VMware vSphere:
Install, Configure, Manage
Lab Manual
ESXi 6.7 and vCenter Server 6.7

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Lab Manual
ESXi 6.7 and vCenter Server 6.7
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Lab 1 Deploying and Configuring Virtual Machines

Objective: Create and prepare a virtual machine for use

In this lab, you perform the following tasks:

1. Access Your Student Desktop

2. Create a Virtual Machine

3. Install VMware Tools

4. Copy Files to the Desktop

In this lab, you use vSphere Client to perform the tasks.

Task 1: Access Your Student Desktop

The system assigned to you serves as an end-user terminal. You access and manage the lab environment from the student desktop.

1. Connect to the lab environment using Remote Desktop Connection.

2. Log in to your student desktop login as vclass\administrator with the password VMware1!.

Task 2: Create a Virtual Machine

You create a virtual machine based on specific requirements, such as a particular operating system or hardware configuration. You create a virtual machine that you use in this task only. In subsequent tasks, prebuilt virtual machines are in place.

1. From your student desktop Student-a-01, connect to your VMware Host Client.

    a. Click the Firefox icon from the taskbar of your student desktop.

    b. In the favorites bar, select **vSphere Site-A > Host Client (SA-ESXi-01)**.

2. Log in with the host user name root and the password VMware1!.

3. The Host Client opens with **Host** selected in the Navigator pane.

4. In the right pane, click **Create/Register VM** to open the New virtual machine wizard.

5. On the Select creation type page, verify that **create a new virtual machine** is selected and click **Next**.

6. On the Select a name and guest OS page, configure settings for your virtual machine.

    a. Name your virtual machine Win10-Empty.

    b. From the **Compatibility** drop-down menu, select **ESXi 6.7 virtual machine**.

    c. From the **Guest OS family** drop-down menu, select **Windows**.

    d. From the **Guest OS version** drop-down menu, select **Microsoft Windows 10 (64-bit)** and click **Next**.

7. On the Select storage page, select the **Class-Datastore** datastore and click **Next**.

8. On the Customize settings page, configure settings.

    a. From the **CPU** drop-down menu, select **1**.

    b. Enter `1024 MB` in the **Memory** text box and enter `12 GB` in the **Hard Disk 1** text box.

    c. Find CD/DVD Drive 1 and select **Datastore ISO file** from the drop-down menu.

    d. In the Datastore browser window, select `Class-Datastore` for the sa-esxi-01.vclass.local ESXi host.

    e. From the Class-Datastore, navigate to the Windows 10 operating system ISO image:

       `en_windows_10_enterprise_version_1607_9714415.iso`

    f. Click **Select**.

    g. Click the arrow next to CD/DVD Drive 1.

    h. Verify that the **Connect at power on** check box is selected and click **Next**.

9. On the Ready to Complete page, review the information and click **Finish**.

10. In the Navigator pane, verify that the virtual machine number count is 4.

11. In the Navigator pane, select **Virtual Machines** and verify that your newly created virtual machine appears in the right pane.

12. Click on the **Win10-Empty** virtual machine name in the right pane.

> **NOTE**
>
> Be sure to click the name of the VM, not just the row. The center pane will update to display information about the selected virtual machine.

13. Examine the General Information pane, Hardware Configuration pane, and Resource Consumption pane to review the current settings.

14. In the Hardware Configuration pane, expand **Hard disk 1** and record the information.

    • Backing _____

    • Capacity _____

    • Thin provisioned _____

> **NOTE**
>
> In a production environment, the next step is to install an operating system to the new virtual machine. In order to conserve class and lab time, task 3 uses a prebuilt virtual machine with a Guest operations system already installed.

Task 3: Install VMware Tools

The virtual machine used to continue the lab has the operating system installed and optimized. To continue, you install VMware Tools™ in the Win10-01 virtual machine using your keyboard.

1. In VMware Host Client for sa-esxi-01.vclass.local Navigator pane, click **Virtual Machines**.

2. In the center pane, right-click your **Win10-01** virtual machine and select **Power > Power on**.

3. Once the VM has completely powered on, right-click your Win10-01 virtual machine and select **Console > Open console in a new tab**.

4. You are logged in to the Win10-01 virtual machine as vclass\administrator with the password VMware1!.

5. In VMware Host Client for sa-esxi-01.vclass.local, right-click your Win10-01 virtual machine and select **Guest OS > Install VMware Tools**.

6. Return to the Win10-01 Console tab, right-click the **Win10-01 Console** tab and select **Reload Tab** from the drop-down menu.

7. Using your keyboard, click the **Tab key** to navigate to and select the **Windows Start** icon in the lower left corner of the Win10-01 desktop.

8. Once the Windows Start icon is selected, press the **Enter** key on your keyboard.

   The Windows Start menu opens.

9. Press the **Tab** key twice to select the second column of the Windows Start menu.

10. Press the **downward arrow** key until **Windows System** is selected, then press the **Enter** Key.

11. Press the **downward arrow** key until **This PC** is selected, then press the **Enter** Key.

    The PC window opens.

12. Press the right arrow once, then press the **downward arrow** until **DVD Drive (D:)** is selected.

13. Press the **Enter** key

    VMware Tool Setup opens.

14. Install VMware Tools.

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

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

   c. Press the **Tab** key twice to select **Next**, then press the **Enter** key.

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

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

   f. When the Windows request to restart message appears, press the **Enter** key to select **Yes** to proceed.

15. After the login page appears in the virtual machine console, you are logged in as vclass\administrator with the password VMware1!.

    Leave the virtual machine console open for the next task.

Task 4: Copy Files to the Desktop

You mount an ISO image to the virtual machine's CD/DVD drive so that the files can be copied to the virtual machine desktop for use in later labs.

1. In VMware Host Client for sa-esxi-01.vclass.local, right-click virtual machine **Win10-01** and select **Edit Settings**.

2. Expand **CD/DVD Drive 1** by clicking the arrow next to it.

3. Select **Datastore ISO** from the **CD/DVD Drive 1** drop-down menu.

4. In the Datastore browser window, browse to **Class-Datastore** for the sa-esxi-01.vclass.local ESXi host.

5. From the Class-Datastore, select **ClassFiles-vSphere.iso** and click **Select**.

6. Verify that the **Connect at power on** check box is selected for CD/DVD Drive 1, and click **Save**.

7. Return to the **Win10-01-Console** tab.

8. Click the Windows **Start** icon and navigate to **Windows System > This PC**.

9. Double-click the DVD drive (D:) shortcut to open the **ClassFiles-vSphere.iso** image.

10. Copy the `CPUBUSY` VBScript Script file (not `CPUBUSY PL File`) and the `IOMETER` application file from the DVD drive (D:) to the virtual machine's desktop for use in later labs.
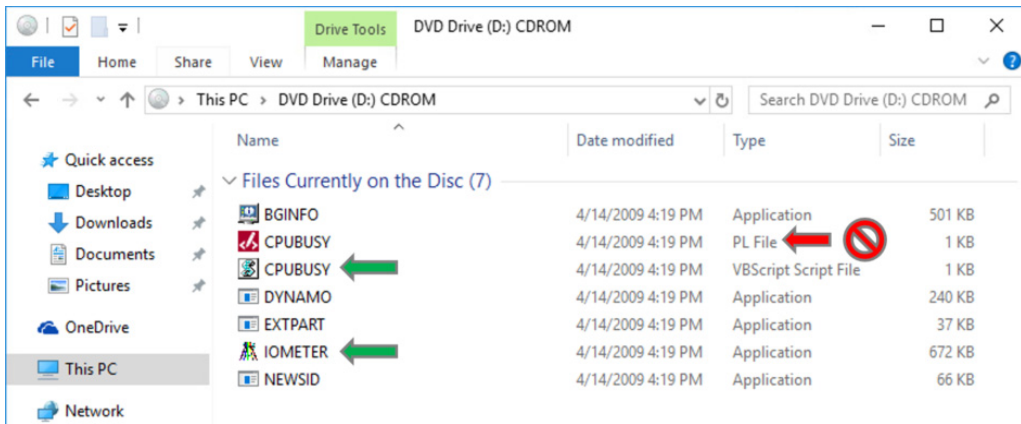
a. Press the **Ctrl** key to select the files and drag **CPUBUSY VB Script File** and **IOMETER** application to the Win10-01 desktop.

b. Close the DVD Drive (D:) CDROM screen.

c. Close the **Win10-01 - Console** tab.

11. Return to VMware Host Client and disconnect the virtual machine from `Classfiles-vSphere.iso` on the CD/DVD drive.

a. In VMware Host Client, right-click the **Win10-01** virtual machine and select **Edit Settings**.

b. In Virtual Hardware, locate **CD/DVD Drive 1**.

c. From the drop-down menu, select **Host device**.

d. Deselect the **Connect** check box next to **CD/DVD Drive 1**.

e. Click **Save**.

12. Log out of Host Client (SA-ESXi-01) and close the Firefox Web Browser.

13. Inform your instructor that you have completed this lab. If prompted, continue to the next lab.

Lab 2 Working with vCenter Server Appliance

Objective: Configure and use vCenter Server Appliance

In this lab, you perform the following tasks:

1. Access your vCenter Server Appliance and Configure Licenses

2. Configure Single Sign-On and Create a Data Center Object

3. Add Your ESXi Hosts to the vCenter Server Inventory

4. Configure the ESXi Hosts as NTP Clients

5. Create a Host and Cluster FolderIn the current lab configuration, no datastores have been configured. Datastores are added in a later lab.

6. Create Virtual Machine and Template Folders

7. Navigate vSphere Client

In this lab, you use vSphere Client to perform the tasks.

Task 1: Access your vCenter Server Appliance and Configure Licenses

You connect to the vSphere Client and license both vCenter Server and ESXi hosts.

1. In your Firefox Web browser, click **vSphere Site-A** on the favorite bar and select **vSphere Client (SA-VCSA-01)**.

2. Log in to vCenter Server with the user name administrator@vsphere.local and the password VMware1!.

3. In vSphere Client, click the **Menu** icon and select **Administration**.
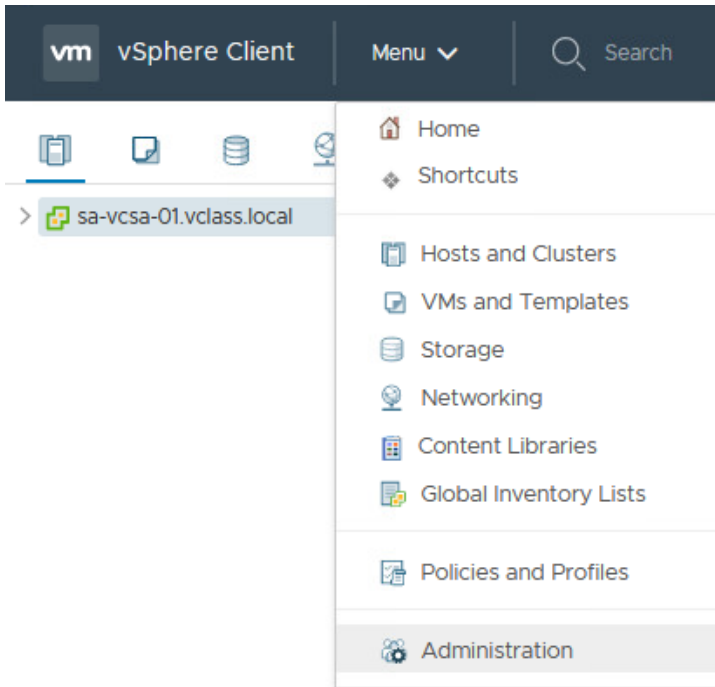
4. In the Navigator pane, select **Licenses**.

5. In the Licenses pane, the **Licenses** tab is selected.

6. Click the **Add New Licenses** icon (the plus sign).

7. On the Enter license keys page, enter the vCenter Server and VMware vSphere® Enterprise Plus Edition™ license keys provided by your instructor in the **License keys** text box.

   You must enter the license keys on separate lines.

8. Verify that both licenses are listed correctly in the text box and click **Next**.

9. On the Edit license names page, enter `VMware vCenter Server` and `VMware ESXi` in the appropriate **License name** text boxes.

10. Click **Next**.

11. On the Ready to complete page, click **Finish**.

12. In the Licenses pane, click the **Assets** tab.

13. Select the **sa-vcsa-01.vclass.local** check box and click **Assign License**.
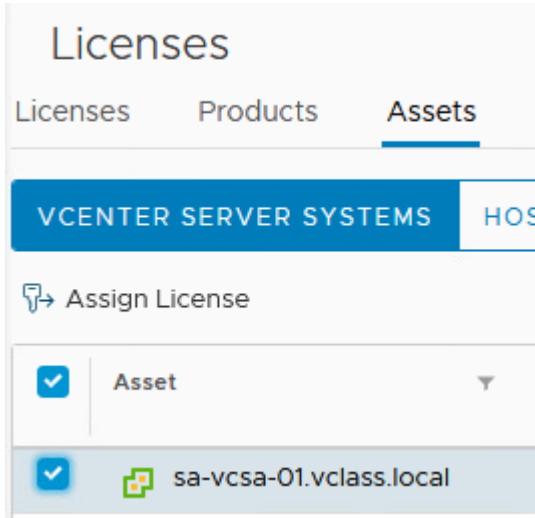
14. In Assign License, select the updated vCenter Server license and click **OK**.

    At the bottom of the Assign License page, the **Some features will become unavailable** message appears.

15. Close the **There are vCenter Server systems with expired or expiring licenses in your inventory** warning.

Task 2: Configure Single Sign-On and Create a Data Center Object

You edit the Single Sign-On (SSO) configuration and create a data center object.

1. In the Administration page, select **Single Sign-On** > **Configuration**.

2. On the **Policies** tab, verify that the **Password Policy** tab is open and click **Edit**.

3. In the **Maximum lifetime** text box, verify that 0 is entered for the password never expires value.

4. Click **OK** to save.

   NOTE

   Setting the password to never expire is not recommended for production environments. This setting is used for lab purposes only.

5. Click the **Menu** icon and select **Shortcuts**.

6. In the Inventories pane, click **Hosts and Clusters**.
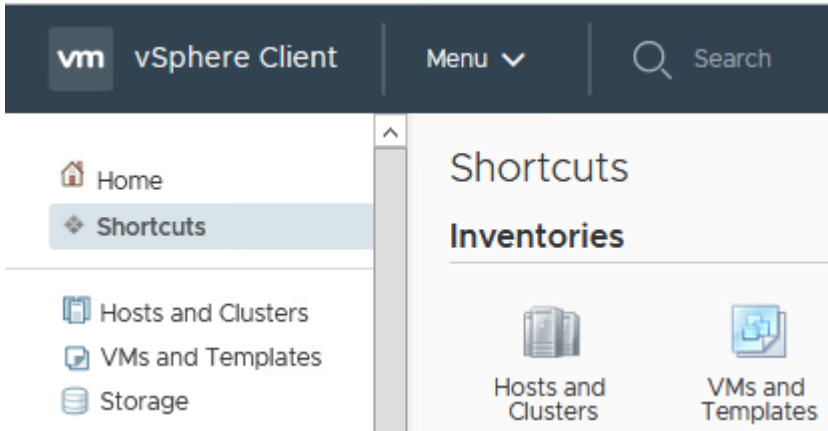
7. In the Navigator pane, right-click **sa-vcsa-01.vclass.local** and select **New Datacenter**.

8. In the New Datacenter **Name** text box, enter **SA-Datacenter** and click **OK**.

   In the Navigator pane, you should see that the new data center object is listed under vCenter Server Appliance.

Task 3: Add Your ESXi Hosts to the vCenter Server Inventory

You add ESXi hosts to the vCenter Server inventory.

1. In the Navigator pane, right-click **SA-Datacenter** and select **Add Host**.

   The Add Host wizard appears.

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, enter the password `VMware1!`, and click **Next**.

4. If you see a security alert stating that the certificate store of vCenter Server cannot verify the certificate, click **Yes** to proceed.

5. On the Host summary page, review the information and click **Next**.

6. On the Assign license page, click the VMware ESXi license key and click **Next**.

7. On the Lockdown mode page, accept the default Disabled and click **Next**.

8. On the VM location page, accept the default and click **Next**.

9. On the Ready to complete page, review the information and click **Finish**.

10. In the Recent Tasks pane, monitor the progress of the task.

11. Repeat steps 1 through 10 to add sa-esxi-02.vclass.local to the Navigator pane.

12. In the Navigator pane, expand **SA-Datacenter**.

13. In the Navigator pane, select **sa-esxi-01.vclass.local**.

    The **Summary** tab opens in the right pane. This tab displays information for the ESXi host, such as CPU, memory, storage, NICs, and virtual machines.

14. Click the arrow next to the Hardware pane to view the hardware details of the ESXi host.

Hardware	⌄
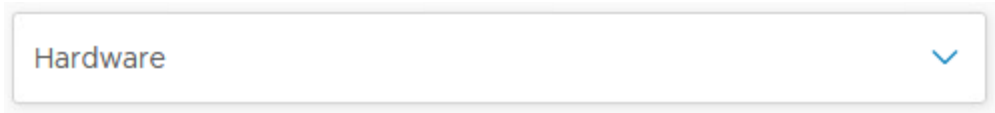
Task 4: Configure the ESXi Hosts as NTP Clients

You configure the ESXi hosts to use Network Time Protocol (NTP) to maintain accurate time and date.

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

   When repeating steps for your second host, select **sa-esxi-02.vclass.local** from the Navigation pane.

2. Navigate to **System** in the middle pane, and select **Time Configuration** to view the current settings.

3. Click **Edit**.

4. Click **Use Network Time Protocol (Enable NTP client)**.

5. In the **NTP Servers** text box, verify that 172.20.10.10 is entered.

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 Time Configuration pane, verify that the NTP client appears as Enabled and that the NTP service status appears as Running.

10. Repeat steps 1 though 9 to configure your second ESXi host.

11. On the Summary tab of your second host, suppress the ESXi Shell enabled and SSH enabled warnings. These warnings are present to alert you of the current host configuration.

In the current lab configuration, no datastores have been configured. Datastores are added in a later lab.

Task 5: Create a Host and Cluster Folder

You create a folder to group hosts and clusters of the same type.

1. In the upper left-hand corner of vSphere Client, click **vSphere Client**.

   The vSphere Client Shortcuts page opens.

2. Click **Hosts and Clusters**.

3. In the Navigator pane, right-click **SA-Datacenter** and select **New Folder** > **New Host and Cluster Folder**.

4. In the **Enter a name for the folder** text box, enter `Lab Servers` and click **OK**.

5. Drag both the ESXi hosts to the `Lab Servers` folder.

6. In the Recent Tasks pane, monitor the Move Entities tasks until they are completed.

Task 6: Create Virtual Machine and Template Folders

You use folders to group virtual machines of the same type.

1. In vSphere Client, click the **Menu** icon and select **VMs and Templates**.

2. Right-click **SA-Datacenter** and select **New Folder** > **New VM and Template Folder**.

3. In the **Enter a name for the folder** text box, enter `Lab VMs` and click **OK**.

4. In the Navigator pane, expand the **SA-Datacenter** object.

5. Right click the **Win10-Empty** virtual machine.

6. In the Actions - Win10-Empty menu, click **Delete from Disk**.

7. In Confirm Delete, click **Yes**.

8. In the Navigator pane, drag the Win10-01 and Win10-02 virtual machines to the `Lab VMs` folder.

9. Expand the `Lab VMs` folder to verify that both virtual machines are in the folder.

10. Right-click **SA-Datacenter** and select **New Folder** > **New VM and Template Folder** to create a second virtual machine folder.

11. In the **Enter a name for the folder** text box, enter `Templates` and click **OK**.

    The `Lab VMs` and `Templates` folder that you created in this lab appears in the Navigator pane.

12. Right-click the **Labs VMs** folder and review the menu commands in the drop-down menu.

13. Click the **Host and Clusters** icon.

14. 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 in the drop-down menus of the Lab VMs folder and the Lab Servers folder?

Task 7: Navigate vSphere Client

In VMware vSphere® Client™, you navigate through the objects in the navigation tree and view the configuration settings to become familiar with the UI layout.

1. In the Navigator pane, click the arrow next to each object to expand the view completely.

2. In the Navigator pane, select **sa-esxi-01.vclass.local**.

3. In the right pane, review the **Summary** tab and record the following information.

    - Hypervisor _____
    - Logical Processors _____
    - NICs _____

4. On the Summary tab, expand the **Hardware** and **Configuration** panes to review the information.

5. In the Navigator pane, select **sa-vcsa-01.vclass.local** to return to the top of the navigation tree.

6. In the **Search** text box on the top, enter `datastore`.

7. When the datastores names appear under the search box, click **Class-Datastore**.
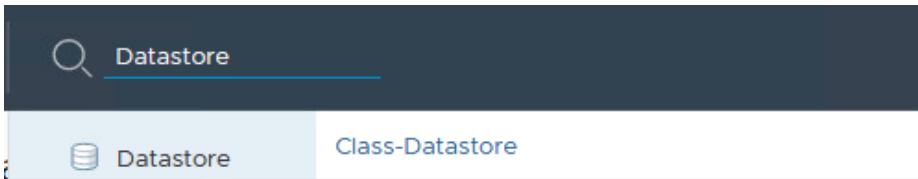
8. On the **Summary** tab, review the datastore details in the Details pane.

9. In vSphere Client, Click the **Menu** icon and select **Home**.

10. Logout of vSphere Client and close the Firefox Web browser.

11. In the next lab, you use vSphere Web Client to perform the tasks.

12. Inform your instructor that you have completed this lab. If prompted, continue to the next lab.

Lab 3 Users, Groups, and Permissions

Objective: Assign roles and permissions to Active Directory users to perform functions in vCenter Server Appliance

In this lab, you perform the following tasks:

1. Join the vCenter Server Appliance to vclass.local Domain
2. Add vclass.local as an Identity Source
3. View Active Directory Users
4. Assign Object Permissions to an Active Directory User
5. Assign Root-Level Global Permission
6. Log In with Windows Session Authentication
7. Use an Active Directory User to Manage a Virtual Machine

In this lab, you use vSphere Web Client to perform the tasks.

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

You can configure a Platform Services Controller appliance or a vCenter Server Appliance with an embedded Platform Services Controller to join or leave an Active Directory domain. Verify that the user name you use to log in to the vCenter Server instance in the vCenter Server Appliance is a member of the SystemConfiguration.Administrators group in vCenter Single Sign-On.

In this lab you join VCSA to the vclass.local domain as an Active Directory (Integrated Windows Authentication) Identity Source. This allows an active directory user to be selected and assigned rights to manage a virtual machine.

1. Open your Firefox web browser, click v**Sphere Site-A** on the favorite bar, and select **vSphere Web Client (SA-VCSA-01)**.

2. Log in with the user name administrator@vsphere.local and the password VMware1!.

3. In vSphere Web Client, click the **Home** icon and select **Administration**.

4. In the Administration pane, navigate to Deployment and select **System Configuration**.

5. Under System Configuration, select **Nodes**.

6. Under Nodes, select **sa-vcsa-01.vclass.local,** and click the **Manage** tab.

7. Under Advanced, select **Active Directory**, and click **Join**.

8. In the sa-vcsa-01.vclass.local Join Active Directory wizard, enter the following information.

Domain	`vclass.local`
Organizational Unit	Leave blank
User name	`administrator@vclass` `.local`
Password	`VMware1!`

9. Click **OK**.

   You will not receive an acknowledgment message after clicking OK. Move to the next step.

10. Reboot the VCSA.

    a. From the sa-vcsa-01.vclass.local Actions menu, and select **Reboot**.
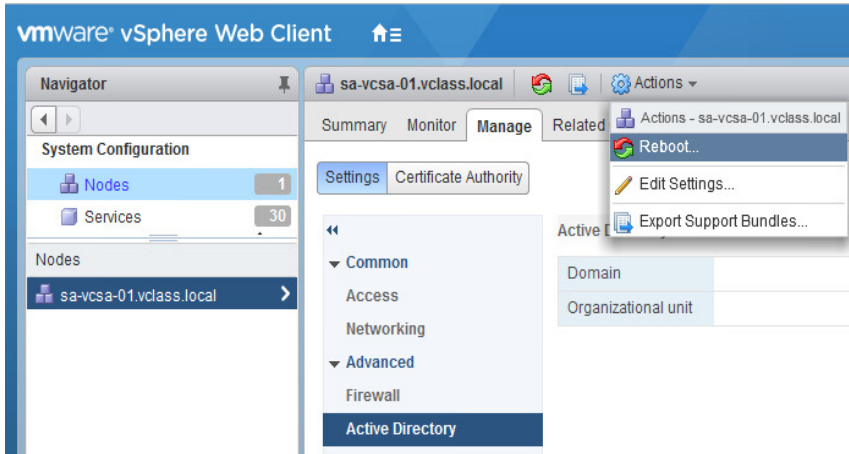
    b. In the sa-vcsa-01.vclass.local - Reboot dialog box, enter `Joining sa-vcsa-01.vclass.local to the vclass.local domain.`, and click **OK**.

    The reboot takes 10 to 15 minutes.

11. Close vSphere Web Client.

Task 2: Add vclass.local as an Identity Source

1. Open the Firefox web browser, click **vSphere Site-A** on the favorite bar, and select **vSphere Web Client (SA-VCSA-01)**.

2. Log in with the user name administrator@vsphere.local and the password VMware1!.

3. In vSphere Web Client, click the **Home** icon, and select **Administration**.

4. In the Administration pane, navigate to Single Sign-on and select **Configuration**.

5. In the SSO Configuration for sa-vcsa-01.vclass.local pane, click the **Identity Sources** tab.

6. On the Identity Sources tab, click the **Add Identity Source** icon (the green plus sign).

    The Add identity source wizard opens.

7. On the Select Identity Source Type page, verify that **Active Directory (Integrated Windows Authentication)** is selected.

8. Click **Next**.

9. On the Configure Identity Source Type page, verify that `VCLASS.LOCAL` is entered in the Domain name field.

10. Click **Next**.

11. On the Ready to Complete page, review your entries and click **Finish**.

12. On the Identity Sources tab, validate that vclass.local has been added as an identity source.

> **Q1.** What is the Type listed for the vclass.local identity source?

Task 3: View Active Directory Users

1. In the Navigator pane, under Single Sign-on click **Users and Groups**.

2. In the Users and Groups pane, the **Users** tab opens.

3. On the Users tab, select **vclass.local** from the **Domain** drop-down menu.

4. Locate the **Administrator** user name.

   The Administrator account is used in the next task.

Task 4: Assign Object Permissions to an Active Directory User

Permission is assigned at a vCenter Server level and propagated to children objects. The assigned permission applies to objects such as data centers, folders, clusters, hosts, virtual machines and other vCenter Server level objects.

In vSphere Web Client, click the **Home** icon and select **Hosts and Clusters**.

1. Right click **sa-vcsa-01.vclass.local** and click **Add Permission**.

2. In the sa-vcsa-01.vclass.local - Add Permissions wizard, select **Administrator** and assign a role.

   a. Under Users and Groups, click **Add**.

   b. On the Select Users/Groups page, select **vclass.local** from the **Domain** drop-down menu.

   c. Under Users and Groups, click **Administrator**.

   d. Click **Add**.

   e. Verify that vclass.local\Administrator is listed in the Users text field.

   f. Click **Check names**.

g. In Correct usernames, click **OK**.
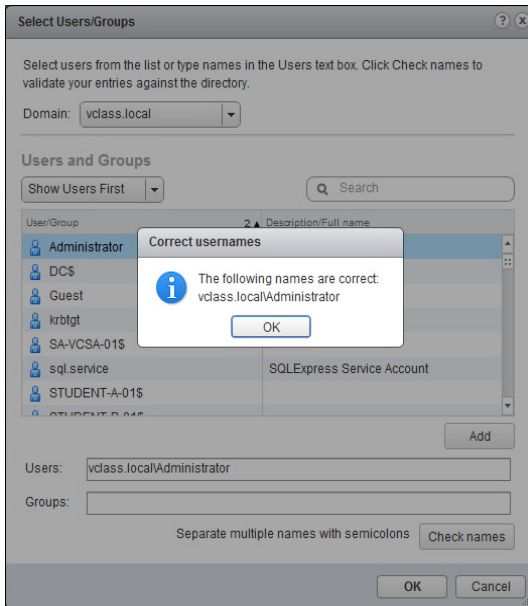
h. In Select User/Groups, click **OK**.

i. Under Assigned Role, select **Administrator** from the **Assigned Role** drop-down menu.

j. In sa-vcsa-01.vclass.local - Add Permission, click **OK**.

Task 5: Assign Root-Level Global Permission

Object level permissions are not available for Content Libraries, the direct parent for content libraries is the global root. To assign a permission on a content library, an Administrator must grant the permission to the user as a global permission.

1. Click the **Home** icon and select **Administration**.

2. In the Navigator pane, navigate to **Access Control** and select **Global Permissions**.

3. In the Global Permissions pane, click **Manage,** and then click the **Add permission** icon (the green plus sign).

4. In the Global Permissions Root - Add Permissions wizard, select **Content library administrator (sample)** and assign a role.

    a. Under Users and Groups, click **Add**.

    b. On the Select Users/Groups page, select **vclass.local** from the **Domain** drop-down menu.

    c. Under Users and Groups, click **Administrator**.

    d. Click **Add**.

    e. Verify that vclass.local\Administrator is listed in the Users text field.

    f. Click **Check names**.

    g. In Correct usernames, click **OK**.

    h. In Select User/Groups, click **OK**.

    i. Under Assigned Role, select **Content library administrator (sample)** from the **Assigned Role** drop-down menu.

    j. In sa-vcsa-01.vclass.local - Add Permission, click **OK**.

    k. Verify that VCLASS.LOCAL\Administrator is included in the User/Group list as Administrator.

5. Log out of vSphere Web Client.

Task 6: Log In with Windows Session Authentication

You now have the option to log in to vSphere Client or vSphere Web Client as administrator@vclass.local or administrator@vsphere.local to complete the remaining labs.

1. On the vSphere Web Client (SA-VCSA-01) login screen, select the **Use Windows session authentication** check box and click **Login**.

2. You are logged in to vSphere Web Client (SA-VCSA-01) as administrator@vclass.local.

Task 7: Use an Active Directory User to Manage a Virtual Machine

1. In vSphere Web Client, click the **Home** icon and select **VMs and Templates**.

2. In the Navigator pane, expand **SA-Datacenter**.

3. Right-click **Photon-ForTemplate** and select **Template > Convert to Template**.

4. Click **Yes** to verify converting the virtual machine to a template.

5. In the Navigator pane, drag the **Photon-ForTemplate** template into the **Templates** folder.

6. Expand the **Templates** folder.

7. Right-click **Photon-ForTemplate** and select **New VM from This Template**.

8. On the Select name and folder page, enter `Photon-01` in the **Virtual Machine Name** text box.

9. Expand the view for **sa-vcsa-01.vclass.local > SA-Datacenter**, select the **Lab VMs** folder and click **Next**.

10. On the Select a compute resource page, expand **SA-Datacenter > Lab Servers**.

11. Select the **sa-esxi-01.vclass.local** host and click **Next**.

12. On the Select storage page, select **Class-Datastore**.

13. From the **Select virtual disk format** drop-down menu, select **Thin Provision** and click **Next**.

14. On the Select Clone options page, accept the default settings and click **Next**.

15. On the Ready to complete page, review the information and click **Finish**.

16. In the Recent Tasks pane, monitor the progress of the template deployment task and wait for completion.

17. In the navigator pane, select **Photon-01**.

18. In the right pane, click the **Summary** tab.

> **Q1.** Which guest OS is Photon-01 running on?

19. In the Navigation pane, right-click **Photon-01**, then click **Delete from Disk**.

20. Click **Yes** to verify the deletion.

21. Log out of vSphere Web Client and close the Firefox Web browser.

22. In the next lab, you use vSphere Client to perform the tasks.

23. Inform your instructor that you have completed this lab. If prompted, continue to the next lab.

Lab 4 Using Standard Switches

Objective: Create a standard switch and a port group

In this lab, you perform the following tasks:

1. View the Standard Switch Configuration

2. Create a Standard Switch with a Virtual Machine Port Group

3. Attach Your Virtual Machines to the New Virtual Machine Port Group

In this lab, you use vSphere Client to perform the tasks.

Task 1: View the Standard Switch Configuration

You view the VMware vSphere® standard switch settings to ensure proper configuration of the default switch.

1. Open your Firefox web browser, click v**Sphere Site-A** on the favorite bar and select **vSphere Client (SA-VCSA-01)**.

2. Log in with the user name administrator@vsphere.local and the password VMware1!.

3. vSphere Client opens to the **Hosts and Clusters** view in the Navigator pane.

4. In the Navigator pane, click the arrows to expand the view.

5. Select **sa-esxi-01.vclass.local**, click on the **Configure** tab, and select **Virtual switches** in the middle pane.

6. In the Virtual switches pane, select the displayed virtual switch and review the information about the virtual switch.

> **Q1.** What is the name of the default standard switch?

> **Q2.** Which physical adapter is the default standard switch connected to?

> **Q3.** Which networks are connected to the default standard switch?

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

You create a virtual machine port group on a standard switch, which handles network traffic at the host level in your vSphere environment.

1. In the center pane, click **Add Networking**.
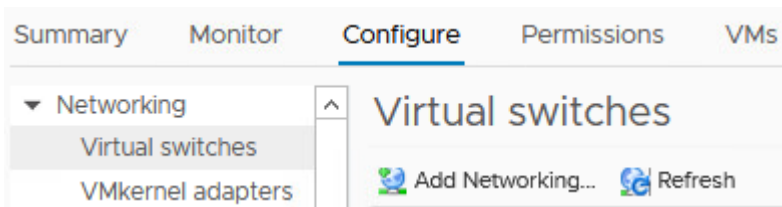
The sa-esxi-01.vclass.local - Add Networking wizard opens.

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, verify that the information is accurate and click **Finish**.

9. In the Virtual switches pane, select **vSwitch1**.

   The vSwitch1 standard switch and the Production port group are added to the Virtual switches pane.

   You might need to click and move the adjustment slider that divides the Virtual switches pane and the detail pane to display the newly created standard switch. You can also minimize the Recent Tasks pane.

10. Repeat task 2 for your second ESXi host sa-esxi-02.vclass.local.

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

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

1. In vSphere Client, click the **Menu** icon and select **VMs and Templates**.

2. In the Navigator pane, click the arrows to expand the view of your Datacenter and folders.

3. In the Navigator pane, select the **Win10-01** virtual machine.

   When repeating this task, select the Win10-02 virtual machine.

4. Ensure that **Win10-01** is powered on.

5. Right-click the virtual machine and select **Edit Settings**.

6. In Edit Settings, find **Network adapter 1**.

7. Click the downward arrow next to VM Network, and click **Browse**.

8. In Select Network, select **Production** and click **OK**.

9. Expand **Network adapter 1** and verify that the **Connect At Power On** and **Connected** check boxes are selected.

10. Click **OK** to close the Edit Settings window.

11. Renew the virtual machine's IP address.

   a. From the Summary tab, click **Launch Web Console**.

   b. You are logged in to the virtual machine as vclass\administrator with the password VMware1!.

   c. Right click the **Windows** icon and select **Run**.

   d. In the Run dialog box, enter `cmd` and click **OK** to open a Command Prompt window.

   e. At the command prompt, run the `ipconfig /release` command.

   f. Run the `ipconfig /renew` command.

   g. Record the virtual machine's IP address. _____

   h. Record the virtual machine's default gateway. _____

12. At the virtual machine's command prompt, ping the Production network's default gateway 172.20.11.10 to verify that the virtual machine is connected to the network.

   Your ping should be successful. If it is not successful, ask your instructor for help.

13. Power on the Win10-02 virtual machine, and repeat steps 5 through 11.

14. Close the Command Prompt and Web Console for both the virtual machines.

15. Leave vSphere Client open for the next lab.

16. Inform your instructor that you have completed this lab. If prompted, continue to the next lab.

Lab 5 Accessing iSCSI Storage

Objective: Configure access to an iSCSI datastore

In this lab, you perform the following tasks:

1. Validate an Existing ESXi Host iSCSI Configuration

2. Add a VMkernel Port Group to a Standard Switch

3. Configure the iSCSI Software Adapter

4. Connect the iSCSI Software Adapters to Storage

In this lab, you use vSphere Client to perform the tasks.

Task 1: Validate an Existing ESXi Host iSCSI Configuration

You use VMkernel interfaces to provide network connectivity for your hosts and to handle other types of traffic, such as VMware vSphere® vMotion® traffic, storage traffic, and VMware vSphere® Fault Tolerance traffic. In this task, you validate an existing VMkernel and iSCSI software adapter configuration on your first host.

1. In vSphere Client, click the **Menu** icon and select **Hosts and Clusters**.

2. In the Navigator pane, select **sa-esxi-01.vclass.local**.

3. In the right pane, the **Configure** tab is open.

4. In the center pane, select **Storage** > **Storage Adapters**.

5. In the **Storage Adapters** pane, validate iSCSI Software Adapter.

   a. Scroll and select the existing iSCSI software adapter.
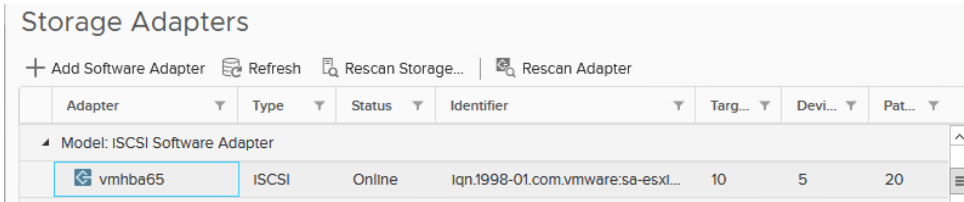
   b. Verify that Online is shown in the Status column.

6. In the Storage Adapters pane, open the **Properties** tab.

   a. Record the storage adapter properties.

      Under Adapter Status

      • Status _____

      Under General

      • Name _____

      • iSCSI Name _____

      Under Authentication

      • Method _____

7. Open the **Devices** tab and verify that MSFT iSCSI Disk devices are present.

8. Open the **Dynamic Discovery** tab.

   • Record the iSCSI Server IP address _____

9. Open the **Static Discovery** tab.

   • Record the second iSCSI Server IP address and port _____

   NOTE

   An IP address and port numbers exist for each vNIC available on the iSCSI server.

10. Open the **Network Port Binding** tab.

    a. In the Port Group column, click **Management Network (vSwitch0)**.

    b. Click **View Details**.

       The Details for vmk0 page opens.

       The information that you recorded in step 8 and step 9 can also be seen in the Details for vmk0 page.

    c. Click **Close**.

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

In this task you configure a VMkernel Port Group on your second host.

1. In the Navigator pane, select **sa-esxi-02.vclass.local**.

2. On the **Configure** tab, select **Networking** > **VMkernel adapters**.

3. Click the **Add Networking** icon.

   The Add Networking wizard appears.

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, configure the VMkernel network settings.

    a. Enter **IP Storage** in the **Network label** text box and click **Next**.

    b. On the IPv4 settings page, click **Use static IPv4 settings**.

    c. In the **IPv4 address** text box, enter **172.20.10.62**.

    d. Enter **255.255.255.0** in the **Subnet mask** text box.

    e. Verify that the default gateway is set to 172.20.10.10.

    f. Click **Next**.

10. On the Ready to complete page, click **Finish**.

Task 3: Configure the iSCSI Software Adapter

You configure the iSCSI software adapter on your second ESXi hosts and verify its iSCSI name.

1. In the Navigator pane, select ESXi host **sa-esxi-02.vclass.local**.

2. On the **Configure** tab, navigate to **Storage** and select **Storage Adapters**.

3. Click the **Add Software Adapter** icon (the plus sign).

   The Add Software Adapter wizard opens.

4. **Add software iSCSI adapter** is selected.

5. Click **OK**.

6. In the Storage Adapters list, scroll down and select the newly created iSCSI software adapter.

Summary	Monitor	Configure	Permissions	VMs	Datastores	Networks					

Storage		Storage Adapters									
Storage Adapters		+ Add Software Adapter Refresh Rescan Storage... Rescan Adapter									
Storage Devices		Adapter	Type	Status	Identifier			Targets	Devices	Paths	
Host Cache Configur.		◢ Model: iSCSI Software Adapter									
Protocol Endpoints											
I/O Filters		vmhba65	iSCSI	Online	iqn.1998-01.com.vmware:sa-esxi-02-70ff...			0	0	0	
Networking											

7. In the Adapter pane, click the **Properties** tab.

8. Verify that the adapter status is Enabled.

9. Click **Edit** next to General.

10. Verify that the name shown in the **iSCSI Name** text box matches `iqn.1998-01.com.vmware:sa-esxi-02-########`.

    # represents characters that might change.

11. Click **OK**.

Task 4: Connect the iSCSI Software Adapters to Storage

You connect the iSCSI adapters on the ESXi hosts to directly connect to a remote iSCSI target on the IP network.

1. In the Storage Adapter pane, click the **Network Port Binding** tab.

2. Click the **Add** icon (the plus sign).

3. Select the **IP Storage** check box and click **OK**.

4. In the Storage Adapter pane, click **Dynamic Discovery,** and click **Add**.

5. On the Add Send Target Server page, enter `172.20.10.10` for the iSCSI server name in the **iSCSI Server** text box and click **OK**.

6. Monitor the Recent Tasks pane and wait for the task to complete.

7. Click the **Rescan Storage Adapters** icon.

8. When the rescan storage message appears, click **OK** and wait for the task to complete.

9. In the Storage Adapter pane, click the **Devices** tab.

10. Verify that five LUNs appear and record the values.

    • LUN number_____

    • Capacity _____

    • Operational state_____

    • Hardware Acceleration_____

    The LUNs are hosted by an iSCSI provider and are used to create datastores in later labs.

11. Compare the results for both the hosts.

12. Leave vSphere Client open for the next lab.

13. Inform your instructor that you have completed this lab. If prompted, continue to the next lab.

Lab 6 Managing VMFS Datastores

Objective: Create and manage VMFS datastores

In this lab, you perform the following tasks:

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 Shared VMFS Datastore Using iSCSI

In this lab, you use vSphere Client to perform the tasks.

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. If vSphere Client is not active, open your Firefox web browser, click **vSphere Site-A Client** in the favorites bar, and select **vSphere Client (SA-VCSA-01)**.

2. Log in with the user name administrator@vsphere.local and the password VMware1!.

3. In vSphere Client, click the **Menu** icon and select **Hosts and Clusters**.

4. Right-click **SA-Datacenter** and select **Storage** > **New Datastore** to start the New Datastore wizard.

5. On the Type page, verify that **VMFS** is selected and click **Next**.

6. On the Name and device selection page, enter **VMFS-2** in the **Datastore name** text box.

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

    A LUN list appears.

8. In the LUN list, select **LUN 2** and click **Next**.

9. On the VMFS version page, accept **VMFS 6** and click **Next**.

10. On the Partition configuration page, reduce the LUN size.

    a. Move the **Datastore Size** slider to reduce the LUN size by 3 GB.

    b. Click **Next**.

11. On the Ready to complete page, review the information and click **Finish**.

12. Right-click **SA-Datacenter** in the inventory and select **Storage** > **New Datastore**.

13. On the Type page, verify that **VMFS** is selected and click **Next**.

14. On the Name and device selection page, enter `VMFS-3` in the **Datastore name** text box.

15. From the **Select a host to view its accessible disks/LUNs** drop-down menu, select **sa-esxi-02.vclass.local**.

    A LUN list appears.

16. From the LUN list, select **LUN 3** and click **Next**.

17. On the VMFS version page, accept **VMFS 6** and click **Next**.

18. On the Partition configuration page, accept the default (full capacity) and click **Next**.

19. On the Ready to complete page, review the information and click **Finish**.

20. Monitor the progress in the Recent Tasks pane until the task is completed.

21. In the Navigator pane, click the **Storage** icon.
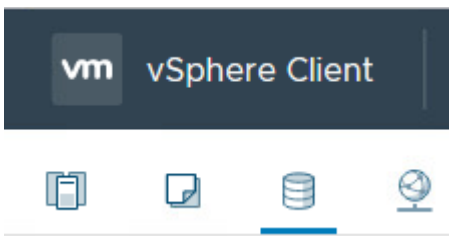
22. Expand SA-Datacenter, verify that the VMFS-2 and VMFS-3 datastores are listed in the datastore inventory.

23. In the datastore inventory, click the **VMFS-2** datastore.

24. Click the **Summary** tab and record the value for storage capacity. _____

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

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

1. In the Navigator pane, right-click the **VMFS-2** datastore and select **Increase Datastore Capacity** to open the Increase Datastore Capacity wizard.

2. On the Select Device page, select **LUN 2**.

   Yes should appear in the Expandable column of LUN 2.

3. Click **Next**.

4. On the Specify Configuration page, accept **Use "Free Space 3.00 GB" to expand the datastore** from the **Partition configuration** drop-down menu and click **Next**.

5. On the Ready to Complete page, review the information and click **Finish**.

6. When the task is completed, select the **VMFS-2** datastore in the Navigator pane.

7. On the **Summary** tab, verify that the datastore size is increased to the maximum capacity, minus the space required for system overhead.

   The new capacity for the VMFS-2 datastore should be 9.75 GB.

Task 3: Remove a VMFS Datastore

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

1. In the Navigator pane, right-click the **VMFS-3** datastore and select **Delete Datastore**.

2. When the `Confirm Delete Datastore` message appears, click **Yes** and wait for the task to be complete.

3. In Recent Tasks, verify that the remove datastore task has completed.

4. Verify that the VMFS-3 datastore has been removed from the Navigator 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.

1. In Navigator pane, click the **VMFS-2** datastore.

2. Click the **Configure** tab.

3. Select **General** from the center pane and click **Increase**.

   The Increase Datastore Capacity wizard starts.

4. On the Select Device page, select **LUN 3** and click **Next**.

5. On the Specify Configuration page, select **Use all available partitions** from the **Partition Configuration** drop-down menu and click **Next**.

   The following message is expected: There is no extent of the datastore on this device. Selecting any configuration option will add a new extent to the datastore.

6. On the Ready to Complete page, review the information and click **Finish**.

7. When the task completes, refresh the page and select **Device Backing** in the middle pane.

8. Verify that two extent device names appear in the Extent Name pane.

    The Extent Name pane should show both of your assigned devices.

    You might need to adjust the size of the Extent Name pane to view all the extent names.

    The screenshot shows the two extents listed in the Extent Name pane and the slider to adjust the size of the pane.

9. Click the **Summary** tab.

10. Record the new value for Total Capacity in the **Summary** tab. _____

    The value should be different from the value seen in task 2, step 7.

11. On the Summary tab, click the **Hosts** tab in right pane.

    The two hosts are connected, indicating that this new datastore is shared between your two ESXi hosts.

12. Right-click your **VMFS-2** datastore in the Navigator pane and select **Rename**.

13. In the **Enter the new name** text box, enter `Shared-VMFS`.

14. Click **OK**.

Task 5: Create a Second Shared VMFS Datastore Using iSCSI

You use an iSCSI shared LUN to create a VMFS6 file system.

1. In vSphere Client, click the **Menu** icon and select **Hosts and Clusters**.

2. Right-click **SA-Datacenter** and select **Storage** > **New Datastore**.

    The New Datastore wizard starts.

3. On the Type page, verify that VMFS is selected and click **Next**.

4. On the Name and device selection page, in the **Datastore name** text box enter `iSCSI-Datastore`.

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

    A LUN list appears.

6. From the newly displayed LUN list, select **LUN 5** named **MSFT iSCSI Disk** (Capacity 139.85 GB) and click **Next**.

7. On the VMFS version page, accept **VMFS 6** and click **Next**.

8. On the Partition configuration page, accept **Use all available partitions** and click **Next**.

9. On the Ready to complete page, review the information and click **Finish**.

10. Click the **Storage icon** in the navigator pane.

11. Verify that iSCSI-Datastore is listed in the Storage view.

12. On the Configure tab, select **Connectivity and Multipathing** to verify that both hosts can see the datastore.
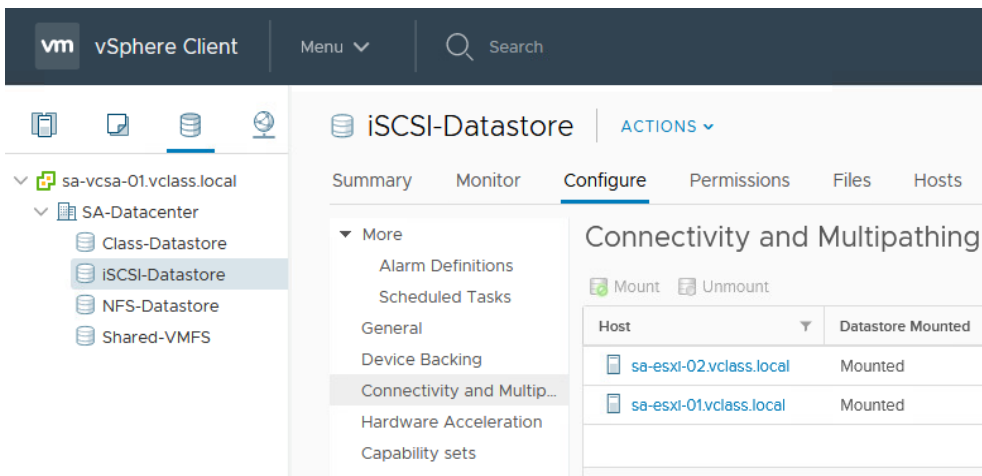
13. Leave vSphere Client open for the next lab.

14. Inform your instructor that you have completed this lab. If prompted, continue to the next lab.

Lab 7 Accessing NFS Storage

Objective: Configure access to an NFS datastore

In this lab, you perform the following tasks:

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

In this lab, you use vSphere Client to perform the tasks.

Task 1: Configure Access to NFS Datastores

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

1. If vSphere Client is not active, open your Firefox Web browser, click **vSphere Site-A** on the favorite bar, and select **vSphere Client (SA-VCSA-01)**.
2. Log in with the user name administrator@vsphere.local and the password VMware1!.
3. In vSphere Client, click the **Menu** icon and select **Storage**.
4. Right-click **SA-Datacenter** and select **Storage** > **New Datastore**.

   The New Datastore wizard starts.
5. On the Type page, select **NFS** and click **Next**.
6. On the **Select NFS version** page, select **NFS 4.1** and click **Next**.
7. On the Name and configuration page, enter `NFS-Datastore` in the **Datastore name** text box.
8. Enter `/NFS-Data` as the folder name in the **Folder** text box.
9. Enter `172.20.10.10` as the NFS server name in the **Server** text box.
10. Click the **Add server** icon (the green plus sign).
11. Validate that 172.20.10.10 is added to the Servers to be added box and click **Next**.

12. On the Configure Kerberos authentication page, accept the default, and click **Next**.

13. On the Host accessibility page, select both the ESXi hosts and click **Next.**

14. On the Ready to complete page, verify the NFS settings and click **Finish**.

15. Verify that your NFS datastore is listed in the Navigator pane.

Task 2: View NFS Storage Information

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

1. Select your **NFS-Datastore** datastore in the Navigator pane.

2. Click the **Summary** tab.

3. View the content pane and record the information about the datastore.

    • Datastore type _____

    • Capacity of the datastore _____

    • Free space of the datastore _____

    • Used space of the datastore _____

4. Leave vSphere Client open for the next lab.

5. Inform your instructor that you have completed this lab. If prompted, continue to the next lab.

Lab 8 Using Templates and Clones

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

In this lab, you perform the following tasks:

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

In this lab, you use vSphere Client to perform the tasks.

Task 1: Create a Virtual Machine Template

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

1. If vSphere Client is not active, open your Firefox web browser, click v**Sphere Site-A** on the favorite bar, and select **vSphere Client (SA-VCSA-01)**.
2. Log in with the user name administrator@vsphere.local and the password VMware1!.
3. In vSphere Client, click the **Menu** icon and select **VMs and Templates**.
4. Right-click the Win10-01virtual machine and select **Power** > **Shut Down Guest OS**.

   NOTE

   If your **Shut Down Guest OS** option is dimmed, refresh vSphere Client and try again.

5. Click **Yes** to verify shut down and wait for the virtual machine to power off completely.
6. Right-click the **Win10-01** virtual machine and select **Template** > **Convert to Template**.
7. Click **Yes** to verify the conversion.

8. Right-click the **Win10-01** virtual machine template and select **Move To Folder**.

9. Select **Templates** in the Move to Folder pane and click **OK**.

10. Expand the **Templates** folder.

11. Right-click the **Win10-01** virtual machine template and select **Rename**.

12. Enter `Win10-Template` and click **OK**.

Task 2: Create Customization Specifications

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

1. In vSphere Client, click the **Menu** icon and select **Policies and Profiles**.

2. Under Policies and Profiles, click **VM Customization Specification** and click the **Create a new specification** icon.
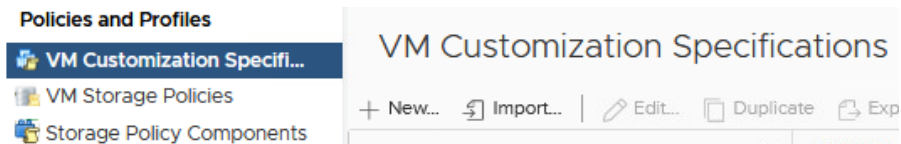
The New VM Guest Customization Spec wizard opens.

3. On the Name and target OS page, enter **Win10-CustomSpec** in the Customization Spec Name text box.

4. Verify that sa-vcsa-01.vclass.local shows next to vCenter Server.

5. Under Guest OS, verify that Windows is selected as the Target guest OS.

6. Verify that Generate a new security identity (SID) is selected.

7. Click **Next**.

8. On the Registration Information page, enter **VMware Student** in the Owner name text box, and enter **VMware** in the Owner organization text box.

9. Click **Next**.

10. On the Computer Name page, select **Use the virtual machine name** and click **Next**.

11. On the Enter Windows License page, leave the **product key** text box blank, leave other settings at their defaults and click **Next**.

12. On the Administrator Password page, enter the password VMware1! and verify it.

13. Click **Next**.

14. On the Time Zone page, select **(GMT-08:00) Pacific Time (US & Canada)** from the **Time Zone** drop-down menu and click **Next**.

15. On the Commands to Run Once page, click **Next**.

16. On the Network page, verify that **Use standard network settings for the guest operating system, including enabling DHCP on all network interfaces** is selected and click **Next**.

17. On the Workgroup or Domain page, verify that **Workgroup** is clicked and that the text box shows **WORKGROUP**.

18. Click **Next**.

19. On the Ready to complete page, review the information and click **Finish**.

20. In the Customization Specification Manager pane, verify that Win10-CustomSpec is listed.

Task 3: Deploy a Virtual Machine from a Template

You use templates to rapidly deploy and provision new virtual machines and easily customize the guest operating systems.

1. Click the **Menu** icon and select **VMs and Templates**.

2. Right-click **Win10-Template** and select **New VM from this Template**.

   The Deploy From Template wizard opens.

3. On the Select a name and folder page, enter `Win10-03` in the **Virtual machine name** text box.

4. In the Select a location for the virtual machine page, expand **SA-Datacenter** and select the **Lab VMs** folder.

5. Click **Next**.

6. On the Select a compute resource page, expand **SA-Datacenter > Lab Servers** and select **sa-esxi-01.vclass.local**.

   The Compatibility pane displays the `Compatibility checks succeeded` message.

7. Click **Next**.

8. On the Select storage page, select **iSCSI-Datastore** from the **Storage Compatibility: Compatible** list.

   The Compatibility pane displays the `Compatibility checks succeeded` message.

9. From the **Select virtual disk format** drop-down list, select **Thin Provision**.

10. Click **Next**.

11. 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**.

12. On the Customize guest OS page, select **Win10-CustomSpec** and click **Next**.

13. On the Ready to complete page, review the information and click **Finish**.

14. Repeat steps 2 through 13 to create another virtual machine on your second host named `Win10-04`.

> **NOTE**
>
> If the `Compatibility alarm - No guest heartbeats are being received` message appears, ignore it. This message does not affect a successful migration.

15. In the Recent Tasks pane, monitor the progress of the two template deployment tasks and wait for their completion.

16. Open a console for each of the newly created virtual machines.

   a. In the Navigator pane of vSphere Client, right-click the Win10-03 virtual machine and select **Open Remote Console**.

   An alternative to using Remote Console is the Web Console launched from the virtual machine Summary tab.
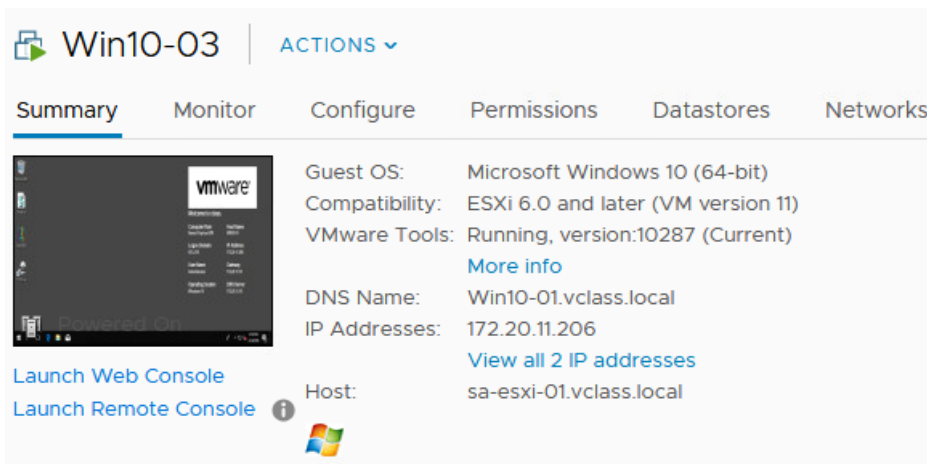
   b. In the Invalid Security Certificate screen, select the **Always trust this host with this certificate** check box.

   c. Click **Connect Anyway**.

   When the virtual machine console opens, you might see the Windows setup process continuing. It automatically reboots a few times to complete the process.

17. You are logged in as vclass\administrator with the password VMware1!.

18. Verify that both IOMETER and CPUBUSY are on the desktop.

19. Verify that VMware Tools is installed by navigating to the Windows system tray at the lower-right corner to show hidden icons and double-click the **VMware Tools** icon.
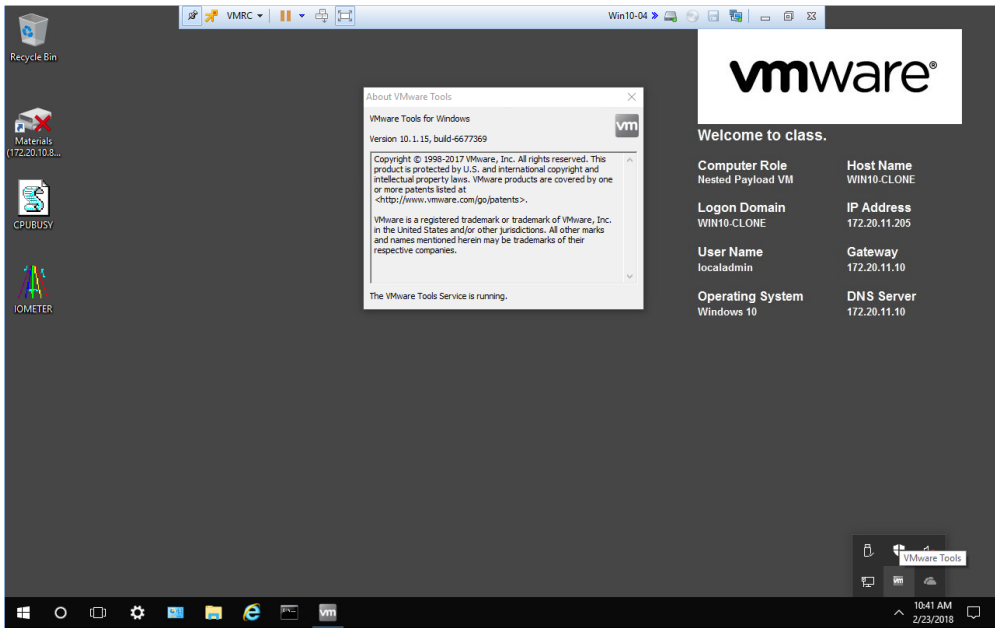
20. Repeat steps 16 through 18 for the Win10-04 virtual machine.

21. Close the virtual machine console for both virtual machines.

    Since Remote Console is used, close Remote Console on the task bar and close the empty Firefox tab for each virtual machine.

22. Leave vSphere Client open for the next lab.

23. Inform your instructor that you have completed this lab. If prompted, continue to the next lab.

Lab 9 Using Content Libraries

Objective: Create a content library to clone and deploy virtual machines

In this lab, you perform the following tasks:

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

In this lab, you use vSphere Client to perform the tasks.

Task 1: Create a Content Library

You create a content library in vSphere Client and populate it with templates, which you can use to deploy virtual machines or vApps in your virtual environment.

1. If vSphere Client is not active, open your Firefox web browser, click v**Sphere Site-A** on the favorite bar, and select **vSphere Client (SA-VCSA-01)**.
2. Log in with the user name administrator@vsphere.local and the password VMware1!.
3. In vSphere Client, click the **Menu** icon and select **Content Libraries**.
4. In the center pane, click the **Create a new content library** icon (plus sign) under **Content Libraries**.
5. On the Name and location page, enter `VM_Library` in the Name text box and click **Next**.
6. In the Configure content library page, verify that **Local content library** is selected.
7. Select the **Publish externally** check box, and click **Next**.

8. In the Add storage page, select **iSCSI-Datastore**, and click **Next**.

9. On the Ready to complete page, review the information and click **Finish**.

10. Wait for this task to finish before you go to the next task.

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 and use them later to provision virtual machines on a cluster or a host. You can also clone a virtual machine or VM template to update an existing template in the library.

1. In vSphere Client, click the **Menu** icon and select **VMs and Templates**.

2. Expand the view of the data center and all folders.

3. Right-click **Photon-ForTemplate** and select **Clone to Template in Library**.

4. For **Clone as**, verify that **New template** is selected.

5. Under the **Name** column, select **VM_Library**.

6. Enter `Photon-LibTemplate` in the template name text box**.**

7. Click **OK** and wait for the task to finish before you go to the next task.

   This process takes about 10 minutes.

Task 3: Deploy a Virtual Machine 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 or a cluster in your vSphere inventory.

1. In vSphere Client, click the **Menu** icon and select **Content Libraries**.

2. In Content Libraries, select **VM_Library**.

3. Click the **Templates** tab.

4. Right-click **Photon-LibTemplate** and select **New VM from This Template**.

5. On the Select name and folder page, enter `Photon-FromLib` in the **Virtual Machine Name** text box.

6. In Select a location for the virtual machine pane, expand **sa-vcsa-01.vclass.local,** select **SA-Datacenter** and click **Next**.

7. On the Select a compute resource page, expand **SA-Datacenter** and select the **sa-esxi-02.vclass.local** host.

8. Click **Next**.

9. On the Review details page, review the information and click **Next**.

10. On the Select storage page, select **Class-Datastore**.

11. From the **Select virtual disk format** drop-down menu, select **Thin Provision** and click **Next**.

12. On the Select Networks page, select **Production** from the Destination Network drop-down menu and click **Next**.

13. On the Ready to complete page, review the information and click **Finish**.

14. In the Recent Tasks pane, monitor the progress of the template deployment task and wait for completion.

15. In vSphere Client, click the **Menu** icon and select **VMs and Templates**.

16. In the navigator pane, select **Photon-FromLib**.

17. Right-click **Photon-FromLib** and select **Power > Power On**.

18. Open a console for the Photon-FromLib virtual machine.

    a. On the Summary tab, click **Launch Web Console**.

19. Verify that the Photon-FromLib virtual machine is running.

20. Close the **Web Console** for the Photon-FromLib virtual machine.

    vSphere Client returns to VMs and Templates.

Task 4: Delete a Content Library

You delete a content library that is no longer required.

1. In vSphere Client, click the **Menu** icon and select **Content Libraries**.

2. In Content Libraries, right-click the **VM_Library** content library and select **Delete**.

3. In the Delete Content Library confirmation dialog box, click **OK** to verify the deletion.

4. Leave vSphere Client open for the next lab.

5. Inform your instructor that you have completed this lab. If prompted, continue to the next lab.

Lab 10 Modifying Virtual Machines

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

In this lab, you perform the following tasks:

1. Clone a Powered-On Virtual Machine

2. Increase the Size of a VMDK File

3. Adjust Memory Allocation on a Virtual Machine

4. Rename a Virtual Machine in the vCenter Server Appliance Inventory

5. Add and Remove a Raw LUN on a Virtual Machine

In this lab, you use vSphere Client to perform the tasks.

Task 1: Clone a Powered-On Virtual Machine

You clone a virtual machine to create a new virtual machine with the same virtual hardware, installed software, configuration, and other properties. The original virtual machine can be powered on, off, or suspended.

1. If vSphere Client is not active, open your Firefox web browser, click v**Sphere Site-A** on the favorite bar, and select **vSphere Client (SA-VCSA-01)**.

2. Log in with the user name administrator@vsphere.local and the password VMware1!.

3. In vSphere Client, click the **Menu** icon, and select **VMs and Templates**.

4. In the Navigator pane, expand the **SA-Datacenter** and the **Lab VMs** folder.

5. Ensure the **Win10-02** virtual machine is powered on.

6. Right-click the **Win10-02** virtual machine and select **Clone** > **Clone to Virtual Machine**.

   The Clone Existing Virtual Machine wizard starts.

7. On the Select a name and folder page, enter `Win10-Clone` in the **Virtual machine** text box.

8. Expand **SA-Datacenter** and select **Lab VMs** from the Select a location for the virtual machine pane and click **Next**.

9. On the select a compute resource page, expand **Lab Servers** and select **sa-esxi-02.vclass.local** from the Select a compute resource pane and click **Next**.

10. On the Select storage page, select **iSCSI-Datastore**.

11. Select **Thin Provision** from the Select virtual disk format drop-down menu and click **Next**.

12. On the Select clone options page, select the **Customize the operating system** and the **Power on virtual machine after creation** check boxes.

13. Click **Next**.

14. On the Customize guest OS page, select **Win10-CustomSpec** and click **Next**.

15. On the Ready to complete page, review the information and click **Finish**.

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

    This task takes 10 minutes to complete.

17. Open a console for the Win10-Clone virtual machine.

    a. In the Navigator pane of vSphere Client, right-click the **Win10-Clone** virtual machine and select **Open Remote Console**.

    When the virtual machine console opens, you might see the Windows setup process continuing. It automatically reboots a few times to complete the process.

    b. You are logged in as vclass\administrator with the password VMware1!.

    c. Verify that VMware Tools is installed by navigating to the Windows system tray at the lower-right corner to show hidden icons and double-click the **VMware Tools** icon.

18. Close the virtual machine console.

Task 2: Increase the Size of a VMDK File

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

1. Right-click your **Win10-Clone** virtual machine in the Navigator pane and select **Edit Settings**.

2. On the **Virtual Hardware** tab, record the size (GB) of Hard Disk 1. _____

3. In the **Hard disk 1** text box, increase the disk size by 2 GB and click **OK**.

4. On the Win10-Clone Summary tab, select **Launch Web Console**.

5. Configure the Win10-Clone virtual machine's guest operating system to detect and extend the increased disk space.

    a. Right-click **Start**, then click on **Disk Management**.

    b. In the lower-right pane, verify that the 2 GB unallocated disk space is discovered.
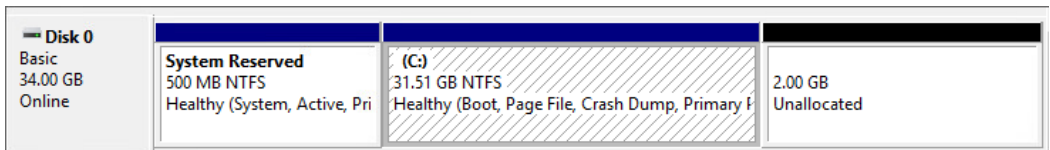
   If the 2.00 GB of unallocated space has not been discovered, click the **Action** menu, and select **Rescan Disks**.

    c. Right-click the C: drive and select **Extend Volume**.

    The Extend Volume wizard starts.

    d. Click **Next**.

    e. On the Select Disks page, verify that **Disk 0** is selected in the Selected pane and click **Next**.

    f. On the Completing the Extend Volume Wizard page, review the information and click **Finish**.

6. In the Disk Management window, verify that the local C: drive (Disk 0) is extended.

7. Record the value for the total size of the C: drive. _____

8. Compare the value with the value that you recorded in step 2.

9. Close the Disk Management window.

10. Close the virtual machine console.

Task 3: Adjust Memory Allocation on a Virtual Machine

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

1. Right-click the **Win10-Clone** virtual machine and select **Power > Shut Down Guest OS** from the Navigator pane.

   NOTE

   If your **Shut Down Guest OS** option is dimmed, refresh the vSphere Client page and try again.

2. Click **Yes** to verify the shut down.

3. On the Win10-Clone Summary tab expand the view of the **VM Hardware** pane and record the amount (GB) of active memory. _____

4. Right-click the **Win10-Clone** virtual machine in the Navigator pane, and select **Edit Settings**.

5. Enter **2500** in the **Memory** text box and verify that **MB** is selected from the drop-down menu.

6. Click **OK**.

7. Verify that the memory is increased on the virtual machine's **Summary** tab.
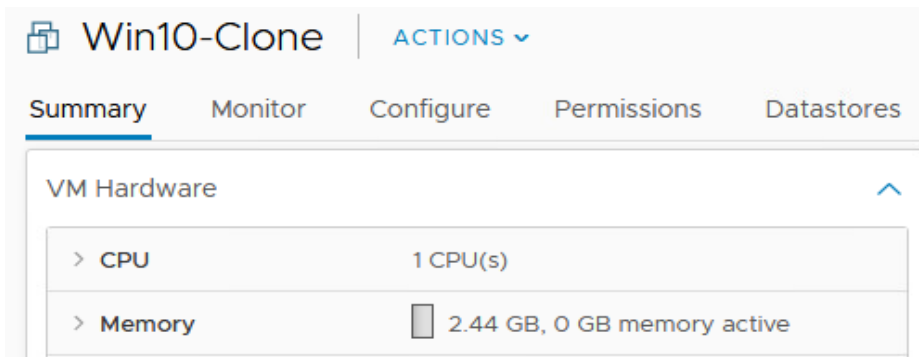
Task 4: Rename a Virtual Machine in the vCenter Server Appliance Inventory

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

1. In the Navigator pane, right-click the **Win10-Clone** virtual machine and select **Rename**.

2. In the **Enter the new name** text box, enter **Win10-05**.

3. Click **OK**.

4. In the Navigator pane, select **Win10-05** virtual machine and click the **Datastores** tab.

5. Right-click **iSCSI-Datastore** and select **Browse Files**.

> **Q1.   What is the name of the Win10-05 virtual machine's folder?**

> **NOTE**
>
> When you change the name of a virtual machine, you change the name used to identify the virtual machine in the vSphere Client inventory, not the name of the virtual machine's folder or files on the datastore.
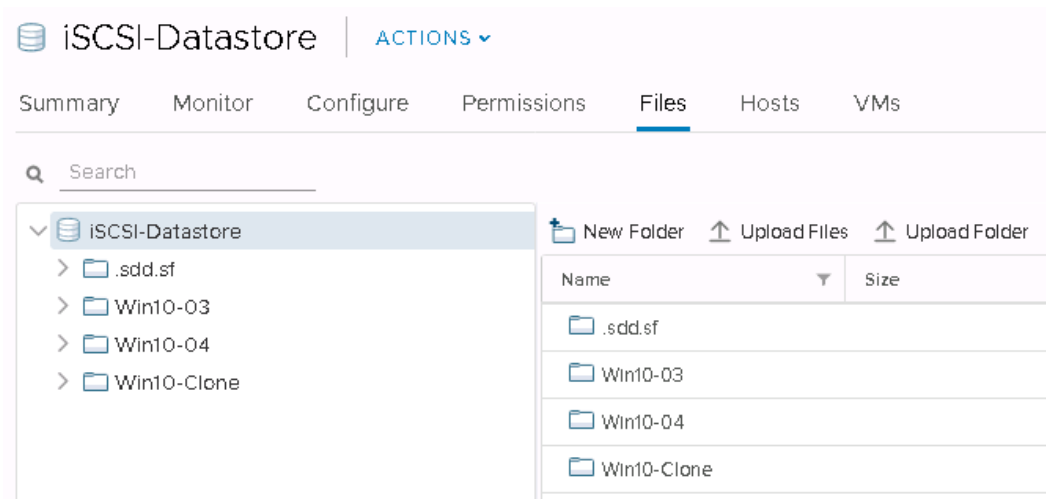
Task 5: Add and Remove a Raw LUN on a Virtual Machine

You use raw device mapping (RDM) to enable a virtual machine to access a LUN directly.

1. Click the **VMs and Templates** icon.

2. Right-click the **Win10-05** virtual machine and select **Edit Settings**.

3. Select **RDM Disk** from the **New device** drop-down menu.
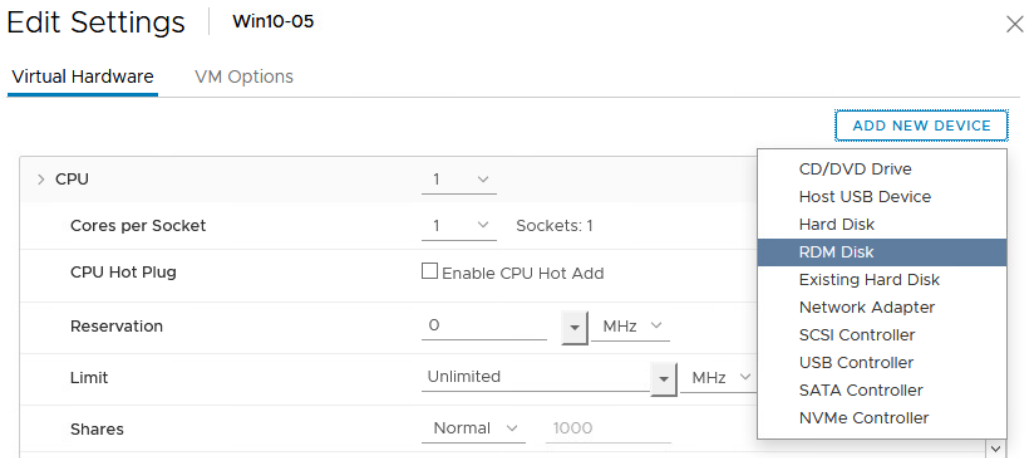
4. In the Select Target LUN dialog box, select **LUN 4** and click **OK**.

5. Click the arrow next to **New Hard disk** to expand the view.

6. In the **Location** drop-down menu, verify that **Store with the virtual machine** is selected.

7. Select **Virtual** from the **Compatibility Mode** drop-down menu, and click **OK**.

8. Verify that the guest operating system can see the new disk.

   a. In the Navigator pane, right-click the **Win10-05** virtual machine and select **Power** > **Power On**.

   b. Right-click the **Win10-05** virtual machine and select **Open Remote Console**.

   c. You are logged in as vclass\administrator with the password VMware1!.

   d. Right-click **Start**, then click on **Disk Management**.

   e. When the Initialize Disk wizard starts, click **Cancel**.

The Initialize Disk wizard is used to format unallocated disks. In this lab, you do not format the newly added RDM, Disk 1.

    f.   Verify that Disk 1 is listed.
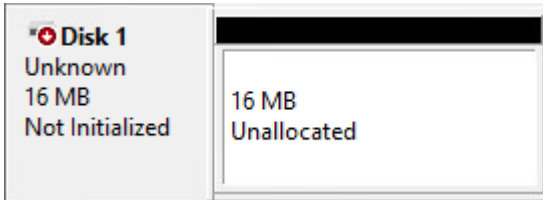
    g.   Close the Disk Management window.

9.   Close the virtual machine console and the Firefox browser tab.

10. In vSphere Client, remove the RDM hard disk from the Win10-05 virtual machine.

    a.   Right-click the **Win10-05** virtual machine and select **Power** > **Shut Down Guest OS**.

    b.   Click **Yes** to verify the shut down and wait for the virtual machine to power off.

    c.   Right-click the **Win10-05** virtual machine and click **Edit Settings**.

    d.   Point to **Hard disk 2** in the edit setting dialog box.

    e.   Click the x icon that appears at the right side of the row for Hard disk 2.
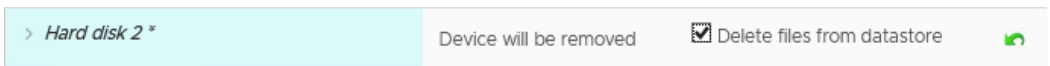
    f.   Select the **Delete files from datastore** check box and click **OK**.

11. Leave vSphere Client open for the next lab.

12. Inform your instructor that you have completed this lab. If prompted, continue to the next lab.

Lab 11 Migrating Virtual Machines

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

In this lab, you perform the following tasks:

1. Migrate Virtual Machine Files from Local Storage to Shared Storage

2. Create a Virtual Switch and a VMkernel Port Group for vSphere vMotion Migration

3. Prepare Virtual Machines to Demonstrate vSphere vMotion Migration

4. Perform vSphere vMotion Migrations of Virtual Machines

5. Perform Compute Resource and Storage Migrations

In this lab, you use vSphere Client to perform the tasks.

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

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

1. If vSphere Client is not active, open your Firefox web browser, click **vSphere Site-A** on the favorite bar, and select **vSphere Client (SA-VCSA-01)**.

2. Log in with the user name administrator@vsphere.local and the password VMware1!.

3. Click the **Menu** icon and select **VMs and Templates**.

4. Verify that the Win10-02 virtual machine is selected and powered on.

5. On the **Summary** tab, in the Related Objects pane, record the name of the storage on which the Win10-02 virtual machine resides. _____

6. Right-click the **Win10-02** virtual machine and select **Migrate**.

   The Migrate wizard opens.

7. Select **Change storage only** on the Select a migration type page and click **Next**.

8. On the Select Storage page, select **iSCSI-Datastore** as the destination storage for the virtual machine files.

   In the Compatibility pane, the `Compatibility checks succeeded` message appears.

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 virtual machine files relocation process to complete.

    This task takes several minutes to complete.

12. Repeat step 5 and step 6 to verify that the Win10-02 virtual machine is on the new datastore, which is iSCSI-Datastore.

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

You create a VMkernel port group virtual switch to move virtual machines from one host to another while maintaining continuous service availability.

1. Click the **Menu** icon and select **Hosts and Clusters**.

2. In the Navigator pane, expand **SA-Datacenter > Lab Servers** and select the host **sa-esxi-01.vclass.local**.

3. Click the **Configure** tab.

4. In the middle pane, navigate to **Networking** and select **Virtual switches**.

5. Click the **Add Networking** icon to open the Add Networking wizard.

6. Accept **VMkernel Network Adapter** in the Select connection type page and click **Next**.

7. Select **New standard switch** in the Select target device page and click **Next**.

8. Click the **green + sign** in the Create a Standard Switch page to add a physical adapter to the switch.

9. Select **vmnic2** as the vmnic for the vSphere vMotion network and click **OK**.

10. Review the information shown and click **Next**.

11. On the Port properties page for connection settings, enter `vMotion` in the **Network label** text box.

12. Select the **vMotion** check box, and click **Next**.

13. On the IPv4 settings page, configure the IP address.

    a. Select **Use static IPv4 settings**.

    b. Enter `172.20.12.51` in the **IPv4 address** text box for the sa-esxi-01.vclass.local host.

    c. Enter `255.255.255.0` in the **Subnet mask** text box for the vMotion VMkernel port IPv4.

    d. Click **Next**.

14. On the Ready to complete page, review the information and click **Finish**.

15. In the Virtual Switches pane, verify that the new virtual switch for vSphere vMotion migration is listed.
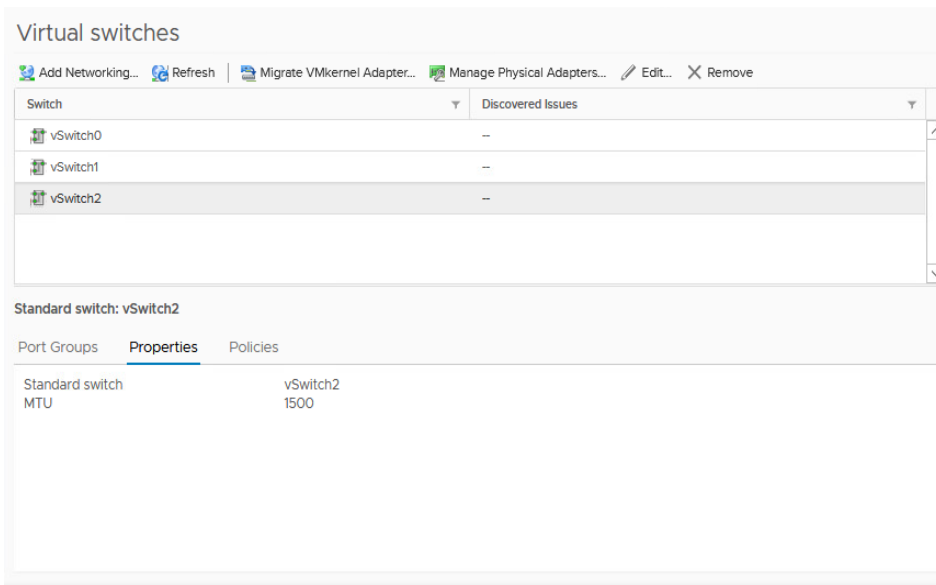
16. Repeat steps 2-15 for sa-esxi-02.vclass.local, using 172.20.12.52 for the vMotion VMkernel port IPv4 address in step 13 b. All other steps remain same.

Task 3: Prepare Virtual Machines to Demonstrate vSphere vMotion Migration

You prepare virtual machines to demonstrate live migration between hosts using vMotion.

1. In the **Navigator** pane, expand the view of the inventory.

2. Right-click the **Win10-03** virtual machine and select **Edit Settings**.

3. On the **Virtual Hardware** tab, select **Client Device** from the **CD/DVD drive 1** drop-down menu.
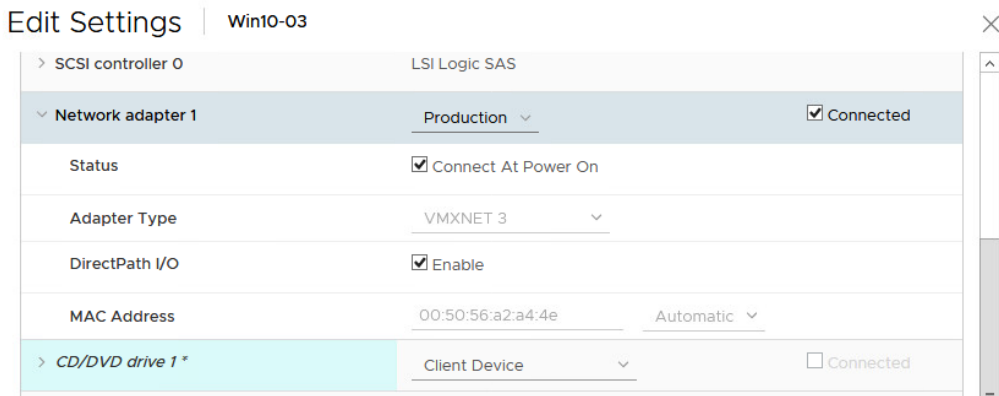
4. Click the arrow next to **Network adapter 1** to expand the view.

5. Verify that **Production** is selected from the drop-down menu.

6. Verify that the **Connect At Power On** check box is selected for Network adapter 1.

7. Click **OK**.

8. Repeat steps 2 through 7 for the **Win10-04** virtual machine.

9. Verify that the **Win10-03** virtual machine is powered on.

10. Right-click the **Win10-03** virtual machine and select **Open Remote Console**.

11. You are logged in as vclass\administrator with the password VMware1!.

12. Click the Search Windows icon in Windows Task bar and enter `cmd` to open a Command Prompt window.
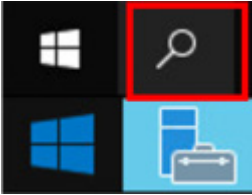
13. When the Command Prompt window opens, enter the `ipconfig` command and record the virtual machine's default gateway IP address. _____

14. Enter `ping -t *default_gateway IP address*` on the command line to start a continuous ping.

Task 4: Perform vSphere vMotion Migrations of Virtual Machines

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

1. Leave the virtual machine console open and return to vSphere Client.

2. Migrate the Win10-03 virtual machine from host sa-esxi-01.vclass.local to host sa-esxi-02.vclass.local.

   a. In the Navigator pane, right-click the **Win10-03** virtual machine and select **Migrate**.

   b. On the Select a migration type page, accept **Change compute resource only** and click **Next**.

   c. On the Select a compute resource page, select **sa-esxi-02.vclass.local**.

   sa-esxi-02.vclass.local is the destination host to which you migrate the Win10-03 virtual machine. The migration requirements are validated. If the validation does not succeed, you receive warning or error messages. You cannot continue with the migration until the errors are resolved.

   d. Click **Next**.

e. On the Select networks page, ensure that **Production** is selected from the **Destination Network** drop-down menu and click **Next**.
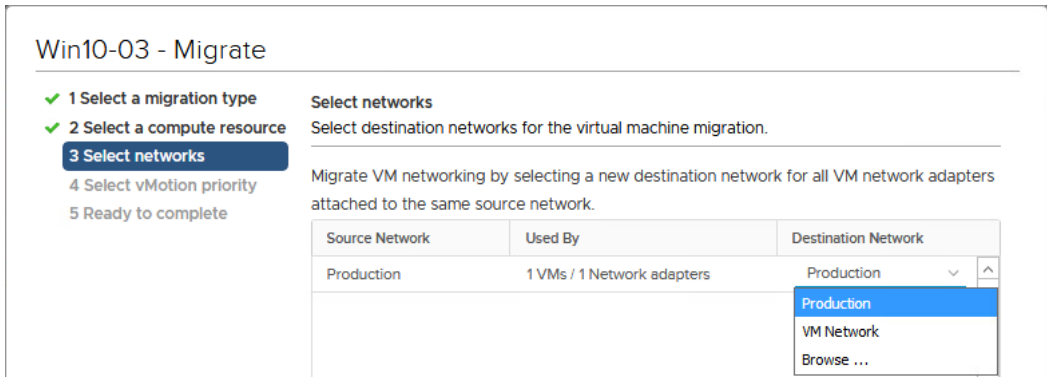
f. Leave **Schedule vMotion with high priority (recommended)** selected on the Select vMotion priority page and click **Next**.

g. On the Ready to complete page, review the information and click **Finish**.

3. Return to the Win10-03 virtual machine console and monitor that no pings are dropped during the migration.

Monitor the console for 1 to 2 minutes. If the Win10-03 virtual machine console is disconnected, reopen the console.

4. Press Ctrl+C to stop the ping.

5. Close the Command Prompt window.

6. Close the Win10-03 virtual machine console.

7. Verify that the Win10-04 virtual machine is powered on.

8. In the Navigator pane, select **Win10-04**.

9. On the **Summary** tab, verify that Win10-04 is on the sa-esxi-02.vclass.local host.

10. Migrate the Win10-04 virtual machine from host sa-esxi-02.vclass.local to host sa-esxi-01.vclass.local.

a. In the Navigator pane, drag the **Win10-04** virtual machine from **sa-esxi-02.vclass.local** to **sa-esxi-01.vclass.local**.

The Migrate wizard opens.

b. On the Select a migration type page, select **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 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**.

11. When the migration tasks are completed, view the Navigator pane to verify that Win10-04 is under sa-esxi-01.vclass.local and Win10-03 is under sa-esxi-02.vclass.local.
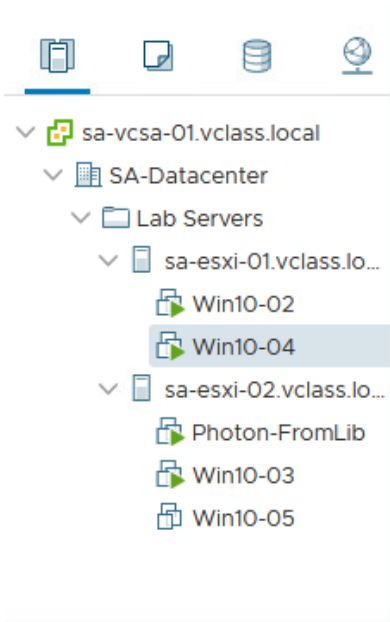
Task 5: Perform Compute Resource and Storage Migrations

You can migrate virtual machines not only to a different host but also to a different datastore across storage accessibility boundaries.

1. In the Navigator pane, right-click the **Photon-FromLib** virtual machine and select **Migrate**.

2. On the Select a migration type page, click **Change both compute resource and storage** and click **Next**.

3. On the Select compute resource page, expand **SA-Datacenter** > **Lab Servers** and select **sa-esxi-01.vclass.local**.

   > **NOTE**
   >
   > If the `Compatibility alarm – No guest heartbeats are being received` message appears, ignore it. This message does not affect a successful migration.

4. Click **Next**.

5. On the Select storage page, select **iSCSI-Datastore** and click **Next**.

6. On the Select network page, verify that **Production** is selected from the **Destination Network** drop-down menu and click **Next**.

7. On the Select vMotion priority page, leave **Schedule vMotion with high priority (recommended)** selected and click **Next**.

8. On the Ready to complete page, review the information and click **Finish**.

9. In the Recent Tasks pane, monitor the progress of the virtual machine migration.

10. When the migration task is completed, view the Navigator pane to verify that the Photon-FromLib virtual machine is listed under your sa-esxi-01.vclass.local ESXi host.

11. Right-click **Photon-FromLib** and select **Power** > **Shut Down Guest OS**.

    > **NOTE**
    >
    > If your **Shut Down Guest OS** option is dimmed, refresh the vSphere Client page and try again.

12. Click **Yes** to verify the shut down.

13. Inform your instructor that you have completed this lab. If prompted, continue to the next lab.

Lab 12 Managing Virtual Machines

Objective: Perform virtual machine management tasks

In this lab, you perform the following tasks:

1. Unregister a Virtual Machine from the vCenter Server Appliance Inventory

2. Register a Virtual Machine in the vCenter Server Appliance Inventory

3. Unregister and Delete Virtual Machines from the Datastore

4. Take Snapshots of a Virtual Machine

5. Add Files and Take Another Snapshot of a Virtual Machine

6. Revert the Virtual Machine to a Snapshot

7. Delete an Individual Snapshot

8. Delete All Snapshots

In this lab, you use vSphere Client to perform the tasks.

Task 1: Unregister a Virtual Machine from the vCenter Server Appliance Inventory

You unregister a virtual machine from the vCenter Server Appliance inventory. Unregistering does not delete the virtual machine from the datastore.

1. If vSphere Client is not active, open your Firefox web browser, click **vSphere Site-A** on the favorite bar, and select **vSphere Client (SA-VCSA-01)**.

2. Log in with the user name administrator@vsphere.local and the password VMware1!.

3. Click the **Menu** icon and select **VMs and Templates**.

4. Select the **Win10-05** virtual machine and click the **Datastores** tab.

5. Record the VMFS datastore name where the **Win10-05** virtual machine resides. _____

6. Verify that the Win10-05 virtual machine is powered off.

7. Right-click **Win10-05** and select **Remove from Inventory**.

   CAUTION

   Do not select **Delete from Disk**. This operation is not recoverable in your lab environment.

8. Click **Yes** to verify the removal.

9. Verify that the Win10-05 virtual machine no longer appears in the Navigator.

10. If needed, click the **Refresh** icon for vSphere Client.

11. In the Navigator pane, click the **Storage** icon and expand the view.

12. Click the datastore name that you recorded in step 5.

13. In the right pane, verify that the **Files** tab is open.

14. View the folders in the middle pane.

   Q1. Does a folder named Win10-05 exist?

15. In the middle pane, select the **Win10-Clone** folder.

16. In the right pane, view the Win10-Clone virtual machine files.

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

If you removed a virtual machine from the vCenter Server Appliance inventory but did not remove its folder from the managed host's datastore, you can return the virtual machine back to the inventory by registering the virtual machine's .vmx file with vCenter Server Appliance.

1. In the right pane, click the **Win10-Clone.vmx** file from the list of virtual machine files in the right pane.

2. Click the **Register VM** icon.

   The screenshot shows an example of registering the Win10-Clone.vmx file.
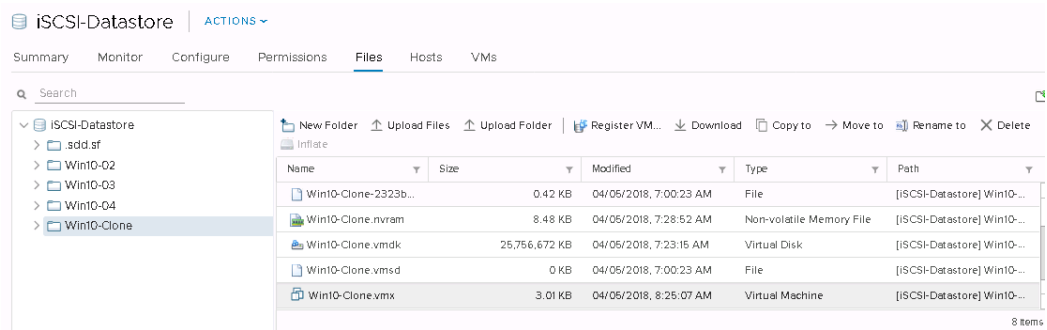
   The Register Virtual Machine wizard opens.

3. On the Select a name and folder page, enter `Win10-05`.

4. In the Select a location for the virtual machine pane, expand **SA-Datacenter** and select the **Lab VMs** folder.

5. Click **Next**.

6. In the Select a compute resource page, expand **SA-Datacenter > Lab Servers**.

7. Select **sa-esxi-01.vclass.local** and click **Next**.

8. On the Ready to Complete page, review the information and click **Finish**.

9. In the Navigator pane, click the **VMs and Templates** icon and verify that the **Win10-05** virtual machine is in the `Lab VMs` folder.

Task 3: Unregister and Delete Virtual Machines from the Datastore

You can remove a virtual machine from the vCenter Server Appliance inventory and delete all the associated virtual machine files from the datastore, including the configuration file and the virtual disk files.

1. In the Navigator pane right-click the **Win10-05** virtual machine, select **Delete from Disk**, and click **Yes** to verify the deletion.

2. Verify that the Win10-05 virtual machine no longer appears in the Navigator pane.

3. Click the **Storage** icon and verify that the folder and files where the Win10-05 virtual machine was registered no longer exist.

4. Click the **VMs and Templates** icon.

5. Right-click the **Photon-FromLib** virtual machine, select **Delete from Disk**, and click **Yes** to verify the deletion.

Task 4: Take Snapshots of a Virtual Machine

You take a snapshot to preserve the state and the data of a virtual machine at the time the snapshot is taken. You use snapshots when you must revert to the same virtual machine state.

1. In the Navigator pane, right-click the **Win10-03** virtual machine and select **Open Remote Console**.

2. You are logged in as vclass\administrator with the password VMware1!.

3. On the virtual machine desktop, drag the **IOMETER** file to the **Recycle Bin**.

4. Right-click the **Recycle Bin** icon and select **Empty Recycle Bin** to delete the IOMETER file permanently.

5. Click **Yes** to verify the file deletion and leave the virtual machine console open.

6. Return to vSphere Client.

    a. Click the **VMware Remote Console icon** in the Windows Tool bar.

    Clicking the VMware Remote Console icon minimizes the console window.
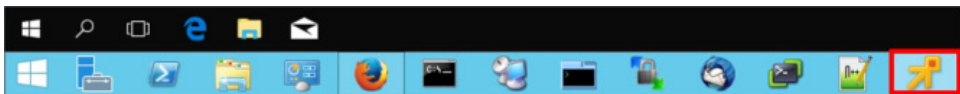
7. Right-click the **Win10-03** virtual machine.

8. Select **Snapshots > Take Snapshot**.

    The Take Snapshot wizard appears.

9. Configure the snapshot.

Option	Action
Name	Enter `Without iometer`.
Description	Enter `Deleted iometer`.
Snapshot the virtual machine's memory	Deselect the check box.
Quiesce guest file system (Needs VMware Tools installed)	Leave the check box deselected.

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

11. Click the **VMware Remote Console icon** to return to the virtual machine desktop.

12. On the virtual machine desktop, drag the **CPUBUSY** file to the **Recycle Bin**.

13. Right-click the **Recycle Bin** icon and select **Empty Recycle Bin** to delete the CPUBUSY file permanently.

14. Click **Yes** to verify the file deletion and leave the virtual machine console open.

15. Return to vSphere Client.

16. Right-click the **Win10-03** virtual machine and select **Snapshots** > **Take Snapshot** to take another snapshot.

17. Configure the snapshot.

Option	Action
Name	Enter `Without iometer or cpubusy`.
Description	Enter `Deleted cpubusy.`
Snapshot the virtual machine's memory	Deselect the check box.
Quiesce guest file system (Needs VMware Tools installed)	Leave the check box deselected.

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

Task 5: Add Files and Take Another Snapshot of a Virtual Machine

You add some files to a virtual machine and create another snapshot of the virtual machine. This snapshot contain files that allow you to see how the virtual machines change when you revert to the different snapshots in subsequent tasks.

1. Connect the `ClassFiles-vSphere.iso` file on the CD/DVD drive to the **Win10-03** virtual machine.

   a. Right-click the **Win10-03** virtual machine and select **Edit Settings**.

   b. Select **Datastore ISO File** from the **CD/DVD drive 1** drop-down menu.

   c. Select **Class-Datastore** in the left pane.

   d. Select the **Classfiles-vSphere.iso** file in the middle pane.

   e. Click **OK**.

   f. Select the **Connected** check box for CD/DVD drive 1.

   g. Click **OK** to close the Edit Settings dialog box.

2. Return to the Win10-03 virtual machine console.

3. Click the Windows Start icon and navigate to **Windows System > This PC**.

4. Click **DVD Drive (D:)** to view files.

5. Copy the `CPUBUSY VBScript Script` file from the D: drive to the virtual machine's desktop.

6. Close the DVD Drive (D:) CDROM window.

7. Return to vSphere Client and disconnect the CD/DVD drive from the Win10-03 virtual machine.

   a. From vSphere Client, right-click the **Win10-03** virtual machine and select **Edit Settings**.

   b. Select **Client Device** from the **CD/DVD drive 1** drop-down menu and click **OK**.

8. Right-click the **Win10-03** virtual machine and select **Snapshots > Take Snapshot** to take another snapshot.

9. Configure the snapshot.

Option	Action
Name	Enter `With cpubusy`.
Description	Enter `Added cpubusy`.

Option	Action
Snapshot the virtual machine's memory	Leave the check box selected.
Quiesce guest file system (needs VMware Tools installed)	Leave the check box deselected.

10. Click **OK**.

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

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

12. Right-click the **Win10-03** virtual machine and select **Snapshots** > **Manage Snapshots**.

    You should see three snapshots. The difference in icons is due to whether the **Snapshot the virtual machine's memory** check box was selected when the snapshot was taken.
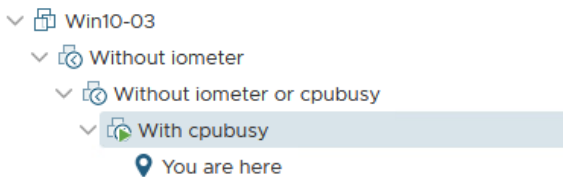
13. Leave the **Manage Snapshots** open.

14. Close the Win10-03 virtual machine console.

    a. Right click the **VMware Remote Console icon** in the Windows Tool bar and select **Close Window**.

    b. Close the empty browser tab.

Task 6: 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 Manage Snapshots, select the **Without iometer or cpubusy** snapshot and click **Revert to**.

2. Click **OK** to verify the revert.

3. Click **Done** to close Manage Snapshots.
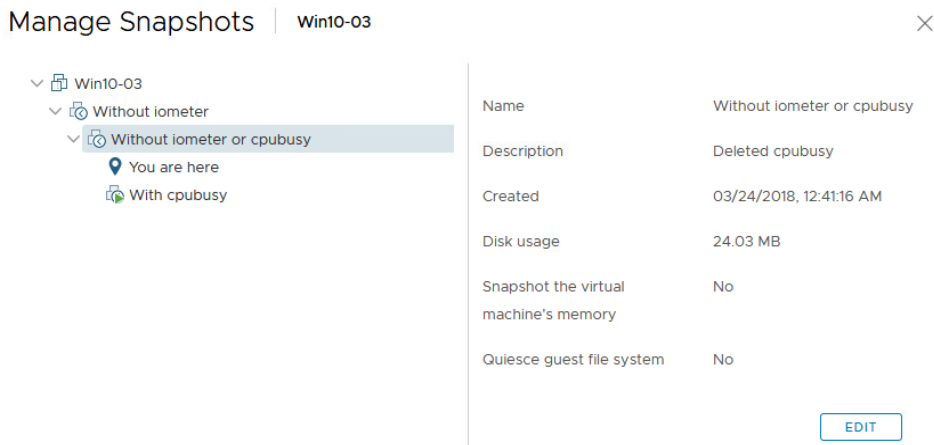
> **Q1. Did the virtual machine power off and why?**

4. In the Navigator pane, right-click the **Win10-03** virtual machine and select **Power** > **Power On**.

5. In the Navigator pane, right-click **Win10-03** and select **Open Remote Console**.

    Wait for the boot process to complete.

6. You are logged in as vclass\administrator with the password VMware1!.

> **Q2. Is either IOMETER or CPUBUSY on the desktop?**

7. Close the Win10-03 virtual machine console.

8. In vSphere Client, right-click the **Win10-03** virtual machine and select **Snapshots** > **Manage Snapshots**.

    The You Are Here pointer should be below the snapshot named Without iometer or cpubusy.

9. Select the **With cpubusy** snapshot on the **Manage Snapshots** tab and click **Revert to**.

10. Click **OK** to verify the revert operation.

11. Click **Done** to close Manage Snapshots.

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

12. Open a console for the Win10-03 virtual machine.

> **Q4.** **Is CPUBUSY on the desktop?**

> **Q5.** **Is IOMETER on the desktop?**

Task 7: Delete an Individual Snapshot

You can remove a snapshot on the **Snapshots** tab. The snapshot files are consolidated and written to the parent snapshot disk.

1. Return to vSphere Client.

2. In the Navigator pane, right-click the **Win10-03** virtual machine and select **Snapshots** > **Manage Snapshots**.

    The **You are here** pointer must be below the With cpubusy snapshot.

3. Select the **Without iometer or cpubusy** snapshot and click the **DELETE** button.

Manage Snapshots | Win10-03

- Win10-03
  - Without iometer
    - Without iometer or cpubusy
      - With cpubusy
        - You are here

DELETE ALL   DELETE   REVERT TO
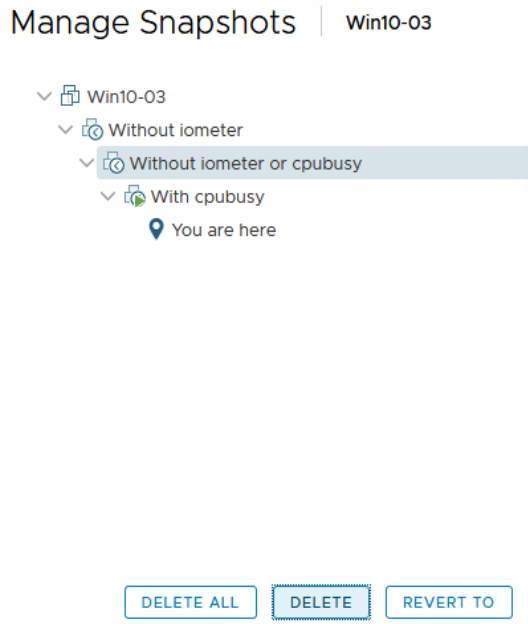
4. Click **OK** to verify the deletion.

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

Q1. Did the virtual machine power off?

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

Task 8: Delete All Snapshots

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

1. In the Navigator pane, right-click the **Win10-03** virtual machine and select **Snapshots > Manage Snapshots.**

2. In Manage Snapshots click **Delete All**.

3. Click **OK** to verify that you want to delete all the remaining snapshots.

   Only the You are here pointer should appear on the snapshots tab.

Manage Snapshots │ Win10-03

∨ 🗄 Win10-03
   📍 You are here
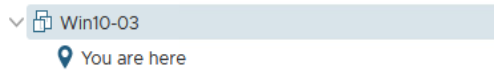
> **Q1. Were all the remaining snapshots deleted from the Manage Snapshots dialog box?**

4. Click **Done** to close Manage Snapshots.

5. Return to the **Win10-03** virtual machine console.

> **Q2. Is CPUBUSY on the desktop, and why?**

6. Close the **Win10-03** virtual machine console.

7. Close vSphere Client.

8. vSphere Web Client is used in the next lab.

9. Inform your instructor that you have completed this lab. If prompted, continue to the next lab.

Lab 13 Managing Resource Pools

Objective: In vCenter Server, create and use resource pools on an ESXi host

In this lab, you perform the following tasks:

1. Create CPU Contention

2. Create Resource Pools

3. Verify Resource Pool Functionality

In this lab, you use vSphere Web Client to perform the tasks.

Task 1: Create CPU Contention

You use a tool to create CPU contention in your lab environment for testing. You force the virtual machines to compete for and share the limited logical CPU resources on the ESXi host, which might lead to performance degradation.

1. Open your Firefox Web browser, click **vSphere Site-A** on the favorite bar, and select **vSphere Web Client (SA-VCSA-01)**.

2. Log in with the user name administrator@vsphere.local and the password VMware1!.

3. vSphere Web Client opens to **Hosts and Clusters**.

4. In the Navigator pane, expand **SA-Datacenter**, the **Lab Servers** folder, and your **ESXi hosts**.

5. Verify that the Win10-02 and Win10-04 virtual machines are powered on and running on sa-esxi-01.vclass.local.
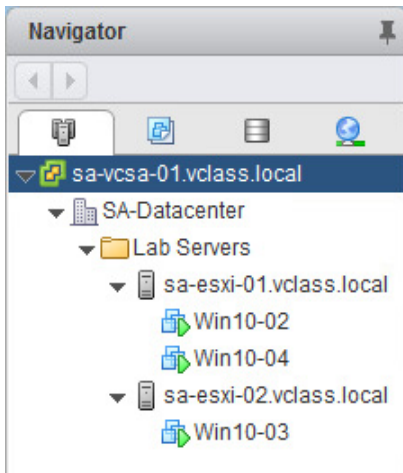
6. If necessary, migrate the virtual machines to sa-esxi-01.vclass.local.

7. Start the CPUBUSY script on the virtual machine desktops.

    a. Right-click on Win10-02 and select **Open Console**.

    b. Select **Web Console**, then click **Continue** in the Open Console panel.

    c. You are logged in as vclass\administrator with the password VMware1!.

    d. On the desktop, right-click **CPUBUSY** and select **Open with Command Prompt**.

    This script runs continuously. It stabilizes in 1 to 2 minutes. This script repeatedly does floating-point computations. The script displays the duration (wall-clock time) of a computation, for example, I did three million sines in # seconds.

    e. Repeat steps a through d on 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.

8. In the Navigator pane, right-click the **Win10-02** virtual machine and select **Edit Settings**.

9. On the **Virtual Hardware** tab, click the arrow next to **CPU**.

10. In the **Scheduling Affinity** text box, enter **1**.

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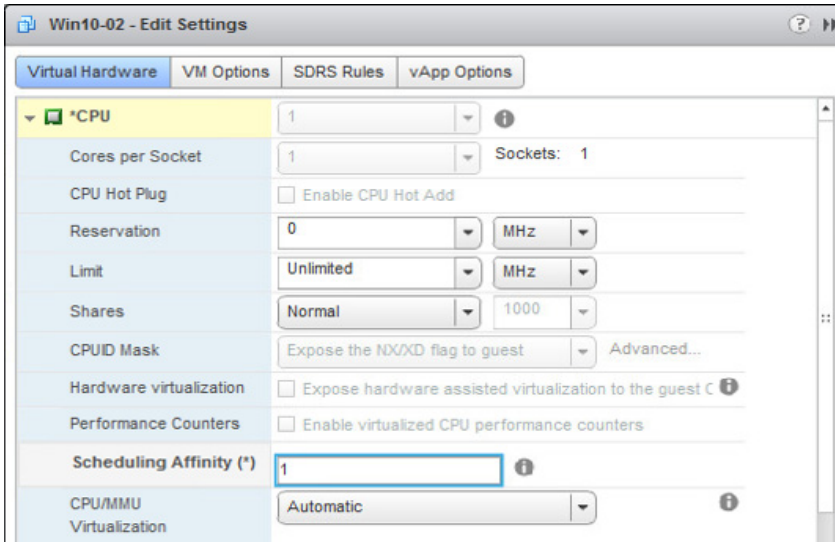
11. Click **OK**.

CAUTION

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

12. Repeat steps 8 through 11 for the Win10-04 virtual machine.

13. Allow the CPUBUSY script to run for 1 or 2 minutes.

Task 2: Create Resource Pools

You use resource pools to delegate control over resources of the host or a cluster and to compartmentalize all resources in a cluster.

1. Right-click **sa-esxi-01.vclass.local** in the Navigator pane and select **New Resource Pool**.

2. Assign properties to the resource pool.

Option	Action
Name	Enter `rp-Test`.
CPU Shares	Select **Low** from the **Shares** drop-down menu.
All other settings	Leave the default settings.

3. Click **OK**.

4. In the Navigator pane, right-click **sa-esxi-01.vclass.local** and select **New Resource Pool**.

5. Assign properties to the resource pool.

Option	Action
Name	Enter `rp-Production`.
CPU Shares	Select **High** from the **Shares** drop-down menu.
All other settings	Leave the default settings.

6. Click **OK**.

Task 3: Verify Resource Pool Functionality

You assign virtual machines to resource pools with different resource settings to monitor and compare the performance differences.

1. Select the **rp-Test** resource pool in the Navigator pane and click the **Summary** tab.

2. In the Resource Settings pane, click the arrow next to CPU to expand the view.

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

3. Select **rp-Production** in the Navigator pane and click the **Summary** tab.

4. View the Resource Settings pane.

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

5. Drag the **Win10-02** virtual machine to the **rp-Production** resource pool.

6. Drag the **Win10-04** virtual machine to the **rp-Test** resource pool.

7. Open each virtual machine console to monitor the results of the CPUBUSY script.

   Allow several minutes for CPU contention to occur. If you are logged out of the console due to inactivity, log in again as vclass\administrator with the password VMware1!.

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

8. In vSphere Web Client, change the CPU shares of the rp-Test resource pool from **Low** to **Normal**.

   a. Right-click the **rp-Test** resource pool in the Navigator pane and click **Settings**.

   b. Verify that **CPU Resources** is selected and click **Edit**.

   c. Select **Normal** from the **Shares** drop-down menu and click **OK**.

9. In each virtual machine console, allow the script to run for a few minutes and compare the performance of the CPUBUSY script on each virtual machine.

   As contention diminishes on the Win10-04 virtual machine, you see a difference in performance.

10. Repeat step 8 to change CPU shares for the rp-Production resource pool from High to Normal.

    As contention diminishes, you see performance balance between the two virtual machines.

11. Press **Ctrl+C** in the Command Prompt window to stop the CPUBUSY script in each virtual machine console.

12. Close the Win10-02 and Win10-04 consoles.

13. Click the **Home** icon and select **Home**.

14. Leave vSphere Web Client open for the next lab.

15. Inform your instructor that you have completed this lab. If prompted, continue to the next lab.

Lab 14 Monitoring Virtual Machine Performance

Objective: Use the system monitoring tools to reflect the CPU workload

In this lab, you perform the following tasks:

1. Create the CPU Workload
2. Use Performance Charts to Monitor CPU Utilization
3. Undo Changes Made to the Virtual Machines

In this lab, you use vSphere Web Client to perform the tasks.

Task 1: Create the CPU Workload

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

1. If vSphere Web Client is not active, open your Firefox web browser, click **vSphere Site-A** on the favorite bar, and select **vSphere Web Client (SA-VCSA-01)**.
2. Log in with the user name administrator@vsphere.local and the password VMware1!.
3. Click the **Home** icon and select **VMs and Templates**.
4. Expand the view of the Navigator pane.
5. Validate that the Win10-02 and Win10-04 virtual machines are powered on.
6. Open consoles for Win10-02 and Win10-04.
7. On each virtual machine desktop, right-click the **CPUBUSY** script file and select **Open with Command Prompt**.

Task 2: Use Performance Charts to Monitor CPU Utilization

You use the performance charts to monitor the CPU, memory, disk, network, and storage metrics.

1. Return to vSphere Web Client.

2. In the Navigator pane, select the **Win10-02** virtual machine.

3. Click the **Monitor** tab, click **Performance** and select **Advanced** in the middle pane.

    The real-time CPU usage graph appears.

4. Click the **Chart Options** link.

    The Chart Options dialog box appears.
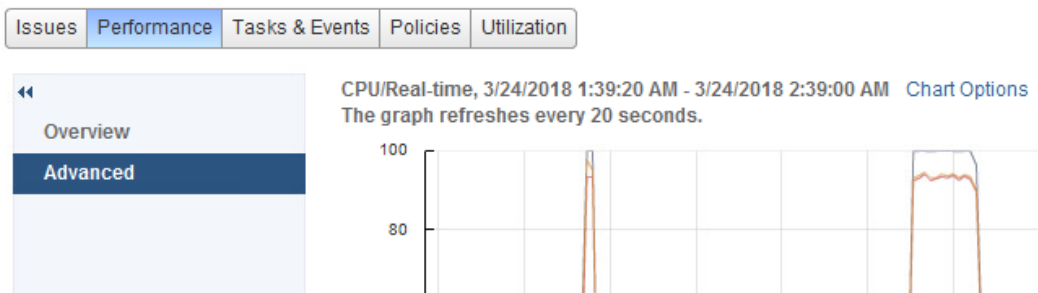
5. Verify that **CPU** is selected in the Chart Metrics pane.
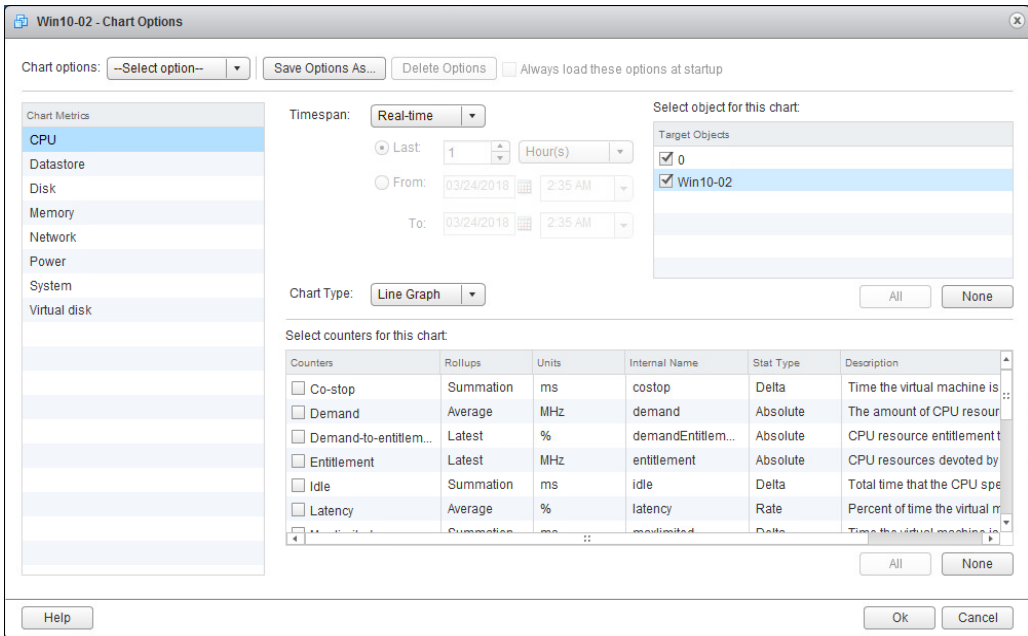
6. In the **Timespan** drop-down menu, verify that **Real-time** is selected.

7. In the Select object for this chart pane on the right, deselect the **Win10-02** virtual machine check box.
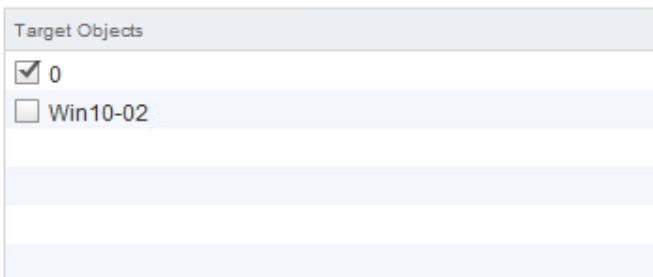
8. In the Select counters for this chart pane, click **None** to deselect all counters.

9. In the Select counters for this chart pane, select the **Ready** and **Used** check boxes and click **OK**.

The CPU/Real-time chart for the Win10-02 virtual machine opens.

CPU/Real-time, 3/24/2018 1:50:40 AM - 3/24/2018 2:50:20 AM   Chart Options
The graph refreshes every 20 seconds.

View: Default

Performance Chart Legend

K..	Object	Measurement	Rollup	Units	Latest	Maxi...	Mini...	Av..
■	0	Ready	Summation	ms	100...	112...	6	4...
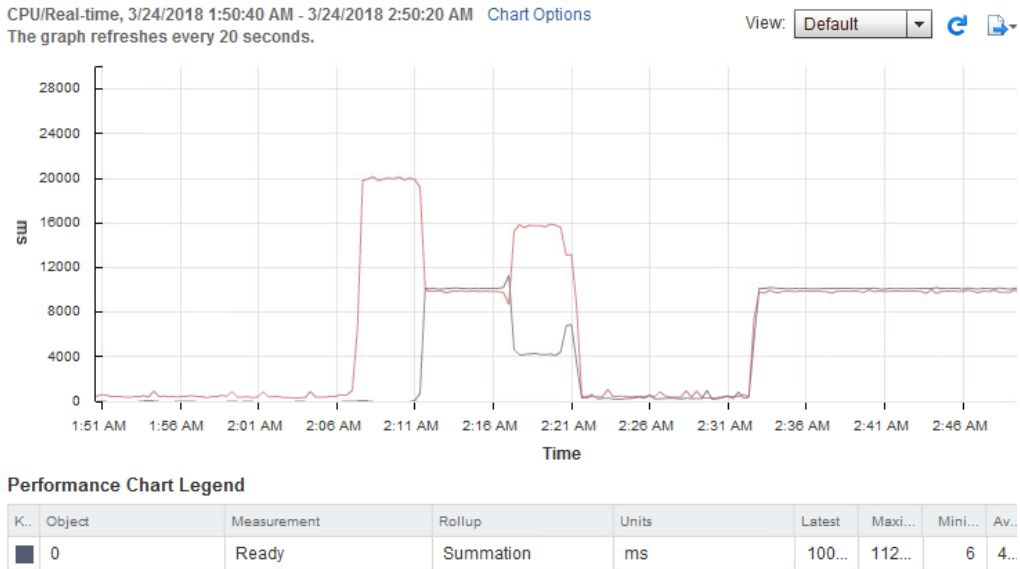
10. Open a new tab in your Firefox web browser and click the **vSphere Web Client** shortcut.

11. Click the **Home** icon and select **VMs and Templates** and expand the view.

12. In the Navigator pane, select the **Win10-04** virtual machine.

13. Repeat steps 3 through 9 to configure the CPU Performance graph for the Win10-04 virtual machine.

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

15. Record the current CPU ready value for each virtual machine and leave the Performance Chart windows open.

- Win10-02 _____
- Win10-04 _____

16. In each virtual machine console, press Ctrl+C in the Command Prompt window to stop the CPUBUSY script.

   CAUTION

   This script must be stopped in each virtual machine. If the script is left running, the next lab is affected.

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

18. Wait for the chart to be updated and compare the CPU ready value with what you recorded in step 15.

   Performance charts update every 20 seconds.

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

Task 3: Undo Changes Made to the Virtual Machines

You revert the configuration changes made to each virtual machine.

1. Close the second vSphere Web Client tab and the two virtual machine consoles.

2. In the first vSphere Web Client tab, remove the scheduling affinity value on the **Win10-02** virtual machine.

   a. In the Navigator pane, right-click the **Win10-02** virtual machine and select **Edit Settings**.

   b. Click the arrow next to CPU to expand the view.

   c. In the **Scheduling Affinity** text box, delete the value 1 and click **OK**.

3. Repeat step 2 to remove the scheduling affinity value on the Win10-04 virtual machine.

4. Right-click the Win10-02 virtual machine, select **Power > Shut Down the Guest OS**.

5. Click **Yes** to verify the guest shut down.

6. Repeat steps 4 and 5 for the Win10-04 virtual machine.

7. Leave vSphere Web Client open for the next lab.

8. Inform your instructor that you have completed this lab. If prompted, continue to the next lab.

Lab 15 Using Alarms

Objective: Use the vCenter Server Appliance alarm feature

In this lab, you perform the following tasks:

1. Create a Virtual Machine Alarm to Monitor a Condition

2. Create a Virtual Machine Alarm to Monitor an Event

3. Trigger Virtual Machine Alarms and Acknowledge the Alarms

4. Disable Virtual Machine Alarms

In this lab, you use vSphere Web Client to perform the tasks.

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

You create and use alarms to respond to selected events, conditions, and states that occur with objects in the vCenter Server inventory.

1. If vSphere Web Client is not active, open your Firefox web browser, click **vSphere Site-A** on the favorite bar, and select **vSphere Web Client (SA-VCSA-01)**.

2. Log in with the user name administrator@vsphere.local and the password VMware1!.

3. Click the **Home** icon and select **Hosts and Clusters**.

4. In the Navigator pane, right-click the **Win10-02** virtual machine and select **Alarms > New Alarm Definition** to open the New Alarm Definition wizard.

> **NOTE**
>
> Because you are creating an alarm for the Win10-02 virtual machine, this alarm monitors only that virtual machine. If you set the alarm on an object higher in the vCenter Server inventory, the alarm applies to multiple virtual machines. For example, if you create an alarm on the vCenter Server Appliance object, the alarm applies to all the virtual machines.

5. Enter `VM CPU Usage - Win10-02` in the General page **Alarm name** text box and click **Next**.

6. On the Triggers page, click **Add** (the green plus sign**)** to add the trigger conditions.

Option	Action
Trigger	Select **VM CPU Usage**.
Operator	Select **is above**.
Warning Condition	Double-click the current value and enter **50** (percent).
Condition Length	Double-click the current value and select **for 30 sec** from the drop-down menu.
Critical Condition	Double-click the current value and manually enter **75** (percent).
Condition Length	Leave the default setting at 5 minutes.

The screenshot shows the results of adding the trigger conditions.
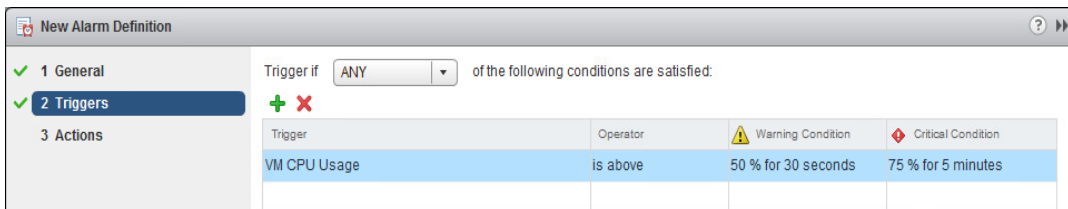
7. Click **Next**.

8. In the Actions page, click **Add** (the green plus sign**)** to configure the action settings.

Option	Action
Action	Select **Suspend VM** from the drop-down menu.
Configuration	Leave blank.
Green to Yellow	Select **Once** from the drop-down menu.
Yellow to Red	Change the setting from **Once** to **no value** in the drop-down menu.
Red to Yellow	Leave blank.
Yellow to Green	Leave blank.
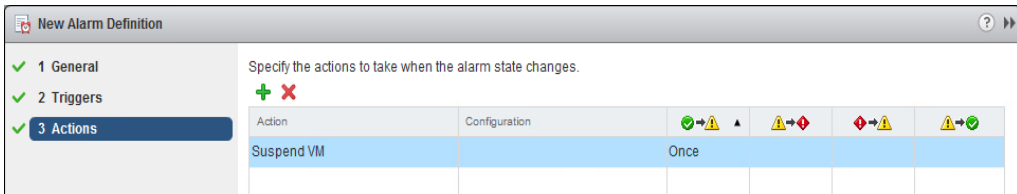
9. Click **Finish**.

10. In the Navigator pane, select the **Win10-02** virtual machine and click the **Monitor** tab.

11. On the **Issues** tab and select **Alarm Definitions**.

12. Verify that the VM CPU Usage - Win10-02 alarm appears in the alarm list for the Win10-02 virtual machine.
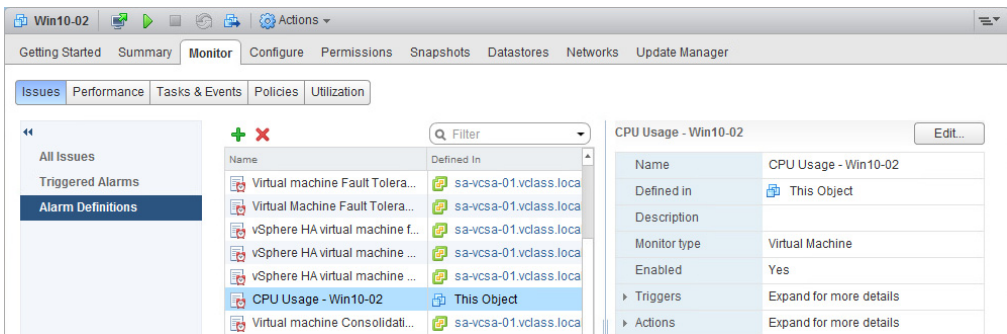
Task 2: Create a Virtual Machine Alarm to Monitor an Event

You set up general alarm settings, alarm triggers, trigger reporting, and alarm actions to monitor and react to a specified event.

1. In the Navigator pane, select **SA-Datacenter**, and click the **Monitor** tab.

2. On the **Issues** tab and select **Alarm Definitions**.

3. Click **Add** (the green plus sign) to add an alarm for the data center.

   The New Alarm Definition wizard starts.

4. Configure the alarm settings in the New Alarm Definition wizard **General** page.

Option	Action
Alarm name	Enter `VM Suspended - Win10-02`.
Monitor	Leave the default setting **Virtual Machines**.
Monitor for	Select **specific event occurring on this object, for example VM Power On.**
Enable this alarm	Leave the check box selected.

5. Click **Next**

6. On the Triggers page, click **Add** (the green plus sign) in the pane named Trigger if ANY of the following events occur.

7. Select **VM suspended** from the Event drop-down menu.

8. Click **Add** (the green plus sign) to specify the conditions for the alarm trigger to fire.

Option	Action
Argument	Select **VM name** from the Argument drop-down menu.
Operator	Leave **equal to** selected.
Value	Enter the virtual machine name `Win10-02`. The name is case-sensitive.
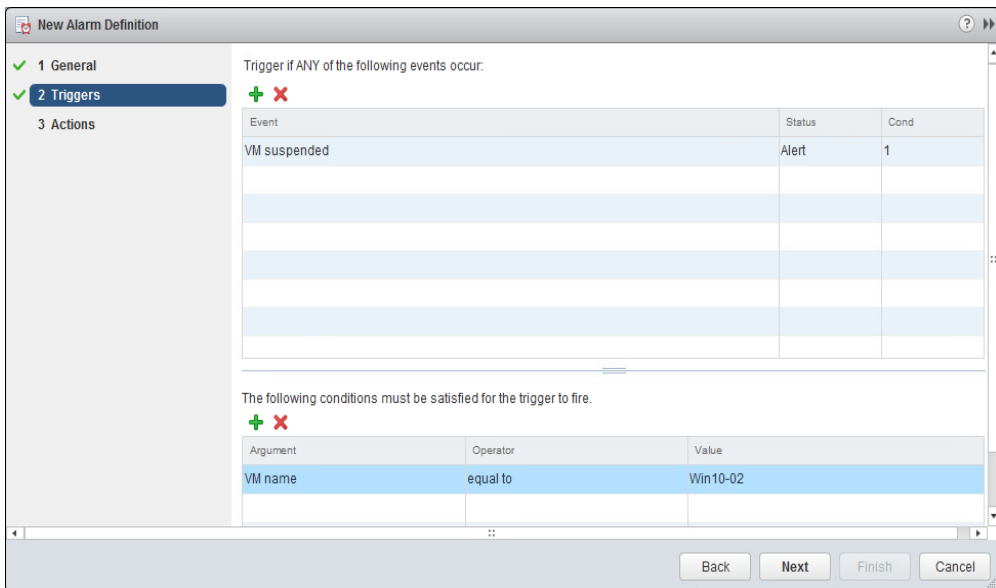
9. Click **Next**.

10. Leave the default settings in the Actions page and click **Finish**.

11. Verify that the VM Suspended - Win10-02 alarm appears in the alarm list for the data center.

Task 3: Trigger Virtual Machine Alarms and Acknowledge the Alarms

You acknowledge an alarm to discontinue it and inform others that you are taking ownership of the issue. Your acknowledged alarms are visible in the system. The alarms are neither cleared nor reset.

1. Power on the **Win10-02** virtual machine.

2. In the Navigator pane, select the **Win10-02** virtual machine.

3. On the **Monitor** tab, click **Issues** and select **Triggered Alarms**.

   The triggered alarms appear in this pane.

4. Open the console for the Win10-02 virtual machine.

5. You are logged in to the Win10-02 virtual machine as vclass\administrator with the password VMware1!.

6. Right-click **CPUBUSY** and select **Open with Command Prompt**.

7. Wait for at least 30 seconds before the alarm is triggered and the virtual machine is suspended.

8. Return to vSphere Web Client, refresh the Triggered Alarms pane and verify that the VM Suspended - Win10-02 alarm is triggered.

An entry for this alarm should appear in the Triggered Alarms list.
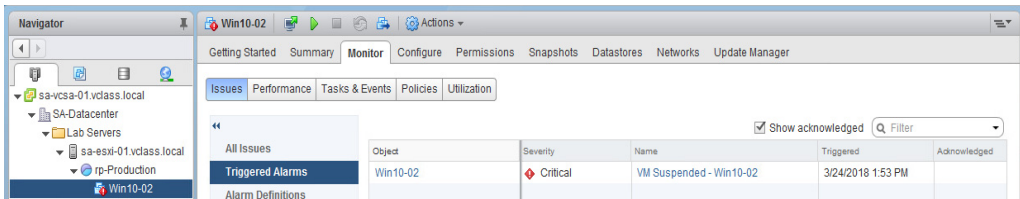
9. Right-click the **VM Suspended - Win10-02** alarm and select **Reset to Green**.

10. On the **Monitor** tab, click **Tasks & Events** and select **Events** in the middle pane.

The description `Manually cleared alarm 'VM Suspend - Win10-02 ' from Red` should appear in the list.

11. In the Navigator pane, right-click the suspended **Win10-02** virtual machine and select **Power > Power On**.

12. Reload and open the Win10-02 virtual machine console.

13. Press Ctrl+C at the command prompt to stop the `CPUBUSY` script.

14. Close the Win10-02 virtual machine console.

15. Right-click the **Win10-02** virtual machine and select **Power > Shut Down Guest OS**.

16. Click **Yes** to verify the Guest Shut Down operation.

17. Verify that the red alert icon is removed from the Win10-02 virtual machine in the Navigator pane.

Task 4: Disable Virtual Machine Alarms

You disable system built-in alarms or the alarms that you defined for specific objects.

1. Disable the VM CPU Usage - Win10-02 alarm.

    a. In the Navigator pane, select the **Win10-02** virtual machine.

    b. On the **Monitor** tab, click **Issues** and select **Alarm Definitions**.

    c. Select the **VM CPU Usage - Win10-02** alarm in the list.

    The VM CPU Usage - Win10-02 pane appears in the right pane.

    d. Click **Edit**.

    e. On the General page, deselect the **Enable this alarm** check box and click **Finish**.

2. Disable the VM Suspended - Win10-02 alarm.

    a. Select **SA-Datacenter** in the Navigator pane.

    b. On the Monitor tab in the middle pane, click **Issues** and select **Alarm Definitions**.

    c. Enter `VM suspended` in the search box.

    d. Right-click the **VM Suspended - Win10-02** alarm in the list and select **Edit**.

    e. On the General page, deselect the **Enable this alarm** check box and click **Finish**.

3. Leave vSphere Web Client open for the next lab.

4. Inform your instructor that you have completed this lab. If prompted, continue to the next lab.

Lab 16 Using vSphere HA

Objective: Use vSphere HA functionality

In this lab, you perform the following tasks:

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

In this lab, you use vSphere Web Client to perform the tasks.

Task 1: Create a Cluster Enabled for vSphere HA

You create a VMware vSphere® High Availability cluster to group multiple ESXi hosts together, to achieve higher levels of virtual machine availability than each ESXi host can provide individually.

1. If vSphere Web Client is not active, open your Firefox web browser, click **vSphere Site-A** on the favorite bar, and select **vSphere Web Client (SA-VCSA-01)**.
2. Log in with the user name administrator@vsphere.local and the password VMware1!.
3. Click the **Home** icon and select **Hosts and Clusters**.
4. Right-click the **SA-Datacenter** object in the Navigator pane and select **New Cluster**.

   The New Cluster dialog box appears.

5. Configure the new cluster.

Option	Action
Name	Enter `SA-Compute-01`.
DRS	Leave the check box deselected.
vSphere HA	Select the **Turn on** check box.

6. Leave the default settings for the other options and click **OK**.

7. In the Recent Tasks pane, monitor the progress as the cluster is created.

Task 2: Add Your ESXi Hosts to the Cluster

You plan the resources and networking architecture of your cluster, add hosts to it, and specify the vSphere HA settings.

1. Add both ESXi hosts to the **SA-Compute-01** cluster.

   a. Drag **sa-esxi-01.vclass.local** to SA-Compute-01.

   b. Drag **sa-esxi-02.vclass.local** to SA-Compute-01.

2. Click **Yes** in the Warning panel.

   Your existing resource pools collapse into the cluster root resource pool.

3. Monitor the Recent Tasks pane and wait for the Configuring vSphere HA task to complete.

   If the tasks do not appear in the Recent tasks pane, you can find them in the Task Console.

4. In the Navigator pane, select **SA-Compute-01** and click the **Monitor** tab.

5. Click **vSphere HA** and select **Summary** in the middle pane.

   The vSphere HA summary information appears.

6. Record the name of the master host. _____

   Q1. Does the number of protected virtual machines match the number of powered-on virtual machines in the cluster?
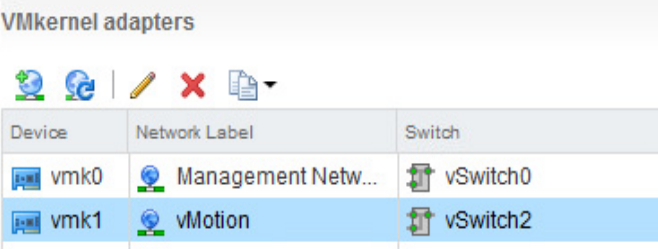
7. Select **Heartbeat** in the middle pane.

Q2. How many datastores are used to monitor heartbeat?

8. In the middle pane, select **Configuration Issues** and review the errors that are displayed.

   At this point, 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.

9. Select **sa-esxi-01.vclass.local** in the Navigator pane and click the **Configure** tab.

10. In the middle pane, navigate to Networking and select **VMkernel adapters**.

11. Select the **vMotion** VMkernel adapter.

12. Click the **Edit Settings** icon.

13. On the Port properties page, ensure that the **vMotion** check box is selected and select the **Management** check box.

14. Click **OK**.

15. In the Navigator pane, right-click **sa-esxi-01.vclass.local** and select **Reconfigure for vSphere HA**.

    NOTE

    You might need to refresh vSphere Web Client to eliminate any obsolete alarm icons.

16. Repeat step 9 through 15 for sa-esxi-02.vclass.local.

17. In the Navigator pane, select **SA-Compute-01** and click the **Monitor** tab.

18. Click **Issues** and select **All Issues** from the middle pane.

    Q3. Are the previous management configuration issues still displayed?

Task 3: 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 Navigator pane, select the master ESXi host that you recorded in task 2, step 6.

2. Click the **VMs** tab and ensure that **Virtual Machines** is selected.

3. Power on the Win10-02 virtual machine.

4. Record the name of one or more powered-on virtual machines on the master host. _____

5. In the Navigator pane, select **SA-Compute-01**.

6. On the Monitor tab, click **vSphere HA** and select **Summary** from the middle pane.

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.

   Verifying that Virtual Machines Unprotected field value is 0 indicates that it is safe to reboot the host.

8. Simulate a host failure by rebooting the master host in the cluster.

   IMPORTANT

   Ensure that you reboot the system. Do not shut down the system.

   a. 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. On the Monitor tab, click **Tasks & Events** and select **Events** in the middle pane.

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

   The initial messages from the hosts might show failures. These messages indicate that the virtual machines on the downed host have failed. The virtual machines take 1 to 2 minutes to successfully restart on the new host.

10. Wait for an additional 1 to 2 minutes for the ESXi host that you rebooted in step 5 to enter an error state.

11. In the Navigator pane, select the ESXi host that is in an error state, indicated with a red error icon.

12. Click the **VMs** tab.

> **Q1. Do you see the virtual machines that were running on the original master ESXi host, which you recorded earlier?**

13. In the Navigator pane, select **SA-Compute-01**.

14. On the **Monitor** tab, click **vSphere HA**.

15. In the middle pane, select **Summary**.

> **Q2. Has the master host changed?**

16. Monitor the original master ESXi host in the Navigator pane until it is fully running again.

    It might take 5 minutes for the original master host to become fully running.

Task 4: View the vSphere HA Cluster Resource Usage

You examine the CPU, memory, and storage I/O resource usage information of the cluster.

1. On the **Monitor** tab, click **Resource Reservation**.

2. Select **CPU** from the middle pane and record the information for the cluster.

    • Total Reservation Capacity (GHz) _____

    • Used Reservation (GHz) _____

    • Available Reservation (GHz) _____

3. In the bottom pane, verify that the CPU reservation is not set on the virtual machines.

    The Reservation column shows 0 (MHz).

Name	1 ▲	Reservation (MHz)	Limit (MHz)	Type
Win10-02		0	Unlimited	Fixed
Win10-03		0	Unlimited	Fixed
Win10-04		0	Unlimited	Fixed

4. In the middle pane, select **Memory** and record the information for the cluster.

   - Total Reservation Capacity (GB) _____

   - Used Reservation (GB) _____

   - Available Reservation (GB) _____

5. In the bottom pane, verify that the memory reservation is not set on the virtual machines.

   The Reservation column shows 0 (MB).

Task 5: Manage vSphere HA Slot Size

You configure admission control to ensure that sufficient resources are available in a cluster to provide failover protection and to ensure that the virtual machine resource reservations are respected.

1. In the Navigation pane, right-click **SA-Compute-01** and select **Settings**.

2. Navigate to Services, and select **vSphere Availability**.

   The Edit Cluster Settings wizard opens.

3. In the right pane, click **Edit**.

4. In the left pane, select **Admission Control**.

5. In the **Define host failover capacity by** drop-down menu, select **Slot Policy (powered-on VMs)** and click **OK**.

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

7. Click **vSphere HA,** and select **Summary** from the middle pane.

8. In the right pane, scroll down to the **Advanced Runtime Info** pane and record the slot information for this cluster.

   - Slot size: CPU _____ (MHz), Memory _____ (MB)

   - Total slots in cluster _____

   - Used slots _____

   - Available slots _____

   - Failover slots _____

9. In the Navigator pane, click the **VMs and Templates** icon.

10. Expand **SA-Datacenter > Lab VMs**, and power on the **Win10-04** virtual machine.

11. Set the CPU reservation on the Win10-04 virtual machine.

    a. Right-click the **Win10-04** virtual machine and select **Edit Settings**.

    b. Click the arrow next to **CPU** to expand the view.

    c. In the **Reservation** text box, enter `512` (MHz) and click **OK**.

12. In the Navigator pane, click the **Hosts and Clusters** icon.

13. In the Navigator pane select **SA-Compute-01**.

14. Return to the **Advanced Runtime Info** pane and view the slot information for this cluster.

    a. In the Advanced Runtime Info pane, verify that the slot size for the CPU changed from the value recorded in step 8.

    b. Record the information shown in the **Slot size** text box.

    Slot size: CPU _____ (MHz), Memory _____ (MB)

15. Use the vSphere HA slot size policy to enforce a slot size.

    a. In the Navigator pane, right-click **SA-Compute-01** and select **Settings**.

    b. In the middle pane select **vSphere Availability** and click **Edit**.

    The Edit Cluster Settings wizard opens.

    c. In the left pane, select **Admission Control**.

d. In the Define host failover capacity by pane, click **Fixed slot size**.
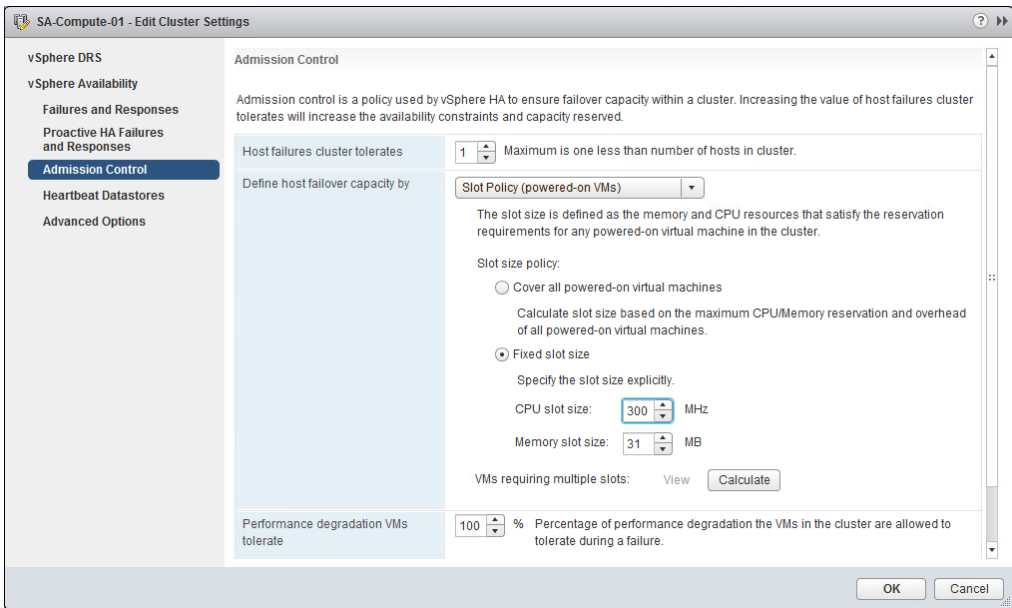
e. In the **CPU slot size** text box, enter `300` (MHz) to change the CPU slot size.

f. Click **Calculate** next to VMs requiring multiple slots, then click the **View** link.

The VMs Requiring Multiple Slots window appears.
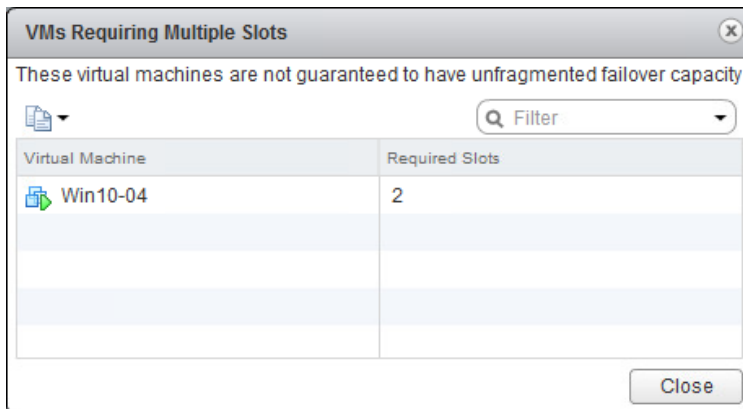
g. Record the Required Slots value for the Win10-04 virtual machine. _____

Because the CPU slot size has a fixed value of 300 MHz, the Win10-04 virtual machine with the 512 MHz CPU reservation uses two slots to power on.

h. Click **Close** and click **OK** to exit the Edit Cluster Settings window.

16. View the slot information for the SA-Compute-01 cluster.

a. Return to the Advanced Runtime Info pane, record the information shown in the **Slot size** text box and compare with the values recorded earlier.

Slot size: CPU _____ (MHz), Memory _____ (MB)

17. Remove the vSphere HA fixed slot size setting.

a. In the Navigator pane, right-click **SA-Compute-01** and select **Settings**.

b. In the middle pane, select **vSphere Availability** and click **Edit**.

The Edit Cluster Settings wizard opens.

c. In the left pane, select **Admission Control**.

d. In the Define host failover capacity by pane, select **Cover all powered-on virtual machines** for the slot size policy.

e. Click **OK**.

18. Remove the CPU reservation on the Win10-04 virtual machine.

a. In the Navigator pane, right-click the **Win10-04** virtual machine and select **Edit Settings**.

b. Click the arrow next to **CPU** to expand the view.

c. Enter 0 (MHz) in the **Reservation** text box and click **OK**.

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

You use admission control to impose constraints on resource usage and ensure that sufficient resources are available in a cluster to provide failover protection. Any actions violating the constraints are not permitted.

In the previous task, when you configured the cluster under Define host failover capacity, you configured vSphere HA to calculate slots. vSphere HA calculates the space for a virtual machine to run based on the largest CPU and memory reservation across all powered-on virtual machines in the cluster. This feature is called strict admission control.

1. Shut down the Guest OS for all the virtual machines.

2. Verify the shut down operation and wait for the process to compete.

Wait another minute for the system to release the memory.

3. In the Navigator pane, select **SA-Compute-01** and click the **Summary** tab.

4. Record the memory information for this cluster.

    - Capacity (total) _____

    - Used _____

    - Free _____

    Your view should be similar to the screenshot.

    ```
    CPU                        FREE: 22.18 GHz

    USED: 220.00 MHz           CAPACITY: 22.40 GHz

    MEMORY                     FREE: 13.39 GB

    USED: 2.61 GB              CAPACITY: 16.00 GB

    STORAGE                    FREE: 156.67 GB

    USED: 133.98 GB            CAPACITY: 290.66 GB
    ```
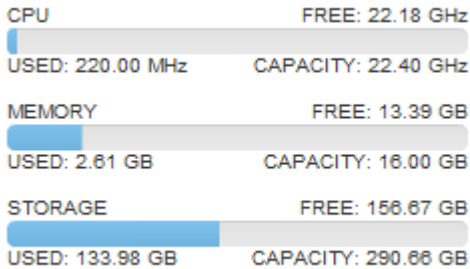
    Q1.   Why is the free memory value for the cluster less than the total memory capacity value?

5. Click the **Monitor** tab, click **Resource Reservation**, and select **Memory** in the middle pane.

6. Assign a 2000 MB memory reservation to the Win10-02 virtual machine.

    a. In the lower pane, right-click the **Win10-02** virtual machine and select **Edit Resource Settings**.

    b. In the **Memory** memory pane, enter **2000** (MB) in the **Reservation** text box and click **OK**.

    c. Repeat steps a through c to set the memory reservation on the Win10-03 and Win10-04 virtual machines.

7. On the **Monitor** tab, and click **vSphere HA**.

8. Select **Summary** in the middle pane.

9. In the Advanced Runtime Info pane, record the value shown in the **Total slots in cluster** text box. _____

    Q2.   Why does vSphere Web Client report N/A as the value?

10. In the Navigator pane, right-click the **Win10-02** virtual machine and select **Power** > **Power On**.

11. Return to the Advanced Runtime Info pane of SA-Compute-01 and click **Refresh** in the lower-right corner of the pane.

12. Record the slot size values that appear.

   • CPU (MHz) _____, Memory (MB) _____

13. View the effect that powering on this virtual machine has on your cluster.

   Q3. **How many total slots in the cluster, used slots, available slots, and failover slots do you see?**

   | NOTE |

   The Advanced Runtime Info pane might display a smaller number of available slots in the cluster than you expect.

   Slot size is calculated using the largest reservations plus the memory overhead of any powered on virtual machines in the cluster. However, vSphere HA admission control considers only the resources on a host that are available for virtual machines. This amount is less than the total amount of physical resources on the host, because some overhead exists.

   Q4. **How is the memory slot size calculated?**

14. In the Navigator pane, right-click the **Win10-04** virtual machine and select **Power > Power On**.

15. Return to the Advanced Runtime Info pane of SA-Compute-01 and click **Refresh**.

16. View the slot information.

   Q5. **How many slots are available and what is the reason?**

17. In the Navigator pane, right-click the **Win10-03** virtual machine and select **Power** > **Power On**.

18. Monitor the Recent tasks pane.

      Q6. **Is your virtual machine allowed to power on, and what is the reason?**

Task 7: Prepare for the Next Lab

You remove the memory reservations on virtual machines and disable admission control when they are no longer needed.

1. Remove the memory reservation on each of the virtual machines.

    a. Right-click the **Win10-02** virtual machine and select **Edit Resource Settings**.

    b. In the Memory section, enter **0** (MB) in the **Reservation** text box and click **OK**.

    c. Repeat steps a and b to remove the memory reservation on the Win10-03 and Win10-04 virtual machines.

2. In the Navigator pane, right-click the **Lab Servers** folder and select **Remove from Inventory**.

3. Click **Yes** to verify the operation.

4. Edit the settings of the cluster to allow the number of running virtual machines to exceed the failover capacity of the cluster.

    a. In the Navigator pane, right-click **SA-Compute-01** and select **Settings**.

    b. In the middle pane, select **vSphere Availability** and click **Edit**.

    The Edit Cluster Settings wizard opens.

    c. In the left pane, click **Admission Control**.

    d. From the **Define host failover capacity by** drop-down menu, select **Disabled**.

    e. Click **OK** to commit your changes.

5. Right-click the **Win10-03** virtual machine in the Navigator pane and select **Power** > **Power On**.

6. Leave vSphere Web Client open for the next lab.

7. Inform your instructor that you have completed this lab. If prompted, continue to the next lab.

Lab 17 Implementing vSphere DRS Clusters

Objective: Implement a vSphere DRS cluster

In this lab, you perform the following tasks:

1. Create a Load Imbalance

2. Create a vSphere DRS Cluster

3. Verify Proper vSphere DRS Cluster Functionality

4. Create, Test, and Disable a VM-VM Affinity Rule

5. Create, Test, and Disable an Anti-Affinity Rule

6. Create, Test, and Disable a VM-Host Affinity Rule

In this lab, you use vSphere Web Client to perform the tasks.

Task 1: Create a Load Imbalance

You create a load imbalance across the ESXi hosts in the SA-Compute-01 cluster to test how VMware vSphere® Distributed Resource Scheduler™ works.

1. If vSphere Web Client is not active, open your Firefox Web browser, click **vSphere Site-A** on the favorite bar, and select **vSphere Web Client (SA-VCSA-01)**.

2. Log in with the user name administrator@vsphere.local and the password VMware1!.

3. Click the **Home** icon and select **Hosts and Clusters**.

4. Select **sa-esxi-01.vclass.local**.

5. On the VMs tab, if virtual machines are present on sa-esxi-01.vclass.local, migrate the virtual machines to sa-esxi-02.vclass.local.

IMPORTANT

Change compute resource only when migrating VMs.

6. In the Navigator pane, select **sa-esxi-02.vclass.local**.

7. On the **VMs** tab, click **Virtual Machines**.

    Compare the list of VMs shown in the list to the VMs shown in the Navigator pane.
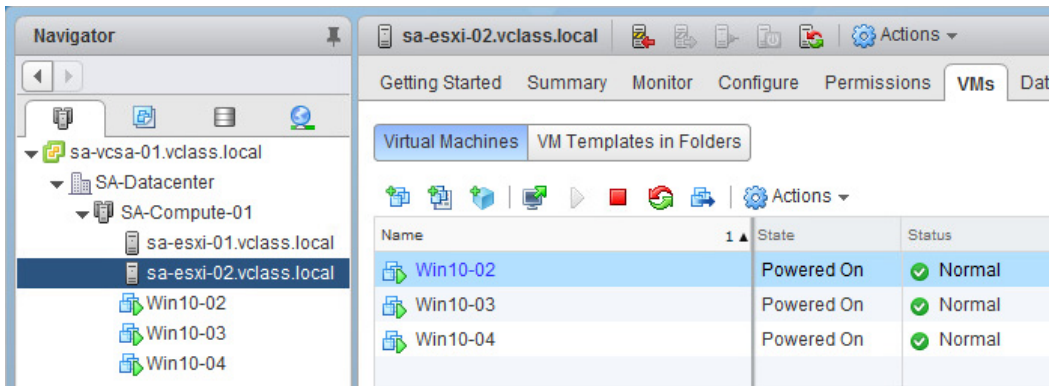
8. Ensure that all the VMs are powered on.

9. Start the CPUBUSY script on each of the virtual machines.

    a. Right-click **Win10-02** and select **Open Console**.

    b. You are logged in as vclass\administrator with the password VMware1!.

    c. Right-click the **CPUBUSY** script on each virtual machine's desktop and select **Open with Command Prompt**.

        The number of running CPUBUSY instances required to cause vSphere DRS to migrate virtual machines to another host varies, depending on the resource capacity of the lab infrastructure.

    d. Repeat steps a through c for Win10-03 and Win10-04.

Task 2: Create a vSphere DRS Cluster

You create a vSphere DRS cluster to balance the computing capacity among all the ESXi hosts and the associated virtual machines without service interruption.

1. In the Navigator pane, right-click the **SA-Compute-01** cluster and select **Settings**.

2. Select **vSphere DRS** from the middle pane.

3. Click **Edit**.

   The Edit Cluster Settings wizard opens.

4. Select the **Turn On vSphere DRS** check box.

5. Select **Manual** from the **DRS Automation** drop-down menu.

6. Click the arrow next to DRS Automation to expand the view and move the **Migration Threshold** slider to **Aggressive**, which is to the right side of the slider.

7. Leave other settings at their default values and click **OK**.

Task 3: Verify Proper vSphere DRS Cluster Functionality

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

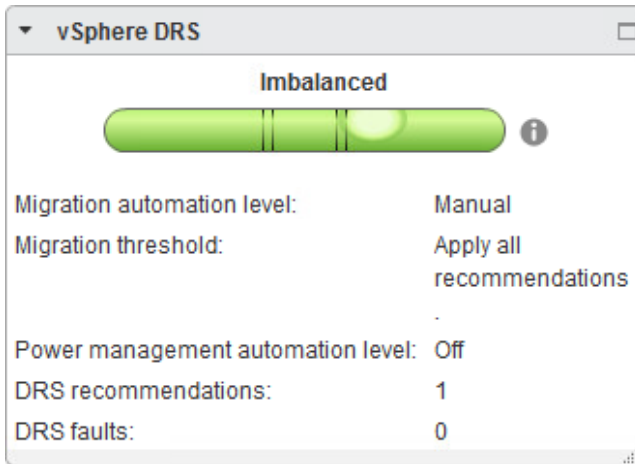1. Click the **Monitor** tab and click **vSphere DRS**.

   If you do not see the expected buttons, refresh vSphere Web Client.

2. Click **Run DRS Now**.

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

3. Click the **Summary** tab and click the arrow next to vSphere DRS to expand the pane.

The screenshot shows the expanded view of the vSphere DRS pane.

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

4. Click the **Monitor** tab, on **vSphere DRS**, and select **CPU Utilization**.

5. In the Sum of Virtual Machine CPU Utilization - Per Host pane, view the CPU consumption on each ESXi host and click each of the colored boxes to view the CPU consumption of each virtual machine.

The screenshot shows the CPU utilization information of the ESXi host and the virtual machine.
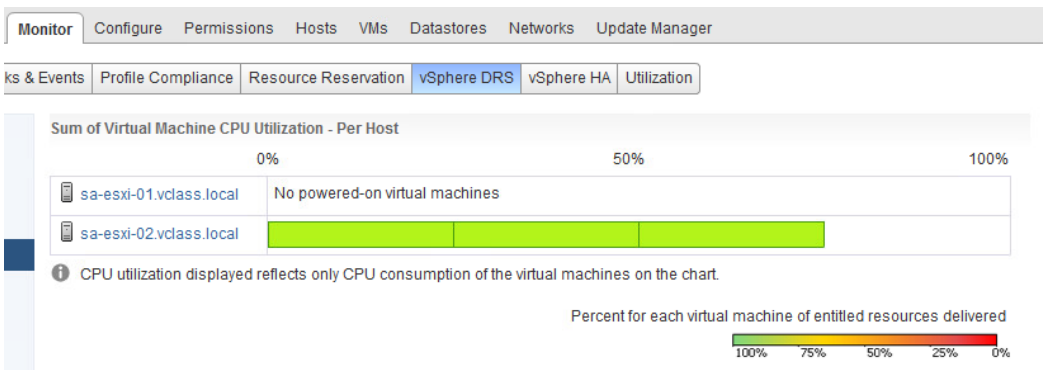
6. In the middle pane, select **Recommendations** and view the vSphere DRS recommendations.

   The screenshot shows a sample recommendation made by vSphere DRS to migrate a virtual machine from one host to another host.

   If vSphere DRS recommendations do not appear, refresh vSphere Web Client.

DRS Recommendations

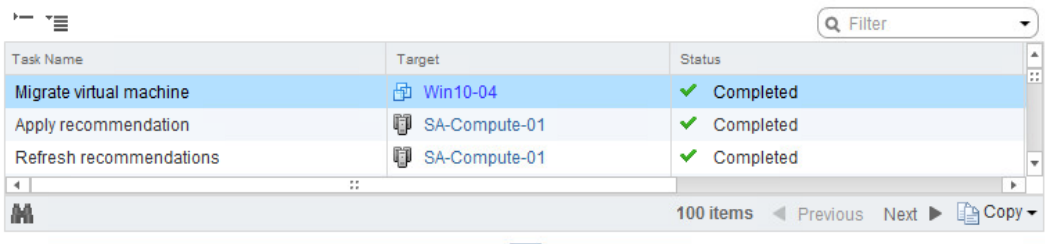| Apply	Priority	Recommendation	Reason
☑	2	Migrate Win10-03 from sa-esxi-02.vclass.local to sa-esxi-01.vclass.local	Balance average memory loads

7. Click **Apply Recommendations**.

   If your recommendations have expired, click **Run DRS Now** to generate new recommendations and apply them.

   If new recommendations do not appear, refresh your browser.

   You may need to click **Run DRS Now** and click **Apply Recommendations** the second time.

8. On the **Monitor** tab and click **Tasks & Events**.

9. Select **Tasks** in the middle pane.

10. Click the **Expand All** icon.

Task Name	Target	Status
Migrate virtual machine	Win10-04	✔ Completed
Apply recommendation	SA-Compute-01	✔ Completed
Refresh recommendations	SA-Compute-01	✔ Completed

100 items ◀ Previous   Next ▶ Copy ▾

Migrate virtual machine

Status: ✔ Completed
Initiator: System
Target: Win10-04
Server: sa-vcsa-01.vclass.local

11. Monitor the Migrate virtual machine task until completion.

12. Click **vSphere DRS** and click **Run DRS Now** to force vSphere DRS to evaluate the cluster status.

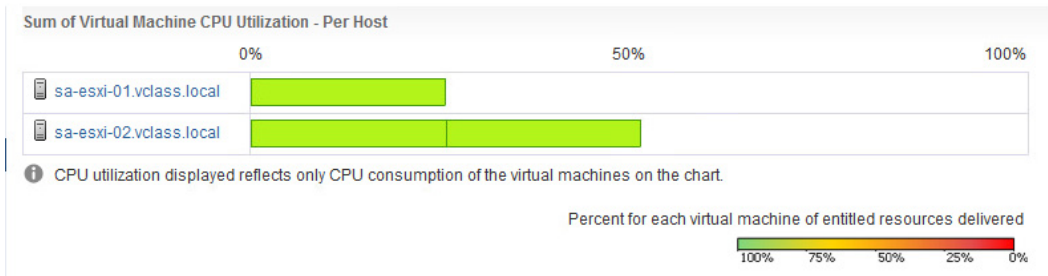> **Q2. Is any recommendation shown?**

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

> **Q3. Does the gauge show that the load is balanced?**

14. Click the **Monitor** tab and click the **vSphere DRS** tab.

15. Select **CPU Utilization**.

The virtual machines should spread across the two ESXi hosts. You can refresh the screen to see the result.

16. In each virtual machine console, press Ctrl+C to stop the `CPUBUSY` script.

17. Close the virtual machine consoles.

Task 4: Create, Test, and Disable a VM-VM Affinity Rule
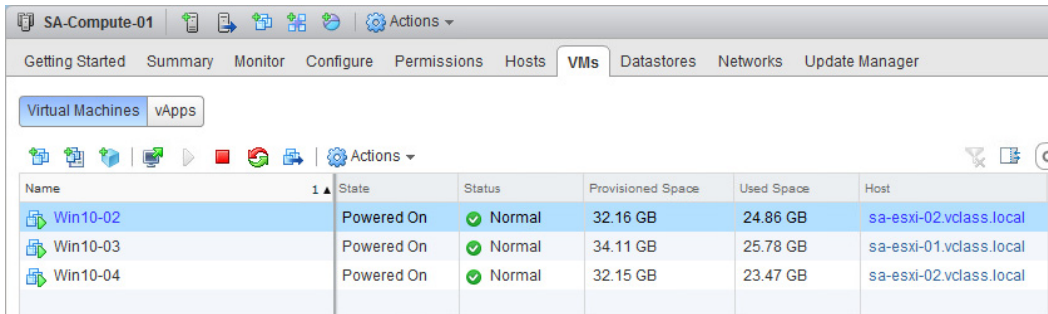
You use VM-VM affinity rules to specify whether the selected individual virtual machines should run on the same host or be kept on separate hosts.

1. In the Navigator pane, select **SA-Compute-01** and click the **VMs** tab.

2. Point to the gray row of column names, right-click the row, and select **Show/Hide Columns**.

3. Select the **Host** check box from the list and click **OK**.

The Host column appears in the table.

You can drag the **Host** column to the left so that it is easily visible.

4. Based on the information in the Name and Host columns, verify that all the virtual machines are not running on a single ESXi host.

Having virtual machines reside on two different ESXi hosts is necessary to test the validity of the VM/Host rule that you create in the later steps. If you have one virtual machine on each ESXi host in the cluster, no action is necessary.

5. In the Navigator pane, right-click **SA-Compute-01** and select **Settings**.

6. Select **VM/Host Rules** in the middle pane.

7. In the VM/Host Rules pane, click **Add**.

    The Create VM/Host Rule dialog box appears.

8. Configure the options for the VM/Host rule.

    a. In the **Name** text box, enter `Colocate-Win10-VMs`.

    b. Leave the **Enable rule** check box selected.

    c. From the **Type** drop-down menu, select **Keep Virtual Machines Together**.

    d. Click **Add** to add members.

    e. Select the check boxes for the Win10-02 and Win10-03 virtual machines and click **OK**.

9. Click **OK** to close the Create VM/Host Rules dialog box.

10. Click the **Monitor** tab and click **vSphere DRS**.

11. Select **Recommendations** and click **Run DRS Now**.

> **Q1. Do you see any recommendations, and why?**

The first recommendation moves Win10-03 off of the sa-esxi-01.vclass.local to maintain cluster balance.

The second migration is based on the vSphere DRS affinity rule that you created. The migrate Win10-04 recommendation is assigned priority 1 because it is attempting to fix a broken affinity rule. Therefore, even if vSphere DRS was configured to Conservative, this recommendation would appear.
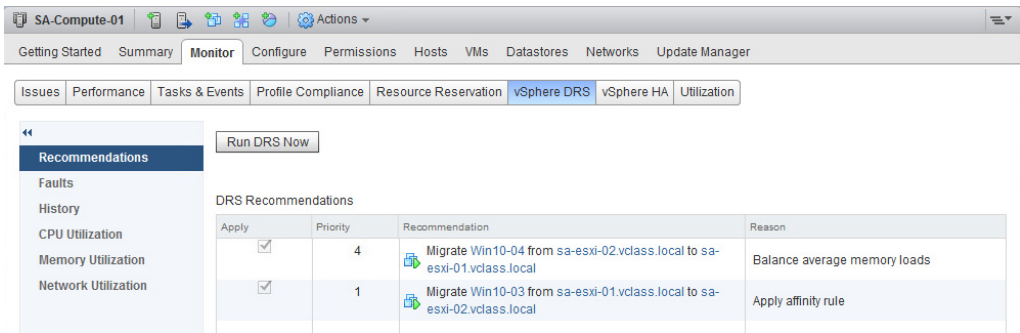
12. Click **Apply Recommendations** and wait for the virtual machine migrations to complete.
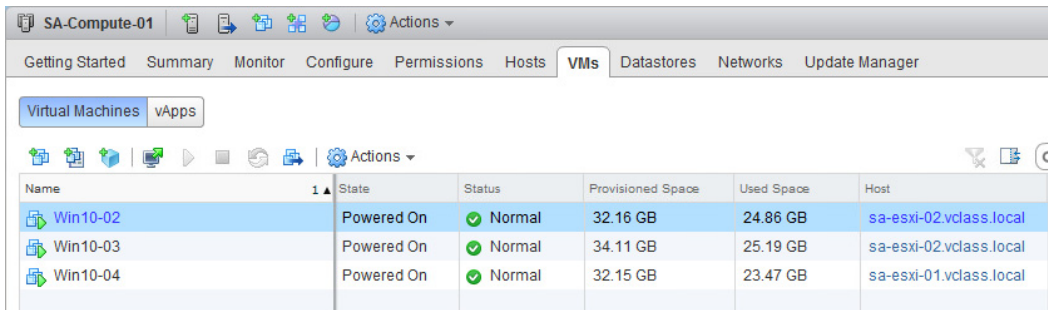
The virtual machines associated with your affinity rule should be migrated to one of the two hosts in the vSphere DRS cluster.

13. Click the **Monitor** tab and click **Tasks & Events** to view the progress of the virtual machine migration and wait for its completion.

14. Click the **VMs** tab.

15. Click the **Host** column heading to sort the virtual machines by the ESXi host on which they reside.

The Win10-02 and Win10-03 virtual machines should be running on the same ESXi host.

Name	1 ▲	State	Status	Provisioned Space	Used Space	Host
Win10-02		Powered On	⊘ Normal	32.16 GB	24.86 GB	sa-esxi-02.vclass.local
Win10-03		Powered On	⊘ Normal	34.11 GB	25.19 GB	sa-esxi-02.vclass.local
Win10-04		Powered On	⊘ Normal	32.15 GB	23.47 GB	sa-esxi-01.vclass.local

16. Click the **Configure** tab, and select **VM/Host Rules** in the middle pane.

17. In the VM/Host Rules pane, select your affinity rule and click **Edit** above the rule.

18. Deselect the **Enable rule** check box and click **OK**.

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

You create a vSphere DRS anti-affinity rule to force the specified virtual machines to be kept on separate hosts.

1. In the VM/Host Rules pane, click **Add**.

2. Configure the options for this VM/Host rule.

   a. In the **Name** text box, enter `Separate-Win10-VMs`.

   b. Keep the **Enable rule** check box selected.

   c. From the **Type** drop-down menu, select **Separate Virtual Machines**.

   d. Click **Add**.

   e. Select the check boxes for the **Win10-02** and **Win10-03** virtual machines own and click **OK**.

3. Click **OK** to close the Create VM/Host Rules dialog box.

4. Click the **Monitor** tab and click **vSphere DRS**.

5. In **Recommendations** and click **Run DRS Now**.

   If new recommendations do not appear, refresh vSphere Web Client.

   The new recommendation is marked as priority 1 as a result of your vSphere DRS rules.
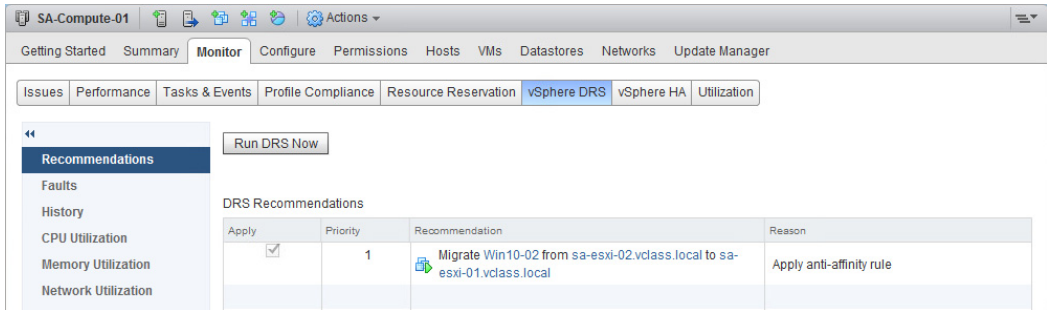
6. Click **Apply Recommendations**.

7. Click the **Monitor** tab and click **Tasks & Events** to view the progress of the virtual machine migration and wait for the virtual machine migration to complete before you proceed to the next step.

8. Click the **VMs** tab.

9. View the information shown in the Host column.

   As a result of your anti-affinity rule, you should see that the virtual machines associated with your anti-affinity rule are placed on two different ESXi hosts.
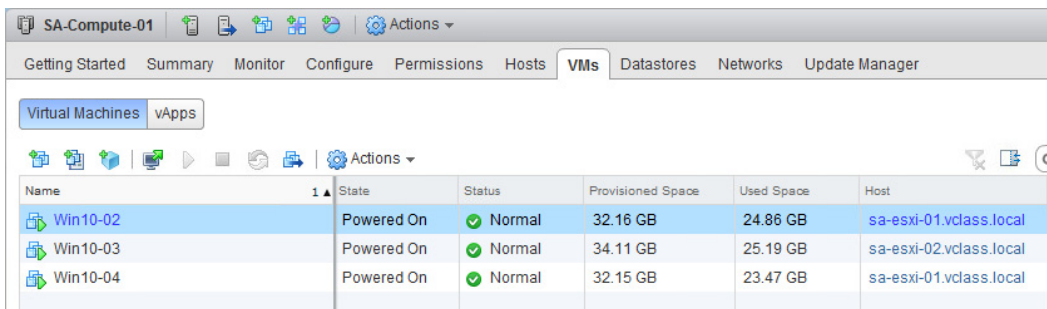
10. Click the **Configure** tab and return to **VM/Host Rules**.

11. In the VM/Host Rules pane, select the **Separate-Win10-VMs** rule.

12. Click **Delete** above the pane and click **Yes** to verify the deletion.

Task 6: Create, Test, and Disable a VM-Host Affinity Rule

You use VM-Host affinity rules to specify whether the members of a selected virtual machine vSphere DRS group can run on the members of a specific host vSphere DRS group.

1. In the middle pane, select **VM/Host Groups**.

2. In the VM/Host Groups pane, click **Add**.

3. In Create VM/Host Group dialog box, configure the options for this rule.

   a. In the **Name** text box, enter `Win10-VMs`.

   b. Verify that **VM Group** is selected from the **Type** drop-down menu.

   c. Click **Add**.

   d. Select the check boxes for the **Win10-03** and **Win10-04** virtual machines.

   e. Click **OK**.

   f. Click **OK** to close the dialog box.

4. In the VM/Host Groups pane, click **Add**.

5. When the Create VM/Host Group dialog box appears, configure the options.

   a. In the **Name** text box, enter `Win10-Host`.

   b. From the **Type** drop-down menu, select **Host Group**.

   c. Click **Add**.

   d. Select the check box for **sa-esxi-02.vclass.local** and click **OK**.

   e. Click **OK** to close the dialog box.

6. Select **VM/Host Rules** in the middle pane.

7. In the VM/Host Rules pane, click **Add**.

8. When the Create VM/Host Rules dialog box appears, configure the options.

   a. In the **Name** text box, enter `Run-only-on-host2`.

   b. Keep the **Enable rule** check box selected.

   c. From the **Type** drop-down menu, select **Virtual Machines to Hosts**.

   d. From the **VM Group** drop-down menu, select **Win10-VMs.**

   e. Select **Must run on hosts in group** from the drop-down menu.

   f. From the **Host Group** drop-down menu, select **Win10-Host**.

   g. Click **OK** to close the dialog box.

9. Click the **Monitor** tab and click **vSphere DRS**.

10. Select **Recommendations** in the middle pane and click **Run DRS Now**.

     Q1.   What recommendations did vSphere DRS make and why?

11. If there are recommendations, click **Apply Recommendations**.

12. Click the **Monitor** tab and click **Tasks & Events** to view the progress of the virtual machine migration and wait for its completion.

    The Win10 virtual machines are migrated as necessary so that they both reside on the second ESXi host.

13. Click the **VMs** tab.

14. Click the **Host** column heading to sort the virtual machines by the ESXi host on which they reside.

    Your Win10-03 and Win10-04 virtual machines that were running on different ESXi hosts are both running on sa-esxi-02.vclass.local.

15. In the Navigator pane, right-click the **Win10-03** virtual machine and select **Migrate**.

    The Migrate wizard starts.

16. On the Select the migration type page, click **Change computer resource only** and click **Next**.

17. On the Select a compute resource page, click **Clusters** and click **SA-Compute-01**.

    In the Compatibility pane, you might notice the `Virtual machine 'Win10-03' on host 'sa-esxi-01.vclass.local' would violate a virtual machine - host affinity rule` message.

    This issue is due to a conflict of the rules that you created and your migration attempt.
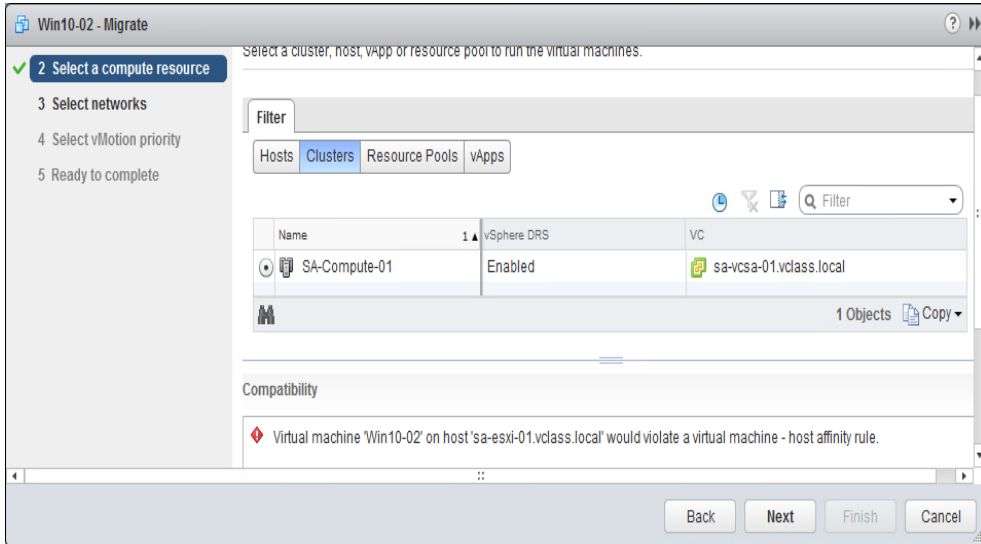
18. Click **Cancel** to cancel the migration.

19. Return to the **Configure** tab, and select **VM/Host Rules** in the middle pane.

20. In the VM/Host Rules pane, select your **Run-only-on-host2** rule and click **Edit** above the rule.

21. Deselect the **Enable rule** check box and click **OK**.

22. Leave vSphere Web Client open for the next lab.

23. Inform your instructor that you have completed this lab. If prompted, continue to the next lab.

Lab 18 Using vSphere Update Manager

Objective: Install, configure, and use vSphere Update Manager

In this lab, you perform the following tasks:

1. Modify the Cluster Settings

2. Configure vSphere Update Manager

3. Create a Patch Baseline

4. Attach a Baseline and Scan for Updates

5. Stage the Patches onto the ESXi Host

6. Remediate the ESXi Host

In this lab, you use vSphere Web Client to perform the tasks.

Task 1: Modify the Cluster Settings

You enable vSphere DRS in the fully-automated mode so that vSphere DRS determines the best possible distribution of virtual machines among your ESXi hosts and automatically performs the migration.

1. On the vSphere Web Client Home page, select **Hosts and Clusters**.

2. If not already selected, select **SA-Compute-01** in the Navigator pane.

3. Right-click **SA-Compute-01** and select **Settings**.

4. Select **vSphere DRS** and click **Edit**.

   The Edit Cluster Settings dialog box appears.

5. On the vSphere DRS page, select **Fully Automated** from the **DRS Automation** drop-down menu.

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

6. In the left pane of the Edit Cluster Settings window, select **Admission Control**.

7. Verify that **Disabled** is selected from the **Define Host Failover capacity By** drop-down menu.

8. Click **OK**.

9. Click the **Monitor** tab for SA-Compute-01, then click the **Resource Reservation** tab.

10. Select **CPU** and review the Reservation (MHz) column to verify that no CPU reservations are assigned to virtual machines.

11. Select **Memory** and review the Reservation (MB) column to verify that no memory reservations are assigned to virtual machines.

   CAUTION

   Removing CPU and memory reservations is necessary in this lab environment for training purposes. In a production environment, you might not need to remove them.

Task 2: Configure vSphere Update Manager

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

1. Click the Home icon and select **Update Manager**.

2. In the Navigator pane, select **sa-vcsa-01.vclass.local**.

3. In the right pane, click the **Manage** tab.

4. In the middle pane, select **Download Settings**.

5. In the Download Settings pane, click **Import Patches**.
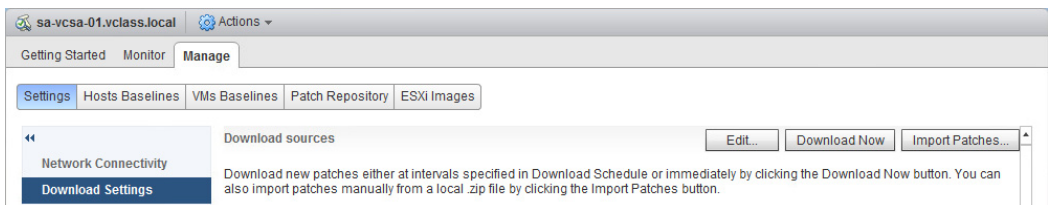
6. Click **Browse**, navigate to the `Desktop\Class Materials and Licenses\Class Folder`, select the **ESXi670-2018xxxxx.zip** file, and click **Open**.

7. Wait until the patch bundle has been uploaded and the `Patch file upload is successful` message is displayed.

8. Click **Next**.

9. If a security warning appears, select the **Install this certificate and do not display any security warnings** check box and click **Ignore**.

10. When the import operation is complete, click **Finish**.

Task 3: Create a Patch Baseline

You create a baseline to specify the requirements that should be met by vSphere objects, such as virtual machines, ESXi hosts, or virtual appliances. Your patch baseline contains a collection of patches, extensions, or upgrades.

1. Click the **Hosts Baselines** tab, and click **New Baseline** to open the New Baseline wizard.

2. On the Name and Type page, enter `ESXi Host Update` in the **Name** text box.

3. In the **Description** text box, enter `Patch for ESXi Host 6.7` and click **Next**.
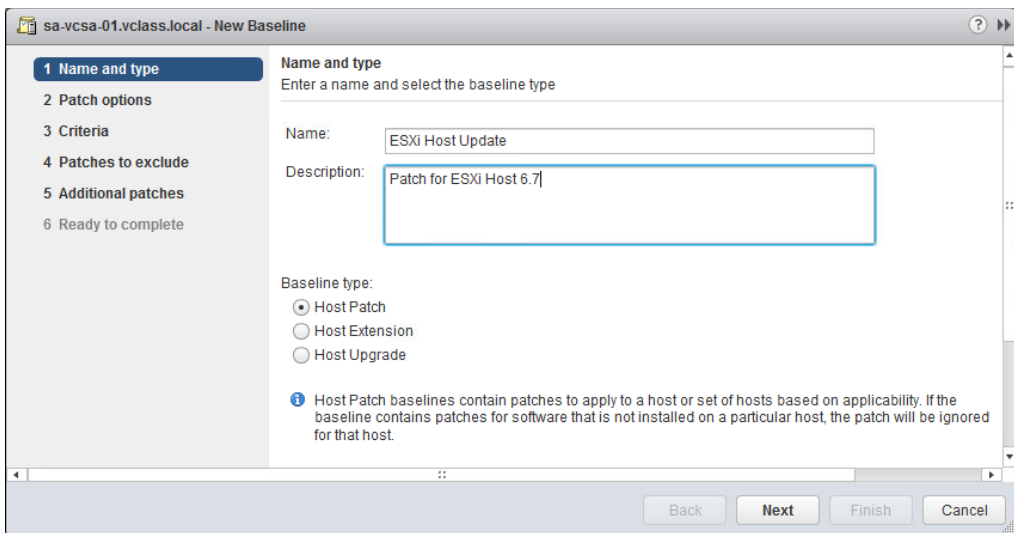
4. On the Patch Options page, click **Fixed** and click **Next**.

5. On the Patches page, select all patches from the list.

6. Click **Next**.

7. On the Ready to Complete page, click **Finish**.

Task 4: Attach a Baseline and Scan for Updates

You use scanning to evaluate a set of hosts, virtual machines, or virtual appliances against the patches, extensions, and upgrades that are included in the attached baselines and baseline groups.

1. On the top-right corner of the **Baselines** tab, click **Go to compliance view**.

2. In the Navigator pane, select **sa-esxi-02.vclass.local** and click the **Update Manager** tab in the right pane.
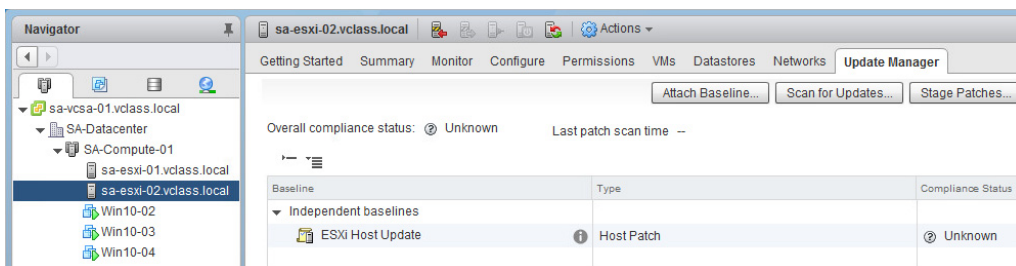
3. Click **Attach Baseline**.

   The Attach Baseline or Baseline Group dialog box appears.

4. Select the **ESXi Host Update** check box and click **OK**.

5. Click **Scan for Updates**.

6. In the Scan for Updates window, verify that the **Patches and Extensions** and **Upgrades** check boxes are both selected and click **OK**.

7. Monitor the Recent Tasks pane and wait for the scan to complete.

8. Select the **ESXi Host Update** baseline in the Baseline list and verify that the ESXi host is listed as noncompliant in the center bottom pane.
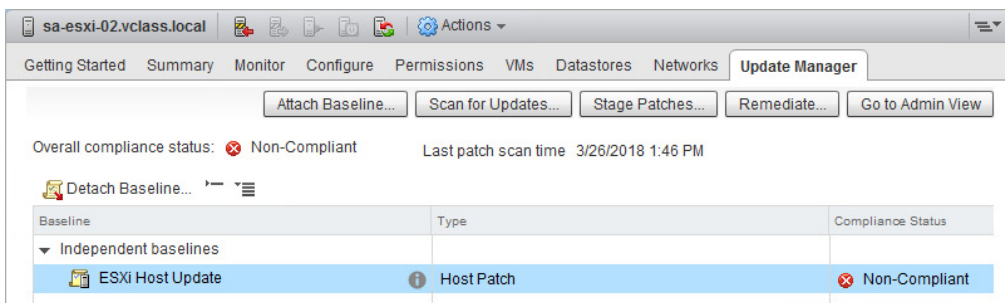
Task 5: Stage the Patches onto the ESXi Host

You stage patches and extensions onto the ESXi hosts so that they are available locally when the remediation process takes place. This method speeds up remediation.

1. In vSphere Web Client, if not already selected, select **sa-esxi-02.vclass.local** in the Navigator pane.

2. In the right pane, click **Stage Patches**.

   The Stage wizard starts.

3. On the Baselines page, select the **ESXi Host Update** baseline and click **Next**.

4. On the Hosts page, verify that the sa-esxi-02.vclass.local host is selected and click **Next**.

5. On the Patches and Extension page, accept the default settings and click **Next**.

6. On the Ready to Complete page, review the information and click **Finish**.

7. Monitor the Recent Tasks pane for the staging tasks to complete.

Task 6: Remediate the ESXi Host

You temporarily disable cluster features, such as VMware vSphere® Distributed Power Management™ in the cluster and apply the patches to the ESXi host.

1. In vSphere Web Client, if not already selected, select **sa-esxi-02.vclass.local** in the Navigator pane.

2. In the right pane, click **Remediate**.

   The Remediate wizard starts.

3. On the Select Baselines page, select the **ESXi Host Update** baseline and click **Next**.

4. On the Select Target objects page, verify that **sa-esxi-02.vclass.local is selected** and click **Next**.

5. On the Patches and Extensions page, leave the default settings and click **Next**.

6. On the Advanced Options page, select the **Schedule this action to run later** check box.

7. Enter `Remediate sa-esxi-02 ESXi host on SA-Compute-01` in the **Task Name** text box.

8. For **Remediation Time**, enter a time that is 3 minutes from the current time and leave the other settings at their default values.
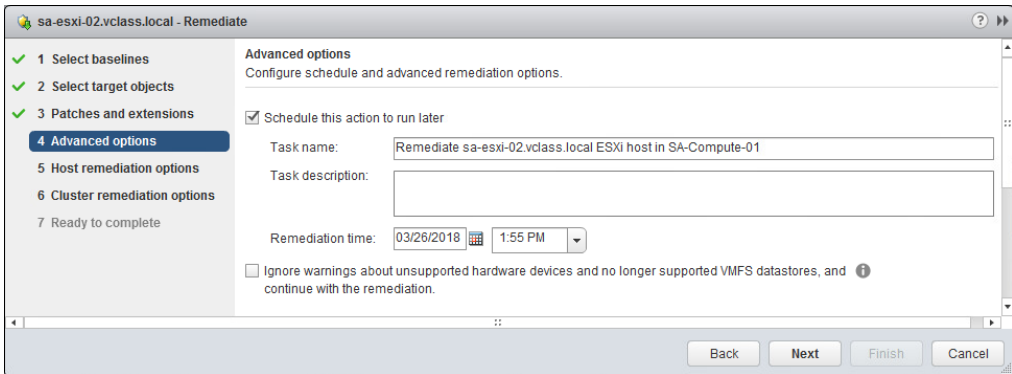
9. Click **Next**.

10. On the Host Remediation Options page, select the **Disable any removeable media devices connected to the virtual machines on the host** check box and leave the other settings at their default values.

11. Click **Next**.

12. On the Cluster Remediation Options page, deselect the **Disable Distributed Power Management (DPM) if it is enabled for any of the selected clusters** check box and click **Next**.

13. On the Ready to Complete page, review the information and click **Finish**.

14. Monitor the Recent Tasks pane.

    If the expected results are not seen, refresh vSphere Web Client.

    Q1. Was the ESXi host patched successfully?

15. Close vSphere Web Client.

    This is the last VMware vSphere 6.7 Install, Configure, Manage lab.

16. Inform your instructor that you have completed all labs for this class.

Answer Key

Lab 2: Working with vCenter Server Appliance

1. The Lab Servers folder has menu commands related to host actions whereas the Lab VMs folder has menu commands related to virtual machines.

Lab 3: Users, Groups, and Permissions

1. vclass.local is listed as Active Directory (Integrated Windows Authentication).

1. Other 3.x Linux (640 bit).

Lab 4: Using Standard Switches

1. The name of the default standard switch is vSwitch0.

2. The default switch is connected to the physical adapter vmnic0.

3. VM Network and Management Network are connected to the default standard switch.

Lab 10: Modifying Virtual Machines

1. The folder name for the Win10-05 virtual machine is Win10-Clone, which is the original name of this virtual machine.

Lab 12: Managing Virtual Machines

Task 1: Unregister a Virtual Machine from the vCenter Server Appliance Inventory 69

1. No, a folder named Win10-05 does not exist. When the Win10-05 virtual machine was first created, the virtual machine and its folder were named after the original virtual machine, Win10-Clone. When the virtual machine was renamed from Win10-Clone to Win10-05, the folder was not renamed.

Task 6: Revert the Virtual Machine to a Snapshot 76

1. Yes. The virtual machine powered off because the memory state was not preserved.
2. No. You removed these files before creating the snapshot named Without iometer or cpubusy.
3. No. The virtual machine did not power off because the memory state was preserved.
4. Yes.
5. No.

Task 7: Delete an Individual Snapshot 77

1. No.
2. 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 8: Delete All Snapshots 79

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

Lab 13: Managing Resource Pools

Task 3: Verify Resource Pool Functionality. 84

1. 2,000.
2. 8,000.
3. The rp-Test resource pool, and the virtual machine in it, have only one-fourth of the CPU shares that the rp-Production resource pool has. So the virtual machine in the rp-Test resource pool receives only one-fourth of the CPU cycles of the logical CPU to which the virtual machines are pinned.

Lab 14: Monitoring Virtual Machine Performance

Task 2: Use Performance Charts to Monitor CPU Utilization 88

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

Lab 16: Using vSphere HA

Task 2: Add Your ESXi Hosts to the Cluster. 102

1. Yes. If both the hosts are added to the cluster and there are no errors on the cluster, the number of protected VMs equal the number of powered-on VMs.
2. Two datastores. Both the datastores are shared by all of the hosts in the cluster. Therefore, they are automatically selected for heartbeating.
3. The management network error messages disappear.

1. No. The virtual machines previously running on the original master ESXi host are running on the remaining host in the cluster.

2. Yes. The slave host is elected as the new master host.

1. Less memory is available because of the overhead needed to run VMkernel. VMkernel is holding back memory for its own use.

2. vSphere Web Client reports N/A for the total number of slots because no virtual machines are powered on yet. The slot size calculation considers only virtual machines that are powered on.

3. You should see 4 total slots in the cluster: one used slot, one available slots, and 2 failover slots. If you do not see 4 slots, refresh vSphere Web Client after 2 minutes and the numbers should get updated.

4. Unlike the CPU slot size calculation, which is based solely on the largest CPU reservation, the calculation for memory slot size is based on the largest memory reservation, plus memory overhead.

5. Zero slots are available. Only two slots were available, the rest were marked as failover slots. Because two virtual machines were powered on, each using one of the available slots, no more slots are available.

6. The Win10-03 virtual machine is not allowed to power on. If a cluster does not have sufficient resources to provide failover protection, the virtual machine does not power on resulting in an error.

Lab 17: Implementing vSphere DRS Clusters

1. Yes. Because all the virtual machines are running on a single host and the running CPUBUSY instances create a large CPU load.

2. No. Because all recommendations are applied.

3. The resource allocation balance improves after applying the vSphere DRS recommendations.

1. Yes. vSphere DRS recommends that the two virtual machines be migrated to other hosts.

1. vSphere DRS recommends that one of your Win10 virtual machine be migrated to a different host due to the violation of your VM/

Host affinity rule. The other Win10 virtual machine is already running on the second host.

Lab 18: Using vSphere Update Manager

1. Yes.