Chapter 1. Deciding whether to use the FC Configuration for Windows Express 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 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 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:

- SAN Administration Guide
Chapter 2. 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.

- Verify that the entire configuration is supported.
- Fill out the worksheet.
- Install the HBA utility from the HBA vendor.
- Update the HBA driver, firmware, and BIOS, if necessary.
- Record the WWPN for each host FC port.
- Install Data ONTAP DSM on the host.
- Create a new aggregate, if necessary.

Where to provision the volume?

<table>
<thead>
<tr>
<th>On the host</th>
<th>Existing SVM with FC configured</th>
<th>Existing SVM with FC not configured</th>
<th>New SVM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Verify that the FC service is running.</td>
<td>Configure FC and create the LUN.</td>
<td>Create a new SVM and LUN.</td>
</tr>
<tr>
<td></td>
<td>Create the LUN.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>On the FC switches</td>
<td>Zone the FC switches by the host and LUN WWPNs.</td>
<td>Discover the new disk (LUN).</td>
<td></td>
</tr>
<tr>
<td>On the host</td>
<td>Initialize and format the LUN.</td>
<td>Verify that the host can write to and read from the LUN.</td>
<td></td>
</tr>
</tbody>
</table>
Verifying that the FC configuration is supported

For reliable operation, you must verify that the entire FC configuration is supported.

About this task

Go to the Lenovo Storage Interoperability Center (LSIC) to verify that you have a supported configuration.

Lenovo Storage Interoperation Center (LSIC): Go to the LSIC Web site to select the known components of your configuration and then get a list of all other supported combinations, with details about supported hardware, firmware, operating systems, drives, and notes.

View results on screen or export them in Excel format.

Completing the FC configuration worksheet

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

**FC host WWPNs**

<table>
<thead>
<tr>
<th>Port</th>
<th>WWPN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initiator (host) port connected to FC switch 1</td>
<td></td>
</tr>
<tr>
<td>Initiator (host) port connected to FC switch 2</td>
<td></td>
</tr>
</tbody>
</table>

**FC target WWPNs**

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

<table>
<thead>
<tr>
<th>LIF</th>
<th>WWPN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Node 1 LIF with port connected to FC switch 1</td>
<td></td>
</tr>
<tr>
<td>Node 2 LIF with port connected to FC switch 1</td>
<td></td>
</tr>
<tr>
<td>Node 1 LIF with port connected to FC switch 2</td>
<td></td>
</tr>
<tr>
<td>Node 2 LIF with port connected to FC switch 2</td>
<td></td>
</tr>
</tbody>
</table>
### Storage configuration

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

<table>
<thead>
<tr>
<th>Node to own LUN</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Aggregate name</td>
<td></td>
</tr>
<tr>
<td>SVM name</td>
<td></td>
</tr>
</tbody>
</table>

### LUN information

<table>
<thead>
<tr>
<th>LUN size</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Host operating system</td>
<td></td>
</tr>
<tr>
<td>LUN name (optional)</td>
<td></td>
</tr>
<tr>
<td>LUN description (optional)</td>
<td></td>
</tr>
</tbody>
</table>

### SVM information

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

<table>
<thead>
<tr>
<th>SVM name</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>SVM IPspace</td>
<td></td>
</tr>
<tr>
<td>Aggregate for SVM root volume</td>
<td></td>
</tr>
<tr>
<td>SVM user name (optional)</td>
<td></td>
</tr>
<tr>
<td>SVM password (optional)</td>
<td></td>
</tr>
<tr>
<td>SVM management LIF (optional)</td>
<td></td>
</tr>
<tr>
<td>Subnet:</td>
<td></td>
</tr>
<tr>
<td>IP address:</td>
<td></td>
</tr>
<tr>
<td>Network mask:</td>
<td></td>
</tr>
<tr>
<td>Gateway:</td>
<td></td>
</tr>
<tr>
<td>Home node:</td>
<td></td>
</tr>
<tr>
<td>Home port:</td>
<td></td>
</tr>
</tbody>
</table>

### 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

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

**Updating the HBA driver and firmware**

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

**Before you begin**

You must have identified the supported driver and firmware versions for your configuration from the Lenovo Storage Interoperability Center (LSIC).

Lenovo Storage Interoperation Center (LSIC): Go to the LSIC Web site to select the known components of your configuration and then get a list of all other supported combinations, with details about supported hardware, firmware, operating systems, drives, and notes.

View results on screen or export them in Excel format.

**About this task**

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

Step 1. List the installed HBA driver and firmware versions by using the HBA utility from your HBA vendor.
Step 2. Download and install the new driver and firmware as needed from the Lenovo Data Center Support Site.

Lenovo Data Center Support

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 and verified HBAs are running supported driver and firmware versions for your configuration.

**About this task**

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

Step 1. Run the HBA utility for your FC HBA type.
Step 2. Select the HBA.
Step 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.

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

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 which you are provisioning.

Step 1. Connect IP-address-of-cluster-management-LIF in an ssh session and log in using your cluster administrator credential.

Step 2. Run the `storage aggregate create` command to create an aggregate.

```
DM-cluster::> storage aggregate create -aggregate aggr0_node1 -nodes DM-cluster-01 -diskcount 8 -raidtype raid_dp -T SSD
```

Step 3. Run the following command to check the aggregate status after complete aggregate creation.

```
DM-cluster::> storage aggregate show
```

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.

- If you want to provision volumes on an SVM that is already configured for FC, you must verify that the FC service is running and then create a LUN on the SVM.
  - “Verifying that the FC service is running on an existing SVM” on page 8
  - “Creating a LUN” on page 8
- If you want to provision volumes on an existing SVM that has FC enabled but not configured, configure FC on the existing SVM.
  - “Configuring FC on an existing SVM” on page 9
    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, create the SVM.
  - “Creating a new SVM” on page 10

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 by using ThinkSystem Storage Manager for DM Series. You must also verify that FC logical interfaces (LIFs) are already created.

Step 1. Connect IP-address-of-cluster-management-LIF in an ssh session and log in using your cluster administrator credential.

Step 2. Run the `vserver fcp show` command to check the FC service status on the SVM.

The following example checks the FC service status on SVM vs0.

```
DM-cluster::> vserver fcp show -vserver vs0
```

Step 3. If the FC service is not running, run the following command to start the FC service.

```
DM-cluster::> vserver fcp modify -vserver vs0 -status-admin up
```

Creating a LUN

You can use the `lun create` command to create a LUN. You can also use the `igroup create` command to create an igroup and map 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 logical interfaces (LIFs) created.
• You must have recorded the worldwide port names (WWPNs) of the host FC ports.

Step 1. Connect IP-address-of-cluster-management-LIF in an ssh session and log in using your cluster administrator credential.

Step 2. Run the **volume create** command to create a volume on a specified SVM and storage aggregate.

The following example creates a new volume named vol0 on a SVM named vs0 and a storage aggregate named aggr0_node1. Upon its creation, the volume is placed in the online state. The volume is 50 GB in size and the create operation runs in the background.

```
DM-cluster::> volume create -vserver vs0 -volume vol0 -aggregate aggr0_node1 -size 50G -state online
```

Step 3. Run the **lun create** command to create a new LUN of a specific size. When you create a LUN, you must specify the LUN OS type.

The following example creates a new LUN named lun0 with a size of 20 GB and OS type of Windows.

```
DM-cluster::> lun create -vserver vs0 -volume vol0 -lun lun0 -size 20GB -ostype windows
```

Step 4. Run the **igroup create** command to create an initiator group (igroup) and map the LUN to the igroup, which enables the specified host to access the LUN.

The following example creates an igroup (igroup0) that consists of one initiator for FCP.

```
DM-cluster::> igroup create -vserver vs0 -igroup igroup0 -protocol fcp -ostype windows -initiator 20:00:00:0d:ec:b4:94:3f
```

Step 5. Run the **lun map** command to map your LUNs to the igroups.

The following example maps LUN lun0 to igroup igroup0.

```
DM-cluster::> lun map -vserver vs0 -volume vol0 -lun lun0 -igroup igroup0
```

### Configuring FC on an existing SVM

You can configure FC on an existing storage virtual machine (SVM) and create a LUN and its containing volume. The FC 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 FC.

Step 1. Connect IP-address-of-cluster-management-LIF in an ssh session and log in using your cluster administrator credential.

Step 2. Check the FC service status. If the FC service is not running, run the **fcp modify** command to start the FC service.

The following example makes the FC service on SVM vs0 up.

```
DM-cluster::> vserver fcp modify -vserver vs0 -status-admin up
```

Step 3. Run the **volume create** command to create a volume on the SVM and storage aggregate.

The following example creates a new volume named vol0 on an SVM named vs0 and a storage aggregate named aggr0_node1. Upon its creation, the volume is placed in the online state. The volume is 50 GB in size and the create operation runs in the background.
DM-cluster::> volume create -vserver vs0 -volume vol0 -aggregate aggr0_node1 -size 50G -state online

Step 4. Run the `lun create` command to create a new LUN of a specific size. When you create a LUN, you must specify the LUN OS type.

The following example creates a new LUN named lun0 with a size of 20 GB and OS type of Windows.

DM-cluster::> lun create -vserver vs0 -volume vol0 -lun lun0 -size 20GB -ostype windows

Step 5. Run the `igroup create` command to create an initiator group (igroup). You can use igroups to control which hosts can access specific LUNs.

The following example creates an FCP igroup called igroup0 that contains the node name of the Windows host associated with that node name.

DM-cluster::> igroup create -vserver vs0 -igroup igroup0 -protocol fcp -ostype windows -initiator 20:00:00:0d:ec:b4:94:3f

Step 6. Run the `network interface create` command to create network logical interfaces (LIFs) for the SVM. An SVM serves data to clients through one or more LIFs. You must create LIFs on the ports you want to use to access data.

The following example creates an LIF named vs0_data_fcp_lif_1 on an SVM named vs0. Their home node is DM-cluster-01 and home port is 0e.

DM-cluster::> network interface create -vserver vs0 -lif vs0_data_fcp_lif_1 data -data-protocol fcp -home-node DM-cluster-01 -home-port 0e

**Note:** You should create at least one LIF for each node in all SVMs serving data with FC protocol.

Step 7. Run the `lun map` command to map your LUNs to the igroups.

The following example maps LUN lun0 on SVM vs0 to igroup igroup0.

DM-cluster::> lun map -vserver vs0 -volume vol0 -lun lun0 -igroup igroup0

You can run the `lun show` command to display the LUN setting.

```
DM-cluster::> lun show
Vserver Path State Mapped Type Size
vs0 /vol/vol0/lun0 online mapped windows 20.00GB
```

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) and the LUN and its containing volume. You can create an SVM to separate the data and administration functions of a user from those of the other users in a cluster.

**About this task**

If you do not have at least one SVM in a cluster to provide data access to clients, you must create one.

Step 1. Connect IP-address-of-cluster-management-LIF in an ssh session and log in using your cluster administrator credential.
Step 2. Run the `vserver create` command to create an SVM.

The following example creates an SVM named vs0, its root volume is named vs0_root and is located on aggregate aggr0_node1, and the language is U.S. English.

```
DM-cluster::> vserver create -vserver vs0 -aggregate aggr0_node1 -subtype default -rootvolume vs0_root -rootvolume-security-style mixed -language en_US.UTF-8
```

Step 3. Run the `vserver fcp create` command to create an FCP service on the SVM.

The following example creates an FCP service on SVM vs0.

```
DM-cluster::> vserver fcp create -vserver vs0
```

Step 4. Run the `volume create` command to create a volume on the SVM and storage aggregate.

The following example creates a new volume named vol0 on an SVM named vs0 and a storage aggregate named aggr0_node1. Upon its creation, the volume is placed in the online state. The volume is 50 GB in size and the create operation runs in the background.

```
DM-cluster::> volume create -vserver vs0 -volume vol0 -aggregate aggr0_node1 -size 50G -state online
```

Step 5. Run the `lun create` command to create a new LUN of a specific size. When you create a LUN, you must specify the LUN OS type.

The following example creates a new LUN named lun0 with a size of 20 GB and OS type of Windows.

```
DM-cluster::> lun create -vserver vs0 -volume vol0 -lun lun0 -size 20GB -ostype windows
```

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The following example creates an FCP igroup called igroup0 that contains the node name of the Windows host associated with that node name.

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```

Step 7. Run the `network interface create` command to create network logical interfaces (LIFs) for the SVM. An SVM serves data to clients through one or more LIFs. You must create LIFs on the ports you want to use to access data.

The following example creates an LIF named vs0_data_fcp_lif_1 on an SVM named vs0. Their home node is DM-cluster-01 and home port is 0e.

```
DM-cluster::> network interface create -vserver vs0 -lif vs0_data_fcp_lif_1 data -data-protocol fcp -home-node DM-cluster-01 -home-port 0e
```

**Note:** You should create at least one LIF for each node in all SVMs serving data with FC protocol.

Step 8. Run the `lun map` command to map your LUNs to the igroups.

The following example maps LUN lun0 on SVM vs0 to igroup igroup0.

```
DM-cluster::> lun map -vserver vs0 -volume vol0 -lun lun0 -igroup igroup0
```

You can run the `lun show` command to display the LUN setting.
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 your DM enclosure by WWPN, not by physical port.

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, ONTAP uses Selective LUN Map to make the LUN accessible only through paths on the node owning the LUN and its HA partner.
- You still must zone all of the FC LIFs on every node for LUN mobility in case the LUN is moved to another node in the cluster.
- When moving a volume or a LUN, you must modify the Selective LUN Map reporting-nodes list before moving.

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.

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

Step 1. Open the Windows Computer Management utility:

<table>
<thead>
<tr>
<th>If you are using...</th>
<th>Navigate to...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Windows Server 2012</td>
<td>Tools → Computer Management</td>
</tr>
<tr>
<td>Windows Server 2008</td>
<td>Start → Administrative Tools → Computer Management</td>
</tr>
<tr>
<td>Windows Server 2016</td>
<td>Start &gt; Administrative Tools &gt; Computer Management</td>
</tr>
</tbody>
</table>

Step 2. Expand the **Storage** node in the navigation tree.
Step 3. Click **Disk Management**
Step 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.

Step 1. Start Windows Disk Management.
Step 2. Right-click the LUN, and then select the required disk or partition type.
Step 3. Follow the instructions in the wizard.
If you choose to format the LUN as NTFS, you should 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.

**Step 1.** On the host, copy one or more files to the LUN.

**Step 2.** Copy the files back to a different folder on the original disk.

**Step 3.** Compare the copied files to the original.

You can use the `comp` command at the Windows command prompt to compare two files.

**Step 4.** Optional: Fail over the storage cluster node containing the LUN and verify that you can still access the files on the LUN.
Chapter 3. Where to find additional information

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

The following documentation is available:

- **SAN Administration Guide**
  
  Describes how to configure and manage the iSCSI and FC protocols for clustered SAN environments, including configuration of LUNs, igroups, and targets.
Appendix A. Contacting Support

You can contact Support to obtain help for your issue.

You can receive hardware service through a Lenovo Authorized Service Provider. To locate a service provider authorized by Lenovo to provide warranty service, go to https://datacentersupport.lenovo.com/serviceprovider and use filter searching for different countries. For Lenovo support telephone numbers, see https://datacentersupport.lenovo.com/supportphonelist for your region support details.
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