

VMware vSphere: Install, Configure, Manage

Lab Manual
ESXi 7 and vCenter Server 7



VMware® Education Services
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**VMware vSphere:
Install, Configure, Manage**

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ESXi 7 and vCenter Server 7

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Typographical Conventions

The following typographical conventions are used in this course.

Conventions	Usage and Examples
Monospace	Identifies command names, command options, parameters, code fragments, error messages, filenames, folder names, directory names, and path names: <ul style="list-style-type: none">• Run the <code>esxtop</code> command.• ... found in the <code>var/log/messages</code> file.
Monospace Bold	Identifies user inputs: <ul style="list-style-type: none">• Enter <code>ipconfig/ release</code>.
Boldface	Identifies user interface controls: <ul style="list-style-type: none">• Click the Configuration tab.
<i>Italic</i>	Identifies book titles: <ul style="list-style-type: none">• <i>vSphere Virtual Machine Administration</i>
< >	Indicates placeholder variables: <ul style="list-style-type: none">• <ESXi_host_name>• ... the <code>Settings/<Your_Name>.txt</code> file

Lab 1 Accessing the Lab Environment

Objective and Tasks

Log in to the student desktop and access the vSphere Client and VMware Host Client:

1. Access the Student Desktop
2. Log In to an ESXi Host with VMware Host Client
3. Log In to vCenter Server with the vSphere Client

Task 1: Access the Student Desktop

You access and manage the lab environment from the student desktop.

The system assigned to you serves as an end-user terminal.

1. Connect to the lab environment using Remote Desktop Connection.
2. Log in to your student desktop by entering **vclass\administrator** as the user name and **VMware1!** as the password.

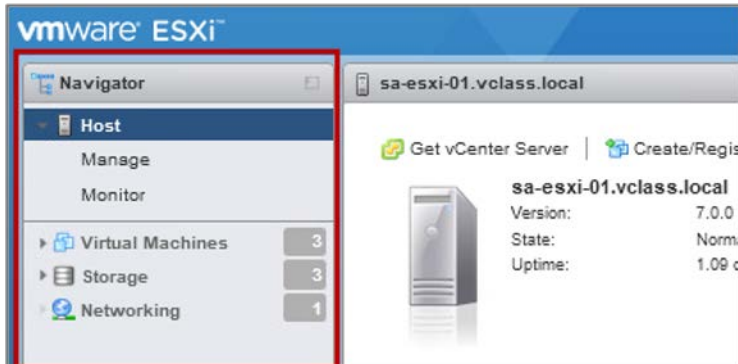
Task 2: Log In to an ESXi Host with VMware Host Client

You log in to the sa-esxi-01.vclass.local ESXi host as user root to familiarize yourself with the VMware Host Client UI.

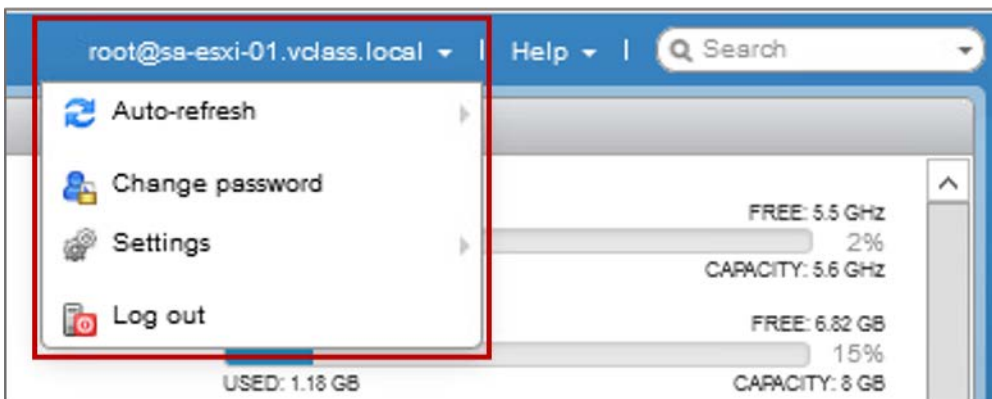
1. From your student desktop Student-a-01, log in to SA-ESXi-01 as root using VMware Host Client.
 - a. Click the **Firefox** icon on the taskbar of your student desktop.
 - b. From the bookmarks toolbar, select **vSphere Site-A > Host Client (SA-ESXi-01)**.

- c. To log in, enter **root** for the user name and **VMware1!** for the password.

VMware Host Client opens with **Host** selected in the left pane, also called the Navigator pane.



2. Explore the user interface by clicking objects in the Navigator pane and viewing information about them in the right pane.
- Q1. How many CPUs and how much memory does this ESXi host have?
 - Q2. Is the NTP service running on this ESXi host?
 - Q3. How many virtual machines are on this host?
 - Q4. What are the guest operating system types for the virtual machines on this host?
3. Log out of VMware Host Client.



Task 3: Log In to vCenter Server with the vSphere Client

Using the vSphere Client, you log in to the sa-vcsa-01.vclass.local vCenter Server system and view information to familiarize yourself with the UI layout.

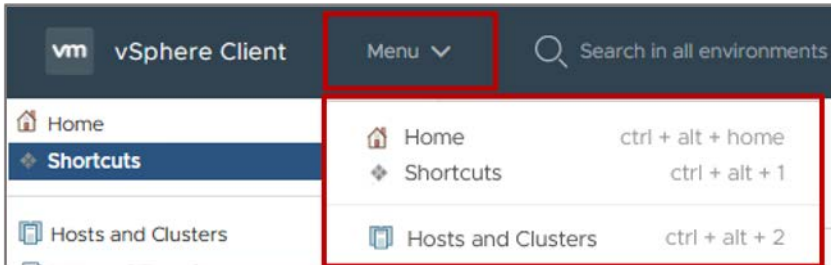
1. From your student desktop Student-a-01, log in to sa-vcsa-01.vclass.local as administrator@vsphere.local using the vSphere Client.
 - a. From the bookmarks toolbar, select **vSphere Site-A > vSphere Client (SA-VCSA-01)**.
 - b. Log in by entering **administrator@vsphere.local** as the user name and **VMware1!** as the password.

The vSphere Client opens, and the Home page appears.

2. On the Home page, select **SA-VCSA-01.VCLASS.LOCAL** from the drop-down menu at the top.

This page provides information about the vCenter Server instance that you are logged into, such as the total CPU, memory, and storage available.

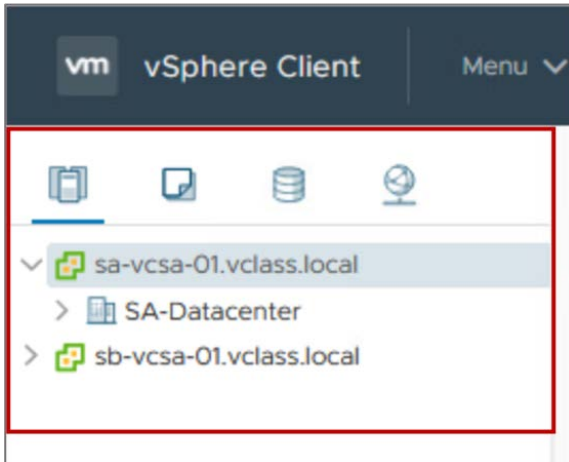
3. From the **Menu** drop-down menu, select **Hosts and Clusters**.



The Hosts and Clusters inventory appears in the left pane, also called the navigation pane.

4. View the navigation pane.

The navigation pane lists the vCenter Server inventory for sa-vcsa-01.vclass.local.

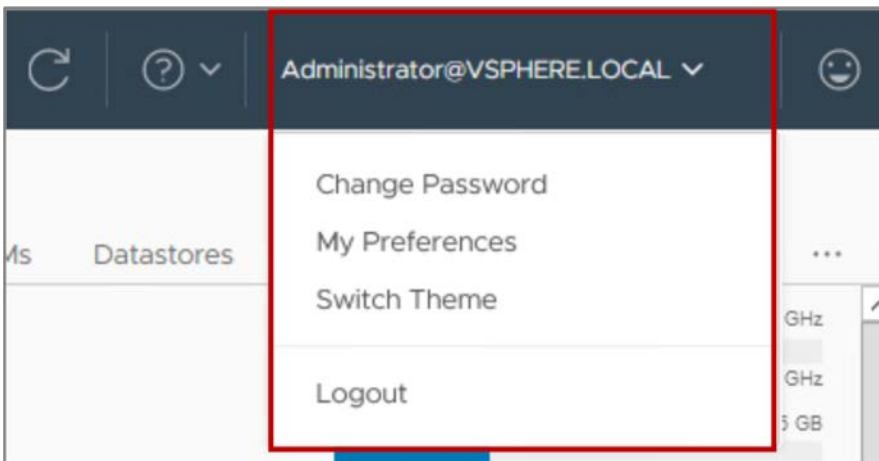


5. View the items in the inventory.

You might have to expand the items in the inventory to view all the objects.

Q1. Do you see the sa-esxi-01.vclass.local host?

6. Log out of the vSphere Client.



The logout function is in the **Administrator@VSPHERE.LOCAL** drop-down menu at the top-right corner of the window.

Lab 2 Configuring an ESXi Host

Objective and Tasks

Use VMware Host Client to configure an ESXi host:

1. Add an ESXi Host to Active Directory
2. Log In to the ESXi Host as an Active Directory User
3. Enable the SSH and vSphere ESXi Shell Services

Task 1: Add an ESXi Host to Active Directory

Using VMware Host Client, you configure the sa-esxi-01.vclass.local ESXi host to use a directory service (Active Directory) for managing users.

1. From your student desktop Student-a-01, log in to sa-esxi-01 as root using VMware Host Client.
 - a. Click the **Firefox** icon on the taskbar of your student desktop.
 - b. From the bookmarks toolbar, select **vSphere Site-A > Host Client (SA-ESXi-01)**.
 - c. Log in by entering **root** for the user name and **VMware1!** for the password.

VMware Host Client opens with **Host** selected in the Navigator pane.

2. In the Navigator pane, select **Manage**.
3. In the right pane, click **Security & users**.
4. Click **Authentication** and click **Join domain**.

The Join domain window opens.

5. In the **Domain name** text box, enter **vclass.local**.
6. Leave the **Use authentication proxy** check box unselected.
7. In the **User name** text box, enter **administrator**.
8. In the **Password** text box, enter **VMware1!**
9. Click **Join domain**.

10. Verify that Active directory is enabled on sa-esxi-01 and that this host has joined the vclass.local domain.

Task 2: Log In to the ESXi Host as an Active Directory User

You verify that you can log in to sa-esxi-01.vclass.local as the Active Directory user esxadmin@vclass.local.

esxadmin@vclass.local is a preconfigured user account that is a member of the ESX Admins domain group.

1. Log out of VMware Host Client.
2. To log back in, enter **esxadmin** for the user name and **VMware1!** for the password.
3. Verify that you successfully logged in as this user.

By default, any user that is a member of the ESX Admins domain group has full administrative access to ESXi hosts that join the domain.

Task 3: Enable the SSH and vSphere ESXi Shell Services

You start the SSH and vSphere ESXi Shell services on sa-esxi-01.vclass.local so that you can remotely access the ESXi host command line.

IMPORTANT

In a production environment, keep SSH and vSphere ESXi Shell services disabled. Enable these services only if you must access the command line to troubleshoot problems. When you finish troubleshooting, disable these services.

1. In the Navigator pane, select **Manage**.
2. In the right pane, click the **Services** tab.
3. Scroll down the list of services to find the vSphere ESXi Shell and SSH services.
vSphere ESXi Shell is the Tech Support Mode (TSM) service, and SSH is the TSM-SSH service. Both of these services are stopped.
4. Select **TSM** and click **Start**.
5. Select **TSM-SSH** and click **Start**.
6. Verify that the TSM and TSM-SSH services have a status of Running.
7. Log out of VMware Host Client.

Lab 3 Creating a Virtual Machine

Objective and Tasks

Use VMware Host Client to create and delete a virtual machine:

1. Create a Virtual Machine
2. Delete the Virtual Machine

Task 1: Create a Virtual Machine

You create a virtual machine based on specific requirements.

1. From your student desktop Student-a-01, log in to SA-ESXi-01 as root using VMware Host Client.
 - a. Click the **Firefox** icon from the taskbar of your student desktop.
 - b. From the bookmarks toolbar, select **vSphere Site-A > Host Client (SA-ESXi-01)**.
 - c. Log in by entering **root** for the user name and **VMware1!** for the password.
2. Ensure that **Host** is selected in the Navigator pane.
3. In the right pane, click **Create/Register VM**.

The New virtual machine wizard opens.

4. On the Select creation type page, verify that **Create a new virtual machine** is selected and click **Next**.
5. On the Select a name and guest OS page, configure settings for your virtual machine.

Option	Action
Name	Enter Win10-Empty .
Compatibility	Select ESXi 7.0 virtual machine from the drop-down menu.

Guest OS family	Select Windows from the drop-down menu.
Guest OS version	Select Microsoft Windows 10 (64-bit) from the drop-down menu.
	Click Next .

6. On the Select storage page, select the **ICM-Datastore** datastore and click **Next**.
7. On the Customize settings page, configure virtual hardware settings.
 - a. Configure CPU, memory, and storage.

Option	Action
CPU	Select 1 from the drop-down menu.
Memory	Enter 1024 MB.
Hard Disk 1	Enter 12 GB.

- b. Find CD/DVD Drive 1 and select **Datastore ISO file** from the drop-down menu.
The Datastore browser window opens.
 - c. In the Datastore browser window, select **ICM-Datastore**.
 - d. From ICM-Datastore, click the **ISO** folder and select the Windows 10 operating system ISO image:
en_windows_10_enterprise_ltsc_2019_x64_dvd_5795bb03.iso.
 - e. Click **Select**.
 - f. Click the arrow next to CD/DVD Drive 1.
 - g. Verify that the **Connect at power on** check box is selected and click **Next**.
8. On the Ready to complete page, review the information and click **Finish**.
9. In the Navigator pane, select **Virtual Machines** and verify that your newly created VM appears in the right pane.
10. Click the **Win10-Empty** virtual machine name in the right pane.
You must click the name of the VM, not just the row, to view information about the VM.
11. Review the settings under General Information, Hardware Configuration, and Resource Consumption.

12. In the Hardware Configuration pane, expand **Hard disk 1** and record the configuration information.
 - Backing _____
 - Capacity _____
 - Thin provisioned _____

NOTE

In a production environment, the next step is to install an operating system in the new VM. However, to save class and lab time, you do not install the guest operating system.

Task 2: Delete the Virtual Machine

You delete the virtual machine that you created to familiarize yourself with the process of removing a VM from disk.

1. In the Navigator pane, right-click the **Win10-Empty** virtual machine and select **Delete**.
2. Click **Delete** to confirm deleting Win10-Empty.
3. Verify that the Win10-Empty VM does not appear in the Navigator pane and the right pane.

You might have to refresh the screen.

Lab 4 Installing VMware Tools

Objective and Tasks

Use VMware Host Client to install VMware Tools into an existing Windows VM:

1. Power On and Open a Console to the VM
2. Install VMware Tools

Task 1: Power On and Open a Console to the VM

To install VMware Tools, you must first power on and open a console to the Win10-Tools VM.

1. From your student desktop Student-a-01, log in to SA-ESXi-01 as root using VMware Host Client.
 - a. Click the **Firefox** icon from the taskbar of your student desktop.
 - b. From the bookmarks toolbar, select **vSphere Site-A > Host Client (SA-ESXi-01)**.
 - c. To log in, enter **root** for the user name and **VMware1!** for the password.
2. Select **Virtual Machines** in the Navigator pane.
3. In the right pane, right-click the **Win10-Tools** virtual machine and select **Power > Power on**.
4. When the Win10-Tools virtual machine icon shows that the VM is powered on, right-click **Win10-Tools** and select **Console > Open console in new tab**.
5. Verify that the VM starts successfully and that you are automatically logged in to Win10-Tools as vclass\administrator.

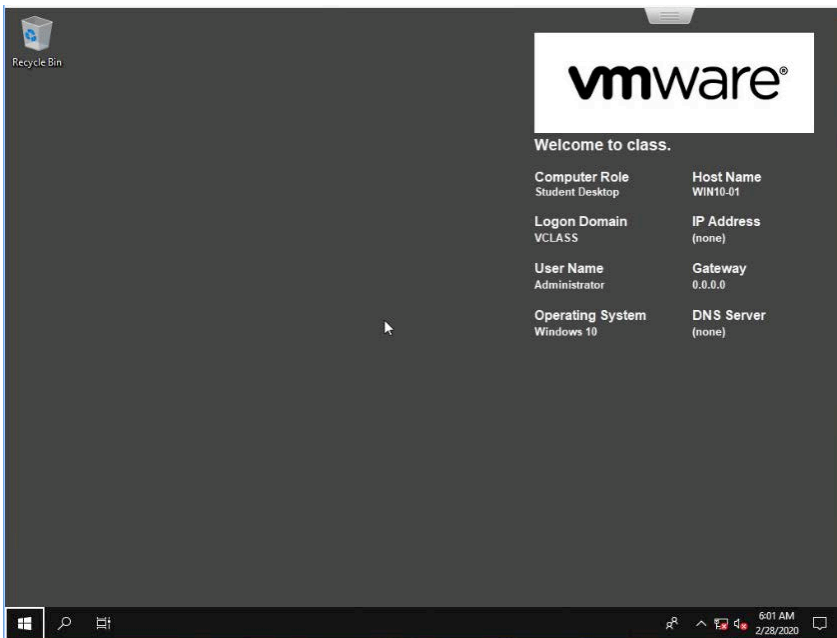
Task 2: Install VMware Tools

You install VMware Tools in the Win10-Tools VM to improve the overall performance of this VM.

NOTE

You perform the installation using the keyboard because mouse performance is suboptimal without VMware Tools. After VMware Tools is installed in the Win10-Tools VM, mouse performance improves substantially.

1. Return to the VMware Host Client window.
2. In the right pane, right-click **Win10-Tools** and select **Guest OS > Install VMware Tools**.
The VMware Tools ISO image is mounted on the CD/DVD drive of the Win10-Tools VM.
3. Select the **Win10-Tools Console** tab.
4. Right-click the **Win10-Tools Console** tab and select **Reload Tab** from the drop-down menu.
5. Click anywhere in the console window and press the Tab key to select the Windows **Start** icon in the lower left corner of the Win10-Tools desktop.



6. After the Windows **Start** icon is selected, press Enter.

The Windows **Start** menu opens.

7. Enter **D: ** and press Enter.

VMware Tools Setup opens.

8. Install VMware Tools.

- a. On the Welcome to the installation wizard for VMware Tools page, press Enter to select **Next**.

- b. On the Choose Setup Type page, verify that **Typical** is selected.

- c. Press Tab twice to select **Next** and press Enter.

- d. On the Ready to Install VMware Tools page, press Enter to select **Install**.

- e. When the installation is complete, press Enter to select **Finish**.

A window opens requesting that you restart the system.

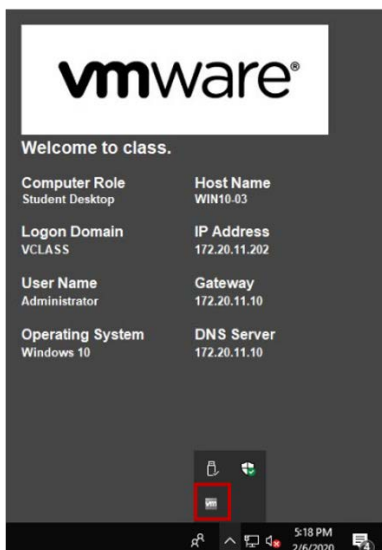
- f. Press Enter to select **Yes** to restart the system.

- g. Wait for the operating system to reboot.

After the reboot is complete, you are automatically logged in as vclass\administrator.

9. Verify that VMware Tools is installed in the VM.

- a. Using your mouse, navigate to the Windows system tray in the lower right to show hidden icons.



- b. Double-click the VMware Tools icon.

The window shows the version of VMware Tools and indicates that the VMware Tools service is running.

- 10. Verify that mouse performance is acceptable.

- a. Right-click the Windows **Start** icon and select **File Explorer**.
- b. Navigate the folders to verify that mouse performance is acceptable.

- 11. Close the Win10-Tools VM console tab.

- 12. Power off the Win10-Tools VM.

- a. In the right pane of VMware Host Client, right-click **Win10-Tools** and select **Power > Power off**.
- b. Click **Yes** to confirm the shutdown.
- c. Verify that the Win10-Tools VM icon indicates that the VM is powered off.

Lab 5 Adding Virtual Hardware

Objective and Tasks

Use VMware Host Client to examine a virtual machine's configuration and add virtual hardware to the virtual machine:

1. Examine a Virtual Machine's Configuration
2. Add Virtual Hard Disks to the Virtual Machine
3. Compare Thin-Provisioned and Thick-Provisioned Disks

Task 1: Examine a Virtual Machine's Configuration

You use VMware Host Client to examine a VM's configuration.

Viewing a VM's configuration is useful for general VM maintenance and troubleshooting purposes.

1. From your student desktop, log in to SA-ESXi-01 as root using VMware Host Client.
 - a. Click the **Firefox** icon from the taskbar of your student desktop.
 - b. From the bookmarks toolbar, select **vSphere Site-A > Host Client (SA-ESXi-01)**.
 - c. To log in, enter **root** for the user name and **VMware1!** for the password.
2. In the Navigator pane, click **Virtual Machines**.
3. Power on the Photon-Hw VM.
 - a. In the right pane, right-click **Photon-Hw** and select **Power > Power on**.
4. In the right pane, click the **Photon-Hw** link.
5. Minimize the Recent tasks pane by clicking the **Minimize** icon in the top-right corner of the Recent tasks pane.

6. Review the Hardware Configuration pane for the virtual machine.
 - Q1. What size is the VM's hard disk 1?
 - Q2. Is Hard disk 1 a thin-provisioned or thick-provisioned disk?
7. Review the Resource Consumption pane for the virtual machine.
 - Q3. How much storage space is used by this VM?
8. Review the General Information pane for the virtual machine.
 - Q4. Is VMware Tools installed and running?

Task 2: Add Virtual Hard Disks to the Virtual Machine

To familiarize yourself with the process of adding virtual hardware, you add two virtual hard disks to the VM. You configure one hard disk as thin-provisioned and the other as thick-provisioned.

1. In the Navigator pane, right-click **Photon-Hw** and select **Edit settings**.

The Edit settings dialog box opens.
2. Click **Add hard disk** and select **New standard hard disk**.
3. For the new hard disk, change the disk size and disk provisioning type.
 - a. Change the size of the new hard disk to 1 GB.
 - b. Expand New Hard disk and click **Thin provisioned**.
4. Minimize **New Hard disk**.
5. Click **Add hard disk** and select **New standard hard disk**.
6. Expand the second new hard disk, change the disk size and disk provisioning type.
 - a. Change the size of the new hard disk to 1 GB.
 - b. Click **Thick provisioned, eagerly zeroed**.
7. Click **Save**.
8. In the Hardware Configuration pane, verify that Hard disk 2 is a 1 GB, thin-provisioned disk, and that Hard disk 3 is a 1 GB, thick-provisioned disk.

Task 3: Compare Thin-Provisioned and Thick-Provisioned Disks

You view and compare thin-provisioned and thick-provisioned virtual disk files. Being aware of the differences between these two disk types is useful for planning your storage needs and also for troubleshooting storage problems.

1. In the Hardware Configuration pane, view the details for Hard disk 2 and Hard disk 3.

Q1. What is the name of the virtual disk file for Hard disk 2?

Q2. What is the name of the virtual disk file for Hard disk 3?

Q3. On what datastore are Hard disk 2 and Hard disk 3 located?

2. Verify the size of the Hard disk 2 and Hard disk 3 virtual disk files.

- a. In the Navigator pane, click **Storage**.

The **Datastores** tab appears in the right pane and ICM-Datastore appears in the list.

- b. Highlight the ICM-Datastore row and click **Datastore browser**.

- c. In the Datastore browser window, select the **Photon-Hw** folder and select **Photon-Hw_1.vmdk**.

Q4. What is the size of Photon-Hw_1.vmdk?

- d. In the Datastore browser window, select **Photon-Hw_2.vmdk**.

Q5. What is the size of Photon-Hw_2.vmdk?

The thin-provisioned disk uses only as much datastore space as the disk needs, in this case, 0 bytes. The thick-provisioned disk has all its space (1 GB) allocated during creation.

3. Click **Close** to close the Datastore browser window.

4. Shut down the Photon-Hw VM.

- a. Select **Photon-Hw** in the Navigator pane and in the right pane, click **Shut down**.

- b. Verify that Photon-Hw is powered off.

5. Log out of VMware Host Client.

Lab 6 Adding vSphere Licenses

Objective and Tasks

Use the vSphere Client to add vSphere licenses to vCenter Server and assign a license to vCenter Server:

1. Add vSphere Licenses to vCenter Server
2. Assign a License to the vCenter Server Instance

Task 1: Add vSphere Licenses to vCenter Server

You add vSphere licenses to vCenter Server.

1. Use the vSphere Client to log in to the SA-VCSA-01 vCenter Server system as the administrator.
 - a. In the bookmarks toolbar in Firefox, select **vSphere Site-A > vSphere Client (SA-VCSA-01)**.
 - b. At the login prompt, enter **administrator@vsphere.local** for the user name and **VMware1!** for the password.
2. Navigate to the License pane.
 - a. In the vSphere Client, from the **Menu** drop-down menu, select **Administration**.
 - b. In the navigation pane, select **Licenses**.
 - c. The Licenses pane opens to the right.
3. Add the vCenter Server and vSphere Enterprise Plus license keys that are provided by your instructor.
 - a. In the right pane, click **Add New Licenses**.
 - b. On the Enter license keys page, enter the vCenter Server and vSphere Enterprise Plus license keys from your instructor in the **License keys** text box.

You must enter the license keys on separate lines.

- c. Verify that both licenses are listed correctly in the text box and click **NEXT**.
 - d. On the Edit license names page, enter **vCenter Server Training** and **ESXi Training** in the appropriate **License name** text boxes.
 - e. Click **NEXT**.
 - f. On the Ready to complete page, click **FINISH**.
4. Verify that the licenses that you added appear in the list.

Task 2: Assign a License to the vCenter Server Instance

You assign a standard license to the sa-vcsa-01.vclass.local vCenter Server instance.

1. In the Licenses pane, select the **Assets** tab.
The vCenter Server systems are listed.
2. Select the **sa-vcsa-01.vclass.local** check box and click **Assign License**.
3. Under Assign License, select the **vCenter Server Training** license.
4. Click **OK**.
5. Verify that sa-vcsa-01.vclass.local has a valid license.

Lab 7 Creating and Managing the vCenter Server Inventory

Objective and Tasks

Use the vSphere Client to create and configure objects in the vCenter Server inventory:

1. Create a Data Center Object
2. Add ESXi Hosts to the Inventory
3. View Information About the ESXi Hosts
4. Configure the ESXi Hosts as NTP Clients
5. Create a Folder for the ESXi Hosts
6. Create Folders for VMs and VM Templates

Task 1: Create a Data Center Object

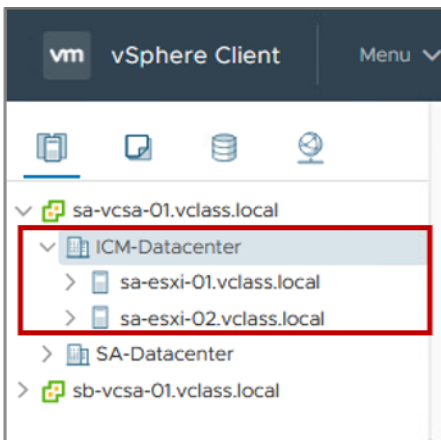
You create a data center object named ICM-Datacenter to organize the hosts and VMs in the environment.

1. Using the vSphere Client, log in to sa-vcsa-01.vclass.local by entering **administrator@vsphere.local** for the user name and **VMware1!** for the password.
2. From the **Menu** drop-down menu, select **Hosts and Clusters**.
3. In the navigation pane, right-click **sa-vcsa-01.vclass.local** and select **New Datacenter**.
The New Datacenter dialog box opens.
4. In the **Name** text box, enter **ICM-Datacenter** and click **OK**.
5. Verify that ICM-Datacenter appears in the navigation pane.

Task 2: Add ESXi Hosts to the Inventory

You add the sa-esxi-01.vclass.local and sa-esxi-02.vclass.local ESXi hosts to the vCenter Server inventory.

1. In the navigation pane, right-click **ICM-Datacenter** and select **Add Host**.
The Add Host wizard opens.
2. On the Name and location page, enter **sa-esxi-01.vclass.local** and click **NEXT**.
3. On the Connection settings page, enter **root** as the user name and **VMware1!** as the password and click **NEXT**.
 - a. If you see a security alert that the certificate store of vCenter Server cannot verify the certificate, click **YES** to proceed.
4. On the Host summary page, review the information and click **NEXT**.
5. On the Assign license page, click the **ESXi Training** license key and click **NEXT**.
6. On the Lockdown mode page, leave the default as **Disabled** and click **NEXT**.
7. On the VM location page, click **NEXT**.
8. On the Ready to complete page, review the information and click **FINISH**.
9. Expand the Recent Tasks pane by clicking the arrows in the bottom-right corner of the window and monitor the progress of the task.
10. Repeat steps 1 through 9 to add sa-esxi-02.vclass.local to the vCenter Server inventory.
For step 2, you enter **sa-esxi-02.vclass.local** on the Name and location page.
11. Verify that sa-esxi-01.vclass.local and sa-esxi-02.vclass.local appear in the navigation pane under ICM-Datacenter.



Task 3: View Information About the ESXi Hosts

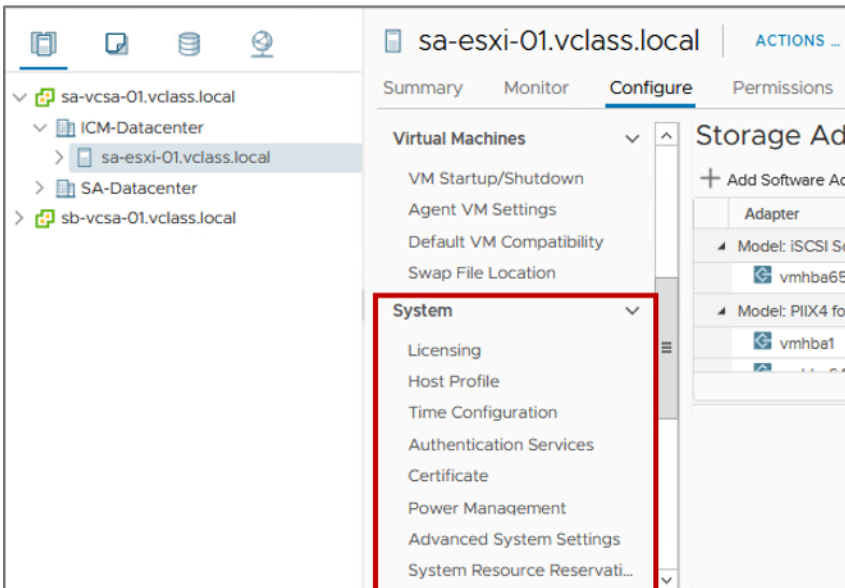
You view information about the ESXi host, including information about CPU, memory, storage, NICs, and virtual machines. Knowing where to look in the UI for this information is useful for monitoring and troubleshooting purposes.

1. In the navigation pane, select **sa-esxi-01.vclass.local**.
2. In the right pane, click the **Summary** tab.
3. Expand the Hardware pane and view the hardware details of the ESXi host.
 - Q1. How many CPUs does this ESXi host have?
 - Q2. How much memory does this ESXi host have?
 - Q3. How many networks is this ESXi host connected to?

Task 4: Configure the ESXi Hosts as NTP Clients

You configure the sa-esxi-01.vclass.local and sa-esxi-02.vclass.local ESXi hosts to use Network Time Protocol (NTP) so they can maintain the accurate time and date.

1. In the navigation pane, select **sa-esxi-01.vclass.local** and click the **Configure** tab in the right pane.
2. In the right pane under System, select **Time Configuration**.



3. Next to Network Time Protocol, click **EDIT**.
The Edit Network Time Protocol dialog box opens.
4. Select the **Enable** check box.
5. In the **NTP Servers** text box, enter **172.20.10.10**.
6. Next to NTP Service Status, select the **Start NTP Service** check box.
7. From the **NTP Service Startup Policy** drop-down menu, select **Start and stop with host**.
8. Click **OK**.
9. In the Network Time Protocol pane, verify that the NTP client is Enabled and that the NTP service status is Running.
10. Repeat steps 1 through 9 to configure sa-esxi-02.vclass.local as an NTP client.

Task 5: Create a Folder for the ESXi Hosts

You create a folder named **Lab Servers** to group the sa-esxi-01.vclass.local and sa-esxi-02.vclass.local ESXi hosts together.

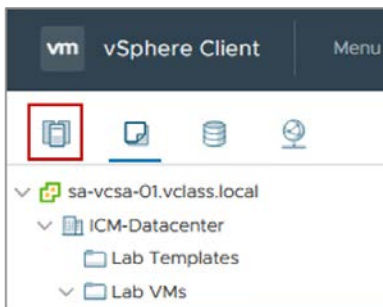
1. In the navigation pane, right-click **ICM-Datacenter** and select **New Folder > New Host and Cluster Folder**.
2. In the **Enter a name for the folder** text box, enter **Lab Servers** and click **OK**.
3. Verify that the **Lab Servers** folder appears in the navigation pane.
4. Drag **sa-esxi-01.vclass.local** and **sa-esxi-02.vclass.local** into the **Lab Servers** folder.
5. Verify that both hosts appear under the **Lab Servers** folder.

Task 6: Create Folders for VMs and VM Templates

You create a folder named **Lab VMs** and you create a folder named **Lab Templates**. You observe the differences in the menu commands between folders.

1. From the **Menu** drop-down menu, select **VMs and Templates**.
2. Create a folder for the VMs and move VMs into the folder.
 - a. Right-click **ICM-Datacenter** and select **New Folder > New VM and Template Folder**.
 - b. In the **Enter a name for the folder** text box, enter **Lab VMs** and click **OK**.

- c. In the navigation pane, expand **ICM-Datacenter**.
 - d. Drag the **Win10-02**, **Win10-04**, and **Win10-06** virtual machines to the **Lab VMs** folder.
 - e. Verify that all three virtual machines appear under the **Lab VMs** folder.
3. Create a folder for VM templates.
 - a. Right-click **ICM-Datacenter** and select **New Folder > New VM and Template Folder**.
 - b. In the **Enter a name for the folder** text box, enter **Lab Templates** and click **OK**.
 - c. Verify that the **Lab Templates** folder appears in the navigation pane.
 4. Compare the actions that you can perform on the **Lab VMs** folder and the **Lab Servers** folder.
 - a. Right-click the **Lab VMs** folder and review the menu commands in the drop-down menu.
 - b. Click the **Host and Clusters** icon in the navigation pane.



- c. Right-click the **Lab Servers** folder and review the menu commands in the drop-down menu.
- Q1. What is the difference between the menu commands for the **Lab VMs** folder and the **Lab Servers** folder?

Lab 8 Configuring Active Directory: Joining a Domain

Objective and Tasks

Join vCenter Server to the vclass.local domain:

1. Join vCenter Server to the vclass.local Domain

Task 1: Join vCenter Server to the vclass.local Domain

You join sa-vcsa-01 to the vclass.local domain, which is an Active Directory identity source. After joining the domain, an AD user can be selected and assigned rights to manage a virtual machine.

1. Using the vSphere Client, log in to sa-vcsa-01.vclass.local by entering **administrator@vsphere.local** for the user name and **VMware1!** for the password.
2. From the **Menu** drop-down menu, select **Administration**.
3. In the navigation pane under Single Sign-On, select **Configuration**.
4. In the Configuration pane, click **Active Directory Domain**.

The **sa-vcsa-01.vclass.local** node is selected.

5. Click **JOIN AD**.

The Join Active Directory Domain dialog box opens.

6. Configure the Active Directory domain options.
 - a. Enter **vclass.local** in the **Domain** text box.
 - b. Leave the **Organizational Unit** text box blank.

- c. Enter **administrator@vclass.local** in the **User name** text box.
 - d. Enter **VMware1!** in the **Password** text box.
 - e. Click **JOIN**.
7. Verify that sa-vcsa-01.vclass.local successfully joined Active Directory.
 8. Restart vCenter Server Appliance using the vCenter Server Appliance Management Interface.

vCenter Server Appliance must be restarted for these changes to take effect.

- a. Open a new tab in the browser.
- b. From the bookmarks toolbar, select **vSphere Site-A > vCenter Appliance Management (SA-VCSA-01)**.
- c. If a security warning appears, click **Advanced** and click **Accept the Risk and Continue**.
- d. At the login screen, log in by entering **root** for the user name and **VMware1!** for the password.

The vCenter Server Management window opens.

- e. From the **Actions** drop-down menu in the top-right corner, select **Reboot**.
- f. Click **YES** to proceed.

The reboot takes 10–15 minutes. During this time, the vSphere Client is unavailable.

9. Close the VMware Appliance Management browser tab.
10. In the vSphere Client tab, refresh the screen periodically until the vSphere Client login page appears.

Lab 9 Configuring Active Directory: Adding an Identity Source

Objective and Tasks

Add vclass.local as an identity source:

1. Add vclass.local as an Identity Source

Task 1: Add vclass.local as an Identity Source

You add an identity source to enable the single sign-on configuration.

1. Using the vSphere Client, log in to sa-vcsa-01.vclass.local by entering **administrator@vsphere.local** for the user name and **VMware1!** for the password.
2. From the **Menu** drop-down menu, select **Administration**.
3. In the navigation pane under Single Sign On, select **Configuration**.
4. In the right pane, click **Identity Sources**.

The vsphere.local and LocalOS domains appear as identity sources.

5. Click **ADD**.

The Add Identity Source dialog box opens.

6. For the Identity Source Type, verify that **Active Directory (Integrated Windows Authentication)** is selected.
7. Verify that the domain name is vclass.local.
8. Click **ADD**.
9. Verify that vclass.local is added as an identity source.

Lab 10 Users, Groups, and Permissions

Objective and Tasks

Assign roles and permissions so that an Active Directory user can perform functions in vCenter Server:

1. View Active Directory Users
2. Assign Object Permission to an Active Directory User
3. Assign Root-Level Global Permission to an Active Directory User
4. Log In as an Active Directory User
5. Use an Active Directory User to Create a Virtual Machine

Task 1: View Active Directory Users

You view the list of Active Directory users to verify that the Administrator single sign-on account exists.

1. Using the vSphere Client, log in to sa-vcsa-01.vclass.local by entering **administrator@vsphere.local** for the user name and **VMware1!** for the password.
2. From the **Menu** drop-down menu, select **Administration**.
3. Under Single Sign-On in the navigation pane, select **Users and Groups**.
By default, the list of users for the LocalOS domain appears in the right pane.
4. In the Users pane, select **vclass.local** from the **Domain** drop-down menu.
5. Verify that the Administrator user name appears in the list.

Task 2: Assign Object Permission to an Active Directory User

You assign permission at the vCenter Server level to the administrator@vclass.local user.

This permission propagates to the child objects of vCenter Server.

1. From the **Menu** drop-down menu, select **Hosts and Clusters**.
2. In the navigation pane, select **sa-vcsa-01.vclass.local**.
3. In the right pane, click **Permissions**.
4. Click the **Add Permission** icon (the plus sign).

The Add Permission window opens.

5. Configure the permission settings.
 - a. From the **Domain** drop-down menu, select **vclass.local**.

NOTE

Ensure that you select vclass.local, not vsphere.local.

- b. In the **User/Group** search box, enter **admin** and select **Administrator** from the list.
 - c. Leave the role as Administrator.
 - d. Select the **Propagate to children** check box.
 - e. Click **OK**.
6. Verify that vclass\administrator appears in the list, is assigned the Administrator role, and is defined in the vCenter Server object and its children.

Task 3: Assign Root-Level Global Permission to an Active Directory User

You grant global permission to administrator@vclass.local to administer content libraries.

Content libraries are located directly under the global root object. By assigning the Content Library Administrator role to administrator@vclass.local at the global root, this user has administrator rights for all content libraries.

1. From the **Menu** drop-down menu, select **Administration**.
2. In the navigation pane under Access Control, select **Global Permissions**.
3. In the Global Permissions pane, click the **Add Permission** icon (the plus sign).

The Add Permission window opens.

4. Configure the permission settings.
 - a. From the **Domain** drop-down menu, select **vclass.local**.
 - b. In the **User/Group** search box, enter **admin** and select **Administrator** from the list.
 - c. From the **Role** drop-down menu, select **Content library administrator (sample)**.
 - d. Select the **Propagate to children** check box.
 - e. Click **OK**.
5. Verify that vclass.local\administrator appears in the list, is assigned the Content Library Administrator (sample) role, and is assigned global permission.

Task 4: Log In as an Active Directory User

You log in to the vSphere Client as administrator@vclass.local and verify that the login is successful.

1. Log out of the vSphere Client.
2. On the vSphere Client login screen, enter **administrator@vclass.local** as the user name and **VMware1!** as the password.
3. Verify that you are logged in to the vSphere Client as administrator@vclass.local.

Task 5: Use an Active Directory User to Create a Virtual Machine

You create a virtual machine to show how an Active Directory user can perform administrative tasks.

1. In the vSphere Client, from the **Menu** drop-down menu, select **VMs and Templates**.
2. Create a VM named Test VM in the Lab VMs folder.
 - a. In the navigation pane, expand **ICM-Datacenter**.
 - b. Right-click **Lab VMs** and select **New Virtual Machine**.
The New Virtual Machine wizard opens.
 - c. On the Select a creation type page, select **Create a new virtual machine** and click **NEXT**.
 - d. On the Select a name and folder page, enter **Test VM** in the **Virtual machine name** text box.
 - e. Verify that **Lab VMs** is selected and click **NEXT**.
 - f. On the Select a compute resource page, expand the **Lab Servers** folder, select **sa-esxi-01.vclass.local**, and click **NEXT**.

- g. On the Select storage page, select **ICM-Datastore** and click **NEXT**.
 - h. On the Select compatibility page, leave **ESXi 7.0 and later** selected and click **NEXT**.
 - i. On the Select a guest OS page, select **Linux** from the **Guest OS Family** drop-down menu.
 - j. Select **VMware Photon OS (64-bit)** from the **Guest OS Version** drop-down menu and click **NEXT**.
 - k. On the Customize hardware page, expand the New Hard disk pane and select **Thin Provision** from the **Disk Provisioning** drop-down menu.
 - l. Click **NEXT**.
 - m. On the Ready to complete page, click **FINISH**.
 - n. Expand the **Lab VMs** folder in the navigation pane and verify that Test VM appears under this folder.
3. Delete Test VM.
- a. In the navigation pane, right-click **Test VM** and select **Delete from Disk**.
 - b. Click **YES** to confirm the deletion.
 - c. Verify that Test VM does not appear under the **Lab VMs** folder.
4. Log out of the vSphere Client.

Lab 11 Using Standard Switches

Objective and Tasks

Create a standard switch and a port group for virtual machines:

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

Task 1: View the Standard Switch Configuration

You view the vSphere standard switch settings to confirm the proper configuration of the default switch.

1. Using the vSphere Client, log in to sa-vcsa-01.vclass.local by entering **administrator@vsphere.local** for the user name and **VMware1!** for the password.
2. From the **Menu** drop-down menu, select **Hosts and Clusters**.
3. Select **sa-esxi-01.vclass.local** in the navigation pane and click the **Configure** tab in the right pane.
4. Under Networking, select **Virtual switches**.
5. Review the information about the vSwitch0 standard switch that is provided in the Virtual switches pane.
 - Q1. Which physical adapter is vSwitch0 connected to?
 - Q2. Which port groups are connected to vSwitch0?
 - Q3. Which virtual machines and templates are connected to the VM Network port group?

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

You create a standard switch and a virtual machine port group on the standard switch to handle network traffic at the host level in your vSphere environment.

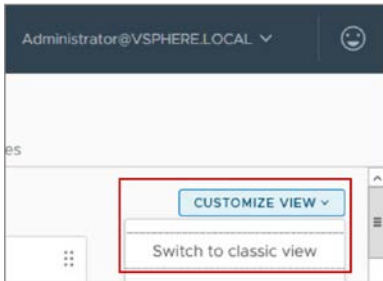
1. Select **sa-esxi-01.vclass.local** in the navigation pane and click **ADD NETWORKING** in the right pane.
The Add Networking wizard opens.
2. On the Select connection type page, click **Virtual Machine Port Group for a Standard Switch** and click **NEXT**.
3. On the Select target device page, click **New standard switch** and click **NEXT**.
4. On the Create a Standard Switch page, click the **Add adapters** icon (the green plus sign).
5. Select **vmnic3** and click **OK**.
6. Review the information for the new active adapter and click **NEXT**.
7. On the Connection settings page, enter **Production** in the **Network label** text box and click **NEXT**.
8. On the Ready to complete page, review the information and click **FINISH**.
9. In the Virtual switches pane, minimize the vSwitch0 pane and expand the vSwitch1 pane.
10. Verify that the Production port group is on vSwitch1 and that vmnic3 is the physical adapter.
11. Repeat steps 1 through 10 to create vSwitch1 and the Production port group on sa-esxi-02.vclass.local.

Task 3: Attach Virtual Machines to the Virtual Machine Port Group

You attach virtual machines to the virtual machine port group so that the virtual machines can communicate with other networked devices.

1. Select **VMs and Templates** from the **Menu** drop-down menu.
2. In the navigation pane, expand the **Lab VMs** folder.
3. Connect the Win10-02 VM to the Production port group.
 - a. In the navigation pane, select the **Win10-02** virtual machine.
 - b. Right-click the virtual machine and select **Edit Settings**.
 - c. In the Edit Settings window, find **Network adapter 1**.
 - d. Click the downward arrow next to VM Network and click **Browse**.

- e. In the Select Network window, select **Production** and click **OK**.
- f. Expand **Network adapter 1** and verify that the **Connect At Power On** check box is selected.
- g. Click **OK** to close the Edit Settings window.
4. In the right pane, click the **Summary** tab.
5. View the VM Hardware pane and verify that the Production port group is listed.
The Production port group has a status of disconnected because the VM is powered off.
6. Power on the Win10-02 VM.
 - a. In the navigation pane, right-click **Win10-02** and select **Power > Power On**.
7. In Win10-02's **Summary** tab, verify that you are in the classic view of the vSphere Client.
 - a. If you see the **CUSTOMIZE VIEW** drop-down menu in the **Summary** tab, then select **Switch to classic view** from the drop-down menu.



8. In Win10-02's **Summary** tab, click the **Launch Web Console** link.



9. Wait for the boot process to complete.

The Win10-02 VM is configured to automatically log you in as vclass\administrator.

10. Renew the virtual machine's IP address.

- a. In the VM's console, right-click the Windows **Start** icon and select **Run**.
- b. In the Run dialog box, enter **cmd** and click **OK** to open a Command Prompt window.
- c. At the command prompt, enter **ipconfig /release** to release the VM's current IP address.
- d. Enter **ipconfig /renew** to give the VM a new IP address.
- e. View the command's output and record the IPv4 address and the default gateway:
 - IPv4 address of the virtual machine _____
 - Default gateway of the virtual machine _____

11. At the command prompt, enter **ping 172.20.11.10** to verify that the virtual machine is connected to the Production network.

This command pings the Production network's default gateway. Your ping should be successful. If it is not successful, ask your instructor for help.

12. Close the Win10-02 VM's console tab.
13. Repeat steps 3 through 10 on the Win10-04 VM.

Lab 12 Accessing iSCSI Storage

Objective and Tasks

Configure access to an iSCSI datastore:

1. View an Existing ESXi Host iSCSI Configuration
2. Add a VMkernel Port Group to a Standard Switch
3. Add the iSCSI Software Adapter to an ESXi Host
4. Connect the iSCSI Software Adapters to Storage

Task 1: View an Existing ESXi Host iSCSI Configuration

You familiarize yourself with the existing VMkernel and iSCSI software adapter configuration on sa-esxi-01.vclass.local.

1. Using the vSphere Client, log in to sa-vcsa-01.vclass.local by entering **administrator@vsphere.local** for the user name and **VMware1!** for the password.
2. From the **Menu** drop-down menu, select **Hosts and Clusters**.
3. In the navigation pane, select **sa-esxi-01.vclass.local** and select the **Configure** tab in the right pane.
4. In the right pane under Storage, select **Storage Adapters**.
5. In the Storage Adapters pane, verify the status of the existing iSCSI software adapter.
 - a. Select the iSCSI software adapter (vmhba65).
 - b. Verify that Online appears in the Status column.

6. Review the properties of the iSCSI software adapter.
 - a. In the Storage Adapters pane, select the **Properties** tab.
 - b. Review the storage adapter properties.
 - Adapter status
 - Adapter name
 - Adapter iSCSI name
 - Authentication method
7. Select the **Devices** tab and review the information in the Datastore column.
8. Verify that the following LUNs appear in the list.
 - LUN 2 (11 GB)
 - LUN 5 (130 GB)
 - LUN 6 (7 GB)

These LUNs should have a status of Not Consumed in the Datastore column.

The LUNs are hosted by an iSCSI provider and can be used to create datastores.

9. Select the **Dynamic Discovery** tab and record the iSCSI Server IP address.

10. Review and record information about the network port binding configuration.
 - a. Select the **Network Port Binding** tab.
 - b. In the Port Group column, select the **IP Storage (vSwitch0)** check box.
 - c. Click **View Details**.
The Details for vmk1 window opens.
 - d. Review the details in each tab for vmk1.
 - e. In the **VMkernel Adapter > IP Settings** tab, record the IPv4 address for vmk1.

 - f. Click **CLOSE**.

Task 2: Add a VMkernel Port Group to a Standard Switch

You configure a VMkernel port group on vSwitch0 on sa-esxi-02.vclass.local to be used for IP storage traffic.

1. In the navigation pane, select **sa-esxi-02.vclass.local**.
2. On the **Configure** tab, select **VMkernel adapters** under Networking.
3. Click the **Add Networking** icon.
The Add Networking wizard opens.
4. On the Select connection type page, verify that **VMkernel Network Adapter** is selected and click **NEXT**.
5. On the Select target device page, click **Select an existing standard switch**.
6. Click **BROWSE** and select **vSwitch0**.
7. Click **OK**.
8. Click **NEXT**.
9. On the Port properties page, enter **IP Storage** in the **Network label** text box and click **NEXT**.
10. On the IPv4 settings page, configure the IPv4 settings.
 - a. Click **Use static IPv4 settings**.
 - b. In the **IPv4 address** text box, enter **172.20.10.62**.
 - c. In the **Subnet mask** text box, enter **255.255.255.0**.
 - d. Verify that the default gateway and DNS server address are set to 172.20.10.10.
 - e. Click **NEXT**.
11. On the Ready to complete page, click **FINISH**.
12. Verify that vmk1, labeled IP Storage, appears in the VMkernel adapters list.

Task 3: Add the iSCSI Software Adapter to an ESXi Host

You add the iSCSI software adapter to sa-esxi-02.vclass.local so that you can access the iSCSI server.

1. In the navigation pane, verify that **sa-esxi-02.vclass.local** is selected.
2. On the **Configure** tab under Storage, select **Storage Adapters**.
3. Click **Add Software Adapter**.
The Add Software Adapter window opens.
4. Confirm that **Add software iSCSI adapter** is selected and click **OK**.
5. In the Storage Adapters list, select the newly created iSCSI software adapter.
6. Select the **Properties** tab.
7. Verify that the adapter status appears as Enabled.
8. Verify that the iSCSI name matches iqn.1998-01.com.vmware:sa-esxi-02-#####.
The # symbol represents characters that might change.

Task 4: Connect the iSCSI Software Adapters to Storage

You configure the iSCSI adapter on sa-esxi-02.vclass.local to connect directly to a remote iSCSI target on the IP network.

1. In the Storage Adapters pane, select the **Dynamic Discovery** tab and click **Add**.
2. In the Add Send Target Server window, enter **172.20.10.15** in the **iSCSI Server** text box and click **OK**.
A warning appears stating that because of recent configuration changes, a rescan of vmhba65 is recommended. Do not rescan yet.
3. In the Storage Adapters pane, click the **Network Port Binding** tab.
4. Click **Add**.
5. Select the **IP Storage (vSwitch0)** check box and click **OK**.
A warning appears stating that because of recent configuration changes, a rescan of vmhba65 is recommended.
6. Click **Rescan Storage**.
The Rescan Storage window scans for new storage devices and new VMFS volumes by default.
7. Click **OK**.

8. Monitor the Recent Tasks pane and wait for the rescan tasks to finish.
9. In the Storage Adapter pane, select the **Devices** tab.
10. Verify that the following LUNs appear in the list.
 - LUN 2 (11 GB)
 - LUN 5 (130 GB)
 - LUN 6 (7 GB)

These LUNs should have a status of Not Consumed in the Datastore column.

The LUNs are hosted by an iSCSI provider and can be used to create datastores.

Lab 13 Managing VMFS Datastores

Objective and Tasks

Create and manage VMFS datastores:

1. Create VMFS Datastores for the ESXi Host
2. Expand a VMFS Datastore to Consume Unused Space on a LUN
3. Remove a VMFS Datastore
4. Extend a VMFS Datastore
5. Create a Second VMFS Datastore

Task 1: Create VMFS Datastores for the ESXi Host

You set up VMFS datastores on iSCSI-based storage devices to be used as repositories by virtual machines.

1. Using the vSphere Client, log in to sa-vcsa-01.vclass.local by entering **administrator@vsphere.local** for the user name and **VMware1!** for the password.
2. From the **Menu** drop-down menu, select **Storage**.
3. Create a VMFS datastore called VMFS-2 on the specified LUN on sa-esxi-01.vclass.local.
 - a. In the navigation pane, right-click **ICM-Datcenter** and select **Storage > New Datastore**.
The New Datastore wizard opens.
 - b. On the Type page, verify that **VMFS** is selected and click **NEXT**.
 - c. On the Name and device selection page, enter **VMFS-2** in the **Datastore name** text box.

- d. From the **Select a host to view its accessible disks/LUNs** drop-down menu, select **sa-esxi-01.vclass.local**.

A LUN list appears.

- e. In the LUN list, select **LUN 2** (11 GB in size).

Name and device selection
Select a name and a disk/LUN for provisioning the datastore.

Datastore name: VMFS-2

Select a host to view its accessible disks/LUNs: sa-esxi-01.vclass.local

Name	LUN	Capacity	Hardware...	Drive T...	!
FreeNAS iSCSI Disk (nas....	4	5.00 GB	Supported	Flash	
FreeNAS iSCSI Disk (nas....	5	130.00 GB	Supported	Flash	
FreeNAS iSCSI Disk (nas....	6	7.00 GB	Supported	Flash	
FreeNAS iSCSI Disk (nas....	2	11.00 GB	Supported	Flash	
Local VMWare Disk (mpx....	0	8.00 GB	Not suppor...	Flash	

- f. Click **NEXT**.
- g. On the VMFS version page, accept **VMFS 6** and click **NEXT**.
- h. On the Partition configuration page, move the **Datastore Size** slider to reduce the datastore size by 3 GB and click **NEXT**.
- For example, if the datastore size is 11 GB, change the size to 8 GB.
- i. On the Ready to complete page, review the information and click **FINISH**.
4. In the navigation pane, verify that the VMFS-2 datastore appears under ICM-Datcenter.
5. In the navigation pane, select **VMFS-2**.
6. In the right pane, select the **Summary** tab and record the value for storage capacity.
-
7. Create a VMFS datastore called VMFS-3 on the specified LUN on sa-esxi-02.vclass.local.
- a. Right-click **ICM-Datcenter** and select **Storage > New Datastore**.
- b. On the Type page, verify that **VMFS** is selected and click **NEXT**.
- c. On the Name and device selection page, enter **VMFS-3** in the **Datastore name** text box.
- d. From the **Select a host to view its accessible disks/LUNs** drop-down menu, select **sa-esxi-02.vclass.local**.
- A LUN list appears.
- e. In the LUN list, select **LUN 6** (7 GB in size) and click **NEXT**.
- f. On the VMFS version page, accept **VMFS 6** and click **NEXT**.

- g. On the Partition configuration page, accept the default (**Use all available partitions**) and click **NEXT**.
 - h. On the Ready to complete page, review the information and click **FINISH**.
8. Verify that the VMFS-3 datastore appears under ICM-Datcenter.

Task 2: Expand a VMFS Datastore to Consume Unused Space on a LUN

You dynamically increase the capacity of the VMFS-2 datastore when more space is required by virtual machines.

1. In the navigation pane, right-click the **VMFS-2** datastore and select **Increase Datastore Capacity**.
The Increase Datastore Capacity wizard opens.
2. On the Select Device page, select **LUN 2** (11 GB in size).
3. Scroll the window to the right and verify that Yes appears in the Expandable column.
4. Click **NEXT**.
5. On the Specify Configuration page, accept **Use “Free Space 3 GB” to expand the datastore** from the **Partition Configuration** drop-down menu and click **NEXT**.
6. On the Ready to complete page, review the information and click **FINISH**.
7. When the task is completed, select the **VMFS-2** datastore in the navigation pane.
8. On the **Summary** tab, verify that the datastore size is increased to the maximum capacity.
9. Record the total storage capacity. _____

Task 3: Remove a VMFS Datastore

You delete a VMFS datastore to free up storage space for other purposes. The datastore is destroyed and removed from all hosts.

1. In the navigation pane, right-click the **VMFS-3** datastore and select **Delete Datastore**.
2. Click **YES** to confirm deleting the datastore.
3. Monitor the Recent Tasks pane and wait for the task to finish.
4. Verify that the VMFS-3 datastore is removed from the navigation pane.

Task 4: Extend a VMFS Datastore

You extend the capacity of a VMFS datastore when extra storage space is needed. You use a second LUN to extend the size of a datastore based on the first LUN. You also rename the VMFS datastore to make the name more descriptive.

1. Extend the capacity of the VMFS-2 datastore.
 - a. In the navigation pane, select **VMFS-2**.
 - b. Select the **Configure** tab in the right pane.
 - c. Select **General** and next to Capacity, click **INCREASE**.
The Increase Datastore Capacity wizard opens.
 - d. On the Select Device page, select **LUN 6** (7 GB) and click **NEXT**.
 - e. On the Specify Configuration page, select **Use all available partitions** from the **Partition Configuration** drop-down menu.
 - f. Click **NEXT**.
 - g. On the Ready to complete page, review the information and click **FINISH**.
 - h. Monitor the Recent Tasks pane and when the task finishes, refresh the page.
2. Verify that the size of the VMFS-2 datastore is increased.
 - a. Select **Device Backing** in the right pane.
 - b. Verify that two extent names appear in the Device Backing pane.
 - c. Click the **Summary** tab.
 - d. Record the new value for the total storage capacity. _____
 - e. Verify that the recorded value is larger than the final value in task 2, step 8.
3. Click the **Hosts** tab in the right pane.
sa-esxi-01.vclass.local and sa-esxi-02.vclass.local are in the list, indicating that this new datastore is shared between your two ESXi hosts.
4. Rename the VMFS-2 datastore to Shared-VMFS.
 - a. In the navigation pane, right-click **VMFS-2** and select **Rename**.
 - b. In the **Enter the new name** text box, enter **Shared-VMFS**.
 - c. Click **OK**.
 - d. Verify that the datastore is renamed to Shared-VMFS.

Task 5: Create a Second VMFS Datastore

You use an iSCSI-shared LUN to create another VMFS datastore.

1. In the navigation pane, right-click **ICM-Datcenter** and select **Storage > New Datastore**.
The New Datastore wizard starts.
2. On the Type page, verify that VMFS is selected and click **NEXT**.
3. On the Name and device selection page, enter **iSCSI-Datastore** in the **Datastore name** text box.
4. From the **Select a host to view its accessible disks/LUNs** drop-down menu, select **sa-esxi-01.vclass.local**.
A LUN list appears.
5. From the LUN list, select **LUN 5** (130 GB in size) and click **NEXT**.
6. On the VMFS version page, accept **VMFS 6** and click **NEXT**.
7. On the Partition Configuration page, accept **Use all available partitions** and click **NEXT**.
8. On the Ready to complete page, review the information and click **FINISH**.
9. In the navigation pane, verify that iSCSI-Datastore appears under ICM-Datcenter.
10. Select **iSCSI-Datastore** and in the right pane, click the **Configure** tab.
11. In the **Configure** tab, select **Connectivity and Multipathing**.
12. Verify that sa-esxi-01.vclass.local and sa-esxi-02.vclass.local are connected to the datastore.

Lab 14 Accessing NFS Storage

Objective and Tasks

Create an NFS datastore and record its storage information:

1. Configure Access to an NFS Datastore
2. View NFS Storage Information

Task 1: Configure Access to an NFS Datastore

You mount an NFS share to your ESXi hosts and use it as a datastore.

1. Using the vSphere Client, log in to sa-vcsa-01.vclass.local by entering **administrator@vsphere.local** for the user name and **VMware1!** for the password.
2. From the **Menu** drop-down menu, select **Storage**.
3. Create an NFS datastore called NFS-Datastore.
 - a. Right-click **ICM-Datacenter** and select **Storage > New Datastore**.
The New Datastore wizard starts.
 - b. On the Type page, click **NFS** and click **NEXT**.
 - c. On the **Select NFS version** page, click **NFS 4.1** and click **NEXT**.
 - d. On the Name and configuration page, enter **NFS-Datastore** in the **Datastore name** text box.
 - e. Enter **/NFS-Data** in the **Folder** text box.
 - f. Enter **172.20.10.10** in the **Server** text box.
 - g. Click the **Add server** icon (the green plus sign) to add the server.
Clicking the plus sign adds 172.20.10.10 to the box that appears below.
 - h. Click **NEXT**.

- i. On the Configure Kerberos authentication page, accept the default and click **NEXT**.
 - j. On the Host accessibility page, select both the ESXi hosts and click **NEXT**.
 - k. On the Ready to complete page, verify the NFS settings and click **FINISH**.
4. Verify that the NFS datastore is listed in the navigation pane under ICM-Datacenter.

Task 2: View NFS Storage Information

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

1. In the navigation pane, select **NFS-Datastore**.
2. Click the **Summary** tab in the right pane.
3. Review the information about the NFS datastore.
 - Datastore type
 - Capacity of the datastore
 - Free space of the datastore
 - Used space of the datastore

Lab 15 Using a vSAN Datastore

Objective and Tasks

View a vSAN datastore configuration and a virtual machine's components on the vSAN datastore:

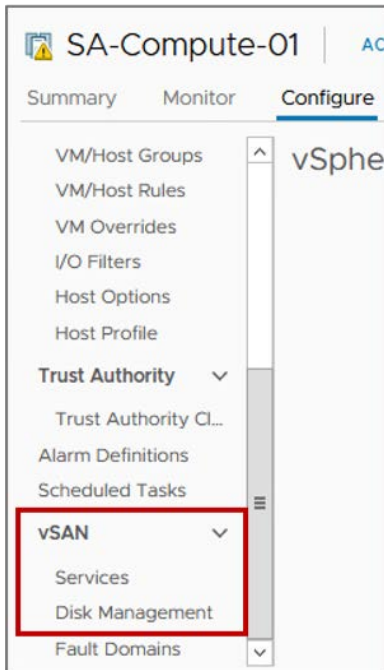
1. View a vSAN Datastore Configuration
2. View the vSAN Default Storage Policy
3. View a Virtual Machine on the vSAN Datastore

Task 1: View a vSAN Datastore Configuration

You view an existing vSAN datastore configuration in the SA-Compute-01 cluster to familiarize yourself with where to find vSAN information in the vSphere Client.

1. Using the vSphere Client, log in to sa-vcsa-01.vclass.local by entering **administrator@vsphere.local** for the user name and **VMware1!** for the password.
2. Verify that vSAN is enabled on the SA-Compute-01 cluster.
 - a. From the **Menu** drop-down menu, select **Hosts and Clusters**.
 - b. In the navigation pane, expand **SA-Datacenter** and select **SA-Compute-01**.
 - c. In the right pane, click the **Configure** tab.
 - d. In the right pane under Configuration, select **Quickstart**.
 - e. Verify that vSAN appears as one of the selected services.
3. View the ESXi hosts that belong to the vSAN cluster.
 - a. In the right pane, click the **Summary** tab.
 - b. Expand the Cluster Resources pane and view the number of hosts in the vSAN cluster.

- c. In the right pane, click the **Hosts** tab to view the names of the ESXi hosts in the cluster.
4. View the disk group configuration on the hosts in the vSAN cluster.
 - a. In the right pane, click the **Configure** tab.
 - b. Under vSAN, select **Disk Management**.



- c. Under the first ESXi host in the list, select the disk group.

Information about the disk group appears in the lower pane.

 - Q1. How many disks are in this disk group?
 - Q2. What are the disk drive types?
 - Q3. What disk tier does each drive belong to?
- d. View the disk groups for the other ESXi hosts.

The number of disk drives, drive types, and tier assignments are the same as the first host.

5. View the VMkernel port configuration that is used to access the vSAN datastore.
 - a. In the navigation pane, select **sa-esxi-04.vclass.local** and, in the right pane, click the **Configure** tab.
 - b. In the right pane, under Networking, select **VMkernel adapters**.
 - c. Select **vmk2** in the VMkernel adapters list.
 - d. Click the **Properties** tab.
 - e. Verify that vSAN appears as an enabled service.
6. View storage capacity information for the vSAN cluster.
 - a. In the navigation pane, select **SA-Compute-01**.
 - b. In the right pane, click the **Summary** tab.
 - c. Review the information on the vSAN Overview pane.

This pane shows current storage capacity used.
 - d. Under vSAN Capacity, click the **Details** link.

The **Monitor** tab appears and the Capacity Overview pane shows used space and free space in the vSAN cluster.

Task 2: View the vSAN Default Storage Policy

You view information about the vSAN default storage policy, and you estimate the usable storage capacity of this policy.

1. From the **Menu** drop-down menu, select **Policies and Profiles**.
2. In the navigation pane, select **VM Storage Policies**.
3. In the right pane, scroll down the menu and select **vSAN Default Storage Policy**.
4. In the **Rules** tab, view the rule set for this storage policy.

This storage policy uses RAID 1 (mirroring).

5. Estimate the usable storage capacity of the vSAN default storage policy.
 - a. From the **Menu** drop-down menu, select **Storage**.
 - b. In the navigation pane under SA-Datacenter, select **vsanDatastore**.
 - c. In the right pane, click the **Monitor** tab.
 - d. Under vSAN, select **Capacity**.

In the Usable capacity analysis pane, you can estimate the effective free space available on the vSAN datastore if you deploy a VM with the specified storage policy. The policy selected is **vSAN Default Storage Policy**.

Q1. Why is the policy's effective free space the value that it is?

Task 3: View a Virtual Machine on the vSAN Datastore

You power on a virtual machine on the vSAN datastore, and you familiarize yourself with the vSAN components that make up the VM.

1. Verify that **vsanDatastore** is selected in the navigation pane.
2. In the right pane, click the **VMs** tab.

A virtual machine named Photon-03 appears in the list.
3. In the right pane, click the **Photon-03** link.

In the navigation pane, Photon-03 is selected and its **Summary** tab is displayed.
4. View the vSAN components that make up the Photon-03 virtual machine.
 - a. Power on Photon-03.
 - b. Select **Photon-03** in the navigation pane.
 - c. In the right pane, click the **Monitor** tab.
 - d. Under vSAN, select **Physical disk placement**.
 - e. Review the virtual object components that make up the virtual machine.
5. In the navigation pane, minimize SA-Datacenter.

Lab 16 Using VM Templates: Creating Templates and Deploying VMs

Objective and Tasks

Create a VM template, create a customization specification, and deploy VMs from a template:

1. Create a Virtual Machine Template
2. Create Customization Specifications
3. Deploy Virtual Machines from a Template

Task 1: Create a Virtual Machine Template

You create a template to securely preserve the configuration of a virtual machine and easily deploy new virtual machines from the template.

1. Using the vSphere Client, log in to sa-vcsa-01.vclass.local by entering **administrator@vsphere.local** for the user name and **VMware1!** for the password.
2. From the **Menu** drop-down menu, select **VMs and Templates**.
3. In the navigation pane, expand ICM-Datacenter.
4. Convert the Photon-Template virtual machine to a template.
 - a. In the navigation pane, look at Photon-Template's icon.
The icon indicates that Photon-Template is a virtual machine.
 - b. Right-click **Photon-Template** and select **Template > Convert to Template**.
 - c. Click **YES** to confirm the conversion.
 - d. In the navigation pane, verify that Photon-Template has a new icon.
The icon indicates that Photon-Template is a template.

5. Move Photon-Template to the **Lab Templates** folder.
 - a. Right-click **Photon-Template** and select **Move to folder**.
 - b. Select **Lab Templates** in the Move to folder window and click **OK**.
6. Verify that Photon-Template appears in the **Lab Templates** folder.

Task 2: Create Customization Specifications

You save the guest operating system settings in a customization specification, which is applied when you clone virtual machines or deploy virtual machines from templates.

1. From the **Menu** drop-down menu, select **Policies and Profiles**.

The VM Customization Specifications pane appears.
2. In the right pane, click **New** to create a custom specification.

The New VM Customization Specification wizard opens.
3. On the Name and target OS page, configure the specification name and target guest OS.
 - a. Enter **Photon-CustomSpec** in the **Name** text box.
 - b. Verify that **sa-vcsa-01.vclass.local** is selected from the **vCenter Server** drop-down menu.
 - c. Under Guest OS, click **Linux** as the **Target guest OS**.
 - d. Click **NEXT**.
4. On the Computer name page, specify the computer name and the domain name.
 - a. Click **Use the virtual machine name**.
 - b. Enter **vclass.local** in the **Domain name** text box.
 - c. Click **NEXT**.
5. On the Time zone page, configure the area and location.
 - a. Select **US** from the **Area** drop-down menu.
 - b. Select **Pacific** from the **Location** list.
 - c. Click **NEXT**.
6. On the Customization script page, click **NEXT**.
7. On the Network page, click **Use standard network settings for the guest operating system, including enabling DHCP on all network interfaces** and click **NEXT**.

8. On the DNS settings page, configure the DNS server and DNS search path.
 - a. Enter **172.20.10.10** in the **Primary DNS server** text box.
 - b. Enter **vclass.local** in the **DNS search path** text box and click **ADD**.
 - c. Click **NEXT**.
9. On the Ready to complete page, review the information and click **FINISH**.
10. In the VM Customization Specifications pane, verify that Photon-CustomSpec is listed.

Task 3: Deploy Virtual Machines from a Template

You use a template to deploy and provision new virtual machines and customize their guest operating systems.

1. From the **Menu** drop-down menu, select **VMs and Templates**.
2. Deploy a VM from Photon-Template to sa-esxi-01.vclass.local.
 - a. In the navigation pane, right-click **Photon-Template** and select **New VM from This Template**.

The Deploy From Template wizard opens.
 - b. On the Select a name and folder page, enter **Photon-11** in the **Virtual machine name** text box.
 - c. Expand **ICM-Datacenter** and select **Lab VMs**.
 - d. Click **NEXT**.
 - e. On the Select a compute resource page, expand **ICM-Datacenter > Lab Servers** and select **sa-esxi-01.vclass.local**.
 - f. Click **NEXT**.
 - g. On the Select storage page, select **iSCSI-Datastore** from the list.
 - h. From the **Select virtual disk format** drop-down menu, select **Thin Provision** and click **NEXT**.
 - i. On the Select clone options page, select the **Customize the operating system** and the **Power on virtual machine after creation** check boxes and click **NEXT**.
 - j. On the Customize guest OS page, select **Photon-CustomSpec** and click **NEXT**.
 - k. On the Ready to complete page, review the information and click **FINISH**.

3. Deploy a VM from Photon-Template to sa-esxi-02.vclass.local.
 - a. In the navigation pane, right-click **Photon-Template** and select **New VM from This Template**.

The Deploy From Template wizard opens.
 - b. On the Select a name and folder page, enter **Photon-12** in the **Virtual machine name** text box.
 - c. Expand **ICM-Datacenter** and select **Lab VMs**.
 - d. Click **NEXT**.
 - e. On the Select a compute resource page, expand **ICM-Datacenter > Lab Servers** and select **sa-esxi-02.vclass.local**.
 - f. Click **NEXT**.
 - g. On the Select storage page, select **iSCSI-Datastore** from the list.
 - h. From the **Select virtual disk format** drop-down menu, select **Thin Provision** and click **NEXT**.
 - i. On the Select clone options page, select the **Customize the operating system** and the **Power on virtual machine after creation** check boxes and click **NEXT**.
 - j. On the Customize guest OS page, select **Photon-CustomSpec** and click **NEXT**.
 - k. On the Ready to complete page, review the information and click **FINISH**.
4. In the Recent Tasks pane, monitor the progress of the two virtual machine cloning tasks and wait for their completion.
5. When the tasks are complete, verify that the VMs are placed in the inventory correctly.
 - a. Verify that Photon-11 and Photon-12 appear in the navigation pane under the **Lab VMs** folder.
 - b. Verify that Photon-11 and Photon-12 are powered on.
 - c. View Photon-11's **Summary** tab and verify that this VM is located on sa-esxi-01.vclass.local.
 - d. View Photon-12's **Summary** tab and verify that this VM is located on sa-esxi-02.vclass.local.
6. Open the web consoles to the Photon-11 and Photon-12 VMs.
 - a. Select each virtual machine and in the **Summary** tab, click the **Launch Web Console** link.

7. Verify that the login prompt appears in each console.
8. Close the VM console tabs for both virtual machines.

Lab 17 Using Content Libraries

Objective and Tasks

Create a content library to clone and deploy virtual machines:

1. Create a Content Library
2. Clone a VM Template to a Template in a Content Library
3. Deploy a VM from a VM Template in the Content Library

Task 1: Create a Content Library

In the vSphere Client, you create a content library that you can use to store templates and deploy virtual machines in your virtual environment.

1. Using the vSphere Client, log in to sa-vcsa-01.vclass.local by entering **administrator@vsphere.local** for the user name and **VMware1!** for the password.
2. From the **Menu** drop-down menu, select **Content Libraries**.
The Content Libraries pane appears.
3. In the right pane, click **Create**.
The New Content Library wizard opens.
4. On the Name and location page, enter **VM Library** in the **Name** text box and click **NEXT**.
5. On the Configure content library page, verify that **Local content library** is selected.
6. Select the **Enable publishing** check box and click **NEXT**.

7. On the Add storage page, scroll to the bottom of the list, select **vsanDatastore**, and click **NEXT**.
8. On the Ready to complete page, review the information and click **FINISH**.
9. Verify that the VM Library content library appears in the list.

Task 2: Clone a VM Template to a Template in a Content Library

You clone virtual machines or VM templates from the vCenter Server inventory to templates in the content library. You use the content library templates to provision virtual machines on a cluster or host.

1. From the **Menu** drop-down menu, select **VMs and Templates**.
2. In the navigation pane, expand **ICM-Datacenter > Lab Templates**, right-click **Photon-Template**, and select **Clone to Library**.

The Clone to Template in Library window appears.

3. Next to **Clone as**, verify that **New template** is selected.
4. Under the Name column, click **VM Library**.
5. Enter **Photon-LibTemplate** in the **Template name** text box and click **OK**.
6. In the Recent Tasks pane, monitor the tasks to completion.

Task 3: Deploy a VM from a VM Template in the Content Library

You use a virtual machine template from a content library to deploy a virtual machine to a host in your vSphere inventory.

1. From the **Menu** drop-down menu, select **Content Libraries**.
2. In the navigation pane, select **VM Library**.
3. In the right pane, click the **Templates** tab.
4. Click **OVF & OVA Templates**.
5. Create a VM from Photon-LibTemplate.
 - a. Right-click **Photon-LibTemplate** and select **New VM from This Template**.

The New Virtual Machine from Content Library wizard opens.
 - b. On the Select name and folder page, enter **Photon-13** in the **Virtual machine name** text box.
 - c. In Select a location for the virtual machine pane, select **SA-Datacenter** and click **NEXT**.

- d. On the Select a compute resource page, select **SA-Datacenter > SA-Compute-01** and select **sa-esxi-04.vclass.local**.
- e. Click **NEXT**.
- f. On the Review details page, review the information.

A warning appears stating that the OVF package contains advanced configuration options that might pose a security risk.
- g. Click **NEXT**.
- h. On the Select storage page, select **vsanDatastore** and click **NEXT**.
- i. On the Select networks page, select **VM Network** from the **Destination Network** drop-down menu and click **NEXT**.
- j. On the Ready to complete page, review the information and click **FINISH**.
6. In the Recent Tasks pane, monitor the progress of the template deployment task and wait for its completion.
7. From the **Menu** drop-down menu, select **VMs and Templates**.
8. In the navigation pane, verify that Photon-13 appears under SA-Datacenter.
9. In the navigation pane, right-click **Photon-13** and select **Power > Power On**.
10. Verify that the Photon-13 VM starts successfully.
 - a. In Photon-13's **Summary** tab, click the **Launch Web Console** link.
 - b. In the VM console window, verify that the boot process is successful and the login prompt appears.

The boot process takes a couple of minutes.
 - c. Close the Photon-13 console tab.

Lab 18 Modifying Virtual Machines

Objective and Tasks

Modify a virtual machine's hardware and rename a virtual machine:

1. Adjust Memory Allocation on a Virtual Machine
2. Increase the Size of a VMDK File
3. Rename a Virtual Machine in the vCenter Server Inventory

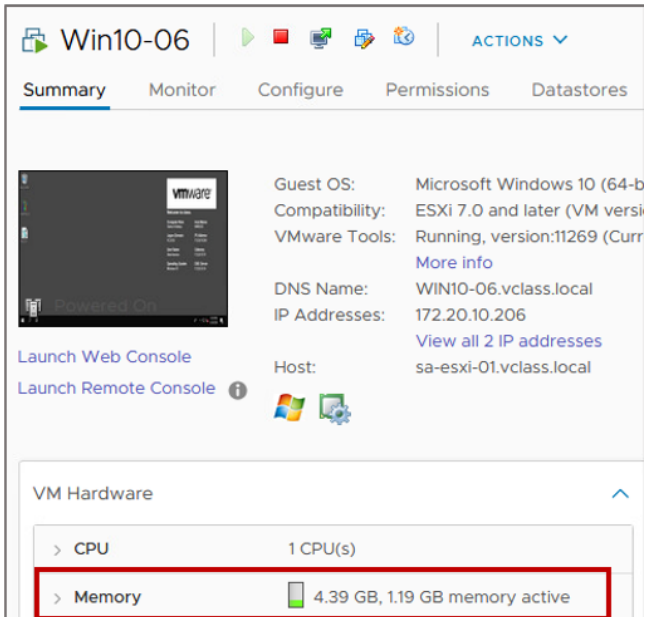
Task 1: Adjust Memory Allocation on a Virtual Machine

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

1. Using the vSphere Client, log in to sa-vcsa-01.vclass.local by entering **administrator@vsphere.local** for the user name and **VMware1!** for the password.
2. From the **Menu** drop-down menu, select **VMs and Templates**.
3. Power on the Win10-06 VM.
 - a. In the navigation pane, right-click **Win10-06** and select **Power > Power On**.
4. In Win10-06's **Summary** tab, expand the VM Hardware pane and record the amount (GB) of total memory. _____
5. In the navigation pane, right-click **Win10-06** and select **Edit Settings**.
6. In the **Memory** text box, enter **4500** and select **MB** from the drop-down menu.

The memory hot plug function is enabled for Win10-06. Therefore, you can add memory to Win10-06 while it is powered on.
7. Click **OK**.

- On the virtual machine's **Summary** tab, verify that the memory size has increased.



Task 2: Increase the Size of a VMDK File

You increase the size of the virtual machine disk (VMDK) file and configure the guest operating system to detect the additional space.

- In the navigation pane, right-click **Win10-06** and select **Edit Settings**.
- On the **Virtual Hardware** tab, record the size (GB) of Hard Disk 1. _____
- In the **Hard disk 1** text box, increase the disk size by 2 GB and click **OK**.
- View the VM Hardware pane in Win10-06's **Summary** tab and verify that Hard disk 1 shows the correct disk size.
- Open a Win10-06 web console.
 - In Win10-06's **Summary** tab, click the **Launch Web Console** link.
- Configure the Win10-06 virtual machine's guest operating system to detect and extend the increased disk space.
 - Right-click the Windows **Start** icon and select **Disk Management**.

The Disk Management window opens.
 - In the lower pane, verify that the 2 GB of unallocated disk space is discovered.

- c. If the 2 GB of unallocated space is not discovered, click **Action** and select **Rescan Disks**.
 - d. Right-click the **C:** drive and select **Extend Volume**.
The Extend Volume wizard starts.
 - e. Click **Next**.
 - f. On the Select Disks page, verify that **Disk 0** is selected in the Selected pane and click **Next**.
 - g. On the Completing the Extend Volume Wizard page, review the information and click **Finish**.
7. In the Disk Management window, verify that the local C: drive (Disk 0) is extended.
 8. Record the value for the total size of the C: drive. _____
 9. Compare the value with the value that you recorded in step 2.
 10. Close the Disk Management window.
 11. Close the Win10-06 console tab.

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

You rename an existing virtual machine in the vCenter Server inventory.

1. In the navigation pane, right-click **Win10-06** and select **Rename**.
2. In the **Enter the new name** text box, enter **Win10-New**.
3. Click **OK**.
4. In the navigation pane, select **Win10-New**.
5. In the right pane, select the **Datastores** tab.
ICM-Datastore appears in the list. This datastore is where the Win10-New VM's files are located.
6. Right-click **ICM-Datastore** and select **Browse Files**.
7. Record the name of the Win10-New virtual machine's folder. _____

When you change the name of a virtual machine, you change the name that identifies the VM in the vCenter Server inventory, not the name of the VM's folder or files on the datastore.

8. Rename Win10-New back to Win10-06.
 - a. In the navigation pane, right-click **Win10-New** and select **Rename**.
 - b. In the **Enter the new name** text box, enter **Win10-06** and click **OK**.
 - c. Verify that Win10-06 appears in the navigation pane.
9. Shut down Win10-06.
 - a. In the navigation pane, right-click **Win10-06** and select **Power > Shut Down Guest OS**.
 - b. Click **YES** to confirm the shut down.

Lab 19 vSphere vMotion Migrations

Objective and Tasks

Configure vSphere vMotion networking and migrate virtual machines using vSphere vMotion:

1. Configure vSphere vMotion Networking on sa-esxi-01.vclass.local
2. Configure vSphere vMotion Networking on sa-esxi-02.vclass.local
3. Prepare Virtual Machines for vSphere vMotion Migration
4. Migrate Virtual Machines Using vSphere vMotion

Task 1: Configure vSphere vMotion Networking on sa-esxi-01.vclass.local

You create a virtual switch and a VMkernel port group on sa-esxi-01.vclass.local that can be used to move virtual machines from one host to another while maintaining continuous service availability.

1. Using the vSphere Client, log in to sa-vcsa-01.vclass.local by entering **administrator@vsphere.local** for the user name and **VMware1!** for the password.
2. From the **Menu** drop-down menu, select **Hosts and Clusters**.
3. In the navigation pane, expand **ICM-Datacenter > Lab Servers** and select **sa-esxi-01.vclass.local**.
4. In the right pane, select the **Configure** tab.
5. Under Networking, select **Virtual switches**.
6. Click **ADD NETWORKING**.

The Add Networking wizard opens.

7. On the Select connection type page, click **VMkernel Network Adapter** and click **NEXT**.

8. On the Select target device page, click **New standard switch** and click **NEXT**.
9. On the Create a Standard Switch page, click the green plus sign to add a physical adapter to the switch.
10. Select **vmnic2** for the vSphere vMotion network and click **OK**.
11. Review the information and click **NEXT**.
12. On the Port properties page, enter **vmotion** in the **Network label** text box.
13. Select the **vmotion** check box and click **NEXT**.
14. On the IPv4 settings page, configure the IP address.
 - a. Click **Use static IPv4 settings**.
 - b. Enter **172.20.12.51** in the **IPv4 address** text box.
 - c. Enter **255.255.255.0** in the **Subnet mask** text box.
 - d. Click **NEXT**.
15. On the Ready to complete page, review the information and click **FINISH**.
16. In the Virtual switches pane, verify that the vSwitch2 virtual switch is listed and that vSwitch2 contains the vMotion VMkernel port.

Task 2: Configure vSphere vMotion Networking on sa-esxi-02.vclass.local

You create a virtual switch and a VMkernel port group on sa-esxi-02.vclass.local that is used for vSphere vMotion migrations.

1. In the navigation pane, expand **ICM-Datacenter > Lab Servers** and select **sa-esxi-02.vclass.local**.
2. In the right pane, select the **Configure** tab.
3. Under Networking, select **Virtual switches**.
4. Click **ADD NETWORKING**.

The Add Networking wizard opens.
5. On the Select connection type page, click **VMkernel Network Adapter** and click **NEXT**.
6. On the Select target device page, click **New standard switch** and click **NEXT**.
7. On the Create a Standard Switch page, click the green plus sign to add a physical adapter to the switch.
8. Select **vmnic2** for the vSphere vMotion network and click **OK**.

9. Review the information and click **NEXT**.
10. On the Port properties page, enter **vMotion** in the **Network label** text box.
11. Select the **vMotion** check box and click **NEXT**.
12. On the IPv4 settings page, configure the IP address.
 - a. Click **Use static IPv4 settings**.
 - b. Enter **172.20.12.52** in the **IPv4 address** text box.
 - c. Enter **255.255.255.0** in the **Subnet mask** text box.
 - d. Click **NEXT**.
13. On the Ready to complete page, review the information and click **FINISH**.
14. In the Virtual switches pane, verify that the vSwitch2 virtual switch is listed and that vSwitch2 contains the vMotion VMkernel port.

Task 3: Prepare Virtual Machines for vSphere vMotion Migration

Using vSphere vMotion, you prepare virtual machines for hot migration between hosts.

1. In the navigation pane, verify that the Win10-02 and Win10-04 virtual machines are powered on.
2. Verify that Win10-02 and Win10-04 are connected to the Production network.
 - a. Select **Win10-02** in the navigation pane.
 - b. Click the **Summary** tab in the right pane.
 - c. Expand the VM Hardware pane and verify that network adapter 1 is connected to the Production network.
 - d. Repeat steps a through c on Win10-04.

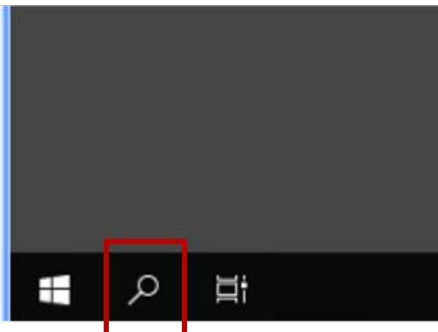
3. Open the remote console to Win10-02.



- a. In the navigation pane, select **Win10-02**.
- b. In Win10-02's **Summary** tab, click **Launch Remote Console**.

The VMware Remote Console window to Win10-02 opens.

4. In the remote console, click the search icon in the Windows taskbar and enter **cmd** to open a Command Prompt window.



5. When the Command Prompt window opens, enter **ipconfig** and record the virtual machine's default gateway IP address. _____
6. Enter **ping -t <default_gateway_IP_address>** on the command line to start a continuous ping.

Task 4: Migrate Virtual Machines Using vSphere vMotion

You perform hot migrations of virtual machines residing on a shared datastore that is accessible to both the source and the target ESXi hosts.

1. Leave the Win10-02 console open and return to the vSphere Client.
2. Migrate the Win10-02 virtual machine from host sa-esxi-01.vclass.local to host sa-esxi-02.vclass.local.
 - a. In the navigation pane, right-click **Win10-02** and select **Migrate**.
The Migrate wizard opens.
 - b. On the Select a migration type page, click **Change compute resource only** and click **NEXT**.
 - c. On the Select a compute resource page, select **sa-esxi-02.vclass.local**.
The sa-esxi-02.vclass.local host is the destination host to which you migrate the Win10-02 virtual machine. The migration requirements are validated. If the validation does not succeed, warning or error messages appear in the Compatibility pane. If errors appear, you cannot continue with the migration until the errors are resolved.
 - d. Click **NEXT**.
 - e. On the Select networks page, verify that **Production** is selected from the **Destination Network** drop-down menu and click **NEXT**.
 - f. On the Select vMotion priority page, leave **Schedule vMotion with high priority (recommended)** selected and click **NEXT**.
 - g. On the Ready to complete page, review the information and click **FINISH**.
3. Monitor the Recent Tasks pane and verify that the Relocate virtual machine task started.
4. Return to the Win10-02 console and monitor to verify that no pings are dropped during the migration.
5. Switch between the Recent Tasks pane and the Win10-02 console and monitor the migration progress.
6. When the migration is complete, return to the Win10-02 console and close the Command Prompt window to stop the ping command.
7. Close the Win10-02 console window.
8. View Win10-02's **Summary** tab and verify that Win10-02 is located on the sa-esxi-02.vclass.local host.
9. In the navigation pane, select **Win10-04**.
10. Verify that Win10-04 is powered on.

11. On the **Summary** tab, verify that Win10-04 is on the sa-esxi-01.vclass.local host.
12. Migrate the Win10-04 virtual machine from host sa-esxi-01.vclass.local to host sa-esxi-02.vclass.local.
 - a. In the navigation pane, drag **Win10-04** from sa-esxi-01.vclass.local to sa-esxi-02.vclass.local.

The Migrate wizard opens.
 - b. On the Select a migration type page, click **Change compute resource only** and click **NEXT**.
 - c. On the Select a compute resource page, verify that **sa-esxi-02.vclass.local** is selected and click **NEXT**.
 - d. On the Select networks page, verify that **Production** is selected from the **Destination Network** drop-down menu and click **NEXT**.
 - e. On the Select vMotion priority page, leave **Schedule vMotion with high priority (recommended)** selected and click **NEXT**.
 - f. On the Ready to complete page, review the information and click **FINISH**.
13. Monitor the Recent Tasks pane and wait for the Relocate virtual machine task to finish.
14. Verify that Win10-04 appears in the navigation pane under sa-esxi-02.vclass.local.

Lab 20 vSphere Storage vMotion Migrations

Objective and Tasks

Use vSphere Storage vMotion to migrate virtual machines:

1. Migrate Virtual Machine Files from Local Storage to Shared Storage
2. Migrate Both the Compute Resource and Storage of a Virtual Machine

Task 1: Migrate Virtual Machine Files from Local Storage to Shared Storage

With vSphere Storage vMotion, you migrate the files of a virtual machine from one datastore to another while the virtual machine is running.

1. Using the vSphere Client, log in to sa-vcsa-01.vclass.local by entering **administrator@vsphere.local** for the user name and **VMware1!** for the password.
2. From the **Menu** drop-down menu, select **VMs and Templates**.
3. In the navigation pane, select the **Photon-11** virtual machine and verify that it is powered on.
4. Locate the Related Objects pane on Photon-11's **Summary** tab.
5. Verify that the Photon-11 virtual machine is located on iSCSI-Datastore.
6. In the navigation pane, right-click **Photon-11** and select **Migrate**.
The Migrate wizard opens.
7. On the Select a migration type page, click **Change storage only** and click **NEXT**.
8. On the Select storage page, select **ICM-Datastore** as the destination storage.
9. Click **NEXT**.

10. On the Ready to complete page, review the information and click **FINISH**.
11. Monitor the Recent Tasks pane and wait for the Relocate virtual machine task to finish.
This task takes several minutes to finish.
12. In the Related Objects pane on the **Summary** tab, verify that the Photon-11 virtual machine is on ICM-Datastore.

Task 2: Migrate Both the Compute Resource and Storage of a Virtual Machine

You migrate the Photon-11 virtual machine to a different ESXi host and a different datastore.

1. In the navigation pane, select **Photon-11**.
2. In the Related Objects pane on Photon-11's **Summary** tab, verify that Photon-11 is on sa-esxi-01.vclass.local and ICM-Datastore.
3. Migrate the Photon-11 VM to host sa-esxi-02.vclass.local and datastore iSCSI-Datastore.
 - a. In the navigation pane, right-click **Photon-11** and select **Migrate**.
 - b. On the Select a migration type page, click **Change both compute resource and storage** and click **NEXT**.
 - c. On the Select compute resource page, select **ICM-Datcenter > Lab Servers > sa-esxi-02.vclass.local** and click **NEXT**.
 - d. On the Select storage page, select **iSCSI-Datastore** and click **NEXT**.
 - e. On the Select networks page, select **VM Network** from the **Destination Network** drop-down menu and click **NEXT**.
 - f. On the Select vMotion priority page, leave **Schedule vMotion with high priority (recommended)** selected and click **NEXT**.
 - g. On the Ready to complete page, review the information and click **FINISH**.
4. In the Recent Tasks pane, monitor the progress of the virtual machine migration.
This task takes several minutes to finish.
5. Verify that the Photon-11 virtual machine migrated successfully.
 - a. In the Related Objects pane on Photon-11's **Summary** tab, verify that the host is sa-esxi-02.vclass.local and that the datastore is iSCSI-Datastore.

6. Shut down the Photon-11 VM.
 - a. In the navigation pane, right-click **Photon-11** and select **Power > Shut Down Guest OS**.
 - b. Click **YES** to confirm the shutdown.

Lab 21 Working with Snapshots

Objective and Tasks

Take VM snapshots, revert a VM to a different snapshot, and delete snapshots:

1. Take Snapshots of a Virtual Machine
2. Add Files and Take Another Snapshot of a Virtual Machine
3. Revert the Virtual Machine to a Snapshot
4. Delete an Individual Snapshot
5. Delete All Snapshots

Task 1: Take Snapshots of a Virtual Machine

You take a snapshot to preserve the state and the data of a virtual machine at the time that the snapshot is taken.

You use snapshots when you must revert to a previous virtual machine state.

1. Using the vSphere Client, log in to sa-vcsa-01.vclass.local by entering **administrator@vsphere.local** for the user name and **VMware1!** for the password.
2. From the **Menu** drop-down menu, select **VMs and Templates**.
3. Open the **Win10-02** VM's web console.
 - a. Select **Win10-02** in the navigation pane.
 - b. In Win10-02's **Summary** tab, click the **Launch Web Console** link.

The **IOMETER.EXE** and **CPUBUSY.VBS** files are located on Win10-02's desktop.

4. Return to the vSphere Client.

5. Take a snapshot of Win10-02.
 - a. In the navigation pane, right-click **Win10-02** and select **Snapshots > Take Snapshot**.
The Take Snapshot window opens.
 - b. In the **Name** text box, enter **With iometer and cpubusy**.
 - c. Deselect the **Snapshot the virtual machine's memory** check box.
 - d. Click **OK**.
6. Monitor the Recent Tasks pane and wait for the task to complete.
7. Delete the CPUBUSY.VBS and IOMETER.EXE files from the Windows desktop.
 - a. Return to the Win10-02 VM's console tab.
 - b. On the desktop, drag the **CPUBUSY.VBS** file and the **IOMETER.EXE** file to the Recycle Bin.
8. Return to the vSphere Client.
9. Take another snapshot of Win10-02.
 - a. In the navigation pane, right-click **Win10-02** and select **Snapshots > Take Snapshot**.
The Take Snapshot window opens.
 - b. In the **Name** text box, enter **Without iometer and cpubusy**.
 - c. Deselect the **Snapshot the virtual machine's memory** check box.
 - d. Click **OK**.
10. Monitor the Recent Tasks pane and wait for the task to complete.

Task 2: Add Files and Take Another Snapshot of a Virtual Machine

You add a file to the virtual machine and create another snapshot of the virtual machine.

This snapshot contains a file from which you can see how a virtual machine changes when you revert to different snapshots in subsequent tasks.

1. Restore the CPUBUSY.VBS file from the Recycle Bin to the virtual machine's desktop.
 - a. Return to the Win10-02 VM console tab.
 - b. Double-click the Recycle Bin on the desktop.
 - c. Right-click **CPUBUSY.VBS** and select **Restore**.
 - d. Close the Recycle Bin window.
 - e. Verify that CPUBUSY.VBS appears on the desktop.

2. Take a snapshot of Win10-02.
 - a. Return to the vSphere Client.
 - b. Right-click **Win10-02** and select **Snapshots > Take Snapshot**.
 - c. In the **Name** text box, enter **With cpubusy**.
 - d. In the Description text box, enter **Restored cpubusy to the desktop**.
 - e. Leave the **Snapshot the virtual machine's memory** check box selected.
 - f. Click **OK**.

3. Monitor the task in the Recent Tasks pane and wait for its completion.

This task takes slightly longer than previous snapshots because the guest memory is also saved.

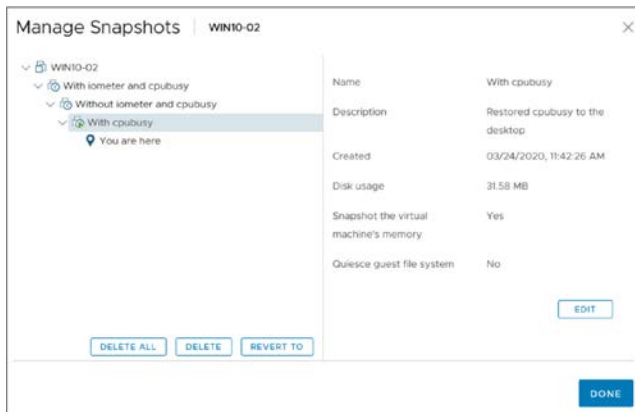
4. Close the Win10-02 VM console tab.

Task 3: Revert the Virtual Machine to a Snapshot

You revert a virtual machine to the state it had at the time when the selected snapshot was taken.

1. In the navigation pane, right-click **Win10-02** and select **Snapshots > Manage Snapshots**.

You should see three snapshots. The difference in icons is because you selected the **Snapshot the virtual machine's memory** check box when you took the snapshot.



2. In the **Manage Snapshots** window, view the snapshots tree.
 - Q1. Where is the **You are here** pointer located?
3. Select the **Without iometer and cpubusy** snapshot and click **REVERT TO**.

4. Click **OK** to confirm the revert operation.

Q2. Where is the You are here pointer located now?

5. Click **DONE** to close the Manage Snapshots window.

Q3. Did the Win10-02 virtual machine power off and why?

6. Power on **Win10-02**.

7. Open the Win10-02 VM web console.

Wait for the boot process to finish. When it finishes, you are logged in as vclass\administrator.

Q4. Is either IOMETER.EXE or CPUBUSY.VBS on the desktop?

8. Close the Win10-02 VM console tab.

9. In the vSphere Client, right-click **Win10-02** and select **Snapshots > Manage Snapshots**.

The You Are Here pointer should appear under the snapshot called Without iometer and cpubusy.

10. In the **Manage Snapshots** window, select the **With cpubusy** snapshot and click **REVERT TO**.

11. Click **OK** to confirm the revert operation.

The You Are Here pointer should appear under the snapshot called With cpubusy.

12. Click **DONE** to close the Manage Snapshots window.

Q5. Did the virtual machine power off? Why or why not?

13. Open the Win10-02 VM web console.

Q6. Is CPUBUSY.VBS on the desktop?

Q7. Is IOMETER.EXE on the desktop?

Task 4: Delete an Individual Snapshot

You remove a snapshot to initiate file consolidation to the parent snapshot disk.

1. Return to the vSphere Client.
2. In the navigation pane, right-click the **Win10-02** virtual machine and select **Snapshots > Manage Snapshots**.

The You are here pointer appears under the With cpubusy snapshot.

3. Select the **Without iometer and cpubusy** snapshot and click **DELETE**.
4. Click **OK** to confirm the deletion.

The Without iometer and cpubusy snapshot should disappear.

5. Click **DONE** to close Manage Snapshots.

Q1. Did the virtual machine power off?

Q2. In the virtual machine console, is CPUBUSY on the desktop?

Task 5: Delete All Snapshots

You use the Delete All function to delete all the snapshots of a virtual machine.

1. Return to the vSphere Client.
2. Right-click the **Win10-02** virtual machine and select **Snapshots > Manage Snapshots**.
3. In the Manage Snapshots window, click **DELETE ALL**.
4. Click **OK** to confirm that you want to delete all the remaining snapshots.

Only the You are here pointer should appear in the snapshots tree.

Q1. Were all the remaining snapshots deleted from the Manage Snapshots window?

5. Click **DONE** to close the Manage Snapshots window.
6. Return to the Win10-02 VM console tab.

Q2. Is CPUBUSY on the desktop. If so, why?

7. Close the Win10-02 VM console tab.

Lab 22 Controlling VM Resources

Objective and Tasks

Control VM CPU resources using shares:

1. Create CPU Contention
2. Verify CPU Share Functionality

Task 1: Create CPU Contention

You create CPU contention between the Win10-02 and Win10-04 virtual machines for testing your lab environment. You use CPU affinity to force both VMs to be scheduled on the same logical CPU, and you run the `CPUBUSY` script on both VMs to generate CPU activity. By creating contention, you force the VMs to compete for and share the limited logical CPU resources on the ESXi host. This approach might lead to performance degradation.

1. Using the vSphere Client, log in to sa-vcsa-01.vclass.local by entering **administrator@vsphere.local** for the user name and **VMware1!** for the password.
2. From the **Menu** drop-down menu, select **Hosts and Clusters**.
3. Shut down the Win10-02 and Win10-04 virtual machines.
 - a. In the navigation pane, right-click each VM and select **Power > Shut Down Guest OS**.
 - b. Click **YES** to confirm the shutdown.
4. Migrate Win10-04 from sa-esxi-02.class.local to sa-esxi-01.vclass.local.
 - a. In the navigation pane, right-click **Win10-04** and select **Migrate**.
 - b. On the Select a migration type page, click **Change compute resource only** and click **NEXT**.
 - c. On the Select a compute resource page, select **sa-esxi-01.vclass.local** and click **NEXT**.
 - d. On the Select networks page, verify that **Production** is selected from the **Destination Network** drop-down menu and click **NEXT**.

- e. On the Ready to complete page, review the information and click **FINISH**.
- 5. Verify that Win10-02 is on sa-esxi-01.vclass.local.
 - a. If Win10-02 is not on sa-esxi-01.vclass.local, then migrate the VM to this host.
- 6. Configure the Win10-02 and Win10-04 virtual machines to run only on logical CPU 1.
 - a. In the navigation pane, right-click **Win10-02** and select **Edit Settings**.
 - b. On the **Virtual Hardware** tab, expand CPU to view the pane.
 - c. In the **Scheduling Affinity** text box, enter **1**.

This affinity setting forces the Win10-02 virtual machine to run only on logical CPU 1.
 - d. Click **OK**.

IMPORTANT

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

- e. Repeat steps a through d on the Win10-04 virtual machine.
- 7. Power on Win10-02 and Win10-04.
- 8. Verify that Win10-02 and Win10-04 each has a CPU shares value of Normal.
 - a. In the navigation pane, select **Win10-02** and click the **Summary** tab in the right pane.
 - b. In the VM Hardware pane, expand CPU.
 - c. Verify that the Shares value is Normal.
 - d. Repeat steps a through c on Win10-04.
- 9. Start the CPUBUSY script on the Win10-02 and Win10-04 virtual machine desktops.
 - a. Open the Win10-02 VM web console.
 - b. On the desktop, right-click **CPUBUSY** and select **Open with Command Prompt**.

This script runs continuously. It stabilizes in 1–2 minutes. The script repeatedly performs floating-point computations. The script displays the duration (wall-clock time) of a computation, for example, `I did ten million sines in # seconds`.
 - c. Repeat steps a and b for the Win10-04 virtual machine.

You can use the number of seconds reported as a performance estimate. The program should run at about the same rate in each virtual machine.

10. After 1 or 2 minutes, verify that the duration of computation value (in seconds) is similar between Win10-02 and Win10-04.

Q1. Why are the values similar?

Task 2: Verify CPU Share Functionality

You verify that VMs receive the correct CPU allocation during contention. CPU allocation is based on the number of shares given to the VM.

1. Return to the vSphere Client.
2. Change the number of CPU shares for Win10-02 to High.
 - a. In the navigation pane, right-click **Win10-02** and select **Edit Settings**.
 - b. On the **Virtual Hardware** tab, expand the CPU pane.
 - c. From the **Shares** drop-down menu, select **High**.
 - d. Click **OK**.
3. Change the number of CPU shares for Win10-04 to Low.
 - a. In the navigation pane, right-click **Win10-04** and select **Edit Settings**.
 - b. On the **Virtual Hardware** tab, expand the CPU pane.
 - c. From the **Shares** drop-down menu, select **Low**.
 - d. Click **OK**.
4. In each virtual machine's **Summary** tab, verify that CPU shares are set to High for Win10-02 and Low for Win10-04.
5. Return to each VM console to monitor the results of the `CPUBUSY` script.

If you are logged out of the console because of inactivity, log in again as `vclass\administrator` with `VMware1!` as the password.

Q1. What is the difference in performance between the two virtual machines?

6. Close the Command Prompt window to stop the `CPUBUSY` script in each VM console.

This script must be stopped in each virtual machine. If the script is left running, the performance of other labs might be affected.
7. Close the Win10-02 and Win10-04 VM console tabs.

Lab 23 Monitoring Virtual Machine Performance

Objective and Tasks

Use the system monitoring tools to review the CPU workload:

1. Create a CPU Workload
2. Use Performance Charts to Monitor CPU Use
3. Remove CPU Affinity and Change CPU Shares to Normal

Task 1: Create a CPU Workload

You run the **CPUBUSY** script in each virtual machine to create a heavy CPU workload in your lab environment.

1. Using the vSphere Client, log in to sa-vcsa-01.vclass.local by entering **administrator@vsphere.local** for the user name and **VMware1!** for the password.
2. From the **Menu** drop-down menu, select **VMs and Templates**.
3. Verify that the Win10-02 and Win10-04 virtual machines are powered on.
4. In each VM's **Summary** tab, open VM web consoles for Win10-02 and Win10-04.
5. On both virtual machine desktops, right-click the **CPUBUSY** script file and select **Open with Command Prompt**.

Task 2: Use Performance Charts to Monitor CPU Use

You use performance charts to monitor CPU metrics.

1. Return to the vSphere Client.
2. View the CPU performance chart for the Win10-02 virtual machine.
 - a. In the navigation pane, select **Win10-02**.
 - b. In the right pane, click the **Monitor** tab and select **Advanced** under Performance.

The real-time CPU usage graph appears.
 - c. Click the **Chart Options** link.

The Chart Options dialog box opens.
 - d. In the Chart Metrics pane, verify that **CPU** is selected.
 - e. In the **Timespan** drop-down menu, verify that **Real-time** is selected.
 - f. In the Select object for this chart pane on the right, deselect the **O** check box.

The Win10-02 VM should be the only selected object.
 - g. In the Select counters for this chart pane, verify that the **Readiness** and **Usage** check boxes are the only boxes that are selected.
 - h. Click **OK**.

The CPU/Real-time chart for the Win10-02 virtual machine opens.
3. Open a new tab in the web browser and start a second vSphere Client instance.
 - a. To start the vSphere Client, select **vSphere Site-A > vSphere Client (SA-VCSA-01)** in the bookmarks toolbar in Firefox.
4. In the second vSphere Client instance, repeat step 2 to view the CPU performance chart for the Win10-04 virtual machine.
5. In the vSphere Client windows that show the CPU charts for Win10-02 and Win10-04, view the Latest column for the Readiness metric.
6. Record the latest CPU readiness value for each virtual machine and leave the Performance Chart windows open.
 - Win10-02 _____
 - Win10-04 _____
7. In each VM console, close the Command Prompt window to stop the CPUBUSY script.

This script must be stopped in each virtual machine. If the script is left running, the performance of other labs might be affected.

8. In the vSphere Client windows that show the CPU charts for Win10-02 and Win10-04, view the Latest column for the Readiness metric.
9. Wait for the chart to be updated and compare the CPU ready value with what you recorded in step 6.

Performance charts update every 20 seconds.

Q1. Did the CPU ready value change? If it did, what is the reason for the change?

10. Close the Win10-02 console tab, the Win10-04 console tab, and the second vSphere Client tab.

Task 3: Remove CPU Affinity and Change CPU Shares to Normal

You shut down the Win10-02 and Win10-04 virtual machines, remove CPU affinity from both virtual machines, and change the CPU shares of both virtual machines to Normal.

1. Shut down the Win10-02 and Win10-04 virtual machines.
 - a. In the navigation pane, right-click each VM and select **Power > Shut Down Guest OS**.
 - b. Click **YES** to confirm the shutdown.
2. Change the CPU shares to Normal and remove CPU affinity from Win10-02 and Win10-04.
 - a. In the navigation pane, right-click **Win10-02** and select **Edit Settings**.
 - b. Expand the CPU pane.
 - c. From the **Shares** drop-down menu, select **Normal**.
 - d. In the **Scheduling Affinity** text box, delete the value 1.

Entering **0** is not the same as deleting the value. The text box must be blank.
 - e. Click **OK**.
 - f. Repeat steps a through e to change the CPU shares and remove the scheduling affinity value on Win10-04.

Lab 24 Using Alarms

Objective and Tasks

Create alarms to monitor virtual machine events and conditions:

1. Create a Virtual Machine Alarm to Monitor a Condition
2. Trigger the Virtual Machine Alarm
3. Create a Virtual Machine Alarm to Monitor an Event
4. Trigger the Virtual Machine Alarm
5. Disable Virtual Machine Alarms

Task 1: Create a Virtual Machine Alarm to Monitor a Condition

You create an alarm to monitor a condition that occurs on a virtual machine.

1. Using the vSphere Client, log in to sa-vcsa-01.vclass.local by entering **administrator@vsphere.local** for the user name and **VMware1!** for the password.
2. From the **Menu** drop-down menu, select **VMs and Templates**.
3. Power on the Win10-02 virtual machine.
 - a. In the navigation pane, right-click **Win10-02** and select **Power > Power On**.
4. Right-click **Win10-02** and select **Alarms > New Alarm Definition**.

The New Alarm Definition wizard opens.

Because you are creating an alarm for the Win10-02 virtual machine object, this alarm monitors only that object. If you set the alarm on an object higher in the vCenter Server inventory, the alarm applies to the parent object and all relevant child objects in the hierarchy.

5. On the Name and Targets page, enter **Win10-02 CPU Usage** in the **Alarm Name** text box.

The target type is Virtual Machine and the target object is Win10-02.

6. Click **NEXT**.

7. On the Alarm Rule 1 page, define the trigger condition.

If VM CPU Usage is above 50% for 30 seconds, then trigger the alarm and show the alarm as Warning.

- a. From the first drop-down menu, select **VM CPU Usage**.
- b. From the **select an operator** drop-down menu, select **is above**.
- c. In the **%** text box, enter **50**.
- d. From the last drop-down menu, select **30 sec**.
- e. From the **select severity** drop-down menu, select **Show as Warning**.

The alarm rule should look like this:

Alarm Rule 1

IF

VM CPU Usage

is above 50 % for 30 sec

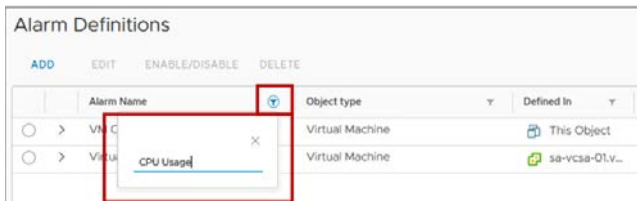
ADD ADDITIONAL TRIGGER

THEN

Trigger the alarm and Show as Warning

- f. Click **NEXT**.
8. On the Reset Rule 1 page, read the rule and do not change anything.
The reset rule is to reset the alarm to Normal if the warning condition is no longer met.
9. Click **NEXT**.
10. On the Review page, review the alarm information.
The alarm is enabled by default.
11. Click **CREATE**.

12. Verify that the alarm definition is created.
 - a. In the navigation pane, select **Win10-02** and click the **Configure** tab.
 - b. In the right pane, select **Alarm Definitions**.
 - c. Verify that the Win10-02 CPU Usage alarm appears in the alarm list.
 - d. If you cannot easily find the alarm, use the filter in the Alarm Name column and search for some or all of the alarm name.



Task 2: Trigger the Virtual Machine Alarm

You trigger the virtual machine alarm, reset the virtual machine alarm, and view the events that occurred when the alarm was triggered.

1. Generate CPU activity in Win10-02 to trigger the Win10-02 CPU Usage alarm.
 - a. In Win10-02's **Summary** tab, click the **Launch Web Console** link to open the VM web console.
 - b. On Win10-02's desktop, right-click **CPUBUSY.VBS** and select **Open with Command Prompt**.

The CPUBUSY script should generate enough activity to reach 50 percent CPU usage.
2. Return to the vSphere Client.
3. Verify that the Win10-02 CPU Usage alarm is triggered.
 - a. Click Win10-02's **Monitor** tab, and select **Triggered Alarms** under Issues and Alarms.
 - b. Wait for at least 30 seconds and refresh the Triggered Alarms pane.
 - c. Verify that the Win10-02 CPU Usage alarm appears in the Triggered Alarms list.
4. In the right pane under Tasks and Events, select **Events**.

An entry states that the Win10-02 CPU Usage alarm changed from green to yellow.

5. Acknowledge the triggered alarm.

- a. In the right pane under Issues and Alarms, click **Triggered Alarms**.
- b. Select the check box next to **Win10-02 CPU Usage**.
- c. Click **ACKNOWLEDGE**.

The Triggered Alarms pane shows the time that the alarm was acknowledged and the user that acknowledged the alarm.

6. Stop the CPUBUSY script.

- a. Return to the Win10-02 console tab.
- b. Close the Command Prompt window to stop the CPUBUSY script.

7. Verify that Win10-02 returns to a normal state.

- a. Return to the vSphere Client.
- b. Refresh the Triggered Alarms pane and verify that the Win10-02 CPU Usage alarm no longer appears.

You might have to wait a minute for CPU usage to decrease.

- c. In the navigation pane, verify that Win10-02's icon does not show the warning symbol.
- d. In the right pane under Tasks and Events, select **Events**.

An entry states that the Win10-02 CPU Usage alarm changed from yellow to green.

8. Close the Win10-02 console tab.

Task 3: Create a Virtual Machine Alarm to Monitor an Event

You create an alarm to monitor an event that occurs on any virtual machine in ICM-Datcenter.

1. In the navigation pane, select **ICM-Datcenter** and click the **Configure** tab in the right pane.
2. In the Alarm Definitions pane, click **ADD**.

The New Alarm Definition wizard starts.

3. On the Name and Targets page, configure the alarm name and target type.

- a. Enter **VM Suspended** in the **Alarm Name** text box.
- b. Select **Virtual Machines** from the **Target type** drop-down menu.
The target objects are all virtual machines in ICM-Datacenter.
- c. Click **NEXT**.

4. On the Alarm Rule 1 page, define the trigger condition.

If a VM is suspended, then trigger an alarm, and show the alarm as Warning.

- a. From the first drop-down menu, select **VM suspended**.
The VM suspended event appears under the Power and Connection State category.
- b. From the **select severity** drop-down menu, select **Show as Warning**.
The alarm rule should look like this:

Alarm Rule 1

IF

VM suspended ▼ [ADD ARGUMENT](#)

THEN

Trigger the alarm and * Show as Warning ▼

- c. Click **NEXT**.

5. Configure the reset rule.

If the VM is powered on, then reset the alarm to normal.

- a. On the Reset Rule 1 page, enable **Reset the alarm to green** by clicking the toggle switch.
- b. Click the first drop-down menu and enter **powered** in the **Search** box.
- c. Select **VM powered on** from the search results.

The reset rule should look like this:

Reset Rule 1

Reset the alarm to green ☒

IF

VM powered on [ADD ARGUMENT](#)

THEN

Reset the alarm to * ☒ Normal

- d. Click **NEXT**.
6. On the Review page, review the alarm information.

The alarm is enabled by default.
 7. Click **CREATE**.
 8. Verify that the alarm definition is created.
 - a. If you cannot easily find the alarm, use the filter in the Alarm Name column and search for some or all of the alarm name.

Task 4: Trigger the Virtual Machine Alarm

You trigger the virtual machine alarm, reset the virtual machine alarm, and view the events that occurred when the alarm was triggered.

1. Trigger the VM Suspended alarm by suspending Win10-02.
 - a. In the navigation pane, right-click **Win10-02** and select **Power > Suspend**.
 - b. Click **YES** to confirm suspending the VM.

2. Verify that the VM Suspended alarm is triggered.
 - a. In the navigation pane, select **ICM-Datacenter**.
 - b. In the right pane, click the **Monitor** tab and under Issues and Alarms, select **Triggered Alarms**.
 - c. Monitor the Recent Tasks pane and wait for the Suspend virtual machine task to complete.
 - d. Refresh the Triggered Alarms pane.
 - e. Verify that the VM Suspended alarm appears in the Triggered Alarms list.
3. Power on Win10-02.
 - a. In the navigation pane, right-click **Win10-02** and select **Power > Power On**.
4. Verify that Win10-02 has returned to a normal state.
 - a. In the navigation pane, verify that Win10-02's icon does not show the warning symbol.
 - b. Refresh the Triggered Alarms pane.

The VM Suspended alarm no longer appears in the list.
 - c. Under Tasks and Events, select **Events**.

You should see an entry stating that the VM Suspended alarm changed from yellow to green.

Task 5: Disable Virtual Machine Alarms

You disable the Win10-02 CPU Usage and the VM Suspended alarms.

1. Disable the Win10-02 CPU Usage alarm.
 - a. In the navigation pane, select **Win10-02**.
 - b. Click the **Configure** tab and select **Alarm Definitions**.
 - c. Search for the Win10-02 CPU Usage alarm.

If necessary, use the filter in the Alarm Name column to search for the alarm.
 - d. Click **Win10-02 CPU Usage** and click **DISABLE**.
 - e. Verify that the Win10-02 CPU Usage alarm is disabled.
2. Repeat step 1 to disable the VM Suspended alarm.

Perform this step on the ICM-Datacenter object because the alarm is defined on this object.

Lab 25 Implementing vSphere DRS Clusters

Objective and Tasks

Implement a vSphere DRS cluster and verify proper functionality:

1. Create a Cluster That Is Enabled for vSphere DRS
2. Modify vSphere DRS Settings
3. Add ESXi Hosts to the Cluster
4. Verify vSphere vMotion Configuration on the ESXi Hosts
5. Create a Load Imbalance
6. Verify Proper vSphere DRS Cluster Functionality

Task 1: Create a Cluster That Is Enabled for vSphere DRS

You create a vSphere DRS cluster to ensure that the resource requirements for the virtual machines in the cluster are satisfied.

1. Using the vSphere Client, log in to sa-vcsa-01.vclass.local by entering **administrator@vsphere.local** for the user name and **VMware1!** for the password.
2. From the **Menu** drop-down menu, select **Hosts and Clusters**.
3. In the navigation pane, right-click **ICM-Datacenter** and select **New Cluster**.
The New Cluster dialog box opens.

4. Configure the new cluster.
 - a. In the **Name** text box, enter **ICM-Compute-01**.
 - b. Click the **vSphere DRS** toggle button to on.
 - c. Leave the default settings for the other options and click **OK**.
5. Verify that the ICM-Compute-01 cluster appears in the navigation pane under ICM-Datcenter.

In the right pane, the Cluster quickstart pane appears.
6. Verify that vSphere DRS is listed under Selected services.

Task 2: Modify vSphere DRS Settings

You modify the automation level and migration threshold settings for testing purposes.

1. In the navigation pane, select **ICM-Compute-01** and click the **Configure** tab.
2. Under Services, select **vSphere DRS** and click **EDIT**.

The Edit Cluster Settings dialog box opens.
3. Select **Manual** from the **Automation Level** drop-down menu.

With Manual mode, you can manually apply vSphere DRS recommendations.
4. Move the **Migration Threshold** slider to **Aggressive**, which is to the right side of the slider.
5. Leave other settings at their default values and click **OK**.

Task 3: Add ESXi Hosts to the Cluster

You add sa-esxi-01.vclass.local and sa-esxi-02.vclass.local to the ICM-Compute-01 cluster.

1. In the navigation pane, drag **sa-esxi-01.vclass.local** to ICM-Compute-01.

The Move Host into Cluster dialog box opens.

 - a. Leave the default and click **OK**.
2. In the navigation pane, drag **sa-esxi-02.vclass.local** to ICM-Compute-01.

The Move Host into Cluster dialog box opens.

 - a. Leave the default and click **OK**.
3. In the navigation pane, verify that sa-esxi-01.vclass.local and sa-esxi-02.vclass.local appear under the ICM-Compute-01 cluster.

Task 4: Verify vSphere vMotion Configuration on the ESXi Hosts

You verify that a VMkernel port is configured for vSphere vMotion on sa-esxi-01.vclass.local and sa-esxi-02.vclass.local.

1. In the navigation pane, select **sa-esxi-01.vclass.local** and click the **Configure** tab.
2. In the right pane under Networking, select **VMkernel adapters**.
3. Select the VMkernel adapter labeled **vMotion**.
4. On the **All** tab in the lower pane, verify that vMotion appears as an enabled service.
5. Repeat steps 1 through 4 for sa-esxi-02.vclass.local.

Task 5: Create a Load Imbalance

You create a load imbalance in the ICM-Compute-01 cluster to test how vSphere DRS works.

1. In the navigation pane, verify that Win10-02 is powered on.
2. In Win10-02's **Summary** tab, verify that Win10-02 is on sa-esxi-01.vclass.local.
3. If Win10-02 is not on sa-esxi-01.vclass.local, migrate Win10-02 to sa-esxi-01.vclass.local.
 - a. In the navigation pane, right-click **Win10-02** and select **Migrate**.
 - b. On the Select a migration type page, click **Change compute resource only** and click **NEXT**.
 - c. On the Select a compute resource page, select **sa-esxi-01.vclass.local** and click **NEXT**.
 - d. On the Select networks page, click **NEXT**.
 - e. On the Select vMotion priority page, leave the default and click **NEXT**.
 - f. On the Ready to complete page, click **FINISH**.
 - g. Verify that Win10-02 is successfully migrated to sa-esxi-01.vclass.local.

4. Power on Win10-04 and Win10-06 and place both VMs on sa-esxi-01.vclass.local.
 - a. In the navigation pane, right-click **Win10-04** and select **Power > Power On**.

The Power On Recommendations window opens. vSphere DRS provides you with one or more recommendations for placing the VM when it is powered on.
 - b. Select the recommendation that places Win10-04 on sa-esxi-01.vclass.local and click **OK**.
 - c. In the navigation pane, right-click **Win10-06** and select **Power > Power On**.

The Power On Recommendations window opens.
 - d. Select the recommendation that places Win10-06 on sa-esxi-01.vclass.local and click **OK**.
5. Verify that Win10-02, Win10-04 and Win10-06 are on sa-esxi-01.vclass.local.
 - a. In the navigation pane, select **sa-esxi-01.vclass.local**.
 - b. In the right pane, click the **VMs** tab and verify that Win10-02, Win10-04 and Win10-06 are listed.
6. Open the web consoles for Win10-02 and Win10-04.
7. Start the **CPUBUSY** script on the Win10-02 and Win10-04 virtual machines.
 - a. In Win10-02's web console, right-click the **CPUBUSY** script and select **Open with Command Prompt**.
 - b. In Win10-04's web console, right-click the **CPUBUSY** script and select **Open with Command Prompt**.

Task 6: Verify Proper vSphere DRS Cluster Functionality

You can run vSphere DRS in either manual, partially automated, or fully automated modes. In manual mode, you review the recommendations for optimal virtual machine placement provided by vSphere DRS and decide whether to make the changes.

1. Return to the vSphere Client.
2. Select **ICM-Compute-01** in the navigation pane and click the **Monitor** tab in the right pane.
3. In the right pane under vSphere DRS, select **Recommendations**.
4. Click **RUN DRS NOW**.

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

If recommendations appear in the list, do not apply them yet.

5. View information about the vSphere DRS cluster.
 - a. Click the **Summary** tab and expand the vSphere DRS pane.
 - b. View the cluster DRS score and the VM DRS score.
 - c. Click the **Information** icon next to VM DRS Score to review how to interpret the VM DRS score.
 - Q1. Are any VMs experiencing resource contention?
 - Q2. How many vSphere DRS recommendations and DRS faults are shown?
 - d. Click **VIEW ALL VMS**.
 - Q3. Look at the DRS Score. Are Win10-02, Win10-04, and Win10-06 experiencing serious CPU contention?
 - e. On the **Monitor** tab under vSphere DRS, select **CPU Utilization**.
 - f. View the CPU consumption on each ESXi host and click each of the colored boxes to view the CPU consumption of each virtual machine.
6. Generate new vSphere DRS recommendations.
 - a. In the right pane under vSphere DRS, select **Recommendations**.
 - b. Click **RUN DRS NOW** to refresh the recommendations list.
 - c. Review the recommendations listed.
7. Click **APPLY RECOMMENDATIONS** to apply all recommendations in the list.

8. Monitor the Recent Tasks pane and wait for the virtual machine migration tasks to complete.
9. In the DRS Recommendations pane, click **RUN DRS NOW** to force vSphere DRS to evaluate the cluster status.

Q4. Are any new recommendations listed?

10. Click the **Summary** tab and view the vSphere DRS pane.

Q5. Have the cluster and VM DRS scores improved?

11. Click the **Monitor** tab and select **CPU Utilization** under vSphere DRS.

The virtual machines should spread across the two ESXi hosts. You might need to refresh the window.

12. In the Win10-02 and Win10-04 console tabs, stop the CPUBUSY script.

You must ensure that the CPUBUSY script is stopped in all VMs to avoid performance problems.

- a. Right-click the VM console tab and select **Reload Tab**.
- b. Close the Command Prompt window.

13. Close the Win10-02 and Win10-04 console tabs.

It might take several minutes for the virtual machines to stabilize and the alerts to clear.

14. Disable vSphere DRS in the ICM-Compute-01 cluster.

- a. In the navigation pane, right-click **ICM-Compute-01** and select **Settings**.

The vSphere DRS pane appears.

- b. In the right pane, click **EDIT**.
- c. Click the **vSphere DRS** toggle button to disable vSphere DRS and click **OK**.
- d. Verify that vSphere DRS is turned off.

Lab 26 Using vSphere HA

Objective and Tasks

Use vSphere HA functionality:

1. Enable vSphere HA in a Cluster
2. View Information About the vSphere HA Cluster
3. Configure Network Management Redundancy
4. Test the vSphere HA Functionality
5. View the vSphere HA Cluster Resource Usage
6. Configure the Percentage of Resource Degradation to Tolerate

Task 1: Enable vSphere HA in a Cluster

You enable vSphere HA on the ICM-Compute-01 cluster to achieve higher levels of virtual machine availability than each ESXi host can provide individually.

1. Using the vSphere Client, log in to sa-vcsa-01.vclass.local by entering **administrator@vsphere.local** for the user name and **VMware1!** for the password.
2. From the **Menu** drop-down menu, select **Hosts and Clusters**.
3. Select **ICM-Compute-01** and click the **Configure** tab in the right pane.
4. Under Services, select **vSphere Availability** and click **EDIT**.

The Edit Cluster Settings dialog box opens.

5. Click the **vSphere HA** toggle button to on and click **OK**.
6. Monitor the Recent Tasks pane and wait for the vSphere HA configuration tasks to complete.
7. Click the **Configure** tab and verify that vSphere HA is turned on.

Task 2: View Information About the vSphere HA Cluster

You view status and configuration information about the ICM-Compute-01 cluster. You notice that the ESXi hosts in the cluster have only one management network port.

1. In the right pane, click the **Monitor** tab.

2. Under vSphere HA, select **Summary**.

The vSphere HA summary information appears.

3. Record the name of the master host. _____

- a. If a master host is not listed, click **REFRESH**.

vSphere HA might still be in the initialization process.

Q1. Does the number of protected virtual machines match the number of powered-on virtual machines in the cluster?

4. Under vSphere HA, select **Heartbeat**.

Q2. How many datastores are used to monitor heartbeat?

5. Under vSphere HA, select **Configuration Issues** and review errors or warnings that are displayed.

You should see warning messages that each ESXi host has no management network redundancy. Currently, each ESXi host has a single management network port. vSphere HA still works if an ESXi host is configured with one management network port, but a second management network port is necessary for management network port redundancy.

Configuring management network port redundancy is also a best practice.

Task 3: Configure Network Management Redundancy

You configure a second management network port on sa-esxi-01.vclass.local and sa-esxi-02.vclass.local to create redundancy and remove the single point of failure.

1. Configure a second management network port on the ESXi hosts in the cluster.

You use the vMotion VMkernel adapter as the second management network port.

- a. In the navigation pane, select **sa-esxi-01.vclass.local** and click the **Configure** tab.
- b. In the right pane under Networking, select **VMkernel adapters**.
- c. Select the **vMotion** VMkernel adapter and click **Edit settings**.

The Edit Settings wizard opens.

- d. On the Port properties page, verify that the **vMotion** check box is selected and select the **Management** check box.
- e. Click **OK**.
- f. In the navigation pane, right-click **sa-esxi-01.vclass.local** and select **Reconfigure for vSphere HA**.
- g. Monitor the Recent Tasks pane and wait for the reconfiguration task to complete.
- h. Repeat steps a through g for sa-esxi-02.vclass.local.
2. Verify that no configuration issues are listed for vSphere HA.
 - a. In the navigation pane, select the **ICM-Compute-01** cluster and click the **Monitor** tab.
 - b. In the right pane under vSphere HA, select **Configuration Issues**.

Q1. Do you see any warning messages about no host management network redundancy?

Task 4: Test the vSphere HA Functionality

You set up vSphere HA to monitor the cluster environment and detect hardware failures.

When an ESXi host outage is detected, vSphere HA automatically restarts the virtual machines on the other ESXi hosts in the cluster.

1. In the navigation pane, select **ICM-Compute-01** and click the **Monitor** tab.
2. Under vSphere HA, select **Summary** and record the name of the master host.

3. Verify that the master host contains one or more powered-on virtual machines.
 - a. Select the master host in the navigation pane.
 - b. In the right pane, click the **VMs** tab and verify that **Virtual Machines** is selected.
 - c. If all the virtual machines are powered off on the master host, power on at least one of the virtual machines.
4. Record the name of one or more powered-on virtual machines on the master host.

5. In the navigation pane, select **ICM-Compute-01**.
6. Click the **Monitor** tab and select **Summary** under vSphere HA.
7. In the Virtual Machines pane, verify that the Protected field matches the number of powered-on VMs within the cluster and that the Unprotected field value is 0.

8. Simulate a host failure by rebooting the master host in the cluster.
Ensure that you reboot the system. Do not shut down the system.
 - a. In the navigation pane, right-click the master ESXi host and select **Power > Reboot**.
A warning message appears stating that you chose to reboot the host, which is not in maintenance mode.
 - b. Enter **Testing vSphere HA** as the reason for rebooting and click **OK**.
9. View the events that occur while the vSphere HA cluster recovers from the host failure.
 - a. Select **ICM-Compute-01** in the navigation pane and click the **Monitor** tab in the right pane.
 - b. Under Tasks and Events, select **Events**.
The cluster entries are sorted by time. Note the entries that appear when the host failure was detected.
 - c. In the navigation pane, select the host that you rebooted and click the **VMs** tab in the right pane.
Q1. Do you see the virtual machines that were running on this host (the original master host) and whose names you recorded earlier?
 - d. In the navigation pane, select **ICM-Compute-01**.
 - e. In the right pane, click the **Monitor** tab.
 - f. In the right pane under vSphere HA, select **Summary**.
Q2. Has the master host changed?
10. Monitor the original master ESXi host in the navigation pane until it is fully running again.
It might take several minutes for the original master host to become fully running.

Task 5: View the vSphere HA Cluster Resource Usage

You examine the CPU and memory resource usage information of the ICM-Compute-01 cluster.

1. In the navigation pane, select **ICM-Compute-01** and click the **Monitor** tab in the right pane.
2. Examine CPU reservation information for the cluster.
 - a. In the right pane under Resource Allocation, select **CPU**.

- b. Record information for the cluster.
 - Total Reservation Capacity (GHz) _____
 - Used Reservation (GHz) _____
 - Available Reservation (GHz) _____
- c. Verify that the CPU reservation is not set on the virtual machines.
The Reservation column shows 0 (MHz).
3. Examine memory reservation information for the cluster.
 - a. Under Resource Allocation, select **Memory** and record the information for the cluster.
 - Total Reservation Capacity (GB) _____
 - Used Reservation (GB) _____
 - Available Reservation (GB) _____
 - b. Verify that the memory reservation is not set on the virtual machines.
The Reservation column shows 0 (MB).

Task 6: Configure the Percentage of Resource Degradation to Tolerate

In your vSphere HA cluster, you specify the percentage of resource degradation to tolerate and you verify that a message appears when the reduction threshold is met.

You must enable vSphere DRS to use this admission control option.

1. Enable vSphere DRS on the ICM-Compute-01 cluster.
 - a. In the navigation pane, right-click **ICM-Compute-01** and select **Settings**.
 - b. In the right pane under Services, select **vSphere DRS** and click **EDIT**.
The Edit Cluster Settings window appears.
 - c. Click the vSphere DRS toggle button to on.
 - d. From the **Automation Level** drop-down menu, select **Fully Automated** and click **OK**.
2. Configure the percentage of resource degradation to tolerate.
 - a. In the right pane under Services, select **vSphere Availability**.
 - b. Click **EDIT**.
The Edit Cluster Settings window appears.
 - c. Click **Admission Control**.

- d. In the **Performance degradation VMs tolerate** text box, enter **0**.
If you reduce the threshold to 0%, a warning is generated when cluster usage exceeds the available cluster capacity.
 - e. Click **OK**.
3. Generate CPU activity in the Win10-02 VM.
 - a. In the navigation pane, select **Win10-02** and in the right pane, click the **Summary** tab.
 - b. Click the **Launch Web Console** link to open the VM console.
 - c. Right-click the **CPUBUSY** script and select **Open with Command Prompt**.
 4. Verify that a message appears about the configured failover resources in the ICM-Compute-01 cluster.
 - a. In the navigation pane, select **ICM-Compute-01** and click the **Summary** tab in the right pane.

You should see an informational message that says `Running VMs utilization cannot satisfy the configured failover resources on the cluster ICM-Compute-01 in ICM-Datacenter`.
 5. In the Win10-02 console tab, close the Command Prompt window to stop the CPUBUSY script.

You must ensure that the CPUBUSY script is stopped to avoid performance problems.
 6. Close the Win10-02 console tab.
 7. In the vSphere Client, refresh the window.
 8. Verify that the message about the configured failover resources is not shown.

Lab 27 Using vSphere Lifecycle Manager

Objective and Tasks

Update ESXi hosts using vSphere Lifecycle Manager:

1. Import Update Files to the Image Depot
2. Create a Cluster with vSphere Lifecycle Manager Enabled
3. Add ESXi Hosts to the Cluster
4. Update ESXi Hosts Using the Cluster Image

Task 1: Import Update Files to the Image Depot

You import an ESXi image, sample vendor add-ons, and sample test components to the vSphere Lifecycle Manager image depot. You use these images to update the hosts in the ICM-Compute-01 cluster.

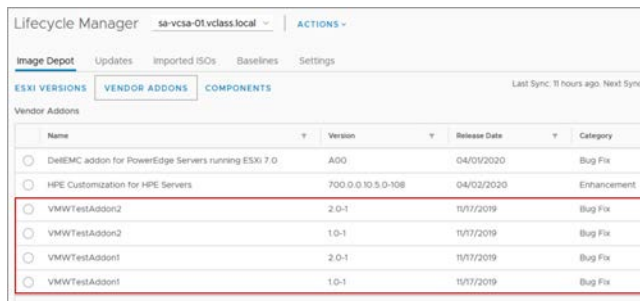
1. Using the vSphere Client, log in to sa-vcsa-01.vclass.local by entering **administrator@vsphere.local** for the user name and **VMware1!** for the password.
2. From the **Menu** drop-down menu, select **Lifecycle Manager**.
The Image Depot page appears in the right pane.
3. Import an ESXi image to the image depot.
 - a. In the right pane, select **Import Updates** from the **ACTIONS** drop-down menu.
The Import Updates dialog box opens.
 - b. Click **BROWSE** and navigate to **Desktop > Class Materials** and **Licenses > Downloads**.

- c. Double-click **VMware-ESXi-7.0.0-15847920-depot.zip**.

The Import Updates window opens, displaying a progress bar for Step 1 of 2.

After Step 1 completes, the window closes, and the Import updates task appears in the Recent Tasks pane. This task represents Step 2 in the process.

- d. Monitor the Recent Tasks pane and wait for the Import updates task to complete.
 - e. Verify that your uploaded image file appears in the Image Depot pane.
4. Import sample vendor add-ons and components to the image depot.
 - a. From the **ACTIONS** drop-down menu, select **Import Updates**.
 - b. Click **BROWSE** and double-click **SampleAddonsComponents.zip** in **C:\Materials\Downloads**.
 - c. Monitor the Recent Tasks pane and wait for the Import updates task to complete.
 - d. Click **VENDOR ADDONS** and verify that four items appear in the list.



Lifecycle Manager					
sa-vcsa-01.vclass.local		ACTIONS			
Image Depot					
Updates Imported ISOs Baselines Settings					
ESXI VERSIONS VENDOR ADDONS COMPONENTS					
Last Sync: 11 hours ago. Next Sync:					
Vendor Addons					
Name	Version	Release Date	Category		
<input type="radio"/> DelEMC add-on for PowerEdge Servers running ESXi 7.0	A00	04/01/2020	Bug Fix		
<input type="radio"/> HPE Customization for HPE Servers	700.0.0.10.5.0-108	04/02/2020	Enhancement		
<input type="radio"/> VMWTestAddon2	2.0-1	11/17/2019	Bug Fix		
<input type="radio"/> VMWTestAddon2	1.0-1	11/17/2019	Bug Fix		
<input type="radio"/> VMWTestAddon1	2.0-1	11/17/2019	Bug Fix		
<input type="radio"/> VMWTestAddon1	1.0-1	11/17/2019	Bug Fix		

5. Import one more component to the image depot.
 - a. From the **ACTIONS** drop-down menu, select **Import Updates**.
 - b. Click **BROWSE** and double-click **VMware-ESXi-7.0.0-15847920-vib-test-certs.zip** in **C:\Materials\Downloads**.
 - c. Monitor the Recent Tasks pane and wait for the Import updates task to complete.

- d. Click **COMPONENTS** and verify that the Test VIB signing certs component and two test components appear in the list.

Lifecycle Manager sa-vcsa-01.vclass.local ACTIONS

Image Depot Updates Imported ISOs Baselines Settings

ESXI VERSIONS **VENDOR ADDONS** **COMPONENTS** Last Sync: 11 hours ago; Next Sync: in 12 hrs

<input type="radio"/>	VMWTestAddon1	2.0-1	11/11/2019	Bug Fix
<input type="radio"/>	VMWTestAddon1	1.0-1	11/17/2019	Bug Fix

Components Show Independent components

	Name	Version	Release Date	Category
<input type="radio"/>	Broadcom Emulex Connectivity Division igfc driver for FC adapters	12.6.228.4-1	03/10/2020	Enhancement
<input type="radio"/>	Broadcom Emulex Connectivity Division NVMe over Fabric driver for FC adapters	12.6.228.4-1	03/19/2020	Enhancement
<input type="radio"/>	VMware Tools 11.0.6 Async Release	11.0.6	04/06/2020	Bug Fix
<input type="radio"/>	Test VIB signing certs	vib-test-certs 7.0.0	03/16/2020	General
<input type="radio"/>	vmwTestComponent4	1.0	11/17/2019	General
<input type="radio"/>	vmwTestComponent3	1.0	11/17/2019	Enhancement

6. View details about the images, add-ons, and components that you uploaded.
 - a. On the **Image Depot** tab, click **ESXI VERSIONS**.
 - b. Select the ESXi entry in the list and review the details and components that appear to the right.

The ESXi version, release date, category, and a full list of components are provided.
 - c. Click **VENDOR ADDONS** and select the first add-on in the list.
 - d. Review the details that appear to the right.

The add-on version, release date, category, and a list of added components are provided.
 - e. Select the other add-ons in the list and review their details to the right.
 - f. Click **COMPONENTS** and select the first component on the list.
 - g. Review the details that appear to the right.

The component version, release date, category, and severity are provided.
 - h. Select the other components in the list and review their details to the right.

Task 2: Create a Cluster with vSphere Lifecycle Manager Enabled

You create a vSphere cluster, and you configure the cluster to manage multiple ESXi hosts using a single image to maintain consistency in the cluster.

1. From the **Menu** drop-down menu, select **Hosts and Clusters**.
2. In the navigation pane, right-click the **ICM-Datacenter** object and select **New Cluster**.
The New Cluster dialog box opens.
3. Configure the new cluster.

Option	Action
Name	Enter ICM-Compute-02 .
vSphere DRS	Click the toggle button to turn on this service.
vSphere HA	Leave the service turned off.
vSAN	Leave the service turned off.
Manage all hosts in the cluster with a single image	Click the Information icon, read the information provided, and close the box. Select the check box.
ESXi Version	Select 7.0 GA - 15847920 .
Vendor Addon (optional)	Select None . Click OK .

4. In the Recent Tasks pane, monitor the progress as the cluster is created.
5. Verify that ICM-Compute-02 appears in the navigation pane under ICM-Datacenter.
In the right pane, the Cluster quickstart pane appears.
6. Verify that vSphere DRS and Lifecycle Management (Manage all hosts with one image) are listed under Selected services.

Task 3: Add ESXi Hosts to the Cluster

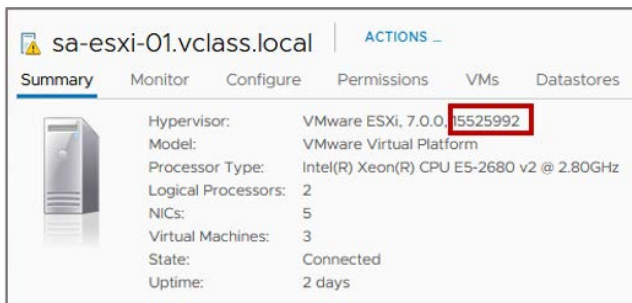
You remove sa-esxi-01.vclass.local and sa-esxi-02.vclass.local from the ICM-Compute-01 cluster and add them to the ICM-Compute-02 cluster.

1. Shut down all VMs that are on sa-esxi-01.vclass.local and sa-esxi-02.vclass.local.

You must shut down the VMs on sa-esxi-01.vclass.local and sa-esxi-02.vclass.local because you will be placing these hosts into maintenance mode.

- a. Right-click a powered-on VM and select **Power > Shut Down Guest OS**.
 - b. Click **YES** to confirm the shutdown.
2. Record the ESXi build number for sa-esxi-01.vclass.local and sa-esxi-02.vclass.local.
 - a. Click the ESXi host's **Summary** tab.
 - b. View the Hypervisor information and record the ESXi build number for sa-esxi-01.vclass.local and sa-esxi-02.vclass.local. _____

The build number should be the same for both hosts.



3. Place sa-esxi-01.vclass.local and sa-esxi-02.vclass.local in maintenance mode.
 - a. In the navigation pane, right-click **sa-esxi-01.vclass.local** and select **Maintenance Mode > Enter Maintenance Mode**.
 - b. Deselect the **Move powered-off and suspended virtual machines to other hosts in the cluster** check box.
 - c. Click **OK** to confirm placing the host in maintenance mode.
 - d. Repeat steps a through c on sa-esxi-02.vclass.local.
 - e. Verify that sa-esxi-01.vclass.local and sa-esxi-02.vclass.local are in maintenance mode.

4. In the navigation pane, drag **sa-esxi-01.vclass.local** and **sa-esxi-02.vclass.local** to the ICM-Compute-02 cluster.

The Move Host into Cluster dialog box opens.

- a. Leave the default and click **OK**.

These hosts should no longer be part of the ICM-Compute-01 cluster and are still in maintenance mode.

5. Take sa-esxi-01.vclass.local and sa-esxi-02.vclass.local out of maintenance mode.

- a. In the navigation pane, right-click **sa-esxi-01.vclass.local** and select **Maintenance Mode > Exit Maintenance Mode**.

- b. Right-click **sa-esxi-02.vclass.local** and select **Maintenance Mode > Exit Maintenance Mode**.

6. Power on the Win10-02, Win10-04, and Win10-06 VMs.

You power on these VMs to demonstrate that vSphere Lifecycle Manager can update the ESXi hosts while VMs are powered on.

- a. In the navigation pane, right-click the VM and select **Power > Power On**.

Task 4: Update ESXi Hosts Using the Cluster Image

You scan hosts for compliance and update the hosts using the defined cluster image.

1. In the navigation pane, select **ICM-Compute-02** and click the **Updates** tab in the right pane.

2. Add vendor add-ons and components to the base ESXi image.

- a. In the Image pane, click **EDIT**.

The Edit Image pane appears.

- b. Next to Vendor Addon, click **SELECT**.

The Select Vendor Addon window opens.

- c. Click **VMWTestAddon1** and click **SELECT**.

- d. Verify that VMWTestAddon1 2.0-1 appears next to Vendor Addon.

- e. Next to Components, click **Show details**.

- f. Click **ADD COMPONENTS**.

The Add Components window opens.

- g. Select the **Test VIB signing certs** check box and the **vmwTestComponent3** check box and click **SELECT**.

h. Verify that the components that you selected appear in the list.

i. In the Edit Image pane, click **SAVE**.

You might have to scroll down to see the **SAVE** button.

3. Monitor the Recent Tasks pane.

Several tasks are started. Saving the changes to the image automatically starts the Check compliance of cluster with image task.

4. Wait for the task to complete.

5. View the Image Compliance pane and read any warning and information messages.

6. Select each host in the list and view its compliance information.

a. Verify that each host is out of compliance with the image.

b. Verify that the host versions and image versions are different for each of the images.

7. In the Image Compliance pane, click **RUN PRE-CHECK** to ensure that the ICM-Compute-02 cluster is ready to remediate.

8. Wait for the precheck tasks to complete and verify that **No pre-check issues found** appears in the Image Compliance pane.

9. In the Image Compliance pane, click **REMEDIATE ALL** to remediate the hosts in the cluster.

The Review Remediation Impact window opens.

10. Read the information in the remediation impact summary, accept the terms of the End User License Agreement and click **START REMEDIATION**.

11. Monitor the remediation from the Image Compliance pane.

12. Monitor the Recent Tasks pane to view the status of the individual tasks that are started during the remediation.

vSphere DRS migrates VMs off a host before remediating the host.

The hosts are rebooted as part of the remediation. When the hosts come back online, a second compliance check automatically runs.

13. When the remediation is complete, verify that the Image Compliance pane shows that all hosts in the cluster are compliant.

Answer Key

Lab 1 Accessing the Lab Environment

Task 2: Log In to an ESXi Host with VMware Host Client..... 1

Q1. How many CPUs and how much memory does this ESXi host have?

A1. This ESXi host has 2 CPUs and 8 GB of memory.

Q2. Is the NTP service running on this ESXi host?

A2. No.

Q3. How many virtual machines are on this host?

A3. Six.

Q4. What are the guest operating system types for the virtual machines on this host?

A4. Microsoft Windows 10 and VMware Photon OS.

Task 3: Log In to vCenter Server with the vSphere Client..... 3

Q1. Do you see the sa-esxi-01.vclass.local host?

A1. No because that host has not yet been added to the vCenter Server inventory.

Lab 5 Adding Virtual Hardware

Task 1: Examine a Virtual Machine's Configuration 15

Q1. What size is the VM's hard disk 1?

A1. 5 GB.

Q2. Is Hard disk 1 a thin-provisioned or thick-provisioned disk?

A2. Thin-provisioned disk.

Q3. How much storage space is used by this VM?

A3. A little over 2 GB.

Q4. Is VMware Tools installed and running?

A4. Yes.

Task 3: Compare Thin-Provisioned and Thick-Provisioned Disks..... 17

Q1. What is the name of the virtual disk file for Hard disk 2?

- A1.** Photon-Hw_1.vmdk
- Q2.** What is the name of the virtual disk file for Hard disk 3?
- A2.** Photon-Hw_2.vmdk
- Q3.** On what datastore are Hard disk 2 and Hard disk 3 located?
- A3.** ICM-Datastore
- Q4.** What is the size of Photon-Hw_1.vmdk?
- A4.** 0 Bytes
- Q5.** What is the size of Photon-Hw_2.vmdk?
- A5.** 1 Gigabyte

Lab 7 Creating and Managing the vCenter Server Inventory

Task 3: View Information About the ESXi Hosts 23

- Q1.** How many CPUs does this ESXi host have?
- A1.** 2 CPUs
- Q2.** How much memory does this ESXi host have?
- A2.** 8 GB
- Q3.** How many networks is this ESXi host connected to?
- A3.** One network

Task 6: Create Folders for VMs and VM Templates 24

- Q1.** What is the difference between the menu commands for the Lab VMs folder and the Lab Servers folder?
- A1.** The menu commands for the Lab Servers folder relate to host actions, whereas the menu commands for the Lab VMs folder relate to virtual machine actions.

Lab 11 Using Standard Switches

Task 1: View the Standard Switch Configuration 33

- Q1.** Which physical adapter is vSwitch0 connected to?
- A1.** vmnic0
- Q2.** Which port groups are connected to vSwitch0?
- A2.** IP Storage, Management Network, and VM Network
- Q3.** Which virtual machines and templates are connected to the VM Network port group?
- A3.** Photon-Hw, Photon-Template, Win10-02, Win10-04, Win10-06, and Win10-Tools.

Lab 15 Using a vSAN Datastore

Task 1: View a vSAN Datastore Configuration..... 49

Q1. How many disks are in this disk group?

A1. Three disks.

Q2. What are the disk drive types?

A2. All three disks are flash drives.

Q3. What disk tier does each drive belong to?

A3. One 5 GB flash drive is used for the cache tier, and two 10 GB flash drives are used for the capacity tier.

Task 2: View the vSAN Default Storage Policy 51

Q1. Why is the policy's effective free space the value that it is?

A1. Because the storage policy uses RAID 1 (mirroring), RAID 1 provides full redundancy. A full copy of the VM is maintained and, therefore, the VM takes up twice the amount of space as a VM that is not mirrored.

Lab 21 Working with Snapshots

Task 3: Revert the Virtual Machine to a Snapshot.....77

Q1. Where is the You are here pointer located?

A1. Under the snapshot called With cpubusy.

Q2. Where is the You are here pointer located now?

A2. Under the snapshot called Without iometer and cpubusy.

Q3. Did the Win10-02 virtual machine power off and why?

A3. Yes. The virtual machine powered off because the memory state was not preserved.

Q4. Is either IOMETER.EXE or CPUBUSY.VBS on the desktop?

A4. No. These files were deleted before creating the snapshot called Without iometer and cpubusy.

Q5. Did the virtual machine power off? Why or why not?

A5. No. The virtual machine did not power off because the memory state was preserved.

Q6. Is CPUBUSY.VBS on the desktop?

A6. Yes.

Q7. Is IOMETER.EXE on the desktop?

A7. No.

Task 4: Delete an Individual Snapshot 79

Q1. Did the virtual machine power off?

A1. No.

Q2. In the virtual machine console, is CPUBUSY on the desktop?

A2. Yes. The CPUBUSY file is still on the desktop because deleting the snapshot does not change the virtual machine's current state. Deleting the snapshot removes the ability to return to that snapshot's point in time.

Task 5: Delete All Snapshots..... 79

Q1. Were all the remaining snapshots deleted from the Manage Snapshots window?

A1. Yes.

Q2. Is CPUBUSY on the desktop. If so, why?

A2. Yes. The current state of the virtual machine is not altered. Snapshots are consolidated and then removed. The option to revert to those earlier points in time is no longer available.

Lab 22 Controlling VM Resources

Task 1: Create CPU Contention.....81

Q1. Why are the values similar?

A1. The values are similar because the CPU share allocation of Win10-02 and Win10-04 gives them equal share of the CPU on which they are both running.

Task 2: Verify CPU Share Functionality..... 83

Q1. What is the difference in performance between the two virtual machines?

A1. Win10-04 has only one-fourth of the CPU shares that Win10-02 has. So Win10-04 receives only one-fourth of the CPU cycles of the logical CPU to which the virtual machines are pinned.

Lab 23 Monitoring Virtual Machine Performance

Task 2: Use Performance Charts to Monitor CPU Use..... 86

Q1. Did the CPU ready value change? If it did, what is the reason for the change?

A1. Yes. After the scripts stop, the CPU ready value decreases significantly because CPU contention does not occur.

Lab 25 Implementing vSphere DRS Clusters

Task 6: Verify Proper vSphere DRS Cluster Functionality..... 99

Q1. Are any VMs experiencing resource contention?

A1. Yes. Three VMs are experiencing serious contention.

- Q2. How many vSphere DRS recommendations and DRS faults are shown?
- A2.** The answer might vary, but you should see at least one recommendation.
- Q3. Look at the DRS Score. Are Win10-02, Win10-04, and Win10-06 experiencing serious CPU contention?
- A3.** Yes, they should be experiencing serious CPU contention.
- Q4. Are any new recommendations listed?
- A4.** No.
- Q5. Have the cluster and VM DRS scores improved?
- A5.** Yes.

Lab 26 Using vSphere HA

Task 2: View Information About the vSphere HA Cluster102

- Q1. Does the number of protected virtual machines match the number of powered-on virtual machines in the cluster?
- A1.** Yes. If both hosts are added to the cluster and no errors occur on the cluster, the number of protected VMs equals the number of powered-on VMs.
- Q2. How many datastores are used to monitor heartbeat?
- A2.** Two datastores. Because both datastores are shared by all the hosts in the cluster, the datastores are automatically selected for heartbeating.

Task 3: Configure Network Management Redundancy102

- Q1. Do you see any warning messages about no host management network redundancy?
- A1.** No, the warning messages are no longer present.

Task 4: Test the vSphere HA Functionality103

- Q1. Do you see the virtual machines that were running on this host (the original master host) and whose names you recorded earlier?
- A1.** No. The virtual machines previously running on this host are running on the remaining host in the cluster.
- Q2. Has the master host changed?
- A2.** Yes. The subordinate host is elected as the new master host.