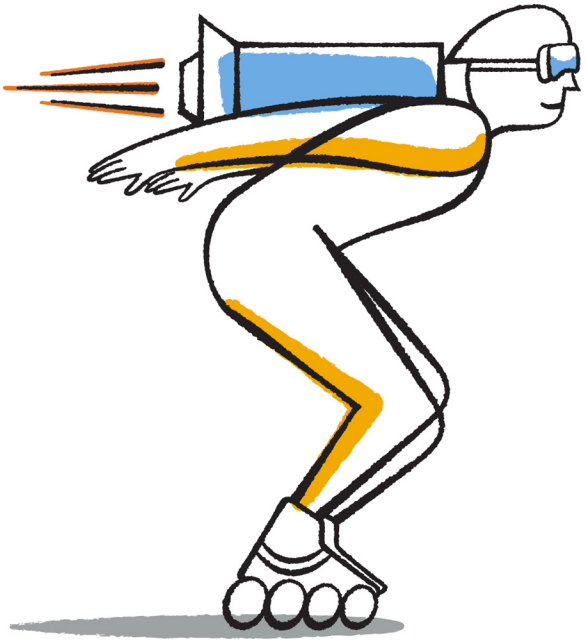
Clustered Data ONTAP® 8.3

FC Configuration for ESX Express Guide



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Deciding whether to use this guide

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

This guide is based on the following assumptions:

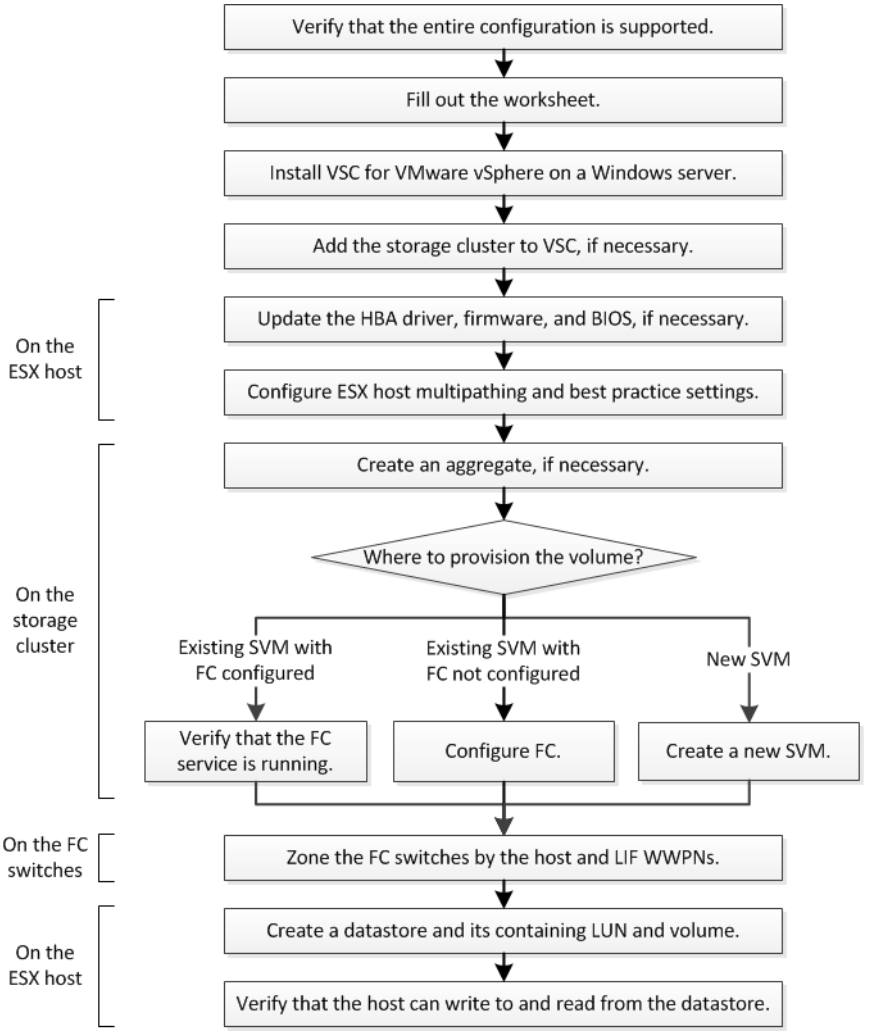
- You want to use best practices, not explore every available option.
- You do not want to read a lot of conceptual background.
- You want to use OnCommand System Manager, not the command-line interface or an automated scripting tool.
- You are using a supported version of Virtual Storage Console for VMware vSphere to configure storage settings for your ESX host and to provision the datastores.
- Your network uses IPv4 addressing.
- You are using traditional FC HBAs on ESXi 5.x and traditional FC switches.
  This guide does not cover FCoE.
- You have at least two FC target ports available on each node in the cluster.
  Onboard FC and UTA2 (also called "CNA") ports, as well as some adapters are configurable. Configuring those ports is done in the Data ONTAP CLI and is not covered in this guide.
- You are not configuring FC SAN boot.
- You are creating datastores on the host.
  This guide does not cover raw device mapping (RDM) disks or using N-port ID virtualization (NPIV) to provide FC directly to VMs.

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 5.0 for VMware vSphere Installation and Administration Guide*
- *VMware vSphere Storage* for your version of ESXi 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.

FC configuration workflow

When you make storage available to a host using FC, you provision a volume and LUN on the Storage Virtual Machine (SVM), and then connect to the LUN from the host.



Verifying that the FC configuration is supported

To ensure reliable operation, you must verify that the entire FC 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)
   - FC host bus adapter (HBA) model and driver, firmware, and BIOS versions
   - Storage protocol (FC)
   - ESXi operating system version
   - Guest operating system type and version
   - Virtual Storage Console for VMware vSphere (VSC) 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.

Filling out the FC configuration worksheet

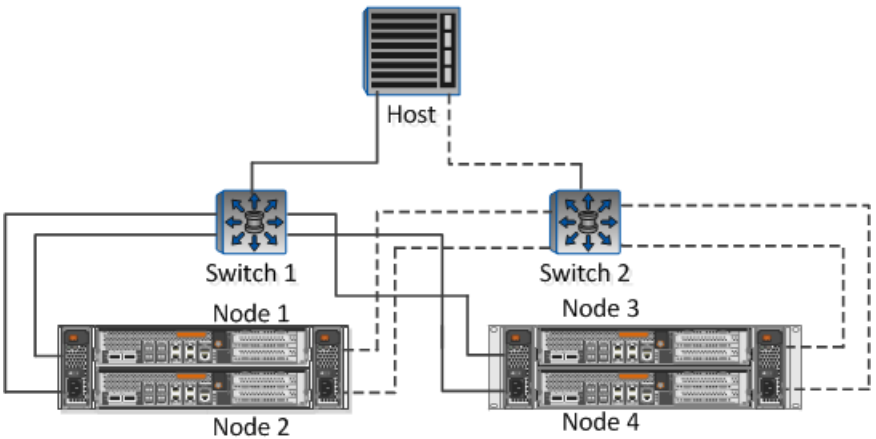
You require FC initiator and target WWPNs and storage configuration information to perform FC configuration tasks.

FC host WWPNs

Port	WWPN
Initiator (host) port connected to FC switch 1	
Initiator (host) port connected to FC switch 2	

FC target WWPNs

You require two FC data LIFs for each node in the cluster. The WWPNs are assigned by Data ONTAP when you create the LIFs as part of creating the Storage Virtual Machine (SVM).



LIF	WWPN
Node 1 LIF with port connected to FC switch 1	
Node 2 LIF with port connected to FC switch 1	
Node 3 LIF with port connected to FC switch 1	
Node 4 LIF with port connected to FC switch 1	
Node 1 LIF with port connected to FC switch 2	

LIF	WWPN
Node 2 LIF with port connected to FC switch 2	
Node 3 LIF with port connected to FC switch 2	
Node 4 LIF with port connected to FC 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 for VMware vSphere (VSC) automates many of the configuration and provisioning tasks required to use NetApp FC storage with an ESX 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 ESX host.
- The Windows server on which you install VSC must have network connectivity to the ESX 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.
- 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, fill in the web page that is displayed to register VSC with the vCenter Server that manages your ESX host.

Adding the storage cluster or SVM to VSC for VMware vSphere

Before you can provision the first datastore to an ESX 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 the 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**.

Updating the HBA driver, firmware, and BIOS

If the FC host bus adapters (HBAs) in the ESX host are not running supported driver, firmware, and BIOS versions, you must update them.

Before you begin

You must have identified the supported driver, firmware, and BIOS versions for your configuration from the *NetApp Interoperability Matrix Tool*.

About this task

Drivers, firmware, BIOS, and HBA utilities are provided by the HBA vendors.

Steps

1. List the installed HBA driver, firmware, and BIOS versions using the ESXi host console commands for your version of ESXi.
2. Download and install the new driver, firmware, and BIOS as needed from the HBA vendor's support site.

   Installation instructions and any required installation utilities are available with the download.

Related information

VMware KB article 1002413: Identifying the firmware of a Qlogic or Emulex FC HBA

Configuring ESX host multipathing and best practice settings

You must ensure that the host multipathing and best practice settings are correct so that the ESX host can correctly handle the loss of an FC path 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**.

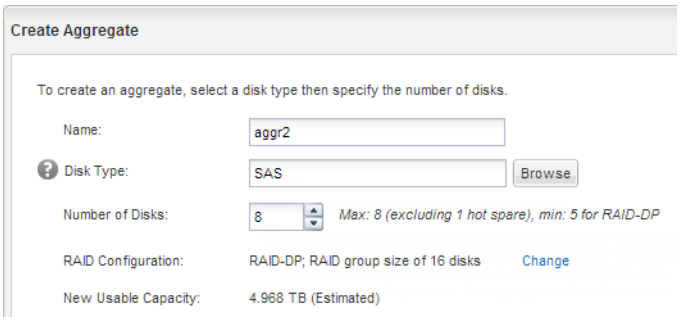
   The vCenter Web Client displays the task progress.

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**.



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 FC 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 FC, see *Verifying that the FC service is running on an existing SVM* on page 12.
- If you want to provision volumes on an existing SVM that has FC enabled but not configured, see *Configuring FC 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 FC service is running on an existing SVM

If you choose to use an existing Storage Virtual Machine (SVM), you must verify that the FC service is running on the SVM. You must also verify that FC LIFs are already created.

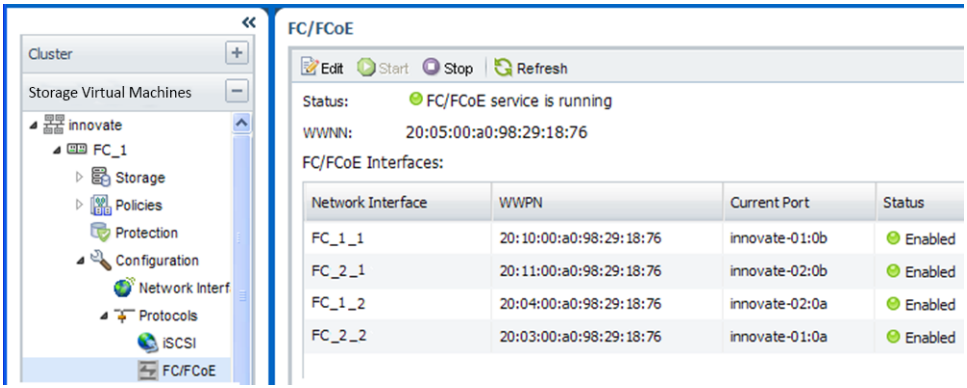
Before you begin

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 then click **Configuration > Protocols > FC/FCoE**.
4. Verify that the FC service is running.



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

5. Verify that there are at least two FC LIFs listed for each node.

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

Configuring FC on an existing SVM

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

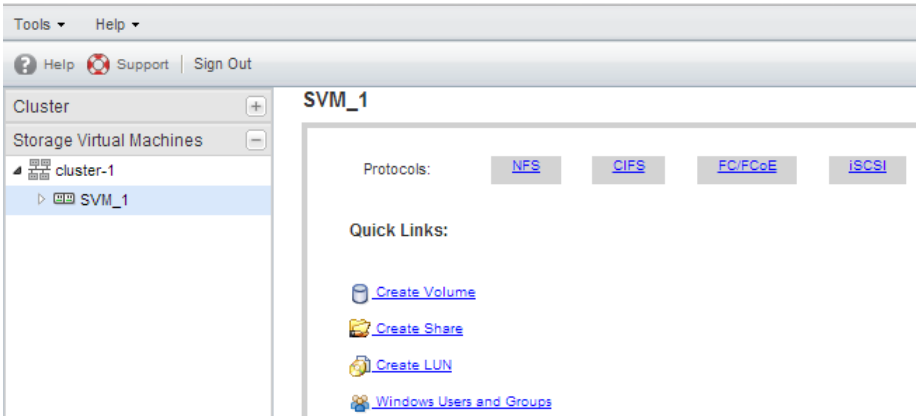
Before you begin

Your FC fabric must be configured and the desired physical ports must be connected to the fabric.

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 **Storage Virtual Machines** hierarchy, and select the SVM.
3. In the SVM **Details** pane, verify that **FC/FCoE** is displayed with a gray background, which indicates that the protocol is enabled but not fully configured.

   If **FC/FCoE** is displayed with a green background, the SVM is already configured.



4. Click the **FC/FCoE** protocol link with the gray background.

   The Configure FC/FCoE Protocol window is displayed.

5. Configure the FC service and LIFs from the **Configure FC/FCoE protocol** page:

   a. Select the **Configure Data LIFs for FC** check box.

   b. Enter **2** in the **LIFs per node** field.

      Two LIFs are required for each node, to ensure availability and data mobility.

   c. Skip the optional **Provision a LUN for FCP storage** area, because the LUN is provisioned by Virtual Storage Console for VMware vSphere in a later step.

   d. Click **Submit & Continue**.

6. Review the **Summary** page, record the LIF information, and then click **OK**.

Creating a new SVM

The Storage Virtual Machine (SVM) provides the FC 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 collected the information in the worksheet.
  See *Filling out the FC configuration worksheet* on page 7.
- Your FC fabric must be configured and the desired physical ports must be connected to the fabric.

Steps

1. Expand the Storage Virtual Machine (SVM) hierarchy in the left navigation pane, and then click **Create**.
2. 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.
3. If the **Configure CIFS/NFS protocol** page appears because you enabled CIFS or NFS, click **Skip** and then configure CIFS or NFS later.
4. If the **Configure iSCSI protocol** page appears because you enabled iSCSI, click **Skip** and then configure iSCSI later.
5. Configure the FC service and LIFs from the **Configure FC/FCoE protocol** page:
   a. Select the **Configure Data LIFs for FC** check box.

   b. Enter **2** in the **LIFs per node** field.

      Two LIFs are required for each node to ensure availability and data mobility.

c. Skip the optional **Provision a LUN for FCP storage** area, because the LUN is provisioned by Virtual Storage Console for VMware vSphere in a later step.

d. Click **Submit & Continue**.

6. 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**.

7. Review the **Summary** page, record the LIF information, and then click **OK**.

Related information

Clustered Data ONTAP 8.3 CIFS/SMB Configuration Express Guide
Clustered Data ONTAP 8.3 NFS Configuration Express Guide
Clustered Data ONTAP 8.3 CIFS and NFS Multiprotocol Configuration Express Guide
Clustered Data ONTAP 8.3 iSCSI Configuration for ESX Express Guide

Zoning the FC switches by the host and LIF WWPNs

Zoning the FC switches enables the hosts to connect to the storage and limits the number of paths. You zone the switches using the management interface of the switches.

Before you begin

- You must have administrator credentials for the switches.
- You must know the WWPN of each host initiator port and of each FC LIF for the Storage Virtual Machine (SVM) in which you created the LUN.

About this task

For details about zoning your switches, see the switch vendor's documentation.

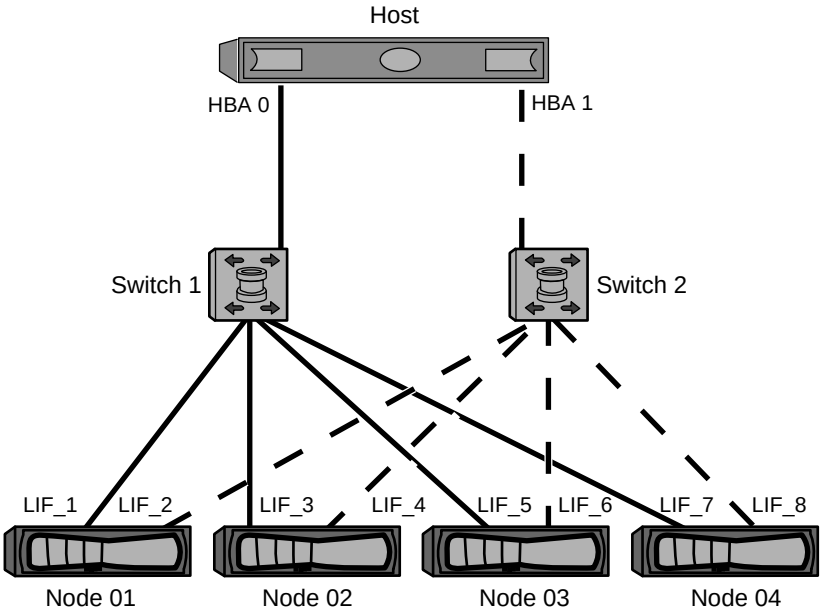
You must zone by WWPN, not by physical port. Each initiator port must be in a separate zone with all of its corresponding target ports.

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 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 zone all of the FC LIFs on every node for data mobility, 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 additional nodes in preparation for moving the LUN to a different node.

The following illustration shows a host connected to a four-node cluster. There are two zones, one zone indicated by the solid lines and one zone indicated by the dashed lines. Each zone contains one initiator from the host and a LIF from each storage node.



You must use the WWPNs of the target LIFs, not the WWPNs of the physical FC ports on the storage nodes. The LIF WWPNs are all in the range `2`*`x`*`:`*`xx`*`:00:a0:98:`*`xx`*`:`*`xx`*`:`*`xx`*, where *x* is any hexadecimal digit. The physical port WWPNs are all in the range `50:0a:09:8`*`x`*`:`*`xx`*`:`*`xx`*`:`*`xx`*`:`*`xx`*.

Steps

1. Log in to the FC switch administration program, and then select the zoning configuration option.
2. Create a new zone that includes the first initiator that also includes all of the FC LIFs that connect to the same FC switch as the initiator.
3. Create additional zones for each FC initiator in the host.
4. Save the zones, and then activate the new zoning configuration.

Provisioning a datastore and creating its containing LUN and volume

A datastore contains virtual machines and their VMDKs on the ESX host. The datastore on the ESX 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 ESX host.

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

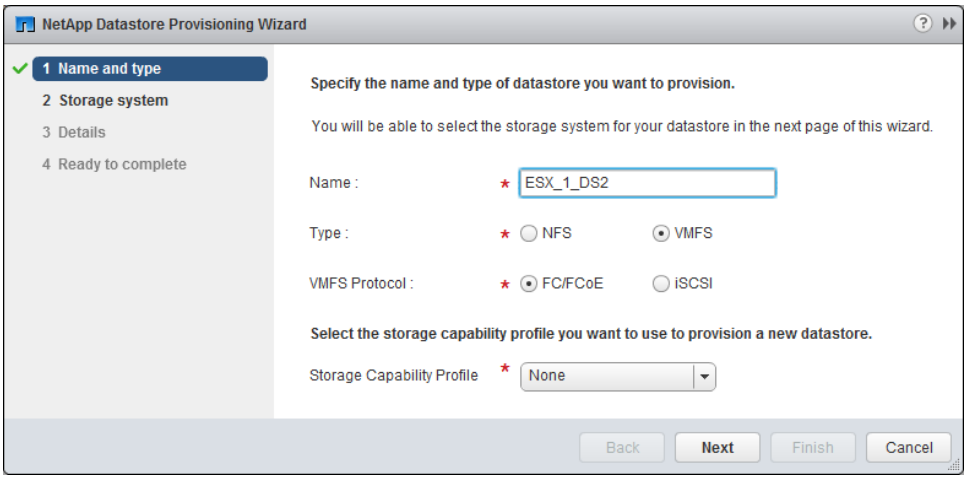
About this task

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 ESX host, and then select **NetApp VSC > Provision Datastore**.

   The Datastore Provisioning Wizard starts.
4. Select the requested information in the wizard:



- Select **VMFS** as the datastore type.
- Select **FC/FCoE** 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 ESX cluster, make the datastore available to all the hosts in the cluster.

Related information

Virtual Storage Console 5.0 for VMware vSphere Installation and Administration Guide

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.

Before you begin

The datastore and its containing LUN must have been created.

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 *Clustered Data ONTAP 8.3 High-Availability Configuration Guide*.

Steps

1. On the vSphere Web Client **Home** page, click the **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 FC service is running on the storage cluster and check the FC paths to the LUN and FC switch zoning.
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 ESX cluster, view the datastore from each ESX 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 FC 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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