VMware Virtual SAN:
Deploy and Manage

Lab Manual
Virtual SAN 6.2

vmware®

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Deploy and Manage
Virtual SAN 6.2
Part Number EDU-EN-VSANDM62-LAB
Lab Manual

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Lab 1 Licensing vSphere and Virtual SAN Components

Objective: Access vSphere Web Client and license vSphere and Virtual SAN components

In this lab, you perform the following tasks:

1. Prepare the User Interface
2. Verify That the vSphere Components have Valid Licenses
3. Add New vSphere Licenses if Licenses have Expired
4. Verify That ESXi Hosts are Connected to vCenter Server
5. Add a Virtual SAN License

Task 1: Prepare the User Interface

VMware vSphere® Web Client displays perspectives and actions for objects in various panes.

Use the following information from the class configuration handout:

- VMware vCenter Server® administrator user name
- Standard lab password

1. Log in to the student desktop system as directed by the instructor.
2. Use Internet Explorer to log in to vSphere Web Client.

   Always use the Internet Explorer browser. Do not use Mozilla Firefox unless instructed to do so.

   a. On the taskbar, click the **Internet Explorer** shortcut.

b. On the Internet Explorer favorites toolbar, click **Site-A vSphere Web Client**.

c. If necessary, add a security exception for vSphere Web Client by clicking the **Continue to this website** link on the security warning page.

d. Log in using the VMware vCenter Server administrator user name and standard lab password.

3. Minimize the Alarms, Work In Progress, and Recent Tasks panes.

a. In the Recent Tasks pane, click the **Pin** icon in the top-right corner.
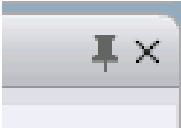
The Recent Tasks pane is minimized.

b. In the Alarms pane, click the **Pin** icon to minimize the pane.

c. Minimize the Work In Progress pane by clicking the **Pin** icon.

4. In the center pane, click **Hosts and Clusters**.

5. In the left pane, click the arrow to expand the data center.

6. Hide the Getting Started tabs.

a. In the center pane, click the **Close** tab icon in the top-right corner of the **Getting Started** tab.
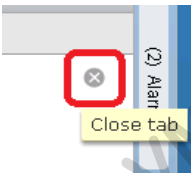
b. In the Close Getting Started Tab dialog box, click **Yes**.

c. In vSphere Web Client, select **Hide All Getting Started Pages** from the **Help** drop-down menu.
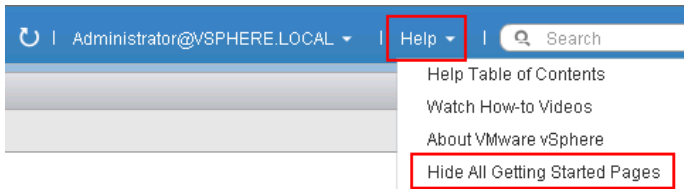
d. In vSphere Web Client, point to the **Home** icon and select **Home**.

e. On the Home page, click **VMs and Templates** under Inventories.

f. In the left pane, select the data center.

   The **Getting Started** tab does not appear.

7. In vSphere Web Client, point to the **Home** icon and select **Home**.

Task 2: Verify That the vSphere Components have Valid Licenses

You use vSphere Web Client to verify that the vCenter Server system and the VMware ESXi™ hosts have valid licenses.

Use the following information from the class configuration handout:

- vCenter Server system name
- ESXi host names

1. On the Home page, click the **Licensing** icon under Administration.

2. Verify that vCenter Server and ESXi licenses exist.

   a. In the center pane, click the **Assets** tab.

   b. In the **vCenter Server systems** tab, verify that the vCenter Server system is assigned a valid VMware vCenter® Server Standard™ 6 license.

   c. In the **Hosts** tab, verify that each ESXi host in the list is assigned a valid VMware vSphere® Enterprise Plus Edition™ 6 license.

3. If the vCenter Server and ESXi licenses have expired, then perform task 3.

4. If the vCenter Server and ESXi licenses are valid, then proceed to task 4.

Task 3: Add New vSphere Licenses if Licenses have Expired

You use vSphere Web Client to add new licenses for vCenter Server and ESXi if the current licenses have expired. You skip this task if the licenses are valid.

Use the following information from the class configuration handout:

- vCenter Server 6 Standard license key
- vSphere 6 Enterprise Plus license key
- vCenter Server system name
- ESXi host names

1. Add license keys for vCenter Server and ESXi.

    a. Click the **Licenses** tab.

    b. Click the **Create New Licenses** icon.
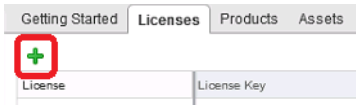
    The **Create New Licenses icon** looks like a green plus symbol.

    c. In the **License keys** text box, enter the vCenter Server 6 Standard license key.

    d. Press Enter to create a new line and enter the vSphere 6 Enterprise Plus license key.

    e. Click **Next**.

    f. In the **License name** text box for the vCenter Server 6 Standard license, enter `vCenter Server license`.

    g. In the **License name** text box for the vSphere 6 Enterprise Plus license, enter `ESXi Host license`.

    h. Click **Next**.

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

    j. Verify that the two new licenses appear in the center pane.

2. Assign a license key to the vCenter Server system.

    a. In the center pane, click the **Assets** tab.

    b. Click **vCenter Server systems**.

    One vCenter Server system is displayed in the list, and is selected.

c. Click the **Assign License** icon.
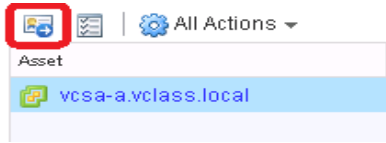
d. In the Licenses list, click **vCenter Server license** and click **OK**.

3. Assign a license key to the ESXi hosts.

    a. In the center pane, click **Hosts**.

    b. Use Shift+click to select all four hosts.

    c. Click the **Assign License** icon.

    d. In the Licenses list, click **ESXi host license** and click **OK**.

Task 4: Verify That ESXi Hosts are Connected to vCenter Server

You use vSphere Web Client to verify that the ESXi hosts appear as connected in the vCenter Server inventory.

1. Point to the **Home** icon and select **Hosts and Clusters**.
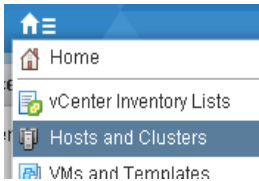
2. View the left pane, expand the data center, and verify that the ESXi hosts are connected.

3. If the state of the hosts is Disconnected, reconnect the ESXi hosts.

    a. In the center pane, click the **Related Objects** tab.

    b. In the center pane, click **Hosts**.

    c. In the center pane, use Shift+click to select the disconnected hosts.

    d. Right-click one of the selected ESXi hosts and select **Connection** > **Connect**.

    e. In the Reconnect host window, click **Yes**.

    f. Monitor the tasks in the Recent Tasks pane until the four ESXi hosts are reconnected.

4. Minimize the Recent Tasks pane by clicking the **Pin** icon.

5. In vSphere Web Client, point to the **Home** icon and select **Home**.

Task 5: Add a Virtual SAN License

You use vSphere Web Client to add the license for the VMware Virtual SAN™ Enterprise 6 features.

Use the following information from the class configuration handout:
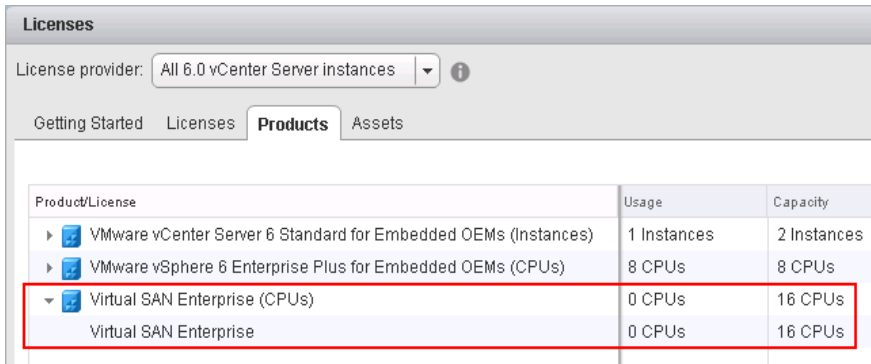
• Virtual SAN 6 Enterprise license key

1. In the left pane, select **Administration**, then **Licenses**.

2. Assign the license keys.

   a. In the center pane, click the **Licenses** tab.

   b. Click the **Create New Licenses** icon.
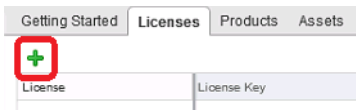
   c. Enter the Virtual SAN 6 Enterprise license key.

   d. Click **Next**.

   e. In the **License name** text box, enter **Virtual SAN Enterprise**.

   f. Click **Next**.

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

   h. In the center pane, click the **Products** tab.

i. Click the arrow to expand **Virtual SAN Enterprise (CPUs)**.

The Virtual SAN Enterprise license is listed in the center pane.

Licenses		
License provider: All 6.0 vCenter Server instances ▼ ⓘ		
Getting Started Licenses **Products** Assets		

Product/License	Usage	Capacity
▶ 🔲 VMware vCenter Server 6 Standard for Embedded OEMs (Instances)	1 Instances	2 Instances
▶ 🔲 VMware vSphere 6 Enterprise Plus for Embedded OEMs (CPUs)	8 CPUs	8 CPUs
▼ 🔲 Virtual SAN Enterprise (CPUs)	0 CPUs	16 CPUs
Virtual SAN Enterprise	0 CPUs	16 CPUs

3. In vSphere Web Client, point to the **Home** icon and select **Home**.

vmware® vSphere Web Client   🏠≡

🏠 Home ⬅

Lab 2 Basic Storage Commands

Objective: Become familiar with basic storage commands

In this lab, you perform the following tasks:

1. (Optional) Prepare the Environment
2. Execute Basic Storage Commands

Task 1: (Optional) Prepare the Environment

If any systems were logged out, disconnected, or timed out, you must restore the student lab environment to continue the labs.

If no systems were logged out, disconnected, or timed out, do not perform this task.

Use the following information from the class configuration handout:

- vCenter Server administrator user name
- Standard lab password

1. Log in to the student desktop system.
2. On the taskbar, click the **Internet Explorer** icon.
3. On the Internet Explorer favorites bar, click **Site-A vSphere Web Client**.
4. Log in using the vCenter Server administrator user name and standard lab password.

Task 2: Execute Basic Storage Commands

You use MTPuTTY to connect to an ESXi host. You run the `esxcli`, `df`, `vdq`, and `partedUtil` commands to check storage devices status.

1. Use MTPuTTY to log in to the first ESXi host.

    a. On the taskbar, click the **MTPuTTY** icon.

    b. In the left pane, double-click the first ESXi host.

        You are logged in to the ESXi host as user root.

2. Get the version information of the host.

    ```
    esxcli system version get
    ```

    Q1. What is the build of the host?

3. View all datastores and file systems.

    ```
    df -h
    ```

    Q2. What is the version of the VMware vSphere® VMFS datastore?

    Q3. What is the size of the VMFS datastore?

4. View any mounted NFS version 3 datastores.

    ```
    esxcli storage nfs list
    ```

    Q4. Were any datastores listed?

5. View any mounted NFS version 4.1 datastores.

    ```
    esxcli storage nfs41 list
    ```

    Q5. Were any datastores listed?

6. View the FCoE adapter list.

    ```
    esxcli fcoe adapter list
    ```

Q6. Are any FCoE adapters listed?

7. Check the status of the software iSCSI initiator for the host.

```
esxcli iscsi software get
```

Q7. Is the software iSCSI initiator enabled on the host?

8. Clear the PuTTY window.

```
clear
```

9. List all physical disks and their attributes.

```
esxcli storage core device list | more
```

The `more` command displays the command output on one page at a time.

Q8. What is the total number of devices listed?

Q9. Are any devices listed with a display name other than Local VMware Disk?

10. Examine the details of the mpx.vmhba1:C0:T0:L0 disk.

```
esxcli storage core device list --device=mpx.vmhba1:C0:T0:L0
```

Q10. What is the SSD status of Local VMware Disk (mpx.vmhba1:C0:T0:L0)?

11. Examine the file systems available.

```
esxcli storage filesystem list
```

Q11. What is the name of the VMFS 5 file system?

12. Examine additional disk information.

```
vdq -q | more
```

Q12. What is the state of the disk, mpx.vmhba1:C0:T0:L0?

Q13. What is the reason for this state?

13. View the usage information for the `partedUtil` command.

    ```
    partedUtil -h
    ```

14. Get the partition information of the mpx.vmhba1:C0:T0:L0 disk.

    ```
    partedUtil getptbl /dev/disks/mpx.vmhba1:C0:T0:L0
    ```

15. Exit the MTPuTTY session.

    ```
    exit
    ```

16. Close the MTPuTTY window.

Lab 3 Configuring a Virtual SAN Network

Objective: Configure the vSphere network for Virtual SAN

In this lab, you perform the following tasks:

1. (Optional) Prepare the Environment
2. Create a Distributed Switch and Virtual SAN Distributed Port Group
3. Add Hosts to the Distributed Switch and Assign an Uplink to the Virtual SAN Port Group
4. Add a VMkernel Adapter for Virtual SAN Traffic
5. Add a vSphere vMotion Port Group
6. Assign an Uplink to the vSphere vMotion Port Group
7. Add a VMkernel Adapter for vSphere vMotion Traffic
8. Use esxcli to Check Virtual SAN Networking

Task 1: (Optional) Prepare the Environment

If any systems were logged out, disconnected, or timed out, you must restore the student lab environment to continue the labs.

If no systems were logged out, disconnected, or timed out, do not perform this task.

Use the following information from the class configuration handout:

- vCenter Server administrator user name
- Standard lab password

1. Log in to the student desktop system.
2. On the taskbar, click the **Internet Explorer** icon.
3. On the Internet Explorer favorites bar, click **Site-A vSphere Web Client**.

4. Use the vCenter Server administrator user name and standard lab password to log in to the vCenter Server system.

Task 2: Create a Distributed Switch and Virtual SAN Distributed Port Group

You create a distributed switch and configure a distributed port group for Virtual SAN traffic.

1. On the Home page, in the center pane, click the **Networking** icon.

2. In the left pane, click the arrow to expand your data center.

3. Create a distributed switch on which to place the Virtual SAN network.

    a. In the left pane, right-click the data center and select **Distributed Switch** > **New Distributed Switch**.

    b. In the **Name** text box, enter **dvs-VSAN** and click **Next**.

    c. On the Select version page, accept the default selection and click **Next**.

    d. On the Edit settings page, enter **pg-VSAN** in the **Port group name** text box.

    e. Accept the remaining default selections, and click **Next**.

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

4. Monitor the creation of the distributed switch.

    a. Click the Recent Tasks pane to open it.
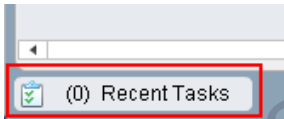
    b. Monitor the Recent Tasks pane to verify that the task completes successfully.

        If you wish to minimize the Recent Tasks pane, click the **Pin** icon.

5. Verify that the distributed switch and distributed port group that you created are listed in the left pane.

    If you do not see the distributed switch or distributed port group, click the **Refresh** icon in vSphere Web Client.

6. Configure the Virtual SAN port group to use only Uplink 4.

   a. In the left pane, expand the distributed switch and right-click **pg-VSAN**.

   b. Select **Edit Settings**.

   c. On the Teaming and failover page, select **Uplink 1** and click the down arrow until the uplink appears under Unused uplinks.

   d. Select **Uplink 2** and use the down arrow to move it to the Unused uplinks section.

   e. Select **Uplink 3** and move it to the Unused uplinks section.

   f. Click **OK**.

   g. Monitor the Recent Tasks pane to verify that the task completes successfully.

Task 3: Add Hosts to the Distributed Switch and Assign an Uplink to the Virtual SAN Port Group

You add the ESXi hosts to the distributed switch, and you assign an uplink to the Virtual SAN port group.

Use the following information from the class configuration handout:

 • Virtual SAN vmnic

1. Add the ESXi hosts to the distributed switch.

   a. In the left pane, right-click **dvs-VSAN** and select **Add and Manage Hosts**.

   b. In the Add and Manage Hosts window, verify that **Add hosts** is selected.

   c. Click **Next**.

   d. On the Select hosts page, click **New Hosts**.

e. In the Select new hosts window, select the **Host** check box to select all the hosts in the list.

f. Click **OK**.

g. Verify that the four selected hosts appear in the Host list.

2. At the bottom of the window, select the **Configure identical network settings on multiple hosts (template mode)** check box and click **Next**.

3. On the Select template host page, select the first ESXi host (to use as the template) and click **Next**.

4. On the Select network adapter tasks page, deselect the **Manage VMkernel adapters (template mode)** check box.

5. Click **Next**.

6. Assign the Virtual SAN vmnic of each host to Uplink 4.

a. On the Manage physical network adapters (template mode) page, select Virtual SAN vmnic in the top list.

b. Click **Assign Uplink**.

Manage physical network adapters (template mode)
Add or remove physical network adapters to this distributed switch.

① Configure or review physical network adapter assignments for t

🔲 Assign uplink   🔁 Reset changes   ℹ View settings

Host/Physical Network Adapters	1 ▲ In Use by Switch
On this switch	
▾ **On other switches/unclaimed**	
🖼 vmnic0	vSwitch0
🖼 vmnic1	--
🖼 vmnic2	--
🖼 vmnic3	--

c. In the Select an Uplink window, select **Uplink 4** and click **OK**.

d. In the bottom list, click **Apply to all**.

e. Scroll through the bottom list and ensure that Virtual SAN vmnic for each host is assigned to Uplink 4.

f. Click **Next**.

7. On the Analyze impact page, click **Next**.

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

9. Monitor the Recent Tasks pane and verify that the task completes successfully.

Task 4: Add a VMkernel Adapter for Virtual SAN Traffic

You add a VMkernel adapter to each host to be used for Virtual SAN traffic, and you assign the VMkernel adapter to the Virtual SAN port group.

1. In the left pane, right-click **dvs-VSAN** and select **Add and Manage Hosts**.

2. In the Add and Manage Hosts window, click **Manage host networking** and click **Next**.

3. Select all hosts.

a. On the Select hosts page, click **Attached Hosts**.

b. On the Select member hosts window, select the **Host** check box to select all ESXi hosts, and click **OK**.

c. Select the **Configure identical network settings on multiple hosts (template mode)** check box and click **Next**.

4. On the Select template host page, select the first ESXi host (to use as the template) and click **Next**.

5. On the Select network adapter tasks page, deselect the **Manage physical adapters (template mode)** check box.

Select network adapter tasks
Select the network adapter tasks to perform.

☐ **Manage physical adapters (template mode)**
    Add physical network adapters to the distributed switch, assign them to uplinks, or remove existing ones.

☑ **Manage VMkernel adapters (template mode)**
    Add VMkernel network adapters to this distributed switch, migrate them from other switches, assign them to distributed port groups, configure their settings, or remove existing ones.

☐ **Migrate virtual machine networking**
    Migrate VM network adapters by assigning them to distributed port groups on the distributed switch.
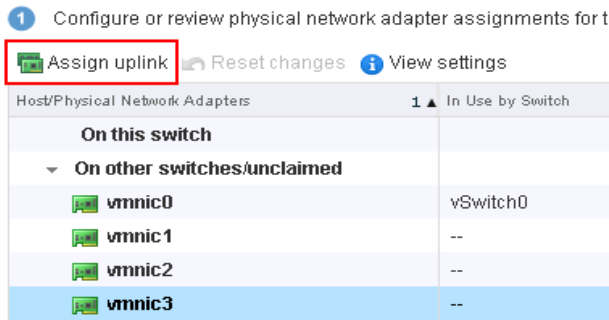
☐ **Manage advanced host settings**
    Set the number of ports per legacy host proxy switch.

6. Click **Next**.

7. Add a VMkernel adapter for Virtual SAN on all the hosts.

   a. On the Manage VMkernel network adapters (template mode) page, click **New Adapter**.

   b. On the Select target device page, verify that **Select an existing network** is selected, and click **Browse**.

   c. In the Select Network window, select the Virtual SAN port group and click **OK**.

   d. Click **Next**.

   e. On the Port properties page, select the **Virtual SAN traffic** check box and click **Next**.

   f. On the IPv4 settings page, verify that **Obtain IPv4 settings automatically** is selected and click **Next**.

      The IP address for the VMkernel adapter is assigned by the DHCP service.

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

   h. On the Manage VMkernel network adapters (template mode) page, click **Apply to all** in the bottom list.

   i. In the Apply VMkernel network adapter configuration to other hosts dialog box, click **OK**.

   j. Scroll through the bottom list and ensure that a VMkernel adapter is created on the Virtual SAN port group for each host.

k. Click **Next**.

8. On the Analyze impact page, click **Next**.

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

10. Monitor the Recent Tasks pane to verify that the task completes successfully.

11. Verify that all four hosts are added to the Virtual SAN port group.

    a. In the left pane, select **dvs-VSAN**.

    b. In the center pane, click the **Manage** tab and click **Settings**.

    c. In the center pane, select **Topology** in the list on the left.

    d. In the center pane, click the arrow to expand the list of VMkernel ports for **pg-VSAN**, and
        click the arrow to expand **Uplink 4**.

    e. Verify the Virtual SAN port group configuration:

        • Four VMkernel adapters are listed in the pg-VSAN port group and each VMkernel
           adapter has a DHCP-assigned IP address.

        • The same vmnic on all four ESXi hosts has been allocated to uplink 4 in the Uplink 4
           port group.
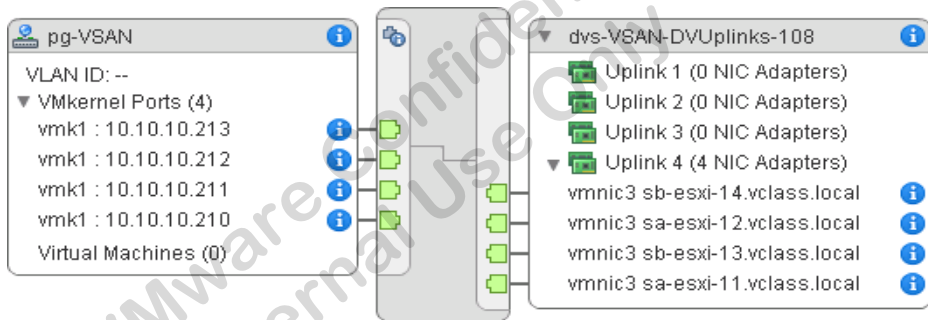
        If you do not see the IP addresses, click the **Refresh** icon in vSphere Web Client.

Task 5: Add a vSphere vMotion Port Group

You create a VMware vSphere® vMotion® port group on the distributed switch.

1. In the left pane, right-click **dvs-VSAN** and select **Distributed Port Group > New Distributed
    Port Group**.

2. In the **Name** text box, enter **pg-vMotion** and click **Next**.

3. On the Configure settings page, accept the default values and click **Next**.

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

5. Monitor the Recent Tasks pane and verify that the task completes successfully.

Task 6: Assign an Uplink to the vSphere vMotion Port Group

You attach the hosts to the distributed switch. Then for each host, you assign an uplink to the vSphere vMotion port group.

Use the following information from the class configuration handout:

• vSphere vMotion vmnic

1. Assign vSphere vMotion vmnic to Uplink 2 for all the hosts in the cluster.

   a. Right-click **dvs-VSAN** and select **Add and Manage Hosts**.

   b. In the Add and Manage Hosts window, click **Manage host networking**, and click **Next**.

   c. On the Select hosts page, click **Attached hosts**.

   d. In the Select member hosts window, select the **Host** check box and click **OK**.

   e. Verify that the four hosts appear in the Host list.

   f. Select the **Configure identical network settings on multiple hosts (template mode)** check box and click **Next**.

   g. On the Select template host page, select the first ESXi host and click **Next**.

   h. On the Select network adapter tasks page, deselect the **Manage VMkernel adapters (template mode)** check box and click **Next**.

   i. On the Manage physical network adapters (template mode) page, select the assigned vSphere vMotion vmnic in the top list.

   j. Click **Assign Uplink**.

   k. In the Select an Uplink window, select **Uplink 2** and click **OK**.

Host/Physical Network Adapters	In Use by Switch	Uplink
▼ 🖥 sa-esxi-01.vclass.local (template)		
▼ On this switch		
🖼 vmnic1 (Assigned)	--	Uplink 2
🖼 vmnic3	dvs-VSAN	Uplink 4
▼ On other switches/unclaimed		
🖼 vmnic0	vSwitch0	--

   l. In the bottom list, click **Apply to all**.

m. Verify that the vmnic assignments for the second, third, and fourth hosts match the vmnic-to-uplink assignments of the first host.

n. Click **Next**.

o. On the Analyze impact page, click **Next**.

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

q. Monitor the Recent Tasks pane to verify that the tasks complete successfully.

2. Configure the vSphere vMotion port group to only use Uplink 2.

a. In the left pane, expand **dvs-VSAN** to display the port groups.

b. Right-click your vSphere vMotion port group and select **Edit Settings**.

c. In the Edit Settings window, click **Teaming and failover** on the left.

d. On the Teaming and failover page, select **Uplink 1** and click the down arrow until this uplink is under Unused uplinks.

e. Repeat step d to move Uplink 3 and Uplink 4 to the Unused uplinks section.

f. Verify that Uplink 2 is the only entry under Active uplinks.

g. Click **OK**.

h. Monitor the Recent Tasks pane to verify that the tasks complete successfully.

Task 7: Add a VMkernel Adapter for vSphere vMotion Traffic

You add a VMkernel adapter to each host to be used for vSphere vMotion traffic, and you assign the VMkernel adapter to the vSphere vMotion port group.

1. Right-click **dvs-VSAN** and select **Add and Manage Hosts**.

2. In the Add and Manage Hosts window, click **Manage host networking** and click **Next**.

3. Select all hosts.

    a. On the Select hosts page, click **Attached Hosts**.

    b. In the Select member hosts window, select the **Host** check box and click **OK**.

    c. On the Select hosts page, verify that all four ESXi hosts appear in the list.

    d. Select the **Configure identical network settings on multiple hosts (template mode)** check box and click **Next**.

4. On the Select template host page, select the first ESXi host and click **Next**.

5. On the Select network adapter tasks page, deselect the **Manage physical adapters (template mode)** check box and click **Next**.

6. Add a VMkernel adapter for vSphere vMotion on all the hosts.

    a. On the Manage VMkernel network adapters page, click **New Adapter**.

    b. On the Select target device page, verify that **Select an existing network** is selected, and click **Browse**.

    c. In the Select Network window, select the **pg-vMotion** port group and click **OK**.

    d. Click **Next**.

    e. On the Port properties page, select the **vMotion traffic** check box and click **Next**.

    f. On the IPv4 settings page, verify that **Obtain IPv4 settings automatically** is selected, and click **Next**.

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

    h. On the Manage VMkernel network adapters (template mode) page, click **Apply to all** in the bottom list.

    i. Click **OK** in the informational message dialog box.

    j. In the bottom list, verify that a VMkernel adapter on the vSphere vMotion port group exists for each host.

    k. Click **Next**.

7. On the Analyze impact page, click **Next**.

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

9. Monitor the Recent Tasks pane to verify that all tasks complete successfully.

10. In the left pane, select your distributed switch.

11. In the center pane, verify the following topology:

- A VMkernel adapter and a DHCP-assigned IP address have been added to the vSphere vMotion port group for each host.

- The vSphere vMotion vmnic for each host appears under Uplink 2.
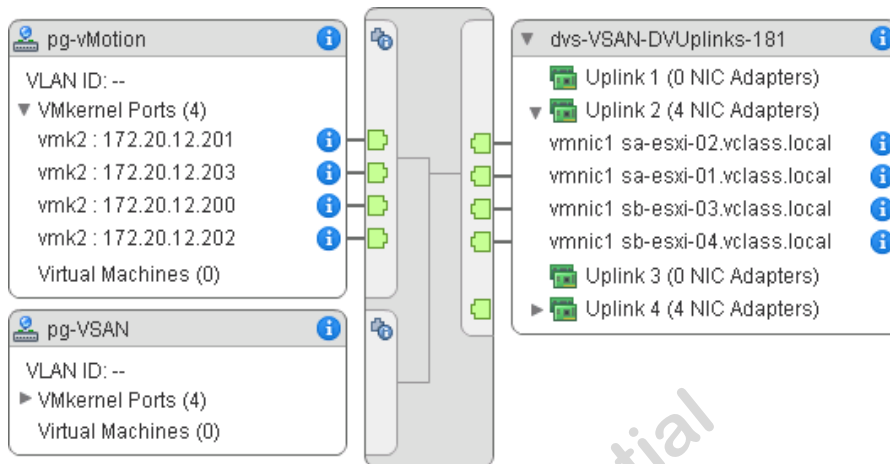
If you do not see the IP addresses, click the **Refresh** icon in vSphere Web Client.

12. In vSphere Web Client, point to the **Home** icon and select **Home**.

Task 8: Use esxcli to Check Virtual SAN Networking

You use MTPuTTY to connect to an ESXi host and run commands to check the Virtual SAN networking status.

1. Use MTPuTTY to log in to the first ESXi host.

   a. On the taskbar, click the **MTPuTTY** icon.

b. In the left pane, double-click the first ESXi host.
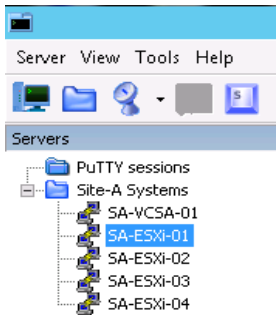
You are automatically logged in as user root.

2. View the Virtual SAN networking.

```
esxcli vsan network list
```

Q1. What vmknic name is used?

3. Exit the MTPuTTY session.

```
exit
```

4. Close the MTPuTTY window.

Lab 4 Configuring a Virtual SAN Cluster

Objective: Configure a Virtual SAN cluster

In this lab, you perform the following tasks:

1. (Optional) Prepare the Environment

2. Create a Virtual SAN Cluster to Use Manual Disk Claim Mode

3. Move Three ESXi Hosts into the Virtual SAN Cluster

4. Assign the Virtual SAN Enterprise License to the Cluster

Task 1: (Optional) Prepare the Environment

If any systems were logged out, disconnected, or timed out, you must restore the student lab environment to continue the labs.

If no systems were logged out, disconnected, or timed out, do not perform this task.

Use the following information from the class configuration handout:

- vCenter Server administrator user name

- Standard lab password

1. Log in to the student desktop system.

2. On the taskbar, click the **Internet Explorer** icon.

3. On the Internet Explorer favorites bar, click **Site-A vSphere Web Client**.

4. Log in using the vCenter Server administrator user name and standard lab password.

Task 2: Create a Virtual SAN Cluster to Use Manual Disk Claim Mode

You use vSphere Web Client to enable Virtual SAN on a vSphere cluster, and you configure the cluster to use manual disk claim mode.

1. In the center pane, click **Hosts and Clusters**.

2. In the left pane, right-click the data center, and select **New Cluster**.

3. In the New Cluster window enter **VSAN** in the **Name** text box.

4. Select the **Turn ON** check box for DRS and accept the default values.

5. Click the arrow to expand the Virtual SAN panel.

6. Select the **Turn ON** check box in the Virtual SAN panel.

7. Select **Manual** from the **Add disks to storage** drop-down menu.

8. Click **OK**.

9. Monitor the Recent Tasks pane to verify that the task completes successfully.

Task 3: Move Three ESXi Hosts into the Virtual SAN Cluster

You move three ESXi hosts into the Virtual SAN cluster.

1. In the left pane, select the data center.

2. In the center pane, click the **Related Objects** tab, then click **Hosts**.

3. In the center pane, use Shift+click or Ctrl+click to select only the first, second, and third ESXi hosts in the list.
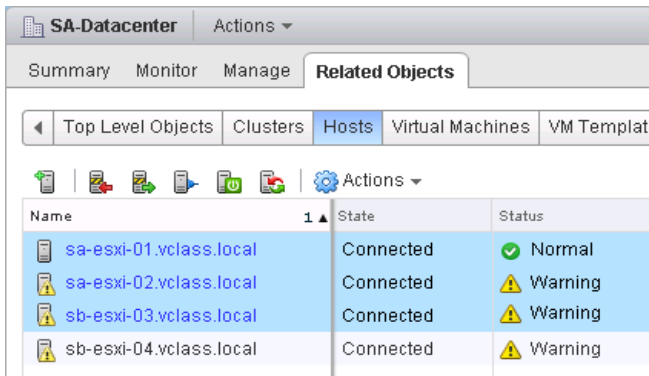
4. Right-click the selected hosts and select **Move To**.

5. In the Move To dialog box, click **Yes**.

6. In the Move To window, expand the data center.

7. Select the Virtual SAN cluster and click **OK**.

8. In the Move Host into This Cluster window, accept the default values, and click **OK**.

   This window appears for each selected host. Accept the default values, and click **OK** for the remaining two hosts.

9. Monitor the Recent Tasks pane to verify that the tasks complete successfully.

10. Click the **Refresh** icon in vSphere Web Client.

   The left pane should look like the following image:
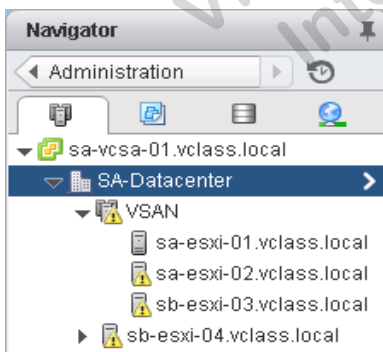
11. In the left pane, notice that the Virtual SAN cluster icon has a warning symbol.

> **Q1.** **What alarms were triggered on the cluster? (Hint: View the cluster Summary tab.)**

Task 4: Assign the Virtual SAN Enterprise License to the Cluster

You assign the Virtual SAN 6 Enterprise license to the Virtual SAN cluster.

1. In the left pane, select the Virtual SAN cluster.
2. In the center pane, click the **Manage** tab and click **Settings**.
3. Select **Licensing** on the left side.
4. In the Licensing panel, click **Assign License**.
5. In the Assign License window, select the Virtual SAN Enterprise license and click **OK**.
6. Monitor the Recent Tasks pane to verify that the task completes successfully.
7. In vSphere Web Client, point to the **Home** icon and select **Home**.

Lab 5 Configuring Hybrid Disk Groups

Objective: Configure hybrid disk groups for a Virtual SAN cluster

In this lab, you perform the following tasks:

1. (Optional) Prepare the Environment
2. Mark the 6.00 GB Disks of the Hosts as Magnetic Disks
3. Create Disk Groups for All Hosts in the Cluster
4. Identify and Rename a Virtual SAN Datastore

Task 1: (Optional) Prepare the Environment

If any systems were logged out, disconnected, or timed out, you must restore the student lab environment to continue the labs.

If no systems were logged out, disconnected, or timed out, do not perform this task.

Use the following information from the class configuration handout:

- vCenter Server administrator user name
- Standard lab password

1. Log in to the student desktop system.
2. On the taskbar, click the **Internet Explorer** icon.
3. On the Internet Explorer favorites bar, click **Site-A vSphere Web Client**.
4. Log in using the vCenter Server administrator user name and standard lab password.

Task 2: Mark the 6.00 GB Disks of the Hosts as Magnetic Disks

The hosts are backed by solid-state drive (SSD) storage. For hybrid disk groups, at least two standard magnetic disks must be available. You use vSphere Web Client to set the disk type to hard-disk drive (HDD).

1. In the center pane, click the **Hosts and Clusters** icon.

2. In the left pane, expand the Virtual SAN cluster and select the first ESXi host.

3. In the center pane, click the **Manage** tab and click **Storage**.

4. In the center pane, select **Storage Devices** on the left side.

5. Examine the **Drive Type** column for the drives in the list.

6. Click the **Capacity** column title to sort by the available capacity.

7. Configure the 6.00 GB capacity drives as HDD.

   a. In the storage devices list, select the disk with 6.00 GB capacity.

   b. Click the **HDD** icon at the top of the Storage Devices list and click **Yes**.
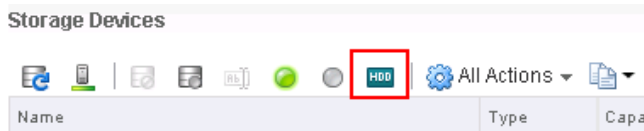
c. Monitor the **Drive Type** column until the 6.00 GB disk changes from Flash to HDD.

vSphere Web Client refreshes twice as part of this process.

d. Repeat steps a to c for the other 6.00 GB drive.

8. Verify that the 6.00 GB disks have a drive type of HDD.

Name	Type	Capacity	1 ▲	Operational State	Hardware Acceleration	Drive Type
Local VMware Disk (mpx.vmhba1:C0:T1:L0)	disk	4.00 GB		Attached	Not supported	Flash
Local VMware Disk (mpx.vmhba1:C0:T4:L0)	disk	4.50 GB		Attached	Not supported	Flash
Local VMware Disk (mpx.vmhba1:C0:T3:L0)	disk	6.00 GB		Attached	Not supported	HDD
Local VMware Disk (mpx.vmhba1:C0:T2:L0)	disk	6.00 GB		Attached	Not supported	HDD

9. Repeat steps 5 to 8 for the two remaining ESXi hosts in the cluster.

As a convenience, you can use Shift+click or Ctrl+click to select more than one drive at a time.

Task 3: Create Disk Groups for All Hosts in the Cluster

You use vSphere Web Client to create a Virtual SAN disk group on each of the ESXi hosts in the cluster. The 6.00 GB HDD disks are used for the capacity tier, and the 4.00 GB flash disk is used for the cache tier.

1. In the left pane, select your Virtual SAN cluster.
2. In the center pane, click the **Manage** tab, and click **Settings**.
3. Select **Disk Management** on the left side.
4. In the center pane, click the **Claim disks** icon.

The Claim Disks for Virtual SAN Use window appears, and the disks are grouped by disk model and size.

5. For each row in the list, change the values under the **Claim For** column so that the 6.00 GB HDD drives are claimed for the capacity tier, and the 4.00 GB Flash drives are claimed for the cache tier.

None of the other disks must be claimed.

a. For the 6.00 GB HDD drives, select **Capacity tier** under the Claim For column.

b. For the 4.00 GB Flash drives, select **Cache tier** under the Claim For column.

c. For the 6.50 GB Flash drives, select **Do not claim** under the Claim For column.

d. For the 4.50 GB Flash drives, select **Do not claim** under the Claim For column.

6. Click **OK**.

7. Monitor the Recent Tasks pane to verify that the task completes successfully.

8. Verify that the disk groups were created.

   Q1.   What is the disk group type of each disk group?

   _____

a. Select each disk group and verify that it contains a 4.00 GB Flash drive and two 6.00 GB HDD drives.

9. View general disk information about the Virtual SAN cluster.

a. Under Virtual SAN in the center pane, select **General** on the left side.

   Q2.   What is the disk format version?

   _____

b. Click the **Summary** tab in the center pane.

c. Expand the Virtual SAN capacity panel and record the amount of free capacity. _____

Task 4: Identify and Rename a Virtual SAN Datastore

You identify and rename the Virtual SAN datastore for your Virtual SAN cluster.

1. In the center pane, click the **Related Objects** tab.

2. On the **Related Objects** tab, click **Datastores**.

3. In the center pane, right-click **vsanDatastore** and select **Rename**.

4. In the Datastore - Rename window, enter `Student-VSAN`.

5. Click **OK**.

6. Verify that the datastore name has changed.

7. Point to the **Home** icon and select **Home**.

Lab 6 Configuring All-Flash Disk Groups

Objective: Create an all-flash disk group configuration

In this lab, you perform the following tasks:

1. (Optional) Prepare the Environment

2. Verify that the 4.50 GB and 6.50 GB Disks of the Hosts are Flash Disks

3. Create an All-Flash Disk Group for Each Host in the Cluster

4. Delete the Hybrid Disk Groups

5. Mark the 6.00 GB Disks of the Hosts as Flash Disks

6. Create a Second All-Flash Disk Group for Each Host in the Cluster

Task 1: (Optional) Prepare the Environment

If any systems were logged out, disconnected, or timed out, you must restore the student lab environment to continue the labs.

If no systems were logged out, disconnected, or timed out, do not perform this task.

Use the following information from the class configuration handout:

- vCenter Server administrator user name

- Standard lab password

1. Log in to the student desktop system.

2. On the taskbar, click the **Internet Explorer** icon.

3. On the Internet Explorer favorites bar, click **Site-A vSphere Web Client**.

4. Log in using the vCenter Server administrator user name and standard lab password.

Task 2: Verify that the 4.50 GB and 6.50 GB Disks of the Hosts are Flash Disks

You use vSphere Web Client to verify that the 4.50 GB and the 6.50 GB disks have the disk type Flash.

1. In the center pane, click the **Hosts and Clusters** icon.

2. In the left pane, expand the Virtual SAN cluster and select the first ESXi host.

3. In the center pane, click the **Manage** tab, and click **Storage**.

4. In the center pane, select **Storage Devices** on the left side.

5. Examine the Drive Type column for the drives in the list.

6. In the storage devices list, click the **Capacity** column title to sort by the available capacity.

7. Verify that the 4.50 GB and 6.50 GB drives are of type Flash.

   Your 6.50 GB and 4.50 GB disks should look like the following figure.

Name	Type	Capacity 1 ▲	Operational State	Hardware Acceleration	Drive Type
Local VMware Disk (mpx.vmhba1:C0:T1:L0)	disk	4.00 GB	Attached	Not supported	Flash
Local VMware Disk (mpx.vmhba1:C0:T4:L0)	disk	4.50 GB	Attached	Not supported	Flash
Local VMware Disk (mpx.vmhba1:C0:T3:L0)	disk	6.00 GB	Attached	Not supported	HDD
Local VMware Disk (mpx.vmhba1:C0:T2:L0)	disk	6.00 GB	Attached	Not supported	HDD
Local VMware Disk (mpx.vmhba1:C0:T5:L0)	disk	6.50 GB	Attached	Not supported	Flash
Local VMware Disk (mpx.vmhba1:C0:T6:L0)	disk	6.50 GB	Attached	Not supported	Flash

8. Repeat steps 5 to 7 for the remaining two ESXi hosts in the cluster.

Task 3: Create an All-Flash Disk Group for Each Host in the Cluster

You create an all-flash disk group on each of your ESXi hosts. The 6.50 GB Flash disks are used for the capacity tier, and the 4.50 GB flash disk is used for the cache tier.

1. In the left pane, select your Virtual SAN cluster.

2. In the center pane, click the **Manage** tab, and click **Settings**.

3. Select **Disk Management** on the left side.

4. In the center pane, click the **Claim disks** icon.

The Claim Disks for Virtual SAN Use window appears, and the disks are grouped by disk model and size.

5. For each row in the list, change the values under the **Claim For** column so that the 6.50 GB Flash drives are claimed for the capacity tier, and the 4.50 GB Flash drive is claimed for the cache tier.

    a. For the 6.50 GB Flash drives, select **Capacity tier** under the **Claim For** column.

    b. For the 4.50 GB Flash drives, select **Cache tier** under the **Claim For** column.

6. Click **OK**.

7. Monitor the Recent Tasks pane to verify that the task completes successfully.

8. Verify that the disk groups were created.

    Q1.   What is the disk group type of each all-flash disk group that you created?

    _____

    a. Select each disk group and verify that it contains a 4.50 GB Flash drive and two 6.50 GB Flash drives.

9. View capacity information for the Virtual SAN cluster.

    a. Click the **Summary** tab in the center pane.

    b. Expand the Virtual SAN capacity panel and record the amount of free capacity. _____

Task 4: Delete the Hybrid Disk Groups

You use vSphere Web Client to delete the hybrid disk groups in the Virtual SAN cluster.

1. In the center pane, click the **Manage** tab, and click **Settings**.

2. Select **Disk Management** on the left side.

3. In the disk groups list, select the hybrid disk group for the first ESXi host.

4. Click the **Remove the disk group** icon.

Disk Groups					
Disk Group	Disks in Use	State	Virtual SAN ...	Type
▼ 🖥 sa-esxi-01.vclass.local	6 of 7	Connected	Healthy	
🖬 Disk group (0000000000766d686261313a313a30)	3	Mounted	Healthy	Hybrid
🖬 Disk group (0000000000766d686261313a343a30)	3	Mounted	Healthy	All flash
▼ 🖥 sa-esxi-02.vclass.local	6 of 7	Connected	Healthy	
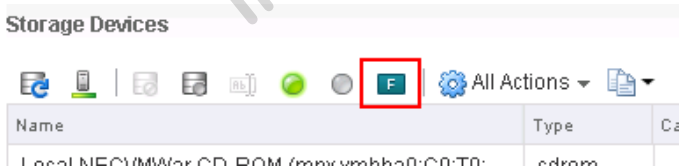
5. In the Remove Disk Group window, keep the default migration mode and click **Yes**.

6. Monitor the Recent Tasks pane to verify that the task completes successfully.

7. Repeat steps 3 to 6 to remove the hybrid disk group from the other two ESXi hosts.

Task 5: Mark the 6.00 GB Disks of the Hosts as Flash Disks

You use vSphere Web Client to set the disk type to Flash.

1. In the left pane, select the first ESXi host.

2. In the center pane, click the **Manage** tab, and click **Storage**.

3. In the center pane, select **Storage Devices** on the left side.

4. Examine the **Drive Type** column for the drives in the list.

5. Change each 6.00 GB HDD drive to Flash.

    a. Select the 6.00 GB disk.

    b. Click the **Flash** icon and click **Yes**.

Storage Devices		
🔃 🗄 | 📇 📇 📑 🟢 ⚪ **F** | ⚙ All Actions ▾ 📄▾		
Name	Type	Ca
Local NEC VMWar CD-ROM (mpx.vmhba0:C0:T0:	cdrom	

c. Monitor the **Drive Type** column until the 6.00 GB disk changes from HDD to Flash.

vSphere Web Client refreshes twice as part of this process.

Name	Type	Capacity 1▲	Operational State	Hardware Acceleration	Drive Type
Local VMware Disk (mpx.vmhba1:C0:T1:L0)	disk	4.00 GB	Attached	Not supported	Flash
Local VMware Disk (mpx.vmhba1:C0:T4:L0)	disk	4.50 GB	Attached	Not supported	Flash
Local VMware Disk (mpx.vmhba1:C0:T3:L0)	disk	6.00 GB	Attached	Not supported	Flash
Local VMware Disk (mpx.vmhba1:C0:T2:L0)	disk	6.00 GB	Attached	Not supported	Flash
Local VMware Disk (mpx.vmhba1:C0:T5:L0)	disk	6.50 GB	Attached	Not supported	Flash
Local VMware Disk (mpx.vmhba1:C0:T6:L0)	disk	6.50 GB	Attached	Not supported	Flash

    d. Repeat steps a to c for the other 6.00 GB HDD drive.

6. Repeat step 5 for the two remaining ESXi hosts in the cluster.

For convenience, you can use Shift+click or Ctrl+click to select more than one drive at a time.

Task 6: Create a Second All-Flash Disk Group for Each Host in the Cluster

You create a second all-flash disk group on each of your ESXi hosts. The 6.00 GB Flash disks are used for the capacity tier, and the 4.00 GB flash disk is used for the cache tier. All-flash disk groups are needed to demonstrate the Virtual SAN 6.2 features that are only available for all-flash disk configurations.

1. In the left pane, select your Virtual SAN cluster.

2. In the center pane, click the **Manage** tab, and click **Settings**.

3. Select **Disk Management** on the left side.

4. In the center pane, click the **Claim disks** icon.

The Claim Disks for Virtual SAN Use window appears, and the disks are grouped by disk model and size.

5. For each row in the list, change the values under the **Claim For** column so that the 6.00 GB Flash drives are claimed for the capacity tier, and the 4.00 GB Flash drives are claimed for the cache tier.

    a. For the 6.00 GB Flash drives, select **Capacity tier** under the **Claim For** column.

    b. For the 4.00 GB Flash drives, select **Cache tier** under the **Claim For** column.

6. Click **OK**.

7. Monitor the Recent Tasks pane to verify that the task completes successfully.

8. View capacity information for the Virtual SAN cluster.

a. Click the **Summary** tab in the center pane.

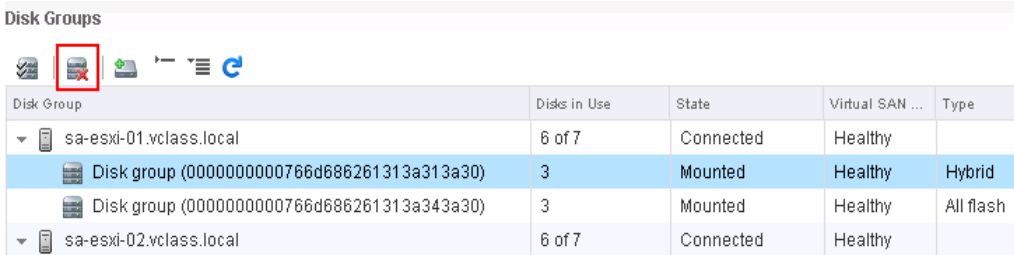b. Expand the Virtual SAN capacity panel and record the amount of free capacity. _____

9. Point to the **Home** icon and select **Home**.

Lab 7 Virtual SAN Storage Commands

Objective: Use ESXCLI commands to examine the Virtual SAN disks

In this lab, you perform the following tasks:

1. (Optional) Prepare the Environment
2. Examine the Virtual SAN Disks

Task 1: (Optional) Prepare the Environment

If any systems were logged out, disconnected, or timed out, you must restore the student lab environment to continue the labs.

If no systems were logged out, disconnected, or timed out, do not perform this task.

Use the following information from the class configuration handout:

- vCenter Server administrator user name
- Standard lab password

1. Log in to the student desktop system.
2. On the taskbar, click the **Internet Explorer** icon.
3. On the Internet Explorer favorites bar, click **Site-A vSphere Web Client**.
4. Log in using the vCenter Server administrator user name and standard lab password.

Task 2: Examine the Virtual SAN Disks

You use MTPuTTY to issue `esxcli` commands to examine storage on the ESXi host.

1. Log in to the first ESXi host from the command line.

a.   On the taskbar, click the **MTPuTTY** icon.

b.   In the left pane, double-click the first ESXi host.

You are logged in as user root.

2.   Examine the details of the network interface cards of the host.

```
esxcli network nic list
```

Q1.   Which network cards have a link status of Up?

3.   Examine the vsan commands that are available.

```
esxcli vsan
```

4.   Check the name of the Virtual SAN datastore.

```
esxcli vsan datastore name get
```

Q2.   What is the name of the Virtual SAN datastore?

5.   Get information about the Virtual SAN cluster that this host is joined to.

```
esxcli vsan cluster get
```

Q3.   What is the health state of the local node (host)?

6.   Get the default Virtual SAN policy.

```
esxcli vsan policy getdefault
```

Q4.   What is the number of host failures to tolerate for the VM Home Namespace object?

7.   Check the esxcli command for unmounting disk groups.

```
esxcli vsan storage diskgroup unmount
```

Q5.   What else is required to unmount the disk?

Do not unmount the disk group.

8. Exit the MTPuTTY session.

    ```
    exit
    ```

9. Close the MTPuTTY window.

Lab 8 Deploying Virtual Machines to Virtual SAN

Objective: Deploy a virtual machine and specify a storage policy

In this lab, you perform the following tasks:

1. (Optional) Prepare the Environment
2. Import a Virtual Machine to the First ESXi Host
3. Migrate the Virtual Machine to a Local Datastore
4. Migrate the Virtual Machine to the Virtual SAN Datastore

Task 1: (Optional) Prepare the Environment

If any systems were logged off, disconnected, or timed out, you must restore the student lab environment to continue the labs.

If no systems were logged off, disconnected, or timed out, do not perform this task.

Use the following information from the class configuration handout:

- vCenter Server administrator user name
- Standard lab password

1. Log in to the student desktop system.
2. On the taskbar, click the **Internet Explorer** icon.
3. On the Internet Explorer favorites bar, click **Site-A vSphere Web Client**.
4. Log in using the vCenter Server administrator user name and standard lab password.

Task 2: Import a Virtual Machine to the First ESXi Host

You use vSphere Web Client to import a virtual machine installed with a minimal operating system (CentOS Linux operating system). The virtual machine name is Linux-A-01. You place the virtual machine on the first ESXi host.

1. In the center pane, click **Hosts and Clusters**.

2. In the left pane, right-click the first ESXi host and select **Deploy OVF Template**.

3. On the Select source page, click **Browse**.

   The Open window might open in the background. Click the **Open** icon on the task bar if necessary.

4. In the Open window, click the **Desktop** icon and navigate to `Class Materials and Licenses\Downloads\VM01`.

5. Select the `Linux-A-01.ovf` file, and click **Open**.

6. On the Select source page, click **Next**.

7. On the Review details page, click **Next**.

8. On the Select name and folder page, select the data center, and click **Next**.

9. On the Select storage page, select your Virtual SAN datastore, accept the default settings, and click **Next**.

10. On the Setup networks page, accept the default setting and click **Next**.

11. On the Ready to complete page, select the **Power on after deployment** check box and click **Finish**.

12. Monitor the Recent Tasks pane to verify that the task completes successfully.

13. Verify that your new virtual machine is listed in the left pane and is powered on.

    If you do not see the virtual machine listed and powered on, click the **Refresh** icon in vSphere Web Client.

14. In the left pane, select the **Linux-A-01** virtual machine and click the **Summary** tab.

15. Verify that the virtual machine is located on the first ESXi host.

16. In the **Summary** tab, view the Related Objects panel and the VM Storage Policies panel.

    You might need to scroll down in the center pane to see these panels.

   Q1.   On which datastore is the virtual machine located?

Q2.   Which storage policy is the virtual machine using?

Q3.   Is the virtual machine compliant with its storage policy?

Task 3: Migrate the Virtual Machine to a Local Datastore

You migrate your virtual machine from the Virtual SAN datastore to the local datastore on the first ESXi host, and you observe how the migration to the local datastore affects virtual machine storage policy compliance.

Use the following information from the class configuration handout:

- Local datastore name

1. In the left pane, right-click the **Linux-A-01** virtual machine and select **Migrate**.

2. On the Select the migration type page, click **Change storage only** and click **Next**.

3. On the Select storage page, select the local datastore.

4. Leave **Keep existing VM storage policies** selected in the **VM Storage Policy** drop-down menu.

    Q1.   In the Compatibility panel towards the bottom, what does the warning say?

5. Click **Next**.

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

7. Monitor the Recent Tasks pane to verify that the task completes successfully.

8. In the virtual machine **Summary** tab, view the Related Objects panel and the VM Storage Policies panel.

    Q2.   On which datastore is the virtual machine located?

    Q3.   Which storage policy is the virtual machine using?

    Q4.   Is the virtual machine compliant with its storage policy?

Task 4: Migrate the Virtual Machine to the Virtual SAN Datastore

You migrate your virtual machine back to the Virtual SAN datastore to make the virtual machine compliant with its storage policy.

1. In the left pane, right-click the **Linux-A-01** virtual machine, and select **Migrate**.

2. On the Select the migration type page, click **Change storage only**, and click **Next**.

3. On the Select storage page, select the Virtual SAN datastore.

4. Select **Datastore Default** from the **VM Storage Policy** drop-down menu and click **Next**.

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

6. Monitor the Recent Tasks pane and verify that the task completes successfully.

7. In the center pane, in the VM Storage Policies panel, observe that the compliance status is Not Applicable.

▼ VM Storage Policies	□
VM Storage Policies	Virtual SAN Default Storage Policy
VM Storage Policy Compliance	⊘ Not Applicable
Last Checked Date	2/28/2016 5:45 PM
	Check Compliance
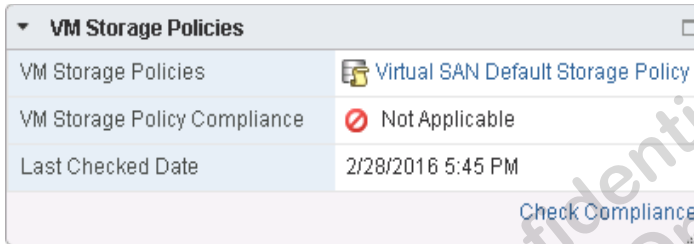
8. Click the **Check Compliance** link.

9. Verify that the compliance status is updated to Compliant.

10. Point to the **Home** icon and select **Home**.

Lab 9 Creating Storage Policies

Objective: Create and review virtual machine storage policies

In this lab, you perform the following tasks:

1. (Optional) Prepare the Environment
2. Examine the Default Storage Policy
3. Create a Custom Policy with No Failure Tolerance
4. Assign the Custom Policy to a Virtual Machine
5. Bring the Virtual Machine into Compliance
6. Compare Virtual Machines with Different Storage Policies
7. Edit Custom Policy to Require Two Disk Stripes Per Object
8. Edit Custom Policy to Increase Failure Tolerance to One
9. Create an Invalid Storage Policy

Task 1: (Optional) Prepare the Environment

If any systems were logged out, disconnected, or timed out, you must restore the student lab environment to continue the labs.

If no systems were logged out, disconnected, or timed out, do not perform this task. Use the following information from the class configuration handout:

- vCenter Server administrator user name
- Standard lab password

1. Log in to the student desktop system.
2. On the taskbar, click the **Internet Explorer** icon.

3. On the Internet Explorer favorites bar, click **Site-A vSphere Web Client**.

4. Log in using the vCenter Server administrator user name and standard lab password.

Task 2: Examine the Default Storage Policy

You examine the default storage policy included for Virtual SAN datastores.

1. In vSphere Web Client, in the center pane, select **VM Storage Policies**.

2. In the center pane, right-click **Virtual SAN Default Storage Policy,** and select **Edit Settings**.

   a. Examine the rules in Rule-Set 1 and view the Storage Consumption Model panel.

   Based on the rules in Rule-Set 1, the Storage Consumption Model panel shows the amount of storage that would be consumed for a virtual machine that is 100 GB in size.

   Q1. Why is the storage space twice the size of the virtual machine size?

   b. Click **Cancel**.

Task 3: Create a Custom Policy with No Failure Tolerance

You create a custom Virtual SAN storage policy that does not require failure tolerance.

1. Click the **Create a new VM storage policy** icon.
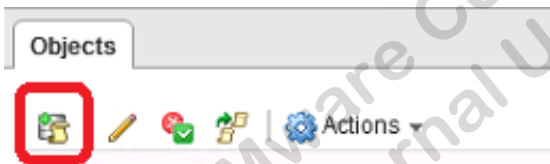
2. On the Name and description page, enter `Custom01` in the **Name** text box, and click **Next**.

3. Review the Rule-Sets page and click **Next**.

4. On the Rule-Set 1 page, select **VSAN** from the **Rules based on data services** drop-down menu.

5. From the **<Add rule>** drop-down menu, select **Number of failures to tolerate**.

6. In the **Number of failures to tolerate** text box, enter `0.`

7. View the Storage Consumption Model information.

   Based on Rule-Set 1, the Storage Consumption Model panel shows the amount of storage that would be consumed for a virtual machine that is 100 GB in size.

Q1. Why is the storage space size equal to the virtual machine size?

8. Click **Next**.

9. On the Storage compatibility page, select **Incompatible**.

   Only the local datastore is listed under Incompatible storage.

10. On the Storage compatibility page, select **Compatible**.

   Only the Virtual SAN datastore is listed under Compatible storage.

11. Click **Next**.

12. Click **Finish**.

13. Verify that the custom storage policy is created and appears in the list.

Task 4: Assign the Custom Policy to a Virtual Machine

You import a second virtual machine and apply your new Virtual SAN storage policy.

Use the following information from the class configuration handout:

- Local datastore name

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

2. Deploy the second virtual machine template from the VM02 folder to your local datastore.

   a. In the left pane, right-click the data center and select **Deploy OVF Template**.

   b. On the Select source page, click **Browse**.

   The Open window might open in the background. Click the **Open** icon on the task bar if necessary.

   c. In the Open window, click the **Desktop** icon and navigate to Class Materials and Licenses\Downloads\VM02.

   d. Select the Linux-A-02.ovf file and click **Open**.

   e. On the Select source page, click **Next**.

   f. On the Review details page, click **Next**.

   g. On the Select name and folder page, select your data center and click **Next**.

   h. On the Select a resource page, select the Virtual SAN cluster and click **Next**.

i. On the Select storage page, select the local datastore and click **Next**.

j. On the Setup networks page, accept the default setting and click **Next**.

k. On the Ready to complete page, select the **Power on after deployment** check box and click **Finish**.

l. Monitor the Recent Tasks pane to verify that the task completes successfully.

3. Verify that your new virtual machine is listed in the left pane and is powered on.

   If you do not see the virtual machine listed and powered on, click the **Refresh** icon in vSphere Web Client.

4. Assign your custom storage policy to the virtual machine.

   a. In the left pane, right-click your second virtual machine and select **VM Policies** > **Edit VM Storage Policies**.

   b. Select your custom storage policy from the **VM storage policy** drop-down menu.

   c. Click **Apply to all**.

      The VM Storage Policy column shows the custom storage policy name.

   d. Click **OK**.

   e. Monitor the Recent Tasks pane to verify that the task completes successfully.

5. In the left pane, select the **Linux-A-02** virtual machine, and click the **Summary** tab.

6. In the **Summary** tab, view the Related Objects panel and the VM Storage Policies panel.

   You might need to scroll down in the center pane to see these panels.

   Q1. **On which datastore is the virtual machine located?**

   Q2. **Which storage policy is the virtual machine using?**

   Q3. **Is the virtual machine compliant with its storage policy?**

Task 5: Bring the Virtual Machine into Compliance

You migrate your second virtual machine from the local datastore to the Virtual SAN datastore in order to bring it into compliance with its storage policy.

1. Examine the virtual machine details from the policy view.

a. Point to the **Home** icon and select **Policies and Profiles**.

b. In the left pane, select **VM Storage Policies**.

c. In the center pane, select your custom policy and click the name of the policy.

   When the policy is selected, the name of the policy turns into a link. If you do not select the policy first, the name does not turn into a link and clicking the name only selects the policy.

   The selected name of the policy links to the policy details page.

d. In the center pane, click the **Summary** tab.

   Q1. How many virtual machines have been assigned this policy and what is their status?

e. In the center pane, click the **Monitor** tab.

   Q2. Which virtual machine is noncompliant?

2. Migrate your second virtual machine to the Virtual SAN datastore to bring it into compliance.

   a. Point to the **Home** icon and select **VMs and Templates**.

   b. In the left pane, right-click your second virtual machine, and select **Migrate**.

   c. On the Select the migration type page, click **Change storage only,** and click **Next**.

   d. On the Select storage page, select your Virtual SAN datastore.

   e. Leave **Keep existing VM storage policies** selected in the **VM Storage Policy** drop-down menu and click **Next**.

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

   g. Monitor the Recent Tasks pane until the task completes successfully.

3. In the left pane, click the Back button to return to the policy view.
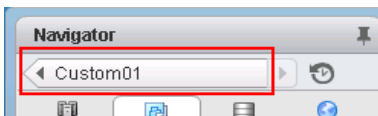
4. In the center pane, click the **Trigger VM storage policy compliance check** icon.
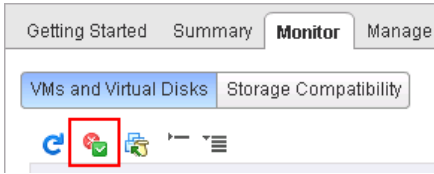
5. Verify that the compliance status of the virtual machine files change to Compliant.

Task 6: Compare Virtual Machines with Different Storage Policies

You view the objects and components of the first virtual machine and the second virtual machine, and you understand why the component layouts differ between the two virtual machines.

1. Point to the **Home** icon and select **VMs and Templates**.

2. View component information for the Hard disk 1 and VM home objects of the first virtual machine.

    a. In the left pane, select your first virtual machine.

    b. In the center pane, click the **Monitor** tab and click **Policies**.

        The VM home object is selected.

    c. Click the **Physical Disk Placement** tab at the bottom.

    d. If you cannot see the objects in the bottom tab, drag the divider upward. You can also minimize the Recent Tasks pane.

    Q1. What components are listed for VM home?

    e. Select **Hard disk 1** in the top panel.

    Q2. What components are listed for Hard disk 1?

3. View component information for the Hard disk 1 and VM home objects of the second virtual machine.

    a. In the left pane, select your second virtual machine.

b. In the center pane, click the **Monitor** tab and click **Policies**.

In the center pane, **VM home** is selected.

> **Q3. What components are listed for VM home?**

4. In the center pane, select **Hard disk 1**.

> **Q4. What components are listed for Hard disk 1?**

> **Q5. Why are the Hard disk 1 components of the first virtual machine different than the Hard disk 1 components of the second virtual machine?**

Task 7: Edit Custom Policy to Require Two Disk Stripes Per Object

You edit the custom storage policy to require two disk stripes per object, and you see the effect that the modified storage policy has on the virtual machine.

1. Edit your custom storage policy to require two disk stripes per object.

   a. Point to the **Home** icon and select **Policies and Profiles**.

   b. In the left pane, select **VM Storage Policies**.

   c. In the center pane, right-click your custom storage policy, and select **Edit Settings**.

   d. In the Edit VM Storage Policy window, select **Rule-Set 1** on the left.

   e. Select **Number of disk stripes per object** from the **Add Rule** drop-down menu.

   f. In the **Number of disk stripes per object** text box, enter **2** and click **OK**.

   g. In the VM Storage Policy in Use window, select **Manually later** and click **Yes**.

2. Propagate the policy changes to the virtual machines that use this policy.

   a. In the left pane, select your custom storage policy.

   b. In the center pane, click the **Monitor** tab.

c. Click the **Reapply VM storage policy to all out of date entities** icon and click **Yes**.

The status of the virtual machine's objects changes from Out of Date to Compliant or Noncompliant.

3. Examine your second virtual machine again to see what effect the policy change has.

    a. Point to the **Home** icon and select **VMs and Templates**.

    b. In the left pane, select the second virtual machine.

    c. In the center pane, select the **Monitor** tab and select **Policies**.

    d. If any of the objects in the center pane still have a status of noncompliant, click the **Checks the compliance of all VM storage policies** icon once every 30 seconds until all objects are in compliance.

        The Hard disk 1 object might take a few minutes to become compliant.

    Q1. How many components are listed in the Physical Disk Placement tab for VM home?

    e. In the center pane, select **Hard Disk 1**.

    Q2. How many components are listed in the Physical Disk Placement tab?

Task 8: Edit Custom Policy to Increase Failure Tolerance to One

You edit the custom storage policy to increase failure tolerance to one, and you see the effect that the modified storage policy has on the virtual machine.

1. Edit your custom storage policy to increase the number of failures to tolerate to 1.

    a. Point to the **Home** icon and select **Policies and Profiles**.

    b. In the left pane, select **VM Storage Policies**.

    c. In the center pane, right-click your custom storage policy and select **Edit Settings**.

    d. In the Edit VM Storage Policy window, select **Rule-Set 1** on the left.

    e. In the **Number of failures to tolerate** text box, enter **1** and click **OK**.

f. In the VM Storage Policy in Use window, select **Manually later**, and click **Yes**.

2. Propagate the policy changes to the virtual machines that use this policy.

   a. In the left pane, select your custom storage policy.

   b. In the center pane, click the **Reapply VM storage policy to all out of date entities** icon.

   A message warns of any potential performance effects as data is copied from the virtual machine.

   c. Click the **Show predicted storage impact** link.

   The Predicted Storage Impact window provides details about how the storage changes affect the datastore.

   d. Click **Close** and click **Yes** to reapply the storage policy.

   The status of the virtual machine objects changes from Out of Date to Compliant or Noncompliant.

3. Examine how the virtual machine has changed.

   a. Point to the **Home** icon and select **VMs and Templates**.

   b. In the left pane, select the second virtual machine.

   c. In the center pane, select the **Monitor** tab and select **Policies**.

   d. If any of the objects in the center have a status of noncompliant, click the **Checks the compliance of all VM storage policies** icon once every 30 seconds until all objects are in compliance.

   The Hard disk 1 object might take a few minutes to become compliant.

   Q1. What components are listed in the Physical Disk Placement tab for VM home?

   e. In the center pane, select **Hard disk 1**.

   Q2. What components are listed in the Physical Disk Placement tab for Hard disk 1?

   Q3. Why are there so many components now?

Task 9: Create an Invalid Storage Policy

You create an invalid storage policy and you view the error that vSphere Web Client displays.

1. In vSphere Web Client, point to the **Home** icon, and select **Policies and Profiles**.

2. In the left pane, click **VM Storage Policies**.

3. In the center pane, click the **Create a new VM storage policy** icon.

4. On the Name and description page, accept the default name and click **Next**.

5. On the Rule-Sets page, click **Next**.

6. Select **VSAN** from the **Rules based on data services** drop-down menu.

7. Select **Number of failures to tolerate** from the **<Add rule>** drop-down menu and enter **3**.

8. At the bottom of the window, click **Add another rule set**.

9. Select **VSAN** from the **Rules based on data services** drop-down menu.

   The drop-down menu is highlighted in red.

10. Point to the **Rules based on data services** drop-down menu to display the tool tip.

    The selection is highlighted in red because you cannot create multiple rule sets for the same namespace (in this case, VSAN). Only one rule set per namespace is allowed in a single storage policy.

11. Click **Cancel** to exit the Create New VM Storage Policy wizard.

12. In vSphere Web Client, point to the **Home** icon and select **Home**.

Lab 10 Using Maintenance Mode Options

Objective: Use different maintenance mode options and observe host state changes

In this lab, you perform the following tasks:

1. (Optional) Prepare the Environment
2. View Object Placement Across the Physical Disks in Virtual SAN
3. Put the Host in Maintenance Mode Using the No Data Migration Option
4. Put the Host in Maintenance Mode Using the Ensure Accessibility Option
5. Put the Host in Maintenance Mode Using the Full Data Migration Option

Task 1: (Optional) Prepare the Environment

If any systems were logged out, disconnected, or timed out, you must restore the student lab environment to continue the labs.

If no systems were logged out, disconnected, or timed out, do not perform this task. Use the following information from the class configuration handout:

- vCenter Server administrator user name
- Standard lab password

1. Log in to the student desktop system.
2. On the taskbar, click the **Internet Explorer** icon.
3. On the Internet Explorer favorites bar, click **Site-A vSphere Web Client**.

4. Log in using the vCenter Server administrator user name and standard lab password.

Task 2: View Object Placement Across the Physical Disks in Virtual SAN

You monitor the physical and virtual disks that are used by Virtual SAN.

1. In the center pane, click the **Hosts and Clusters** icon.

2. In the left pane, select your Virtual SAN cluster.

3. In the center pane, click the **Monitor** tab, and click **Virtual SAN**.

4. In the center pane, select **Physical Disks** on the left.

5. Use the list of disks in the center pane to determine which virtual machine is listed most frequently.

   a. In the center pane, select the first flash drive in the disk list.

   b. Check the VM objects on Disk list at the bottom of the center pane to see whether any virtual machine components are listed.

      Count how many components are listed for each virtual machine across all of the flash devices.

   c. If no virtual machines are listed, select the next disk marked Flash in the disk list and count the components listed for each virtual machine.

   d. Repeat steps b and c until you have examined all the flash drives in the list.

      Q1. Which virtual machine is listed most frequently?

      Q2. Why is that virtual machine listed most frequently?

6. Examine the **Physical Disk Placement** tab for the details of Hard Disk 1 for the second virtual machine.

   a. In the center pane, select **Virtual Disks** on the left side.

   b. In the center pane, expand the second virtual machine and select **Hard Disk 1**.

   c. Review the information on the **Physical Disk Placement** tab at the bottom of the center pane.

   d. Record the host that is listed twice in the **Physical Disk Placement** tab. _____

      If more than one host is listed twice, choose any one of the hosts.

In this example, the esxi-b-03 host is listed twice because it contains two of the data components of the virtual machine.

Task 3: Put the Host in Maintenance Mode Using the No Data Migration Option

You put the host that you recorded in task 2 into maintenance mode, specifying No Data Migration as the Virtual SAN data migration option. You observe the virtual machine state as its compute resource is removed.

1. Put the selected host into maintenance mode and do not migrate any data.

   a. In the left pane, right-click the ESXi host that you recorded in task 2 and select **Maintenance Mode** > **Enter Maintenance Mode**.

   b. In the Confirm Maintenance Mode window, select **No data migration** from the **Virtual SAN data migration** drop-down menu and click **OK**.

   c. If a DRS warning message appears, click **OK**.

   d. Monitor the Recent Tasks pane to verify that the task completes successfully.

2. After the selected host appears in maintenance mode, click the **Refresh** icon in vSphere Web Client.

3. View the virtual machine's compliance status.

   a. In the left pane, select your second virtual machine.

   b. In the center pane, click the **Monitor** tab, and click **Policies**.

   c. Click the **Checks the compliance of all VM storage policies** icon.

> **Q1.** What is the virtual machine storage policy compliance status?

4. View the virtual machine's component information.

   a. Select **Hard Disk 1** and examine the **Physical Disk Placement** tab.

   > **Q2.** What is different on the Physical Disk Placement tab?

5. In the left pane, right-click the host that is in maintenance mode, select **Maintenance Mode** > **Exit Maintenance Mode**.

6. Monitor the Recent Tasks pane to verify that the task completes successfully.

   The host is no longer in maintenance mode.

7. In the left pane, select your second virtual machine.

8. In the center pane, select **Hard Disk 1** for your second virtual machine and examine the **Physical Disk Placement** tab.

   All components of Hard Disk 1 have a status of Active.

   If you do not see a status of Active, click the **Refresh** icon in vSphere Web Client.

9. In the center pane, click the **Checks the compliance of all VM storage policies** icon.

10. Verify that the compliance status of the virtual machine objects changes from Noncompliant to Compliant.

Task 4: Put the Host in Maintenance Mode Using the Ensure Accessibility Option

You put the host that you recorded in task 2 into maintenance mode, specifying Ensure Accessibility as the Virtual SAN data migration option. You observe the virtual machine state as its compute resource is removed.

1. Put the selected host into maintenance mode and ensure accessibility for virtual machines.

   a. In the left pane, right-click the host that you recorded in task 2 and select **Maintenance Mode** > **Enter Maintenance Mode**.

   b. In the Confirm Maintenance Mode window, select **Ensure Accessibility** from the **Virtual SAN data migration** drop-down menu, and click **OK**.

   c. Monitor the Recent Tasks pane to verify that the task completes successfully.

2. After the selected host appears in maintenance mode, click the **Refresh** icon in vSphere Web Client.

3. In the left pane, select your second virtual machine.

4. In the center pane, select **Hard Disk 1** on your second virtual machine and examine the **Physical Disk Placement** tab.

   Q1. What is different on the Physical Disk Placement tab?

   Q2. Why did none of the components migrate to another host?

5. In the center pane, click the **Checks the compliance of all VM storage policies** icon.

   Q3. What is the compliance status of the virtual machine objects?

6. In the left pane, right-click the selected host and select **Maintenance Mode** > **Exit Maintenance Mode**.

7. Monitor the Recent Tasks pane to verify that the task completes successfully.

8. In the left pane, select your second virtual machine.

9. In the center pane, select **Hard Disk 1** for your second virtual machine and examine the **Physical Disk Placement** tab.

   All components of Hard Disk 1 have a status of Active.

   If you do not see a status of Active, click the **Refresh** icon in vSphere Web Client.

10. In the center pane, click the **Checks the compliance of all VM storage policies** icon.

11. Verify that the compliance status of the virtual machine objects changes from Noncompliant to Compliant.

Task 5: Put the Host in Maintenance Mode Using the Full Data Migration Option

You put the host that you recorded in task 2 into maintenance mode, specifying the Full Data option. You observe the virtual machine state as its compute resource is removed.

1. Put the selected host into maintenance mode and perform a full data migration.

   a. In the left pane, right-click the host that you recorded in task 2 and select **Maintenance Mode** > **Enter Maintenance Mode**.

   b. In the Confirm Maintenance Mode window, select **Full data migration** from the **Virtual SAN data migration** drop-down menu, and click **OK**.

c. Monitor the Recent Tasks pane until the task fails.

Q1. Why did the task fail?

2. Point to the **Home** icon and select **Home**.

Lab 11 Scaling Out a Virtual SAN Cluster

Objective: Scale out the Virtual SAN cluster and perform management tasks

In this lab, you perform the following tasks:

1. (Optional) Prepare the Environment
2. Add a Fourth Host to a Virtual SAN Cluster
3. Verify that the Fourth Host Has Flash Drives
4. Create Disk Groups for the Fourth Host
5. Test Maintenance Mode Data Evacuation with a Fourth Host
6. Demonstrate Disk Group Maintenance Without Maintenance Mode
7. Edit Custom Policy to Use RAID 5

Task 1: (Optional) Prepare the Environment

If any systems were logged out, disconnected, or timed out, you must restore the student lab environment to continue the labs.

If no systems were logged out, disconnected, or timed out, do not perform this task.

Use the following information from the class configuration handout:

- vCenter Server administrator user name
- Standard lab password

1. Log in to the student desktop system.
2. On the taskbar, click the **Internet Explorer** icon.

3. On the Internet Explorer favorites bar, click **Site-A vSphere Web Client**.

4. Log in using the vCenter Server administrator user name and standard lab password.

Task 2: Add a Fourth Host to a Virtual SAN Cluster

You add a fourth ESXi host to your Virtual SAN cluster.

1. In the center pane, click the **Hosts and Clusters** icon.

2. View resource information about the Virtual SAN cluster.

    a. In the left pane, select your Virtual SAN cluster.

    b. In the center pane, click the **Summary** tab.

    c. Record the total CPU capacity of the Virtual SAN cluster. _____

    d. Record the total memory capacity of the Virtual SAN cluster. _____

    e. Record the total storage capacity of the Virtual SAN cluster. _____

    f. Expand the Cluster Resources panel.

    g. Record the number of hosts that participate in the cluster. _____

3. Move the fourth ESXi host into the Virtual SAN cluster.

    a. In the left pane, right-click your Virtual SAN cluster, and select **Move Hosts into Cluster**.

    b. In the Move Hosts into Cluster window, select the check box of your fourth ESXi host, and click **OK**.

    c. In the Move Host into This Cluster window, leave the default values, and click **OK**.

4. Monitor the Recent Tasks pane to verify that the task completes successfully.

5. Click the **Refresh** icon in vSphere Web Client.

6. View resource information about the Virtual SAN cluster.

    a. In the center pane, click the cluster **Summary** tab.

    b. View the Cluster Resources panel.

    Q1. How many hosts are present in the Virtual SAN cluster?

    c. Compare the total CPU capacity of the Virtual SAN cluster to the value recorded in step 2.c.

    d. Compare the total memory capacity of the Virtual SAN cluster to the value recorded in step 2.d.

Q2. Why do the values not match for CPU and memory capacity?

   e. Compare the total storage capacity of the Virtual SAN cluster to the value recorded in step 2.e.

Q3. Why do the values match for storage capacity?

7. Verify that the host has access to the Virtual SAN datastore.

   a. In vSphere Web Client, point to the **Home** icon and select **Storage**.

   b. In the left pane, expand the data center and select your Virtual SAN datastore.

   c. In the center pane, click the **Related Objects** tab.

   d. On the **Related Objects** tab, click **Hosts**.

   e. Verify that your fourth host is listed in the center pane.

Task 3: Verify that the Fourth Host Has Flash Drives

Before creating disk groups for the fourth ESXi host, you verify that the host contains flash drives.

1. In vSphere Web Client, point to the **Home** icon and select **Hosts and Clusters**.

2. In the left pane, select your fourth ESXi host.

3. In the center pane, click the **Manage** tab and click **Storage**.

4. In the center pane, select **Storage Devices** on the left side.

5. Examine the Drive Type column for the drives in the list.

6. Verify that the 4.00 GB, 4.50 GB, 6.00 GB and 6.50 GB drives are of type Flash.

Task 4: Create Disk Groups for the Fourth Host

You use vSphere Web Client to create two disk groups for the fourth ESXi host.

1. Create a disk group with the 4.00 GB and 6.00 GB disks.

   a. In the left pane, select your Virtual SAN cluster.

   b. In the center pane, click the **Manage** tab and click **Settings**.

   c. Select **Disk Management** on the left.

   d. In the center pane, select the fourth ESXi host and click the **Claim disks** icon.

e. In the Claim Disks for Virtual SAN Use window, click the arrow next to the entry for the 6.00 GB disks.

   The 6.00 GB flash disks for the fourth ESXi host appear in the list.

f. Click the arrow next to the entry for the 4.00 GB disks.

   The 4.00 GB flash disk for the fourth ESXi host appears in the list.

g. Click the arrow to minimize the entry for the 6.00 GB and 4.00 GB disks.

h. Change the values under the **Claim For** column title so that the 6.00 GB Flash drives are claimed for the capacity tier, and the 4.00 GB Flash drives are claimed for the cache tier.

   None of the other disks must be claimed.

   - For the 6.00 GB Flash drives, select **Capacity tier** under the **Claim For** column.

   - For the 4.00 GB Flash drives, select **Cache tier** under the **Claim For** column.

   - For the 6.50 GB Flash drives, select **Do not claim** under the **Claim For** column.

   - For the 4.50 GB Flash drives, select **Do not claim** under the **Claim For** column.

Disk Model/Serial Number	Claim For	Drive Type
▸ F VMware Virtual disk , 6.00 GB disks	🖥 Capacity tier	Flash
▸ F VMware Virtual disk , 4.00 GB disks	⚡ Cache tier	Flash
▸ F VMware Virtual disk , 6.50 GB disks	🚫 Do not claim	Flash
▸ F VMware Virtual disk , 4.50 GB disks	🚫 Do not claim	Flash

i. Click **OK**.

j. Monitor the Recent Tasks pane to verify that the task completes successfully.

2. Create a disk group with the 4.50 GB and 6.50 GB disks.

a. In the center pane, select the fourth ESXi host and click the **Claim disks** icon.

b. Change the values under the **Claim For** column title so that the 6.50 GB Flash drives are claimed for the capacity tier, and the 4.50 GB Flash drives are claimed for the cache tier.

   - For the 6.50 GB Flash drives, select **Capacity tier** under the **Claim For** column.

   - For the 4.50 GB Flash drives, select **Cache tier** under the **Claim For** column.

c. Click **OK**.

d. Monitor the Recent Tasks pane to verify that the task completes successfully.

3. View the Virtual SAN information.

a. Click the **Refresh** icon in vSphere Web Client.

b. Click the **Summary** tab.

c. View the Virtual SAN Capacity panel.

d. Record the total capacity of the Virtual SAN datastore. _____

Task 5: Test Maintenance Mode Data Evacuation with a Fourth Host

In lab 10, a maintenance mode attempt failed because insufficient resources were available to support the data evacuation. With a fourth host, this operation succeeds.

1. In the center pane, click the **Monitor** tab and click **Virtual SAN** at the top.

2. In the center pane, select **Virtual Disks**.

3. In the center pane, select **Hard Disk 1** under your second virtual machine.

4. Review the information on the **Physical Disk Placement** tab at the bottom of the center pane.

5. Record the host that is listed twice in the **Physical Disk Placement** tab. _____

   This host contains two of the virtual machine data components.

6. Put the selected host into maintenance mode and perform a full data migration.

   a. In the left pane, right-click the selected host that you recorded in step 5 and select **Maintenance Mode** > **Enter Maintenance Mode**.

   b. In the Confirm Maintenance Mode window, select **Full data migration** from the **Virtual SAN data migration** drop-down menu and click **OK**.

7. Monitor the Recent Tasks pane until the task completes successfully.

   Q1.   Why did the task complete this time?

8. After the task completes, click the **Refresh** icon in vSphere Web Client.

9. View the physical disk placement of Hard Disk 1 for your second virtual machine.

   a. In the left pane, select the Virtual SAN cluster.

   b. In the center pane, click the **Monitor** tab and click **Virtual SAN**.

   c. Select **Virtual Disks** to the left.

   d. Select **Hard Disk 1** of your second virtual machine.

   e. Examine the **Physical Disk Placement** tab.

10. In the left pane, right-click the host in maintenance mode and select **Maintenance Mode** > **Exit Maintenance Mode**.

11. Monitor the Recent Tasks pane until the task completes successfully.

Task 6: Demonstrate Disk Group Maintenance Without Maintenance Mode

You do not need to put the host in maintenance mode to add or remove disks from a disk group.

1. Remove the second capacity disk from the first disk group under your first ESXi host.

   a. In the left pane, select the Virtual SAN cluster.

   b. In the center pane, click the **Manage** tab and click **Settings**.

   c. Select **Disk management** on the left side.

   d. In the Disk Group list, select the first disk group under your first ESXi host.

   e. In the Disk Group details panel at the bottom, select the second capacity disk.

f. Click the **Remove the selected disk(s) from the disk group** icon.

Disk group (0000000000766d686261313a313a30): Disks

Name	Drive Type
F Local VMware Disk (mpx.vmhba1:C0:T1:L0)	Flash
F Local VMware Disk (mpx.vmhba1:C0:T2:L0)	Flash
F Local VMware Disk (mpx.vmhba1:C0:T3:L0)	Flash

g. In the Remove Disk window, accept the default values and click **Yes**.

h. Monitor the Recent Tasks pane until the task completes successfully.

i. Verify that the disk is removed from the disk group.

2. Add the capacity disk back to the first disk group under your first ESXi host.

a. In the **Disk Groups** list, select the first disk group under your first ESXi host.

b. In the Disk group details panel at the bottom, click the **Add a disk to the selected disk group** icon.

Disk group (0000000000766d686261313a313a30): Disks

Name	Drive Type
F Local VMware Disk (mpx.vmhba1:C0:T1:L0)	Flash
F Local VMware Disk (mpx.vmhba1:C0:T2:L0)	Flash

c. In the Add Capacity Disks to Disk Group window, select the check box next to the available 6.00 GB disk and click **OK**.

d. Monitor the Recent Tasks pane until the task completes successfully.

e. Verify that the disk is added back to the disk group.

You might have to wait a couple of minutes and refresh the display.

Task 7: Edit Custom Policy to Use RAID 5

You edit the custom storage policy to use RAID 5. The RAID 5 failure tolerance method requires a minimum of four hosts in the Virtual SAN cluster.

1. Edit your custom storage policy to use the RAID 5 failure tolerance method.

a. Point to the **Home** icon and select **Policies and Profiles**.

b. In the left pane, select **VM Storage Policies**.

c. In the center pane, right-click your custom storage policy and select **Edit Settings**.

d. In the Edit VM Storage Policy window, select **Rule-Set 1** on the left.

e. Select **Failure tolerance method** from the **Add Rule** drop-down menu.

f. From the **Failure tolerance method** drop-down list, select **RAID-5/6 (Erasure Coding) - Capacity**.

g. View the Storage Consumption Model information to see how this failure tolerance method affects the amount of storage consumed.

h. Click **OK**.

i. In the VM Storage Policy in Use window, select **Manually later** and click **Yes**.

2. Propagate the policy changes to the virtual machines that use this policy.

a. In the left pane, select your custom storage policy.

b. In the center pane, click the **Monitor** tab.

c. Click the **Reapply VM storage policy to all out of date entities** icon and click **Yes**.

The status of the virtual machine objects changes from Out of Date to Compliant or Noncompliant.

3. View the components of the second virtual machine.

a. Point to the **Home** icon and select **VMs and Templates**.

b. In the left pane, select your second virtual machine.

c. In the center pane, click the **Monitor** tab and click **Policies**.

d. If any of the objects in the center have a status of noncompliance, click the **Checks the compliance of all VM storage policies** icon once every 30 seconds until all objects are in compliance.

The Hard disk 1 object might take a few minutes to become compliant.

e. In the center pane, select **VM home** and click the **Physical Disk Placement** tab at the bottom.

Q1. What components are listed for VM home?

f. In the center pane, select **Hard disk 1** and click the **Physical Disk Placement** tab at the bottom.

   Q2.   What components are listed for Hard disk 1?

4. Point to the **Home** icon and click **Home**.

Lab 12 Working with Fault Domains

Objective: Create fault domains and examine the effects on virtual machines

In this lab, you perform the following tasks:

1. (Optional) Prepare the Environment

2. Create Three Fault Domains

3. Verify That Custom Storage Policy Works with the Second Virtual Machine

4. Enable Deduplication and Compression on the Cluster

Task 1: (Optional) Prepare the Environment

If any systems were logged out, disconnected, or timed out, you must restore the student lab environment to continue the labs.

If no systems were logged out, disconnected, or timed out, do not perform this task.

Use the following information from the class configuration handout:

- vCenter Server administrator user name

- Standard lab password

1. Log in to the student desktop system.

2. On the taskbar, click the **Internet Explorer** icon.

3. On the Internet Explorer favorites bar, click **Site-A vSphere Web Client**.

4. Log in using the vCenter Server administrator user name and standard lab password.

Task 2: Create Three Fault Domains

You use vSphere Web Client to create three fault domains. The first and second fault domain each contain one ESXi host, and the third fault domain contains two hosts.

1. In the center pane, click the **Hosts and Clusters** icon.

2. In the left pane, select your Virtual SAN cluster.

3. In the center pane, click the **Manage** tab and click **Settings**.

4. Select **Fault Domains & Stretched Cluster** on the left.

5. Create your first fault domain, using your first ESXi host.

   a. In the center pane, click the **Create a new fault domain** icon.

   b. In the **Name** text box, enter **FD-01**.

   c. In the Host list, select the check box for your first ESXi host and click **OK**.

   d. Monitor the Recent Tasks pane until the task completes successfully.

   e. If the new fault domain does not appear, click the **Refresh** icon.
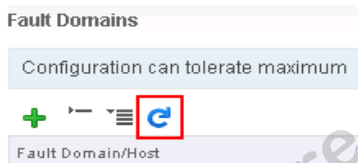
   The new fault domain appears in the center pane.

6. Create a second fault domain with your second ESXi host.

   a. In the center pane, click the **Create a new fault domain** icon.

   b. In the **Name** text box, enter **FD-02**.

   c. In the Host list, select the check box for your second ESXi host and click **OK**.

   d. Monitor the Recent Tasks pane until the task completes successfully.

7. Create a third fault domain with your third ESXi host.

   a. In the center pane, click the **Create a new fault domain** icon.

   b. In the **Name** text box, enter **FD-03**.

c. In the Host list, select the check box for your third ESXi host and click **OK**.

d. Monitor the Recent Tasks pane until the task completes successfully.

8. Add your fourth ESXi host to the third fault domain.

   a. In the center pane, select your fourth ESXi host and click the **Move hosts into fault domain** icon.

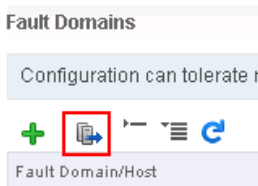   b. In the list of fault domains, select the third fault domain and click **OK**.

   c. Monitor the Recent Tasks pane until the task completes successfully.

   d. If the fourth ESXi host does not appear in the third fault domain, click the **Refresh** icon.

Task 3: Verify That Custom Storage Policy Works with the Second Virtual Machine

Since you created three fault domains with the four ESXi hosts, the second virtual machine, which uses your custom storage policy, might be out of date. You check if the second virtual machine is still compliant with the custom storage policy. If the virtual machine is not compliant with the storage policy, then you take steps to resolve the issue.

1. Verify that the second virtual machine is still in compliance with its assigned storage policy.

   a. Point to the **Home** icon and select **VMs and Templates**.

   b. In the left pane, select the second virtual machine.

   c. In the center pane, click the **Monitor** tab and click **Policies**.

d. Click the **Checks the compliance of all VM storage policies** icon.

> **Q1.** Why are the virtual machine objects not compliant?

2. Create a fourth fault domain by using the fourth ESXi host.

   a. Point to the **Home** icon and select **Hosts and Clusters**.

   b. Select the Virtual SAN cluster.

      The Fault Domains & Stretched Cluster panel appears in the center pane.

   c. Select the fourth ESXi host, which currently belongs to the third fault domain.

   d. Click the **Move hosts out of fault domain** icon.

Fault Domains

Configuration can tolerate maxim

➕ | 🗗 🗗 | ▔— ▔☰ ⟳

Fault Domain/Host

   e. Click **Yes** to confirm the move.

   f. Monitor the Recent Tasks pane until the task completes successfully.

3. Create a fourth fault domain with your fourth ESXi host.

   a. In the center pane, click the **Create a new fault domain** icon.

   b. In the **Name** text box, enter **FD-04**.

   c. In the Host list, select the check box for your fourth ESXi host and click **OK**.

   d. Monitor the Recent Tasks pane until the task completes successfully.

   e. If the new fault domain does not appear, click the **Refresh** icon.
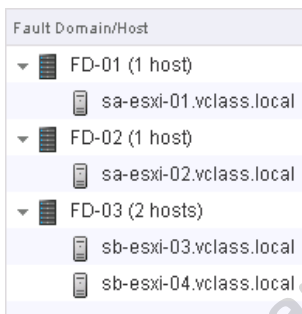
4. Reapply the custom storage policy to your second virtual machine.

   a. Point to the **Home** icon and select **VMs and Templates**.

   b. In the left pane, select the second virtual machine.

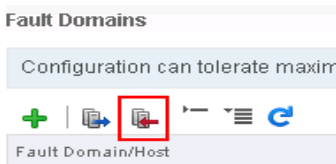   c. In the center pane, click the **Monitor** > **Policies** tab.

   d. Click the **Checks the compliance of all VM storage policies** icon.

> **Q2.** Are the virtual machine objects compliant?

5. View the effect the policy change has on the physical disk placement of your second virtual machine.

   a. View the components of the VM home object in the **Physical Disk Placement** tab.

      Q3.   How many components are listed?

      Q4.   Are these components spread across all four fault domains?

   b. In the center pane, select **Hard Disk 1**.

      Q5.   How many components are listed in the Physical Disk Placement tab?

      Q6.   Are these components spread across all four fault domains?

Task 4: Enable Deduplication and Compression on the Cluster

You enable deduplication and compression on the Virtual SAN cluster.

1. Point to the **Home** icon and select **Hosts and Clusters**.
2. In the left pane, select the Virtual SAN cluster.
3. In the center pane, click the **Manage** tab and click **Settings**.
4. Select **General** under Virtual SAN on the left.
5. In the Virtual SAN Is Turned ON panel, click **Edit**.
6. In the **Deduplication and compression** drop-down list, select **Enabled**.
7. Select the **Allow Reduced Redundancy** check box and click **OK**.
8. Monitor the Recent Tasks pane until the task completes successfully.

   Notify your instructor when the task has started.

   This task takes several minutes to complete. You must ensure that this task completes successfully before proceeding to the next lab.

9. Point to the **Home** icon and select **Home**.

Lab 13 Using the Health and Performance Services

Objective: Monitor Virtual SAN health, performance, and capacity

In this lab, you perform the following tasks:

1. (Optional) Prepare the Environment
2. Simulate a Host Failure to Trigger Health Alerts
3. Monitor the Health Service for Failed Tests
4. View Information About the Failed Network Tests
5. View Information About the Failed Physical Disk Tests
6. View Information About the Failed Cluster Tests
7. Resolve the Host Failure
8. Enable the Performance Service
9. View Performance Graphs
10. View Virtual SAN Capacity Details

Task 1: (Optional) Prepare the Environment

If any systems were logged out, disconnected, or timed out, you must restore the student lab environment to continue the labs.

If no systems were logged out, disconnected, or timed out, do not perform this task.

Use the following information from the class configuration handout:

- vCenter Server administrator user name
- Standard lab password

1. Log in to the student desktop system.

2. On the taskbar, click the **Internet Explorer** icon.

3. On the Internet Explorer favorites bar, click **Site-A vSphere Web Client**.

4. Log in using the vCenter Server administrator user name and standard lab password.

Task 2: Simulate a Host Failure to Trigger Health Alerts

You simulate a host failure by disconnecting the ESXi host from vCenter Server.

1. In the center pane, click the **Hosts and Clusters** icon.

2. In the left pane, right-click the first ESXi host and select **Connection** > **Disconnect**.

3. Click **Yes** to confirm the disconnect.

4. Verify that the first ESXi host is disconnected.

Task 3: Monitor the Health Service for Failed Tests

You use the health service to identify health tests that failed.

1. In the left pane, select the Virtual SAN cluster.

2. Click the **Monitor** tab and click **Virtual SAN**.

3. In the center pane, select **Health** on the left side.

   The Virtual SAN Health panel shows a number of failed tests.

   Virtual SAN Health (Last checked: Today at 5:54 PM)

Test Result	Test Name
❌ Failed	▸ Network
❌ Failed	▸ Physical disk
❌ Failed	▸ Cluster
⚠ Warning	▸ Hardware compatibility
✅ Passed	▸ Data
✅ Passed	▸ Limits
✅ Passed	▸ Performance service

Task 4: View Information About the Failed Network Tests

You view information about the failed network tests and identify how to troubleshoot and resolve the underlying issues.

1. Expand the Network test category.

    Out of all the network tests, the first two tests have failed.

Virtual SAN Health (Last checked: Today at 5:54 PM)

Test Result	Test Name
❌ Failed	▼ Network
❌ Failed	Hosts disconnected from VC
❌ Failed	Unexpected Virtual SAN cluster members
✅ Passed	All hosts have a Virtual SAN vmknic configured
✅ Passed	All hosts have matching multicast settings
✅ Passed	All hosts have matching subnets
✅ Passed	Basic (unicast) connectivity check (normal ping)
✅ Passed	Hosts with connectivity issues
✅ Passed	Hosts with Virtual SAN disabled
✅ Passed	MTU check (ping with large packet size)
✅ Passed	Multicast assessment based on other checks
✅ Passed	Virtual SAN cluster partition

2. View the first network test that failed.

    a. Select **Hosts disconnected from VC** and view the bottom panel.

    Q1.   What is the purpose of this test?

    Q2.   What host is disconnected from vCenter Server?

    b. Click **Ask VMware**, and go through the knowledge base article.

    Q3.   According to the article, how would you troubleshoot and fix the error?

    c. Close the knowledge base article window.

3. View the second network test that has failed.

    a. Select **Unexpected Virtual SAN cluster members** and view the bottom panel.

        Q4.   What host is an unexpected Virtual SAN cluster member?

    b. Click **Ask VMware**, and go through the knowledge base article.

        Q5.   What is the purpose of this test?

        Q6.   What does it mean when this test returns an error?

        Q7.   How would you troubleshoot and fix the error?

    c. Close the knowledge base article window.
4. Minimize the Network test category.

Task 5: View Information About the Failed Physical Disk Tests

You view information about the failed physical disk tests, and you identify how to troubleshoot and resolve the underlying issues.

1. Expand the Physical disk test category.

   Out of all the physical disk tests, the first test has failed.

   Virtual SAN Health (Last checked: Today at 5:54 PM)

Test Result	Test Name
❌ Failed	▶ Network
❌ Failed	▼ Physical disk
❌ Failed	Physical disk health retrieval issues
✅ Passed	Component limit health
✅ Passed	Component metadata health
✅ Passed	Congestion
✅ Passed	Disk capacity
✅ Passed	Memory pools (heaps)
✅ Passed	Memory pools (slabs)
✅ Passed	Metadata health
✅ Passed	Overall disks health
✅ Passed	Software state health

2. View the physical disk test that has failed.

   a. Select **Physical disk health retrieval issues** and view the bottom panel.

      Q1. What is the purpose of this test?

   b. Click **Ask VMware**, and go through the knowledge base article.

      Q2. According to the article, how would you troubleshoot and fix the error?

   c. Close the knowledge base article window.

3. Minimize the Physical disk test category.

Task 6: View Information About the Failed Cluster Tests

You view information about the failed cluster tests and identify how to troubleshoot and resolve the underlying issues.

1. Expand the Cluster test category.

   Out of all the cluster tests, the first test failed, and the second test has a result of Unknown.

2. View the cluster test that has failed.

    a. Select **Virtual SAN CLOMD liveness** and view the bottom panel.

        Q1. Does the bottom panel give you enough information to identify the problem?

        Q2. What is the status of the first ESXi host?

    b. Click **Ask VMware**, and go through the knowledge base article.

        Q3. According to the article, what is the purpose of CLOMD?

        Q4. Why was the first ESXi host given a status of unknown?

        Q5. What does the article mention as a good test to further probe into CLOMD health?

    c. Close the knowledge base article window.

3. Minimize the Cluster test category.

4. Run the virtual machine creation test to test the health of CLOMD.

    a. In the center pane, select **Proactive Tests** on the left side.

    b. Select the VM creation test.

    c. Click the **Run Test Now** icon and click **Yes** to confirm running the test.

        Q6. Did the VM creation test fail? Why or why not?

Task 7: Resolve the Host Failure

You resolve the host failure by reconnecting the ESXi host to vCenter Server.

1. In the left pane, right-click the first ESXi host and select **Connection** > **Connect**.

2. Click **Yes** to confirm the reconnect.

3. Verify that the first ESXi host is connected.

4. Rerun the proactive VM creation test and verify that the test is successful on all the ESXi hosts.

5. Rerun the health tests and verify that the network, physical disk, and cluster tests pass.

   a. In the left pane, select the Virtual SAN cluster.

   b. In the center pane, click the **Monitor** tab and click **Virtual SAN**.

   c. Select Health on the left side.

   d. In the Virtual SAN Health panel, click **Retest**.

   e. Verify that no failed tests are listed.

Task 8: Enable the Performance Service

You enable the performance service to collect performance data.

1. In the center pane, click the **Manage** tab and click **Settings**.

2. Select **Health and Performance** on the left side.

3. Click **Edit** to the right of Performance Service.

4. Leave the default storage policy selected and click **OK**.

5. In the center pane, verify that the performance service is turned on, the stats object is healthy, and the stats object is compliant with its storage policy.

Task 9: View Performance Graphs

You view various performance graphs for the cluster, ESXi hosts, and virtual machines, and you familiarize yourself with the different metrics.

1. View performance metrics for the cluster.

   a. In the left pane, select the Virtual SAN cluster.

   b. In the center pane, click **Monitor** and click **Performance**.

   c. Select Virtual SAN - Virtual Machine Consumption on the left side.

   d. Scroll through the different performance metrics and click the **Information** icon next to performance metrics that are of interest to you.

    e. View the Backend panel to get familiar with the performance metrics that are available for monitoring.

2. View performance metrics for the first ESXi host.

    a. In the left pane, select the first ESXi host.

    b. In the center pane, click **Monitor** and click **Performance**.

    c. In the center pane, select **Virtual SAN - Virtual Machine Consumption** on the left side.

    d. Scroll through the different performance metrics and click the **Information** icon next to performance metrics that are of interest to you.

    e. View the Backend, Disk Group, and Disk panels to get familiar with the performance metrics that are available for monitoring.

3. View performance metrics for the second virtual machine.

    a. In the left pane, select the second virtual machine.

    b. In the center pane, click **Monitor** and click **Performance**.

    c. In the center pane, select **Virtual SAN - Virtual Disk** on the left side.

    d. Scroll through the different performance metrics and click the **Information** icon next to performance metrics that are of interest to you.

    e. View the Virtual Machine Consumption panel to get familiar with the performance metrics that are available for monitoring.

Task 10: View Virtual SAN Capacity Details

You view the capacity details of your Virtual SAN cluster.

1. In the left pane, select the Virtual SAN cluster.

2. In the center pane, click the **Monitor** tab and select **Virtual SAN**.

3. Select **Capacity** on the left side.

4. View the following capacity information.

   • Virtual SAN used capacity and free capacity

   • Deduplication and compression overhead

   • Deduplication and compression savings

   • Used capacity breakdown by object types

   • Used capacity breakdown by data types

5. Point to each object type to get a description of the object type.

6. Point to each data type to get a description of the data type.

7. Point to the **Home** icon and select **Home**.

Lab 14 Using Ruby vSphere Console and ESXi Commands

Objective: Use RVC, Virtual SAN Observer, and ESXi commands to monitor Virtual SAN

In this lab, you perform the following tasks:

1. (Optional) Prepare the Environment
2. Determine the Target Host
3. Create a Virtual Machine Snapshot
4. Log In to Ruby vSphere Console
5. Configure RVC Marks
6. Use vsan Commands to Monitor Virtual SAN
7. Access the Virtual SAN Observer Web Site and Monitor Performance Metrics
8. Use the esxtop Command to Monitor Virtual SAN

Task 1: (Optional) Prepare the Environment

If any systems were logged out, disconnected, or timed out, you must restore the student lab environment to continue the labs.

If no systems were logged out, disconnected, or timed out, do not perform this task.

Use the following information from the class configuration handout:

- vCenter Server administrator user name
- Standard lab password

1. Log in to the student desktop system.

2. On the taskbar, click the **Internet Explorer** icon.

3. On the Internet Explorer favorites bar, click **Site-A vSphere Web Client**.

4. Log in using the vCenter Server administrator user name and standard lab password.

Task 2: Determine the Target Host

You use vSphere Web Client to determine the host on which the first virtual machine is located.

1. In the center pane, click the **Hosts and Clusters** icon.

2. In the left pane, select your first virtual machine.

3. In the center pane, click the **Summary** tab.

4. Record the name of the host on which this virtual machine is located. _____

Task 3: Create a Virtual Machine Snapshot

You use vSphere Web Client to create a snapshot for the first virtual machine.

1. In the left pane, right-click the first virtual machine.

2. Select **Snapshots** > **Take Snapshot**.

3. In the **Name** text box, enter **Snapshot 1**.

4. Keep the rest of the default options and click **OK**.

5. Monitor the Recent Tasks pane to verify that the task completes successfully.

6. Point to the **Home** icon and select **Home**.

Task 4: Log In to Ruby vSphere Console

You use MTPuTTY to log in to the vCenter Server system. Then, you log in to Ruby vSphere Console (RVC).

Use the following information from the class configuration handout:

- vCenter Server name
- vCenter Server RVC user name
- Standard lab password

1. Use MTPuTTY to log in to the vCenter Server system.

   a. On the taskbar, click the **MTPuTTY** icon.

   b. In the left pane, double-click the vCenter Server system.

      You are automatically logged in to the vCenter Server system as user root.

2. Log in to RVC.

   You can use tab completion to help enter commands.

   a. At the command prompt, enter **rvc** *vCenter_Server_RVC_user_name*.

      Example: rvc administrator@vsphere.local@localhost

   b. If prompted to confirm the connection, enter **y**.

   c. Enter the standard lab password.

Task 5: Configure RVC Marks

You use RVC to create marks (shortcuts) to the data center name, cluster name, an ESXi host name, and a virtual machine name.

Use the following information from the class configuration handout:

- Data center name

- Virtual SAN cluster name

1. Change to the data center directory.

```
cd /localhost/data_center_name
```

Example: `cd /localhost/SA-Datacenter`

2. Create an RVC mark for the cluster name.

```
mark cluster ~/computers/"Cluster_Name"
```

Example: `mark cluster ~/computers/VSAN`

3. Create an RVC mark for the ESXi host that you recorded in task 2, step 4.

```
mark esxi ~cluster/hosts/Target_ESXi_host.
```

Target_ESXi_host is the ESXi host that you recorded in task 2, step 4.

Example: `mark esxi ~cluster/hosts/sa-esxi-02.vclass.local`

4. Create an RVC mark for the first virtual machine.

```
mark vm ~/vms/first_virtual_machine.
```

Example: `mark vm ~/vms/Linux-A-01`

Task 6: Use vsan Commands to Monitor Virtual SAN

You use a variety of `vsan` commands from RVC to view information about the Virtual SAN cluster.

1. Check the number of component counts in the cluster against the maximum number of components allowed.

    a. Enter **vsan.check_limits ~cluster**.

    b. Record the number of components that are in use on each host.

        •   First ESXi host. _____

        •   Second ESXi host. _____

        •   Third ESXi host. _____

        •   Fourth ESXi host. _____

    c. Record the maximum number of components for any host. _____

2. Collect Virtual SAN cluster and host information.

    a. Enter **vsan.cluster_info ~cluster**.

        Q1. What is the build number of all the ESXi hosts in the cluster?

        Q2. What fault domain is the second ESXi host in?

b. Enter **vsan.host_info ~esxi**.

   Q3. Is auto claim enabled?

3. View component information for the snapshot delta object of the virtual machine.

   a. Enter **vsan.vm_object_info ~vm**.

   b. In the command output, find the disk backing entry for Linux-A-01-000001.vmdk.

      Q4. On what hosts are the components of the snapshot delta located?

4. Simulate Virtual SAN host failures.

   a. Enter **vsan.whatif_host_failures -s ~cluster**.

      Q5. What is the total HDD capacity for the cluster with all four hosts up?

      Q6. What percentage of the HDD capacity will be used in the event of a single host failure?

   Keep the MTPuTTY window open.

Task 7: Access the Virtual SAN Observer Web Site and Monitor Performance Metrics

You start the Virtual SAN Observer Web server. You then use the Mozilla Firefox web browser to access the Virtual SAN Observer web site and monitor performance metrics.

Use the following information from the class configuration handout:

- vCenter Server name
- vCenter Server RVC user name
- Standard lab password

1. In the MTPuTTY window, start the Virtual SAN Observer Web server.

   ```
   vsan.observer ~cluster --run-webserver --force
   ```

   The vsan.observer web server runs for one hour by default or until you manually stop it by pressing Ctrl+C. Leave the command running until instructed to stop it.

2. Use the Firefox web browser to log in to the Virtual SAN Observer web site.

   a. On the student desktop, double-click the **Mozilla Firefox** icon.

   b. Go to https://*vCenter_Server_name*:8010.

Example: https://sa-vcsa-01.vclass.local:8010

The browser warns that your connection is not secure.

   c. In the browser window, click **Advanced**, then click **Add Exception**.

   d. In the Add Security Exception window, click **Confirm Security Exception**.

      The Virtual SAN Observer login screen appears.

   e. In the **Password** text box, enter the standard lab password and click the **Login** button.

3. In the VSAN Observer window, click the **VSAN Disks** tab.

Various metrics provide information about the storage, aggregated on a per host basis.

4. On the VSAN Disks page, click the **What am I looking at** link.

This link displays a high-level description of the page and what the graphs on the page represent. The link also displays basic information about conditions that the graphs can be used to analyze.

5. In the VSAN Observer window, click the **VSAN Disks (deep-dive)** tab.

6. Select the first ESXi host from the **Host to show** drop-down menu.

7. Find the RC Hit Rate graph.

This graph provides a deeper look at the physical view of the disks. For instance, Read Cache (RC) Hit Rate represents the I/O that is serviced by the solid-state drive. A low value represents I/O that is read or written directly from the magnetic disks behind the SSD.

8. Review the remaining tabs and use the **What am I looking at** link for an overview of how each tab functions.

9. Close the Mozilla Firefox window.

10. Stop the Virtual SAN Observer Web server.

   a. In the MTPuTTY window, press Ctrl+C to end the Virtual SAN Observer session.

   b. Enter **exit** to log out of RVC.

   c. Enter **exit** to log out of the vCenter Server system.

   d. Click **Close** to close the vCenter Server session window.

      Keep the MTPuTTY window open.

Task 8: Use the esxtop Command to Monitor Virtual SAN

You use MTPuTTY to log in to the first ESXi host, and you use the esxtop command to monitor Virtual SAN.

1. In the MTPuTTY window, in the left pane, double-click the first ESXi host.

You are automatically logged in to the host as user root.

2. At the command prompt, enter **esxtop** to start the esxtop utility.

3. Display disk-related information.

   a. Press **u**.

   b. View information such as reads/second and writes/second for the disk devices on this host.

4. Display storage controller information.

   a. Press **d**.

   b. View information such as reads/second and writes/second for the host bus adapters on this host.

5. Display the queue depth for each storage controller.

   a. Press **f**.

      Pressing f displays a screen where columns can be selected and deselected.

   b. Press **D** and press Return.

      This command adds queue statistics to the display.

   c. View the AQLEN column (queue statistics) for each host bus adapter.

6. Display host memory-related information.

   a. Press **m**.

   b. View information such as the amount of physical memory (PMEM).

7. Display host network-related information.

   a. Press **n**.

   b. View information by vmnic and VMkernel adapter.

8. Press Ctrl+C to exit the **esxtop** utility.

9. Enter **exit** to log out of the ESXi host.

10. Close the MTPuTTY window.

Lab 15 Creating a Stretched Cluster

Objective: Create a stretched cluster

In this lab, you perform the following tasks:

1. (Optional) Prepare the Environment
2. Add the Witness Appliance to the Data Center
3. Configure the Virtual SAN Network for the Witness Appliance
4. Create Static Routes on the ESXi Hosts
5. Remove the Existing Fault Domains
6. Configure a Stretched Cluster
7. Check the Health of the Stretched Cluster
8. View Virtual Machine File Placement in the Stretched Cluster

Task 1: (Optional) Prepare the Environment

If any systems were logged out, disconnected, or timed out, you must restore the student lab environment to continue the labs.

If no systems were logged out, disconnected, or timed out, do not perform this task.

Use the following information from the class configuration handout:

- vCenter Server administrator user name

- Standard lab password

1. Log in to the student desktop system.

2. On the taskbar, click the **Internet Explorer** icon.

3. On the Internet Explorer favorites bar, click **Site-A vSphere Web Client**.

4. Log in using the vCenter Server administrator user name and standard lab password.

Task 2: Add the Witness Appliance to the Data Center

You add the witness appliance to the data center. The witness appliance must not reside in the Virtual SAN cluster.

Use the following information from the class configuration handout:
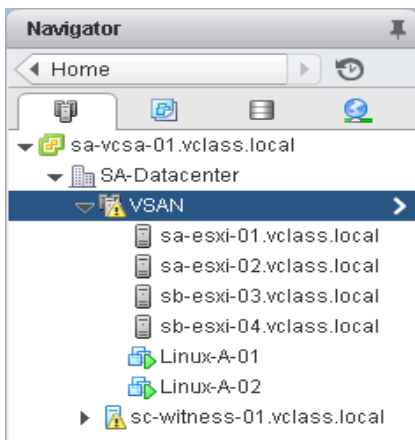
- Witness appliance name
- Standard lab password

1. In the center pane of vSphere Web Client, click **Hosts and Clusters**.

2. Right-click your data center and select **Add Host**.

    You must add the witness appliance to the data center, not to the Virtual SAN cluster.

3. In the **Host name or IP address** text box, enter the name of the witness appliance.

4. Click **Next**.

5. On the Connection settings page, enter `root` for the user name, and use the standard lab password.

6. In the Security Alert dialog box, click **Yes**.

7. On the Host summary page, click **Next**.

8. On the Assign license page, verify that License 1 is selected, and click **Next**.

    License 1 is the special license for the Virtual SAN witness appliance.

9. On the Lockdown mode page, accept the default setting, and click **Next**.

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

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

12. Monitor the Recent Tasks pane to verify that the task completes successfully.

13. Verify that the witness appliance appears in the left pane.

14. Notice how the witness appliance icon differs from that of an ESXi host.

> **Q1.** **Why does the witness appliance icon have a warning symbol? Hint: View the Summary tab of the witness appliance.**

Task 3: Configure the Virtual SAN Network for the Witness Appliance

You configure the second network adapter on the witness appliance. This network is used for Virtual SAN traffic.

1. View the existing virtual switch configuration on the witness appliance.

   a. In the left pane, select the witness appliance.

   b. In the center pane, click the **Manage** tab, then click **Networking**.

   c. Click **Virtual switches** on the left side.

   d. Select **witnessSwitch**.

e. Verify that a VMkernel port is created on the witnessPg port group.
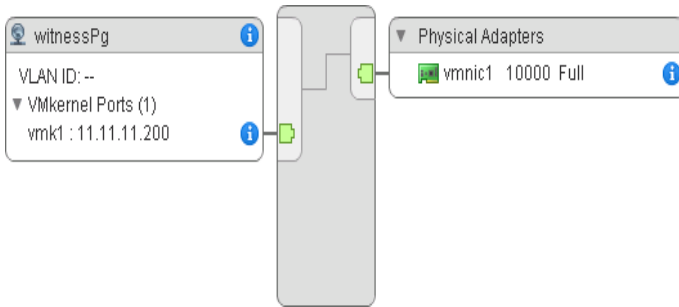
f. Record the IP address of the VMkernel adapter on the witnessPg port group.
_____

2. Verify that Virtual SAN traffic is enabled on the witnessPg port group.

   a. In the center pane, click **VMkernel adapters** on the left side.

   b. Select the VMkernel adapter that is configured on the witnessPg port group.

   c. In the bottom panel, verify that Virtual SAN traffic is enabled.

Task 4: Create Static Routes on the ESXi Hosts

You create static routes on the ESXi hosts to access the Virtual SAN network on the witness host.

NOTE

A static route is also required on the witness host to provide the witness host access to the Virtual SAN network of the data sites. In this lab environment, the static route on the witness host has already been created for you.

Use the following information from the class configuration handout:

- Witness site gateway address
- Witness site Virtual SAN network address

1. Use MTPuTTY to log in to the first ESXi host.

   a. On the taskbar, click the **MTPuTTY** icon.

b. In the left pane, double-click the first ESXi host.

You are logged in as user root.

2. View the network route table.

```
esxcli network ip route ipv4 list
```

The route table contains a route to the Virtual SAN network at the data site, the host management network, and the vSphere vMotion network.

3. Add a static route to the Virtual SAN network at the witness site.

```
esxcli network ip route ipv4 add --gateway Gateway_address --network
    Network_address
```

Replace Gateway_address with the witness site gateway address, and replace Network_address with the witness site Virtual SAN network address.

Example: `esxcli network ip route ipv4 add --gateway 10.10.10.10 --network 11.11.11.0/24`

4. View the network route table.

```
esxcli network ip route ipv4 list
```

5. Verify that a route to the witness site Virtual SAN network appears in the list.

For example, if the gateway is 10.10.10.10, and the network is 11.11.11.0, the route entry looks like this.

```
[root@sa-esxi-01:~] esxcli network ip route ipv4 list
Network      Netmask         Gateway        Interface   Source
-----------  -------------   -------------  ----------  ------
default      0.0.0.0         172.20.10.10   vmk0        MANUAL
10.10.10.0   255.255.255.0   0.0.0.0        vmk1        MANUAL
11.11.11.0   255.255.255.0   10.10.10.10    vmk1        MANUAL
172.20.10.0  255.255.255.0   0.0.0.0        vmk0        MANUAL
172.20.12.0  255.255.255.0   0.0.0.0        vmk2        MANUAL
[root@sa-esxi-01:~]
```

6. Repeat steps 1 to 5 for the remaining three ESXi hosts.

7. Exit all MTPuTTY sessions, and close the MTPuTTY window.

## Task 5: Remove the Existing Fault Domains

You remove the existing fault domains so you can reuse the ESXi hosts for the stretched cluster.

1. In the left pane of vSphere Web Client, select your Virtual SAN Cluster.

2. In the center pane, click the **Manage** tab and click **Settings**.

3. Select **Fault Domains & Stretched Cluster** on the left.

4. Select the first fault domain and click the **Remove selected fault domains** icon.
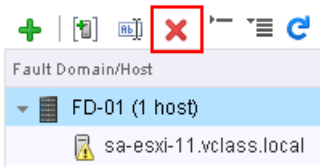
5. In the Delete Fault Domains dialog box, click **Yes**.

6. Repeat steps 4 and 5 to delete the other three fault domains.

   After all fault domains are removed, the list should look like this.
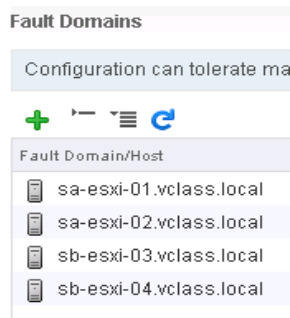
Task 6: Configure a Stretched Cluster

You configure a stretched cluster using the four ESXi hosts and the witness appliance.

Use the following information from the class configuration handout:

- Witness appliance name

1. In the center pane, in the Stretched Cluster panel, click **Configure**.

2. On the Configure fault domains page, make the following changes.

   a. Under Preferred fault domain, enter **Site A** in the **Name** text box.

b. Under Secondary fault domain, enter **Site B** in the **Name** text box.

c. Use Shift+click or Ctrl+click to select the third and fourth ESXi hosts in the list.

d. Click **>>**.

The third and fourth ESXi hosts appear in the Secondary fault domain pane.

Configure fault domains
Divide the hosts in 2 fault domains that will be used for configuring VSAN stretched cluster.

Preferred fault domain ⓘ	Secondary fault domain ⓘ
Name: Site A	Name: Site B
Q Filter ▾	Q Filter ▾
Fault Domain/Host	**Fault Domain/Host**
🗄 sa-esxi-01.vclass.local	🗄 sb-esxi-03.vclass.local
🗄 sa-esxi-02.vclass.local	🗄 sb-esxi-04.vclass.local

e. Click **Next**.

3. On the Select a witness host page, expand the data center and select the witness appliance.

4. Click **Next**.

5. On the Claim a disk group on witness host page, select the 10.00 GB flash disk for the cache tier.

6. Select the 15 GB flash disk for the capacity tier.

7. Click **Next**.

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

9. Monitor the Recent Tasks pane to verify that the tasks complete successfully.

10. View the stretched cluster information in the center pane.

Stretched Cluster

Status	Enabled
Preferred fault domain	Site A
Witness host	sc-witness-01.vclass.local

Fault Domains

Configuration can tolerate maximum	1 fault domain failures ℹ

⊢— ᵀ≡ 🔄

Fault Domain/Host
▾ 🌟 Site A (2 hosts)
☐ sa-esxi-01.vclass.local
☐ sa-esxi-02.vclass.local
▾ ☰ Site B (2 hosts)
☐ sb-esxi-03.vclass.local
☐ sb-esxi-04.vclass.local

Task 7: Check the Health of the Stretched Cluster

You use the Virtual SAN health service to check the health of the stretched cluster.

1. In the center pane, click the **Monitor** tab and click **Virtual SAN**.

2. Click **Health** on the left side.

3. Expand the Stretched cluster test category to view the different tests that are used to check the stretched cluster configuration.

4. Verify that none of the stretched cluster tests have failed.

Task 8: View Virtual Machine File Placement in the Stretched Cluster

You view the placement of a virtual machine components in the stretched cluster.

1. View the components of the first virtual machine.

   a. In the left pane, expand the Virtual SAN cluster and select the first virtual machine.

   b. In the center pane, click the **Monitor** tab, and click **Policies**.

   c. Click the **Physical Disk Placement** tab for the VM home object.

d. Verify that the witness component is on the witness host, and that a data component exists in each fault domain.

e. Select **Hard disk 1** and click the **Physical Disk Placement** tab.

f. Verify that the witness component is on the witness host, and that a data component exists in each fault domain.

2. View the components of the second virtual machine.

a. In the left pane, select the second virtual machine.

b. In the center pane, view the compliance status of the virtual machine objects.

> **Q1. Why are the virtual machine objects noncompliant?**

3. Point to the **Home** icon and select **Home**.

Lab 16 Configuring vSphere HA and DRS in the Stretched Cluster

Objective: Configure vSphere HA and DRS in the stretched cluster and simulate failure scenarios

In this lab, you perform the following tasks:

1. (Optional) Prepare the Environment
2. Enable vSphere HA on the Cluster
3. Create DRS Affinity Rules and Groups
4. Simulate a Site Failure
5. Observe the Virtual Machine State
6. Resolve the Site Failure
7. (Optional) Recreate Static Routes on the ESXi Hosts

Task 1: (Optional) Prepare the Environment

If any systems were logged out, disconnected, or timed out, you must restore the student lab environment to continue the labs.

If no systems were logged out, disconnected, or timed out, do not perform this task.

Use the following information from the class configuration handout:

- vCenter Server administrator user name
- Standard lab password

1. Log in to the student desktop system.

2. On the taskbar, click the **Internet Explorer** icon.

3. On the Internet Explorer favorites bar, click **Site-A vSphere Web Client**.

4. Log in using the vCenter Server administrator user name and standard lab password.

Task 2: Enable vSphere HA on the Cluster

You enable vSphere HA on the Virtual SAN cluster and you configure the vSphere HA settings according to VMware recommendations.

1. In the center pane, click **Hosts and Clusters**.

2. In the left pane, select the Virtual SAN cluster.

3. In the center pane, click the **Manage** tab, and click **Settings**.

4. Select **vSphere HA** on the left side.

5. Turn on vSphere HA.

   a. Click **Edit**.

   b. Select the **Turn on vSphere HA** check box.

6. Configure the host isolation response.

   a. Expand **Failure conditions and VM response**.

   b. Scroll down, and from the **Response for Host Isolation** drop-down list, select **Power off and restart VMs**.

7. Configure the admission control settings.

   a. Scroll down and expand **Admission Control**.

   b. Click **Define failover capacity by reserving a percentage of the cluster resources**.

   c. Set **Reserved failover CPU capacity** to 50.

   d. Set **Reserved failover Memory capacity** to 50.

8. Disable datastore heartbeating.

   a. Scroll down and expand **Datastore for Heartbeating**.

   b. Click **Use datastores only from the specified list**.

   You must keep the list empty.

   c. Click **OK**.

9. Monitor the Recent Tasks pane to verify that the tasks complete successfully.

Task 3: Create DRS Affinity Rules and Groups

You create virtual machine groups and host groups for the preferred site and the secondary site. You also create virtual machine-to-host rules to control where the virtual machines should run.

1. Create virtual machine groups for the preferred site and the secondary site.

    a. In the center pane, click the **Manage** tab of the cluster, and click **VM/Host Groups** on the left side.

    b. Click **Add**.

    c. In the **Name** text box, enter `Preferred_VMs`.

    d. Keep **VM Group** selected as the type.

    e. Click **Add**.

    f. Select the **Linux-A-01** check box and click **OK**.

    g. Click **OK**.

    h. Repeat steps b to g to create a virtual machine group for the secondary site:

        • Name the virtual machine group Secondary_VMs.

        • Add the Linux-A-02 virtual machine to the group.

2. Create host groups for the preferred site and the secondary site.

    a. In the center pane, under VM/Host Groups, click **Add**.

    b. In the **Name** text box, enter `Preferred`.

    c. From the **Type** drop-down list, select **Host Group**.

    d. Click **Add**.

    e. Select the check box next to the first and second ESXi hosts and click **OK**.

    f. Click **OK**.

    g. Repeat steps a to f to create a host group for the secondary site:

        • Name the host group Secondary.

        • Add the third and fourth hosts to the group.

3. Verify that two virtual machine groups and two host groups are created.

VM/Host Groups

| Add... | Edit... | Delete |

Name	Type
📇 Preferred_VMs	VM Group
📇 Secondary_VMs	VM Group
📇 Preferred	Host Group
📇 Secondary	Host Group

VM/Host Group Members
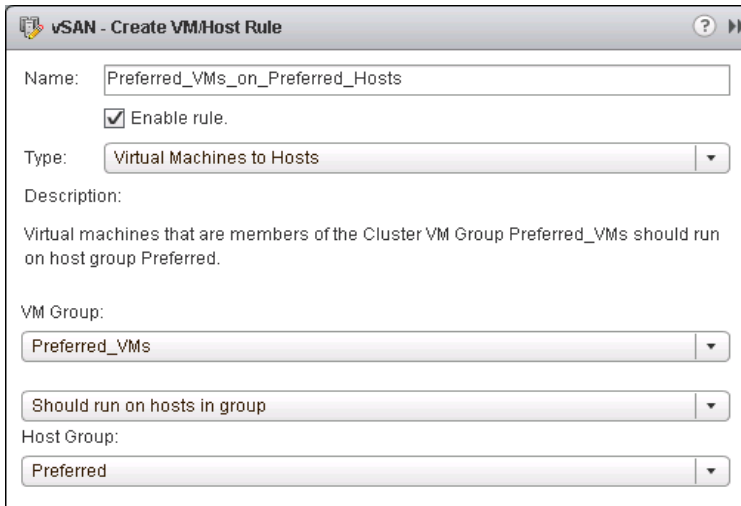
| Add... | Remove |

Secondary Group Members
🖥 sb-esxi-03.vclass.local
🖥 sb-esxi-04.vclass.local

4. Create an affinity rule that states that the Preferred_VMs group should run on the Preferred host group.

   a. In the center pane, select **VM/Host Rules** on the left side.

   b. Click **Add**.

   c. In the **Name** text box, enter `Preferred_VMs_on_Preferred_Hosts`.

   d. From the **Type** drop-down list, select **Virtual Machines to Hosts**.

   e. From the **VM Group** drop-down list, select **Preferred_VMs**.

   f. From the second drop-down list, select **Should run on hosts in group**.

g. From the **Host Group** drop-down list, select **Preferred**.

h. Click **OK**.

5. Repeat step 4 to create an affinity rule that states that the Secondary_VMs group should run on the Secondary host group.

   • Name the rule Secondary_VMs_on_Secondary_Hosts.

6. Verify that both rules appear in the VM/Host Rules panel.

Task 4: Simulate a Site Failure

You simulate a site failure by shutting down the hosts in one of the data sites.

1. View the host information of the first virtual machine.

   a. In the left pane, expand the Virtual SAN cluster and select **Linux-A-01**.

   b. In the center pane, click the **Summary** tab.

   c. Record the host name on which this virtual machine is running. _____

2. Determine the DRS host group in which the host is located.

   a. In the left pane, select the Virtual SAN cluster.

   b. In the center pane, click the **Manage** tab and click **Settings**.

   c. Select **VM/Host Groups** on the left side.

   d. Select the different host groups to view the group members.

e. For the host that you recorded in step 1.c, record the name of the host group in which the host is a member. _____

f. Record the name of the other host that is in this host group. _____

3. Shut down the ESXi hosts that you recorded in step 1.c and 2.f.

These ESXi hosts belong to the same DRS host group.

a. In the left pane, right-click the ESXi host that you recorded in step 1.c.

b. Select **Power** > **Shut down** and click **OK**.

c. Perform steps a and b to shut down the ESXi host that you recorded in step 2.f.

d. Wait until the left pane shows both the ESXi hosts as not responding.

If after a couple of minutes, you do not see the ESXi hosts as not responding, then click the **Refresh** icon in vSphere Web Client.

Task 5: Observe the Virtual Machine State

You observe the virtual machine state as its compute resource is removed.

1. In the left pane, select **Linux-A-01**.

If the virtual machine has a status of disconnected, then vSphere HA is in the process of restarting the virtual machine on the data site that is active.

Wait until the virtual machine is connected before proceeding to the next step.

2. Click the **Refresh** icon in vSphere Web Client periodically to check if the virtual machine is connected.

3. In the center pane, click the **Summary** tab.

>   Q1. On which host is the virtual machine now running?

4. Click the **Monitor** tab and click **Policies**.

>   Q2. Are any of the components of the virtual machine unavailable? If so, which one?

Task 6: Resolve the Site Failure

You resolve the site failure by powering on the hosts in the failed data site. In this lab environment, you must log in to the vCloud Director (OneCloud) user interface to perform this task.

1. Verify that you have your student login credentials.

   Your instructor can help you if you have lost your login information.

2. Record the VMware OneCloud URL provided by your instructor. _____

3. On the taskbar, click the **Internet Explorer** shortcut.

4. In the Internet Explorer window, browse to the OneCloud URL that you recorded in step 2.

5. When prompted, log in using the student credentials.

   The user name and password are the same as you used to access the login server at the start of the class.

6. In the OneCloud vCloud Director interface, one vApp appears on the **Home** tab.

7. In the vApp box, click the **Open** link that appears above the **Stop** icon.

   The OneCloud vCloud Director interface changes to the My Cloud tab, with the vApp details in the right pane.

8. In the right pane, click the **Virtual Machines** tab.

9. In the virtual machines list, find the ESXi hosts that you shut down.

10. Right-click each ESXi host and select **Power On**.

    Wait at least a couple of minutes for the ESXi hosts to boot up.

11. In vSphere Web Client, verify that both of the ESXi hosts are powered on.

    If necessary, click the **Refresh** icon to refresh the display.

12. Point to the **Home** icon and select **Home**.

Task 7: (Optional) Recreate Static Routes on the ESXi Hosts

For the ESXi hosts that were shut down, you recreate the static routes on the hosts to access the Virtual SAN network on the witness host. For details on how to save these static routes across reboots, see VMware knowledge base article 2043564 at http://kb.vmware.com/kb/2043564. This article explains how to modify the local.sh file in ESXi to execute commands during the boot process.

NOTE

You can skip this task if you are done using the Virtual SAN cluster.

Use the following information from the class configuration handout:

- Witness site gateway address

- Witness site Virtual SAN network address

1. Use MTPuTTY to log in to the first ESXi host that you shut down in task 4.

   a. On the taskbar, click the **MTPuTTY** icon.

   b. In the left pane, double-click the ESXi host.

      You are logged in as user root.

2. View the network route table.

   ```
   esxcli network ip route ipv4 list
   ```

   The route table contains a route to the Virtual SAN network at the data site, the host management network, and the vSphere vMotion network.

3. Add a static route to the Virtual SAN network at the witness site.

   ```
   esxcli network ip route ipv4 add --gateway Gateway_address --network
       Network_address
   ```

   Replace Gateway_address with the witness site gateway address, and replace Network_address with the witness site Virtual SAN network address.

   Example: `esxcli network ip route ipv4 add --gateway 10.10.10.10`
   `--network 11.11.11.0/24`

4. View the network route table.

   ```
   esxcli network ip route ipv4 list
   ```

5. Verify that a route to the witness site Virtual SAN network appears in the list.

6. Repeat steps 1 to 5 for the other ESXi host that you shut down.

7. Exit all MTPuTTY sessions, and close the MTPuTTY window.

8. In vSphere Web Client, verify that the Linux-A-01 virtual machine components are back to an Active state, and the virtual machine is compliant.

Appendix A Designing a Virtual SAN Deployment

Objective: Design a Virtual SAN deployment

In this lab, you perform the following tasks:

1. Review the Case Study
2. Create a Virtual SAN Design
3. Describe Your Design Choices
4. Describe and Diagram the Logical Design
5. Describe and Diagram the Physical Design

Task 1: Review the Case Study

You work with a group to design a Virtual SAN deployment based on a case study.

1. Review the small-and-medium business case study.

Company

ACME Recreational Vehicles Corporation is a manufacturer of motor homes in the United States. The company has its headquarters in Raleigh, North Carolina, and a remote office in Tucson, Arizona. The company also maintains one manufacturing plant and one assembly plant. The CIO is cost-conscious and questions anything that seems overly complex or overpriced. The branch office engineers in Tucson, Arizona, have requested a new lab kit based on vSphere for development purposes. This new lab design must include Virtual SAN capabilities to help keep the storage cost low.

The lab assessment revealed that the engineering team is requesting an environment that can run a total of 100 virtual machines. Many of these virtual machines are identical, allowing an increase of

virtual machines running on each host. The engineering team is comfortable with running 35 virtual machines per host.

Resource Requirements

The engineering team has submitted an estimate of average resource use.

Attribute	Value
vCPU	1
Memory	5 GB
Virtual machine VMDK size	1 60 GB virtual disk

No estimates for the number of network adapters were made during the assessment. Server form factor requirements do not exist. Both the blade servers and rack servers come with a single dual-port Gigabit Ethernet (GigE) NIC, with capacity for additional dual-port or quad-port NICs at additional cost. You must recommend how many additional dual-port or quad-port NICs are needed. Availability of the virtual machines is important. Separation of management, lab virtual machines, storage, and vSphere vMotion are required.

The network traffic infrastructure consists of multiple VLANs to provide separation for network traffic. More VLANs can be added, if necessary. The LAN infrastructure includes multiple access 10 GigE switches to provide redundancy and load balancing. No DMZ is present in the lab environment.

Current VLAN Configuration

VLAN 10	Management
VLAN 20	Production
VLAN 30	Lab

Constraints

Constraints can limit the design features and its implementation.

Number	Description
C001	Virtual SAN is required for the shared storage solution.
C002	Target platform is a rack server with dual six-core 2.93 GHz CPUs, 128 GB RAM, and 6x 2.5 inch drive bays.
C003	The target platform is 2U.
C004	The target platform integrated NIC is dual-port and operates at 10 GigE.

Restraints

No strict business requirements are involved in this lab. Current business policies strictly forbid production services to be hosted in engineering labs.

Task 2: Create a Virtual SAN Design

You work with your assigned group to create a storage design that meets the customer's storage goals and business requirements.

1. Determine and record the appropriate features and components to include in your storage design.

    • Number of hosts. _____

    • Number of host bus adapters, host bus adapter (HBA) ports, arrays, and virtual switches. _____

    • Storage policy rules to use. _____

    • Number of data disks. _____

    • Number of solid-state drives. _____

    • Number of disk groups. _____

Task 3: Describe Your Design Choices

You work with your assigned group to describe your design choices.

1. If you included the number of hosts in your design, record the information.

    • Justification. _____

    • Design impacts. _____

2. If you included the number of additional HBAs in your design, record the information.

    • Justification. _____

    • Design impacts. _____

3. If you included vSphere standard switches or distributed switches in your design, record the information.

    • Justification. _____

    • Design impacts. _____

4. If you included Network I/O Control in your design, record the information.

    • Justification. _____

    • Design impacts. _____

5. If you included Virtual SAN cluster size in your design, record the information.

    • Justification. _____

    • Design impacts. _____

6. If you included storage policy in your design, record the information.

    • Justification. _____

    • Design impacts. _____

Task 4: Describe and Diagram the Logical Design

You work with your assigned group to describe and diagram the logical design.

1. Record the number of ports per host per switch for your logical design. _____

2. Record the usable size of the Virtual SAN datastore. _____

3. Draw a diagram of the logical design.

Task 5: Describe and Diagram the Physical Design

You work with your assigned group to describe and diagram the physical design.

1. Record the storage network VLAN. _____

2. Draw a diagram of the physical design.

Answer Key

Lab 2: Basic Storage Commands

1.	Releasebuild-3620759.	**7.**	Yes.
2.	VMFS 5.	**8.**	Nine devices.
3.	7.8 GB.	**9.**	Yes, the CD-ROM is listed as a different
4.	No, no mounted NFS version 3 datastores		name.
	were listed.	**10.**	True.
5.	No, no mounted NFS 4.1 datastores were	**11.**	Local-sa-esxi-01.
	listed.	**12.**	Ineligible for use by VSAN.
6.	No.	**13.**	This disk is partitioned.

Lab 3: Configuring a Virtual SAN Network

1. vmk1

Lab 4: Configuring a Virtual SAN Cluster

1. Virtual SAN datastore vsanDatastore in cluster VSAN in data center SA Datacenter does not have sufficient capacity.

Also, a number of Virtual SAN health alarms were triggered.

Lab 5: Configuring Hybrid Disk Groups

1.	Hybrid	**2.**	3.0 (latest)

Lab 6: Configuring All-Flash Disk Groups

1. All flash

Lab 7: Virtual SAN Storage Commands

1. vmnic0, vmnic1, vmnic2, and vmnic3 have a status of Up.
2. Student-VSAN
3. Healthy

4. One
5. The command requires the ID of the flash disk or hard disk for a particular disk group to unmount that disk group.

Lab 8: Deploying Virtual Machines to Virtual SAN

1. Student-VSAN
2. Virtual SAN Default Storage Policy.

3. Yes

1. Datastore does not match current VM policy.
2. Local-sa-esxi-01

3. Virtual SAN Default Storage Policy.
4. No.

Lab 9: Creating Storage Policies

1. The policy is set to tolerate a single failure and the Failure Tolerance Method defaults to RAID 1. As such, virtual machines assigned to this storage policy have their files mirrored across two hosts, doubling the amount of storage used.

1. Since the number of failures to tolerate is zero, a mirrored copy of the virtual machine is not created.

1. Local-sa-esxi-01
2. Custom01

3. No, the status is Not Applicable.

1. One virtual machine has been assigned this policy and the status is noncompliant.

2. The Linux-A-02 virtual machine is noncompliant and has a compliance status of Not Applicable.

1. Three components are listed: one witness and two RAID 1 components.
2. Three components are listed: one witness and two RAID 1 components.
3. One component is listed: a RAID 0 component.

4. One component is listed: a RAID 0 component.
5. The storage policy for the first virtual machine has a value of 1 for failures to tolerate, and the storage policy for the second virtual machine has a value of 0 for failures to tolerate.

1. VM home still has a single component listed
because the VM home object is not striped.

2. Two RAID 0 components are listed.

1. Three components are listed: one witness
component and two RAID 1 components
across two drives.

2. Four RAID 0 components are listed across
four drives.

3. Because the policy requires two sets of the
data from the virtual machine to support the
failures, and each set must be striped across
two disparate drives.

Lab 10: Using Maintenance Mode Options

1. Your second virtual machine is listed more
frequently.

2. Because the second virtual machine has a
policy applied with more striping requirements
than the first virtual machine.

1. Noncompliant

2. Two virtual machine components, which are
on the host in maintenance mode, have a
component state of Absent.

1. Two of the components for the virtual machine
have a component state of Absent.

2. A component replica is still on another host.

3. Noncompliant

1. No resource was available to migrate the data
to another host that did not already have a
component running on it. Without a fourth

host, the system cannot ensure that the
storage policy requirements are met.

Lab 11: Scaling Out a Virtual SAN Cluster

1. 4

2. The values do not match because the fourth
ESXi host automatically adds its CPU and
Memory resources to the cluster as soon as it
has joined.

3. The storage capacity remains the same
because the cluster is in Manual disk claim
mode and the new host does not
automatically add its storage to the Virtual
SAN datastore.

1. The fourth host gives the cluster a destination
to migrate the data in order to maintain
compliance with the storage policy.

2. The two components formerly recorded on the
host that is in maintenance mode are now
located on the fourth ESXi host.

1. Four RAID 5 components, and no witnesses.

2. Four RAID 5 stripes, each containing two components. No witness components exist.

Lab 12: Working with Fault Domains

1. This storage policy requires at least four fault domains with hosts contributing all-flash storage, but only three were found.

2. Yes

3. Four RAID 5 components

4. Yes

5. Four RAID 0 pairs of RAID 5 components.

6. Yes

Lab 13: Using the Health and Performance Services

1. To check if vCenter Server has an active connection to all the hosts in the cluster.

2. The first ESXi host.

3. Find out why the ESXi host is no longer connected to vCenter Server. One option is to manually try to reconnect the ESXi host to vCenter Server. If connecting the ESXi host through vSphere Web Client fails, try connecting to the ESXi host using SSH. Or, try connecting to the host DCUI and investigate underlying issues.

4. The first ESXi host.

5. This test checks if all ESXi hosts participating in the Virtual SAN cluster are part of the same vSphere cluster. This check should not fail, as by definition, a Virtual SAN cluster and a vSphere cluster should in effect have all the same members.

6. Even though the ESXi host might not be part of the vSphere cluster, Virtual SAN still utilizes the host, using the host to store data and service I/O. ESXi hosts that are disconnected from vCenter Server could cause this error.

7. You should check why an ESXi host that is part of the Virtual SAN cluster is no longer connected to the vCenter Server system.

1. To check if there is an issue retrieving the physical disk information from hosts in the Virtual SAN cluster.

2. You should check why an ESXi host that is part of the Virtual SAN cluster is no longer connected to the vCenter Server system.

1. Yes, it might help. The error "Host is not in connected status" tells you that the host is disconnected and therefore, you should check its status in the vCenter Server inventory.

2. Unknown.

3. CLOMD is the Cluster Level Object Manager Daemon. This daemon runs on every ESXi host in the Virtual SAN cluster and is responsible for new object creation, initiating the repair of existing objects after failures. CLOMD is also responsible for all types of data moves and evacuations, maintaining

balance and thus triggering rebalancing, implementing policy changes, and so on.

4. If any of the ESXi hosts are disconnected, the CLOMD liveness state of the disconnected host is shown as unknown. If the health service is not installed on a particular ESXi host, the CLOMD liveness state of all the ESXi hosts is also reported as unknown.

5. Perform a virtual machine creation test (Proactive test). This test involves object creation and exercises and tests CLOMD thoroughly.

6.	The VM creation test was successful on the second, third, and fourth ESXi hosts. But the		test failed on the first ESXi host because the host is not connected.

Lab 14: Using Ruby vSphere Console and ESXi Commands

1.	build-3620759.	4.	Answers will vary.
2.	Answers will vary.	5.	Approximately 95 GB (23.67 GB x 4).
3.	No, it is not enabled.	6.	Answers will vary.

Lab 15: Creating a Stretched Cluster

1. No datastores have been configured. This warning is OK because the witness appliance cannot host any virtual machines.

1. The RAID 5/6 failure tolerance method is not supported in a stretched cluster.

Lab 16: Configuring vSphere HA and DRS in the Stretched Cluster

1.	On a host in the data site that is still active.	2.	Yes. The components located on a host at the failed site are absent.