

IBM System Storage N series



Clustered Data ONTAP 8.2 iSCSI Configuration and Provisioning for ESX Express Guide

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Preface

About this guide

This document applies to IBM N series systems running Data ONTAP, including systems with gateway functionality. If the terms *Cluster-Mode* or *clustered Data ONTAP* are used in this document, they refer to the Data ONTAP features and functionality designed for clusters, which are different from 7-Mode and prior Data ONTAP 7.1, 7.2, and 7.3 release families.

In this document, the term *gateway* describes IBM N series storage systems that have been ordered with gateway functionality. Gateways support various types of storage, and they are used with third-party disk storage systems—for example, disk storage systems from IBM, HP®, Hitachi Data Systems®, and EMC®. In this case, disk storage for customer data and the RAID controller functionality is provided by the back-end disk storage system. A gateway might also be used with disk storage expansion units specifically designed for the IBM N series models.

The term *filer* describes IBM N series storage systems that either contain internal disk storage or attach to disk storage expansion units specifically designed for the IBM N series storage systems. Filer storage systems do not support using third-party disk storage systems.

Supported features

IBM System Storage N series storage systems are driven by NetApp Data ONTAP software. Some features described in the product software documentation are neither offered nor supported by IBM. Please contact your local IBM representative or reseller for further details.

Information about supported features can also be found on the N series support website (accessed and navigated as described in Websites).

Websites

IBM maintains pages on the World Wide Web where you can get the latest technical information and download device drivers and updates. The following web pages provide N series information:

- A listing of currently available N series products and features can be found at the following web page:
www.ibm.com/storage/nas/
- The IBM System Storage N series support website requires users to register in order to obtain access to N series support content on the web. To understand how the N series support web content is organized and navigated, and to access the N series support website, refer to the following publicly accessible web page:
www.ibm.com/storage/support/nseries/
This web page also provides links to AutoSupport information as well as other important N series product resources.
- IBM System Storage N series products attach to a variety of servers and operating systems. To determine the latest supported attachments, go to the IBM N series interoperability matrix at the following web page:

www.ibm.com/systems/storage/network/interophome.html

- For the latest N series hardware product documentation, including planning, installation and setup, and hardware monitoring, service and diagnostics, see the IBM N series Information Center at the following web page:
publib.boulder.ibm.com/infocenter/nasinfo/nseries/index.jsp

Getting information, help, and service

If you need help, service, or technical assistance or just want more information about IBM products, you will find a wide variety of sources available from IBM to assist you. This section contains information about where to go for additional information about IBM and IBM products, what to do if you experience a problem with your IBM N series product, and whom to call for service, if it is necessary.

Before you call

Before you call, make sure you have taken these steps to try to solve the problem yourself:

- Check all cables to make sure they are connected.
- Check the power switches to make sure the system is turned on.
- Use the troubleshooting information in your system documentation and use the diagnostic tools that come with your system.
- Refer to the N series support website (accessed and navigated as described in Websites) for information on known problems and limitations.

Using the documentation

The latest versions of N series software documentation, including Data ONTAP and other software products, are available on the N series support website (accessed and navigated as described in Websites).

Current N series hardware product documentation is shipped with your hardware product in printed documents or as PDF files on a documentation CD. For the latest N series hardware product documentation PDFs, go to the N series support website.

Hardware documentation, including planning, installation and setup, and hardware monitoring, service, and diagnostics, is also provided in an IBM N series Information Center at the following web page:

publib.boulder.ibm.com/infocenter/nasinfo/nseries/index.jsp

Hardware service and support

You can receive hardware service through IBM Integrated Technology Services. Visit the following web page for support telephone numbers:

www.ibm.com/planetwide/

Firmware updates

IBM N series product firmware is embedded in Data ONTAP. As with all devices, ensure that you run the latest level of firmware. Any firmware updates are posted to the N series support website (accessed and navigated as described in Websites).

Note: If you do not see new firmware updates on the N series support website, you are running the latest level of firmware.

Verify that the latest level of firmware is installed on your machine before contacting IBM for technical support.

How to send your comments

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Be sure to include the following:

- Exact publication title
- Publication form number (for example, GC26-1234-02)
- Page, table, or illustration numbers
- A detailed description of any information that should be changed

Deciding whether to use this guide

This guide describes how to quickly set up the iSCSI service on a Vserver, provision a LUN, and make the LUN available using an iSCSI initiator on an ESX host computer. You should use this guide if you want a standard configuration following best practices.

The guide does not provide information about all the available options or a lot of conceptual background for the tasks.

This guide is based on the following assumptions:

- Your storage system has been successfully installed and a cluster has been created.
- You have downloaded and are running OnCommand System Manager 3.0 or later for all applicable tasks.

This guide does not include procedures using the Data ONTAP CLI except when the CLI is the only way to complete a task.

- You are using the native ESX iSCSI software initiator on ESX 4.x, ESXi 4.x, or ESXi 5.x.
- 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 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 installation, or if you want more conceptual background information, you should see the following documentation instead:

- *Clustered Data ONTAP SAN Administration Guide*
- *Clustered Data ONTAP SAN Configuration Guide*
- *Virtual Storage Console for VMware vSphere Installation and Administration Guide*
- *OnCommand System Manager Help* (available within the product)
- *VMware iSCSI SAN Configuration Guide* for your version of ESX 4 (available from VMware)
- *VMware vSphere Storage* for your version of ESX 5 (available from VMware)

This documentation is available on the IBM N series support website (accessed and navigated as described in Websites) or from the Support Resources section of the VMware site.

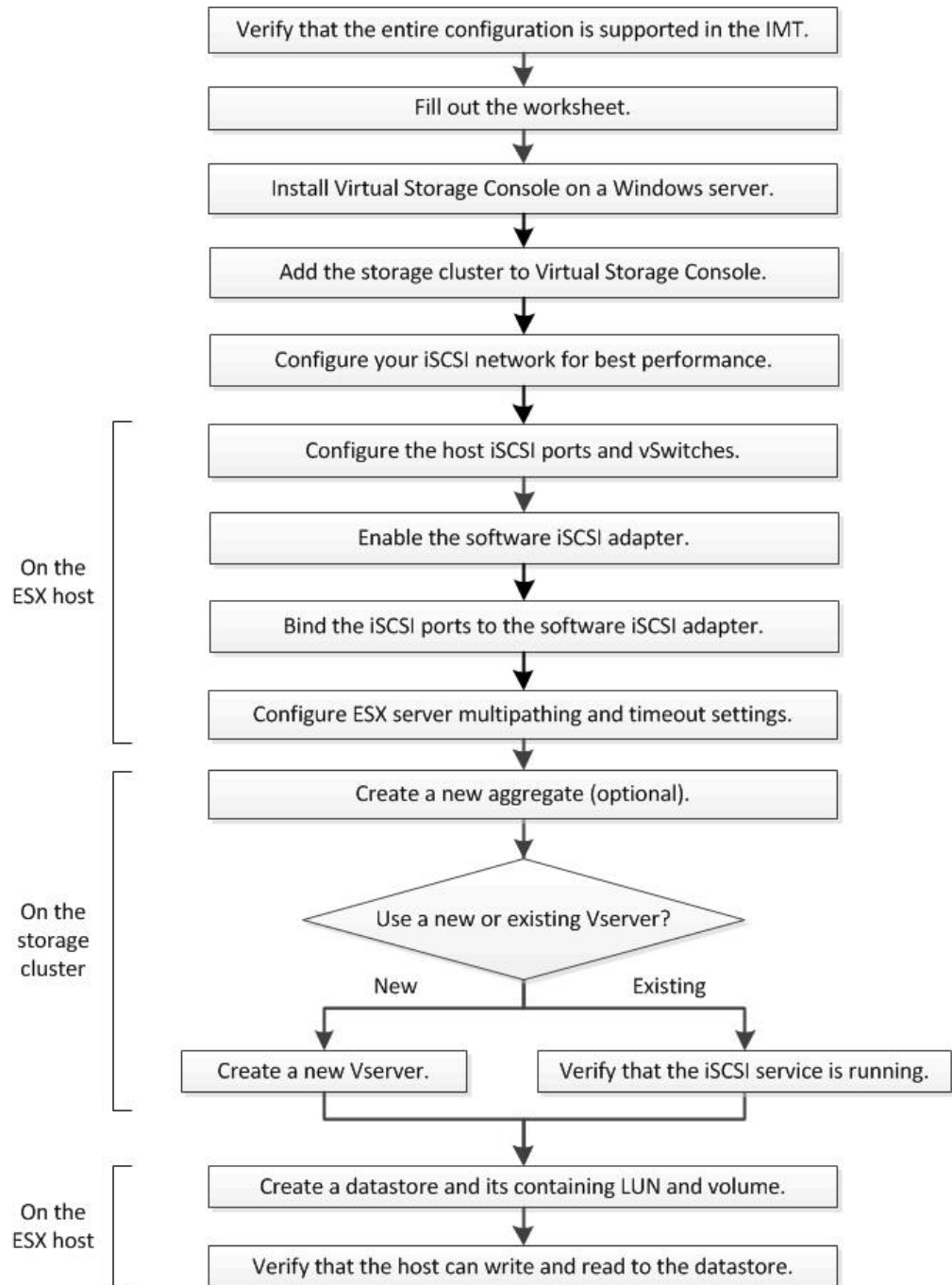
Related information:

 IBM N series support website: www.ibm.com/storage/support/nseries

 Featured VMware Documentation Sets

iSCSI configuration and provisioning workflow

When you make storage available to an ESX host using iSCSI, you provision a volume and LUN on the Vserver 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 IBM N series interoperability matrix website (accessed and navigated as described in Websites) lists the supported configurations.

Procedure

1. Go to the IBM N series interoperability matrix website (accessed and navigated as described in Websites) 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)
 - ESX or 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 notes that are specific to your configuration.
 - Policies and Guidelines
Provides general guidelines for all SAN configurations.

Related information:

 IBM N series interoperability matrix: www.ibm.com/systems/storage/network/interophome.html

Filling out the iSCSI provisioning worksheet

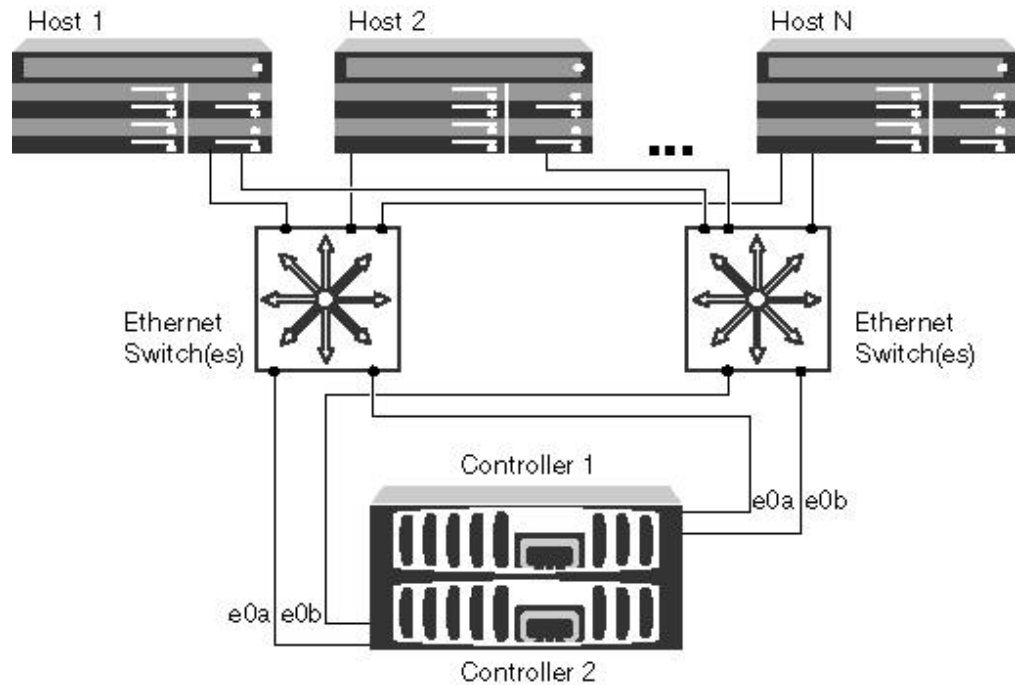
You require network addresses and storage configuration information to perform iSCSI provisioning tasks.

Target network addresses

The Vserver is the iSCSI target.

You require at least four IP addresses for the iSCSI data LIFs. There should be two separate networks for high availability.

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



Node / LIF	IP address	Network mask	Gateway	VLAN ID	Home port
Node 1 / 1					
Node 1 / 2					
Node 2 / 1					
Node 2 / 2					
Node 3 / 1 (optional)					
Node 3 / 2 (optional)					
Node 4 / 1 (optional)					
Node 4 / 2 (optional)					

Storage configuration

If the aggregate or Vserver is already created, record their names here. Otherwise you can create them as required.

Node to own LUN	
Aggregate name	
Vserver name	

LUN information

LUN size	
LUN name (optional)	

LUN description (optional)	
----------------------------	--

Vserver information

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

Vserver name	
Aggregate for Vserver root volume	
Vserver user name (optional)	
Vserver password (optional)	
Vserver management LIF (optional)	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 IBM N series iSCSI 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.
- The optional VSC Backup and Recovery capabilities are not required for any tasks in this guide.

Procedure

1. Download the version of VSC that is supported for your configuration from the IBM N series support website (accessed and navigated as described in Websites). There are separate download packages for 32-bit and 64-bit systems.
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 to VSC

Before you can provision the first datastore to an ESX host in your Datacenter, you must add the cluster or a specific Vserver to VSC. Adding the cluster enables you to provision storage on any Vserver in the cluster.

Before you begin

You must have the administrator credentials for the storage cluster or the Vserver being added.

Procedure

1. Log in to the vSphere Client.
2. Select the ESX host from the inventory pane.
3. On the IBM N series tab, select **Monitoring and Host Configuration > Overview**.
4. In the Storage Controllers section, click **Add**.
5. In the Add Storage System dialog box, enter the host name and administrator credentials for the storage cluster or Vserver.

Configuring your iSCSI 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.

Procedure

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).

Configuring host iSCSI ports and vSwitches

The ESX host requires network ports for the iSCSI connections to the storage cluster. Each host requires at least two VMkernel ports, and each VMkernel port must be on a separate dedicated vSwitch and physical network adapter.

About this task

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 ESX host. If you require more detailed instructions, see the following VMware documentation:

- VMware *iSCSI SAN Configuration Guide* for your version of ESX or ESXi 4
- VMware *vSphere Storage* for your version of ESXi 5

Procedure

1. Log in to the vSphere Client and then select the ESX host from the inventory pane.
2. On the Configuration 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. Repeat the previous step to create a second VMkernel port and vSwitch.

Related information:

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.

Procedure

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. The binding process is different for ESX 4 and ESX 5.

Before you begin

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

About this task

For ESXi 5.x, you can bind the iSCSI ports using the vSphere Client. For ESX 4.x and ESXi 4.x, you must bind the ports using the ESX CLI.

For detailed instructions, see the following VMware documentation:

- VMware *iSCSI SAN Configuration Guide* for your version of ESX or ESXi 4
- VMware *vSphere Storage* for your version of ESXi 5

Procedure

1. Bind the first iSCSI port to the iSCSI software adapter:
 - For ESX 4.x, use the **esxcli swiscsi** command.
 - For ESXi 5.x, use the Network Configuration tab of the iSCSI software adapter properties dialog box in the vSphere Client.
2. Bind the second iSCSI port to the iSCSI software adapter.

Related information:

Configuring ESX host multipathing and timeout settings

You must ensure that the host multipathing and timeout settings are correct so that the ESX host can correctly handle the loss of an iSCSI connection or a storage failover event.

Before you begin

Virtual Storage Console for VMware vSphere must be installed and registered with the vSphere Server that manages the ESX host.

Procedure

1. Log in to the vCenter Server using the vSphere Client.
2. Select the datacenter that owns the ESX host in the Inventory panel, and then select the IBM N series tab.
3. On the Overview panel of Monitoring and Host Configuration, right-click the ESX host and select **Set Recommended Values**.
4. Ensure that all of the options are selected, and click **OK**. The vCenter Client displays the task completion in the Recent Tasks panel.

Creating an aggregate

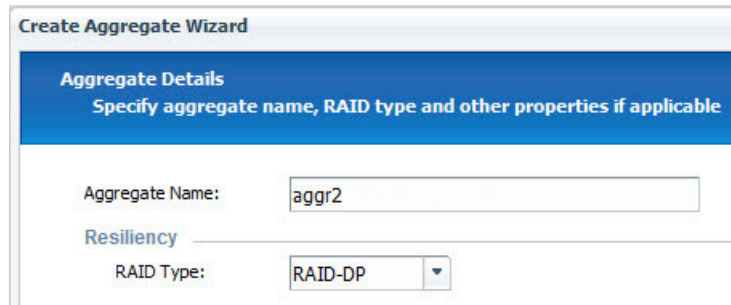
You create an aggregate to provide storage to one or more FlexVol volumes. Aggregates are made up of physical storage objects, such as HDDs and SSDs.

About this task

This procedure is performed using System Manager.

Procedure

1. From the home page, double-click the appropriate storage system.
2. Expand either the **Cluster** or the **Nodes** hierarchy in the left navigation pane.
3. In the navigation pane, click **Storage > Aggregates**.
4. Click **Create**.
5. In the Create Aggregate wizard, click **Next**.
6. Optional: If you want to change the default name, specify a new name, such as aggr2. The default aggregate name ends in a date and time stamp.



7. Accept the default value for **RAID Type**, and click **Next**. You can change the RAID type later if necessary.
8. In the Aggregate Details page, click **Select disks**.
9. In the Change Disk Selection page, select the node on which you want to create the aggregate, specify at least 5 disks in the **Number of capacity disks to use** field, and click **Save and Close**.
10. Click **Create**.
11. Click **Finish**.

Results

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

Creating a new Vserver

The Vserver provides the iSCSI target and owns the LUN and its containing volume. The logical interfaces (LIFs) that provide paths to the LUN are owned by the Vserver.

Before you begin

You must have the network addresses to create LIFs for each node.

About this task

The Vserver can always be managed by the cluster administrator. You can optionally define an administrator for only this Vserver.

Procedure

1. From the OnCommand System Manager home page, double-click the appropriate storage system.
2. Expand the **Vservers** hierarchy in the left navigation pane.
3. In the Vserver window, click **Create**.
4. On the Vserver Details page, enter a name for the Vserver, select **iSCSI** as the data protocol, and then select an aggregate for the root volume.

The screenshot shows the 'Vserver Setup' window with a progress bar at the top indicating step 1: 'Enter Vserver basic details'. The main section is titled 'Vserver Details' and contains the following fields:

- Vserver Name:** iscsi_1
- Data Protocols:** CIFS, NFS, ☒ iSCSI, FC/FCoE
- Language:** C.UTF-8 [c.utf_8] (with a dropdown arrow)
- Security Style:** UNIX (with a dropdown arrow)
- Root Aggregate:** aggr2 (with a dropdown arrow)

Below the Language field, there is a note: 'The language of the Vserver determines the character set used to display the file names and data for all NAS volumes in the Vserver. Therefore, you must set the language with correct value.'

5. Click **Submit & Continue** to accept the remaining default values.
6. On the Configure iSCSI Protocol page, enter the network addresses for the data LIFs from the worksheet. Each node must have two LIFs on separate networks for high availability.
Selecting the **Review or modify LIFs configuration** check box enables you to enter individual addresses instead of having the addresses assigned automatically based on a starting address.
7. Review the summary information, and if you had the system automatically assign IP addresses, record the iSCSI LIF details.

Verifying that the iSCSI service is running on an existing Vserver

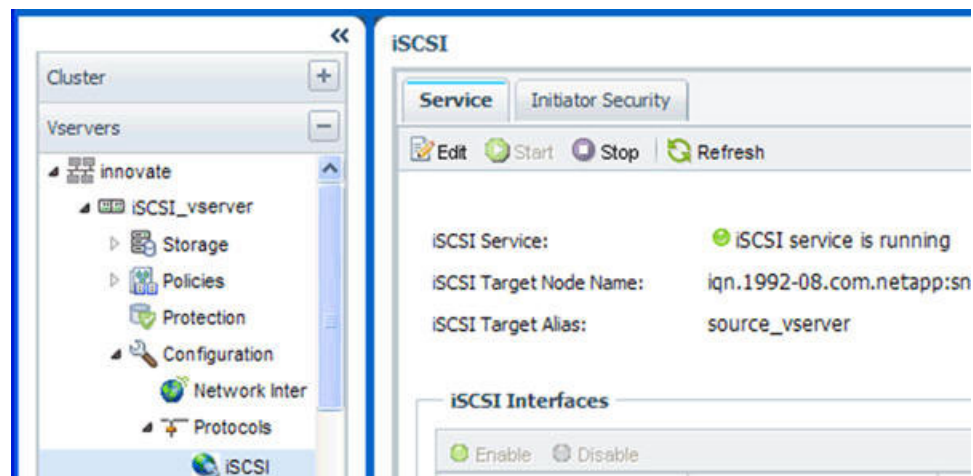
If you choose to use an existing Vserver, you must verify that the iSCSI service is running on the Vserver.

Before you begin

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

Procedure

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



5. Record the iSCSI interfaces listed for the Vserver.

What to do next

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

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

Creating a datastore and its containing LUN and volume

A datastore contains virtual machines and their VMDKs on the ESX host. A LUN on the storage cluster is represented as a datastore on the ESX host.

Before you begin

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

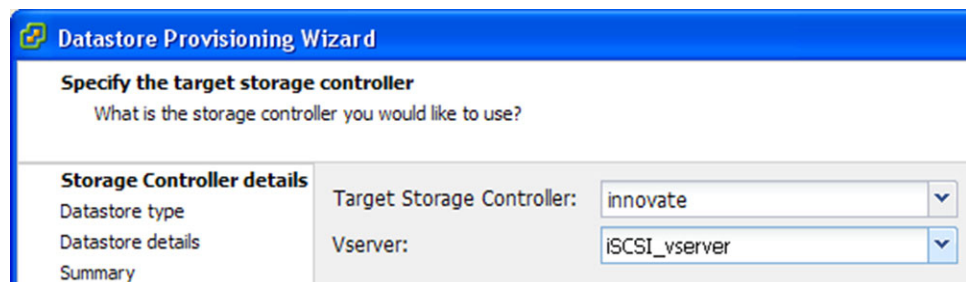
VSC must have sufficient cluster or Vserver credentials to create the LUN and volume.

About this task

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

Procedure

1. Log in to the vCenter Server using the vSphere Client.
2. Select the Datacenter that owns the ESX host in the Inventory panel, and then select the IBM N series tab.
3. If the Vserver on which you are creating the LUN is not listed, click **Update** on the Overview panel of Monitoring and Host Configuration.
4. Right-click the ESX host in the Inventory panel and then select **IBM N series > Provisioning and Cloning > Provision datastore**. The Datastore Provisioning Wizard starts.



5. Type the requested information in the wizard. Note the following required values:
 - Datastore type: VMFS
 - Protocol: iSCSI
 - Create new volume container: selected
 - Thin provision: unselectedTo learn more about thin provisioning and the requirements for using it, see the *Clustered Data ONTAP SAN Administration Guide*.

What to do next

For an ESX 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.

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.

Procedure

1. In the navigation pane of the vSphere Client, select the host.
2. On the Configuration tab, click **Storage**.
3. Right-click the new datastore, and select **Browse Datastore**. The datastore browser is displayed.
4. Using the datastore browser, create a new folder in the datastore and upload a file to the new folder.
5. Optional: Fail over the cluster node containing the LUN and verify that you can still access the file on the datastore using the datastore browser.
6. For an ESX cluster, view the datastore from each ESX host in the cluster and verify that the file you uploaded is displayed.

What to do next

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.

Where to find additional information

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

All of the following documentation is available from the IBM N series support website (accessed and navigated as described in Websites):

Clustered Data ONTAP SAN Configuration Guide

Describes supported FC, iSCSI, and FCoE topologies for connecting host computers to storage controllers in clusters.

Clustered Data ONTAP 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.

OnCommand System Manager Help

Describes how to use OnCommand System Manager to complete typical tasks. Available within the product.

Virtual Storage Console for VMware vSphere Installation and Administration Guide

Provides an overview of Virtual Storage Console for VMware vSphere and instructions for installing and setting up its software components.

VMware documentation

Documentation about iSCSI for ESX and ESXi servers is available directly from VMware:

iSCSI SAN Configuration Guide

This VMware guide describes iSCSI configuration for ESX and ESXi 4.x.

vSphere Storage

This VMware guide describes iSCSI configuration for ESXi 5.x.

Multipathing Configuration for Software iSCSI Using Port Binding

Technical White Paper describes MPIO setup for ESX and ESXi servers.

Related information:

 IBM N series support website: www.ibm.com/storage/support/nseries

 Featured VMware Documentation Sets

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