pane.  
The Extent Name pane should show both of your assigned LUN IDs.
6. Click the **Summary** tab.
7. In the **Summary** tab, record the new value for Total Capacity. \_\_\_\_\_  
The value should differ from the value in task 3.
8. Rename this datastore *VMFS-student\_number* where student number is the number of your assigned ESXi host.
9. Leave the vSphere Web Client open for the next lab.



## Lab 12

# Using Templates and Clones

### Objective: Deploy a virtual machine from a template and clone a virtual machine

In this lab, you will perform the following tasks:

1. Copy Sysprep Files to vCenter Server Appliance
2. Create a Template
3. Create Customization Specifications
4. Deploy a Virtual Machine from a Template
5. Clone a Virtual Machine that is Powered On

### Task 1: Copy Sysprep Files to vCenter Server Appliance

The Sysprep files are an essential component of guest operating system customization. The Sysprep files are obtained from Microsoft and copied to VMware® vCenter™ Server Appliance™.

Students should do the steps in this task as a team from a single student desktop.

Use the following information from the class configuration handout:

- VMware® vCenter Server™ root password
1. On the desktop of your student virtual machine, double-click **WinSCP**.
  2. Double-click **Upload sysprep files to the vCVA**.
  3. If you receive a security warning, click **Update** to update the certificate.
  4. If asked for a user name, type **root**.

5. Type the administrator password and click **OK**.
6. Copy all the files from the Sysprep folder on the desktop to the vCenter Server Appliance `/etc/vmware-vpx/sysprep/svr2003` directory.
7. After the file copy is complete, select **Disconnect** from the Session menu.
8. Close the WinSCP program.

## Task 2: Create a Template

A virtual machine template serves as a template for creating new virtual machines.

Students should do the steps in this task individually.

Use the following information from the class configuration handout:

- vCenter Server Appliance root password
1. If the VMware vSphere® Web Client is not already active, open a Web browser and connect to the vCenter Server Appliance home page at [https://vCenter\\_Server\\_Appliance:9443/](https://vCenter_Server_Appliance:9443/).
  2. On the vCenter Server Appliance Login page, log in as root and type the administrator password.
  3. Click **Login**.
  4. Select **vCenter > Virtual Machines**.
  5. Right-click the virtual machine named `your_name##-1`.
  6. Click **Shut Down Guest OS**.
  7. Click **Yes** to confirm shutdown and wait for the virtual machine to power off.
  8. Right-click the virtual machine and select **All vCenter Actions > Convert to Template**.
  9. Select **vCenter > VM Templates**.
  10. Right-click the virtual machine named `your_name##-1` and select **Move To**.
  11. Expand **VM Folders** and select **Templates**.
  12. Click **OK**.
  13. Right-click the virtual machine template and click **Rename**.
  14. Type `your_name Template` to change the template name and click **OK**.

## Task 3: Create Customization Specifications

A custom Sysprep answer file is a file that stores a number of customization settings such as computer name, licensing information, and workgroup or domain settings. You create a customization specification for template deployment.

Students should do the steps in this task individually.

Use the following information from the class configuration handout:

- Windows product key
  - vCenter Server root password
  - Virtual machine administrator password
  - Time zone
1. In the vSphere Web Client, click **Home**.
  2. In the Monitoring panel, click **Customization Specification Manager**.
  3. Click the **Create a new specification** icon (the left-most icon).

Option	Action
Target VM Operating System	Select <b>Windows</b> .
Customization Spec Name	Type <i>your_name-CustomSpec</i> . Click <b>Next</b> .
Set Registration Information	Type <b>VMware Student</b> for Name and <b>VMware</b> for Organization. Click <b>Next</b> .
Set Computer Name	Click <b>Use the virtual machine name</b> and click <b>Next</b> .
Enter Windows License	Type the Windows product key and leave all the other default values. Click <b>Next</b> .
Set Administrator Password	Type the Windows administrator password. Retype the password in the <b>Confirm password</b> text box and click <b>Next</b> .
Time Zone	Select the time zone and click <b>Next</b> .
Run Once	Leave the default and click <b>Next</b> .
Configure Network	Leave the default and click <b>Next</b> .
Set Workgroup or Domain	Leave the default and click <b>Next</b> .

<b>Option</b>	<b>Action</b>
Set Operating System Options	Leave the default and click <b>Next</b> .
Ready to Complete	Click <b>Finish</b> .

4. Verify that your customization specification was created successfully.

## **Task 4: Deploy a Virtual Machine from a Template**

Virtual machines can be rapidly deployed from templates saving time in creating new virtual machines. You deploy a virtual machine from your template and enable vCenter Server to customize the guest operating system.

Students should do the steps in this task individually.

Use the following information from the class configuration handout:

- Shared VMware vSphere® VMFS datastore for virtual machines
1. In the vSphere Web Client, click **Home**.
  2. Select **vCenter > VM Templates**.
  3. Right-click your named template and select **Deploy VM from this Template**.
  4. When prompted by the Deploy Template wizard, perform the following actions.

<b>Option</b>	<b>Action</b>
Select a name	Name the new virtual machine with your first name, followed by the number of your VMware ESXi™ host and the sequence number 2. For example, if Mike’s ESXi host is named ESXi01, the name of this virtual machine is Mike01-2.
Select a location	Select the <code>LabVMs</code> folder and click <b>Next</b> .
Select a compute resource	Expand the <code>Lab Servers</code> folder and click your ESXi host. Click <b>Next</b> .
Select a virtual disk format	Keep the default.
Select a destination storage for the virtual machine files	Select the Shared VMFS datastore for virtual machines and click <b>Next</b> .

Option	Action
Select clone options	Select <b>Customize the operating system</b> . Select <b>Power on this virtual machine after creation</b> . Click <b>Next</b> .
Customize guest OS	Select <i>your_name</i> CustomSpec. Click <b>Next</b> .
Ready to Complete	Click <b>Finish</b> .

5. Repeat steps 3 and 4 and create another virtual machine.  
Name this virtual machine *your\_name###-3*.
6. In the Recent Tasks pane on the right side of the vSphere Web Client, monitor the progress of the template deployment task.
7. Select **vCenter > Virtual Machines**.
8. After you create these virtual machines, open a virtual machine console to each of your new virtual machines.
9. Verify that each virtual machine passes the following checks.
  - The virtual machine boots up successfully. Wait at least 2 minutes for Sysprep to complete its tasks, which includes a reboot of the system.
  - You can log in to the guest operating system as administrator with the virtual machine administrator password.
  - VMware® Tools™ is installed.
  - The `cpubusy.vbs` file is on the desktop.
10. Close the virtual machine console. Do not shut down the virtual machine.

## Task 5: Clone a Virtual Machine that is Powered On

Cloning a virtual machine creates a duplicate of the virtual machine with the same configuration and installed software as the original. You can clone a virtual machine while it is powered off, powered on, or suspended.

Students should do the steps in this task individually.

Use the following information from the class configuration handout:

- Local VMFS datastore for virtual machines
1. Right-click the *your\_name##-2* virtual machine and select **Clone To Virtual Machine**.
  2. When prompted by the Clone Virtual Machine wizard, perform the following actions.

<b>Option</b>	<b>Action</b>
Name	Name the new virtual machine Hot-Clone, followed by the number of your ESXi host, for example, Mike has an ESXi host named ESXi01. The name of this virtual machine is Hot-Clone01.
Inventory Location	Select the <code>LabVMs</code> folder and click <b>Next</b> .
Select a compute resource	Expand the <code>Lab Servers</code> folder and click your ESXi host. Click <b>Next</b> .
Select virtual disk format	Keep the default.
Select a destination storage for the template files	Select the Local VMFS datastore for virtual machines, and click <b>Next</b> .
Select clone options	Select <b>Customize the operating system</b> . Select <b>Power on this virtual machine after creation</b> . Click <b>Next</b> .
Customize guest OS	Select <i>your_nameCustomSpec</i> . Click <b>Next</b> .
Ready to Complete	Click <b>Finish</b> .

3. Monitor the progress of the task in the **Recent Tasks** pane.
4. Leave the vSphere Web Client open for the next lab.

## Lab 13

# Modifying a Virtual Machine

### **Objective: Modify a virtual machine's hardware and add a raw LUN to a virtual machine**

In this lab, you will perform the following tasks:

1. Increase the Size of a VMDK File
2. Adjust Memory Allocation on a Virtual Machine
3. Rename a Virtual Machine in the vCenter Server Inventory
4. Add a Raw LUN to a Virtual Machine
5. Expand a Thin-Provisioned Virtual Disk

### **Task 1: Increase the Size of a VMDK File**

Increase the size of a virtual machine's C: drive and configure the guest operating system to detect the additional space.

Students should do the steps in this task individually.

Use the following information from the class configuration handout:

- VMware® vCenter™ Server Appliance™ host name
- VMware® vCenter Server™ root password
- Virtual machine administrator password

1. If the VMware vSphere® Web Client is not already active, open a Web browser and connect to the vCenter Server Appliance home page at [https://vCenter\\_Server\\_Virtual\\_Appliance\\_name:9443](https://vCenter_Server_Virtual_Appliance_name:9443).
2. On the vCenter Server Appliance Login page, log in as root with the password and click **Login**.
3. Select **vCenter > Virtual Machines**.
4. Verify that the Hot-Clone## virtual machine is powered on.
5. If the virtual machine is not powered on, power it on now.
6. Right-click your Hot-Clone## virtual machine in the inventory and select **Edit Settings**.  
The Virtual Machine's Edit Settings window is displayed.
7. In the Virtual Hardware list, select **Hard Disk 1**.
8. In Hard Disk 1, type **3GB** and click **OK**.
9. Increase the size of the disk from within the guest operating system.
  - a. In the **Summary** tab, select **Launch Console**.
  - b. Log in to the guest operating system as Administrator, with the virtual machine administrator password.
  - c. On the virtual machine desktop, double-click **My Computer**.  
**Q1. What is the total size of the C: drive?**
  - d. Use Windows Explorer to open the `C:\dell\ExtPart` folder.
  - e. Double-click the `extpart.exe` file.
  - f. In Volume to extend, type **C:**.
  - g. In Size to expand the volume, type **1024** to extend the volume by 1,024MB.
  - h. On the virtual machine desktop, double-click **My Computer** to verify that the C: drive is extended.
  - i. Record the value for the total size of the C: drive. \_\_\_\_\_  
**Q2. What is the difference between the values recorded in Q1 and Q2?**
- j. Close the virtual machine's console.



## Task 2: Adjust Memory Allocation on a Virtual Machine

You can add, change, or configure virtual machine memory resources or options to enhance virtual machine performance.

Students should do the steps in this task individually.

1. Right-click the Hot-Clone## virtual machine in the inventory and select **Shut Down Guest OS**.
2. Click **Yes** to confirm the shutdown.
3. After the virtual machine has shut down, right-click the virtual machine and select **Edit Settings**.
4. In the Virtual Hardware list, select the size value next to Memory.
5. Change the value to **512** and ensure that **MB** is selected from the drop-down menu.
6. Click **OK**.
7. Click the virtual machine's **Summary** tab to verify that the memory has increased.

## Task 3: Rename a Virtual Machine in the vCenter Server Inventory

When you change the name of a virtual machine, you change the name used to identify the virtual machine in the vCenter Server inventory.

Students should do the steps in this task individually.

1. In the inventory, right-click your Hot-Clone## virtual machine and select **Rename**.
2. Rename the virtual machine to *your\_name##-4*, where ## is the number of your VMware ESXi™ host.

For example, if Greg has a host named ESXi01, the name of his virtual machine is Greg01-4.

### CAUTION

Renaming a virtual machine in the inventory does not rename the virtual machine's folder or the files in the virtual machine's folder on the datastore.

## Task 4: Add a Raw LUN to a Virtual Machine

A raw device mapping (RDM) enables a virtual machine to directly access and use a logical unit number (LUN).

Students should do the steps in this task individually.

Use the following information from the class configuration handout:

- Your raw LUN ID
- Virtual machine administrator password

1. Add a raw LUN to the *your\_name###-2* virtual machine.
  - a. In the inventory, right-click the *your\_name###-2* virtual machine and select **Edit Settings**.  
The Virtual Machine Edit Settings dialog box is displayed.
  - b. From the New Device drop-down menu, select **RDM Disk** and click **Add**.
  - c. In the Select Target LUN dialog box, select the assigned LUN.
  - d. Click **OK**.
  - e. Click the arrow next to New Hard disk to expand the new hard disk properties.
  - f. Configure the following properties for the new hard disk.

<b>Option</b>	<b>Action</b>
Location	Select <b>Store with the virtual machine</b> .
Compatibility Mode	Select <b>Virtual</b> .
Shares	Keep the default.
Limit IOPs	Keep the default.
Virtual Flash	Keep the default.
Virtual Device Node	Keep the default.
Disk Mode	Keep the default.

- g. Click **OK** to close the Edit Settings dialog box.
2. Verify that the guest operating system can see the new disk.
  - a. Open a console to the virtual machine and log in as Administrator, with the virtual machine administrator password.
  - b. Select **Start > Programs > Administrative Tools > Computer Management**.
  - c. Click **Disk Management**.
  - d. If a disk wizard starts, click **Cancel**.
  - e. Verify that Disk 1 is listed.  
Disk 1 is the RDM. You can now use the guest operating system utilities to format the drive. In this lab, you do not have to format the drive.
  - f. Close the Computer Management window and close the virtual machine console.

## Task 5: Expand a Thin-Provisioned Virtual Disk

If you created a virtual disk in the thin format, you can convert the thin disk to a virtual disk in thick provision, eager-zeroed format.

Students should do the steps in this task individually.

1. Select **Home > Hosts and Clusters > Training > Lab Servers > Your\_ESXi\_host\_name**.
2. Click the **Related Objects** tab and click **Virtual Machines**.
3. View and record the storage information for the virtual machine named *your\_name##-3*.
  - Provisioned Space \_\_\_\_\_
  - Used Space \_\_\_\_\_
4. Click *your\_name##-3* and select the **Summary** tab.
5. Click the arrow next to Hard Disk 1 in the virtual machine hardware box and record the datastore. \_\_\_\_\_
6. Right-click *your\_name##-3* and select **Shut Down Guest OS**.
7. Click **Yes** to confirm shutdown.
8. Inflate the thin-provisioned virtual disk.
  - a. Select **Home > Storage > Training**.
  - b. Right-click the datastore that you recorded in step 5 and select **Browse Files**.
  - c. Open the folder for the virtual machine named *your\_name##-3*.
  - d. Right-click the *your\_name##-3.vmdk* file and select **Inflate**.
9. Wait for the operation to finish.
10. Select **Home > vCenter > Hosts and Clusters > Training > Lab Servers > Your\_ESXi\_host\_name**.
11. Click the **Related Objects** tab and click **Virtual Machines**.
12. Power on the virtual machine.
13. Observe the Used space and Provisioned space columns.

The Size column displays a new value equal to the size of the virtual disk.
14. Leave the vSphere Web Client open for the next lab.



## Lab 14

# Migrating Virtual Machines

### Objective: Use vSphere vMotion and vSphere Storage vMotion to migrate virtual machines

In this lab, you will perform the following tasks:

1. Migrate Virtual Machine Files with vSphere Storage vMotion
2. Create a Virtual Switch and a VMkernel Port Group for vSphere vMotion Migration
3. Verify That Your ESXi Host Meets vSphere vMotion Requirements
4. Verify That Your Virtual Machines Meet vSphere vMotion Requirements
5. Perform a vSphere vMotion Migration of a Virtual Machine on a Shared Datastore
6. Perform a Cross-Host vSphere Storage vMotion Migration to a Local Datastore
7. Prepare for the Next Lab

### Task 1: Migrate Virtual Machine Files with vSphere Storage vMotion

With VMware vSphere® Storage vMotion®, you can migrate a virtual machine and its disk files from one datastore to another while the virtual machine is running.

Students should do the steps in this task individually.

#### NOTE

Student A and student B will log in to the team VMware® vCenter Server™ system simultaneously because some of these tasks require cooperation. You should communicate with your teammate.

Use the following information from the class configuration handout:

- vCenter Server root password
  - Shared datastore
1. Open the VMware vSphere® Web Client.
  2. Log in to the team VMware® vCenter™ Server Appliance™ as root and type the password.
  3. Select **vCenter > Virtual Machines**.
  4. Migrate each of your virtual machines from your local datastore to the shared datastore.
    - a. Select *your\_name##-4* and click the **Summary** tab.
    - b. Under **Storage** in the **Related Objects** panel, record the datastore that the virtual machine resides on. \_\_\_\_\_
    - c. In the vSphere Web Client inventory, right-click the *your\_name##-4* virtual machine and click **Migrate**
    - d. When prompted by the Migrate Virtual Machine wizard, perform the following actions.

<b>Option</b>	<b>Action</b>
Select Migration Type	Select <b>Change Datastore</b> .
Select a destination storage for the virtual machine files	Select the shared datastore that you recorded.
Select a virtual disk format	Keep the default. Click <b>Next</b> .
Ready to Complete	Click <b>Finish</b> .

- e. Monitor the progress of the task in the Recent Tasks pane.
- f. After the task is finished, click the **Summary** tab of the virtual machine that you migrated to verify that your virtual machine is on the new datastore.

## Task 2: Create a Virtual Switch and a VMkernel Port Group for vSphere vMotion Migration

Create a virtual switch with a VMkernel port that can be used in VMware vSphere® vMotion® migrations.

Students should do the steps in this task individually.

Use the following information from the class configuration handout:

- vmnic for the vSphere vMotion network
  - vSphere vMotion IP address
  - vSphere vMotion subnet mask
1. Select **Home > vCenter > Hosts and Clusters**.
  2. In the vCenter Web Client inventory, expand **Training > Lab Servers**.
  3. Select your VMware ESXi™ host in the inventory, and in the right pane click **Manage**.
  4. Click **Networking** and ensure that the virtual switches tab is selected.
  5. Click the icon **Add Host Networking**.
  6. When prompted by the Add Network wizard, perform the following actions.

Option	Action
Connection Type	Select <b>VMkernel Network Adapter</b> . Click <b>Next</b> .
Select target device	Select <b>New standard switch</b> . Click <b>Next</b> .
Create a Standard Switch	Click the + sign and add the adapter that you recorded. Click <b>OK</b> then click <b>Next</b> .
Port Properties	Type <b>vMotion</b> for the Network Label. Select the <b>vMotion traffic</b> check box under <b>Available Services</b> . Click <b>Next</b> .
IP Address	Select <b>Use static IPv4 settings</b> . Type the vSphere vMotion IP address that you recorded.
Subnet Mask	Type the vSphere vMotion subnet mask that you recorded. Click <b>Next</b> .
Ready to complete	Confirm the settings and click <b>Finish</b> .

7. Verify the configuration information for the new virtual switch in the Networking panel.

### Task 3: Verify That Your ESXi Host Meets vSphere vMotion Requirements

Verify that your ESXi host meets vSphere vMotion requirements.

Students should do the steps in this task individually.

Use the following information from the class configuration handout:

- Shared datastore
1. Select **Home > vCenter > Hosts and Clusters**.
  2. Select each ESXi host and click its **Summary** tab.
  3. View the **Processor Type** information to verify that the CPUs are compatible.
  4. Click your ESXi host's **Manage** tab.
  5. Verify that a vSphere vMotion port group exists and that it is configured with a speed and duplex of 1000Mb, Full Duplex.
    - a. Click the **Networking** button.
    - b. Select **vSwitch 2** and verify that a vSphere vMotion port group exists.  
Verify that the port is a VMkernel port.
    - c. Verify that the physical adapter connected to the virtual switch has its speed and duplex defined as 1000 full.
  6. Verify that both ESXi hosts have access to the same shared datastores.
    - a. Select **Home > vCenter > Storage**.
    - b. In the vCenter Web Client inventory, expand **vcva01 > Training**.
    - c. Select the shared datastore you recorded.
    - d. In the right pane, click **Manage**.
    - e. On the Manage tab, click **Settings**.
    - f. Click **Connectivity and Multipathing**.
    - g. Verify that both hosts are displayed in the table.



## Task 4: Verify That Your Virtual Machines Meet vSphere vMotion Requirements

Verify that a virtual machine's settings meet vSphere vMotion requirements.

Students should do the steps in this task individually.

1. Select **Home > vCenter > VMs and Templates**.
2. In your `LabVMs` folder, click the `your_name##-2` virtual machine.
3. In the right pane, click **Summary**.
4. In the VM Hardware pane, click **Edit Settings**.
5. Verify that the virtual machine's CD/DVD Drive 1 is not connected to a local device and does not have an image defined in a local datastore.
  - a. In the Hardware list, verify that the Summary column for CD/DVD Drive 1 shows Client Device.
  - b. If the Summary column does not show Client Device, select CD/DVD Drive 1 in the list and click **Client Device** to remove existing connections.
6. In the **Hardware** list, find Network Adapter 1.
7. Verify that the virtual machine is either disconnected from the network or connected to a network accessible by the destination ESXi host (your partner's ESXi host).
8. Check the **Hardware** list for a hard disk that is labeled **Hard Disk 2**.
  - a. If you have such a disk, point to the disk.
  - b. After a moment, click the **x** button that appears at the right side of the row for Hard Disk 2.
  - c. Select the **Delete files from datastore** check box.

This raw device mapping (RDM) hard disk was added in a previous lab and must be removed because it is a private LUN and the other ESXi host cannot access it. You perform this step so that the virtual machine will be compatible with vSphere vMotion.
9. Verify that CPU affinity is not set.
  - a. Click the arrow next to CPU to expand the advanced CPU options.
  - b. If the **Scheduling Affinity** panel displays a number, delete the number.
10. Click **OK** to apply all virtual machine changes.
11. Repeat this task for all your other virtual machines.

## Task 5: Perform a vSphere vMotion Migration of a Virtual Machine on a Shared Datastore

Migration with vSphere vMotion allows virtual machine processes to continue working throughout a migration.

Students should do the steps in this task individually.

Use the following information from the class configuration handout:

- ESXi host to which to migrate virtual machines
  - Virtual machine administrator password
1. Select **Home > vCenter > Hosts and Clusters**.
  2. Expand the vCenter Server inventory view by clicking on the arrow next to your ESXi host so that you can see all your virtual machines.
  3. If the *your\_name###-2* virtual machine is powered off, right-click *your\_name###-2* and select **Power On**.
  4. After the virtual machine is powered on, right-click *your\_name###-2* and select **Open Console**.
  5. Log in to the virtual machine with the administrator account and password that you recorded.
  6. Open a command prompt on the virtual machine.
  7. Type the **ipconfig** command and record the virtual machine's default gateway. \_\_\_\_\_
  8. Type **ping -t default\_gateway** that you recorded in step 7 and press Enter to start a continuous ping of the virtual machine's default gateway.
  9. Leave the virtual machine console open and return to the vSphere Web Client.
  10. Migrate *your\_name###-2* to your partner's ESXi host.
    - a. Right-click the virtual machine named *your\_name###-2* and select **Migrate**.
    - b. When prompted by the Migrate Virtual Machine wizard, perform the following actions.

Option	Action
Select Migration Type	Select <b>Change host</b> .
Select Destination	<p>Expand the inventory view and select the ESXi host that you recorded to which you want to migrate virtual machines.</p> <p>The migration requirements are validated. If the validation does not succeed, you receive warning or error messages. You cannot continue with the migration until the errors are resolved.</p> <p><b>NOTE</b></p> <p>One reason that the validation might not succeed is if an RDM resides in a private LUN. See task 4, step 8.</p>
vMotion Priority	Leave the default value and click <b>Next</b> .
Ready to Complete	Click <b>Finish</b> .

11. Return to the virtual machine console. Arrange the windows so that you can observe both the virtual machine console and the Recent Tasks pane in vSphere Client.
12. Monitor the command prompt in the virtual machine and verify that no pings are dropped during the migration.
13. In the Recent Tasks pane, monitor the progress of the virtual machine migration.
14. After the Relocate virtual machine task is complete in the Recent Tasks pane, press CTRL+C in the cmd window of the virtual machine console to stop the ping.
15. Close the virtual machine console and return to the vSphere Web Client.
16. Verify that your virtual machine is displayed under your partner's ESXi host in the inventory.
17. If your other virtual machines are powered off, power them on now.
18. Use vSphere vMotion and verify that your other virtual machines can be migrated successfully to your partner's ESXi host.
19. Migrate *your\_name##-2* back to your ESXi host.

## Task 6: Perform a Cross-Host vSphere Storage vMotion Migration to a Local Datastore

vSphere vMotion migration to another host and datastore is possible in VMware vSphere® environments without shared storage.

Students should do the steps in this task individually.

Use the following information from the class configuration handout:

- ESXi host to which to migrate virtual machines
  - Local datastore name
1. Select **Home > vCenter > Hosts and Clusters**.
  2. Expand the vCenter Server inventory view by clicking the arrow next to your ESXi host so that you can see all your virtual machines.
  3. Migrate *your\_name###-2* to your partner's ESXi host.
    - a. Click the virtual machine named *your\_name###-2* and select **Migrate**.

### NOTE

If *your\_name###-2* is powered off, power it on before beginning the vSphere vMotion migration.

- b. When prompted by the Migrate Virtual Machine wizard, perform the following actions.

Option	Action
Select Migration Type	Select <b>Change both host and datastore</b> . Click <b>Next</b> .
Select Destination	Expand the inventory view and select the ESXi host that you recorded to which you want to migrate virtual machines.
Select Datastore	Select the local datastore.
vMotion Priority	Leave the default value. Click <b>Next</b> .
Ready to Complete	Click <b>Finish</b> .

4. In the Recent Tasks pane, monitor the progress of the virtual machine migration.
5. Verify that your virtual machine is displayed under your partner's ESXi host in the inventory.

## Task 7: Prepare for the Next Lab

Migrate all your virtual machines back to your host.

Students should do the steps in this task individually.

Use the following information from the class configuration handout:

- Shared datastore name
1. Select **Home > vCenter > Hosts and Clusters**.
  2. Expand the vCenter Server inventory view so that you can see all your virtual machines.
  3. Migrate each of your virtual machines back to your ESXi host.
    - a. If any of your virtual machines are powered off, power it on before performing the vSphere vMotion migration.
    - b. Click your virtual machine and select **Actions > Migrate**.
    - c. When prompted by the Migrate Virtual Machine wizard, perform the following actions.

Option	Action
Select Migration Type	Select <b>Change host</b> or <b>Change host and datastore</b> for the virtual machine you migrated to local storage.
Select Destination	Expand the inventory view and select your ESXi host.
Datastore	Select <b>Shared datastore</b> .
vMotion Priority	Leave the default value.
Ready to Complete	Click <b>Finish</b> .

4. In the Recent Tasks pane, monitor the progress of the virtual machine migration.
5. Verify that your virtual machines are displayed under your ESXi host in the inventory.
6. Close the vSphere Web Client.



## Lab 15

# Managing Virtual Machines

### Objective: Perform several virtual machine management tasks

In this lab, you will perform the following tasks:

1. Unregister a Virtual Machine in the vCenter Server Inventory
2. Register a Virtual Machine in the vCenter Server Inventory
3. Unregister and Delete Virtual Machines from Disk
4. Take Snapshots of a Virtual Machine
5. Revert to a Snapshot
6. Delete an Individual Snapshot
7. Use the Delete All Function in Snapshot Manager

### Task 1: Unregister a Virtual Machine in the vCenter Server Inventory

Unregistering a virtual machine from the inventory unregisters it from the host and VMware® vCenter Server™ inventory, but does not delete it from the datastore.

Students should do the steps in this task individually.

Use the following information from the class configuration handout:

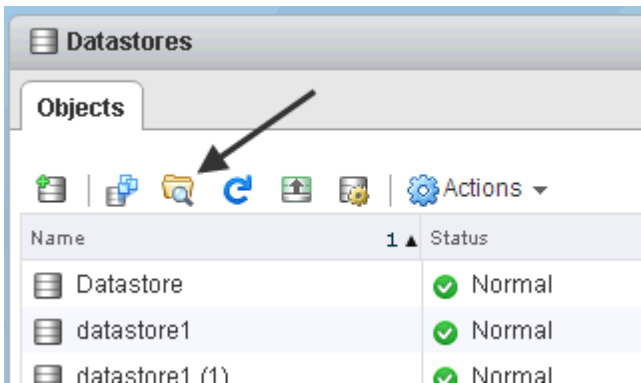
- VMware® vCenter™ Server Appliance™ system name
- vCenter Server root password

1. If the VMware vSphere® Web Client is not already active, open a Web browser and connect to the vCenter Server Appliance page at [https://vCenter\\_Server\\_Appliance\\_name:9443/](https://vCenter_Server_Appliance_name:9443/).
2. On the Login page, log in as root with the password that you recorded and click **Login**.
3. Select **vCenter > Virtual Machines**.
4. Click *your\_name###-4*, where **##** is the number of your VMware ESXi™ host, and click the **Summary** tab.
5. From the **Related Object** panel in the **Summary** tab, record the VMFS datastore name where the virtual machine resides. \_\_\_\_\_
6. Right-click *your\_name###-4* and select **Shut Down Guest OS**.
7. After the virtual machine has shut down, right-click *your\_name###-4* and select **All vCenter Actions > Remove from Inventory**.

### CAUTION

Do not select **Delete from Disk**. This operation is not recoverable.

8. Click **Yes** to confirm the removal and verify that *your\_name###-4* is no longer displayed in the inventory.
9. Select **Home > vCenter > Datastores**.
10. Select the VMware vSphere® VMFS datastore under the Objects tab on which *your\_name###-4* is located and select the **Navigate to the datastore file browser** icon.





11. View the folders in the Datastore browser.

**Q1. Is there a folder named *your\_name##-4*?**

12. Click the *yourname##-4* folder to view the virtual machine files.

13. Leave the Datastore browser open for the next task.

## Task 2: Register a Virtual Machine in the vCenter Server Inventory

If you removed a virtual machine from the vCenter Server inventory but did not remove it from the managed host's datastore, you can return it to the vCenter Server inventory by registering it with the vCenter Server system.

Students should do the steps in this task individually.

1. In the list of files to the right of the **Folders** pane, right-click the *yourname##-4.vmx* file and select **Register VM**.
2. When prompted by the Add to Inventory wizard, perform the following actions.

Option	Action
Name & Location	Type <i>your_name##-5</i> , where ## is the number of your ESXi host. In the <b>Inventory Location</b> pane, select your <code>LabVMs</code> folder. Click <b>Next</b> .
Host/Cluster	Select your ESXi host. Click <b>Next</b> .
Ready to Complete	Click <b>Finish</b> .

3. Verify that the virtual machine is placed back in the inventory.
  - a. Select **Home > vCenter > VMs and Templates**.
  - b. Verify that *your\_name##-5* is in your `LabVMs` folder.

### Task 3: Unregister and Delete Virtual Machines from Disk

You use the Delete from Disk option to remove a virtual machine from the vCenter Server inventory and delete all virtual machine files, including the configuration file and virtual disk files, from the datastore.

Students should do the steps in this task individually.

1. Select the *your\_name##-5* virtual machine in the inventory and click the **Summary** tab.
2. Record the VMFS datastore name on which this virtual machine resides. \_\_\_\_\_
3. Right-click *your\_name##-5* and select **All vCenter Actions > Delete from Disk**.
4. Click **Yes** to confirm the deletion and verify that *your\_name##-5* is no longer displayed in the inventory.
5. Select **Home > vCenter > Datastores**.
6. Select the VMFS datastore on which *your\_name##-5* was located and click the **Navigate to the datastore file browser** icon.
7. Verify that the virtual machine files no longer exist.

The folder has the original virtual machine name: *your\_name##-4*.

### Task 4: Take Snapshots of a Virtual Machine

Snapshots preserve the state and data of a virtual machine at the time you take the snapshot. Snapshots are useful when you must revert repeatedly to the same virtual machine state, but you do not want to create multiple virtual machines.

Students should do the steps in this task individually.

Use the following information from the class configuration handout:

- Virtual machine Administrator password
  - Third-party software ISO location
1. Select **Home > vCenter > Virtual Machines**.
  2. Right-click the *your\_name##-3* virtual machine, and select **Open Console**.
  3. Log in as Administrator, with the virtual machine administrator password that you recorded.
  4. Drag the `iometer.exe` file to the Recycle Bin.
  5. To remove the `iometer.exe` file, right-click the **Recycle Bin** icon and select **Empty Recycle Bin**.
  6. Click **Yes** to confirm the file deletion and leave the virtual machine console open.

7. In the vSphere Web Client, right-click the *your\_name##-3* virtual machine and select **Take Snapshot**.
8. When prompted by the Take Virtual Machine Snapshot wizard, perform the following actions.

Option	Value
Name	Type <b>Without iometer</b> .
Description	Type <b>Deleted iometer.exe</b> .
Snapshot the virtual machine's memory	Click to deselect.
Quiesce guest file system (Needs VMware Tools installed)	Leave deselected.

9. Click **OK** and monitor the task in the Recent Tasks pane.
10. Return to the virtual machine console and drag the *cpubusy.vbs* file to the Recycle Bin.
11. To remove the *cpubusy.vbs* file, right-click the **Recycle Bin** icon and select **Empty Recycle Bin**.
12. Click **Yes** to confirm the file deletion and leave the virtual machine console open.
13. Return to the vSphere Web Client and take another snapshot of this virtual machine by right-clicking the virtual machine and clicking **Take Snapshot**.
14. When prompted by the Take Virtual Machine Snapshot wizard, perform the following actions.

Option	Action
Name	Type <b>Without iometer and cpubusy</b> .
Description	Type <b>Deleted cpubusy.vbs</b> .
Snapshot the virtual machine's memory	Click to deselect.
Quiesce guest file system (Needs VMware Tools installed)	Leave deselected.

15. Click **OK** and monitor the task in the Recent Tasks pane.

16. If `ClassFiles-vSphere.iso` is not already connected, connect `ClassFiles-vSphere.iso` to your virtual machine's CD-ROM drive.
  - a. Right-click the virtual machine and select **Edit Settings**.
  - b. Select **CD/DVD Drive 1 > Datastore ISO file**.
  - c. Navigate to the software ISO location that you recorded.
  - d. Select the `Classfiles-vSphere.iso` ISO image and click **OK**.
  - e. Select **Connected** next to CD/DVD Drive 1.
  - f. Click **OK** to close the Edit Settings dialog box.
17. View your virtual machine console.
18. If autorun does not open the CD-ROM, use Windows Explorer and go to the CD-ROM drive (D:).
19. Copy the `cpubusy.vbs` file from the CD-ROM drive (D:) to the virtual machine's desktop.
20. Disconnect from `Classfiles-vSphere.iso` on the CD-ROM drive.
  - a. Right-click the virtual machine in the inventory and select **Edit Settings**.
  - b. In the **Virtual Hardware** list, select the drop-down menu next to **CD/DVD Drive 1**.
  - c. Select **Client Device** and click **OK**.
21. Right-click the virtual machine in the inventory and take another snapshot of this virtual machine by clicking **Take Snapshot**.
22. When prompted by the Take Virtual Machine Snapshot wizard, perform the following actions.

Option	Action
Name	Type <b>with cpubusy</b> .
Description	Type <b>Added cpubusy.vbs</b> .
Snapshot the virtual machine's memory	Leave selected.
Quiesce guest file system (Needs VMware Tools installed)	Leave deselected.

23. Click **OK** and monitor the task in the Recent Tasks pane.
24. Right-click the virtual machine and select **Manage Snapshots**.  
You should see three snapshots.
25. Leave the Snapshot Manager open.

## Task 5: Revert to a Snapshot

The **Revert to** feature enables you to return a virtual machine to the time when the selected snapshot was created.

Students should do the steps in this task individually.

Use the following information from the class configuration handout:

- Virtual machine administrator password
1. In the Snapshot Manager, select the snapshot named `Without iometer and cpubusy` and click **Revert to**.
  2. Click **Yes** to confirm that you want to revert to `Without iometer and cpubusy`.
  3. Click **Close** to close the Snapshot Manager.

**Q1. Did the virtual machine power off and what is the reason?**

4. Start your virtual machine by right-clicking the virtual machine and selecting **Power On**.
5. Log in to your virtual machine as Administrator with the virtual machine administrator password that you recorded.

**Q2. Do you see either `iometer.exe` or `cpubusy.vbs` on the desktop?**

6. In the vSphere Web Client, right-click the virtual machine and select **Manage Snapshots**.  
You should see that the **You Are Here** pointer has been placed below the snapshot named `Without iometer and cpubusy`.
7. In the Snapshot Manager, select the snapshot named `With cpubusy` and click **Revert to**.
8. Click **Yes** to confirm that you want to revert to `With cpubusy`.
9. Click **Close** to close the Snapshot Manager.

**Q3. Did the virtual machine power off and what is the reason?**

**Q4. Do you see `cpubusy.vbs` on the desktop?**

**Q5. Do you see `iometer.exe` on the desktop?**

## Task 6: Delete an Individual Snapshot

Deleting a snapshot removes the snapshot from the Snapshot Manager. The snapshot files are consolidated and written to the parent snapshot disk.

Students should do the steps in this task individually.

1. Right-click the virtual machine and select **Manage Snapshots**.

You should see that the You Are Here pointer has been placed below the snapshot named with `cpubusy`.

2. In the Snapshot Manager, click the snapshot named `Without iometer and cpubusy` and click **Delete**.
3. Click **Yes** to confirm that you want to delete `Without iometer and cpubusy`.
4. Click **Close** to close the Snapshot Manager.

**Q1. Did the virtual machine power off?**

**Q2. Do you see `cpubusy.vbs` on the desktop?**

## Task 7: Use the Delete All Function in Snapshot Manager

Delete All consolidates and writes changes between snapshots and previous delta disk states to the base parent disk and merges them with the base virtual machine disk.

Students should do the steps in this task individually.

1. Right-click the virtual machine and select **Manage Snapshots**.

You should see that the You Are Here pointer has been placed below the snapshot named with `cpubusy`.

2. In the Snapshot Manager, click the **Delete All** button.
3. Click **Yes** to confirm that you want to delete all the remaining snapshots.

**Q1. Were all the remaining snapshots deleted from the Snapshot Manager?**

4. Click **Close** to close the Snapshot Manager.

**Q2. Do you see `cpubusy.vbs` on the desktop and what is the reason?**

5. Close the virtual machine console.





# Lab 16

## Managing VMware vSphere vApps

### Objective: Perform vApp management tasks

In this lab, you will perform the following tasks:

1. Create a vApp
2. Power on a vApp
3. Remove a vApp

### Task 1: Create a vApp

VMware vSphere® vApp™ is a container, like a resource pool and can contain one or more virtual machines. A vApp also shares some functionality with virtual machines.

Students should do the steps in this task individually.

Use the following information from the class configuration handout:

- VMware® vCenter Server™ root password
1. If the VMware vSphere® Web Client is not already active, open a Web browser and connect to the VMware® vCenter™ Server Appliance™ page at [https://vCenter\\_Server\\_Appliance:9443/](https://vCenter_Server_Appliance:9443/).
  2. On the vCenter Server Appliance login page, log in as root and type the root password.
  3. Click **Login**.
  4. Select **Home > vCenter > Virtual Machines**.
  5. Right-click *your\_name##-2* and select **Shut Down Guest OS**.
  6. Click **Yes** to confirm the shutdown.

7. Repeat steps 5–6 to shut down *your\_name##-3*.  
Wait until both virtual machines have been powered off.
8. Select **Home > vCenter > vApps**.
9. Click the **Create a New vApp** icon.
10. When prompted by the New vApp wizard, perform the following actions.

<b>Option</b>	<b>Action</b>
Creation type	Select <b>Create a new vApp</b> . Click <b>Next</b> .
Select destination	Select your VMware ESXi™ host. Click <b>Next</b> .
App Name	Type <i>your_name-vApp</i> .
Select folder	Select the <code>Lab VM</code> folder. Click <b>Next</b> .
Resource allocation	Leave the defaults. Click <b>Next</b> .
Ready to Complete	Click <b>Finish</b> .

11. Select **Home > vCenter > VMs and Templates**.
12. Expand **Lab VMs**.
13. Verify that the vApp appears in the inventory.
14. Drag the virtual machine named *your\_name##-2* to your vApp.
15. Drag the virtual machine named *your\_name##-3* to your vApp.

**Q1. Do you see *your\_name##-2* or *your\_name##-3* on the left side of the vSphere Web Client in the VMs and Templates view?**

16. Select **Home > vCenter > Hosts and Clusters**.

17. Expand the vApp.
18. Click the **Related Objects** tab and click the **Virtual Machines** button.

**Q2. Do you see *your\_name##-2* and *your\_name##-3* on the right side of the vSphere Web Client in the Virtual Machines view?**

19. Select **Home > vCenter > VMs and Templates**.
20. Right-click the vApp and select **Edit Settings**.
21. Click the right arrow next to **Start Order** to expand the options.
22. Select *your\_name##-2* and click the down arrow twice.  
*your\_name##-2* is placed in group 2.
23. Verify that *your\_name##-3* is displayed first, in group 1.
24. Select *your\_name##-3* and change the value in the **Startup sequence proceeds when** text box from 120 to 20 (seconds) and press Enter.
25. Select *your\_name##-2* and change the value in the **Startup sequence proceeds when** text box from 120 to 20 (seconds) and press Enter.
26. Click **OK**.

## Task 2: Power on a vApp

A vApp can power on and power off, and can also be cloned.

1. Right-click the vApp and select **Power On**.
2. Monitor the tasks in the Recent Tasks pane.

**Q1. Do the virtual machines power on at the same time?**

### Task 3: Remove a vApp

Remove the vApp that you created.

Use the following information from the class configuration handout:

- vCenter Server Appliance root password
1. Right-click the vApp and select **Shut Down**.
  2. Click **Yes** to confirm the shutdown.
  3. Select **Home > vCenter > Hosts and Clusters**.
  4. Expand the vApp.
  5. Drag *your\_name##-2* from your vApp to your host.
  6. Repeat step 5 for *your\_name##-3*.
  7. Right-click the vApp and select **All vCenter Actions > Delete from Disk**.
  8. Click **Yes** to confirm the deletion.
  9. Leave the vSphere Web Client open for the next lab.

# Lab 17

## User Permissions

### Objective: Use a custom user role

In this lab, you will perform the following tasks:

1. Create a Custom Role in vCenter Server
2. Assign Permissions on vCenter Server Inventory Objects
3. Verify Permission Usability

### Task 1: Create a Custom Role in vCenter Server

You can create custom roles by using the role-editing facilities in the VMware vSphere® Web Client to create privilege sets that match your user needs.

Students should do the steps in this task individually.

Use the following information from the class configuration handout:

- VMware® vCenter™ Server Appliance™ root password
1. Use the vSphere Web Client to log in to your team vCenter Server system as user root, with the password that you recorded.
  2. Select **Home > Administration > Roles**.
  3. Click the **Create Role** icon.  
The Create Role dialog box is displayed.
  4. In **Role name**, type **VM Creator-your\_name**.

5. In the Privileges pane, select the following privileges.

<b>Option</b>	<b>Action</b>
Datastore	Select <b>Allocate space</b> .
Network	Select <b>Assign network</b> .
Resource	Select <b>Assign virtual machine to resource pool</b> .
Virtual machine > Configuration	Select <b>Add new disk</b> . Select <b>Add or remove device</b> . Select <b>Memory</b> .
Virtual machine > Interaction	Select <b>All privileges</b> . Select <b>Interaction</b> to include all privileges in this subcategory.
Virtual machine > Inventory	Select <b>Create new</b> .

6. Click **OK** to add the role.

## **Task 2: Assign Permissions on vCenter Server Inventory Objects**

Permissions are access roles that consist of a user and the user's assigned role for an object such as a virtual machine.

Students should do the steps in this task individually.

Use the following information from the class configuration handout:

- Active Directory (AD) domain
  - Your nonprivileged domain account name
  - Datastore for domain users
1. Select **Home > vCenter > VMs and Templates**.
  2. Select your `LabVMs` folder.
  3. Click the **Manage** tab and click the **Permissions** tab.
  4. In the **Permissions** tab, click the **Add Permissions** icon.  
The Assign Permissions dialog box is displayed.
  5. Click **Add**.

6. From the drop-down menu in the Domain panel, select the AD domain that you recorded.
7. In the Users and Groups panel, select the user name of the nonprivileged domain account that you recorded.
8. Click **Add**.
9. Click **OK** to continue.
10. In the Assigned Role panel, click the **VM Creator - *your\_name*** role.
11. Leave the **Propagate to children** check box selected and click **OK**.
12. Verify that the permission appears in the **Permissions** tab.

#### **NOTE**

Note that you assigned your custom role to a specific folder. In the steps that follow, you assign the custom role to a specific host, datastore, and network. As a result, the user can create virtual machines, but *only* in the specified folder, host, datastore, and network. On the other hand, you can assign the role on an object higher in the vCenter Server inventory, such as the vCenter Server object. This role assignment enables the user to create virtual machines in any folder, host, datastore, and network.

13. Select **Home > vCenter > Hosts and Clusters**.
14. Select your VMware ESXi™ host in the inventory.
15. Click the **Manage** tab and click the **Permissions** tab.
16. Add the permission using steps 4–11.
17. Select **Home > vCenter > Datastores**.
18. Select the datastore for the domain users that you recorded and click the **Permissions** tab.
19. Add the permission using steps 4–11.
20. Select **Home > vCenter > Standard Networks**.
21. Select the Production network.
22. Click the **Manage** tab and click the **Permissions** tab.
23. Add the permission using steps 4–11.

### Task 3: Verify Permission Usability

Permissions grant users the right to perform the activities specified by the role on the object to which the role is assigned.

Students should do the steps in this task individually.

Use the following information from the class configuration handout:

- Your nonprivileged domain account name
  - Your nonprivileged domain account password
  - ESXi host
  - Datastore for domain users
  - Guest operating system
1. In the upper-right corner of the vSphere Web Client, note that you are logged in as root.
  2. Click the drop-down menu next to root@localos and click **Logout**.
  3. Log in to your vCenter Server system with the nonprivileged domain user name and password that you recorded.
  4. In the upper-right corner of the vSphere Web Client, note that you are logged in as the nonprivileged domain user.
  5. Select **Home > vCenter > VMs and Templates**.  
LabVMs is the only folder that you see.
  6. Right-click your LabVMs folder and select **New Virtual Machine**.
  7. When prompted by the Create New Virtual Machine wizard, perform the following actions.

Option	Action
Select a creation type	Click <b>Create a new virtual machine</b> and click <b>Next</b> .
Select a Name and folder	Type <i>your_name-Temp</i> , where <i>your_name</i> is your first name (for example, Mike-Temp).
Inventory Location	Ensure that the Lab VMs folder is selected. Click <b>Next</b> .
Select a compute resource	Expand the Lab Servers folder, select the ESXi host that you recorded, and click <b>Next</b> .



<b>Option</b>	<b>Action</b>
Select storage	Select the datastore for domain users that you recorded. The other datastores are not displayed in the list. Click <b>Next</b> .
Select compatibility	Ensure that <b>Compatible with ESXi 5.5 and later</b> is selected and click <b>Next</b> .
Guest Operating System	Select the guest operating system that you recorded and click <b>Next</b> .
Customize hardware	Select the following options.
CPU	Leave the defaults.
Memory	Select <b>MB</b> from the drop-down menu and type <b>4</b> .
New Hard disk	Note the options that are not available to you. Leave the default.
Disk Size	In <b>Capacity</b> , type <b>2</b> and leave the default at GB. Note that the Disk Provisioning option is unavailable. Leave the default setting for <b>Location</b> .
New Network	Verify that <b>Production</b> is the only option on the drop-down menu for NIC 1. Leave all other options at their default settings. Click <b>Next</b> .
Ready to Complete	Click <b>Finish</b> .

- Monitor the progress of the task in the Recent Tasks pane.

**Q1. Which inventory objects are available for the user?**

- After the task is completed, verify that the virtual machine was created successfully.
- Right-click your virtual machine in the inventory.  
Familiarize yourself with the options that the role does not permit. For example, the **All vCenter Actions > Delete from Disk** option is unavailable.
- Log out of the vSphere Web Client where you are logged in as the *domain user*.

12. Log in to the vSphere Web Client instance as root.
13. Select **Home > vCenter > Hosts and Clusters**.
14. Right-click the virtual machine *your\_name*-Temp and select **All vCenter Actions > Delete from Disk**.
15. Click **Yes** to confirm deletion.

# Lab 18

## Resource Pools

### Objective: Create and use resource pools on an ESXi host by using vCenter Server

In this lab, you will perform the following tasks:

1. Create CPU Contention
2. Create a Resource Pool Named Fin-Test
3. Create a Resource Pool Named Fin-Prod
4. Verify Resource Pool Functionality

#### Task 1: Create CPU Contention

CPU contention is the state of multiple virtual machines competing for limited logical CPU resources and being forced by the VMKernel to share, possibly resulting in poorer virtual machine performance.

Students should do the steps in this task individually.

Use the following information from the class configuration handout:

- VMware® vCenter™ Server Appliance™
  - VMware® vCenter Server™ root password
1. If the VMware vSphere® Web Client is not already active, open a Web browser and connect to the vCenter Server Appliance page at [https://vCenter\\_Server\\_Virtual\\_Appliance:9443/](https://vCenter_Server_Virtual_Appliance:9443/).
  2. Log in as root with the password that you recorded.

3. Select **Home > vCenter > VMs and Templates**.
4. Power on your virtual machines *your\_name###-2* and *your\_name###-3* if they are powered off and ensure that your virtual machines are running on your host.
5. Open a console to the virtual machines *your\_name###-2* and *your\_name###-3* and log in as Administrator.
6. On each virtual machine's desktop, to start an instance of the `cpubusy.vbs` script, right-click the script and select **Open with Command Prompt**.

This script runs continuously. Wait 1 to 2 minutes for it to stabilize. This script repeatedly does floating-point computations. The script also displays the duration (wall-clock time) of a computation. For example:

```
I did three million sines in 2 seconds!
```

Use the number of seconds reported as a performance estimate. You should find that the program runs at approximately the same rate in each virtual machine.

7. In the inventory view, right-click the *your\_name###-2* virtual machine and select **Edit Settings**.
8. In the **Virtual Hardware** tab, expand the **CPU** properties.
9. In the **Scheduling Affinity** section, type **1** in the space provided.  
The virtual machine will run only on processor 1.
10. Click **OK**.

#### **CAUTION**

CPU affinity is used mainly to create CPU contention for training purposes. Use of this feature in a production environment is strongly discouraged.

11. Repeat steps 7 through 10 to set the scheduling affinity for the other virtual machine, *your\_name###-3*.  
Force the virtual machine to use the same processor as the first virtual machine (processor 1). Allow `cpubusy.vbs` to run for a minute or two.  
Use the number of seconds reported as a performance estimate. You should find that the program runs at approximately the same rate in each virtual machine.

## Task 2: Create a Resource Pool Named Fin-Test

Resource pools allow you to delegate control over resources of a host.

Students should do the steps in this task individually.

1. Select **Home > vCenter > Hosts and Clusters**.
2. Right-click your VMware ESXi™ host and select **All vCenter Actions > New Resource Pool**.
3. Perform the following actions to assign properties to the resource pool.

<b>Option</b>	<b>Action</b>
Name	Type <b>Fin-Test</b> .
CPU Resource Shares	Select <b>Low</b> from the drop-down menu.
All other settings	Leave the defaults.

4. Click **OK**.

## Task 3: Create a Resource Pool Named Fin-Prod

Resource pools enable you to delegate control over resources of a host.

Students should do the steps in this task individually.

1. Select **Home > vCenter > Hosts and Clusters**.
2. Right-click your ESXi host in the inventory and select **All vCenter Actions > New Resource Pool**.
3. Perform the following actions to assign properties to the resource pool.

<b>Option</b>	<b>Action</b>
Name	Type <b>Fin-Prod</b> .
CPU Resource Shares	Select <b>High</b> from the drop-down menu.
All other settings	Leave the default.

4. Click **OK**.

## Task 4: Verify Resource Pool Functionality

You can add an existing virtual machine to a resource pool.

Students should do the steps in this task individually.

1. Select **Fin-Test** in the inventory and click the **Summary** tab.
2. View the CPU Resource Settings panel.

**Q1. What is the number of shares for this resource pool?**

3. Select **Fin-Prod** and click the **Summary** tab.
4. View the Resource Settings panel.

**Q2. What is the number of shares for this resource pool?**

5. Drag *your\_name###-2* to the Fin-Prod resource pool.
6. Drag *your\_name###-3* to the Fin-Test resource pool.
7. View the results of `cpubusy.vbs` in each virtual machine console.

**Q3. What is the difference in performance between the virtual machines?**

8. To change **CPU shares** of the Fin-Test resource pool from **Low** to **Normal**, right-click the Fin-Test resource pool in the inventory and click **Settings**.
9. Click **Edit** in the CPU Resource pane and change shares to **Normal** from the drop-down menu.
10. Click **OK**.

Leave **CPU shares** at **High** for the Fin-Prod resource pool.

11. Run the scripts for a few seconds and compare the performance of the script in each virtual machine.
12. If CPU contention occurs, you see a difference in performance between the virtual machines.
13. Using steps 6 through 8, change **CPU shares** of the Fin-Prod resource pool from **High** to **Normal**.
14. To stop the `cpubusy.vbs` scripts in each virtual machine, press Ctrl+C in each `cpubusy` window.
15. Leave the vSphere Web Client open for the next lab.

# Lab 19

## Monitoring Virtual Machine Performance

### **Objective: Demonstrate that system-monitoring tools reflect CPU workload**

In this lab, you will perform the following tasks:

1. Create CPU Activity
2. Use vSphere Web Client to Monitor CPU Utilization
3. Undo Changes Made to the Virtual Machines

### **Task 1: Create CPU Activity**

Run the `cpubusy.vbs` script in each virtual machine to create a heavy CPU load.

Students should do the steps in this task individually.

Use the following information from the class configuration handout:

- VMware® vCenter™ Server Appliance™
  - VMware® vCenter Server™ root password
1. Use a Web browser to connect to the VMware vSphere® Web Client URL.
  2. Log in as user root with the team vCenter Server root password.

3. In the left navigation pane, select **Home > vCenter > VMs and Templates**.
4. Expand the view under your vCenter Server to show your virtual machines.
5. Maximize the consoles to the *your\_name###-2* and *your\_name###-3* virtual machines and log in as Administrator.
6. On each virtual machine's desktop, to start an instance of the `cpubusy.vbs` script, right-click the script and select **Open with Command Prompt**.

## Task 2: Use vSphere Web Client to Monitor CPU Utilization

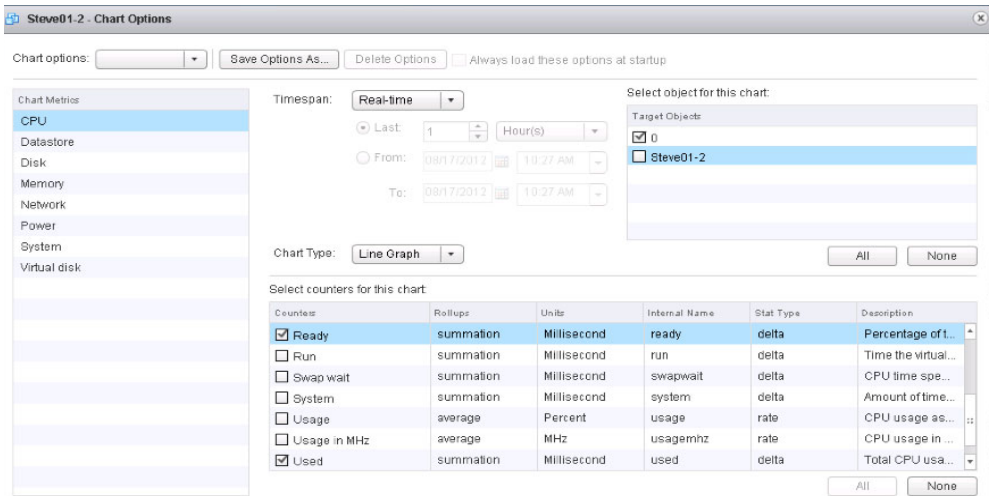
You monitor CPU, memory, disk, network, and storage metrics by using the performance charts.

Students should do the steps in this task individually.

1. Click *your\_name###-2* in the inventory.
2. Click the **Monitor** tab and click the **Performance** tab.  
The Overview view is displayed by default.
3. Click the **Advanced** button.  
By default, the Advanced panel shows CPU usage in real time.
4. Click the **Chart Options** link.
5. If you cannot see the **Chart Options** link, unpin the right column to make the link visible.
6. Click the **Chart Options** link.  
The Customize Performance Chart dialog box is displayed.
7. Select **CPU**.
8. In the **Timespan** drop-down menu, select **Real-time**.
9. In the Target Objects pane on the right, deselect the check box with the virtual machine's name.
10. In the Counters pane, click **None** to deselect all selected counters.



- Select the Used and Ready counters.



- Click **OK**.

The chart is displayed.

- Open a new tab in your Web browser and open a second instance of the vSphere Web Client by navigating to the vSphere Web Client URL.

You are not required to retype your connection credentials.

- Select *your\_name##-3* in the inventory.
- Click the **Monitor** tab and click the **Performance** tab.
- Configure the CPU Performance graph for *your\_name##-3* and select the same chart options that you selected in steps 2 through 10.

Each Web browser window now shows the configured chart for one of your virtual machines.

- In the Web browser window for each virtual machine, point to the end of the line graph to view the current CPU ready value.
- Record the current CPU ready value for each virtual machine.

- your\_name##-2* \_\_\_\_\_
- your\_name##-3* \_\_\_\_\_

Leave the Performance Chart windows open.

19. To stop the `cpubusy.vbs` scripts in each virtual machine, press Ctrl+C in each `cpubusy` window.

#### **CAUTION**

Ensure that this script is stopped in each virtual machine. If the script is still running, it affects the next lab.

20. In the Web browser window for each virtual machine, point to the end of the line graph to view the current CPU ready value.

#### **NOTE**

Wait for the chart to be updated. Performance charts update every 20 seconds.

- Q1. Did the CPU ready value change and, if it did, what is the reason for the change?**

### **Task 3: Undo Changes Made to the Virtual Machines**

Undo changes made to each virtual machine.

Students should do the steps in this task individually.

1. Close the Web browser window for *your\_name###-3*.
2. Close the virtual machine consoles.
3. Remove the scheduling affinity value from *your\_name###-2*.
  - a. Right-click the *your\_name###-2* virtual machine in the inventory and select **Edit Settings**.
  - b. Click the **Virtual Hardware** tab if its not selected.
  - c. Click the arrow next to **CPU** and delete the value 1 from the text box in the Scheduling Affinity pane.
  - d. Click **OK**.
4. Repeat step 3 on *your\_name###-3*.

# Lab 20

## Using Alarms

### Objective: Demonstrate the vCenter Server alarm feature

In this lab, you will perform the following tasks:

1. Create a Virtual Machine Alarm That Monitors for a Condition
2. Create a Virtual Machine Alarm That Monitors for an Event
3. Trigger Virtual Machine Alarms and Acknowledge the Alarms
4. Disable Virtual Machine Alarms

### Task 1: Create a Virtual Machine Alarm That Monitors for a Condition

Alarms are notifications that occur in response to selected events, conditions, and states that occur with objects in the inventory.

Students should do the steps in this task individually.

Use the following information from the class configuration handout:

- VMware® vCenter™ Server Appliance™
  - VMware® vCenter Server™ root password
1. If the VMware vSphere® Web Client is not already active, use it to log in to your team vCenter Server system.
  2. Log in as user root, with the password.
  3. Select **Home > vCenter > Hosts and Clusters**.

4. Select the *your\_name##-2* virtual machine in the inventory and select **Manage > Alarm Definitions**.

Note that the virtual machine inherited alarms defined at the vCenter Server level.

5. Click the **Add** icon in the Alarm Definitions pane.

The Alarm Settings dialog box is displayed.

**NOTE**

Because you are creating an alarm for the *your\_name##-2* virtual machine, this alarm monitors only that virtual machine. If you set the alarm on an object higher in the vCenter Server inventory, the alarm applies to multiple virtual machines. For example, if you create the alarm on the vCenter Server object itself, the alarm applies to all virtual machines.

6. In the **General** tab, perform the following actions.

<b>Option</b>	<b>Action</b>
Alarm name	Type <b>VM CPU Usage - <i>your_name</i></b> .
Description	Leave blank.
Alarm Type – Monitor	Select <b>Virtual Machine</b> and select <b>Monitor for specific conditions or state, for example, CPU usage</b> .
Enable this alarm	Leave selected. Click <b>Next</b> .

7. On the **Triggers** tab, click **Add**.
8. Perform the following actions to add a trigger.

<b>Option</b>	<b>Action</b>
Trigger	Select <b>VM CPU Usage</b> .
Operator	Select <b>Is above</b> .
Warning Condition	Double-click the current value and type <b>25</b> .
Condition Length	Select <b>for 30 sec</b> from the drop-down menu.

Option	Action
Critical Condition	Type 50.
Condition Length	Leave the default (5 minutes).

- Click **Next**.
- Click the **Add** icon.
- Configure the following action settings.

Option	Action
Action	Click <b>Send a notification email</b> below the <b>Action</b> header to activate the drop-down menu and select <b>Suspend VM</b> from the list.
Configuration	Leave this field blank.
Green to Yellow	Select <b>Once</b> from the list.
Yellow to Red	Change the setting from <b>Once</b> to no value.
Red to Yellow	Leave blank.
Yellow to Green	Leave blank.

- Click **Finish**.
- Verify that your alarm is in the list of alarms.

## Task 2: Create a Virtual Machine Alarm That Monitors for an Event

Creating an alarm involves setting up general alarm settings, alarm triggers, trigger reporting, and alarm actions.

- Select **Home > vCenter > Hosts and Clusters > Training** in the inventory.
- Select **Manage > Alarm Definitions**.
- Click the **Add** icon.

The Alarm Settings dialog box is displayed.

4. In the **General** tab, perform the following actions.

<b>Option</b>	<b>Action</b>
Alarm name	Type <b>VM Suspended</b> - <i>your_name</i> .
Description	Leave blank.
Alarm Type – Monitor	Select <b>Virtual Machines</b> and select <b>Monitor for specific event occurring on this object, for example, VM Power On</b> .
Enable this alarm	Leave selected.

5. Click **Next**.
6. Click the **Add** icon.
7. Click the drop-down arrow in the **Event** column to select a drop-down menu with a list of triggers. Perform the following actions.

<b>Option</b>	<b>Action</b>
Event	Select <b>VM suspended</b> .
Status	Keep the default.

8. Below the **Following Conditions** column, click the **Add** icon.
9. In the **Argument** column, select the drop-down menu labeled **Change tag** and select **VM name** from the list.
10. In the **Operator** column, leave **equal to** selected.
11. Click the area under the **Value** column.
12. Type *your\_name##*-2 as the virtual machine name.  
*your\_name* is your first name, and *##* is the number of your VMware ESXi™ host. The virtual machine name is case-sensitive.
13. Click **Next**.
14. Without making changes in the **Actions** tab, click **Finish**.
15. Verify that your alarm is in the list of alarms.

### Task 3: Trigger Virtual Machine Alarms and Acknowledge the Alarms

After an alarm is acknowledged, its alarm actions are discontinued. Alarms are neither cleared nor reset when acknowledged.

Students should do the steps in this task individually.

1. Click the *your\_name###-2* virtual machine in the inventory and select **Monitor > Issues**.
2. Click the **Triggered Alarms** button.

Triggered alarms are displayed in this pane.

3. In the inventory, right-click the *your\_name###-2* virtual machine and select **Open Console**.
4. Position the virtual machine console so that you can see both the console and the **Triggered Alarms** pane at the same time.
5. On the virtual machine's desktop, right-click `cpubusy.vbs` and select **Open with Command Prompt**.

This action starts one instance of `cpubusy.vbs`. Wait at least 30 seconds before the alarm is triggered. When the virtual machine is suspended, the alarm has been triggered.

#### NOTE

Your VM CPU Usage alarm appears only briefly in the Triggered Alarms pane. So you might not see this alarm if you are not viewing the pane at the time the alarm was triggered. But you should see your VM Suspended alarm after the virtual machine is suspended.

6. Monitor the Recent Tasks pane for the Suspend Virtual Machine task.
7. Verify that your VM Suspended alarm is triggered.

You should see an entry for this alarm in the Triggered Alarms pane. The **Acknowledged** and **Acknowledged By** text boxes are blank.

8. Right-click your VM Suspended alarm and select **Reset to Green**.

The **Acknowledged** and **Acknowledged By** text boxes are now populated.

9. To power on the suspended virtual machine, right-click the virtual machine in the inventory and select **Power On**.
10. In the virtual machine console, press Ctrl+C in the command window to stop `cpubusy.vbs`.
11. Close the virtual machine console.
12. In the **Alarms** tab, right-click your VM Suspended alarm and select **Clear**.
13. In the inventory, verify that the red alert icon is removed from the virtual machine.

## Task 4: Disable Virtual Machine Alarms

You disable alarms from the object on which they were defined. You can enable a disabled alarm at any time.

Students should do the steps in this task individually.

1. Disable your VM CPU Usage alarm.
  - a. Select the *your\_name##-2* virtual machine in the inventory.
  - b. Click the **Manage** tab and click the **Alarms Definitions** tab.
  - c. Right-click your VM CPU Usage alarm and select **Edit**.
  - d. In the **General** tab, deselect the **Enable this alarm** check box and click **Finish**.
2. Disable your VM Suspended alarm.
  - a. Select **Home > vCenter > Hosts and Clusters**.
  - b. Select the Training data center in the inventory.
  - c. Click the **Manage** tab and click the **Alarms Definitions** tab.
  - d. Find your VM Suspended alarm in the list, right-click the alarm, and select **Edit**.
  - e. In the **General** tab, deselect the **Enable this alarm** check box and click **Finish**.
3. Leave the VMware vSphere® Web Client open for the next lab.



## **Lab 21**

# Using VMware vSphere High Availability

### **Objective: Demonstrate vSphere HA functionality**

In this lab, you will perform the following tasks:

1. Create a Cluster Enabled for vSphere HA
2. Add Your ESXi Host to a Cluster
3. Test vSphere HA Functionality
4. Determine the vSphere HA Cluster Resource Usage
5. Manage vSphere HA Slot Size
6. Configure a vSphere HA Cluster with Strict Admission Control
7. Prepare for Upcoming Labs

### **Task 1: Create a Cluster Enabled for vSphere HA**

VMware vSphere® High Availability clusters enable a collection of VMware ESXi™ hosts to work together. A group of ESXi hosts can provide higher levels of availability for virtual machines than each ESXi host can provide individually.

Do this task as a team. Student A should do the steps in this task.

Use the following information from the class configuration handout:

- VMware® vCenter™ Server Appliance™
  - VMware® vCenter Server™ root password
1. If the VMware vSphere® Web Client is not already active, use it to log in to your team vCenter Server system.
  2. Log in as user root with the password that you recorded.
  3. Select **Home > vCenter > Hosts and Clusters**.
  4. In the inventory, right-click the Training datacenter and click **New Cluster**.
  5. When prompted by the New Cluster wizard, perform the following actions.

<b>Option</b>	<b>Action</b>
Name	Type <b>Lab Cluster</b> .
vSphere HA	Click <b>Turn on</b> next to vSphere HA.
Host Monitoring	Leave the default setting selected.
Admission Control Status	Leave the default setting selected.
Policy	Click <b>Percentage of cluster resources reserved as failover spare capacity</b> .
VM Monitoring Status	Leave the default setting selected.
EVC	Leave the default setting selected.
Virtual SAN	Leave the default setting selected.

6. Click **OK**.
7. Monitor the Recent Tasks pane.  
A cluster is created.

## Task 2: Add Your ESXi Host to a Cluster

After you have planned the resources and networking architecture of your cluster, you can use the vSphere Web Client to add hosts to the cluster and specify the cluster's vSphere HA settings.

Students should do the steps in this task individually.

1. Select **Home > vCenter > Hosts and Clusters**.
2. Expand your `Lab Servers` folder inventory object and select your ESXi host.
3. Drag your ESXi host to the Lab Cluster inventory object.

Your existing resource pools will be collapsed into the cluster root resource pool.

4. Monitor the Recent Tasks pane and wait for the Configuring vSphere HA task to complete.
5. After vSphere HA is enabled, select the Lab Cluster inventory object.
6. Click the **Monitor** tab and click the **vSphere HA** tab.  
The vSphere HA Summary status pane is displayed.
7. Review the content on each tab.

**Q1. Which host is the master host?**

**Q2. Does the number of protected virtual machines match the number of virtual machines in the cluster?**

8. Click **Heartbeat**.

**Q3. How many datastores are used for heartbeating?**

9. Click the **Configuration Issues** link and review the errors that are listed.

### NOTE

The errors indicate that the ESXi hosts in the cluster have no management network redundancy. That is, each ESXi host has a single management network port configured for the cluster. vSphere HA still works if an ESXi host is configured with one management network port, but a second management network port is necessary for redundancy.

10. Select your host in the inventory and navigate to **Manage > Networking > VMKernel Adapters**.

11. Select the **vMotion** VMkernel adapter.
12. Click the **Edit Settings** icon.
13. Enable the **Management Traffic** check box and click **OK**.
14. Right-click your ESXi host and select **All vCenter Actions > Reconfigure for vSphere HA**.
15. Select **Lab Cluster**.

**Q4. Have the previous configuration errors disappeared?**

### **Task 3: Test vSphere HA Functionality**

Verify that vSphere HA works properly.

Do this task as a team. Student B should do the steps in this task.

1. Select **Home > vCenter > Hosts and Clusters**.
2. In the inventory, select the master ESXi host.
3. Click the **Related Objects** tab and click the **Virtual Machines** tab.
4. Record the name of one or more powered-on virtual machines on the master host. \_\_\_\_\_
5. Simulate a host failure by rebooting one of the hosts in the cluster.



















#### **CAUTION**

Ensure that you reboot the system and that you do *not* shut down the system.

- a. Right-click the master ESXi host that you recorded in task 2, step 7 Q1, and click **Reboot**.  
A message warns you that your host is not in maintenance mode.
  - b. Type **Testing vSphere HA** as the reason for rebooting and click **OK**.
6. In the inventory, select **Lab Cluster**.

7. Click the **Monitor** tab and click the **Events** tab.

The cluster entries are sorted by time. Note the entries that vSphere HA made when the host failure was detected.

Description	Type	Date Time	Task	Target
 Alarm 'Host error': an SNMP trap for entity esxi02.vclass.local was sent	info	7/26/2013 1:17 PM		 esxi02.vclass.lo...
 Alarm 'Host error' on esxi02.vclass.local changed from Gray to Gray	info	7/26/2013 1:17 PM		 esxi02.vclass.lo...
 Alarm 'Host error' on esxi02.vclass.local changed from Gray to Gray	info	7/26/2013 1:17 PM		 esxi02.vclass.lo...
 Alarm 'Host error' on esxi02.vclass.local triggered an action	info	7/26/2013 1:17 PM		 esxi02.vclass.lo...
 Alarm 'Host error' on esxi02.vclass.local changed from Gray to Gray	info	7/26/2013 1:17 PM		 esxi02.vclass.lo...
 Issue detected on esxi01.vclass.local in Training: <F2> Customize Syst...	warning	7/26/2013 1:17 PM		 esxi01.vclass.lo...
 Issue detected on esxi01.vclass.local in Training: This host should be u...	warning	7/26/2013 1:17 PM		 esxi01.vclass.lo...
 Issue detected on esxi01.vclass.local in Training: This host permits inst...	warning	7/26/2013 1:17 PM		 esxi01.vclass.lo...
 Issue detected on esxi02.vclass.local in Training: <F2> Customize Syst...	warning	7/26/2013 1:17 PM		 esxi02.vclass.lo...

**NOTE**

The initial messages from the hosts might indicate failures. These messages are indicative that the virtual machines on the downed host have failed. It will take 1 to 2 minutes for the virtual machines to successfully migrate to the new host.

8. Select the running ESXi host in the cluster.
9. Click the **Related Objects** tab and click the **Virtual Machines** tab.  
The virtual machines that were running on the original master ESXi host should now be running on the remaining host in the cluster.
10. Monitor the vCenter Server inventory until you see that the original master ESXi host is available.
11. Click the Lab Cluster inventory object.
12. Click the **Summary** tab.
13. Select **Monitor > vSphere HA**.
14. Compare the results to the answer in task 2, step 7 Q1.

**Q1. Has the master host changed?**

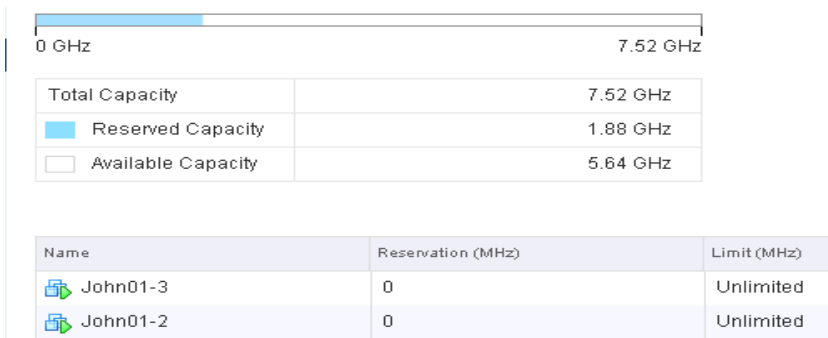
## Task 4: Determine the vSphere HA Cluster Resource Usage

Record the information found on the **Resource Allocation** tab for Lab Cluster and answer questions based on that information.

Do this task as a cluster team. Student B should do the steps in this task.

1. Select **Home > vCenter > Hosts and Clusters**.
2. Select **Lab Cluster** in the inventory and click the **Resource Allocation** tab.

Your view should look like the screenshot.



3. Record the following information.

- CPU total capacity (GHz) for the cluster \_\_\_\_\_
- CPU reserved capacity (GHz) for the cluster \_\_\_\_\_
- CPU available capacity (GHz) for the cluster \_\_\_\_\_
- Virtual machine in the inventory that has the highest CPU requirement, the number of virtual CPUs (vCPUs), and CPU speed of the virtual machine \_\_\_\_\_

#### NOTE

One way to determine these values is to view each virtual machine's **Summary** tab. View how many vCPUs the virtual machine has. Then view the **Summary** tab of the ESXi host on which your virtual machines are located. View the speed of the host's CPU. The speed of the physical CPU determines the speed of the vCPU.

- Memory total capacity (GB) for the cluster \_\_\_\_\_
- Memory reserved capacity (GB) for the cluster \_\_\_\_\_
- Memory available capacity (GB) for the cluster \_\_\_\_\_
- Virtual machine that has the highest memory requirement and the memory size of the virtual machine \_\_\_\_\_

#### NOTE

One way to determine these values is to view each virtual machine's **Summary** tab and verify the memory size of the virtual machine.

## Task 5: Manage vSphere HA Slot Size

vCenter Server uses admission control to ensure that sufficient resources are available in a cluster to provide failover protection and to ensure that virtual machine resource reservations are respected.

Do this task as a cluster team. Student A should do the steps in this task.

1. Select **Home** > **vCenter** > **Hosts and Clusters**.
2. Right-click **Lab Cluster** in the inventory and select **Settings**.
3. Select **vSphere HA** and click **Edit**.
4. Click the arrow next to **Admission Control** to expand the Admission Control options.
5. Ensure that the **Define failover capacity by static number of hosts** policy is selected.
6. Click **OK**.
7. Select **Lab Cluster** in the inventory.

8. Click the **Monitor** tab and click the **vSphere HA** tab.
9. View the slot information for this cluster.
  - a. In the **Advanced Runtime Info**, view the slot information for this cluster.
  - b. Record the CPU space and RAM that your default slot requires. \_\_\_\_\_
10. Select **Home > vCenter > VMs and Templates**.
11. Set the CPU reservation on the virtual machine *your\_name##-3*.
  - a. Right-click *your\_name##-3* in the inventory and select **Edit Settings**.
  - b. Click the arrow to expand **CPU** properties.

The CPU setting is selected.
  - c. Set the **Reservation** text box to **512MHz**.
  - d. Click **OK** to commit the change.
12. Select **Home > vCenter > Hosts and Clusters**.
13. View slot information for this cluster.
  - a. In the **Monitor > vSphere HA** tab of the cluster, view the Advanced Runtime Info pane.
  - b. Record whether changing the reservation changed the slot size from the value that you recorded in step 9. \_\_\_\_\_
  - c. Record the CPU, vCPU space, and RAM that your slot requires now. \_\_\_\_\_
14. Use the vSphere HA Slot size policy to enforce a slot size.
  - a. Right-click **Lab Cluster** in the inventory and select **Settings**.
  - b. Click **Edit**.
  - c. Expand the **Admission Control** options.
  - d. Select **Fixed slot size**.
  - e. In CPU slot size, type **300**.
  - f. Next to VMs requiring multiple slots, click the **Calculate** button.

Because the CPU slot size has now been fixed to 300MHz, the virtual machine *yourname-3* with its 512MHz CPU reservation will use two slots while powering on. Click the **View** link to verify the virtual machines that require multiple slots.
  - g. Click **OK** to close the Edit Cluster Settings window.



15. View the slot information for this cluster.
  - a. Click the **Monitor** tab and click the **vSphere HA** tab of the cluster.
  - b. View the Advanced Runtime Info pane. Compare the current value with what you recorded in step 13.
 

**Q1. What are the CPU, vCPU space, and RAM that your slot requires?**
16. Remove the vSphere HA fixed slot size setting.
  - a. Right-click **Lab Cluster** in the inventory and select **Settings**.
  - b. Click **Edit**.
  - c. Expand the **Admission Control** options.
  - d. Select **Cover all powered-on virtual machines**.
  - e. Click **OK** to close the Edit Cluster Settings window.
17. Remove the CPU reservation on *your\_name##-3*.
  - a. Right-click *your\_name##-3* in the inventory and select **Edit Settings**.
  - b. Click the arrow to expand **CPU** properties.
  - c. Change the CPU reservation to 0 (MHz).
  - d. Click **OK** to commit the change.

## Task 6: Configure a vSphere HA Cluster with Strict Admission Control

A slot is a logical representation of memory and CPU resources. By default, it is sized to satisfy the requirements, that is, the reservations, for any powered-on virtual machine in the cluster.

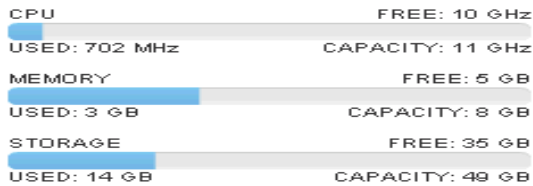
Do this task as a cluster team. Student B should do the steps in this task.

### NOTE

In task 5, when you configured your cluster with **Define failover capacity by static number of hosts**, you instructed vSphere HA to calculate slots. vSphere HA calculated the space for a virtual machine to run based on the largest CPU and memory reservation across all virtual machines. In this task, you learn how strict admission control works.

1. Select **Home > vCenter > Hosts and Clusters > Lab Cluster > Related Objects > Virtual Machines**.
2. Shut down all virtual machines.
3. After all virtual machines are powered off, click the **Lab Cluster > Summary** tab.

4. Identify the total memory capacity and divide it by the number of ESXi hosts in the cluster.  
The result is the usable memory per ESXi host. For example, if you have two ESXi hosts in your cluster and the total capacity for memory is 8GB, then  $8 / 2 = 4$ .



#### NOTE

The value for Total Capacity that you see in this step might differ from what you see in the screenshot.

5. Record the available memory per ESXi host. \_\_\_\_\_  
The virtual machines have no memory reservations.

**Q1. Why is less memory available in the cluster than in the total memory installed in the ESXi hosts?**

6. Click the **Monitor** tab for the Lab Cluster and click the **Resource Allocation** button.  
7. Click **Memory**.  
8. Identify the Total Capacity, Reserved Capacity, and Available Capacity for your Lab Cluster.

**Q2. Why is the available capacity less than the amount that was calculated in step 5?**

9. Assign a 384MB memory reservation to each *your\_name###-2* virtual machine.
  - a. Right-click each *your\_name###-2* virtual machine listed in the **Resource Allocation** tab and select **All vCenter Actions > Edit Resource Settings**.
  - b. Set the memory reservation to 384 MB.
  - c. Click **OK** to commit the changes.
10. Before powering on virtual machines, select **Lab Cluster**.
11. Click the **Monitor** tab and the **vSphere HA** tab.
12. Record the total number of slots in the cluster. \_\_\_\_\_

**Q3. Why does the vSphere Web Client report that many slots?**

13. Right-click the *student\_A\_name###-2* virtual machine and select **Power On**.
14. To see the effect that powering on this virtual machine has on your cluster, click **Refresh** to refresh the Advanced Runtime Info pane.

**Q4. What are the values that you see for total slots, used slots, available slots, and failover slots?**

**Q5. Why is the value for Failover slots only half the number of Total slots?**

15. Record the values that you see.
  - CPU slot size (MHz) \_\_\_\_\_
  - Memory slot size (MB) \_\_\_\_\_

**Q6. Why does the memory slot size not match the value that you recorded?**

16. In the inventory, right-click each of your *student\_A\_name###-3* virtual machines and select **Power On**.

17. Click **Refresh** to refresh the Advanced Runtime Info pane and view the number of available slots change.

**Q7. How many slots are available now and what is the reason?**

18. Right-click the *student\_B\_name##-2* virtual machine and select **Power > Power On**.

19. Monitor the Recent tasks pane.

**Q8. Is your virtual machine allowed to power on and what is the reason?**

**Q9. If a cluster has  $N$  total slots, does it mean that you can power on  $N$  virtual machines?**

## Task 7: Prepare for Upcoming Labs

Remove the `Lab Servers` folder, which is no longer needed. Then reconfigure the cluster for upcoming labs by removing the memory reservations that were set up previously and by disabling admission control.

Do this task as a cluster team. Student A should do the steps in this task.

1. Right-click the `Lab Servers` folder inventory object and select **All vCenter Actions > Remove from Inventory**.
2. Click **Yes** to confirm the operation.
3. In the inventory, select **Lab Cluster** and click **Monitor > Resource Allocation**.
4. Click **Memory** and remove the virtual machine memory reservation for each of the virtual machines.
  - a. Right-click each virtual machine that has a memory reservation and click **All vCenter Actions > Edit Resource Settings**.
  - b. Select the memory reservation value (for example, 384) and type **0**.
  - c. Click **OK**.
  - d. Repeat steps a through c for the other virtual machines with reservations.

5. Edit the settings of the cluster to allow the number of running virtual machines to exceed the failover capacity of the cluster.
  - a. In the inventory, right-click **Lab Cluster** and select **Settings**.
  - b. In the right pane, select **vSphere HA**.
  - c. Click **Edit**.
  - d. Expand **Admission Control** and select **Do not reserve failover capacity**.
  - e. Click **OK** to commit your changes.
6. Keep the vSphere Web Client open for the next lab.



## **Lab 22**

# (Optional) Designing a Network Configuration

### **Objective: Design a network configuration for an ESXi host, based on a set of requirements**

In this lab, you will perform the following tasks:

1. Analyze the Requirements
2. Design Virtual Switches and Physical Connections

Based on a scenario, you design the network configuration for a VMware ESXi™ host, specifying the following requirements:

- Virtual switches
- Ports and port groups
- Port group policies
- Physical connections

A set of network requirements is provided. The requirements are not complete and they leave a good deal of detail to the imagination. Use your assumptions to complete those details (stating your assumptions when appropriate).

This lab can be done separately by each member in the ESXi team.

### **Task 1: Analyze the Requirements**

In this task, you analyze the requirements for a network configuration for an ESXi host.

You are the administrator in charge of configuring an ESXi host in your company's production environment. This ESXi host is one of several hosts that must be configured identically in your production environment.

Plan for configuring the ESXi host so that it can be one node in a VMware vSphere® Distributed Resource Scheduler™ or VMware vSphere® High Availability cluster.

Do not configure the cluster at this time, but have all the necessary networking details in place so that the cluster can be configured later.

1. Use the following networking requirements to inform your analysis of the configuration.
2. Add details to the requirements in the table.

<b>Component</b>	<b>Networking Requirements</b>
Virtual machines and applications	<p>Web-based applications that are implemented by using four virtual machines arranged as follows:</p> <ul style="list-style-type: none"><li>• VM1 and VM2: Web servers, and network address translation (NAT) clients of VM3</li><li>• VM3: front end for the Web servers. Acts as a NAT router for the back-end virtual machines</li><li>• VM4: a test box, used to test intrusion detection systems and virus-protection software, among other applications.</li></ul> <p>An intrusion detection system (IDS) is a device or application that monitors a network for malicious activities or policy violations and produces reports to a management system.</p>
IP-based storage	A NAS, used to hold running virtual machines for the test virtual machines only (storage for the production virtual machines is provided by a SAN)
Physical NICs	Four physical network adapters: one 1 GigE and three 10 GigE
External networks	Two physical switches and four external LANs, each named to indicate its purpose. A single physical switch is configured to handle traffic for three networks, which are implemented as VLANs. One physical switch is dedicated to the management LAN, which, by company policy, must be physically separate from all other networks. The management LAN is used by VMware® vCenter Server™ for monitoring vSphere HA heartbeat, among other uses.

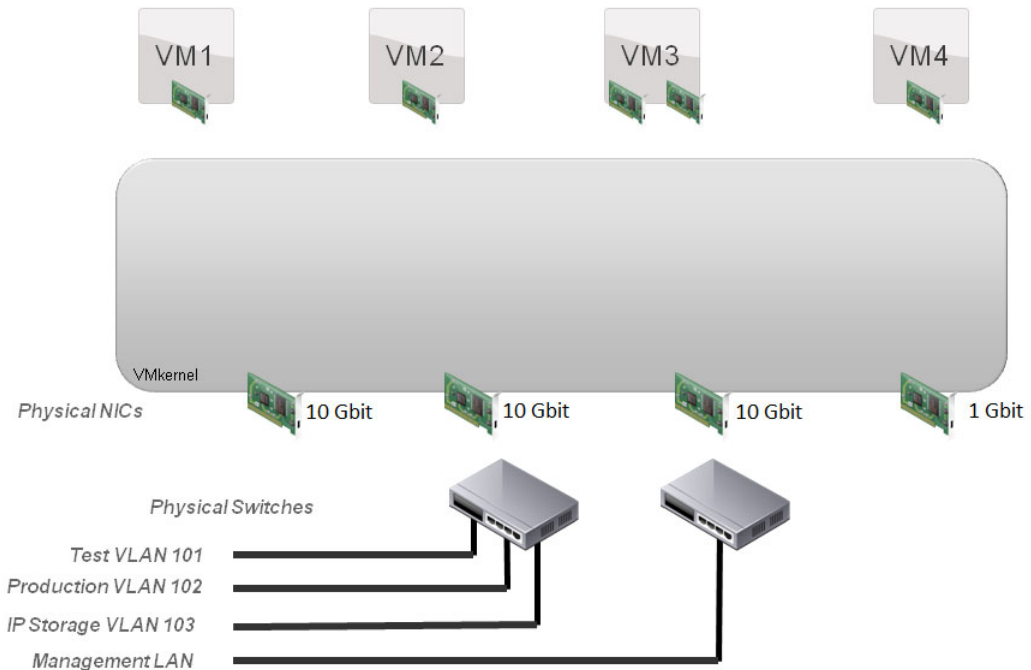


## Task 2: Design Virtual Switches and Physical Connections

In this task, you use the information in task 1 and the diagram to draw a network configuration.

No single answer is correct. In fact, many reasonable solutions are possible. The point of this lab is not to find the single correct answer. Rather, this lab encourages a discussion of the advantages and disadvantages of different solutions.

- Using the information in task 1 and the following diagram, draw a network configuration.
- Show all virtual switches, their ports, and their port groups.
- Indicate the policies to be applied to each [switch, port, and port group?] (NIC teaming, VLANs, security, traffic shaping).
- Show the connections from the virtual machines to the virtual switches.
- Show the connections from the physical NICs to the physical switches.





## Lab 23

# Configuring VMware vSphere Fault Tolerance

### Objective: Configure vSphere FT for a virtual machine and verify that vSphere FT works

In this lab, you will perform the following tasks:

1. Prepare the Virtual Machine
2. Enable the vSphere FT Logging
3. Activate the vSphere FT Protection
4. Test the vSphere FT Configuration
5. Disable and Turn Off vSphere FT Protection

#### **NOTE**

Not all classroom lab environments support VMware vSphere® Fault Tolerance. If the hardware in your classroom does not support vSphere FT, do the exercise with the vSphere FT simulation provided by your instructor. Adobe Flash Player 8 or later is required to view the simulation.

## Task 1: Prepare the Virtual Machine

Configure a virtual machine capable of using vSphere FT in a nested VMware ESXi™ environment (that is, running ESXi hosts as virtual machines).

Students should perform this lab as a team. Student A should do the steps in this task. *Do this task only if your instructor tells you to do it.*

Use the following information from the class configuration handout:

- VMware® vCenter™ Server Appliance™
- VMware® vCenter Server™ root password
- Partner ESXi host

### CAUTION

Nested ESXi is not an officially supported configuration, nor is running vSphere FT in nested ESXi. Neither configuration should be used in production environments.

This task should be performed only by students using a nested lab environment. For example, the vClass environment provided by VMware® uses a nested environment, which requires additional steps to be performed to enable the lab to work. If you are unsure whether you should do this task, ask your instructor.

1. If the VMware vSphere® Web Client is not already active, log in to the team vCenter Server system as user root, with the password that you recorded.
2. Select **Home > vCenter > VMs and Templates**.
3. Select one of the *your\_name###-#* virtual machines, where *##* corresponds to the number of your ESXi host.
4. Record the name of the virtual machine. \_\_\_\_\_
5. If the virtual machine is powered on, shut down the guest operating system.
6. Right-click the virtual machine and select **Edit Settings**.
7. Click **CD/DVD drive 1** and verify that the **Client Device** is selected in the drop-down menu next to CD/DVD drive 1.
8. Expand the **CD/DVD drive 1** properties and verify that **Passthrough CDROM** is selected in the **Device Mode** drop-down menu.
9. Click the **VM Options** tab and click the arrow next to **Advanced**.
10. Click **Edit Configuration** next to Configuration Parameters.
11. In the Name column, find the **replay.supported** line.

12. In the Value column, change `false` to `true` and press Enter.
13. Add the `replay.allowFT` and `replay.allowBTOOnly` lines to the Configuration Parameters.
  - a. On the Configuration Parameters page, click **Add Row**.
  - b. In the **Name** column, type `replay.allowFT`.
  - c. In the **Value** column, type `true`.
  - d. In the **Name** column, type `replay.allowBTOOnly`.
  - e. In the **Value** column, type `true`.

The Configuration Parameters page should look like the screenshot.

**Configuration Parameters**

Modify or add configuration parameters as needed for experimental features or as instructed by technical support. Entries cannot be removed.

Name	1 ▲	Value
pciBridge7.pciSlotNumber	24	
pciBridge7.present	TRUE	
pciBridge7.virtualDev	pcieRootPort	
replay.allowBTOOnly	true	
replay.allowFT	true	
replay.filename		
replay.supported	True	
sched.cpu.latencySensitivity	normal	
sched.mem.min	0	
sched.scsi0:0.throughputCap	off	
sched.swan.derivedName	/vmfs/volumes/51e46660-4985c01a-8b82-0050560	

14. Click **OK** twice.

Wait for the virtual machine to do a reconfiguration.

15. After the configuration is complete, leave the vSphere Web Client open.

## Task 2: Enable the vSphere FT Logging

On each host that you want to add to a VMware vSphere® High Availability cluster, you must configure two VMkernel ports. This configuration ensures that the host can also support vSphere FT.

### NOTE

This lab uses only a single VMkernel port for fault-tolerant traffic and shares the VMkernel port with the vMotion VMkernel interface that you configured in an earlier lab. In most environments, you would use a separate VMkernel port for each feature.

Students should do the steps in this task individually.

1. Select **Home > vCenter > Hosts and Clusters**.
2. Select your ESXi host in the inventory and click the **Summary** tab.
3. View the Configuration pane.

The **Host Configured for FT** field should show **No**.

4. Click the **Manage** tab.
5. Click the **Networking** link and click **VMkernel adapters**.
6. Select **vMotion** from the list and click the **Edit Settings** icon.
7. Select the **Fault Tolerance Logging** check box and click **OK**.
8. Click the **Summary** tab and confirm that the **Host Configured for FT** field now shows **Yes**.

### CAUTION

If this lab is performed in a nested ESXi environment, this text box continues to show **No** because ESXi is installed on virtual hardware, not physical hardware.

9. Wait for your ESXi host partner to complete this task.

## Task 3: Activate the vSphere FT Protection

After you have finished all the required steps for enabling vSphere FT for your cluster, you can use the feature by turning it on for individual virtual machines.

Student B should do the steps in this task.

1. If the vSphere Web Client is not already active, use the vSphere Web Client to log in to the team vCenter Server system as user root.
2. Select **Home > vCenter > Hosts and Clusters**.

3. Select the virtual machine you recorded in Task 1, step 3, in the inventory and verify that it meets the requirements for vSphere FT, as outlined in the lecture book.

### CAUTION

If this lab is performed in a nested ESXi environment, you must select the virtual machine that was configured in task 1.

4. If the virtual machine is powered on, right-click the virtual machine and select **Shut Down Guest OS**.
5. Click **Yes** to confirm shutdown.
6. Right-click the virtual machine and select **All vCenter Actions > Fault Tolerance > Turn On Fault Tolerance**.
7. Read the warning and click **Yes** to confirm to activate vSphere FT.
8. Monitor the Recent Tasks pane while vSphere HA is turning on vSphere FT.

The virtual machine icon will change to a dark blue color when the Fault Tolerance configuration is complete.

9. After the tasks complete, view the information in the **Summary** tab of the virtual machine.
  - a. Find the **Host** value at the top of the tab and record the host on which the primary virtual machine is located. \_\_\_\_\_
  - b. Find the value **Secondary Location** in the Fault Tolerance pane of the Summary tab and record the host on which the secondary virtual machine is located. \_\_\_\_\_
10. Power on the virtual machine and observe how the information in the Fault Tolerance panel on the virtual machine Summary pane changes.

## Task 4: Test the vSphere FT Configuration

Test the vSphere FT configuration.

Student A should do the steps in this task.

1. Open a console to the primary virtual machine.
2. Open the VMware® vSphere Client™ and connect directly to the ESXi host that you recorded in task 3, step 9b.
3. In the inventory, right-click the secondary virtual machine name and click **Open Console**.  
The virtual machine is labeled *your\_name###-#* (Secondary).
4. Arrange the consoles side by side.
5. Log in to the primary virtual machine as Administrator.

6. In the primary virtual machine, open a Command Prompt window and type `ipconfig`.
7. Record the IP address of the primary virtual machine. \_\_\_\_\_
8. Start a continuous ping to your ESXi host:  

```
# ping -t <ESXi_host_name>
```
9. Return to the vSphere Web Client. In the inventory, right-click your virtual machine and select **All vCenter Actions > Fault Tolerance > Test Failover** to simulate a virtual machine failure.
10. Quickly view the virtual machine consoles side by side and watch what happens over the next couple of minutes. Monitor particularly the console title bars.  

The virtual machine console in the vSphere Web Client still shows the primary's console, but the primary is now running on the other host. The vSphere Client continues to display the console of the virtual machine running on the host to which you connected, but now it is the primary virtual machine. Both open console windows are displaying the primary.
11. Record whether the ping operation increased in its time value during the failover. \_\_\_\_\_
12. Click the `your_name###-# Summary` tab in the vSphere Web Client.
13. View the host information displayed for the primary and the secondary virtual machines.
14. Access the console of the primary virtual machine.
15. Press Ctrl+C to stop the continuous pings.
16. Close the consoles.
17. Close the vSphere Client but leave the vSphere Web Client open.

## Task 5: Disable and Turn Off vSphere FT Protection

Disabling vSphere FT for a virtual machine suspends its fault tolerance protection by halting the secondary virtual machine but preserving it and its configuration and history.

Student B should do the steps in this task.

1. In the vSphere Web Client inventory, right-click the protected virtual machine and select **All vCenter Actions > Fault Tolerance** and view the menu options.



2. Compare the warning messages that you would see if you were turning off vSphere FT instead of disabling vSphere FT.
  - a. Click **Turn Off Fault Tolerance**.  
A warning message is displayed.
  - b. Read the warning message and note which actions are taken.
  - c. Click **No**.
  - d. Right-click the protected virtual machine and select **Fault Tolerance**.
  - e. Select **Disable Fault Tolerance**.
  - f. Read the warning message and note which actions are taken.
  - g. Click **No**.

**Q1. What is the difference between Turn Off Fault Tolerance and Disable Fault Tolerance?**

- h. Right-click the protected virtual machine and select **Fault Tolerance > Turn Off Fault Tolerance**.
        - i. When the warning message is displayed, click **Yes**.
3. Verify that the Fault Tolerance pane on the **Summary** tab is no longer present.
4. Click **Home > vCenter > Hosts and Clusters > Lab Cluster**.
5. Click **Monitor > Resource Allocation > Memory**.
6. Verify that the *your\_name###-#* virtual machine does not have a memory reservation configured.
  - a. If the virtual machine still has a reservation configured, right-click the virtual machine and click **All vCenter Actions > Edit Resource Settings**.
  - b. Change **Memory Reservation** to 0.
  - c. Click **OK**.
7. Leave the vSphere Web Client open for the next lab.



## **Lab 24**

# VMware vSphere Distributed Resource Scheduler

### **Objective: Implement a DRS cluster**

In this lab, you will perform the following tasks:

1. Create a Load Imbalance
2. Create a DRS Cluster
3. Verify Proper DRS Cluster Functionality
4. Create, Test, and Disable a VM-VM Affinity Rule
5. Create, Test, and Disable an Anti-Affinity Rule
6. Create, Test, and Disable a Virtual Machines to Hosts Affinity Rule

## Task 1: Create a Load Imbalance

Create a load imbalance across the hosts.

Student A should do the steps in this task.

Use the following information from the class configuration handout:

- VMware® vCenter™ Server Appliance™
  - VMware® vCenter Server™ root password
1. If the VMware vSphere® Web Client is not already active, log in to the team vCenter Server system as user root with the password that you recorded.
  2. Migrate all the virtual machines to one host.
  3. Select **Home > vCenter > Hosts and Clusters**.
  4. In the inventory, select **Lab Cluster** and click the **Related Objects > Virtual Machines** tab.
  5. Right-click each virtual machine and select **Power On**.

Wait for all virtual machines to power on.

Four virtual machines should be running on the same host. If all virtual machines are not running on the same host, migrate the virtual machines by using VMware vSphere® vMotion®.

6. Start an instance of `cpubusy.vbs` in three or four of the powered-on virtual machines.
  - a. Right-click a virtual machine and select **Open Console**.
  - b. Log in to your virtual machine as Administrator, with the password that you recorded.
  - c. To start an instance of the `cpubusy.vbs` script (on the virtual machine's desktop), right-click the script and select **Open with Command Prompt**.
7. Repeat steps 6 a through c until you have three or four virtual machines running CPU busy.

### NOTE

The number of virtual machines running `cpubusy.vbs` necessary to cause VMware vSphere® Distributed Resource Scheduler™ (DRS) to begin migrations depends on the resource capacity of the lab infrastructure. Your instructor can advise you on how many virtual machines running `cpubusy.vbs` you need.

## Task 2: Create a DRS Cluster

A DRS cluster is a collection of VMware ESXi™ hosts and associated virtual machines with shared resources and a shared management interface.

Student B should do the steps in this task.

1. If the vSphere Web Client is not already active, log in to the team vCenter Server system as user root.
2. Select **Home > vCenter > Hosts and Clusters**.
3. Right-click the **Lab Cluster** inventory object and select **Settings**.
  - a. Select **vSphere DRS** and click **Edit**.
  - b. Select the **Turn on vSphere DRS** check box.
  - c. Next to **DRS Automation**, select **Manual** from the drop-down menu.
  - d. Click the arrow next to **DRS Automation** and move the **Migration Threshold** slider to the right to **Aggressive**.
  - e. Click **OK** to apply the changes.

## Task 3: Verify Proper DRS Cluster Functionality

Verify that the DRS cluster is functioning properly.

Student A should do the steps in this task.

1. Select **Home > vCenter > Hosts and Clusters**.
2. Click the **Lab Cluster** inventory object.
3. Click **Monitor**.
4. Click the **vSphere DRS** tab.
5. Click the **Run DRS Now** button.

Clicking this link forces DRS to immediately evaluate the cluster and provide recommendations instead of waiting the standard 5 minutes before generating recommendations.

6. Click the **Summary** tab.
7. Observe the vSphere DRS panel on the **Summary** tab.

**Q1. Does the gauge show that the load is imbalanced?**

8. Select **Monitor > vSphere DRS > CPU Utilization**.

9. View the **Sum of Virtual Machine CPU Utilization - Per Host** chart.
10. Select the **Show as %** drop-down menu and select **MHz**.  
This chart displays the CPU use per host. Point to each colored square. You see information on how much of the entitled resource each virtual machine is using.
11. Click **Recommendations**.
12. Review the DRS recommendations.
13. Click **Apply Recommendations** and monitor the Recent Tasks pane for virtual machine migrations.  
Wait for the virtual machine migrations to complete.
14. Click the **Run DRS Now** button in the upper-left corner of the **DRS** tab.  
This action forces DRS to evaluate the cluster status.
15. Click the **Summary** tab.

**Q2. Does the gauge show that the load is balanced?**

16. Select **Monitor > vSphere DRS > CPU Utilization**.
17. Wait about one minute and press the **Refresh** button in the vSphere Web Client.  
The virtual machines should spread across the two hosts.
18. To stop the `cpubusy.vbs` scripts in each virtual machine, press Ctrl+C in each `cpubusy` window.
19. Close the virtual machine consoles.

## **Task 4: Create, Test, and Disable a VM-VM Affinity Rule**

A VM-VM affinity rule specifies whether the selected individual virtual machines should run on the same host or be kept on separate hosts.

Students should do the steps in this task individually.

1. Select **Lab Cluster** in the inventory.
2. Click the **Related Objects** tab and click the **Virtual Machines** tab.

3. Verify that the two virtual machines that you own are running on different ESXi hosts.

If the virtual machines that you own are running on the same ESXi host, select one to migrate to the other ESXi host in the cluster before you go to step 4. If you have one virtual machine on each ESXi host in the cluster, no action is necessary.

#### **NOTE**

If you do not see the Host text box in the table, right-click one of the gray column names. Select **Show/Hide Columns** and select **Host** from the list.

4. Right-click **Lab Cluster** in the inventory and select **Settings**.

5. Select **DRS Rules** and click **Add**.

The Lab Cluster Settings dialog box is displayed.

6. Perform the following actions in the Lab Cluster Settings dialog box.

- a. In the Name text box, type **Colocate your\_first\_name VMs**.
- b. From the **Type** drop-down menu, select **Keep Virtual Machines Together**.
- c. Click **Add** to add members.
- d. In the Virtual Machines dialog box, select the check box next to each of the virtual machines that you own, named *your\_name###-#*.
- e. Click **OK**.

7. Click **OK** to close the Create DRS Rule dialog box.

8. Select **Monitor > vSphere DRS > Recommendations**.

9. Evaluate the cluster configuration by clicking the **Run DRS Now** link.

**Q1. Do you see any recommendations and what is the reason?**

#### **NOTE**

If you did not get a recommendation, use vSphere vMotion migration to move one of your named virtual machines to the other ESXi host in the cluster. Return to the **DRS** tab and click **Run DRS** to see what the results are.

10. If you are ahead of your lab partner, wait for your partner to reach this point in the lab.

11. Student A should click **Apply Recommendations** and monitor the Recent Tasks pane as the recommendation is applied.

The virtual machines associated with your affinity rule are migrated to one of the two hosts in the DRS cluster.

12. Click the **Related Objects** tab and click the **Virtual Machines** tab.
13. Click the **Host** column heading to sort the virtual machines by the ESXi host on which they reside.  
The virtual machines that you own should be running on the same ESXi host.
14. Right-click the **Lab Cluster** inventory object and select **Settings**.
15. Select **DRS Rules**, select your affinity rule, and click **Edit**.
16. To disable the affinity rule, deselect the **Enable rule** check box next to your affinity rule and click **OK**.

## Task 5: Create, Test, and Disable an Anti-Affinity Rule

With an anti-affinity rule, DRS ensures that the specified virtual machines are kept on separate hosts.

Students should do the steps in this task individually.

1. Right-click **Lab Cluster** in the inventory and select **Settings**.
2. Click **DRS Rules**.
3. On the DRS Rules page, click **Add**.
4. Perform the following actions in the Rules dialog box.
  - a. In the Name text box, type **Separate your\_first\_name VMs**.
  - b. From the **Type** drop-down menu, select **Separate Virtual Machines**.
  - c. Click **Add**.
  - d. In the Virtual Machines dialog box, select the check box next to each of the virtual machines that you own, named *your\_name###-#*.
  - e. Click **OK**.
5. In the Rules dialog box, click **OK**.
6. Select **Lab Cluster**.
7. Click the **Monitor** tab and click the **vSphere DRS** tab.



8. Click the **Run DRS Now** button to make DRS evaluate the state of the cluster and make recommendations.

A recommendation to separate your virtual machines should be displayed. The recommendation is a priority 1 as a result of the DRS rules. If a recommendation is not displayed, check the rules that you created to verify the accuracy of your inputs.

9. If you are ahead of your lab partner, wait for your partner to reach this point in the lab.
10. Student B should click **Apply Recommendations**.
11. Monitor the Recent Tasks pane as the recommendations are applied.

The virtual machines with anti-affinity rules applied to them are migrated to another ESXi host in the cluster.

12. Click the **Related Objects** tab and click the **Virtual Machines** tab.
13. Click the **Host** column heading to sort the virtual machines by the ESXi host on which they reside.

The virtual machines you own should be running on different ESXi hosts.

14. Right-click the **Lab Cluster** inventory object and select **Settings**.
15. In the left pane, select **DRS Rules** and click the rule you just created.
16. Click **Delete**.
17. Click **Yes** to delete the DRS rule.

## Task 6: Create, Test, and Disable a Virtual Machines to Hosts Affinity Rule

A Virtual Machines to Hosts affinity rule specifies whether the members of a selected virtual machine DRS group can run on the members of a specific host DRS group.

Students should do the steps in this task individually.

1. Right-click **Lab Cluster** in the vCenter Server inventory and select **Settings**.
2. In the left pane, select **DRS Groups**.
3. In the DRS Groups panel, click **Add**.
4. In the DRS Group window, perform the following steps.
  - a. In the **Name** text box, type *your\_name-VMs*.
  - b. From the **Type** drop-down menu, ensure that **VM DRS Group** is selected.
  - c. Click **Add**.

- d. Click both of your named virtual machines to select them.
  - e. Click **OK**.
  - f. Click **OK**.
5. In the DRS Groups panel, click **Add**.
  6. In the DRS Group window, perform the following steps.
    - a. In the **Name** text box, type *your\_name-ESXi host*.
    - b. Change the type to **Host DRS Group**.
    - c. Click **Add**.
    - d. Click the ESXi host assigned to you to select it.
    - e. Click **OK**.
    - f. Click **OK**.
  7. In the left pane, click **DRS Rules**.
  8. Click **Add**.
  9. In the Rules dialog box, perform the following actions.

<b>Option</b>	<b>Action</b>
Name	Type <b>Run only on <i>your_name-ESXi host</i></b> .
Type	Select <b>Virtual Machines to Hosts</b> from the drop-down menu.
Cluster VM Group	Select <b><i>your_name-VMs</i></b> from the drop-down menu. Select <b>Must run on hosts in group</b> from the drop-down menu.
Cluster Host Group	Select <b><i>your_name-ESXi host</i></b> from the drop-down menu.

10. Click **OK** to close the Rules dialog box.
11. Select **Lab Cluster**.
12. Click the **Monitor** tab and click the **vSphere DRS** tab.
13. Click the **Run DRS** link to make DRS evaluate the state of the cluster and make recommendations.

If no recommendations are made, the virtual machine might already be located on the correct host. You might need to migrate the virtual machine to the other ESXi host.

14. Record why DRS has made this recommendation. \_\_\_\_\_
15. If you are ahead of your lab partner, wait for your partner to reach this point in the lab.
16. Student A should click **Apply Recommendations**.
17. Monitor the Recent Tasks pane as the recommendations are applied.

The virtual machines with Virtual Machines to Hosts affinity rules applied to them are migrated to another ESXi host in the cluster.

18. Click the **Related Objects** tab and click the **Virtual Machines** tab.
19. Click the **Host** column heading to sort the virtual machines by the ESXi host on which they reside.

The virtual machines that you own that were running on your partner's ESXi host should have been migrated to your ESXi host.

20. Right-click one of your virtual machines and click **Migrate**.
21. In the Migrate Virtual Machine wizard, perform the following actions.

<b>Option</b>	<b>Action</b>
Select Migration Type	Select <b>Change host</b> . Click <b>Next</b> .
Select Destination Resource	Select <b>Lab Cluster</b> and select the <b>Allow host selecting within this cluster</b> check box.

**Q1. What do you see in the Compatibility panel?**

22. Click **Cancel** to close the Migrate Virtual Machine wizard.
23. Right-click the **Lab Cluster** inventory object and select **Settings**.
24. In the left pane, select **DRS Rules**.
25. To disable your Virtual Machines to Hosts affinity rule, select the rule, click **Edit**, and deselect **Enable rule**.
26. Click **OK**.
27. Leave your vSphere Web Client open for the next lab.



# Lab 25

## VMware vSphere Update Manager

### Objective: Install, configure, and use vSphere Update Manager

In this lab, you will perform the following tasks:

1. Install vSphere Update Manager
2. Install the Update Manager Client Plug-In
3. Modify Cluster Settings
4. Configure vSphere Update Manager
5. Create a Patch Baseline
6. Attach a Baseline and Scan for Updates
7. Stage the Patches onto the ESXi Hosts
8. Remediate the ESXi Hosts

### Task 1: Install vSphere Update Manager

If your VMware® vCenter Server™ system is running on Windows, you can install the VMware vSphere® Update Manager™ server component either on the same computer as the vCenter Server system or on another computer. If you are using the VMware® vCenter™ Server Appliance™, the vSphere Update Manager server component must be installed elsewhere.

Do this task as a team. Student A should perform this task.

Use the following information from the class configuration handout:

- vSphere Update Manager system name
  - Location of installation software
  - Setup language
  - vCenter Server system name
  - vCenter Server root password
1. If you are not already connected to the desktop that you recorded for installing vSphere Update Manager, open a connection to it now.

This action is typically done with Remote Desktop Connection. Your instructor will provide specific details if you are to use some other technology.

2. Go to the location of the installation software.
3. Double-click `autorun.exe`.
4. If security warning dialog boxes are displayed, click **Run**.
5. In the VMware vCenter Installer window, click the **vSphere Update Manager** link.
6. Click **Install** to start the installation wizard.
7. Click **Run** when the Security Warning dialog box is displayed.
8. When prompted by the installation wizard, perform the following actions.

<b>Option</b>	<b>Action</b>
Setup Language	Select the setup language that you recorded and click <b>OK</b> .
Welcome page	Click <b>Next</b> .
License Agreement	Select <b>I accept the terms in the license agreement</b> and click <b>Next</b> .
Support Information	Deselect <b>Download updates from default sources immediately after installation</b> and click <b>Next</b> .
IP Address/Name	Type the team vCenter Server system name or IP address.
Port	Accept the default.
Username	Type <code>root</code> .

Option	Action
Password	Type the root password that you recorded. Click <b>Next</b> .
Database Options	Accept the default and click <b>Next</b> .
VMware vSphere Update Manager Port Settings	If name resolution is working, select the host name from the drop-down menu. If name resolution is not working, select the IP address from the drop-down menu.  Accept the default selection for all other settings and click <b>Next</b> .
Destination Folder	Accept the default selection for all other settings and click <b>Next</b> .  Click <b>OK</b> when the warning box is displayed.
Ready to Install the Program	Click <b>Install</b> .

- Click **Finish** to close the installation wizard.
- Click **Exit** to close the VMware vCenter Installer window.

## Task 2: Install the Update Manager Client Plug-In

To use vSphere Update Manager, you must install the Update Manager Client plug-in, which is delivered as a plug-in for the VMware vSphere® Client™.

Students should do the steps in this task individually.

Use the following information from the class configuration handout:

- vCenter Server root password
- Open the vSphere Client and log in to your team vCenter Server system as user root. Use the password that you recorded.
  - In the menu bar, select **Plug-ins > Manage Plug-ins**.
  - Under **Available Plug-ins** in the Plug-in Manager window, click the **Download and Install** link next to VMware vSphere Update Manager Extension.
  - If security warning dialog boxes are displayed, click **Run**.

- When prompted by the VMware vSphere Update Manager Client 5.5 wizard, perform the following actions.

<b>Option</b>	<b>Action</b>
Setup Language	Select the setup language that you recorded. Click <b>OK</b> .
Welcome page	Click <b>Next</b> .
License Agreement	Select <b>I accept the terms in the license agreement</b> and click <b>Next</b> .
Ready to Install the Program	Click <b>Install</b> .

- When the installation completes, click **Finish**.
- When the security warning is displayed, select **Install this certificate and do not display any security warnings for “host\_name”** to prevent this warning from being displayed in the future.
- Click **Ignore** to proceed with the connection.
- Verify in the Plug-in Manager window that the Update Manager Client plug-in was enabled.
- Click **Close** to close the Plug-in Manager window.
- Leave the vSphere Client open.

### **Task 3: Modify Cluster Settings**

Enable VMware vSphere® Distributed Resource Scheduler™ (DRS) in fully automated mode and disable VMware vSphere® High Availability admission control.

Students should work as a team to complete this task. Student B should perform this task.

- Select **Home > Inventory > Hosts and Clusters**.
- Right-click **Lab Cluster** in the inventory and select **Edit Settings**.

The Lab Cluster Settings dialog box is displayed.

- In the left pane, select **vSphere DRS**.
- Select **Fully Automated**.

This operation enables vSphere DRS to migrate virtual machines as necessary without asking permission from an administrator.

- In the left pane, select **vSphere HA**.



6. Click **Disable: Allow VM power on operations that violate availability constraints** in the **Admission Control** page.
7. Click **OK**.
8. Select **Lab Cluster** in the inventory and click the **Resource Allocation** tab.
9. Observe the **Reservations** column to verify that no CPU and memory reservations are assigned to virtual machines.

Removing CPU and memory reservations is necessary for this training environment. In a production environment, you might not have to remove CPU or memory reservations.

## Task 4: Configure vSphere Update Manager

Instead of using a shared repository or the Internet as a download source for patches and extensions, you can import patches and extensions manually by using an offline bundle.

Do this task as a team. Student A should perform this task.

Use the following information from the class configuration handout:

- VMware ESXi™ patch bundle
1. Select **Home > Solutions and Applications > Update Manager**.
  2. Click the **Configuration** tab.
  3. Click the **Download Settings** link.
  4. Click the **Import Patches** link.
  5. Click **Browse** and select the ESXi patch bundle that you recorded.
  6. Click **Open**.
  7. Click **Next**.
  8. When the security warning is displayed, select **Install this certificate and do not display any security warnings for “host\_name”** to prevent this warning from being displayed in the future.
  9. Click **Ignore** to proceed with the connection.
  10. Click **Finish** to complete the import operation.

## Task 5: Create a Patch Baseline

Baselines contain a collection of one or more patches, extensions, or upgrades.

Do this task as a team. Student B should perform this task.

1. Click the **Baselines and Groups** tab.

You see two **Create** links: one under the Baseline panel and one under the Baseline Groups panel.

2. Click the **Create** link under the Baseline panel.
3. When prompted by the New Baseline wizard, perform the following actions.

<b>Option</b>	<b>Action</b>
Baseline Name	Type <b>ESXi Host Update</b> .
Baseline Description	Type <b>Patch for ESXi 5.5</b> .
Baseline Type	Keep the default value and click <b>Next</b> .
Patch Options	Select <b>Fixed</b> and click <b>Next</b> .
Patches	Select each patch and click the down arrow under the horizontal scroll bar to add the patch to the Fixed Patches to Add pane.  Click <b>Next</b> .
Ready to Complete	Review your patch baseline. Verify the accuracy of <b>Baseline Name</b> and <b>Baseline Type</b> and click <b>Finish</b> .

## Task 6: Attach a Baseline and Scan for Updates

Scanning is the process in which attributes of a set of hosts, virtual machines, or virtual appliances are evaluated against the patches, extensions, and upgrades included in the attached baselines and baseline groups.

Do this task as a team. Student A should perform this task.

1. In the upper-right corner of the **Baselines and Groups** tab, click the **Compliance View** link.
2. Select **Lab Cluster** in the vCenter Server inventory and click the **Update Manager** tab.  
If you do not see the **Update Manager** tab, click the right arrow to access it.
3. Click the **Attach** link.

The Attach Baseline or Group dialog box is displayed.

4. Select the **ESXi Host Update** check box and click **Attach**.
5. Click the **Scan** link.
6. In the Confirm Scan window, verify that the **Patches and Extensions** and **Upgrades** check boxes are selected.
7. Click **Scan**.
8. Monitor the Recent Tasks pane and wait for the scan to finish.

When the task is complete, the scan should discover that the ESXi hosts are noncompliant.

## Task 7: Stage the Patches onto the ESXi Hosts

Staging patches and extensions speeds up the remediation process because the patches and extensions are already available locally on the hosts.

Students should do the steps in this task individually.

1. Select your ESXi host from the right pane of the **Update Manager** tab in the lab cluster.  
You should see both ESXi hosts on the **Update Manager** tab of the lab cluster. Do not select the ESXi hosts from the vCenter Server inventory in the left pane.
2. Click **Stage**.
3. When prompted by the Stage wizard, perform the following actions.

Option	Action
Baseline Selection	Accept the default selections and click <b>Next</b> . In the <b>Patches</b> column, you see that zero patches are staged.
Patch and Extension Exclusion	Accept the default selections and click <b>Next</b> .
Ready to Complete	Click <b>Finish</b> .

4. Monitor the Recent Tasks pane for the staging tasks.  
Wait for the tasks to complete.

### NOTE

Both team members must complete task 7 before proceeding to task 8.

## Task 8: Remediate the ESXi Hosts

Remediation of hosts in a cluster requires that you temporarily disable cluster features such as VMware vSphere® Distributed Power Management™ and VMware vSphere® HA admission control.

Do this task as a team. Student B should perform this task.

1. In the vCenter Server inventory, select **Lab Cluster**.
2. Click the **Update Manager** tab.
3. To begin the patching process, click **Remediate**.
4. When prompted by the Remediate wizard, perform the following actions.

<b>Option</b>	<b>Action</b>
Remediation Selection	Leave the default and click <b>Next</b> .
Patches and Extensions	Leave the default and click <b>Next</b> .
Schedule	Leave the default and click <b>Next</b> .
Host Remediation Options	Select <b>Disable any removeable media devices connected to the virtual machines on the host</b> .  Leave all other fields at their default selection and click <b>Next</b> .
Cluster Remediation Options	Deselect <b>Disable Distributed Power Management (DPM) if it is enabled for any of the selected clusters</b> .  Click <b>Generate Report</b> to identify which tasks the remediation process performs for you.  Click <b>Close</b> and click <b>Next</b> .
Ready to Complete	Review and verify your selections for accuracy. Click <b>Finish</b> .

5. Monitor the Recent Tasks pane.

The hosts in Lab Cluster show 100 percent compliance when remediation completes.

- Q1. Which ESXi host was remediated first?**
  
- Q2. Was the ESXi host placed into maintenance mode by the remediation process?**
  
- Q3. Were the virtual machines migrated to the other node in the cluster?**
  
- Q4. Was the patch installed on the ESXi host in maintenance mode?**
  
- Q5. Was the patched ESXi host rebooted?**
  
- Q6. Did the patched ESXi host exit maintenance mode?**
  
- Q7. Was the other node placed into maintenance mode?**
  
- Q8. Were the virtual machines that the ESXi host migrated to the other node present in the cluster?**
  
- Q9. Was the other ESXi host patched?**
  
- Q10. Did the other node exit the maintenance mode?**



## Lab 26

# (Optional) Installing the VMware vCenter Server Components

### Objective: Install the vCenter Server components

In this lab, you will perform the following tasks:

1. Install the vCenter Server Components

### Task 1: Install the vCenter Server Components

Install the VMware® vCenter Server™ software.

Students should do the steps in this task as a team.

Use the following information from the class configuration handout:

- Windows vCenter Server system name
  - vCenter Server administrator password
  - Location of the vCenter Server installation software
1. Browse to the location of the vCenter Server installation software.
  2. Start the VMware vCenter Installer.
    - If you have an ISO image or physical CD-ROM mounted on the vCenter Server system's CD-ROM drive and autorun is enabled, the installer main window is displayed.
    - For files that are located in a local folder or that are on a network share, open the folder containing the files and double-click the `autorun.exe` file.

3. If security warning messages are displayed, click **Run** to continue.
4. Click the **vCenter Server Simple Install** link and click **Install**.
5. If a security warning message is displayed, click **Run** to continue.
6. When prompted by the installation wizard, perform the following actions.

<b>Option</b>	<b>Action</b>
Welcome Page	Click <b>Next</b> .
License Agreement	Select <b>I agree to the terms in the license agreement</b> and click <b>Next</b> . You do not assign a license for this lab.
Simple Install Prerequisites	Click <b>Next</b> .
Single Sign On Information	In the <b>Password</b> and <b>Confirm Password</b> text boxes, type the password that you recorded.
Site name	Type <b>Training-Site</b> and click <b>Next</b> .
Simple Install Port Settings	Accept the default option and click <b>Next</b> .
Destination Folder	Accept the default folder and click <b>Next</b> .
Simple Install Information	Click the <b>Install</b> button. Wait for the VMware® vCenter™ Single Sign-On™ installation to complete and the VMware vSphere® Web Client installation starts, followed by the Inventory Service installation and the vCenter Server installation.
License Key	Do not type a license key. Install in evaluation mode and click <b>Next</b> .
Database Options	Select <b>Install a Microsoft SQL Server 2008 Express instance</b> and click <b>Next</b> .
vCenter Server Service	Select <b>Use Local SYSTEM Account</b> . Verify that the default fully qualified domain name (FQDN) matches your local system name, which you recorded. If the values do not match, change the FQDN to the correct value. Click <b>Next</b> .
Configure Ports	Accept the default and click <b>Next</b> .



<b>Option</b>	<b>Action</b>
vCenter Server JVM Memory	Accept the default and click <b>Next</b> .
Ready to Install the Program	Click <b>Install</b> .

7. When the installation is complete, click **Finish** to exit the wizard.
8. Click **OK** in the VMware vCenter Installer dialog box.
9. Close the VMware vCenter Installer window.



# Answer Key

## Lab 3: Working with Virtual Machines

Task 3: Identify a Virtual Machine Disk Format and Usage Statistics . . . . .	14
1. The disk type should read Thin Provision.	

## Lab 6: Configuring VMware vCenter Single Sign-On

Task 2: Use the vSphere Web Client to Add the Domain Admins Group to Administrators . . . . .	32
1. You do not see any hosts in the inventory. Although you have permission to log in to the server, you have not given permissions to the VMware ESXi™ administrators to see any of the vCenter Server objects in the inventory.	

## Lab 7: Creating Folders in VMware vCenter Server

Task 2: Create Two Virtual Machine Folders . . . . .	36
1. The <code>Lab Servers</code> folder displays menu choices related to host actions whereas the <code>LabVM</code> and <code>Templates</code> folders display menu choices related to virtual machines.	

## Lab 13: Modifying a Virtual Machine

Task 1: Increase the Size of a VMDK File . . . . .	59
1. For example, if you are using a vClass kit, this value is approximately 2GB.	2. The value should differ by ~1GB.

## Lab 15: Managing Virtual Machines

Task 1: Unregister a Virtual Machine in the vCenter Server Inventory . . . . .	75
1. Yes, there is a folder named <code>your_name##-4</code> . When the virtual machine was first created, it and its folder were named <code>Hot-Clone##</code> . When the virtual machine was renamed to <code>your_name##-4</code> , its folder's name was not renamed. Only when the virtual machine was migrated to a new datastore was the folder automatically renamed to <code>your_name##-4</code> .	

Task 5: Revert to a Snapshot . . . . .	.81
1. Yes. Because the memory state was not preserved.	3. No. Because the memory state was preserved.
2. No.	4. Yes.
	5. No.
Task 6: Delete an Individual Snapshot . . . . .	.82
1. No.	2. Yes.
Task 7: Use the Delete All Function in Snapshot Manager . . . . .	.82
1. Yes.	snapshots were removed. There is no longer an option to revert to those earlier points in time.
2. Yes. The current state of the virtual machine was not altered. All that happened was that	

## Lab 16: Managing VMware vSphere vApps

Task 1: Create a vApp. . . . .	.85
1. You see the vApp, but not the virtual machines themselves.	2. Yes. You can see the vApp and the virtual machines that the vApp contains.
Task 2: Power on a vApp . . . . .	.87
1. No. The first virtual machine powers on and about 20 seconds later, the second virtual machine powers on.	

## Lab 17: User Permissions

Task 3: Verify Permission Usability . . . . .	.92
1. Only the LabVMs folder, their ESXi host, your datastore, and the ProdVMs network were available.	

## Lab 18: Resource Pools

Task 4: Verify Resource Pool Functionality . . . . .	.98
1. 2,000	resource pool receives only one-fourth of the CPU cycles of the logical CPU to which the virtual machines are pinned. Note: In the past, bugs have required that the virtual machines be powered off before being dragged to the resource pool.
2. 8,000	
3. The Fin-Test resource pool (and thus the virtual machine in it) has only one-fourth of the CPU shares that the Fin-Prod resource pool has. So the virtual machine in the Fin-Test	

## Lab 19: Monitoring Virtual Machine Performance

Task 2: Use vSphere Web Client to Monitor CPU Utilization . . . . .	.100
1. Yes. The CPU ready value should decrease significantly because the CPU contention that was created by running the <code>cpubusy.vbs</code> script was terminated.	

## Lab 21: Using VMware vSphere High Availability

### Task 2: Add Your ESXi Host to a Cluster . . . . . 111

1. The answer depends on which host wins the election.
2. The number of virtual machines protected by vSphere HA varies from one team to another. The number depends on how many virtual machines the teams have created and how many of those virtual machines are powered on.
3. Both shared datastores are shown in the heartbeat because both have live virtual machines.
4. Yes, the error message has disappeared.

### Task 3: Test vSphere HA Functionality . . . . . 112

1. Yes. The slave host should have been elected the master host.

### Task 5: Manage vSphere HA Slot Size . . . . . 115

1. The slot size CPU value should now show 300MHz.

### Task 6: Configure a vSphere HA Cluster with Strict Admission Control . . . . . 117

1. Less memory is available because of the overhead needed to run the VMkernel. The VMkernel is holding back memory for its own use.
2. The available capacity is less because the cluster is configured to tolerate the loss of one of the two hosts, and there is overhead to run the ESXi host.
3. The vSphere Web Client reports N/A for the total number of slots because no virtual machines have been powered on yet. The slot size calculation considers only virtual machines that are powered on.
4. You should see six total slots (three per host in the cluster): one used slot, two available slots, and three failover slots.
5. The value is half the number of Total slots because you must reserve half of the slots to be able to tolerate the failure of one host in the cluster.
6. Unlike the CPU slot size calculation, which is based solely on the largest CPU reservation, the calculation for memory slot size is based on the largest memory reservation, plus memory overhead.
7. Zero slots are available because the cluster only has six slots. Of those slots, only three slots were originally available because you had to reserve three failover slots. You have now used all the available slots.
8. The virtual machine was not allowed to power on because the cluster has no available slots.
9. No. Of those  $N$  total slots, some will be failover slots. The number of virtual machines that you can run is necessarily less than the number of slots. For example, in a two-host cluster that tolerates the failure of one host, only  $N/2$  slots are available.

## Lab 23: Configuring VMware vSphere Fault Tolerance

### Task 5: Disable and Turn Off vSphere FT Protection . . . . . 132

1. Turning off vSphere FT removes vSphere FT protection from this virtual machine and deletes all historical vSphere FT data. Disabling vSphere FT removes vSphere FT protection from this virtual machine but keeps historical information about vSphere FT performance.

## Lab 24: VMware vSphere Distributed Resource Scheduler

### Task 3: Verify Proper DRS Cluster Functionality .....137

1. Yes, because all the virtual machines are running on a single host. balanced than it was and DRS has improved the resource allocation for the virtual machines.
2. It depends on your lab environment. Even if the cluster is still imbalanced, it is more

### Task 4: Create, Test, and Disable a VM-VM Affinity Rule.....138

1. Yes, because the DRS affinity rule that you created is trying to keep the virtual machines together on the same host.

### Task 6: Create, Test, and Disable a Virtual Machines to Hosts Affinity Rule .....141

1. You receive the error message: "Virtual machine '*your\_name###*' on host '*host\_name*' would violate a Virtual Machines to Hosts affinity rule."

## Lab 25: VMware vSphere Update Manager

### Task 8: Remediate the ESXi Hosts.....152

1. Answers vary.
2. Yes
3. All powered-on virtual machines were migrated. Any powered-off virtual machine was not migrated.
4. Yes
5. Yes
6. Yes
7. Yes
8. Yes
9. Yes
10. Yes