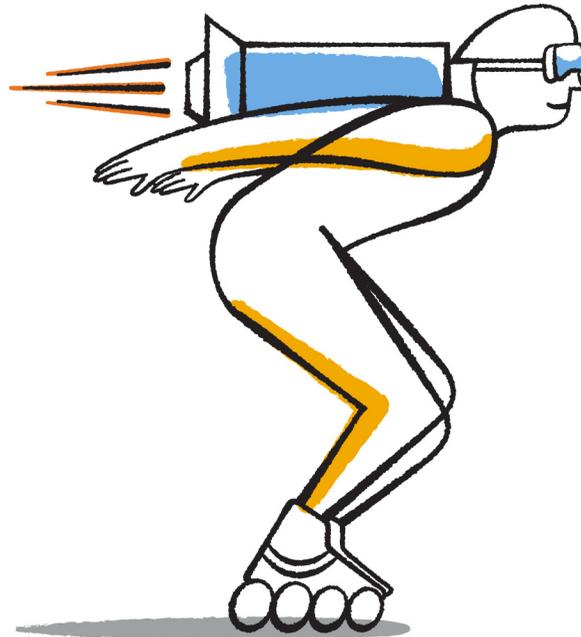




NetApp®

Clustered Data ONTAP® 8.3

FC Configuration for Windows 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 using an FC HBA on a Windows host computer.

This guide is based on the following assumptions:

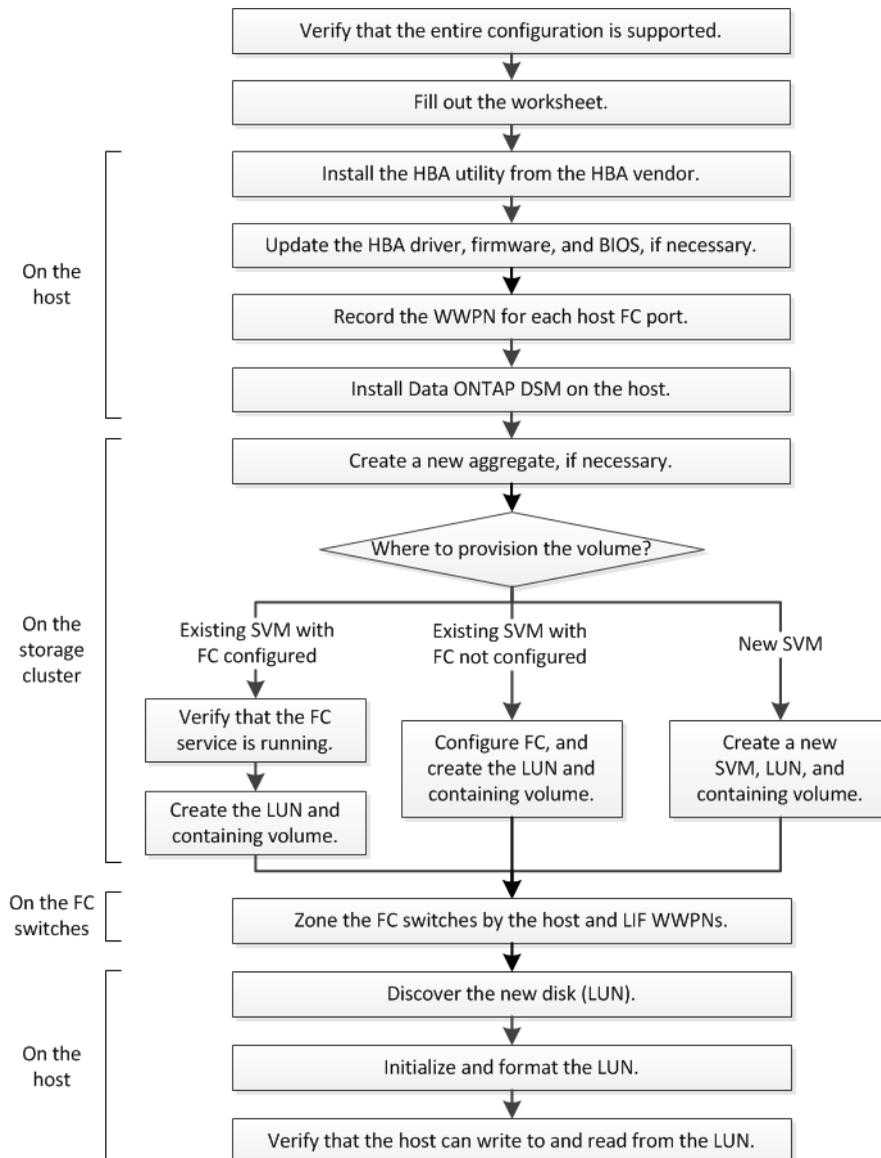
- You want to use best practices, not explore every available option.
- You do not want to read a lot of conceptual background.
- You want to use OnCommand System Manager, not the command-line interface or an automated scripting tool.
- You are using traditional FC HBAs and switches.
This guide does 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 not using virtual Fibre Channel (VFC) with Hyper-V or ESX guests.

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*](#)
- [*NetApp Documentation: Host Utilities \(current releases\)*](#) for your version of Windows Host Utilities
- [*Data ONTAP DSM 4.1 For Windows MPIO Installation and Administration Guide*](#)
- [*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)
 - Windows operating system version
 - Data ONTAP DSM for Windows MPIO
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.
Review the alerts to identify the hotfixes that are required for your operating system.
 - Policies and Guidelines
Provides general guidelines for all SAN configurations.

Filling out the FC configuration worksheet

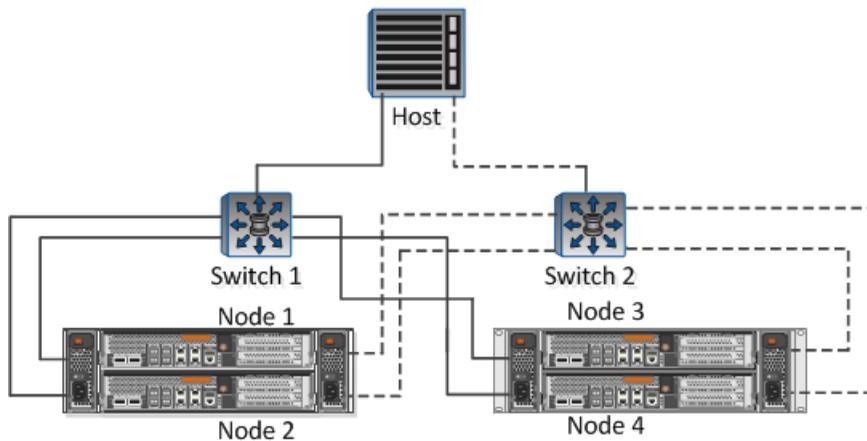
You require FC initiator and target WWPNS and storage configuration information to perform FC configuration tasks.

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 | |

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| 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 | |
| Host operating system | |
| 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 the HBA utility from the HBA vendor

The HBA utility enables you to view the worldwide port name (WWPN) of each FC port. The utility is also useful for troubleshooting FC issues.

About this task

Each HBA vendor offers an HBA utility for their FC HBAs. You must download the correct version for your host operating system and CPU.

The following is a partial list of HBA utilities:

- Emulex OneCommand Manager for Emulex HBAs
- QLogic QConvergeConsole for QLogic HBAs

Steps

1. Download the appropriate utility from your HBA vendor's web site.
2. Run the installation program and follow the prompts to complete the installation.

Related information

[Emulex Downloads and Documentation](#)

[QLogic: NetApp Downloads](#)

Updating the HBA driver, firmware, and BIOS

If the FC host bus adapters (HBAs) in the Windows 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 HBA utility from your HBA vendor.
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.

Recording the WWPN for each host FC port

The worldwide port name (WWPN) is required to zone the FC switches and to create the igroups that allow the host to access its LUN.

Before you begin

You must have installed the vendor's HBA utility for the HBAs in your host.

About this task

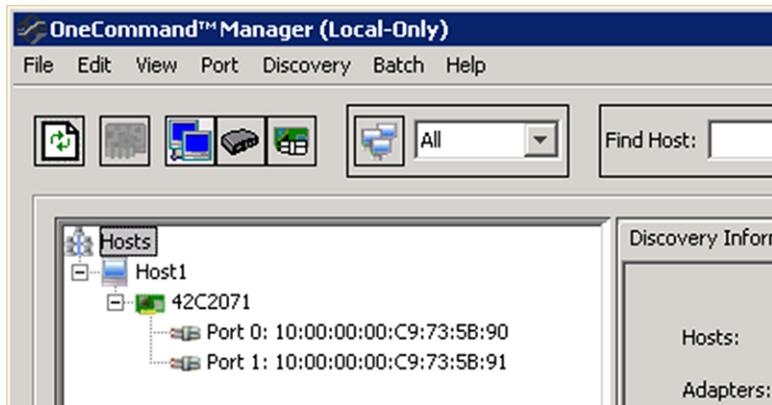
The WWPN is used for all configuration. You do not have to record the worldwide node name (WWNN).

Steps

1. Run the HBA utility for your FC HBA type.
2. Select the HBA.
3. Record the WWPN of each port.

Example

The following example shows Emulex OneCommand Manager.



Other utilities, such as QLogic QConvergeConsole, provide the equivalent information.

4. Repeat the previous step for each FC HBA in the host.

Installing the Data ONTAP DSM for Windows MPIO

The Data ONTAP DSM for Windows MPIO manages multiple paths between the Windows host and the storage cluster. Multiple paths are required to ensure that your host can access its LUN if a path or component fails. The Data ONTAP DSM sets the required timeout values and storage parameters on the host.

Before you begin

You must have completed the following tasks:

- Identified the required version of the Data ONTAP DSM for Windows MPIO from the [NetApp Interoperability Matrix Tool](#)
- Identified any required Windows hotfixes from the [NetApp Interoperability Matrix Tool](#)
The *Data ONTAP DSM for Windows MPIO Installation and Administration Guide* lists the basic hotfix requirements. The specific row in the [NetApp Interoperability Matrix Tool](#) for your configuration lists the latest hotfix requirements.
- Obtained a license key for the Data ONTAP DSM for Windows MPIO

About this task

This task requires rebooting the Windows host.

Detailed installation information is available in the *Data ONTAP DSM for Windows MPIO Installation and Administration Guide*, available with the software download.

Steps

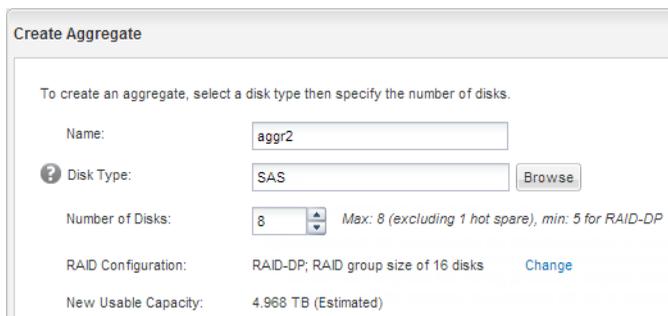
1. Download the appropriate version of the Data ONTAP DSM from [NetApp Support](#).
2. Install any required Windows hotfixes.
The Data ONTAP DSM installer will not proceed until the required hotfixes have been installed.
3. For Windows Server 2008, install Windows PowerShell 2.0 or later.
Installing PowerShell is not required for Windows Server 2008 R2 or later.
4. Run the Data ONTAP DSM installation program and follow the prompts.
5. Reboot the Windows host when prompted.

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**.



Create Aggregate

To create an aggregate, select a disk type then specify the number of disks.

| | |
|----------------------|--|
| Name: | <input type="text" value="aggr2"/> |
| Disk Type: | <input type="text" value="SAS"/> <input type="button" value="Browse"/> |
| Number of Disks: | <input type="text" value="8"/> <small>Max: 8 (excluding 1 hot spare), min: 5 for RAID-DP</small> |
| RAID Configuration: | RAID-DP; RAID group size of 16 disks Change |
| 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 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 13 and [Creating a LUN and its containing volume](#) on page 14.
- If you want to provision volumes on an existing SVM that has FC enabled but not configured, see [Configuring FC and creating a LUN on an existing SVM](#) on page 16.

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 17.

Verifying that the FC service is running on an existing SVM

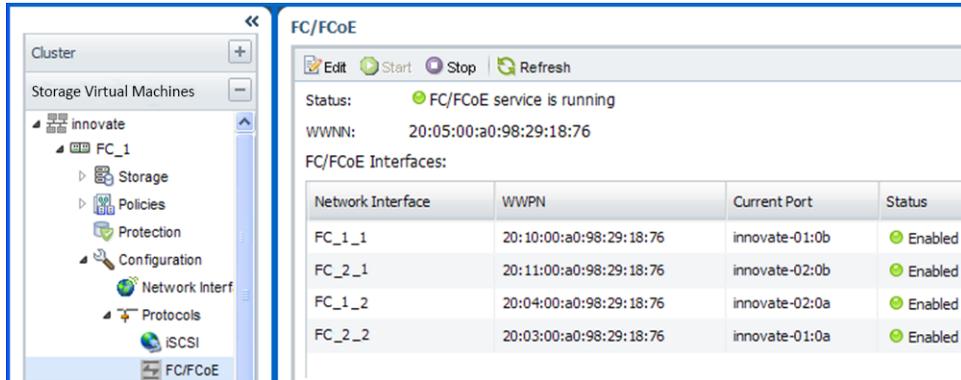
If you choose to use an existing Storage Virtual Machine (SVM), you must verify that the FC service is running on the SVM. You must also verify that FC LIFs are already created.

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.

Creating a LUN and its containing volume

The Create LUN wizard creates a LUN and the FlexVol volume that contains the LUN. The wizard also creates the igroup and maps the LUN to the igroup, which enables the specified host to access the LUN.

Before you begin

- There must be an aggregate with enough free space to contain the LUN.
- There must be a Storage Virtual Machine (SVM) with the FC protocol enabled and the appropriate LIFs created.
- You must have recorded the WWPNs of the host FC ports.

About this task

If your organization has a naming convention, you should use names for the LUN, volume, and so on that fit your convention. Otherwise, you should accept the default names.

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 **Storage > LUNs**.

4. In the **LUN Management** tab, click **Create**, and then type or select information as prompted by the wizard.
5. On the **General Properties** page, select the LUN type **Windows 2008 or later** for LUNs used directly by the Windows host, or select **Hyper-V** for LUNs containing VHDs for Hyper-V virtual machines.

Leave the **Thin Provisioned** check box unselected.



You can specify the size of the LUN. Storage will be optimized according to the type selected.

Type: ▼

Size: ▼

Thin Provisioned

6. On the **LUN Container** page, create a new FlexVol volume.

Create LUN Wizard

LUN Container
You can let the wizard create a volume or you can choose an existing v

The wizard automatically chooses the aggregate with most free space for crea
LUN. But you can choose a different aggregate of your choice. You can also s
volume/qtree to create your LUN.

Create a new flexible volume in

Aggregate Name:

Volume Name:

7. On the **Initiators Mapping** page, click **Add Initiator Group**, enter the required information on the **General** tab, and then on the **Initiators** tab, enter all the WWPNs of the host FC ports that you recorded.
8. Confirm the details, and then click **Finish** to complete the wizard.

Related information

Clustered Data ONTAP 8.3 System Administration Guide for Cluster Administrators

Configuring FC and creating a LUN on an existing SVM

You can configure FC on an existing Storage Virtual Machine (SVM) and create a LUN and its containing volume with a single wizard. 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.

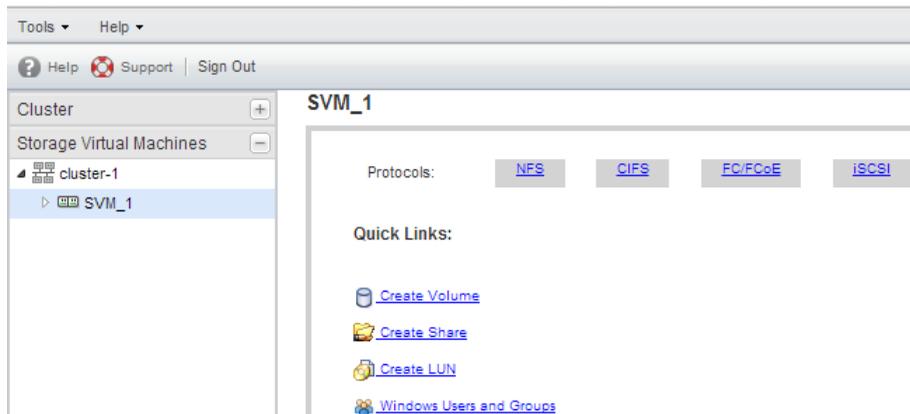
Before you begin

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. In the **Provision a LUN for FCP storage** area, enter the desired LUN size, host type, and WWPNs of the host initiators.
- d. Click **Submit & Continue**.

Example

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:

SVM Details

Specify a unique name and the data protocols for the SVM

SVM Name:

IPspace:

Volume Type: FlexVol volumes Infinite Volume

An SVM can contain either multiple FlexVol volumes or a single Infinite Volume.
You cannot change the volume type of the SVM after you set it.

Data Protocols: CIFS NFS iSCSI FC/FCoE

Default Language:

The language of the SVM determines the character set used to display the file names and data for all NAS volumes in the SVM. Therefore, you must set the language with correct value.

Security Style:

Root Aggregate:

- 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. In the **Provision a LUN for FCP storage** area, enter the desired LUN size, host type, and WWPNs of the host initiators.
 - d. Click **Submit & Continue**.

Example

Storage Virtual Machine (SVM) Setup

1 Enter SVM basic details 2 Configure CIFS/NFS protocol 3 Configure iSCSI protocol 4 **Configure FC/FCoE protocol** 5 Enter SVM administrator details

Configure FC/FCoE protocol

? Configure LIFs to access the data using FC/FCoE protocol

Data Interface (LIF) Configuration

Both FC and FCoE enabled hardware found. Click on the appropriate checkbox to configure the FC and/or FCoE LIFs.

Configure Data LIFs for FC

LIFs per node: (Minimum: 1, Maximum: 2)

Review or Edit the Interface Association

Configure Data LIFs for FCoE

Provision a LUN for FCP storage (Optional)

Lun Size: GB

LUN OS Type:

Host Initiator:

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 Windows 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

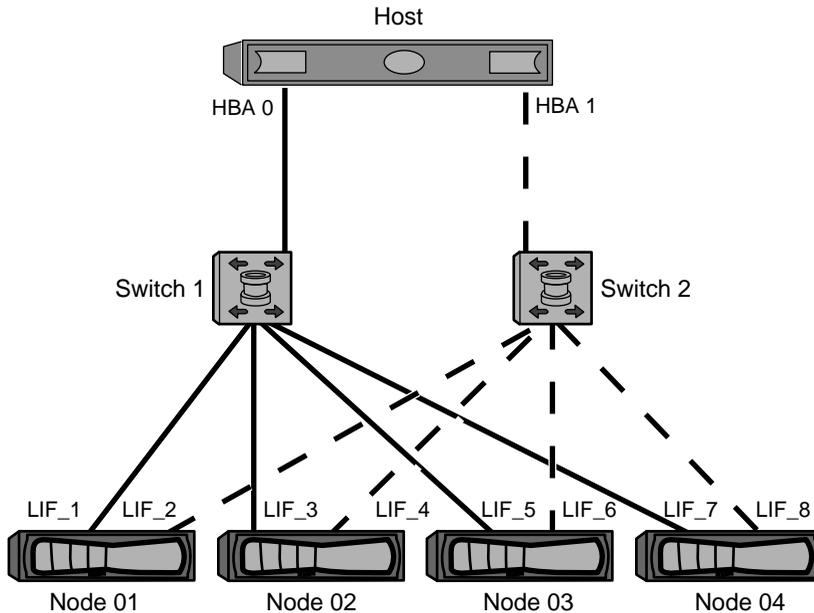
For details about zoning your switches, see the switch vendor's documentation.

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 $2x:xx:00:a0:98:xx:xx:xx$, where x is any hexadecimal digit. The physical port WWPNs are all in the range $50:0a:09:8x:xx:xx:xx:xx$.

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.

Discovering new disks

LUNs on your Storage Virtual Machine (SVM) appear as disks to the Windows host. Any new disks for LUNs you add to your system are not automatically discovered by the host. You must manually rescan disks to discover them.

Steps

1. Open the Windows Computer Management utility:

| For... | Click... |
|---------------------|---|
| Windows Server 2012 | Tools > Computer Management |
| Windows Server 2008 | Start > Administrative Tools > Computer Management |

2. Expand the **Storage** node in the navigation tree.
3. Click **Disk Management**.
4. Click **Action > Rescan Disks**.

Initializing and formatting the LUN

When a new LUN is first accessed by the Windows host, it has no partition or file system. You must initialize the LUN, and optionally format it with a file system.

Before you begin

The LUN must have been discovered by the Windows host.

About this task

LUNs appear in Windows Disk Management as disks.

You can initialize the disk as a basic disk with a GPT or MBR partition table.

You typically format the LUN with a file system such as NTFS, but some applications use raw disks instead.

Steps

1. Start Windows Disk Management.
2. Right-click the LUN, and then select the required disk or partition type.
3. Follow the instructions in the wizard.

If you choose to format the LUN as NTFS, you must select the **Perform a quick format** check box.

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 LUN must be initialized and formatted with a file system.

About this task

If the storage 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 storage cluster is in production use.

If any of the tests fail, you should verify that the FC service is running and check the FC paths to the LUN.

Steps

1. On the host, copy one or more files to the LUN.
2. Copy the files back to a different folder on the original disk.
3. Compare the copied files to the original.
You can use the `comp` command at the Windows command prompt to compare two files.
4. Optional: Fail over the storage cluster node containing the LUN and verify that you can still access the files on the LUN.
5. Use the Data ONTAP DSM to view the paths to the LUN and verify that you have the expected number of paths.

You should see two paths to the storage cluster node on which the LUN is created, and two paths to the partner node.

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.
- [*Data ONTAP DSM 4.1 For Windows MPIO Installation and Administration Guide*](#)
Describes how to install and use the Data ONTAP DSM for Windows MPIO software.

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