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Lab Overview - HOL-1808-02-CHG - vSAN v6.6.1 Challenge Lab
Lab Guidance

Note: It will take more than 90 minutes to complete this lab. You should expect to only finish 2-3 of the modules during your time. The modules are independent of each other so you can start at the beginning of any module and proceed from there. You can use the Table of Contents to access any module of your choosing.

The Table of Contents can be accessed in the upper right-hand corner of the Lab Manual.

[Lab Abstract: Here you place your topic and introduce your VMW product. Describe the general lab scenario]

Lab Module List:

- **Module 1 - vSAN Configuration** (30 minutes) (Basic) Students are challenged to enable a vSAN Cluster and also utilize the new vSAN 6.6 Health Check and Configuration Assist.
- **Module 2 - vSAN Day-2 Operations** (30 minutes) (Basic) Students will be challenged to Scale their vSAN Cluster, leverage Storage Policies and Monitor vSAN.
- **Module 3 - vSAN Troubleshooting (Beginner)** (30 minutes) (Basic) Students will be challenged to identify and resolve vSAN Troubleshooting issues at a Beginner Level.
- **Module 4 - vSAN Troubleshooting (Advanced)** (45 minutes) (Advanced) Students will be challenged to identify and resolve vSAN Troubleshooting issues at an Advanced Level.
- **Module 5 - vSAN Interoperability** (30 minutes) (Basic) Students will examine how other VMware technologies can be utilized together with vSAN.
- **Module 6 - Bonus Module (vSAN Encryption)** (30 minutes) (Basic) Students will be challenged to enable vSAN Encryption including adding a KMS instance to vCenter.

Lab Captains:

- Ken Osborn, Sr. Systems Engineer, USA
- John Browne, Staff Technical Support Training Specialist, Ireland

Special Thanks for their guidance and assistance:

- Cormac Hogan, Director & Chief Technologist, Storage Product Marketing
- Pete Koehler, Senior Technical Marketing Manager
- Jase McCarty, Staff Technical Marketing Architect
- Jeff Hunter, Staff Technical Marketing Architect
This lab manual can be downloaded from the Hands-on Labs Document site found here:

http://docs.hol.vmware.com

This lab may be available in other languages. To set your language preference and have a localized manual deployed with your lab, you may utilize this document to help guide you through the process:


Welcome to the vSAN 6.6 Challenge Lab!

In this Lab we will challenge you to apply your vSAN knowledge as related to performing initial Configuration, Day-2 Operations and Troubleshooting Tasks within a vSAN Environment (we provide [Hints] along the way but try to resist the urge to click these unless absolutely necessary)!

In addition, we will also "Challenge you to Learn" about vSAN 6.6 Interoperability with other VMware Products such as vRealize Operations Manager.

Thank you for joining us today and please enjoy your Lab.

VMware Technology Network (VMTN)

For additional hints and to discuss the challenges presented in the lab further, be sure to visit the VMware Technology Netowork (VMTN) Community Pages:

https://communities.vmware.com/community/vmtn/challenge-lab/vrealize-operations
Location of the Main Console

1. The area in the RED box contains the Main Console. The Lab Manual is on the tab to the Right of the Main Console.
2. A particular lab may have additional consoles found on separate tabs in the upper left. You will be directed to open another specific console if needed.
3. Your lab starts with 90 minutes on the timer. The lab can not be saved. All your work must be done during the lab session. But you can click the **EXTEND** to increase your time. If you are at a VMware event, you can extend your lab time twice, for up to 30 minutes. Each click gives you an additional 15 minutes. Outside of VMware events, you can extend your lab time up to 9 hours and 30 minutes. Each click gives you an additional hour.

Alternate Methods of Keyboard Data Entry

During this module, you will input text into the Main Console. Besides directly typing it in, there are two very helpful methods of entering data which make it easier to enter complex data.
Click and Drag Lab Manual Content Into Console Active Window

You can also click and drag text and Command Line Interface (CLI) commands directly from the Lab Manual into the active window in the Main Console.

Accessing the Online International Keyboard

You can also use the Online International Keyboard found in the Main Console.

1. Click on the Keyboard Icon found on the Windows Quick Launch Task Bar.
Click once in active console window

In this example, you will use the Online Keyboard to enter the "@" sign used in email addresses. The "@" sign is Shift-2 on US keyboard layouts.

1. Click once in the active console window.
2. Click on the Shift key.

Click on the @ key

1. Click on the "@ key".

Notice the @ sign entered in the active console window.
Activation Prompt or Watermark

When you first start your lab, you may notice a watermark on the desktop indicating that Windows is not activated.

One of the major benefits of virtualization is that virtual machines can be moved and run on any platform. The Hands-on Labs utilizes this benefit and we are able to run the labs out of multiple datacenters. However, these datacenters may not have identical processors, which triggers a Microsoft activation check through the Internet.

Rest assured, VMware and the Hands-on Labs are in full compliance with Microsoft licensing requirements. The lab that you are using is a self-contained pod and does not have full access to the Internet, which is required for Windows to verify the activation. Without full access to the Internet, this automated process fails and you see this watermark.

This cosmetic issue has no effect on your lab.

Look at the lower right portion of the screen
Please check to see that your lab is finished all the startup routines and is ready for you to start. If you see anything other than "Ready", please wait a few minutes. If after 5 minutes your lab has not changed to "Ready", please ask for assistance.
Module 1 - vSAN Configuration (30 minutes)
Introduction

Are you ready for vSAN Configuration Challenges?

This Module contains the following challenges:

- Challenge 1: Enable vSAN 6.6
- Challenge 2: vSAN 6.6 Configuration Assist
- Challenge 3: vSAN 6.6 Health Check

Please note that these Challenges assume a certain level of vSAN familiarity to complete 'on your own'. Fear not, in the event that you are not as familiar, you can still take the Lab and utilize the 'HINT' links to thoroughly guide you through detailed completion steps for each Challenge. There also may be more than one method to solve a challenge. The goal is for you to learn and/or validate your existing knowledge along the way.
Challenge 1: Enable vSAN

It is very easy to enable vSAN. The only pre-requisites that must be in place prior are the configuration of a network interface for vSAN traffic and at least (1) Cache device and (1) Capacity device installed in your Server (or Storage Blade Modules) that you would like to be contributing storage to your vSAN Cluster.

Since vSAN is integrated directly into vSphere there are no Virtual Appliances to install or manage per Host. In addition, since the vSAN Datastore is an object based filesystem, we no longer need to worry about formatting a VMFS Datastore. vSAN takes complexity out of your Storage Environment by eliminating the need for LUNs and the associated questions around how to size LUNs, how many LUNs should be required, etc.

Let's get started!

Open Chrome Browser from Windows Quick Launch Task Bar

1. Click on the Chrome Icon on the Windows Quick Launch Task Bar.

vCenter Login
1. Select the checkbox for "Use Windows session authentication".
2. Click Login

Alternatively, you can enter a User name of administrator@corp.local and a password of VMware1!

**Introduction**

For your first Challenge, you will be required to configure a vSAN Cluster that has the following characteristics:

1. 3-Node vSphere Cluster
2. Deduplication and Compression Required
3. 1x Disk Group per Host (containing 1x Cache Device and 2x Capacity Devices)

Note: vSAN Networking has already been configured

**Your Challenge: Create a vSAN Cluster**

Perform the steps listed below in order to begin the Challenge.

1. Configure vSAN (Hint)
2. Configure vSAN Capabilities to leverage Deduplication and Compression but do NOT configure Encryption or Fault Domains (Hint)
3. Validate Network (Hint)
4. Create 1 Disk Group per Host. Change your 'Group By:' Selector to Host view and Claim Disks using 1x 5GB Cache Device and 2x 10GB Capacity Devices per Diskgroup. (Hint)
5. Review your Ready to Complete selections and complete the Workflow to enable vSAN (Hint)
6. Monitor vSAN Datastore creation progress until complete (Hint)
7. Confirm that the vSAN Datastore has been formed and that Dedupe & Compression are enabled (Hint 1) (Hint 2)

You can also view hints on the VMware Technology Network Communities here:

https://communities.vmware.com/docs/DOC-37004
Challenge 2: vSAN Configuration Assist

An important aspect of a healthy vSAN environment is ensuring correct configurations, device firmware, and device drivers. vSAN 6.6 includes a new vSAN Configuration Assist option to check hardware compatibility, burn-in testing, network configuration, vSAN configuration and adherence to VMware cluster recommendations.

Introduction

For this Challenge, you are required to utilize vSAN 6.6 Configuration Assist to enable adherence to VMware Cluster Setting recommendations. In the event of a vSphere Host failure, it is very important that vSphere HA is enabled so that any impacted Virtual Machines are automatically restarted on another functioning Host in the vSAN Cluster.

Your Challenge: Utilize vSAN Configuration Assist

Perform the step listed below in order to begin the Challenge.

1. Use Configuration Assist to ensure that vSphere HA is enabled ()

You can also view hints on the VMware Technology Network Communities here:

https://communities.vmware.com/docs/DOC-37004
Challenge 3: vSAN Health Check

vSAN includes a wide range of Health Checks that actively monitor your vSAN environment for potential issues.

Introduction

For this Challenge, you are required to utilize the vSAN Health Check to see if there are any Errors and/or Warnings present in your environment.

Your Challenge: Utilize vSAN Health Check

Perform the steps listed below in order to begin the Challenge.

1. Check the Health of your vSAN Cluster. Note that Hardware Compatibility Warnings are expected in our nested Virtualization environment (Hint)
2. Respond to the remaining Performance Service status Warning result indicator (using the Enable capability) (Hint)

You can also view hints on the VMware Technology Network Communities here:

https://communities.vmware.com/docs/DOC-37004
Conclusion

In this Module you flexed your Software Defined Storage Muscles by easily enabling your vSAN Cluster. In addition, you utilized the new vSAN 6.6 Configuration Assist option to ensure that VMware recommended settings were adhered to. You finished by spinning through the vSAN Health check capability and responded to a Warning that was present indicating that you should enable the vSAN Performance Service.

You've finished Module 1

Congratulations on completing Module 1.

If you are looking for additional information on vSAN Administration, try one of these:

- vSAN 6.6 Documentation Center link
- Or go to VMware Storage Hub for all things related to vSAN

Proceed to any module below which interests you most.

- Module 2 - vSAN Day-2 Operations (30 minutes) (Basic)
- Module 3 - vSAN Troubleshooting (Beginner) (30 minutes) (Basic)
- Module 4 - vSAN Troubleshooting (Advanced) (45 minutes) (Advanced)
- Module 5 - vSAN Interoperability (30 minutes) (Basic)
- Module 6 - Bonus Module (vSAN Encryption) (30 minutes) (Basic)

How to End Lab

To end your lab click on the END button.
Module 2 - vSAN Day-2
Operations (30 Minutes)
Introduction

Are you ready for vSAN Configuration Challenges?

This Module contains the following challenges:

- Challenge 1: Scale vSAN Up and Out
- Challenge 2: Configure Storage Policies
- Challenge 3: Monitor vSAN Performance

Please note that these Challenges assume a certain level of vSAN familiarity to complete 'on your own'. Fear not, in the event that you are not as familiar, you can still take the Lab and utilize the '(HINT)' links to thoroughly guide you through detailed completion steps for each Challenge. There also may be more than one method to solve a challenge. The goal is for you to learn and/or validate your existing knowledge along the way.

Lab Preparation

We will use our Module Switcher PowerCLI Application to prepare the environment.

Module Switcher

Double-Click the Module Switcher Desktop Shortcut
Module 2 Start

1. Click the Module 2 Start button

Monitor Progress

Monitor Progress until Complete.

• Press Enter to continue (and close the PowerCLI Window)

Note that it can take several minutes for the Module switcher to complete - thank you for your patience!

Lab Prep Complete

Your Lab has been successfully prepared for Module 2!
1. Click Window **Close** to safely stop the Module Switcher

**Please Note** that you cannot 'go back' and take Modules prior to the one you are currently in unless you end the lab and start it over again (for example: If you Start Module 4, you cannot use the Module Switcher to Start Labs 1, 2 or 3).
Challenge 1: Scale vSAN Out and Up

You've done your Homework and built the perfect vSAN 3-Node Cluster only now those pesky users are demanding more Compute resources and more Storage Capacity.

Time to get back to work!

Open Chrome Browser from Windows Quick Launch Task Bar

1. Click on the Chrome Icon on the Windows Quick Launch Task Bar.

vCenter Login

1. Select the checkbox for "Use Windows session authentication".
2. Click Login

Alternatively, you can enter a User name of administrator@corp.local and a password of VMware1!
Scale Out Introduction

A new Project has spun up out of nowhere in your Organization requiring additional Virtual Machines and associated Hyper-Converged Storage. Your 3-Node vSAN Cluster is going to need to grow, and fast! In this Challenge, you will be expected to scale out your vSAN Cluster by adding an additional vSphere Host and ensuring there are no service disruptions during this process.

The vSAN vmkernel network interface has already been configured by way of the vSphere Distributed Switch (vDS). Although vSAN supports a vSphere Standard Switch (vSS), using a vDS has plenty of benefits like ensuring consistency across your Cluster and easing the Administrative tasks required when adding new Hosts!

Your Challenge: Scale Out your vSAN Cluster

Perform the steps listed below in order to begin the Challenge.

1. Check your existing vSAN Cluster Capacity (Hint 1) (Hint 2)
2. Add esx-04a.corp.local to your existing vSAN Cluster (Hint)
3. Exit Maintenance Mode for esx-04a.corp.local (may require Web Client refresh) (Hint)
4. Create a Single Disk Group using these parameters (Hint)
   - 1x Cache Device (5 GB)
   - 2x Capacity Device (10 GB)
   - 1x 'Spare' (Unclaimed Cache Device) (5 GB)
   - 2x 'Spare' (Unclaimed Capacity Devices) (10 GB)
5. Confirm that your newly added Compute and Capacity is available (Hint 1) (Hint 2)

You can also view hints on the VMware Technology Network Communities here:

https://communities.vmware.com/docs/DOC-37005

Scale Up Introduction

Not satisfied with the additional Compute node you just added, you decide that you better add even more Storage Capacity to your existing vSAN Cluster. Your ace Datacenter 'boots on the ground' team has just installed 2x additional SSD Capacity drives per Host. Now it's your job to scale up the Capacity for each Host by adding these drives to your vSAN Diskgroups and ensure that there are no service disruptions during this process.
**Your Challenge: Scale Up your vSAN Cluster**

Perform the steps listed below in order to begin the Challenge.

1. Create a new Disk Group on each Host utilizing the unclaimed drives (could there be an exciting new vSAN 6.6 Configuration Assist feature that helps simplify this process and alleviates the need to do this individually on each Host)? *(Hint)*
2. Confirm that each Host now contains a 2nd Disk Group *(Hint)*
3. Confirm that your newly added Capacity is available *(Hint)*

You can also view hints on the VMware Technology Network Communities here:

https://communities.vmware.com/docs/DOC-37005
Challenge 2: Configure Storage Policies

Virtual SAN storage policies define storage requirements for your virtual machines. These policies determine how the virtual machine storage objects are provisioned and allocated within the datastore to guarantee the required level of service.

When you enable Virtual SAN on a host cluster, a single Virtual SAN datastore is created and a default storage policy is assigned to the datastore.

When you know the storage requirements of your virtual machines, you can create a storage policy referencing capabilities that the datastore advertises. You can create several policies to capture different types or classes of requirements.

Each virtual machine deployed to Virtual SAN datastores is assigned at least one virtual machine storage policy. You can assign storage policies when you create new virtual machines or you can apply them on-the-fly to existing (running) virtual machines.

Open Chrome Browser from Windows Quick Launch Task Bar

1. Click on the Chrome Icon on the Windows Quick Launch Task Bar.
vCenter Login

1. Select the checkbox for "Use Windows session authentication".
2. Click Login

Alternatively, you can enter a User name of administrator@corp.local and a password of VMware1!

Storage Policy Based Management Introduction

Life was going good until you received an urgent message indicating that you needed to quickly change the Storage characteristics for an existing Virtual Machine (and limit the amount of IOPS that it is able to consume). There are other VM's residing on your vSAN Datastore, increasing concerns about Noisy Neighbor conditions originating from your 'problem' VM that could negatively impact the environment. In addition, you would like to reduce the amount of space that this VM is utilizing.

With traditional Storage Array's you would need to ask your Storage team to provision a new LUN with new Storage capabilities (and you would then have to format this as a new VMFS Volume and migrate your VM to this new Datastore).

Within the VMware Software-Defined-Datacenter (SDDC) and vSAN Software Defined Storage (SDS) you can make these changes on-the-fly with no impact to your environment (and without having to interface with another team).
Your Challenge: Configure Storage Policy

Perform the steps listed below in order to begin the Challenge.

1. Create a new VM Storage Policy that has these vSAN Storage Capabilities (Hint)
   - Primary level of failures to tolerate: 1
   - Failure tolerance method: RAID-5/6 (Erasure Coding)
   - IOPS limit for object: 50

2. Apply newly created Policy to Virtual Machine named, "vSAN-VM_NoisyNeighbor" (Hint)
3. Check Policy Compliance (Hint)
4. Check IOPS Limit (Hint)
Challenge 3: Monitor vSAN Performance

vSAN 6.6 includes new Performance metrics that can be monitored via the vSphere Web Client. In this section, we Challenge you to examine Performance views for three separate vSAN related contexts:

- Overall vSAN Cluster Performance
- Individual vSphere Host Performance
- Individual Virtual Machine Performance

Open Chrome Browser from Windows Quick Launch Task Bar

1. Click on the Chrome Icon on the Windows Quick Launch Task Bar.

vCenter Login

1. Select the checkbox for "Use Windows session authentication".
2. Click **Login**

Alternatively, you can enter a User name of **administrator@corp.local** and a password of **VMware1**!

**Your Challenge: Monitor vSAN Performance**

Perform the steps listed below in order to begin the Challenge.

1. Find and Explore **vSAN Cluster** Performance Metrics (**Hint**)  
2. Find and Explore Individual **vSAN Host** Performance Metrics (**Hint**)  
3. Find and Explore Individual **Virtual Machine** vSAN Performance Metrics (**Hint**)  

You can also view hints on the VMware Technology Network Communities here:

[https://communities.vmware.com/docs/DOC-37005](https://communities.vmware.com/docs/DOC-37005)
Conclusion

My, how far you have come in such a short amount of time. Thanks to the scalable nature of vSAN you were able to not only quickly add additional Compute power but also extra Storage Capacity. You also experienced first-hand the powerful ability to control vSAN Space Efficiency, Availability and Performance via Software-Policy Based Management. Lastly, you armed yourself with knowledge around where to go when looking to Monitor vSAN Performance Metrics.

You've finished Module 2

Congratulations on completing Module 2.

If you are looking for additional information on vSAN Day-2 Operations:

• Go to VMware Storage Hub for all things related to vSAN

Proceed to any module below which interests you most.

• Module 3 - vSAN Troubleshooting (Beginner) (30 minutes) (Basic)
• Module 4 - vSAN Troubleshooting (Advanced) (45 minutes) (Advanced)
• Module 5 - vSAN Interoperability (30 minutes) (Basic)
• Module 6 - Bonus Module (vSAN Encryption) (30 minutes) (Basic)

How to End Lab

To end your lab click on the END button.
Module 3 - vSAN Troubleshooting (30 Minutes, Beginner)
Introduction

This Module contains the following lessons:

- Challenge 1: Troubleshoot vSAN Network
- Challenge 2: Troubleshoot vSAN Disk

Please note that these Challenges assume a certain level of vSAN familiarity to complete 'on your own'. Fear not, in the event that you are not as familiar, you can still take the Lab and utilize the '(HINT)' links to thoroughly guide you through detailed completion steps for each Challenge. There also may be more than one method to solve a challenge. The goal is for you to learn and/or validate your existing knowledge along the way.

Lab Preparation

To prepare our Lab Environment we will now have you run your ModuleSwitcher as well as prepare the vSAN Training (Failure Injection) Tool Environment.

Module Switcher

Double-Click the Module Switcher Desktop Shortcut

Module 3 Start
1. Click the **Module 3 Start** button

**Monitor Progress**

Monitor Progress until Complete.

- Press **Enter to continue** (and close the PowerCLI Window)

**Module Switcher Complete**

1. Click Window **Close** to safely stop the Module Switcher

**vSAN Training Introduction**

Some people think half the fun is breaking things (in order to repair and learn in the process).

Let's inject some failures into our vSAN Cluster so that you can do just that.

To accomplish this, we'll be using a tool simply called, "**vSAN Training**". This tool will inject a hidden (from you) failure condition and it will be your job to figure out what is wrong and then mitigate the issue.
Prepare vSAN Training

- Double-click the Prepare vSAN Training desktop shortcut

Monitor Progress

1. Monitor Progress then Press Enter to continue...

Launch vSAN Training Site

1. Within your Chrome Browser select the New Tab Button
2. Click the vSAN Training Bookmark
Open Chrome Browser from Windows Quick Launch Task Bar

1. Click on the Chrome Icon on the Windows Quick Launch Task Bar.

vSAN Training Site

- Review the vSAN Training Site Information

You are now ready to proceed with the first challenge!
Challenge 1: Troubleshoot vSAN Network

In a Perfect World, troubleshooting would not be required and everything would run flawlessly, 24x7.

In our World, things happen and that is why you get paid the Big Bucks to restore order and availability.

Let’s dig into some Troubleshooting Exercises!

vCenter Login

If a vCenter session is not already established, open a new Tab in your Chrome Browser and select the RegionA\RegionA vCenter bookmark shortcut.

1. Select the checkbox for "Use Windows session authentication".
2. Click Login

Alternatively, you can enter a User name of administrator@corp.local and a password of VMware1!
Your Challenge: Troubleshoot vSAN Network

Perform the steps listed below in order to begin the Challenge.

1. Enter the number 1 for your vSAN Training Scenario ID then click Submit (Hint)
2. Review the vSAN Training Site Results (Do NOT Close this Window) (Hint)
3. Examine the Health of the vSAN Cluster via the vSphere Web Client using vSAN Health Check (Hint)
4. Resolve the Identified Issue (Hint)
5. Retest vSAN Health and confirm that Issue is resolved (Hint)
6. If you could not resolve the Issue, select Clear Scenario via the vSAN Training Tool
7. If you could resolve the Issue, select Back via the vSAN Training Tool

You can also view hints on the VMware Technology Network Communities here:

https://communities.vmware.com/docs/DOC-37006
Challenge 2: Troubleshoot vSAN Disk

Hardware Failures can happen when we least expect them, let's proceed.

vSAN Training Site

![vSAN Training Site](https://192.168.110.22/vsanTraining)

- Confirm that the vSAN Training Site is ready for our next Scenario ID

Your Challenge: Troubleshoot vSAN Disk

Perform the steps listed below in order to begin the Challenge.

Please Note that it can take up to 5 minutes to inject this failure condition within our Lab Environment (if you would prefer not to wait, you can skip this Challenge and move on to the next set of Advanced Challenges - thank you!)

1. Enter the number 8 for your vSAN Training Scenario ID then click Submit (Hint)
2. Review the vSAN Training Site Results (Do NOT Close this Window) (Hint)
3. Examine the Health of the vSAN Cluster via the vSphere Web Client using vSAN Health Check (Hint)
4. Select Clear Scenario via the vSAN Training Tool and review Instructions. Note that not all of the Instructions apply in our case - select the Hint for more information (Hint)
5. Return the vSAN Cluster to its working state via the Guidance in Step 4. (Hint)
6. Retest vSAN Health and confirm that Issue is resolved (Hint)
7. Click Back on the vSAN Training Tool Website

You can also view hints on the VMware Technology Network Communities here:

https://communities.vmware.com/docs/DOC-37006
Conclusion

In this Module you injected failure conditions for vSAN Network and vSAN Disk. As part of this process, you learned how to leverage the vSAN Health Check to identify the behavior that occurs during these type of troubleshooting scenarios.

You've finished Module 3

Congratulations on completing Module 3.

If you are looking for additional information:

- Go to [VMware Storage Hub](#) for all things related to vSAN

Proceed to any module below which interests you most.

- [Module 4 - vSAN Troubleshooting (Advanced)](#) (45 minutes) (Advanced)
- [Module 5 - vSAN Interoperability](#) (30 minutes) (Basic)
- [Module 6 - Bonus Module (vSAN Encryption)](#) (30 minutes) (Basic)

How to End Lab

To end your lab click on the **END** button.
Module 4 - vSAN Troubleshooting (45 Minutes, Advanced)
Introduction

This Module contains the following lessons:

- Challenge 1: Troubleshoot vSAN Configuration
- Challenge 2: Troubleshoot vSAN Services
- Challenge 3: Troubleshoot vSAN Virtual Machines

Please note that these Challenges assume a certain level of vSAN familiarity to complete 'on your own'. Fear not, in the event that you are not as familiar, you can still take the Lab and utilize the '(HINT)' links to thoroughly guide you through detailed completion steps for each Challenge. There also may be more than one method to solve a challenge. The goal is for you to learn and/or validate your existing knowledge along the way.

Lab Preparation

To prepare our Lab Environment we will now have you run your ModuleSwitcher as well as prepare the vSAN Training (Failure Injection) Tool Environment (if required).

Module Switcher

Double-Click the Module Switcher Desktop Shortcut
Module 4 Start

1. Click the Module 4 Start button

Monitor Progress

Monitor Progress until Complete.

(Please note that this startup routine can take a few minutes to complete, thank you for your patience)!

• Press Enter to continue (and close the PowerCLI Window)

Module Switcher Complete

1. Click Window Close to safely stop the Module Switcher
vSAN Training Introduction

NOTE: If you just took Module 3 - vSAN Troubleshooting (Beginner), you do NOT need to prepare the vSAN Training Tool again and can skip the remaining content by clicking here to proceed to your first Challenge in this Module.

If you have just started this Challenge Lab directly and not taken Module 3, please continue:

Prepare vSAN Training

- Double-click the Prepare vSAN Training desktop shortcut

Monitor Progress

- Monitor Progress then Press Enter to continue...
Launch vSAN Training Site

1. Within your Chrome Browser select the **New Tab** Button
2. Click the **vSAN Training** Bookmark

**vSAN Training Site**

Inject a new scenario, assuming the cluster is currently in perfect health and has been returned to the default configuration. Your assignment will be to identify the issue that was injected and resolve it and restore the cluster to full health. Use random scenarios by default, and only if you want to repeat a particular scenario use the input box to ask for a specific scenario.

(You are recommended to use a fresh environment and don't use it for other purpose since the injection error may break the testbed)

Pressing the button will trigger a task which can be watched in the vSphere Web Client. Once it completes successfully, the scenario has been created and your assignment starts. Please don't take any actions before then. Also don't change any settings unrelated to the assignment, as it may break the training software.

Cluster Name: RegionA01-COMP01

(Now we have scenario 1-8)
Scenario ID (leave blank for random): 

- Review the **vSAN Training** Site Information

You are now ready to proceed with the first challenge!
Challenge 1: Troubleshoot vSAN Configuration

Humans make mistakes and when flying without the safety net of proven automation, configuration drift can become a real challenge.

Onward, brave Troubleshooter.

Open Chrome Browser from Windows Quick Launch Task Bar

1. Click on the Chrome Icon on the Windows Quick Launch Task Bar.

vCenter Login

1. Select the checkbox for "Use Windows session authentication".
2. Click Login

Alternatively, you can enter a User name of administrator@corp.local and a password of VMware1!
vSAN Training Site

Confirm that the vSAN Training Site is ready for our next Scenario ID

Your Challenge: Troubleshoot vSAN Configuration

Perform the steps listed below in order to begin the Challenge.

1. Enter the number 2 for your vSAN Training Scenario ID then click Submit (Hint)
2. Review the vSAN Training Site Results (Do NOT Close this Window) (Hint)
3. Examine the Health of the vSAN Cluster via the vSphere Web Client using vSAN Health Check (Hint)
4. Correct the misconfiguration for the impacted Host (Hint)
5. Retest vSAN Health and confirm that Issue is resolved (Hint)
6. Click Back on the vSAN Training Tool Website

You can also view hints on the VMware Technology Network Communities here:

https://communities.vmware.com/docs/DOC-37007
Challenge 2: Troubleshoot vSAN Services

If only things would stay running the way they are supposed to - let's work on spotting a challenge in our environment and take steps to resolve the situation.

vSAN Training Site

1. Enter the number 3 for your vSAN Training Scenario ID then click Submit (Hint)
2. Review the vSAN Training Site Results (Do NOT Close this Window) (Hint)

Your Challenge: Troubleshoot vSAN Services
3. Examine the Health of the vSAN Cluster via the vSphere Web Client using vSAN Health Check (Hint)
4. Use Putty to connect to the impacted Host via SSH and check the state of the impacted Service (Hint)
5. Within your existing Putty session, remediate the impacted Service (Hint)
6. Retest vSAN Health and confirm that Issue is resolved (Hint)
7. Click Back on the vSAN Training Tool Website

You can also view hints on the VMware Technology Network Communities here:

https://communities.vmware.com/docs/DOC-37007
Challenge 3: Troubleshoot vSAN Virtual Machines

Our vSAN Datastore isn't of much use if we aren't using it as a home for our Virtual Machines, but what happens when you are unable to build a new VM?

Hold on tight for your final vSAN Troubleshooting Challenge (and thank you for being here)!

vSAN Training Site

- Confirm that the vSAN Training Site is ready for our next Scenario ID

Your Challenge: Troubleshoot vSAN Virtual Machines

Perform the steps listed below in order to begin the Challenge.
1. Enter the number 5 for your vSAN Training Scenario ID then click Submit (Hint)
2. Review the vSAN Training Site Results (Do NOT Close this Window) (Hint)
3. Attempt to build a new Virtual Machine within the vSAN Cluster (Hint)
4. Figure out why you are unable to build this new Virtual Machine (Hint)
5. Correct the condition and re-attempt the Virtual Machine build if desired (Hint)

All Troubleshooting Challenges Completed!

You can also view hints on the VMware Technology Network Communities here:

https://communities.vmware.com/docs/DOC-37007
Conclusion

In this Module you injected failure conditions for vSAN Network and vSAN Disk. As part of this process, you learned how to leverage the vSAN Health Check to identify the behavior that occurs during these type of troubleshooting scenarios.

You've finished Module 4

Congratulations on completing Module 4.

If you are looking for additional information:

- Go to VMware Storage Hub for all things related to vSAN

Proceed to any module below which interests you most.

- Module 5 - vSAN Interoperability (30 minutes) (Basic)
- Module 6 - Bonus Module (vSAN Encryption) (30 minutes) (Basic)

How to End Lab

To end your lab click on the END button.
Module 5 - vSAN Interoperability (30 Minutes)
Introduction

VMware vSAN has the capability to interoperate with other VMware based solutions. Beginning with vSAN 6.6, VMware has also added the ability to allow operability in the event that vCenter is offline.

This Module contains the following lessons:

- Challenge 1: vCenter Unavailable (ESXi Host Client)
- Challenge 2: vRealize Operations Manager (Operations, Capacity, Troubleshooting)

Lab Preparation

We will use our Module Switcher PowerCLI Application to prepare the environment.

Module Switcher

Double-Click the Module Switcher Desktop Shortcut

Module 5 Start

1. Click the Module 5 Start button
Monitor Progress

Monitor Progress until Complete.

(Please note that this startup routine can take a few minutes to complete, thank you for your patience)!

• Press **Enter to continue** (and close the PowerCLI Window)

**Module Switcher Complete**

1. Click Window **Close** to safely stop the Module Switcher
Challenge 1: vCenter Unavailable (Utilize Host Client)

Oh, No - vCenter is unavailable!!

(not really, but let's pretend)

VMware vSAN 6.6 now provides access to the vSAN control plane through the ESXi Host Client, providing an additional management and monitoring option in the unlikely event that vCenter Server is offline. This provides greater access to vSAN while accommodating for technical issues or human error that prevents access to vCenter Server.

Open Chrome Browser from Windows Quick Launch Task Bar

1. Click on the Chrome Icon on the Windows Quick Launch Task Bar.

vCenter Login

1. Select the checkbox for "Use Windows session authentication".
2. Click **Login**

Alternatively, you can enter a User name of `administrator@corp.local` and a password of **VMware1!**

**Your Challenge: Utilize ESXi Host Client**

**Perform the step listed below in order to begin the Challenge.**

1. Connect to the ESXi Host Client and monitor the vSAN Datastore *(Hint)*
   - [https://esx-01a.corp.local/ui](https://esx-01a.corp.local/ui) *(Really Big Hint!)*
   - **User name:** root
   - **Password:** VMware1!

Note: You will have to manually type the hyperlink above into your Chrome Browser or you can use the HOL ‘SEND TEXT’ feature (upper-left hand corner) to copy/paste.

You can also view hints on the VMware Technology Network Communities here:

[https://communities.vmware.com/docs/DOC-37008](https://communities.vmware.com/docs/DOC-37008)
Challenge 3: vRealize Operations Manager (vSAN Operations)

Accurate interpretation of metrics in the data center is critical to the efficient design, operation, and optimization of any environment. Native (built-in) vSAN monitoring extends the powerful abilities of vRealize Operations (vR Ops) to bring the right information to the eyes of the Administrator running vSAN. This built-in capability exposes vSAN related metrics through predefined dashboards that are designed to assist in common operation and optimization efforts.

Your Challenge: Utilize the vR Ops 6.6 Management Pack to assess the Operational state of vSAN 6.6

This part of the lab is presented as a Hands-on Labs Interactive Simulation. This will allow you to experience steps which are too time-consuming or resource intensive to do live in the lab environment. In this simulation, you can use the software interface as if you are interacting with a live environment.

1. Click here to open the interactive simulation. It will open in a new browser window or tab.
2. When Finished, click the "Return to the lab" link at the top right.

Be aware that the lab continues to run in the background. If the lab goes into standby mode, you can resume it after completing the module.

You can also view hints on the VMware Technology Network Communities here:

https://communities.vmware.com/docs/DOC-37008
Challenge 4: vRealize Operations Manager (vSAN Capacity)

vSAN provides capacity related data in vCenter, but it is a single point in time and one Cluster at a time. Administrators are unable to see utilization trends, how it relates to other resources (CPU, Memory) and what utilization looks like across the data center.

vRealize Operations provides a holistic view of capacity. Trending, correlations between other resources and visibility across Clusters.

Capacity management is a strategic effort for an Administrator. They must have the right information to make smart design and purchasing decisions.

Your Challenge: Utilize the vR Ops 6.6 Management Pack to assess vSAN 6.6 Capacity

This part of the lab is presented as a Hands-on Labs Interactive Simulation. This will allow you to experience steps which are too time-consuming or resource intensive to do live in the lab environment. In this simulation, you can use the software interface as if you are interacting with a live environment.

1. Click here to open the interactive simulation. It will open in a new browser window or tab.
2. When finished, click the “Return to the lab” link to continue with this lab.

Be aware that the lab continues to run in the background. If the lab goes into standby mode, you can resume it after completing the module.

You can also view hints on the VMware Technology Network Communities here:

https://communities.vmware.com/docs/DOC-37008
Challenge 5: vRealize Operations Manager (vSAN Troubleshooting)

Datacenter Administrators can face uncertainty in how to Troubleshoot issues in a vSAN (or any other) environment.

vRealize Operations provides a "Troubleshoot vSAN" dashboard presenting information in such a way to help specifically guide a user through a vSAN Troubleshooting process.

This gives the Administrator not only the necessary data but most importantly a repeatable process to more easily identify and resolve outstanding issues.

Your Challenge: Utilize the vR Ops 6.6 Management Pack to assess the Operational state of vSAN 6.6

This part of the lab is presented as a Hands-on Labs Interactive Simulation. This will allow you to experience steps which are too time-consuming or resource intensive to do live in the lab environment. In this simulation, you can use the software interface as if you are interacting with a live environment.

1. Click here to open the interactive simulation. It will open in a new browser window or tab.
2. When finished, click the “Return to the lab” link to continue with this lab.

The lab continues to run in the background. If the lab goes into standby mode, you can resume it after completing the module.

You can also view hints on the VMware Technology Network Communities here:

https://communities.vmware.com/docs/DOC-37008
Conclusion

In this module you learned about a technique that could be used to Monitor and Administer vSAN in the event that vCenter is offline by using the vSphere Host Client. In addition, you learned how vSAN is further enhanced through the use of other VMware products like vRealize Log Insight and vRealize Operations Manager.

You've finished Module 5

Congratulations on completing Module 5.

If you are looking for additional information:

- Go to VMware Storage Hub for all things related to vSAN

Proceed to the module below:

- Module 6 - Bonus Module (vSAN Encryption) (30 minutes) (Basic)

How to End Lab

To end your lab click on the END button.
Module 6 - Bonus Challenge (vSAN Encryption)
Introduction

This Bonus Module contains the following challenge:

- Challenge 1: Enable vSAN Encryption

Please note that this Challenge assumes a certain level of vSAN familiarity to complete 'on your own'. Fear not, in the event that you are not as familiar, you can still take the Lab and utilize the '(HINT)' links to thoroughly guide you through detailed completion steps for this Challenge. There also may be more than one method to solve this challenge. The goal is for you to learn and/or validate your existing knowledge along the way.

Lab Preparation

Important Note: If you have taken any of the previous challenges already in the same Lab session, you do not need to use the Module Switcher for this Challenge and you can proceed to Challenge 1: Enable vSAN Encryption.

If you have just started the Lab and have gone directly to this Challenge, please use our Module Switcher PowerCLI Application to prepare the environment by following the next set of instructions.

Module Switcher

Double-Click the Module Switcher Desktop Shortcut
Module 6 Start

1. Click the Module 4 Start button (this is not a typo - even though we are in Module 6, the PowerCLI code used for Module 4 is sufficient to prep our environment)

Monitor Progress

Monitor Progress until Complete.

- Press Enter to continue (and close the PowerCLI Window)

Note that it can take several minutes for the Module switcher to complete - thank you for your patience!

Lab Prep Complete

Your Lab has been successfully prepared for Module 6!
1. Click Window **Close** to safely stop the Module Switcher

**Please Note** that you cannot 'go back' and take Modules prior to the one you are currently in unless you end the lab and start it over again (for example: If you Start Module 4, you cannot use the Module Switcher to Start Labs 1, 2 or 3).
Challenge 1: Enable vSAN Encryption

It's possible to enable vSAN Encryption the first time you form a vSAN 6.6 Cluster. In our case, due to a recent Security requirement that has come up in your environment, we are going to ask you to enable it after the fact.

Open Chrome Browser from Windows Quick Launch Task Bar

1. Click on the Chrome Icon on the Windows Quick Launch Task Bar.

vCenter Login

1. Select the checkbox for "Use Windows session authentication".
2. Click Login

Alternatively, you can enter a User name of administrator@corp.local and a password of VMware1!
Encryption Introduction

vSAN Encryption is the industry's first native HCI encryption solution and is built right into the vSAN software. With a couple of clicks, it can be enabled or disabled for all items on the vSAN datastore, with no additional steps.

Because it runs at the Hypervisor level and not in the context of the virtual machine it is virtual machine agnostic.

Since vSAN Encryption is hardware agnostic, there is no requirement to use specialized and more expensive Self-Encrypting Drives (SEDs), unlike some other HCI solutions that offer encryption.

To use vSAN Encryption, just like VM Encryption, a Key Management Server (KMS) is required. Nearly all KMIP 1.1-compliant KMS vendors are compatible, with specific testing completed for vendors such as HyTrust, Gemalto, Thales e-Security, CloudLink, and Vormetric. These solutions are commonly deployed in clusters of hardware appliances or virtual appliances for redundancy and high availability.

In this Challenge, a KMS is present in our Lab environment but vCenter is not configured to use it. That's Step 1 of where you come in!

Your Challenge: Enable vSAN Encryption

Perform the steps listed below in order to begin the Challenge.

1. Add Key Management Server (KMS) to vCenter using these parameters (Hint)
   ◦ Cluster Name: **KMS Cluster**
   ◦ Server alias: **KMS**
   ◦ Server address: **192.168.110.81**
   ◦ Server port: **5696**

2. Establish Trust with KMS (Hint)

3. Enable vSAN Encryption. DO NOT SELECT 'Erase Disks Before Use' (Hint)

You can also view hints on the VMware Technology Network Communities here:

https://communities.vmware.com/docs/DOC-37009

Modifying the On-disk format to enable vSAN-Encryption-at-rest can take quite some time in our nested Lab environment (> ~15 minutes). Once you are finished, you do not need to wait for Encryption to be fully enabled and can safely end your lab.
Conclusion

Thank you for taking our Bonus Module Challenge!

You enabled Data-at-Rest vSAN Encryption with just the click of a few buttons after configuring vCenter to utilize the Key Management Server in our Lab.

You've finished Module 6

Congratulations on completing Module 6.

If you are looking for additional information on vSAN Encryption, try one of these:

- vSAN Encryption Blog Article [link]
- Or go to [VMware Storage Hub] for all things related to vSAN

How to End Lab

To end your lab click on the **END** button.
Module 1 - vSAN Configuration

Appendix - Module 1 Hints and Solutions

This module contains the following lessons:

- Challenge 1 - Enable vSAN
- Challenge 2 - vSAN Configuration Assist
- Challenge 3 - vSAN Health Check

Hints and Solutions for the first challenge

**Challenge 1 - Hints and Solutions**

Enable vSAN Hints and Solutions

Create a vSAN Cluster

1. Select the **RegionA01-COMP01** Cluster
2. Select the **Configure** Sub-Menu
3. Select **General**
4. Click **Configure**
Configure vSAN Capabilities

1. Enable the **Deduplication and Compression** Checkbox
2. Click **Next**

Back To **Your Challenge: Create a vSAN Cluster**
Validate Networking

1. Confirm that **vSAN Enabled** indicates **Yes** for each Host
2. Click **Next**

Back To **Your Challenge: Create a vSAN Cluster**
1. In order to more easily see Disk Allocation by Host, change the **Group by:** filter to **Host**

2. Note that we are claiming 1x 5.00 GB Cache Device and 2x 10.00 GB Capacity Devices (All Flash)

3. Note that for all 3 Hosts there will be a Total Cache claimed size of 15.00 GB and Total Capacity of 60.00 GB

Back To **Your Challenge: Create a vSAN Cluster**
Ready to complete

1. Confirm Settings including **Total vSAN datastore Capacity and Cache** Amounts
2. Click **Finish**

Please note that it can take up to 5 minutes in our nested Lab Environment for this step to complete - thank you for your patience!

Back To **Your Challenge: Create a vSAN Cluster**
Monitor until Complete

1. Select **Recent Tasks**
2. Click **Running**

Back To **Your Challenge: Create a vSAN Cluster**
Check vSAN state

1. Select the **RegionA01-COMP01** Cluster
2. Select the **Configure** Sub-Menu
3. Select **General**
4. Verify that **vSAN is Turned ON** and that **Deduplication and Compression** are Enabled

Back To Your Challenge: Create a vSAN Cluster
Check vSAN Capacity

1. Select the RegionA01-COMP01 Cluster
2. Select the Monitor Sub-Menu
3. Select vSAN
4. Select Capacity
5. Review Capacity & Deduplication and Compression Overviews

Back To Your Challenge: Create a vSAN Cluster

Challenge 2 - Hints and Solutions

vSAN Configuration Assist Hints and Solutions
1. Select the RegionA01-COMP01 Cluster
2. Select the Configure Sub-Menu
3. Select Configuration Assist
4. Expand Generic Cluster and Select HA Enabled
5. Click Configure VMware HA
6. (Not Shown) Select Turn ON vSphere HA and click OK

Back To Your Challenge: Utilize vSAN Configuration Assist

Challenge 3 - Hints and Solutions

vSAN Health Check Hints and Solutions
Health Check Warning

1. Select the **RegionA01-COMP01** Cluster
2. Select the **Monitor** Sub-Menu
3. Select **vSAN**
4. Select **Health**
5. Note that there are two **Warning**’s present (Hardware Compatibility is expected in our Lab Environment)

Back To **Your Challenge: Utilize vSAN Health Check**
Enable Performance Service

1. Select the **RegionA01-COMP01** Cluster
2. Select the **Monitor** Sub-Menu
3. Select **vSAN**
4. Select **Health**
5. Expand **Performance service** and select **Performance service status**
6. Select **Enable**
7. (Not Shown) Click **OK**

The performance service was designed to utilize VSANs distributed architecture. Performance stats are stored in a stats DB which is deployed as an object on the VSAN datastore when the performance service is enabled. The performance service also does not rely on vCenter server. If something should happen to vCenter server, and a new vCenter server needs to be deployed, the performance statistics continue to be captured for future reference.

Back To **Your Challenge: Utilize vSAN Health Check**
Module 2 - vSAN Day-2 Operations

Appendix - Module 2 Hints and Solutions

This module contains the following lessons:

- Challenge 1 - Scale vSAN Out and Up
- Challenge 3 - Configure Storage Policies
- Challenge 4 - Monitor vSAN Performance

Hints and Solutions for the first challenge

**Challenge 1 - Hints and Solutions**

Scale vSAN Cluster Out Hints and Solutions

**Confirm vSAN Compute**

1. Select the RegionA01-COMP01 Cluster
2. Select the Summary Sub-Menu
3. Note the Total Processors: Quantity

Back To Your Challenge: Scale Out your vSAN Cluster
Confirm vSAN Capacity

1. Select the **RegionA01-COMP01** Cluster
2. Select the **Monitor** Sub-Menu
3. Select **vSAN**
4. Select **Capacity**
5. Note **Total Capacity** size

Back To  **Your Challenge: Scale Out your vSAN Cluster**

Scale vSAN Cluster Out

There are a few methods you can use to add esx-04a.corp.local to your existing vSAN Cluster. Perhaps the easiest is to simply drag-and-drop this node into the RegionA01-COMP01 Cluster.
Add Host to Cluster

Drag `esx-04a.corp.local` and drop into `RegionA01-COMP01` Cluster

Move Host into This Cluster

1. Put all of this host's virtual machines in the cluster's root resource pool. Resource pools currently present on the host will be deleted.

2. OK
1. Select **Put all of this host's virtual machines in the cluster's root resource pool**...
2. Click **OK**

**Confirm**

![Image of ESXi hosts]

1. Confirm that **esx-04a.corp.local** is present in Cluster

Back To **Your Challenge: Scale Out your vSAN Cluster**

**Create Disk Groups and Claim Disks**

![Image of vSphere Web Client interface]
Although it is not required, VMware Best Practice is to configure any newly added Hosts with identical Disk Group composition as the other existing Hosts in the vSAN Cluster.

Our Existing Hosts in the Cluster are configured as follows:

**Disk Group 1:**

- 1x Cache Device (5 GB)
- 2x Capacity Device (10 GB)

1. Select the **RegionA01-COMP01** Cluster
2. Select the **Configure** Sub-Menu
3. Select **Disk Management**
4. Select **esx-04a.corp.local**
5. Click the **Create a new disk group** icon

---

**Create Disk Group**

![Create Disk Group](image)

1. Select **1x 5GB Cache Device**
2. Select **2x 10GB Capacity Devices**
3. Click **OK**

**Wait for Disk Group Creation to Complete successfully**

1. Select **Recent Tasks**
2. Monitor progress until **Complete**

Back To **Your Challenge: Scale Out your vSAN Cluster**

**Exit Maintenance Mode**

1. Right-Click `esx-04a.corp.local`>**Maintenance Mode**>**Exit Maintenance Mode**
Monitor until Complete

![Recent Tasks Window]

1. Select the RegionA01-COMP01 Cluster
2. Select the Summary Sub-Menu
3. Note the Total Processors: Quantity (Increase from 6 to 8)

Back To **Your Challenge: Scale Out your vSAN Cluster**
Confirm vSAN Capacity

1. Select the RegionA01-COMP01 Cluster
2. Select the Monitor Sub-Menu
3. Select vSAN
4. Select Capacity
5. Note Total Capacity size (increase from ~59GB to ~79GB)

Back To Your Challenge: Scale Out your vSAN Cluster
1. Select the RegionA01-COMP01 Cluster
2. Select the Configure Sub-Menu
3. Select Configuration Assist
4. Expand vSAN configuration and select All disks claimed
5. Review information and Click Claim Disks for vSAN
Claim Disks

1. Change **Group by:** to **Host** view
2. Select **Expand All** icon
3. Note that a new Disk Group will be configured for each Host containing **1x Cache Device and 2x Capacity Devices**
4. Click **OK**
Monitor Until Complete

1. Expand **Recent Tasks**
2. Monitor until complete

Back To [Your Challenge: Scale Up your vSAN Cluster](#)
1. Select the RegionA01-COMP01 Cluster
2. Select the Configure Sub-Menu
3. Select Disk Management
4. Select the newly added Disk Group
5. Note that each Host now has a 2nd Disk Group and that the newly added Disk Group contains the expected 3x new Devices (1x Cache and 2x Capacity)
6. Repeat Steps 4-5 for the other Hosts if desired

Back To Your Challenge: Scale Up your vSAN Cluster
Confirm vSAN Capacity

1. Select the **RegionA01-COMP01** Cluster
2. Select the **Monitor** Sub-Menu
3. Select **vSAN**
4. Select **Capacity**
5. Note **Total Capacity** size (increase from 79.98 GB to 159.95 GB)

Back To **Your Challenge: Scale Up your vSAN Cluster**

Challenge 3 - Hints and Solutions

Configure Storage Policies
1. Return to **Home** Tab
2. Click **VM Storage Policies**

**Create VM Storage Policy**
Name and Description

1. Name: FTT1-RAID5-IOPSLimit
Policy Structure

A VM storage policy uses rules to describe the storage level of service to be applied to virtual machines.

Common rules are used for configuring data services provided by hosts. Rule-sets are used for configuring data services provided by datastores. Each rule-set describes the same storage type. Only one rule-set will be applied to a VM, depending on the type of storage the VM is

Gold Storage Policy

<table>
<thead>
<tr>
<th>Common Rules</th>
<th>Rules configuring data services</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Rule-set 1</th>
<th>Rule-set 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rules configuring data services Tags Storage Type 1</td>
<td>Rules configuring data services Tags Storage Type 2</td>
</tr>
</tbody>
</table>

1. Click Next
Common Rules

1. Click **Next**
Rule-Set 1

Select a storage type to place the VM and add rules for data services provided by datastores. The rule-set are placed on datastores from the selected storage type. Adding tags to the rule-set will filter only datastor:

- **Storage Type**: VSAN
- **Primary level of failures to tolerate**: 1
- **Failure tolerance method**: RAID-5/6 (Erasure Coding) - Cap...
- **IOPS limit for object**: 50

Add another rule set

Back 2 Next
1. Note that the vsanDatastore shows up as **Compatible** with your newly created Policy
2. Click **Next**
Ready to Complete

1. Click **Finish**

Back To **Your Challenge: Configure Storage Policies**
Edit VM Storage Policies...

1. Right-click vSAN-VM_NoisyNeighbor>VM Policies>Edit VM Storage Policies...

Apply to All

1. Change VM storage policy: to FTT1-RAID5-IOPSLimit and click Apply to all
2. Click on either **VM Home** or **Hard disk 1** and note that the **Predicted impact** indicates lower Storage Consumption (as the VM is now going to be using RAID5 vs. RAID1 duplicate mirrored replicas)

3. Click **OK**

Back To **Your Challenge: Configure Storage Policies**

### Physical Disk Placement

1. Select **vSAN-VM_NoisyNeighbor**
2. Select **Monitor** Sub-Tab
3. Select **Policies**
4. Click **Hard disk 1** (Note compliance status indicates **Compliant**)
5. Select **Physical Disk Placement**
6. Note that the Components have been placed into a **RAID-5** set thereby using less disk capacity than the previous RAID-1 (Mirror) configuration

Back To **Your Challenge: Configure Storage Policies**
Check IOPS Limit

1. Select **vSAN-VM_NoisyNeighbor**
2. Select **Monitor** Sub-Tab
3. Select **Performance**
4. Click **vSAN - Virtual Disk**
5. Note the **IOPS and IOPS Limit** reporting Graph (over time, a red line will be drawn at the 50 line mark to illustrate the limit that you have set via software policy - this will not report immediately in your lab and you can proceed to the next Challenge)

Back To **Your Challenge: Configure Storage Policies**

**Challenge 4 - Hints and Solutions**

Monitor vSAN Performance
vSAN Cluster Performance Metrics

1. Select the RegionA01-COMP01 Cluster
2. Select the Monitor Sub-Menu
3. Select Performance
4. Note the vSAN related Performance selections
5. Scroll-down to see all of the available Metrics

Back To Your Challenge: Monitor vSAN Performance
vSAN Individual Host Performance Metrics

1. Select the esx-01a.corp.local Host
2. Select the Monitor Sub-Menu
3. Select Performance
4. Note the vSAN related Performance selections
5. Scroll-down to see all of the available Metrics

Back To Your Challenge: Monitor vSAN Performance
Virtual Machine Performance Metrics

1. Select the **vSAN-VM-NoisyNeighbor** Virtual Machine
2. Select the **Monitor** Sub-Menu
3. Select **Performance**
4. Note the **vSAN related Performance** selections
5. Scroll-down to see all of the available **Metrics**

Back To **Your Challenge: Monitor vSAN Performance**
Module 3 - vSAN Troubleshooting

Appendix - Module 3 Hints and Solutions

This module contains the following lessons:

- Challenge 1 - Troubleshoot vSAN Network
- Challenge 2 - Troubleshoot vSAN Disk

Challenge 1 - Hints and Solutions

Troubleshoot vSAN Network

vSAN Training Tool

Inject a new scenario, assuming the cluster is currently in perfect health and has been returned to the default configuration. Your assignment will be to identify the issue that was injected and resolve it and restore the cluster to full health. Use random scenarios by default, and only if you want to repeat a particular scenario use the input box to ask for a specific scenario.

(You are recommended to use a fresh environment and don’t use it for other purpose since the injection error may break the testbed)

Pressing the button will trigger a task which can be watched in the vSphere Web Client. Once it completes successfully, the scenario has been created and your assignment starts. Please don’t take any actions before then. Also don’t change any settings unrelated to the assignment, as it may break the training software.

Cluster Name: RegionA01-COMP01

(Now we have scenario 1-8)
Scenario ID (leave blank for random): 1

1. Enter the Scenario ID: 1
2. Click submit
Scenario: ID = 1

[Note]: Customer says "I have no clue, can you take a look?"

A task was triggered which can be watched in the vSphere Web Client. Once it completes successfully, the scenario has been created and your assignment starts. Please DON'T take any actions before then. Also DON'T change any settings unrelated to the assignment, as it may break the training software.

**Please wait and confirm that 'vSAN Training Inject Failure' task has been completed!**

If you cannot fix the problem, click 'Clear Scenario' button to restore the environment.

Clear Scenario

Once you have completed the assignment, click 'Back' to return to the main page, from which you can launch the next assignment.

Back

• Review Instructions
Our Training Tool disables updates to the Recent Tasks tab to prevent revealing details of the failure type that is being injected; however, you can still monitor the parent progress of the Failure Injection Task itself.

1. Select **Tasks**
2. Note the status of **vSAN Training Inject Failure** task

Back To **Your Challenge: Troubleshoot vSAN Network**
vSAN Health Check

1. Select the **RegionA01-COMP01** Cluster
2. Select the **Monitor** Sub-Menu
3. Select **vSAN**
4. Select **Health**
5. (If there are no Errors present, select **Retest**)
6. Expand Network and click **All hosts have a vSAN vmknic configured**
7. Note which **Host** in your Cluster has no vSAN vmknic present

Back To **Your Challenge: Troubleshoot vSAN Network**
Resolve Network Issue

1. Select ESXi Host with vSAN Network Issue (Screenshot may not match -- use Host result indicated via previous Health Check)
2. Select **Configure**
3. Select **VMkernel adapters**
4. Select **vmk3** **vSAN-RegionA01**...
5. Click **Pencil** edit icon
1. Enable **vSAN** Checkbox
2. Click **OK**

Back To **Your Challenge: Troubleshoot vSAN Network**
vSAN Health Check

1. Select the **RegionA01-COMP01** Cluster
2. Select the **Monitor** Sub-Menu
3. Select **vSAN**
4. Select **Health**
5. (If necessary, click **Retest**)
6. Validate that the **Network** Health check is now in a Passed state

Back To **Your Challenge: Troubleshoot vSAN Network**

**Challenge 2 - Hints and Solutions**

Troubleshoot vSAN Disk
vSAN Training Tool

1. Enter the Scenario ID: 8
2. Click submit

Back To Your Challenge: Troubleshoot vSAN Disk
Scenario: ID = 8

[Note]: Customer says "I have no clue, can you take a look?"
Note: This scenario may not be resolved fully by user. Please click 'Clear Scenario' below and then follow the fix steps. The key assignment is to explain the issue and know the resolve process.

A task was triggered which can be watched in the vSphere Web Client. Once it completes successfully, the scenario has been created and your assignment starts. Please DON'T take any actions before then. Also DON'T change any settings unrelated to the assignment, as it may break the training software.

**Please wait and confirm that 'vSAN Training Inject Failure' task has been completed!**

If you cannot fix the problem, click 'Clear Scenario' button to restore the environment.
[Clear Scenario]

Once you have completed the assignment, click 'Back' to return to the main page, from which you can launch the next assignment.

[Back]
Monitor vSAN Training Inject Failure Task

Our Training Tool disables updates to the Recent Tasks tab to prevent revealing details of the failure type that is being injected; however, you can still monitor the parent progress of the Failure Injection Task itself.

1. Select **Tasks**
2. Note the status of **vSAN Training Inject Failure** task

Back To **Your Challenge: Troubleshoot vSAN Disk**
vSAN Health Check

1. Select the RegionA01-COMP01 Cluster
2. Select the Monitor Sub-Menu
3. Select vSAN
4. Select Health
5. (If there are no Errors present, select Retest)
6. Expand Physical Disk and select Overall disks health
7. Note that esx-02a.corp.local has a simulated disk failures

Back To Your Challenge: Troubleshoot vSAN Disk
Clear Scenario Instructions

1. Ignore everything other than the highlighted information (unplugging the disk and waiting for vSAN Training Inject Failure does not apply)

When you selected 'Clear Scenario' the vSAN Training tool reversed the simulated failed devices. In order to clear the condition in vSphere, you will need to rescan Storage Adapters for the impacted Host.

Back To Your Challenge: Troubleshoot vSAN Disk
Rescan Storage

1. Select ESXi Host with vSAN Disk Issue (will not be the same Host each time - use result indicated via Health Check)
2. Select Configure
3. Select Storage Devices
4. Select Rescans all storage adapters on the host... icon

Rescan Storage, cont.

1. Leave checkboxes enabled and click **OK**
Monitor Progress

1. Expand **Recent Tasks**
2. Monitor Progress until **Complete**

Back To **Your Challenge: Troubleshoot vSAN Disk**

vSAN Health Check

1. Select the **RegionA01-COMP01** Cluster
2. Select the **Monitor** Sub-Menu
3. Select **vSAN**
4. Select **Health**
5. (If necessary, click **Retest**)
6. Validate that the **Physical Disk** Health check is now in a Passed state

Note that it might take several minutes after the Storage Rescan operation for the Health Test to return Passed status again.
Reset Host Error

1. Select the esx-02a.corp.local host
2. Select Summary
3. Click Reset To Green

Back To Your Challenge: Troubleshoot vSAN Disk
Module 4 - vSAN Troubleshooting (Advanced)

Appendix - Module 4 Hints and Solutions

This module contains the following lessons:

- Challenge 1 - Troubleshoot vSAN Configuration
- Challenge 2 - Troubleshoot vSAN Services
- Challenge 3 - Troubleshoot vSAN Virtual Machines

Challenge 1 - Hints and Solutions

Troubleshoot vSAN Configuration

vSAN Training Tool

Inject a new scenario, assuming the cluster is currently in perfect health and has been returned to the default configuration. Your assignment will be to identify the issue that was injected and resolve it and restore the cluster to full health. Use random scenarios by default, and only if you want to repeat a particular scenario use the input box to ask for a specific scenario.

(You are recommended to use a fresh environment and don’t use it for other purpose since the injection error may break the testbed)

Pressing the button will trigger a task which can be watched in the vSphere Web Client. Once it completes successfully, the scenario has been created and your assignment starts. Please don’t take any actions before then. Also don’t change any settings unrelated to the assignment, as it may break the training software.

Cluster Name: RegionA01-COMP01

(Now we have scenario 1-8)
Scenario ID (leave blank for random) 2 1

submit 2
1. Enter the Scenario ID: 2  
2. Click **submit**

**Back To**  
Your Challenge: Troubleshoot vSAN Configuration

**Scenario: ID = 2**

![Image of vSphere Web Client window]

**Scenario: ID = 2**

[Note]: Customer says "I have no clue, can you take a look?"

A task was triggered which can be watched in the vSphere Web Client. Once it completes successfully, the scenario has been created and your assignment starts. Please DON'T take any actions before then. Also DON'T change any settings unrelated to the assignment, as it may break the training software.

**Please wait and confirm that 'vSAN Training Inject Failure' task has been completed!**

If you cannot fix the problem, click 'Clear Scenario' button to restore the environment.

**Clear Scenario**

Once you have completed the assignment, click 'Back' to return to the main page, from which you can launch the next assignment.

**Back**
Monitor vSAN Training Inject Failure Task

1. Select **Tasks**
2. Note the status of **vSAN Training Inject Failure** task

Back To **Your Challenge: Troubleshoot vSAN Configuration**
vSAN Health Check

1. Select the RegionA01-COMP01 Cluster
2. Select the Monitor Sub-Menu
3. Select vSAN
4. Select Health
5. (If there are no Errors present, select Retest)
6. Expand Cluster and select Advanced vSAN configuration in sync
7. Note that Host that has a different VSAN.ClomRepairDelay value set than the other Host(s).

The vSAN advanced setting VSAN.ClomRepairDelay specifies the amount of time vSAN waits before rebuilding a disk object after a host is either in a failed state (absent failures) or in Maintenance Mode. By default, the repair delay value is set to 60 minutes; this means that in the event of a host failure, VSAN waits 60 minutes before rebuilding any disk objects located on that particular host.

Back To Your Challenge: Troubleshoot vSAN Configuration
Advanced System Settings

1. Select the impacted Host from the previous Health Check step
2. Select the **Configure** Sub-Menu
3. Select **Advanced System Settings**
4. Click **Edit**
### Edit Advanced System Settings

1. Type **vsan.clomrepair** in search field
2. Enter Value of **60**
3. Click **OK**

Back To [Your Challenge: Troubleshoot vSAN Configuration](#)
vSAN Health Check

1. Select the RegionA01-COMP01 Cluster
2. Select the Monitor Sub-Menu
3. Select vSAN
4. Select Health
5. (If necessary, click Retest)
6. Validate that the Cluster Health check is now in a Passed state

Back To Your Challenge: Troubleshoot vSAN Configuration

Challenge 2 - Hints and Solutions

Troubleshoot vSAN Services
vSAN Training Tool

Inject a new scenario, assuming the cluster is currently in perfect health and has been returned to the default configuration. Your assignment will be to identify the issue that was injected and resolve it and restore the cluster to full health. Use random scenarios by default, and only if you want to repeat a particular scenario use the input box to ask for a specific scenario.

(You are recommended to use a fresh environment and don’t use it for other purpose since the injection error may break the testbed)

Pressing the button will trigger a task which can be watched in the vSphere Web Client. Once it completes successfully, the scenario has been created and your assignment starts. Please don’t take any actions before then. Also don’t change any settings unrelated to the assignment, as it may break the training software.

Cluster Name: RegionA01-COMP01

(Now we have scenario 1-8)
Scenario ID (leave blank for random)

1. Enter the Scenario ID: 3
2. Click submit

Back To Your Challenge: Troubleshoot vSAN Services
Scenario: ID = 3

[Note]: Customer says "I have no clue, can you take a look?"

A task was triggered which can be watched in the vSphere Web Client. Once it completes successfully, the scenario has been created and your assignment starts. Please DON'T take any actions before then. Also DON'T change any settings unrelated to the assignment, as it may break the training software.

**Please wait and confirm that 'vSAN Training Inject Failure' task has been completed!**

If you cannot fix the problem, click 'Clear Scenario' button to restore the environment.

Clear Scenario

Once you have completed the assignment, click 'Back' to return to the main page, from which you can launch the next assignment.

Back
Monitor vSAN Training Inject Failure Task

1. Select **Tasks**
2. Note the status of **vSAN Training Inject Failure** task

Back To: **Your Challenge: Troubleshoot vSAN Services**
vSAN Health Check

1. Select the **RegionA01-COMP01** Cluster
2. Select the **Monitor** Sub-Menu
3. Select **vSAN**
4. Select **Health**
5. (If there are no Errors present, select **Retest**)
6. Expand **Cluster** and select **vSAN CLOMD liveness**
7. Note that **Host** that is reporting an **Abnormal** state and **Cannot connect to clomd** Error

CLOMD (Cluster Level Object Manager Daemon) plays a key role in the operation of a vSAN cluster. It runs on every ESXi host and is responsible for new object creation, initiating repair of existing objects after failures, all types of data moves and evacuations (For example: Enter Maintenance Mode, Evacuate data on disk removal from vSAN), maintaining balance and thus triggering rebalancing, implementing policy changes, etc).

Back To **Your Challenge: Troubleshoot vSAN Services**
Putty

1. Click the **Putty** shortcut on the taskbar

Putty Configuration

1. Double-click the **Host** that returned **Abnormal** status in the previous Health Check Step
Check clomd Status

1. Type the following command to check clomd status: `/etc/init.d/clomd status`
2. Note that the clomd is not running

Back To Your Challenge: Troubleshoot vSAN Services

Start clomd Service

1. Type the following command to start the clomd service: `/etc/init.d/clomd start`

Back To Your Challenge: Troubleshoot vSAN Services
vSAN Health Check

1. Select the **RegionA01-COMP01** Cluster
2. Select the **Monitor** Sub-Menu
3. Select **vSAN**
4. Select **Health**
5. (If necessary, click **Retest**)
6. Validate that the **Cluster** Health check is now in a Passed state

Back To **Your Challenge: Troubleshoot vSAN Services**

Challenge 3 - Hints and Solutions

Troubleshoot vSAN Virtual Machines
vSAN Training Tool

1. Enter the Scenario ID: 5
2. Click submit

Back To Your Challenge: Troubleshoot vSAN Virtual Machines
Scenario: ID = 5

[Note]: Customer says "VM creation started failing. It worked fine yesterday."

A task was triggered which can be watched in the vSphere Web Client. Once it completes successfully, the scenario has been created and your assignment starts. Please DON'T take any actions before then. Also DON'T change any settings unrelated to the assignment, as it may break the training software.

**Please wait and confirm that 'vSAN Training Inject Failure' task has been completed!**

If you cannot fix the problem, click 'Clear Scenario' button to restore the environment. Clear Scenario

Once you have completed the assignment, click 'Back' to return to the main page, from which you can launch the next assignment.

Back
Monitor vSAN Training Inject Failure Task

1. Select Tasks
2. Note the status of vSAN Training Inject Failure task

Back To Your Challenge: Troubleshoot vSAN Virtual Machines

Attempt Virtual Machine Build
1. Right-click the **RegionA01-COMP01** Cluster and select **New Virtual Machine>New Virtual Machine**

**Select Creation Type**

1. Select **create a new virtual machine**
2. Click **Next**
1. Enter Name: **vSAN-VM**
2. Select **RegionA01**
3. Click **Next**
Select a compute resource

1. Select the **RegionA01-COMP01** Cluster
2. Click **Next**
Attempt to select the vSAN Datastore (aka something is wrong)!!

1. Change VM storage policy to: **Virtual SAN Default Storage Policy**
2. Note that the vsanDatastore is showing up as **Incompatible**
3. Examine the **Compatibility error** for more details
4. Click **Cancel**

Back To **Your Challenge: Troubleshoot vSAN Virtual Machines**
Default vSAN Storage Policy

The compatibility error indicated that, "...this storage policy requires at least 5 fault domains contributing storage but only 4 (hosts) were found."

We know that the formula to calculate the number of Hosts required (where Number of Failures to Tolerate = 'n'), is:

\[ 2n + 1 \]  
(e.g. if Failures to Tolerate desired is 2 then \(2(2) + 1 = 5\) Hosts required

Furthermore, we know that the Default vSAN Storage Policy is configured by default with \textbf{Failures to Tolerate (FTT) = 1} which should mean that only 4 Hosts are required.

If you examine the FTT for the Default vSAN Storage Policy in our Lab at the moment, what do you see?

Back To \textbf{Your Challenge: Troubleshoot vSAN Virtual Machines}

Fix the Default vSAN Storage Policy

![Image of vSphere Web Client interface with policies and profiles highlighted]
1. Hover over the vCenter Home Menu
2. Select Policies and Profiles

1. Click VM Storage Policies

1. Select Virtual SAN Default Storage Policy
2. Select Manage sub-menu
3. Click the Pencil (Edit a VM Storage Policy) Icon
Rule-set 1

1. Change Primary level of failures to tolerate = 1
2. Click OK
3. Attempt to rebuild VM

Back To Your Challenge: Troubleshoot vSAN Virtual Machines
Module 5 - vSAN Interoperability

Appendix - Module 5 Hints and Solutions

This module contains the following lessons:

- Challenge 1 - vCenter Unavailable (ESXi Host Client)
- Challenge 2 - Log Insight (iSIM)
- Challenge 3 - vRealize Operations Manager (iSIM)

Hints and Solutions for the first challenge

Challenge 1 - Hints and Solutions

vCenter Unavailable (ESXi Host Client)

Connect to ESXi Host Client

1. URL: https://esx-01a.corp.local/ui (Login: root  Password: VMware1!)
2. Un-check the Customer Experience Improvement Program selection since we are in a Lab Environment
3. Click OK
Note: You will have to manually type the hyperlink above (Step 1) into your Chrome Browser or you can use the HOL 'SEND TEXT' feature (upper-left hand corner) to copy/paste.

**Storage**

1. Select **Storage**
2. Click **vSAN Datastore**

**Monitor**
1. Select **Monitor**
2. Explore the **vSAN Datastore - Monitor** sub-menu's to view vSAN Events, Configuration, Hosts and Health Information

Back To **Your Challenge: Utilize ESXi Host Client**
Module 6 - Bonus Challenge (vSAN Encryption)

Appendix - Module 6 Hints and Solutions

This module contains the following lessons:

- Challenge 1 - Enable vSAN Encryption

Hints and Solutions for the first challenge

Challenge 1 - Hints and Solutions

Enable vSAN Encryption

Add KMS to vCenter

1. Select the vcsa-01a.corp.local vCenter instance
2. Select the Configure Sub-Menu
3. Select Key Management Servers
4. Click + Add KMS...
Add KMS

1. Cluster Name: **KMS Cluster**
2. Server alias: **KMS**
3. Server address: **192.168.110.81**
4. Server port: **5696**
5. Click **OK**

Set default KMS Cluster

1. Click **Yes**
# Trust Certificate

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1. Click **Trust**

Back To **Your Challenge: Enable vSAN Encryption**
Establish Trust with KMS

1. Select the `vcsa-01a.corp.local` vCenter instance
2. Select the `Configure` Sub-Menu
3. Select `Key Management Servers`
4. Select `KMS` instance
5. Click the `Establish trust with KMS` Ribbon
Root CA

1. Validate that the **Root CA Certificate** radial button is enabled
2. Click **OK**
Download Root CA Certificate

1. Click **OK**

Back To **Your Challenge: Enable vSAN Encryption**
Configure vSAN

1. Select the RegionA01-COMP01 Cluster
2. Select the Configure Sub-Menu
3. Select General
4. Click Edit...

Enable vSAN Encryption

1. Select the RegionA01-COMP01 Cluster
2. Select the Configure Sub-Menu
3. Select General
4. Click Edit...
Edit vSAN Settings

1. Enable **Encryption** check-box
2. Verify **KMS cluster: KMS Server**
3. Click **OK**
Encryption Enabled - Converting On-Disk Format

1. Note that Encryption is reporting **Enabled** status
2. Note that progress is being reported for **On-disk Format Version**

Back To **Your Challenge: Enable vSAN Encryption**
Conclusion

Thank you for participating in the VMware Hands-on Labs. Be sure to visit http://hol.vmware.com/ to continue your lab experience online.

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