

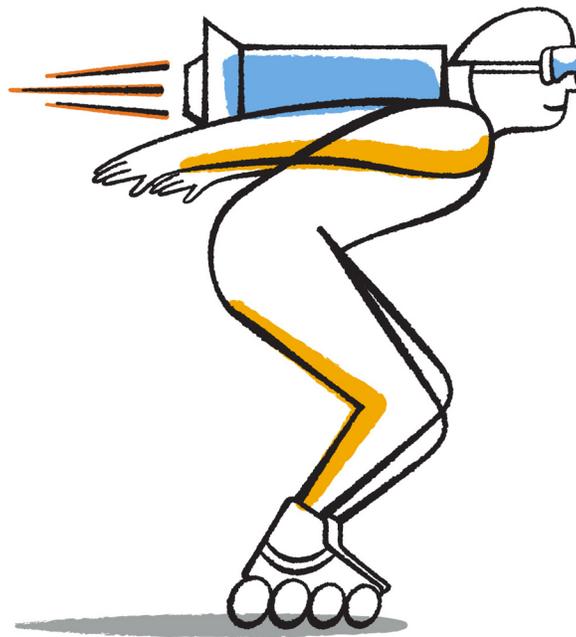


NetApp[®]

Updated for 8.3.1

Clustered Data ONTAP[®] 8.3

iSCSI Configuration for ESX Express Guide



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Part number: 215-09061_B0
June 2015

Contents

Deciding whether to use this guide	4
iSCSI configuration workflow	5
Verifying that the iSCSI configuration is supported	5
Completing the iSCSI configuration worksheet	6
Installing VSC	8
Adding the storage cluster or SVM to VSC for VMware vSphere	8
Configuring your network for best performance	9
Configuring host iSCSI ports and vSwitches	9
Enabling the iSCSI software adapter	10
Binding iSCSI ports to the iSCSI software adapter	10
Configuring the ESXi host best practice settings	10
Creating an aggregate	11
Deciding where to provision the volume	11
Verifying that the iSCSI service is running on an existing SVM	12
Configuring iSCSI on an existing SVM	13
Creating a new SVM	14
Testing iSCSI paths from the host to the storage cluster	15
Provisioning a datastore and creating its containing LUN and volume	16
Verifying that the host can write to and read from the LUN	17
Where to find additional information	18
Copyright information	19
Trademark information	20
How to send comments about documentation and receive update notification	21
Index	22

Deciding whether to use this guide

This guide describes how to quickly set up the iSCSI service on a Storage Virtual Machine (SVM), provision a LUN, and make the LUN available using an iSCSI initiator on an ESX host computer.

This guide is based on the following assumptions:

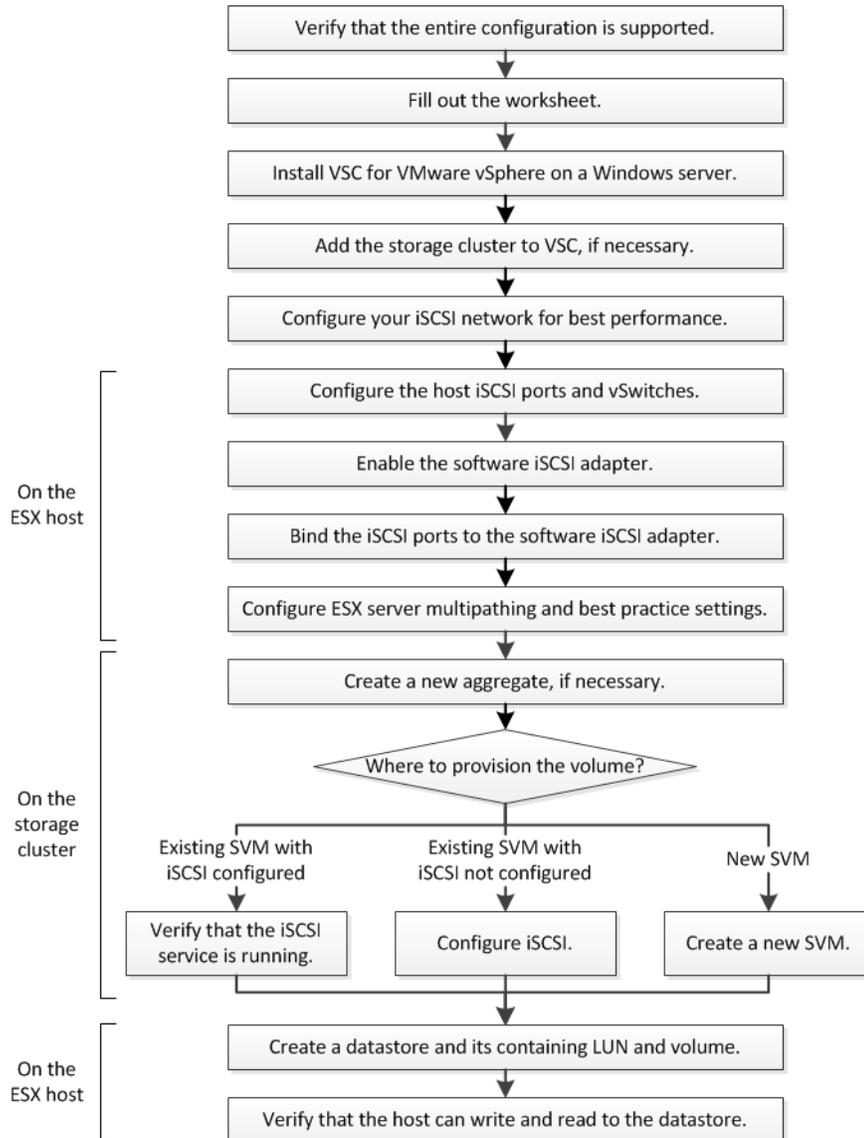
- You want to use best practices, not explore every available option.
- You do not want to read a lot of conceptual background.
- You want to use OnCommand System Manager, not the Data ONTAP command-line interface or an automated scripting tool.
- You are using the native ESX iSCSI software initiator on ESXi 5.x.
- You are not using CHAP authentication for iSCSI.
- You are using a supported version of Virtual Storage Console for VMware vSphere to configure storage settings for your ESX host.
- Your network uses IPv4 addressing.
- You want to assign addresses to logical interfaces using any of the following methods:
 - Automatically from a subnet you define
 - Manually, using an address selected from an existing subnet
 - Manually, using an address that will be added to an existing subnet
- You have at least two high-speed Ethernet ports (1 Gb minimum, 10 Gb recommended) available on each node in the cluster.
Onboard UTA2 (also called “CNA”) ports are configurable. Configuring those ports is performed in the Data ONTAP CLI and is not covered in this guide.
- You are not configuring iSCSI SAN boot.
- You are providing storage to VMs through the ESX hypervisor and not running an iSCSI initiator within the VM.

If these assumptions are not correct for your situation, you should see the following resources:

- [Clustered Data ONTAP 8.3 SAN Administration Guide](#)
- [Clustered Data ONTAP 8.3 SAN Configuration Guide](#)
- [Virtual Storage Console 6.0 for VMware vSphere Installation and Administration Guide](#)
- [VMware vSphere Storage](#) for your version of ESX 5 (available from [VMware](#))
- [NetApp Documentation: OnCommand Workflow Automation \(current releases\)](#)
OnCommand Workflow Automation enables you to run prepackaged workflows that automate management tasks such as the workflows described in Express Guides.

iSCSI configuration workflow

When you make storage available to an ESX host using iSCSI, you provision a volume and LUN on the Storage Virtual Machine (SVM) using Virtual Storage Console for VMware vSphere, and then connect to the LUN from the host.



Verifying that the iSCSI configuration is supported

To ensure reliable operation, you must verify that the entire iSCSI configuration is supported. The Interoperability Matrix lists the supported configurations.

Steps

1. Go to the [NetApp Interoperability Matrix Tool](#) to verify that you have a supported combination of the following components:

- Data ONTAP software
 - Host computer CPU architecture (for standard rack servers)
 - Specific processor blade model (for blade servers)
 - Storage protocol (iSCSI)
 - ESXi operating system version
 - Guest operating system type and version
 - Virtual Storage Console (VSC) for VMware vSphere software
 - Windows Server version to run VSC
2. Click the configuration name for the selected configuration.
Details for that configuration are displayed in the Configuration Details window.
 3. Review the information in the following tabs:
 - Notes
Lists important alerts and information that are specific to your configuration.
 - Policies and Guidelines
Provides general guidelines for all SAN configurations.

Completing the iSCSI configuration worksheet

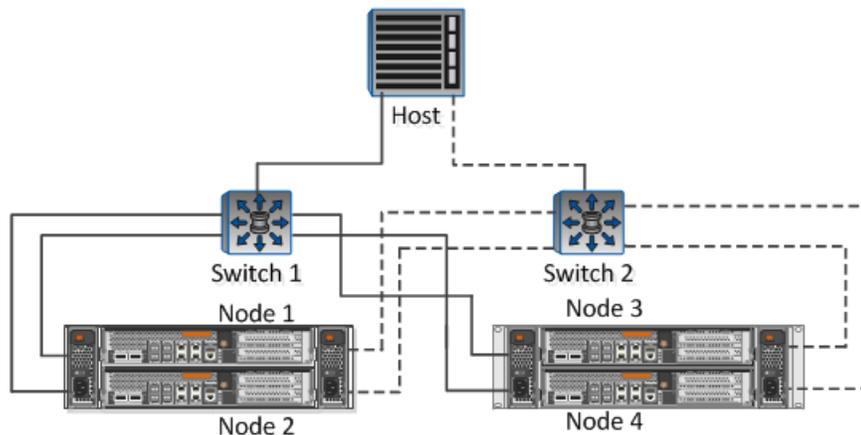
You require network addresses and storage configuration information to perform iSCSI configuration tasks.

Target network addresses

The Storage Virtual Machine (SVM) is the iSCSI target.

You require a subnet with two IP addresses for iSCSI data LIFs for each node in the cluster. There should be two separate networks for high availability. The specific IP addresses are assigned by Data ONTAP when you create the LIFs as part of creating the SVM.

If possible, separate iSCSI traffic on separate physical networks or on VLANs.



Subnet for LIFs: _____

Node or LIF with port to switch	IP address	Network mask	Gateway	VLAN ID	Home port
Node 1 / LIF to switch 1					
Node 2 / LIF to switch 1					
Node 3 / LIF to switch 1					
Node 4 / LIF to switch 1					
Node 1 / LIF to switch 2					
Node 2 / LIF to switch 2					
Node 3 / LIF to switch 2					
Node 4 / LIF to switch 2					

Storage configuration

If the aggregate and SVM are already created, record their names here; otherwise, you can create them as required:

Node to own LUN	
Aggregate name	
SVM name	

LUN information

LUN size	
LUN name (optional)	
LUN description (optional)	

SVM information

If you are not using an existing SVM, you require the following information to create a new one:

SVM name	
SVM IPspace	
Aggregate for SVM root volume	
SVM user name (optional)	
SVM password (optional)	

SVM management LIF (optional)	Subnet:
	IP address:
	Network mask:
	Gateway:
	Home node:
	Home port:

Installing VSC

Virtual Storage Console (VSC) for VMware vSphere automates many of the configuration and provisioning tasks required to use NetApp iSCSI storage with an ESXi host. VSC is a plug-in to vCenter Server.

Before you begin

- You must have administrator credentials on the Windows server.
- You must have administrator credentials on the vCenter Server used to manage the ESXi host.
- The Windows server on which you install VSC must have network connectivity to the ESXi host, to the vCenter Server, and to the storage cluster.

About this task

- You can install VSC on the same Windows server that runs the vCenter Server.
- You cannot install VSC on vCenter Server Appliance (vCSA).
You can install VSC on a separate Windows server or VM and register it with vCSA.
- VSC is not supported on a Windows server with IPv6 enabled.
- You do not need the VSC backup feature license for any tasks in this guide.

Steps

1. Download the version of VSC that is supported for your configuration from [NetApp Support](#).
2. Run the installation wizard on the Windows server.
3. After the wizard finishes, complete the web page that is displayed to register VSC with the vCenter Server that manages your ESXi host.

Adding the storage cluster or SVM to VSC for VMware vSphere

Before you can provision the first datastore to an ESXi host in your Datacenter, you must add the cluster or a specific Storage Virtual Machine (SVM) to Virtual Storage Console for VMware vSphere. Adding the cluster enables you to provision storage on any SVM in the cluster.

Before you begin

You must have administrator credentials for the storage cluster or the SVM that is being added.

About this task

Depending on your configuration, the cluster might have been discovered automatically, or might have already been added.

Steps

1. Log in to the vSphere Web Client.
2. Select **Virtual Storage Console**.
3. Select **Storage Systems** and then click the **Add** icon.
4. In the **Add Storage System** dialog box, enter the host name and administrator credentials for the storage cluster or SVM and then click **OK**.

Configuring your network for best performance

Ethernet networks vary greatly in performance. You can maximize the performance of the network used for iSCSI by selecting specific configuration values.

Steps

1. Connect the host and storage ports to the same network.
It is best to connect to the same switches. Routing should never be used.
2. Select the highest speed ports available, and dedicate them to iSCSI.
10 GbE ports are best. 1 GbE ports are the minimum.
3. Disable Ethernet flow control for all ports.
4. Enable jumbo frames (typically MTU of 9000).
All devices in the data path, including initiators, targets, and switches, must support jumbo frames. Otherwise, enabling jumbo frames actually reduces network performance substantially.

Configuring host iSCSI ports and vSwitches

The ESXi host requires network ports for the iSCSI connections to the storage cluster.

About this task

It is recommended that you use IP Hash as the NIC teaming policy, which requires a single VMkernel port on a single vSwitch.

The host ports and storage cluster ports used for iSCSI must have IP addresses in the same network.

This task lists the high-level steps for configuring the ESXi host. If you require more detailed instructions, see *VMware vSphere Storage* for your version of ESXi from [VMware](#).

Steps

1. Log in to the vSphere Client, and then select the ESXi host from the inventory pane.
2. On the **Manage** tab, click **Networking**.
3. Click **Add Networking**, and then select **VMkernel** and **Create a vSphere standard switch** to create the VMkernel port and vSwitch.

4. Configure jumbo frames for the vSwitch (MTU size of 9000).
5. Repeat the previous step to create a second VMkernel port and vSwitch.

Enabling the iSCSI software adapter

The iSCSI software adapter creates the iSCSI connection on the ESX host. It is built into the operating system, but must be enabled before it can be used.

Before you begin

You must have a VMware vSphere Client installed on your workstation or you must have access to a vSphere Web Client.

Steps

1. Log in to the vSphere Client.
2. Select the ESX host from the inventory pane.
3. Click **Configuration > Storage Adapters**.
4. Select the iSCSI software adapter and click **Properties > Configure**.
5. Select **Enabled** and then click **OK**.

Binding iSCSI ports to the iSCSI software adapter

The ports you created for iSCSI must be associated with the iSCSI software adapter to support multipathing.

Before you begin

- The iSCSI VMkernel ports must be created.
- The iSCSI software adapter must be enabled on the ESX host.

About this task

You can bind the iSCSI ports using the vSphere Client.

For detailed instructions, see *VMware vSphere Storage* for your version of ESXi 5 from [VMware](#).

Steps

1. Bind the first iSCSI port to the iSCSI software adapter using the **Network Port Binding** tab of the iSCSI software adapter **Adapter Details** dialog box in the vSphere Client.
2. Bind the second iSCSI port to the iSCSI software adapter.

Configuring the ESXi host best practice settings

You must ensure that the host multipathing and best practice settings are correct so that the ESXi host can correctly manage the loss of an iSCSI connection or a storage failover event.

Steps

1. From the VMware vSphere Web Client **Home** page, click **vCenter > Hosts**.

2. Right-click the host, and then select **Actions > NetApp VSC > Set Recommended Values**.
3. In the **NetApp Recommended Settings** dialog box, ensure that all of the options are selected, and then click **OK**.

The vCenter Web Client displays the task progress.

Creating an aggregate

If you do not want to use an existing aggregate, you can create a new aggregate to provide physical storage to the volume you are provisioning.

Steps

1. Enter the URL `https://IP-address-of-cluster-management-LIF` in a web browser and log in to System Manager using your cluster administrator credential.
2. In the navigation pane, expand the **Cluster** hierarchy and click **Storage > Aggregates**.
3. Click **Create**.
4. Follow the instructions on the screen to create the aggregate using the default RAID-DP configuration, and then click **Create**.

The screenshot shows the 'Create Aggregate' dialog box with the following fields and values:

- Name:** aggr2
- Disk Type:** SAS (with a 'Browse' button)
- Number of Disks:** 8 (with a range of 'Max: 8 (excluding 1 hot spare), min: 5 for RAID-DP')
- RAID Configuration:** RAID-DP; RAID group size of 16 disks (with a 'Change' link)
- New Usable Capacity:** 4.968 TB (Estimated)

Result

The aggregate is created with the specified configuration and added to the list of aggregates in the Aggregates window.

Deciding where to provision the volume

Before you provision a volume to contain your LUNs, you need to decide whether to add the volume to an existing Storage Virtual Machine (SVM) or to create a new SVM for the volume. You might also need to configure iSCSI on an existing SVM.

About this task

If an existing SVM is already configured with the needed protocols and has LIFs that can be accessed from the host, it is easier to use the existing SVM.

You can create a new SVM to separate data or administration from other users of the storage cluster. There is no advantage to using separate SVMs just to separate different protocols.

Choices

- If you want to provision volumes on an existing SVM that is already configured for iSCSI, see [Verifying that the iSCSI service is running on an existing SVM](#) on page 12.
- If you want to provision volumes on an existing SVM that has iSCSI enabled but not configured, see [Configuring iSCSI on an existing SVM](#) on page 13.
This is the case when you followed another Express Guide to create the SVM while configuring a different protocol.
- If you want to provision volumes on a new SVM, see [Creating a new SVM](#) on page 14.

Verifying that the iSCSI service is running on an existing SVM

If you choose to use an existing Storage Virtual Machine (SVM), you must verify that the iSCSI service is running on the SVM.

Before you begin

You must have selected an existing SVM on which you plan to create a new LUN.

Steps

1. From the OnCommand System Manager home page, double-click the appropriate storage system.
2. Expand the **Storage Virtual Machines** hierarchy in the left navigation pane.
3. In the navigation pane, select the SVM and click **Configuration > Protocols > iSCSI**.
4. Verify that the iSCSI service is running.

Network Interface	Target Portal Group	IP Address
iscsi_lif_1	1028	10.53.33.4
iscsi_lif_2	1029	10.53.33.5

5. Record the iSCSI interfaces listed for the SVM.

After you finish

If the iSCSI service is not running, start the iSCSI service or create a new SVM.

If there are fewer than two iSCSI interfaces per node, update the iSCSI configuration on the SVM or create a new SVM for iSCSI.

Configuring iSCSI on an existing SVM

You can configure iSCSI on an existing Storage Virtual Machine (SVM). The iSCSI protocol must already be enabled but not configured on the SVM. This information is intended for SVMs for which you are configuring multiple protocols, but have not yet configured iSCSI.

Before you begin

You must have enough network addresses available to create two LIFs for each node.

Steps

1. In the navigation pane, expand the **Storage Virtual Machines** hierarchy and select the SVM.
2. In the SVM **Details** pane, verify that **iSCSI** is displayed with a gray background, which indicates that the protocol is enabled but not fully configured.

If **iSCSI** is displayed with a green background, the SVM is already configured.



3. Click the **iSCSI** protocol link with the gray background.
The Configure iSCSI Protocol window is displayed.
4. Configure the iSCSI service and LIFs from the **Configure iSCSI protocol** page:
 - a. Optional: Enter a target alias name.
 - b. Enter **2** in the **LIFs per node** field.
Two LIFs are required for each node, to ensure availability and data mobility.
 - c. Select the subnet for the LIFs.
 - d. Ignore the optional **Provision a LUN for iSCSI storage** area, because the LUN is provisioned by Virtual Storage Console for VMware vSphere in a later step.
 - e. Click **Submit & Close**.
5. Review the **Summary** page, record the LIF information, and then click **OK**.

Creating a new SVM

The Storage Virtual Machine (SVM) provides the iSCSI target through which a host accesses LUNs. When you create the SVM, you also create logical interfaces (LIFs) that provide paths to the LUN. You can create a new SVM to separate data or administration from other users of the storage cluster.

Before you begin

- You must have enough network addresses available to create two LIFs for each node.

Steps

1. Expand the **Storage Virtual Machines** hierarchy in the left navigation pane.
2. Click **Create**.
3. In the **Storage Virtual Machine (SVM) Setup** window, create the SVM:
 - a. Specify a unique name for the SVM.
The name must either be a fully qualified domain name (FQDN) or follow another convention that ensures unique names across a cluster.
 - b. Select the IPspace that the SVM will belong to.
If the cluster does not use multiple IPspaces, the “Default” IPspace is used.
 - c. Keep the default volume type selection.
Only FlexVol volumes are supported with SAN protocols.
 - d. Select all of the protocols that you have licenses for and that you will ever use on the SVM, even if you do not want to configure all of the protocols immediately.
Selecting both NFS and CIFS when you create the SVM enables these two protocols to share the same LIFs. Adding these protocols later does not allow them to share LIFs.
If CIFS is one of the protocols you selected, then the security style is set to NTFS. Otherwise, the security style is set to UNIX.
 - e. Keep the default language setting C.UTF-8.
 - f. Select the desired root aggregate to contain the SVM root volume.
The aggregate for the data volume is selected separately in a later step.
 - g. Click **Submit & Continue**.
The SVM is created, but protocols are not yet configured.
4. If the **Configure CIFS/NFS protocol** page appears because you enabled CIFS or NFS, click **Skip** and then configure CIFS or NFS later.
5. Configure the iSCSI service and LIFs from the **Configure iSCSI protocol** page:
 - a. Optional: Enter a target alias name.
 - b. Select the subnet for the LIFs.
 - c. Enter **2** in the **LIFs per node** field.
Two LIFs are required for each node to ensure availability and data mobility.
 - d. Skip the optional **Provision a LUN for iSCSI storage** area, because the LUN is provisioned by Virtual Storage Console for VMware vSphere in a later step.

- e. Click **Submit & Continue**.
6. If the **Configure FC/FCoE protocol** page appears because you enabled FC, click **Skip** and then configure FC later.
7. When the **SVM Administration** appears, configure or defer configuring a separate administrator for this SVM:
 - Click **Skip** and configure an administrator later if desired.
 - Enter the requested information, and then click **Submit & Continue**.
8. Review the **Summary** page, record the LIF information, and then click **OK**.

Related information

[NetApp Documentation: Clustered Data ONTAP Express Guides](#)

Testing iSCSI paths from the host to the storage cluster

To ensure successful storage failover and data mobility, you need to ensure that you have two paths from the host to every node in the storage cluster. Because the number of paths advertised by the iSCSI target is limited, you need to ping the storage cluster ports from the host.

Before you begin

You must know the IP address or host name of all of the logical interfaces (LIFs) to be used for iSCSI paths.

About this task

Starting with clustered Data ONTAP 8.3, LUNs are mapped to a subset of the initiators in the igroup to limit the number of paths from the host to the LUN.

- By default, only paths from the host to the node containing the Storage Virtual Machine (SVM) where the LUN was created, and paths to the HA partner of that node, are visible to the host.
- You still must create and test paths from the host to every node in the cluster, but the host can access only those paths on the owning node and its HA partner.
- You should use the default LUN mapping behavior.
Only add nodes in other HA pairs to the LUN map in preparation for moving the LUN to a different node.

Steps

1. From the ESX host, use the `ping` command to verify the path to the first LIF.
The `ping` command is available from the ESX service console.
2. Repeat the `ping` command to verify connectivity to each iSCSI LIF on each node in the cluster.

Related information

[VMware KB article 1003486: Testing network connectivity with the ping command](#)

Provisioning a datastore and creating its containing LUN and volume

A datastore contains virtual machines and their VMDKs on the ESXi host. The datastore on the ESXi host is provisioned on a LUN on the storage cluster.

Before you begin

Virtual Storage Console for VMware vSphere (VSC) must be installed and registered with the vCenter Server that manages the ESXi host.

VSC must have sufficient cluster or Storage Virtual Machine (SVM) credentials to create the LUN and volume.

About this task

VSC automates the datastore provisioning, including creating a LUN and volume on the specified SVM.

Steps

1. From the vSphere Web Client **Home** page, click **Hosts and Clusters**.
2. In the navigation pane, expand the datacenter where you want to provision the datastore.
3. Right-click the ESXi host, and then select **NetApp VSC > Provision Datastore**.
4. Provide the required information in the wizard:

NetApp Datastore Provisioning Wizard

1 Name and type
2 Storage system
3 Details
4 Ready to complete

Specify the name and type of datastore you want to provision.

You will be able to select the storage system for your datastore in the next page of this wizard.

Name : * ESX_1_DS2

Type : * NFS VMFS

VMFS Protocol : * FC/FCoE iSCSI

Select the storage capability profile you want to use to provision a new datastore.

Storage Capability Profile * None

Back Next Finish Cancel

- Select **VMFS** as the datastore type.
- Select **iSCSI** as the VMFS protocol.
- Select **None** as the Storage Capability Profile.
- Ensure that the **Thin provision** check box is not selected.
- Select the **Create new volume** check box.

After you finish

Set storage timeouts for guest operating systems using the Guest OS Tools in VSC.

For an ESXi cluster, make the datastore available to all the hosts in the cluster.

Verifying that the host can write to and read from the LUN

Before using the LUN, you should verify that the host can write data to the LUN and read it back.

About this task

If the cluster node on which the LUN is created can be failed over to its partner node, you should verify reading the data while the node is failed over. This test might not be possible if the cluster is in production use.

For detailed instructions on node failover and giveback, see the *Clustered Data ONTAP 8.3 High-Availability Configuration Guide*.

Steps

1. On the vSphere Web Client **Home** page, click **Hosts and Clusters**.
2. In the navigation pane, click the **Storage** tab.
3. Expand the datacenter, and then select the new datastore.
4. In the center pane, click **Manage > Files**.
The contents of the datastore are displayed.
5. Create a new folder in the datastore and upload a file to the new folder.
You might need to install the Client Integration Plug-in.
6. Verify that you can access the file you just wrote.
7. Optional: Fail over the cluster node containing the LUN and verify that you can still write and read a file.
If any of the tests fail, verify that the iSCSI service is running on the storage cluster and check the iSCSI paths to the LUN.
8. Optional: If you failed over the cluster node, be sure to give back the node and return all LIFs to their home ports.
9. For an ESXi cluster, view the datastore from each ESXi host in the cluster and verify that the file you uploaded is displayed.

Where to find additional information

There are additional documents to help you learn more about iSCSI configuration.

All of the following documentation is available:

- [*Clustered Data ONTAP 8.3 SAN Configuration Guide*](#)
Describes supported FC, iSCSI, and FCoE topologies for connecting host computers to storage controllers in clusters.
- [*Clustered Data ONTAP 8.3 SAN Administration Guide*](#)
Describes how to configure and manage the iSCSI, FCoE, and FC protocols for clustered SAN environments, including configuration of LUNs, igroups, and targets.

VMware documentation

Documentation about iSCSI for ESXi servers is available directly from [VMware](#):

- [*vSphere Storage*](#)
This VMware guide describes FC and iSCSI configuration for ESXi 5.x.
- [*Multipathing Configuration for Software iSCSI Using Port Binding*](#)
Technical White Paper describes MPIO setup for ESXi servers.

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Index

A

- about this guide
 - deciding whether to use [4](#)
- adapters
 - binding iSCSI adapters to iSCSI ports [10](#)
 - enabling iSCSI software [10](#)
- additional information
 - where to find iSCSI configuration [18](#)
- aggregates
 - creating [11](#)
- audience
 - for this guide [4](#)

C

- clusters
 - adding to VSC [8](#)
 - testing iSCSI paths from host [15](#)
- comments
 - how to send feedback about documentation [21](#)
- configuration
 - iSCSI workflow [5](#)
 - where to find information about iSCSI [18](#)
- configuring
 - best practice settings on ESXi host [10](#)
 - iSCSI on existing SVMs [13](#)
 - iSCSI ports and vSwitches on ESX host [9](#)
 - iSCSI worksheet for [6](#)
- creating
 - aggregates [11](#)
 - SVMs [14](#)

D

- datastores
 - provisioning [16](#)
- discovering
 - storage cluster in VSC [8](#)
- documentation
 - how to receive automatic notification of changes to [21](#)
 - how to send feedback about [21](#)

E

- ESX hosts
 - enabling iSCSI software adapter [10](#)
 - testing iSCSI paths to storage cluster from [15](#)
 - verifying supported iSCSI configurations [5](#)
- ESX servers
 - requirement for using iSCSI Configuration Express Guide to provide LUNs [4](#)
- ESXi hosts
 - configuring best practice settings [10](#)
 - configuring iSCSI ports and vSwitches on [9](#)
- express guides
 - requirements for using iSCSI with ESX [4](#)

F

- feedback
 - how to send comments about documentation [21](#)
- flowcharts
 - iSCSI configuration [5](#)

G

- guides
 - requirements for using iSCSI Configuration Express [4](#)

H

- hosts
 - enabling iSCSI software adapter [10](#)
 - testing iSCSI paths to storage cluster from [15](#)
 - verifying writing to and reading from LUNs [17](#)

I

- information
 - how to send feedback about improving documentation [21](#)
 - where to find additional iSCSI configuration [18](#)
- initiators
 - enabling iSCSI software [10](#)
- installing
 - VSC for VMware vSphere [8](#)
- Interoperability Matrix
 - verifying supported iSCSI configurations using [5](#)
- iSCSI
 - configuration and provisioning workflow [5](#)
 - configuration worksheet for [6](#)
 - configuring ESX host multipathing and best practice settings for [10](#)
 - configuring network for best performance [9](#)
 - configuring on existing SVMs [13](#)
 - enabling software adapter [10](#)
 - requirements for using iSCSI Configuration Express Guide to provide LUNs to ESX servers [4](#)
 - verifying that configuration is supported [5](#)
 - where to find additional information about configuring [18](#)
- iSCSI service
 - verifying running on SVM [12](#)
- iSCSI software adapters
 - binding to iSCSI ports [10](#)
- iSCSI targets
 - creating as part of configuring SVMs [13](#)
 - creating as part of creating SVMs [14](#)

L

- LIFs
 - creating as part of configuring SVMs [13](#)
 - creating as part of creating SVMs [14](#)

logical interfaces

See LIFs

LUNs

creating [16](#)

deciding where to provision the containing volume on a new or existing SVM [11](#)

requirements for using iSCSI Configuration Express Guide to provide to ESX servers [4](#)

testing iSCSI paths from host to storage cluster [15](#)

verifying that host can write to and read from [17](#)

M

mapping

paths to LUNs are limited by default [15](#)

multipathing

binding iSCSI ports to iSCSI software adapter [10](#)

configuring ESX host settings for iSCSI [10](#)

N

network addresses

iSCSI configuration worksheet for [6](#)

network ports

binding to the iSCSI software adapter [10](#)

configuring for iSCSI on ESX host [9](#)

networks

configuring for best iSCSI performance [9](#)

testing iSCSI paths from host to storage cluster [15](#)

P

paths

testing iSCSI, from host to storage cluster [15](#)

performance

configuring iSCSI networks for best [9](#)

ports

binding to the iSCSI software adapter [10](#)

configuring for iSCSI on ESX host [9](#)

provisioning

datastores and creating containing LUNs and volumes [16](#)

iSCSI workflow [5](#)

iSCSI worksheet for [6](#)

where to find information about iSCSI [18](#)

R

read/write

verifying that host can write to and read from LUNs [17](#)

requirements

verifying supported iSCSI configurations [5](#)

S

software adapters

binding to iSCSI ports [10](#)

storage clusters

adding to VSC [8](#)

testing iSCSI paths from host [15](#)

storage configurations

iSCSI configuration worksheet [6](#)

suggestions

how to send feedback about documentation [21](#)

supported configurations

verifying iSCSI [5](#)

SVMs

adding to VSC [8](#)

configuring iSCSI on existing [13](#)

creating [14](#)

deciding whether to provision a volume on a new or existing [11](#)

verifying iSCSI service is running [12](#)

T

targets

creating iSCSI as part of configuring SVMs [13](#)

creating iSCSI as part of creating SVMs [14](#)

testing

iSCSI paths from host to storage cluster [15](#)

twitter

how to receive automatic notification of documentation changes [21](#)

V

vCenter Server

registering VSC for VMware vSphere with [8](#)

Virtual Storage Console

See VSC

VMkernel ports

binding to the iSCSI software adapter [10](#)

configuring for iSCSI on ESX host [9](#)

VMware ESX hosts

enabling iSCSI software adapter [10](#)

VMware vSphere

adding storage cluster to VSC for [8](#)

verifying supported iSCSI configurations [5](#)

volumes

creating [16](#)

deciding whether to provision on a new or existing SVM [11](#)

VSC

adding storage cluster to [8](#)

installing for VMware vSphere [8](#)

using to provision datastores and create LUNs and volumes [16](#)

vSwitches

configuring for iSCSI on ESX host [9](#)

W

workflows

iSCSI configuration [5](#)

worksheets

iSCSI configuration [6](#)

write/read

verifying that host can write to and read from LUNs [17](#)