

# Dell EMC Unity™ Family Configuring Hosts to Access Fibre Channel (FC) or iSCSI Storage

Version 5.1

## Notes, cautions, and warnings

 **NOTE:** A NOTE indicates important information that helps you make better use of your product.

 **CAUTION:** A CAUTION indicates either potential damage to hardware or loss of data and tells you how to avoid the problem.

 **WARNING:** A WARNING indicates a potential for property damage, personal injury, or death.

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As part of an improvement effort, revisions of the software and hardware are periodically released. Therefore, some functions described in this document might not be supported by all versions of the software or hardware currently in use. The product release notes provide the most up-to-date information on product features. Contact your technical support professional if a product does not function properly or does not function as described in this document.

## Where to get help

Support, product, and licensing information can be obtained as described below.

## Product information

For product and feature documentation or release notes, go to Unity Technical Documentation at: [dell.com/unitydocs](https://dell.com/unitydocs).

## Troubleshooting

For information about products, software updates, licensing, and service, go to Support (registration required) at: [dell.com/support](https://dell.com/support). After logging in, locate the appropriate product page.

# Introduction

## Topics:

- [Overview](#)
- [VSS HW Provider overview](#)

## Overview

This document describes how to configure the following hosts to access Fibre Channel (FC) or iSCSI storage provisioned on a system running the latest operating environment:

- Windows hosts
- AIX hosts
- Citrix XenServer hosts
- HP-UX hosts
- Linux hosts
- Solaris hosts

This document is intended for those who are responsible for setting up host to access storage.

Readers of this document should be familiar with FC or iSCSI LUNs and with the operating system running on the hosts that will access the LUNs.

The Unisphere online help provides specific information about storage, features, and functionality. The online help and a complete set of documentation are available on [Online Support](#).

**i NOTE:** Unless otherwise noted in this guide, "Windows Server" refers to the following versions:

- Windows Server 2008 R2
- Windows Server 2012
- Windows Server 2012 R2
- Windows Server 2016

## VSS HW Provider overview

The VSS HW Provider runs as a Windows service and provides the interface between the Microsoft Volume Shadow Copy Service (VSS) and your storage system. The VSS HW Provider enables VSS requestor applications, such as VSS-enabled backup applications, to make snapshots of iSCSI and FC LUNs.

## Microsoft VSS

VSS provides the backup framework for Windows Servers, and enables the creation of snapshots (called shadow copies for Microsoft VSS) — point-in-time copies of data. VSS is integrated with front-end applications so they can create and access shadow copies.

The VSS architecture includes VSS providers. A VSS provider creates and maintains shadow copies and acts as the interface to point-in-time imaging capabilities either on a storage platform (hardware-based provider) or in a host operating system (software-based provider). The Unity VSS HW Provider is a hardware-based provider that works directly with iSCSI and FC LUNs on the Unity iSCSI and FC interfaces and with the VSS service on Windows Servers hosts to provide consistent shadow copy creation and addressing.

Because the Unity VSS HW Provider is a hardware-based provider, it reduces the load on the CPU and memory of the host. It is also more efficient in an environment where shadow copies of multiple volumes must be taken simultaneously.



Refer to the Microsoft documentation for more information about VSS.

# Fibre Channel (FC)

**Topics:**

- [Setting Up a Windows or Mac OS Host to Use LUN storage over Fibre Channel \(FC\)](#)
- [Setting Up a Unix Host to Use FC Storage](#)

# Setting Up a Windows or Mac OS Host to Use LUN storage over Fibre Channel (FC)

This chapter describes how to set up a Windows or Mac OS host to use LUN storage over FC.

## Topics:

- [Requirements for setting up a host](#)
- [Windows host — Using multi-path management software over FC](#)
- [Configuring FC LUNs for the host](#)
- [Windows host — Setting up for FC LUNs](#)
- [Windows host — Connecting to an FC LUN](#)
- [Windows host — Setting up to use FC LUNs](#)
- [Mac OS host — Setting up for FC LUNs](#)

## Requirements for setting up a host

These system and network requirements must be met before setting up a host to use Unity storage.

Before you can set up a host to use Unity storage, the following storage system and network requirements must be met.

### System requirements

Before configuring hosts to access the storage system, ensure that the following tasks are completed.

- Install and configure the system using the **Initial Configuration** wizard.
- Use Unisphere or the CLI to configure NAS servers or interfaces, or Fibre Channel (FC) LUNs, on the storage system.

### SAN requirements

For a host to connect to FC LUNs or VMware VMFS and Block VVol datastores on the Unity system, the host must be in a SAN environment with the storage system, and zoned so that the host and the storage system are visible to each other over the SAN. For a multi-pathing environment, each Unity FC LUN for the host must have two paths associated with it. These two paths should be on different switches to ensure high availability.

### Path management SAN requirements

When implementing a highly-available SAN between a host and the Unity system, keep in mind that:


- A LUN or VMware VMFS datastore is visible to both SPs.
- You can configure multiple paths for a LUN. These paths should be associated with separate physical ports on the same SP.
- Each LUN must present the same LUN ID to all hosts.

 **NOTE:** Directly attaching a host to a storage system is supported if the host connects to both SPs and has the required multipath software.

# Windows host — Using multi-path management software over FC


Multi-path management software manages the connections (paths) between the host and the storage system to provide access to the storage if one of the paths fails. The following types of multi-path management software are available for a Windows Server connected host:

- EMC PowerPath software on Windows Servers host. Refer to the *Unity Support Matrix* on the support website for compatibility and interoperability information.

 **NOTE:** PowerPath is not supported for Windows 7.

## Setting up a storage system for multi-path management software

For a storage system to operate with hosts running multi-path management software, each LUN on the system should be associated with multiple paths.

 **NOTE:** For highest availability, use multiple paths. The network interfaces can be on separate subnets.

## Installing PowerPath

### Steps

1. You cannot configure your storage system FC connections to present the FC LUNs to both a standalone Windows host and its Windows virtual machines. If you will configure your FC connections to present the FC LUNs directly to a stand-alone Windows host with HBAs, install PowerPath software on the stand-alone host. If you will configure your FC connections to present FC LUNs directly to a Windows virtual machine with HBAs, install PowerPath software on the virtual machine. On the host or virtual machine, download the latest PowerPath version from the PowerPath software downloads section on Online Support.
2. Install PowerPath using a Custom installation as described in the appropriate PowerPath installation and administration guide for the host's or virtual machine's operating system.  
This guide is available on Online Support. If the host or virtual machine is running the most recent version and a patch exists for this version, install it, as described in the `readme` file that accompanies the patch.
3. When the installation is complete, reboot the host or virtual machine.
4. When the host or virtual machine is back up, verify that the PowerPath service has started.

## Configuring FC LUNs for the host

### About this task

Use Unisphere or the CLI to:

### Steps

1. Create FC LUNs for the host.
2. Add the host to the storage system by accessing the Hosts tab in Unisphere or using the CLI and creating a host.
3. Provide host access to the FC LUNs. Host access options are: **No Access, LUN, Snapshot, LUN and Snapshot.**

 **NOTE:** On a Mac OS host, Xsan will not log into the FC storage if no `vdisk0` is configured on the storage system.

For information on performing the above Unisphere tasks, refer to the Unisphere online help.

## Windows host — Setting up for FC LUNs

To set up a Windows host for LUNs, perform these tasks:

1. [Install the Unity VSS HW Provider](#)
2. [For a multi-path configuration, install the MPIO feature](#)
3. [Set registry values](#)

## Install the Unity VSS HW Provider


### About this task

It is recommended that you install the VSS HW Provider on the host that will use the FC LUNs with backup applications.

To install the Unity VSS HW Provider:

### Steps

1. Log in to the host using an account with administrator privileges.
2. Download the software package that you want to install as follows:
  - a. Locate the Unity VSS tool on online support.

 **NOTE:** You may need to filter by **Support Tools**.
  - b. Choose the correct version for your Windows platform, and select the option to save the software to the host.
3. In the directory where you saved the software, double-click the Unity VSS provider executable file to start the installation wizard.
4. Follow the instructions in the wizard to complete the installation of the Unity VSS provider.

## Starting and stopping the Unity VSS HW Provider

The Unity VSS HW Provider runs as a Windows service and is enabled by default. You can stop and start this service from the Windows Services administrative tool.

## For a multi-path configuration, install the MPIO feature

### About this task

If the Windows host will use a multi-path configuration to connect to the LUNs, you should install the MPIO feature. To install MPIO on a Windows Server:


### Steps

1. Open Server Manager.
2. In the **Server Manager** tree, click **Features**.
3. In the **Features** pane, under **Features Summary**, click **Add Features**.
4. In the **Add Features Wizard**, select **Multipath I/O**, and click **Next**.
5. In the **Confirm Installation Selections** dialog box, click **Install**.
6. When the installation is complete, in the Installation **Results** dialog box, click **Close**.
7. When prompted to restart the computer, click **Yes**.

After restarting, the host finalizes the MPIO installation.
8. Click **Close**.

## Set registry values

### About this task

 **NOTE:** Incorrectly modifying the Registry can cause serious system-wide problems that can require you to reinstall the system. Use the Windows Registry Editor at your own risk.

## Steps

1. On the host, run the Windows Registry Editor (**regedit.exe**).
2. Go to HKEY\_LOCAL\_MACHINE\SYSTEM\.
3. Right-click **CurrentControlSet**, and search for the **MaxRequestHoldTime** key and modify its value from 60 to 600 (decimal) or from 3c to 258 (hexadecimal).  
**NOTE:** Verify that the path to the parameter that you found in the CurrentControlSet. If it is not, search for the parameter again. If you make changes to ControlSets other than the top level current set, those changes will not affect the system.
4. If the host is running PowerPath:
  - a. Search for the register keys list in [Registry keys to update \(iSCSI only\)](#).  
**NOTE:** Verify that the path to the parameter that you found in the CurrentControlSet. If it is not, search for the parameter again. If you make changes to ControlSets other than the top level current set, those changes will not affect the system.
  - b. Record the value of each of these registry keys, so you have them in case you need to uninstall PowerPath.
  - c. Update each of these registry keys. See [Registry keys to update \(iSCSI only\)](#).

**Table 1. Registry keys to update (iSCSI only)**

Registry keys	Instructions
LinkDownTime	Set to 600.
AsyncLogoutPauseTimeout (new value)	Add this REG_DWORD key in the same key as LinkDownTime. Set it to 600.
DelayBetweenReconnect PortalRetryCount	Find the DelayBetweenReconnect value. Set the PortalRetryCount value so that $\text{PortalRetryCount} * \text{DelayBetweenReconnect} = 600$
SrbTimeoutDelta (for PowerPath only)	Set to 100 for PowerPath only.

5. Quit the Registry Editor.

## Windows host — Connecting to an FC LUN

Windows hosts connect directly to FC LUNs that they have access to across the SAN. To connect a Windows host to an FC LUN:

- [Configuring a Windows Server, Windows 7, or Windows 8 host to connect to an FC LUN](#)

## Configuring a Windows Server, Windows 7, or Windows 8 host to connect to an FC LUN

### About this task

To add FC storage to a Windows Server, Windows 7, or Windows 8 host:

## Steps

1. Open Storage Manager for SANs. Click **Manage Server Connections**.
2. Click **Add**.
3. In the **Add Server** window, add the storage system, and optionally specify a description.
4. Click **OK**. The storage system appears in the **Manage Server Connections** window. All the ports that were discovered appear on the **Fibre Channel Ports** tab. Optionally, add additional FC ports manually:
  - a. Select the **Fibre Channel Ports** tab.
  - b. Click **Add**.

- c. Specify the WWN of the FC port.
  - d. Click **OK**.
5. Enable the FC ports for LUN access:
  - a. Select the storage system from the server list.
6. Select the **Fibre Channel Ports** tab. Select FC ports to enable. If the storage system is not configured for Multipathing, enabling more than one FC port may cause data corruption. Click **OK**.

## What's next?

Continue to [Windows host — Setting up to use FC LUNs](#)

# Windows host — Setting up to use FC LUNs

To set up a Windows host to use FC LUNs, perform the following tasks:


1. [Register the LUNs as MPIO devices for Windows Server](#)
2. [Set the offset for the LUN to 64 KB](#)
3. [Configure a volume on the LUN](#)

## Register the LUNs as MPIO devices for Windows Server

### About this task


If you are using Multipath I/O (MPIO) with Windows Servers, you must register LUNs as MPIO devices and set up MPIO to discover FC devices:

### Steps

1. On the host, start the MPIO Administrative Tool:  
Either **Start > Administrative Tools** and select **MPIO** or **Start > Run** and type `mpioctrl.exe`.
2. In the MPIO Properties, select **MPIO Devices**, then Click **Add** to show the **Add MPIO Support** dialog box.
3. Fill in the "DGC        VRAID       ".  
 **NOTE:** There should be 5 extra spaces after the word **DGC** and 11 extra spaces after the word **VRAID**.
4. Click **OK** to complete the addition of MPIO device.
5. Restart the host when prompted.

## Set the offset for the LUN to 64 KB

### About this task

 **NOTE:** This task is only required for systems that were upgraded from Windows Server 2003 to a Windows Server version from 2008 to 2016.

After the initiator logs in to a target, each of the target's LUNs that the initiator can access appears as an unknown disk in the Windows Disk Management tool.

To set the offset for the LUN on the host:

### Steps

1. Select **Run > diskpart**.
2. Select the disk:

```
select disk n
```

where *n* is the disk number.

If you do not know the disk number, enter:

```
list disk
```

3. On the selected disk, create a primary partition with an offset of 64 KB:

```
create part pri align=64
```


## Configure a volume on the LUN

### About this task

The following configuration process initializes the LUN, creates a partition, formats a volume on the partition, and mounts the partition on a drive letter:

### Steps

1. On the host, in the Microsoft Disk Management tool, select the LUN.
2. If the system asks you to initialize the disk, click **Yes**, but do not choose to make the disk a dynamic disk because the iSCSI interfaces do not support dynamic disks.  
For a given LUN, its drive letter, disk number, and LUN number are independent.
3. Use a quick format operation (Windows Servers) or the New Simple Volume wizard (Windows 7) to create a volume on the disk with the following properties:
  - NTFS file system
  - 64K location unit size

 **NOTE:** Do not format more than one LUN at a time. Otherwise, some of the volumes can become write-protected and cannot be formatted.

You can change the volume label. Because the disk number of a LUN can change after system restart or after logging in to and out of a target, be sure to change the default volume label ("New Volume") to a descriptive label.

4. Assign an available drive letter to the disk.
5. Close the Disk Management tool.

## Mac OS host — Setting up for FC LUNs

To set up a Mac OS for FC LUNs, you must perform these tasks:

1. [Installing and configuring Xsan on a Mac OS host](#)
2. [Set up a Mac OS host to use LUNs](#)

## Installing and configuring Xsan on a Mac OS host

### About this task

To connect a Mac OS host to FC storage, you must add the host to the SAN as a client.

### Steps

1. On the host, select **System Preferences > Xsan**. Click **Enable Xsan**.
2. Install the Xsan software on the host, and update it to the latest version.
3. Open Xsan Admin and select **Computers**.
4. Add the host to the SAN.



# Set up a Mac OS host to use LUNs

Before the Mac OS host can use a LUN, you must use the Mac OS Disk Utility to:

1. [Format the LUN](#)
2. [Partition the LUN](#)

## Format the LUN

### Steps

1. On the host, go to **Finder > Application > Utilities**.
2. Double-click **Disk Utility**.
3. In the left panel, select the LUN.
4. Click the **Erase** tab.
5. For **Volume Format**, select the format that you want, and confirm your format choice.
6. Click **Erase** and verify the erase procedure, and click **Erase** again to start the erase process.  
When the erase process is finished, the LUN is ready for you to partition it.

## Partition the LUN

### Steps

1. On the host, go to **Finder > Application > Utilities**.
2. Double click **Disk Utility**.
3. In the left panel, select the LUN.
4. Click the **Partition** tab.
5. Under Volume Scheme, select the number of partitions for the LUN.  
The utility displays equal-sized partitions to fill the available space on the LUN.
6. For each partition:
  - a. Select the partition.
  - b. In **Name**, enter a name for the partition.
  - c. Under **Format**, select the format for the partition.  
The default format - Mac OS Extended (Journaled) - is a good choice for most uses.
  - d. In **Size**, enter the size for the partition.
7. When you have specified, the name, size, and format for each partition, click **Apply**.  
The Disk Utility uses the partition information to create volumes that the host can access and use. When the partitioning process is complete, the new volumes are mounted on the desktop and ready to use.  
You are now ready to either migrate data to the LUN or have the host start using the LUN. To migrate data to the LUN, go to [Migrating FC or iSCSI Data to the Storage System](#).

# Setting Up a Unix Host to Use FC Storage

This chapter describes how to set up an AIX, Citrix XenServer, HP-UX, Linux, or Solaris host to use FC storage.

## Topics:

- [Requirements for setting up a host](#)
- [Using multi-path management software on the host](#)
- [AIX host — Setting up for FC storage](#)
- [Citrix XenServer host — Setting up for FC storage](#)
- [HP-UX host — Setting up for FC storage](#)
- [Linux host — Setting up for FC storage](#)
- [Solaris host — Setting up for FC storage](#)
- [What's next?](#)

## Requirements for setting up a host

These system and network requirements must be met before setting up a host to use Unity storage.

Before you can set up a host to use Unity storage, the following storage system and network requirements must be met.


### SAN requirements

For a host to connect to FC LUNs or VMware VMFS and Block VVol datastores on the Unity system, the host must be in a SAN environment with the storage system, and zoned so that the host and the storage system are visible to each other over the SAN. For a multi-pathing environment, each Unity FC LUN for the host must have two paths associated with it. These two paths should be on different switches to ensure high availability.


### Path management SAN requirements

When implementing a highly-available SAN between a host and the Unity system, keep in mind that:

- A LUN or VMware VMFS datastore is visible to both SPs.
- You can configure multiple paths for a LUN. These paths should be associated with separate physical ports on the same SP.
- Each LUN must present the same LUN ID to all hosts.

 **NOTE:** Directly attaching a host to a storage system is supported if the host connects to both SPs and has the required multipath software.

### Storage system requirements

- Install and configure the system using the **Initial Configuration** wizard.
  - Use Unisphere or the CLI to configure NAS servers or interfaces, or Fibre Channel (FC) LUNs, on the storage system.
-  **NOTE:** On an HP-UX host, the iSCSI initiator will not discover the FC storage if it does not detect a LUN from the storage system assigned to host LUN ID 0. We recommend that you create a unique target, create a LUN on this interface, and give it access to the HP-UX host. The first LUN that you assign to a host is automatically assigned host LUN ID 0.

# Using multi-path management software on the host

Multi-path management software manages the connections (paths) between the host and the storage system should one of the paths fail. The following types of multi-path managements software are available for a host connected to a storage system:

- EMC PowerPath software on an HP-UX, Linux, or Solaris host
- Native multipath software on a Citrix XenServer, HP-UX 11i, Linux, or Solaris host

For compatibility and interoperability information, refer to the Unity Support Matrix on the support website.

## Setting up a system for multi-path management software

For a system to operate with hosts running multi-path management software, each LUN on the system should be associated with two paths.

## Installing PowerPath

### Steps

1. On the host or virtual machine, download the latest PowerPath version from the PowerPath software downloads section on the Online Support website.
2. Install PowerPath using a Custom installation and the Celerra option, as described in the appropriate PowerPath installation and administration guide for the host's or virtual machine' operating system.  
This guide is available on Online Support. If the host or virtual machine is running the most recent version and a patch exists for this version, install it, as described in the `readme` file that accompanies the patch.
3. When the installation is complete, reboot the host or virtual machine.
4. When the host or virtual machine is back up, verify that the PowerPath service has started.

## Installing native multipath software

Whether you need to install multipath software, depends on the host's operating system.

### Citrix XenServer

By default XenServer uses the Linux native multipathing (DM-MP) as it multipath handler. This handler is packaged with the Citrix XenServer operating system software.

### Linux

To use Linux native multipath software, you must install the Linux multipath tools package as described in [Installing or updating the Linux multipath tools package](#).

### HP-UX 11i

Native multipath failover is packaged with the HP-UX operating system software.

### Solaris

Sun's native path management software is Sun StorEdge™ Traffic Manager (STMS).

**For Solaris 10** — STMS is integrated into the Solaris operating system patches you install. For information on install patches, refer to the Sun website.

## Installing or updating the Linux multipath tools package

To use Linux native multipath failover software, the Linux multipath tools package must be installed on the host. This package is installed by default on SuSE SLES 10 or higher, but is not installed by default on Red Hat.

If you need to install the multipath tools package, install the package from the appropriate website below.

### For SuSE:

<http://www.novell.com/linux/>

The multipath tools package is included with SuSE SLES 9 SP3 and you can install it with YaST or RPM.

### For Red Hat:

<http://www.redhat.com>

The multipath tools package is included with Red Hat RHEL4 U3 or RHEL5, and you can install it with YaST or Package Manager. If an update is available, follow the instructions for installing it on the <http://www.redhat.com> website.

## What's next?

Do one of the following:

- To set up an AIX host to use storage, refer to [AIX host — Setting up for FC storage](#).
- To set up a Citrix XenServer host to use storage, refer to [Citrix XenServer host — Setting up for FC storage](#).
- To set up an HP-UX host to use storage, refer to [HP-UX host — Setting up for FC storage](#).
- To set up a Linux host to use storage, refer to [Linux host — Setting up for iSCSI storage](#).
- To set up a Solaris host to use storage, refer to [Solaris host — Setting up for FC storage](#).

## AIX host — Setting up for FC storage

To set up an AIX host to use LUNs over Fibre Channel, perform these tasks:

1. [Install AIX software](#)
2. [Configure LUNs as AIX disk drives](#)
3. [Prepare the LUNs to receive data](#)

## Install AIX software

### Steps

1. Log in to the AIX host using an account with administrator privileges.
2. Download the AIX ODM Definitions software package to the /tmp directory on the AIX host as follows:
  - a. Navigate to AIX ODM Definitions on the software downloads section on the **Support** tab of the Online Support website.
  - b. Choose the version of the EMC ODM Definitions for the version of AIX software running on the host, and save the software to the /tmp directory on the host.
3. Start the System Management Interface Tool to install the software:

```
smit installp
```

4. In the /tmp directory, uncompress and untar the EMC AIX fileset for the AIX version running on the host:

```
uncompress EMC.AIX.x.x.x.x.tar.z  
tar -xvf EMC.AIX.x.x.x.x.tar
```

5. In the Install and Update Software menu, select **Install and Update from ALL Available Software** and enter **/tmp** as the path to the software.

6. Select **SOFTWARE to install**.
7. After making any changes to the displayed values, press **Enter**.
8. Scroll to the bottom of the window to see the Installation Summary, and verify that the message "SUCCESS" appears.
9. Reboot the AIX host to have the changes take effect.

## Configure LUNs as AIX disk drives

### About this task

Install the ODM (Object Data Manager) kit on the AIX host:

### Steps


1. Remove any drives that are identified as "Other FC SCSI Disk Drive" by the system by running the following command.

```
lsdev -Cc disk | grep "Other FC SCSI Disk Drive" | awk {'print $1'} | xargs -n1 rmdev -dl
```

2. When applicable, uninstall any existing CLARiiON ODM file sets.

```
installp -u EMC.CLARiiON.*
```

3. Use the following commands to download the AIX ODM package version 5.3.x or 6.0.x from the FTP server at <ftp.emc.com>.

 **NOTE:** IBM AIX Native MPIO for Unity requires a different ODM package. Contact your service provider for more information.

- a. Access the FTP server by issuing the following command:

```
ftp ftp.emc.com
```

- b. Log in with a user name of `anonymous` and use your email address as a password.
  - c. Access the directory that contains the ODM files:

```
cd /pub/elab/aix/ODM_DEFINITIONS
```

- d. Download the ODM package

```
get EMC.AIX.5.3.x.x.tar.Z
```

or

```
get EMC.AIX.6.0.x.x.tar.Z
```

4. Prepare the files for installation.

- a. Move the ODM package into the user install directory.

```
cd /usr/sys/inst.images
```

- b. Uncompress the files.

```
uncompress EMC.AIX.5.3.x.x.tar.Z
```

or

```
uncompress EMC.AIX.6.0.x.x.tar.Z
```

- c. Open, or untar, the files.

```
tar -xvf EMC.AIX.5.3.x.x.tar
```

or

```
tar -xvf EMC.AIX.6.0.x.x.tar
```

- d. Create or update the TOC file.

```
inutoc
```

5. Install the files.

- PowerPath:

```
installp -ac -gX -d . EMC.CLARiION.aix.rte  
installp -ac -gX -d . EMC.CLARiION.fcp.rte
```

- MPIO:

```
installp -ac -gX -d . EMC.CLARiION.aix.rte  
installp -ac -gX -d . EMC.CLARiION.fcp.MPIO.rte
```

 **NOTE:** You can also install the files using the AIX smitty command.

## Scan and verify LUNs

This task explains how to scan the system for LUNs using AIX, PowerPath, or MPIO.

### Prerequisites

#### About this task

After installing the AIX ODM package for Unity, scan and verify LUNs on the Unity system.

#### Steps

1. Use AIX to scan for drives using the following command:

```
cfgmgr
```

2. Verify that all FC drives have been configured properly, and display any unrecognized drives.

```
lsdev -Cc disk
```

PowerPath output example:

hdisk1	Available	EMC CLARiION FCP VRAID Disk
hdisk2	Available	EMC CLARiION FCP VRAID Disk

MPIO output example:

hdisk1	Available	EMC CLARiION FCP MPIO VRAID Disk
hdisk2	Available	EMC CLARiION FCP MPIO VRAID Disk

## Prepare the LUNs to receive data

If you do not want to use a LUN as a raw disk or raw volume, then before AIX can send data to the LUN, you must either partition the LUN or create a database file systems on it. For information on how to perform these tasks, refer to the AIX operating system documentation.

# Citrix XenServer host — Setting up for FC storage

To set up a Citrix XenServer host to use LUNs over Fibre Channel, perform these tasks:

1. [Configure the FC target](#)
2. [Configure the FC target for multipathing](#)

## Configure the FC target

### About this task

The XenServer operating system includes FC software that you must configure for each initiator that will connect to the FC storage.

### Steps

1. Open the XenCenter console.
2. Click **New Storage** at the top of the console.
3. In the **New Storage** dialog box, under **Virtual disk storage**, select **Hardware HBA**.
4. Under **Name**, enter a descriptive name for the LUN (Storage Repository).
5. Click **Next**.
6. Select a LUN, and click **Finish**.

The host scans the target to see if it has any XenServer Storage Repositories (SRs) on it already, and if any exist you are asked if you want to attach to an existing SR or create a new SR.

## Configure the FC target for multipathing

### About this task

Citrix recommends either enabling multipathing in XenCenter before you connect the pool to the storage device or if you already created the storage repository, putting the host into Maintenance Mode before you enable multipathing.

If you enable multipathing while connected to a storage repository, XenServer may not configure multipathing successfully. If you already created the storage repository and want to configure multipathing, put all hosts in the pool into Maintenance Mode before configuring multipathing and then configure multipathing on all hosts in the pool. This ensures that any running virtual machines that have LUNs in the affected storage repository are migrated before the changes are made.

### Steps

1. In XenCenter enable the multipath handler:
  - a. On the host's **Properties** dialog box, select the **Multipathing** tab.
  - b. On the **Multipathing** tab, select **Enable multipathing on this server**.
2. Verify that multipathing is enabled by clicking the storage resource's **Storage general properties**.

# HP-UX host — Setting up for FC storage

To set up an HP-UX host to use LUNs over Fibre Channel, perform these tasks:

1. [Download and install the HP-UX FC HBA software](#)
2. [Make the storage processors available to the host](#)
3. [Verify that native multipath failover sees all paths to the LUNs](#)
4. [Prepare the LUNs to receive data](#)

## Download and install the HP-UX FC HBA software

### Steps

1. On the HP-UX host, open a web browser and download the initiator software from the HP-UX website.
2. Install the initiator software using the information on the site or that you downloaded from the site.

## Make the storage processors available to the host

Verify that each NIC sees only the storage processors (targets) to which it is connected:

```
ioscan -fnC disk  
insf -e
```

`ioscan -NfC disk` (for HP-UX 11i v3 only)

## Verify that native multipath failover sees all paths to the LUNs

### About this task

If you are using multipath failover:

### Steps

1. Rescan for the LUNs:

```
ioscan -NfC disk|  
insf -e
```

2. View the LUNs available to the host:

```
ioscan -NfnC disk
```

3. Verify that all paths to the storage system are CLAIMED:

```
ioscan -NkfnC lunpath
```

## Prepare the LUNs to receive data

### About this task

If you do not want to use a LUN as a raw disk or raw volume, then before HP-UX can send data to the LUN, perform the following tasks as described in the HP-UX operating system documentation:

### Steps

1. Make the LUN visible to HP-UX.
2. Create a volume group on the LUN.

## Linux host — Setting up for FC storage

To set up a Linux host to use LUNs over Fibre Channel, perform these tasks:

- [Scan the storage system for LUNs](#)
- [Set up the Linux host to use the LUN](#)



## Scan the storage system for LUNs

Execute the Linux scan LUNs command.

### About this task


Before scanning the storage system for attached LUNs, they may appear in Linux as **LUNZ**, even after host access is granted to those LUNs. For example:

```
# lsscsi | egrep -i dgc
[13:0:2:0]    disk      DGC      LUNZ      4200    /dev/sdj
[13:0:4:0]    disk      DGC      LUNZ      4200    /dev/sdo
[13:0:5:0]    disk      DGC      LUNZ      4200    /dev/sdv
[13:0:6:0]    disk      DGC      LUNZ      4200    /dev/sdz
[14:0:2:0]    disk      DGC      LUNZ      4200    /dev/sdm
[14:0:4:0]    disk      DGC      LUNZ      4200    /dev/sdu
[14:0:5:0]    disk      DGC      LUNZ      4200    /dev/sdx
[14:0:6:0]    disk      DGC      LUNZ      4200    /dev/sdy
[15:0:2:0]    disk      DGC      LUNZ      4200    /dev/sdac
[15:0:4:0]    disk      DGC      LUNZ      4200    /dev/sdag
.....
```

 **NOTE:** The first column in the output shows *[Host:Bus:Target:LUN]* of each SCSI device, with the last value representing the LUN number.

### Steps

1. In Unisphere, grant LUN access to the Linux host.

 **NOTE:** Ensure that a LUN with LUN ID 0 is present on the Unity system. See [Modify Host LUN IDs](#) for information on manually changing LUN IDs.

2. On the Linux server, run the SCSI bus scan command with the `-r` option:

```
rescan-scsi-bus.sh -a -r
```

3. On the Linux server, rerun the `lsscsi | egrep -i dgc` command to verify the LUN IDs show up appropriately on the Linux host.

```
# lsscsi | egrep -i dgc
[13:0:2:0]    disk      DGC      VRAID     4200    /dev/sdb1
[13:0:2:1]    disk      DGC      VRAID     4200    /dev/sdcf
[13:0:2:2]    disk      DGC      VRAID     4200    /dev/sdcg
[13:0:4:0]    disk      DGC      VRAID     4200    /dev/sdad
[13:0:4:1]    disk      DGC      VRAID     4200    /dev/sdch
[13:0:4:2]    disk      DGC      VRAID     4200    /dev/sdci
[13:0:5:0]    disk      DGC      VRAID     4200    /dev/sdbj
[13:0:5:1]    disk      DGC      VRAID     4200    /dev/sdcj
[13:0:5:2]    disk      DGC      VRAID     4200    /dev/sdck
.....
```

4. If **LUNZ** continues to display, rerun the rescan command using the `--forcerescan` option.

```
rescan-scsi-bus.sh --forcerescan
```

If the issue persists and **LUNZ** still displays, a Linux reboot may be required in order for Linux to recognize the LUNs. Refer to the following Linux knowledgebase article for more information: <https://www.suse.com/support/kb/doc/?id=7009660>

## Set up the Linux host to use the LUN

### About this task

Perform the following tasks as described in the Linux operating system documentation:

### Steps

1. Find the LUN ID:
  - a. In Unisphere, select **Storage > Block > LUNs**.
  - b. On the LUN, select **Edit**.
  - c. On the **Properties** window, select **Access > Access details** to determine the LUN ID.
2. On the host, partition the LUN.
3. Create a file system on the partition.
4. Create a mount directory for the file system.
5. Mount the file system.

### Results

The Linux host can now write data to and read data from the file system on the LUN.

## Solaris host — Setting up for FC storage

To set up a Solaris host to use LUNs over Fibre Channel, perform these tasks:

1. [Configure Sun StorEdge Traffic Manager \(STMS\)](#)
2. [Prepare the LUN to receive data](#)

## Configure Sun StorEdge Traffic Manager (STMS)

### About this task

If you plan to use STMS on the host to manage the paths to the LUNs, you must first configure it:

### Steps

1. Enable STMS by editing the following configuration file:  
Solaris 10 — Do one of the following:
  - Edit the `/kernel/drv/fp.conf` file by changing the `mpxio-disable` option from yes to no.
  - or
  - Execute the following command:
2. We recommend that you enable the STMS auto-restore feature to restore LUNs to their default SP after a failure has been repaired. In Solaris 10, auto-restore is enabled by default.
3. If you want to install STMS offline over NFS, share the root file system of the target host in a way that allows root access over NFS to the installing host, if you want to install STMS offline over NFS. You can use a command such as the following on `target_host` to share the root file system on `target_host` so that `installer_host` has root access:

```
share -F nfs -d 'root on target_host' -o ro,rw=installer_host,root=installer_host /
```

If the base directory of the package (the default is `/opt`) is not part of the root file system, it also needs to be shared with root access.

4. For the best performance and failover protection, we recommend that you set the load balancing policy to round robin:

```
setting load-balance="round-robin"
```

## Prepare the LUN to receive data

### About this task

If you do not want to use the LUN as a raw disk or raw volume, then before Solaris can send data to the LUN, you must perform the following tasks as described in the Solaris operating system documentation:

### Steps

1. Partition the LUN.
2. Create and mount a files system on the partition.

## What's next?

You are now ready to either migrate data to the LUN or have the host start using the LUN. To migrate data to the LUN, go to [Migrating FC or iSCSI Data to the Storage System](#).



# iSCSI

**Topics:**

- [Setting Up a Windows or Mac OS Host to Use LUN storage over iSCSI](#)
- [Setting Up a Unix Host to Use iSCSI Storage](#)

# Setting Up a Windows or Mac OS Host to Use LUN storage over iSCSI

This chapter describes how to set up a Windows or Mac OS host to use EMC LUN storage over iSCSI.

## Topics:

- [Requirements for setting up a host](#)
- [Windows host — Using multi-path management software over iSCSI](#)
- [Configuring iSCSI LUNs for the host](#)
- [Windows host — Setting up for iSCSI LUNs](#)
- [Windows host — Configuring to connect to an iSCSI interface](#)
- [Windows host — Setting up to use iSCSI LUNs](#)
- [Mac OS host — Setting up for iSCSI LUNs](#)
- [iSCSI troubleshooting](#)

## Requirements for setting up a host

These system and network requirements must be met before setting up a host to use Unity storage.

Before you can set up a host to use Unity storage, the following storage system and network requirements must be met.

### System requirements

Before configuring hosts to access the storage system, ensure that the following tasks are completed.

- Install and configure the system using the **Initial Configuration** wizard.
- Use Unisphere or the CLI to configure NAS servers or interfaces, or iSCSI LUNs, on the storage system.

### Network requirements

For a host to connect to LUNs on an iSCSI interface, the host must be in the same network environment with the iSCSI interface. To achieve best performance, the host should be on a local subnet with each iSCSI interface that provides storage for it. In a multi-path environment, each physical interface must have two IP addresses assigned; one on each SP. The interfaces should be on separate subnets.

To achieve maximum throughput, connect the iSCSI interface and the hosts for which it provides storage to their own private network. That is, a network just for them. When choosing the network, consider network performance.

**NOTE:** To achieve optimal iSCSI performance, use separate networks and VLANs to segregate iSCSI traffic from normal network traffic. Configure standard 802.3x Flow Control (Pause or Link Pause) on all iSCSI Initiator and Target ports that are connected to the dedicated iSCSI VLAN.

### Path management network requirements

**NOTE:** Path management software is not supported for a Windows 7 or Mac OS host connected to a Unity system.

When implementing a highly-available network between a host and your system, keep in mind that:

- A LUN is visible to both SPs

- You can configure up to 8 IPs per physical interface. If more than one interface is configured on a physical interface, each interface must be configured on a separate VLAN.
- Network switches may be on separate subnets.

**NOTE:** Directly attaching a host to a Unity system is supported if the host connects to both SPs and has the required multipath software.

The following figure shows a highly-available iSCSI network configuration for hosts accessing a storage resource (iSCSI LUNs). Switch A and Switch B are on separate subnets. Host A and Host B can each access the storage resource through separate NICs. If the storage resource is owned by SP A, the hosts can access the storage resource through the paths to the interfaces on SP A. Should SP A fail, the system transfers ownership of the resource to SP B and the hosts can access the storage resource through the paths to the interfaces on SP B.

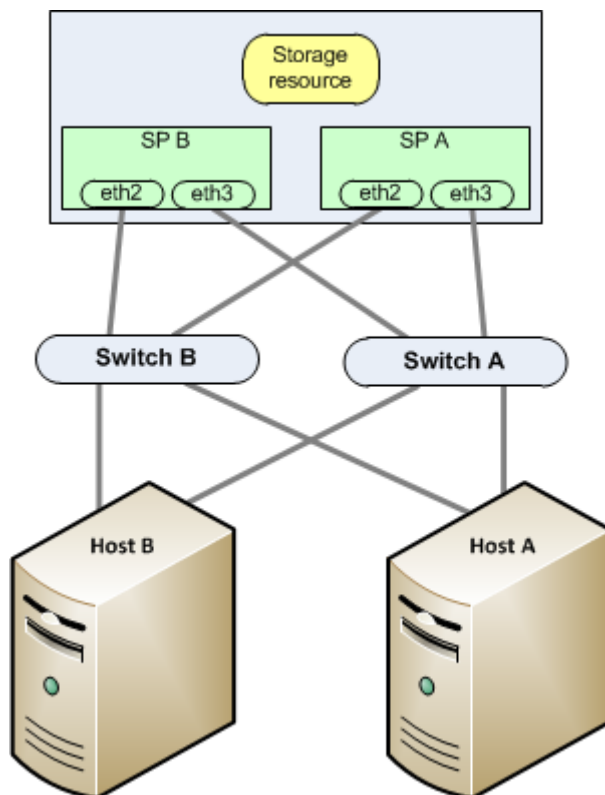


Figure 1. Highly-available iSCSI network sample

## Windows host — Using multi-path management software over iSCSI

Multi-path management software manages the connections (paths) between the host and the storage system to provide access to the storage if one of the paths fails. The following types of multi-path management software are available for a Windows Server connected host:

- EMC PowerPath software on Windows Servers host. Refer to the *Unity Support Matrix* on the support website for compatibility and interoperability information.

**NOTE:** PowerPath is not supported for Windows 7.

- Native MPIO on Windows Servers without Multiple Connections per Session (MCS).

**NOTE:** The MultiPath IO feature must first be enabled before it can be used.


MCS is not supported by Unity.

For information on data availability in your Unity system and your connectivity infrastructure, refer to the *EMC Unity High Availability, A Detailed Review* white paper.

## Setting up your system for multi-path management software

For your system to operate with hosts running multi-path management software, two iSCSI IPs are required. These IPs should be on separate physical interfaces on separate SPs.

Verify the configuration in Unisphere. For details on how to configure iSCSI interfaces, refer to topics about iSCSI interfaces in the Unisphere online help.

 **NOTE:** For highest availability, use two network interfaces on the iSCSI interface. The network interfaces should be on separate subnets. You can view the network interfaces for an iSCSI interface within Unisphere.

## Installing PowerPath

### Steps

1. On the host or virtual machine, download the latest PowerPath version from the PowerPath software downloads section on the Online Support website.
2. Install PowerPath as described in the appropriate PowerPath installation and administration guide for the host's or virtual machine's operating system.

This guide is available on Online Support. If the host or virtual machine is running the most recent version and a patch exists for this version, install it, as described in the `readme` file that accompanies the patch.

3. When the installation is complete, reboot the host or virtual machine.
4. When the host or virtual machine is back up, verify that the PowerPath service has started.


## Configuring iSCSI LUNs for the host

### About this task

Use Unisphere or the CLI to:

### Steps

1. Create storage over iSCSI for the host.
2. Add the host to the storage system in Unisphere or by using the Unity CLI and creating a host. If your host is not already logged in, manually create an iSCSI initiator by providing the host IQN.
3. Provide host access to the storage over iSCSI. Host access options are: **No Access, LUN, Snapshot, LUN and Snapshot.**

 **NOTE:** On a Mac OS host, the Xtend SAN iSCSI initiator will not log into the iSCSI storage if no `vdisk0` is configured on the target (iSCSI interface). We recommend that you to create a unique iSCSI interface, create an iSCSI resource on this iSCSI interface, and provide access to the Mac OS host. The first LUN that you create on this iSCSI resource is `vdisk0`.

For information on performing the above Unisphere tasks, refer to the Unisphere online help.

## Windows host — Setting up for iSCSI LUNs

To set up a Windows host for iSCSI LUNs, perform these tasks:

1. [Install the Unity VSS HW Provider](#)
2. [Install the Microsoft iSCSI Initiator and iSCSI initiator service on the Windows host \(Windows Servers\)](#)
3. [Start the iSCSI initiator service \(Windows Servers\)](#)
4. [For a multi-path configuration, install the MPIO feature \(Windows Servers\)](#)
5. [Set registry values](#)

## Install the Unity VSS HW Provider

### About this task


Installing the Unity VSS HW Provider (for Windows Servers) is optional. However, if you plan to take application consistent snapshots using backup software, you must install the Unity VSS HW Provider.

It is recommended that you install the VSS HW Provider on the host that will use the iSCSI LUNs with backup applications.

To install the Unity VSS HW Provider:

### Steps

1. Log in to the host using an account with administrator privileges.
2. Download the software package that you want to install as follows:
  - a. Locate the Unity VSS tool on online support.

 **NOTE:** You may need to filter by **Support Tools**.
  - b. Choose the correct version for your Windows platform, and select the option to save the software to the host.
3. In the directory where you saved the software, double-click the Unity VSS provider executable file to start the installation wizard.
4. Follow the instructions in the wizard to complete the installation of the Unity VSS provider.

## Starting and stopping the Unity VSS HW Provider

The Unity VSS HW Provider runs as a Windows service and is enabled by default. You can stop and start this service from the Windows Services administrative tool.

## Install the Microsoft iSCSI Initiator and iSCSI initiator service on the Windows host (Windows Servers)

### About this task

To connect to the iSCSI targets (iSCSI interfaces), the host uses an iSCSI initiator, which requires the Microsoft iSCSI Software Initiator and the iSCSI initiator service software. When you install the software on the host, the iSCSI initiator software starts.

To install the Microsoft iSCSI Initiator and iSCSI service:


### Steps

1. Download the latest iSCSI initiator software and related documentation from the Microsoft website to the host.
2. After you download the appropriate software, double-click the executable to open the installation wizard, click **Next** in the Welcome page, and follow the steps in the installation wizard.
3. If this is an upgrade of existing iSCSI initiator software, you must restart the host.
4. For shared storage, make the LanManServer service dependent on the iSCSI initiator service by starting the LanManServer before the iSCSI initiator service with the following command:

```
sc config LanManServer depend= MSiSCSI
```

## Start the iSCSI initiator service (Windows Servers)

To connect to the targets (iSCSI interfaces), the host uses an iSCSI initiator, which requires the Microsoft iSCSI Software Initiator software and the iSCSI initiator service. This software and service are part of the Windows Servers software; however, the driver is not installed until you start the service. You must start the iSCSI initiator service using the administrative tools.

 **NOTE:** If the host is behind a Windows firewall, Microsoft asks if you want to communicate through the firewall. Before proceeding, we suggest that you consult with your network support administrator.



## For a multi-path configuration, install the MPIO feature (Windows Servers)

### About this task

**NOTE:** This task is mandatory. Powerpath is an alternative to Native MS MPIO.

If the Windows host will use a multi-path configuration to connect to the LUNs, you should install the MPIO feature. To install MPIO on a Windows Server:

### Steps

1. Open Server Manager.
2. In the **Server Manager** tree, click **Features**.
3. In the **Features** pane, under **Features Summary**, click **Add Features**.
4. In the **Add Features Wizard**, select **Multipath I/O**, and click **Next**.
5. In the **Confirm Installation Selections** dialog box, click **Install**.
6. When the installation is complete, in the Installation **Results** dialog box, click **Close**.
7. When prompted to restart the computer, click **Yes**.  
After restarting, the host finalizes the MPIO installation.
8. Click **Close**.

## Set registry values

### About this task

**NOTE:** Incorrectly modifying the Registry can cause serious system-wide problems that can require you to reinstall the system. Use the Windows Registry Editor at your own risk.

### Steps

1. On the host, run the Windows Registry Editor (**regedit.exe**).
2. Go to HKEY\_LOCAL\_MACHINE\SYSTEM\.
3. Right-click **CurrentControlSet**, and search for the **MaxRequestHoldTime** key and modify its value from 60 to 600 (decimal) or from 3c to 258 (hexadecimal).  
**NOTE:** Verify that the path to the parameter that you found in the CurrentControlSet. If it is not, search for the parameter again. If you make changes to ControlSets other than the top level current set, those changes will not affect the system.
4. If the host is running PowerPath:
  - a. Search for the register keys list in [Registry keys to update \(iSCSI only\)](#).  
**NOTE:** Verify that the path to the parameter that you found in the CurrentControlSet. If it is not, search for the parameter again. If you make changes to ControlSets other than the top level current set, those changes will not affect the system.
  - b. Record the value of each of these registry keys, so you have them in case you need to uninstall PowerPath.
  - c. Update each of these registry keys. See [Registry keys to update \(iSCSI only\)](#).

**Table 2. Registry keys to update (iSCSI only)**

Registry keys	Instructions
LinkDownTime	Set to 600.
AsyncLogoutPauseTimeout (new value)	Add this REG_DWORD key in the same key as LinkDownTime. Set it to 600.

**Table 2. Registry keys to update (iSCSI only) (continued)**

Registry keys	Instructions
DelayBetweenReconnect PortalRetryCount	Find the DelayBetweenReconnect value. Set the PortalRetryCount value so that $\text{PortalRetryCount} * \text{DelayBetweenReconnect} = 600$
SrbTimeoutDelta (for PowerPath only)	Set to 100 for PowerPath only.

5. Quit the Registry Editor.

## Windows host — Configuring to connect to an iSCSI interface

Before an initiator can establish a session with a target, the initiator must discover where the targets are located and the names of the targets available to it. To obtain this information the initiator uses the iSCSI discovery process. The iSCSI interfaces support discovery with or without an iSNS server. Without iSNS discovery, you must add the target information to the Microsoft iSCSI Initiator. With iSNS discovery, the initiator queries the iSNS server where all iSCSI initiators and targets register themselves, and the server responds with a list of available targets. When the target information is available to the Microsoft iSCSI Initiator, you can connect the host initiator to the target so the host can access the iSCSI LUNs.

**NOTE:** Unless you are using iSCSI targets in a clustered environment, avoid giving more than one initiator access to the same LUN. Conflicts can occur if more than one initiator tries to write to the LUN. If the LUN is formatted with the NTFS file system in Windows, simultaneous writes can corrupt the NTFS file system on the LUN.

Each iSCSI interface is a target. If a storage system has two iSCSI interfaces, it has two targets. Each target has one session.

To connect to an iSCSI target, you must add the target IP address in Microsoft iSCSI Initiator. If you have multiple targets (iSCSI interfaces), you can use the Microsoft iSCSI initiator to discover the targets through an individual IP address.

### To configure the Windows host initiators:

#### For Windows Servers:

- Multi-path configuration with iSCSI or PowerPath:

[Configuring a Windows Server initiator to connect to a storage system iSCSI interface — multi-path configuration](#)

[Setting Up MPIO for a Windows Cluster Using a Storage System](#) gives an end-to-end example of setting up a two-node Windows Server 2008 R2 Exchange cluster in an MPIO multi-path configuration.

#### For Windows 7:

[Configuring a Windows 7 initiator to connect to a storage system iSCSI interface](#)

## Configuring a Windows Server initiator to connect to a storage system iSCSI interface — multi-path configuration

Before you configure a Windows Server initiator to connect to a storage system iSCSI interface in a multi-path configuration:

- You must have configured the storage system iSCSI interface with two IP interfaces on two separate physical ports. Each IP interface should be on a separate IP subnet.
- The Windows host must have two network interfaces. One interface must be on the IP subnet with one of the storage system iSCSI interfaces, and the other interface must be on the IP subnet with the other storage system iSCSI interface.

To configure a Windows Server initiator to connect to a storage system iSCSI interface in a multi-path configuration, perform these tasks:

- Multi-path configuration with Native MPIO:
  - [Setup optional mutual CHAP — Windows Server in multi-path configuration](#)
  - [Configure MPIO to recognize iSCSI devices](#)
  - [Discover the storage system iSCSI interface in an environment — Windows Server in multi-path configuration](#)

4. Review the paths to the SP
5. Verify the paths MPIO will use for load balancing
- Multi-path configuration with PowerPath:
  1. Setup optional mutual CHAP — Windows Server in multi-path configuration
  2. Discover the storage system iSCSI interface in an environment — Windows Server in multi-path configuration

 **NOTE:** MCS is not supported.

## Setup optional mutual CHAP — Windows Server in multi-path configuration

### About this task

To configure optional mutual Challenge Handshake Authentication Protocol (CHAP) you need the mutual CHAP secret specified for the storage system iSCSI interface.


For the storage system iSCSI interface to which you want the host iSCSI initiator to access:

### Steps

1. On the host, start the Microsoft iSCSI Initiator.
2. If mutual CHAP authentication is configured on the storage system iSCSI interface, then in the Microsoft iSCSI Initiator:
  - a. Click the **Configuration** tab.
  - b. On the **Configuration** tab, click **CHAP**.  
The **iSCSI Initiator Mutual Chap Secret** dialog box opens.
  - c. In the **iSCSI Initiator Mutual Chap Secret** dialog box, enter the mutual CHAP secret for the storage system iSCSI interface.  
If the storage system has multiple iSCSI interfaces, this secret is the same for all. You can find this secret in the **CHAP** section on the Access settings page in Unisphere (**Settings > Access > CHAP Interfaces**).
  - d. Click **OK**.

## Configure MPIO to recognize iSCSI devices

### About this task

 **NOTE:** This section does not apply to multi-path configuration with PowerPath.

### Steps

1. Launch the MPIO application.
2. On the **MPIO Properties** dialog box, click the **Discover Multi-Paths** tab.
3. Under **SPC-3 compliant**, select **Add support for iSCSI devices**.
4. Click **Add**. A **Reboot Required** dialog box opens.
5. In the **Reboot Required** dialog box, click **Yes**.
6. Once the server reboots, launch the MPIO application, and verify that the MPIO is configured to claim all iSCSI devices.

## Discover the storage system iSCSI interface in an environment — Windows Server in multi-path configuration

### About this task

If the host initiator is configured for optional initiator Challenge Handshake Authentication Protocol (CHAP) on the storage system iSCSI interface, you need the secret (password) specified for the initiator on the system.


### Steps

1. On the host, start the Microsoft iSCSI Initiator.
2. Click the **Discovery** tab.

3. Under **Target Portals**, click **Discover Portal**.  
The **Discover Target Portal** dialog box opens.
4. In the **Discover Target Portal** dialog box:
  - a. Enter the IP address of the storage system iSCSI interface on the first subnet with the host interface.  
You can find this address with Unisphere by selecting **Storage > Block > iSCSI Interfaces**.
  - b. Click **Advanced**.  
The **Advanced Settings** dialog box opens.
5. In the **Advanced Settings** dialog box, set the following:
  - **Local adapter** to Microsoft iSCSI Initiator.
  - **Initiator IP** to the IP address of the host interface on the first subnet with the storage system iSCSI interface.
6. If the host initiator is configured for optional initiator CHAP on the storage system iSCSI interface:
  - a. Select **Enable CHAP login**.
  - b. Leave **Name** as the default value, which is the initiator's IQN.
  - c. Set **Target secret** to the same secret that is configured for the host initiator on the storage system iSCSI interface.  
The iSCSI interfaces support CHAP secrets of 12 to 16 characters only.
  - d. If the storage system iSCSI interface is configured for mutual CHAP, select **Perform Mutual Authentication**.
7. Click **OK** to close the **Advanced Settings** dialog box.
8. Click the **Targets** tab.
9. In the **Targets** tab under **Discovered Targets**, select the storage system iSCSI target and click **Connect**.  
The **Connect to Target** dialog box opens.
10. In the **Connect to Target** dialog box:
  - a. Verify that **Add this connection to the list of Favorite Targets** is selected.
  - b. Select **Enable Multi-path**.
  - c. Click **Advanced**.  
The **Advanced Settings** dialog box opens.
11. In the **Advanced Settings** dialog box, set the following:
  - **Local adapter** to Microsoft iSCSI Initiator.
  - **Initiator IP** to the address of the host interface on the first subnet with the storage system iSCSI interface.
  - **Target portal IP** to the address of the storage system iSCSI interface on the first subnet with the host interface.  
You can find this address with Unisphere by selecting **Storage > Block > iSCSI Interfaces**.
12. Click **OK** to close the **Advanced Settings** dialog box.
13. Click **OK** to close the **Connect to Target** dialog box.
14. Repeat steps 8 through 13 for all other targets listed in the **Targets** tab. Ensure that the relevant IP addresses are selected accurately. Once connected, each listed target must appear with the **Connected** status.

## Review the paths to the SP

### About this task


 **NOTE:** This section does not apply to multi-path configuration with PowerPath.

### Steps

1. In the **Targets** tab, select a storage system iSCSI interface target, and click **Devices**.
2. On the **Devices** dialog box, under **Configure Multipath IO (MPIO)**, click **MPIO**. The **Device Details** dialog box opens.  
This tab lists all valid paths, with a single path set as Active. This path goes to the SP owner of the storage resource.
3. In the **MPIO** tab, ensure that **Load Balance Policy** is set to **Round Robin With Subset**.
4. Review the list of paths to each device, and verify that they are set to **Active**.  
Although all paths may appear as Active, it does not mean that the I/O operations will be active on all connections. The I/O will be directed only to the paths on the SP that owns the device or storage resource.
5. Click **OK** to close the **Properties** dialog box.
6. Click **OK** to exit the Microsoft iSCSI Initiator.

## Verify the paths MPIO will use for load balancing

### About this task

 **NOTE:** This section does not apply to multi-path configuration with PowerPath.

### Steps

1. Launch the MPIO application.
2. On the **MPIO Properties** dialog box, click the **Configuration Snapshot** tab.
3. Under **Snapshot**, specify a path and file name for the output.
4. Select **Open File upon capture**, and then click **Capture**.  
The output will appear in a text editor. It lists available paths to each device or storage resource. Note the following:
  - Paths with **Active/Optimized** state are used to balance I/O to a storage resource.
  - Paths with **Active/Unoptimized** state are used for failovers only.

## What next?

Continue to [Windows host — Setting up to use iSCSI LUNs](#)

## Configuring a Windows 7 initiator to connect to a storage system iSCSI interface

### About this task

If the host initiator is configured for optional initiator Challenge Handshake Authentication Protocol (CHAP) on the storage system iSCSI interface, you need the secret (password) specified for the initiator on the storage system.

To configure a Windows 7 to connect to a storage system:

### Steps

1. On the host, start the Microsoft iSCSI Initiator.  
One way to start the iSCSI Initiator is by going to the Control Panel and selecting **All Control Panel Items > Administrative Tools > iSCSI Initiator**.
2. If prompted to start the iSCSI service, click **Yes**.
3. In the **Targets** tab, enter the IP address of the storage system iSCSI interface and click **Quick Connect**.
4. In the Quick Connect window under Discovered targets, select the storage system iSCSI interface and click **Connect**.  
The storage system iSCSI LUNs on the target (storage system iSCSI interface) for the host are added to Windows 7.
5. Click **Done**.  
The connection to the storage system iSCSI interface appears on the Targets tab as Connected.
6. Click the **Volumes and Devices** tab and click **Auto Configure**.  
The LUNs are connected to the host.

## Windows host — Setting up to use iSCSI LUNs

To set up a Windows host to use iSCSI LUNs, perform the following tasks:

1. [Register the LUNs as MPIO devices \(Windows Servers\)](#)
2. [Set the offset for the LUN to 64 KB](#)
3. [Configure a volume on the LUN](#)

## Register the LUNs as MPIO devices (Windows Servers)

### About this task


If you are using Multipath I/O (MPIO) with Windows Servers, you must register LUNs as MPIO devices and set up MPIO to discover iSCSI devices:

### Steps

1. On the host, start the MPIO Administrative Tool:  
Either **Start > Administrative Tools** and select **MPIO** or **Start > Run** and enter **mpiocpl.exe**.
2. Open the MPIO control panel, and click the **Discover Multi-Paths** tab.
3. Select the **Add support for iSCSI devices** check box, and click **Add**.
4. When prompted to restart the computer, click **Yes**.  
When the computer restarts, the MPIO Devices tab lists the additional hardware ID "MSFT2005iSCSIBusType\_0x9." When this hardware ID is listed, all iSCSI bus attached devices will be claimed by the Microsoft DSM.
5. Restart the host when prompted.

## Set the offset for the LUN to 64 KB

### About this task

 **NOTE:** This task is only required for systems that were upgraded from Windows Server 2003 to a Windows Server version from 2008 to 2016.

After the initiator logs in to a target, each of the target's LUNs that the initiator can access appears as an unknown disk in the Windows Disk Management tool.

To set the offset for the LUN on the host:

### Steps

1. Select **Run > diskpart**.
2. Select the disk:

```
select disk n
```

where n is the disk number.

If you do not know the disk number, enter:

```
list disk
```

3. On the selected disk, create a primary partition with an offset of 64 KB:

```
create part pri align=64
```

## Configure a volume on the LUN

### About this task


The following configuration process initializes the LUN, creates a partition, formats a volume on the partition, and mounts the partition on a drive letter:

### Steps

1. On the host, in the Microsoft Disk Management tool, select the LUN.
2. If the system asks you to initialize the disk, click **Yes**, but do not choose to make the disk a dynamic disk because the iSCSI interfaces do not support dynamic disks.

For a given LUN, its drive letter, disk number, and LUN number are independent.

3. Use a quick format operation (Windows Servers) or the New Simple Volume wizard (Windows 7) to create a volume on the disk with the following properties:
  - NTFS file system
  - 64K location unit size

 **NOTE:** Do not format more than one LUN at a time. Otherwise, some of the volumes can become write-protected and cannot be formatted.

You can change the volume label. Because the disk number of a LUN can change after system restart or after logging in to and out of a target, be sure to change the default volume label ("New Volume") to a descriptive label.

4. Assign an available drive letter to the disk.
5. Close the Disk Management tool.

## Mac OS host — Setting up for iSCSI LUNs

To set up a Mac OS for iSCSI LUNs, you must perform these tasks:

1. [Installing and configuring the ATTO Xtend SAN iSCSI Initiator on a Mac OS host](#)
2. [Set up a Mac OS host to use LUNs](#)

## Installing and configuring the ATTO Xtend SAN iSCSI Initiator on a Mac OS host

### About this task

To connect a host iSCSI initiator on a Mac OS host to iSCSI storage, you must install the ATTO Xtend SAN iSCSI Initiator and configure the initiator for the target.

### Steps

1. On the storage system, from the **iSCSI Interfaces** page in Unisphere (**Storage > Block > iSCSI Interfaces**), determine the IP address of the storage system iSCSI interface (target) to which you want the host initiator to connect. This iSCSI interface is the one with the iSCSI storage resources for the host.
2. On the Mac OS host, insert the Xtend SAN CD into a CD drive, and following the steps in the installation wizard. An **iSCSI Xtend SAN** icon appears at the location where you chose to install the initiator.
3. Double-click the **iSCSI Xtend SAN** icon.
4. Click the **Discover Targets** tab.
5. In the **Discover Targets** dialog box:
  - a. Enter the IP address of the target, which is the IP address of the iSCSI interface with the iSCSI LUNs for the Mac OS.
  - b. To use optional CHAP:
    - Enter the target user name.
    - Enter the target secret.
    - For optional CHAP mutual authentication, select the **Mutual Authentication** checkbox.
  - c. Click **Finish**.The **Setup** dialog box appears, displaying the iqn of the discovered storage system target.
6. In the **Setup** dialog box:
  - a. Select **Visible** and **Auto Login**.
  - b. Click **Save**.
7. Click the **Status** tab.
8. In the **Status** dialog box, click **Login**.

When the login operation is complete, the red icon before the iqname in the left panel turns green.
9. Click **LUNs** to verify the connections.

If the initiator is connected to the iSCSI interface, the iSCSI LUN for the host appears in the LUNs list.

## Set up a Mac OS host to use LUNs

Before the Mac OS host can use a LUN, you must use the Mac OS Disk Utility to:

1. [Format the LUN](#)
2. [Partition the LUN](#)

### Format the LUN

#### Steps

1. On the host, go to **Finder > Application > Utilities**.
2. Double-click **Disk Utility**.
3. In the left panel, select the LUN.
4. Click the **Erase** tab.
5. For **Volume Format**, select the format that you want, and confirm your format choice.
6. Click **Erase** and verify the erase procedure, and click **Erase** again to start the erase process.  
When the erase process is finished, the LUN is ready for you to partition it.

### Partition the LUN

#### Steps

1. On the host, go to **Finder > Application > Utilities**.
2. Double click **Disk Utility**.
3. In the left panel, select the LUN.
4. Click the **Partition** tab.
5. Under Volume Scheme, select the number of partitions for the LUN.  
The utility displays equal-sized partitions to fill the available space on the LUN.
6. For each partition:
  - a. Select the partition.
  - b. In **Name**, enter a name for the partition.
  - c. Under **Format**, select the format for the partition.  
The default format - Mac OS Extended (Journaled) - is a good choice for most uses.
  - d. In **Size**, enter the size for the partition.
7. When you have specified, the name, size, and format for each partition, click **Apply**.  
The Disk Utility uses the partition information to create volumes that the host can access and use. When the partitioning process is complete, the new volumes are mounted on the desktop and ready to use.  
You are now ready to either migrate data to the LUN or have the host start using the LUN. To migrate data to the LUN, go to [Migrating FC or iSCSI Data to the Storage System](#).

## iSCSI troubleshooting

This section contains information about:

- [iSCSI session troubleshooting](#)
- [Known Microsoft iSCSI Initiator problems](#)

### iSCSI session troubleshooting

#### Steps

1. Use **ping** with the IP address to verify connectivity from the host to the target's IP address.



Using the IP address avoids name resolution issues.

**NOTE:** You can find the IP address for the target by selecting **Storage > Block > iSCSI Interfaces** in Unisphere.

Some switches intentionally drop ping packets or lower their priority during times of high workload. If the ping testing fails when network traffic is heavy, verify the switch settings to ensure the ping testing is valid.

2. On the host, verify that the iSCSI initiator service is started.

**NOTE:** The iSCSI service on the iSCSI interface starts when the system is powered up.

3. In the Microsoft iSCSI Initiator, verify the following for the target portal:

- IP address(es) or DNS name of the storage system iSCSI interface with the host's LUNs.

**NOTE:** For a host running PowerPath or Windows native failover, the target portal has two IP addresses.

- Port is 3260, which is the default communications port for iSCSI traffic.

4. Verify that the iSCSI qualified names (IQN) for the initiators and the iSCSI interface name for the target are legal, globally unique, iSCSI names.

**NOTE:** An IQN must be a globally unique identifier of as many as 223 ASCII characters.

For a Windows host initiator — You can find this IQN on the **General** or **Configuration** tab of the Microsoft iSCSI initiator (depending on the version).

5. If you are using optional CHAP authentication, ensure that the following two secrets are identical by resetting them to the same value:

- The secret for the host initiator in the Microsoft iSCSI Software Initiator or the Linux **open-iscsi** driver.
- The secret configured for the host initiator on the iSCSI interface.

6. If you are using optional mutual CHAP authentication, ensure that the following two secrets are identical by resetting them to the same value:

- The secret for the host initiator in the Microsoft iSCSI Software Initiator or the Linux **open-iscsi** driver.
- The secret for the iSCSI interface on the iSCSI interface.

## Known Microsoft iSCSI Initiator problems

The following table describes known problems that with the Microsoft iSCSI Initiator and describes workarounds.

**Table 3. Microsoft iSCSI Initiator problems**

Problem	Symptom	Workaround
Initiator cannot refresh its targets list.	If you use iSNS and an initiator is disconnected from the network, the initiator may not refresh its target list. When attempting to refresh the target list, the initiator logs the iSNS error auth unknown (0x6) to the Windows Event Log.	<ol style="list-style-type: none"><li>1. Select <b>Windows Administrative Tools &gt; Services</b>.</li><li>2. Stop and restart the <b>Microsoft iSCSI Initiator</b>.</li></ol>
Login problems occur when you use iSNS for target discovery.	When you configure the initiator with iSNS target discovery, it can intermittently fail to log in to a target with the following error message: The target name is not found or is marked as hidden from login.	The Microsoft iSCSI Initiator eventually recovers from this situation. To speed up the process, refresh the target list a few times until the target in question is discovered.
Initiator messages fill up the Windows Event Log.	If the initiator has an active session with an iSCSI interface and the iSCSI interface becomes unavailable, then the initiator logs multiple messages to the Windows Event Log. If multiple LUNs are configured for each target, the messages that the initiator generates can quickly fill the log.	To avoid this situation, log out all connected initiators before bringing the target down for its scheduled downtime.

**Table 3. Microsoft iSCSI Initiator problems (continued)**

Problem	Symptom	Workaround
Cannot write to a filesystem on the storage resource connected to the host.	Filesystem is read-only.	<ol style="list-style-type: none"><li>1. Verify that the registry values as set as described in <a href="#">Set registry values</a>.</li><li>2. Verify that the Microsoft iSCSI Initiator is configured as described in <a href="#">Windows host — Configuring to connect to an iSCSI interface</a></li></ol>

# Setting Up a Unix Host to Use iSCSI Storage

This chapter describes how to set up an AIX, Citrix XenServer, HP-UX, Linux, or Solaris host to use iSCSI storage.

## Topics:

- [Requirements for setting up a host](#)
- [Using multi-path management software on the host](#)
- [AIX host — Setting up for iSCSI storage](#)
- [Citrix XenServer host — Setting up for iSCSI storage](#)
- [HP-UX host — Setting up for iSCSI storage](#)
- [Linux host — Setting up for iSCSI storage](#)
- [Solaris host — Setting up for iSCSI storage](#)
- [What's next?](#)
- [iSCSI session troubleshooting](#)

## Requirements for setting up a host

These system and network requirements must be met before setting up a host to use Unity storage.

Before you can set up a host to use Unity storage, the following storage system and network requirements must be met.

### Network requirements

For a host to connect to LUNs on an iSCSI interface, the host must be in the same network environment with the iSCSI interface. To achieve best performance, the host should be on a local subnet with each iSCSI interface that provides storage for it. In a multi-path environment, each physical interface must have two IP addresses assigned; one on each SP. The interfaces should be on separate subnets.

**NOTE:** The Linux iSCSI driver, which is part of the Linux operating system and which you configure so that the host iSCSI initiators can access the iSCSI storage, does not distinguish between NICs on the same subnet. As a result, to achieve load balancing, an iSCSI interface connected to a Linux host must have each NIC configured on a different subnet.

To achieve maximum throughput, connect the iSCSI interface and the hosts for which it provides storage to their own private network. That is, a network just for them. When choosing the network, consider network performance.

### Path management network requirements

**NOTE:** Path management software is not supported for a Windows 7 or Mac OS host connected to a Unity system.

When implementing a highly-available network between a host and your system, keep in mind that:

- A LUN is visible to both SPs
- You can configure up to 8 IPs per physical interface. If more than one interface is configured on a physical interface, each interface must be configured on a separate VLAN.
- Network switches may be on separate subnets.

**NOTE:** Directly attaching a host to a Unity system is supported if the host connects to both SPs and has the required multipath software.

The following figure shows a highly-available iSCSI network configuration for hosts accessing a storage resource (iSCSI LUNs). Switch A and Switch B are on separate subnets. Host A and Host B can each access the storage resource through separate NICs. If the storage resource is owned by SP A, the hosts can access the storage resource through the paths to the interfaces on SP A. Should SP A fail, the system transfers ownership of the resource to SP B and the hosts can access the storage resource through the paths to the interfaces on SP B.

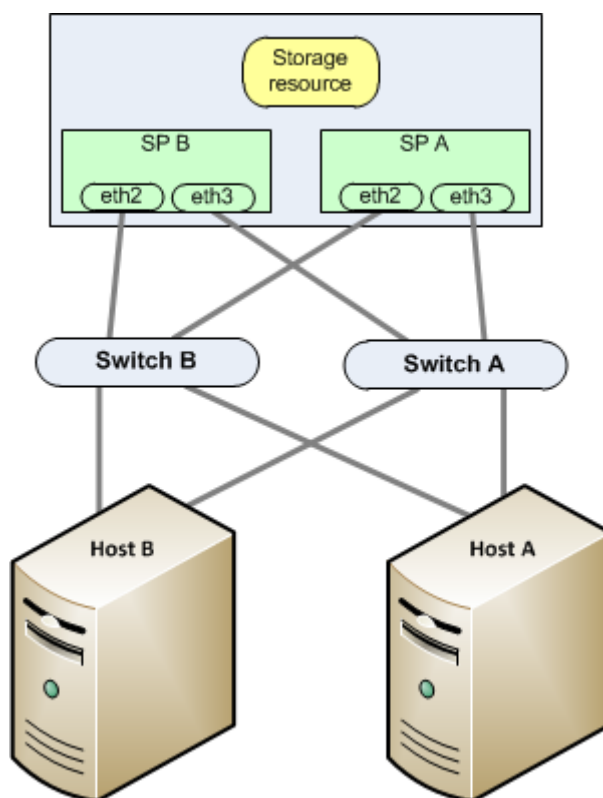


Figure 2. Highly-available iSCSI network sample

## Storage system requirements

- Install and configure the system using the **Initial Configuration** wizard.
  - Use Unisphere or the CLI to configure NAS servers or interfaces, or iSCSI LUNs, on the storage system.
- NOTE:** On an HP-UX host, the iSCSI initiator will not discover the iSCSI storage if it does not detect a LUN from the storage system assigned to host LUN ID 0. We recommend that you create a unique target, create a LUN on this interface, and give it access to the HP-UX host. The first LUN that you assign to a host is automatically assigned host LUN ID 0.

## Using multi-path management software on the host

Multi-path management software manages the connections (paths) between the host and the storage system should one of the paths fail. The following types of multi-path managements software are available for a host connected to a storage system:

- EMC PowerPath software on an HP-UX, Linux, or Solaris host
- Native mulitpath software on a Citrix XenServer, HP-UX 11i, Linux, or Solaris host

For compatibility and interoperability information, refer to the Unity Support Matrix on the support website.

## Setting up your system for multi-path management software

For your system to operate with hosts running multi-path management software, two iSCSI IPs are required. These IPs should be on separate physical interfaces on separate SPs.

Verify the configuration in Unisphere. For details on how to configure iSCSI interfaces, refer to topics about iSCSI interfaces in the Unisphere online help.

- NOTE:** For highest availability, use two network interfaces on the iSCSI interface. The network interfaces should be on separate subnets. You can view the network interfaces for an iSCSI interface within Unisphere.

# Installing PowerPath

## Steps

1. On the host or virtual machine, download the latest PowerPath version from the PowerPath software downloads section on the Online Support website.
2. Install PowerPath as described in the appropriate PowerPath installation and administration guide for the host's or virtual machine's operating system.  
This guide is available on Online Support. If the host or virtual machine is running the most recent version and a patch exists for this version, install it, as described in the `readme` file that accompanies the patch.
3. When the installation is complete, reboot the host or virtual machine.
4. When the host or virtual machine is back up, verify that the PowerPath service has started.

# Installing native multipath software

Whether you need to install multipath software, depends on the host's operating system.

## Citrix XenServer

By default XenServer uses the Linux native multipathing (DM-MP) as its multipath handler. This handler is packaged with the Citrix XenServer operating system software.

## Linux

To use Linux native multipath software, you must install the Linux multipath tools package as described in [Installing or updating the Linux multipath tools package](#).

## HP-UX 11i

Native multipath failover is packaged with the HP-UX operating system software.

## Solaris

Sun's native path management software is Sun StorEdge™ Traffic Manager (STMS).

**For Solaris 10** — STMS is integrated into the Solaris operating system patches you install. For information on install patches, refer to the Sun website.

# Installing or updating the Linux multipath tools package

To use Linux native multipath failover software, the Linux multipath tools package must be installed on the host. This package is installed by default on SuSE SLES 10 or higher, but is not installed by default on Red Hat.

If you need to install the multipath tools package, install the package from the appropriate website below.

## For SuSE:

<http://www.novell.com/linux/>

The multipath tools package is included with SuSE SLES 9 SP3 and you can install it with YaST or RPM.

## For Red Hat:

<http://www.redhat.com>

The multipath tools package is included with Red Hat RHEL4 U3 or RHEL5, and you can install it with YaST or Package Manager. If an update is available, follow the instructions for installing it on the <http://www.redhat.com> website.

## What's next?

Do one of the following:

- To set up an AIX host to use storage, refer to [AIX host — Setting up for iSCSI storage](#).
- To set up a Citrix XenServer host to use storage, refer to [Citrix XenServer host — Setting up for iSCSI storage](#).
- To set up an HP-UX host to use storage, refer to [HP-UX host — Setting up for iSCSI storage](#).
- To set up a Linux host to use storage, refer to [Linux host — Setting up for iSCSI storage](#).
- To set up a Solaris host to use storage, refer to [Solaris host — Setting up for iSCSI storage](#).

## AIX host — Setting up for iSCSI storage

To set up an AIX host to use iSCSI storage, perform these tasks:

1. [Install AIX software](#)
2. [Configure the AIX iSCSI initiator](#)
3. [Configure LUNs as AIX disk drives](#)
4. [Prepare the LUNs to receive data](#)

## Install AIX software

### Steps

1. Log in to the AIX host using an account with administrator privileges.
2. Download the AIX ODM Definitions software package to the /tmp directory on the AIX host as follows:
  - a. Navigate to AIX ODM Definitions on the software downloads section on the **Support** tab of the Online Support website.
  - b. Choose the version of the EMC ODM Definitions for the version of AIX software running on the host, and save the software to the /tmp directory on the host.
3. Start the System Management Interface Tool to install the software:

```
smit installp
```

4. In the /tmp directory, uncompress and untar the EMC AIX fileset for the AIX version running on the host:

```
uncompress EMC.AIX.x.x.x.x.tar.z  
tar -xvf EMC.AIX.x.x.x.x.tar
```

5. In the Install and Update Software menu, select **Install and Update from ALL Available Software** and enter **/tmp** as the path to the software.
6. Select **SOFTWARE to install**.
7. After making any changes to the displayed values, press **Enter**.
8. Scroll to the bottom of the window to see the Installation Summary, and verify that the message "SUCCESS" appears.
9. Reboot the AIX host to have the changes take effect.

## Configure the AIX iSCSI initiator

### About this task

Enable the AIX host to discover iSCSI targets on the storage system:

### Steps

1. On the storage system, from the **iSCSI Interfaces** page in Unisphere (**Storage > Block > iSCSI Interfaces**), determine the IQN and the IP address of the storage system iSCSI interface (target) to which you want the host initiator to connect.
2. On the AIX host, start the System Management Interface Tool:

```
smit
```

3. Using a text editor, open the file `/etc/iscsi/targets`.
4. For each iSCSI interface to be accessed by this initiator, add a line in the format:

```
{portal} {port} {target_iqn}
```

where:

- {portal} = IP address of the network portal
- {port} = number of the TCP listening port (default is 3260)
- {target\_iqn} = formal iSCSI name of the target

## Configure LUNs as AIX disk drives

### About this task

Install the ODM (Object Data Manager) kit on the AIX host:

### Steps


1. Remove any drives that are identified as "Other FC SCSI Disk Drive" by the system by running the following command.

```
lsdev -Cc disk | grep "Other FC SCSI Disk Drive" | awk {'print $1'} | xargs -n1 rmdev -dl
```

2. When applicable, uninstall any existing CLARiON ODM file sets.

```
installp -u EMC.CLARiON.*
```

3. Use the following commands to download the AIX ODM package version 5.3.x or 6.0.x from the FTP server at <ftp.emc.com>.

 **NOTE:** IBM AIX Native MPIO for Unity requires a different ODM package. Contact your service provider for more information.

- a. Access the FTP server by issuing the following command:

```
ftp ftp.emc.com
```

- b. Log in with a user name of `anonymous` and use your email address as a password.
- c. Access the directory that contains the ODM files:

```
cd /pub/elab/aix/ODM_DEFINITIONS
```

- d. Download the ODM package

```
get EMC.AIX.5.3.x.x.tar.Z
```

or

```
get EMC.AIX.6.0.x.x.tar.Z
```

4. Prepare the files for installation.

- a. Move the ODM package into the user install directory.

```
cd /usr/sys/inst.images
```

- b. Uncompress the files.

```
uncompress EMC.AIX.5.3.x.x.tar.Z
```

or

```
uncompress EMC.AIX.6.0.x.x.tar.Z
```

- c. Open, or untar, the files.

```
tar -xvf EMC.AIX.5.3.x.x.tar
```

or

```
tar -xvf EMC.AIX.6.0.x.x.tar
```

- d. Create or update the TOC file.

```
inutoc
```


5. Install the files.

- PowerPath:

```
installp -ac -gX -d . EMC.CLARiion.aix.rte  
installp -ac -gX -d . EMC.CLARiion.fcp.rte
```

- MPIO:

```
installp -ac -gX -d . EMC.CLARiion.aix.rte  
installp -ac -gX -d . EMC.CLARiion.fcp.MPIO.rte
```

 **NOTE:** You can also install the files using the AIX `smitty` command.

## Prepare the LUNs to receive data

If you do not want to use a LUN as a raw disk or raw volume, then before AIX can send data to the LUN, you must either partition the LUN or create a database file systems on it. For information on how to perform these tasks, refer to the AIX operating system documentation.

## Citrix XenServer host — Setting up for iSCSI storage

To set up a Citrix XenServer host to use iSCSI storage, perform these tasks:

1. [Configure the iSCSI software initiator](#)
2. [Configure the iSCSI software initiator for multipathing](#)

## Configure the iSCSI software initiator

### About this task

The XenServer operating system include iSCSI software that you must configure for each initiator that will connect to the iSCSI storage system.



### Steps

1. On the storage system, from the **iSCSI Interfaces** page in Unisphere (**Storage > Block > iSCSI Interfaces**), determine the IP address of the system interface (target) to which you want the host initiator to connect.
2. Open the XenCenter console.
3. Click **New Storage** at the top of the console.
4. In the **New Storage** dialog box, under **Virtual disk storage**, select **iSCSI**.
5. Under **Name**, enter a descriptive name of the virtual disk (Storage Repository).
6. To use optional CHAP
  - a. Check **Use CHAP**.
  - b. Enter the CHAP username and password.
7. Click **Discover IQNs**.
8. Click **Discover LUNs**.
9. Once the **IQN** and **LUN** fields are populated, click **Finish**.

The host scans the target to see if it has any XenServer Storage Repositories (SRs) on it already, and if any exist you are asked if you want to attach to an existing SR or create a new SR.

## Configure the iSCSI software initiator for multipathing

### About this task

Citrix recommends either enabling multipathing in XenCenter before you connect the pool to the storage device or if you already created the storage repository, putting the host into Maintenance Mode before you enable multipathing.

If you enable multipathing while connected to a storage repository, XenServer may not configure multipathing successfully. If you already created the storage repository and want to configure multipathing, put all hosts in the pool into Maintenance Mode before configuring multipathing and then configure multipathing on all hosts in the pool. This ensures that any running virtual machines that have LUNs in the affected storage repository are migrated before the changes are made.

### Steps

1. In XenCenter enable the multipath handler:
  - a. On the host's **Properties** dialog box, select the **Multipathing** tab.
  - b. On the **Multipathing** tab, select **Enable multipathing on this server**.
2. Verify that multipathing is enabled by clicking the storage resource's **Storage general properties**.

## HP-UX host — Setting up for iSCSI storage

To set up an HP-UX host to use iSCSI storage, perform these tasks:

1. [Download and install the HP-UX iSCSI initiator software](#)
2. [Configure HP-UX access to an iSCSI interface \(target\)](#)
3. [Make the storage processors available to the host](#)
4. [Verify that native multipath failover sees all paths to the LUNs](#)
5. [Prepare the LUNs to receive data](#)

## Download and install the HP-UX iSCSI initiator software

### Steps

1. On the HP-UX host, open a web browser and download the iSCSI initiator software from the HP-UX website.
2. Install the initiator software using the information on the site or that you downloaded from the site.

# Configure HP-UX access to an iSCSI interface (target)

## About this task

Before an HP-UX iSCSI initiator can send data to or received data from iSCSI LUNs, you must configure the network parameters for the NIC initiators so that they can connect to the iSCSI interface (target) with the iSCSI LUNs.

To configure access to an iSCSI interface:

## Steps

1. Log into the HP-UX host as superuser (root).
2. Add the path for the iscsi util and other iSCSI executables to the root path:

```
PATH=$PATH:/opt/iscsi/bin
```

3. Verify the iSCSI initiator name:

```
iscsiutil -l
```

The iSCSI software initiator configures a default initiator name in an iSCSI Qualified Name (IQN) format.


For example:

```
iqn.1986-03.com.hp:hpfc214.2000853943
```

To change the default iSCSI initiator name or reconfigure the name to an IEEE EUI-64 (EUI) format, continue to the next step; otherwise skip to step 5.

4. Configure the default iSCSI initiator name:

```
iscsiutil [iscsi-device-file] -i -N iscsi-initiator-name
```

 **NOTE:** For mor information on IQN and EUI formats, refer to the HP-UX iscsi software initiator guide.

where:

- `iscsi-device-file` is the iSCSI device path, `/dev/iscsi`, and is optional if you include the `-i` or `-N` switches in the command.
- `-i` configures the iSCSI initiator information.
- `-N` is the initiator name. When preceded by the `-i` switch, it requires the iSCSI initiator name. The first 256 characters of the name string are stored in the iSCSI persistent information.
- `iscsi-initiator-name` is the initiator name you have chosen, in IQN or EUI format.

5. Verify the new iSCSI initiator name:

```
iscsiutil -l
```

6. For each iSCSI target device you will statically identity, store the target device information in the kernel registry, adding one or more discovery targets:

```
iscsitutil [/dev/iscsi] -a -I ip-address/hostname [-P tcp-port] [-M portal-grp-tag]
```

where

- `-a` adds a discovery target address into iSCSI persistent information. You can add discovery target addresses only with this option.
- `-I` requires the IP address or hostname of the discovery target address.
- `ip-address/hostname` is the IP address or host name component of the target network portal.
- `-P tcp-port` is the listening TCP port component of the discovery target network portal (optional). The default iSCSI TCP port number is 3260.
- `-M portal-grp-tag` is the target portal group tag (optional). The default target portal group tag for discovery targets is 1.

For example:

```
iscsiutil -a -I 192.1.1.110
```

or, if you specify the hostname,

```
iscsiutil -a -I target.hp.com
```

If an iSCSI TCP port used by the discovery target is different than the default iSCSI port of 3260, you must specify the default TCP port used by the discovery target, for example,

```
iscsiutil -a -I 192.1.1.110 -P 5001
```

or

```
iscsiutil -a -I target.hp.com -P 5001
```

7. Verify the discovery targets that you have configured:

```
iscsiutil -p -D
```

8. To discover the operational target devices:

```
/usr/sbin/ioscan -H 225  
ioscan -NfC disk (for HP-UX 11i v3 only)
```

9. To create the device files for the targets:

```
/usr/sbin/insf -H 225
```

10. To display operational targets:

```
iscsiutil -p -O
```

## Make the storage processors available to the host

Verify that each NIC sees only the storage processors (targets) to which it is connected:

```
ioscan -fnC disk  
insf -e
```

```
ioscan -NfC disk (for HP-UX 11i v3 only)
```

## Verify that native multipath failover sees all paths to the LUNs

### About this task

If you are using multipath failover:

### Steps

1. Rescan for the LUNs:

```
ioscan -NfC disk|  
insf -e
```

2. View the LUNs available to the host:

```
ioscan -NfnC disk
```

3. Verify that all paths to the storage system are CLAIMED:

```
ioscan -NkfnC lunpath
```

## Prepare the LUNs to receive data

### About this task

If you do not want to use a LUN as a raw disk or raw volume, then before HP-UX can send data to the LUN, perform the following tasks as described in the HP-UX operating system documentation:

### Steps

1. Make the LUN visible to HP-UX.
2. Create a volume group on the LUN.

## Linux host — Setting up for iSCSI storage

To set up a Linux host to use iSCSI storage, perform these tasks:

1. [Configure Linux iSCSI initiator software](#)
2. [Set up the Linux host to use the LUN](#)

## Configure Linux iSCSI initiator software

### About this task

The Linux operating system includes the iSCSI initiator software — the iSCSI driver **open-iscsi** — that comes with the Linux kernel. You must configure this open-iscsi driver with the network parameters for each initiator that will connect to your iSCSI storage system.

**NOTE:** The Linux iSCSI driver gives the same name to all network interface cards (NICs) in a host. This name identifies the host, not the individual NICs. This means that if multiple NICs from the same host are connected to an iSCSI interface on the same subnet, then only one NIC is actually used. The other NICs are in standby mode. The host uses one of the other NICs only if the first NIC fails.

Each host connected to an iSCSI storage system must have a unique iSCSI initiator name for its initiators (NICs). To determine a host's iSCSI initiator name for its NICs use `cat /etc/iscsi/initiatorname.iscsi` for open-iscsi drivers. If multiple hosts connected to the iSCSI interface have the same iSCSI initiator name, contact your Linux provider for help with making the names unique.


To configure the Linux **open-iscsi** driver:

**NOTE:** The EMC Host Connectivity Guide for Linux on the EMC Online Support website provides the latest information about configuring the **open-iscsi** driver.

### Steps

1. On the storage system, from the **iSCSI Interfaces** page in Unisphere (**Storage > Block > iSCSI Interfaces**), determine the IP address of the storage system iSCSI interface (target) to which you want the host initiators to connect.
2. For any Linux initiators connected to the iSCSI interface with CHAP authentication enabled, stop the iSCSI service on the Linux host.
3. Using a text editor, such as `vi`, open the `/etc/iscsi/iscsi.conf` file.
4. Uncomment (remove the `#` symbol) before the recommended variable settings in the iSCSI driver configuration file as listed in the table below:

**Table 4. Open-iscsi driver recommended settings**

Variable name	Default setting	Recommended setting
<code>node.startup</code>	manual	auto
<code>node.session.iscsi.InitialR2T</code>	No	Yes
<code>node.session.iscsi.ImmediateData</code>	Yes	No
<code>node.session.timeo.replacement_timeout</code>	120	120  <b>NOTE:</b> In congested networks you may increase this value to 600. However, this time must be greater than the combined <code>node.conn[0].timeo.timeo.noop_out_interval</code> and <code>node.conn[0].timeo.timeo.noop_out_time</code> times.
<code>node.conn[0].timeo.timeo.noop_out_interval</code>	10	later in congested networks This value should not exceed the values in <code>node.session.timeo.replacement_timeout</code> .
<code>node.conn[0].timeo.timeo.noop_out_timeout</code>	15	

- To start the iSCSI service automatically on reboot and powerup, set the run level to 345 for the iSCSI service.
- Discover and log in to the host to which you want to connect with the `iscsiadm` command for Red Hat 5 or later or YaST for SuSE 10 or later.  
You need to perform a discovery on only a single IP address because the storage system also returns its other iSCSI target, if it is configured for a second iSCSI interface.

- Configure optional CHAP authentication on the open-iscsi driver initiator:

**For Red Hat 5 or later**

Use the **iscsiadm** command to do the following:

For optional initiator CHAP:

- Enable CHAP as the authentication method.
- Set the username for the initiator to the initiator's IQN, which you can find with the **iscsiadm -m node** command.
- Set the secret (password) for the initiator to the same secret that you entered for the host initiator on the storage system.

For optional mutual CHAP

- Set the username (username\_in) to the initiator's IQN, which you can find with the **iscsiadm -m node** command.
- Set the secret (password\_in) for the target to the same secret that you entered for the iSCSI interface.

**For SuSE 10 or later**

Use the YaST to do the following for the open-iscsi driver initiator:

For optional initiator CHAP:

- Enable incoming authentication.
- Set the initiator CHAP username to the initiator's IQN, which you can find with the **iscsiadm -m node** command.
- Set the initiator CHAP password (secret) to the same secret that you entered for the host initiator on the storage system.

For mutual CHAP:

- Enable outgoing authentication (mutual CHAP).
- Set the mutual CHAP username to the initiator's IQN, which you can find with the **iscsiadm -m node** command.
- Set the initiator password (secret) for the target to the same secret that you entered for the iSCSI interface.

- Find the driver parameter models you want to use, and configure them as shown in the examples in the configuration file.
- Restart the iSCSI service.

## Set up the Linux host to use the LUN

### About this task

Perform the following tasks as described in the Linux operating system documentation:

### Steps

1. Find the LUN ID:
  - a. In Unisphere, select **Storage > Block > LUNs**.
  - b. On the LUN, select **Edit**.
  - c. On the **Properties** window, select **Access > Access details** to determine the LUN ID.
2. On the host, partition the LUN.
3. Create a file system on the partition.
4. Create a mount directory for the file system.
5. Mount the file system.

### Results

The Linux host can now write data to and read data from the file system on the LUN.

## Solaris host — Setting up for iSCSI storage

To set up a Solaris host to use iSCSI storage, perform these tasks:

1. [Configure Sun StorEdge Traffic Manager \(STMS\)](#)
2. [Configure Solaris access to an iSCSI interface \(target\)](#)
3. [Prepare the LUN to receive data](#)

## Configure Sun StorEdge Traffic Manager (STMS)

### About this task

If you plan to use STMS on the host to manage the paths to the LUNs, you must first configure it:

### Steps

1. Enable STMS by editing the following configuration file:

Solaris 10 — Do one of the following:

- Edit the **/kernel/drv/fp.conf** file by changing the `mpxio-disable` option from `yes` to `no`.  
or
- Execute the following command:

```
stmsboot -e
```

2. We recommend that you enable the STMS auto-restore feature to restore LUNs to their default SP after a failure has been repaired. In Solaris 10, auto-restore is enabled by default.
3. If you want to install STMS offline over NFS, share the root file system of the target host in a way that allows root access over NFS to the installing host, if you want to install STMS offline over NFS. You can use a command such as the following on `target_host` to share the root file system on `target_host` so that `installer_host` has root access:

```
share -F nfs -d 'root on target_host' -o ro,rw=installer host,root=installer_host /
```

If the base directory of the package (the default is `/opt`) is not part of the root file system, it also needs to be shared with root access.

4. For the best performance and failover protection, we recommend that you set the load balancing policy to round robin:

```
setting load-balance="round-robin"
```

## Configure Solaris access to an iSCSI interface (target)

### About this task

Before a Solaris iSCSI initiator can send or receive data to the iSCSI LUNs, you must configure the network parameters for the NIC initiators so that they can connect to the iSCSI interface (target) with the iSCSI LUNs.


To configure access to an iSCSI interface:

### Steps

1. Log into the Solaris system as superuser (root).
2. Configure the target device to be discovered using SendTargets dynamic discovery.

Example:

```
iscsiadm modify discovery-address 10.14.111.222:3260
```

 **NOTE:** If you do not want the host to see specific targets, use the static discovery method as described in the Solaris server documentation.

3. Enable the SendTargets discovery method.

Examples:

```
iscsiadm modify discovery --sendtargets enable
```

or

```
iscsiadm modify discovery -t enable
```

4. Create the iSCSI device links for the local system.


For example:

```
devfsadm -i iscsi
```

5. If you want Solaris to login to the target more than once (multiple paths), use:

```
iscsiadm modify target-param -c <logins> <target_iqn>
```

where `logins` is the number of logins and `target_iqn` is the IQN of the iSCSI interface (target).

 **NOTE:** You can determine the IQN of the iSCSI interface from Unisphere on the **iSCSI Interfaces** page (**Storage > Block > iSCSI Interfaces.**).

## Prepare the LUN to receive data

### About this task

If you do not want to use the LUN as a raw disk or raw volume, then before Solaris can send data to the LUN, you must perform the following tasks as described in the Solaris operating system documentation:

### Steps

1. Partition the LUN.
2. Create and mount a files system on the partition.

## What's next?

You are now ready to either migrate data to the LUN or have the host start using the LUN. To migrate data to the LUN, go to [Migrating FC or iSCSI Data to the Storage System](#).

## iSCSI session troubleshooting

### About this task

If you receive a connection error when the host is trying to log in to an iSCSI target (iSCSI interface), or you cannot see the LUNs on the target, you can be having problems with the iSCSI session between the initiator and the target.

If the session cannot be established, or you get unexpected results from the session, follow this procedure:

### Steps

1. Use **ping** with the IP address to verify connectivity from the host to the target's IP address.

Using the IP address avoids name resolution issues.

 **NOTE:** You can find the IP address for the target by selecting **Storage > Block > iSCSI Interfaces** in Unisphere.


Some switches intentionally drop ping packets or lower their priority during times of high workload. If the ping testing fails when network traffic is heavy, verify the switch settings to ensure the ping testing is valid.

2. Check the host routing configuration using Unisphere under **Settings > Access > Routing**.
3. On the host, verify that the iSCSI initiator service is started.

 **NOTE:** The iSCSI service on the iSCSI interface starts when the system is powered up.


4. In the Microsoft iSCSI Initiator, verify the following for the target portal:

- IP address(es) or DNS name of the storage system iSCSI interface with the host's LUNs.

 **NOTE:** For a host running PowerPath or Windows native failover, the target portal has two IP addresses.

- Port is 3260, which is the default communications port for iSCSI traffic.

5. Verify that the iSCSI qualified names (IQN) for the initiators and the iSCSI interface name for the target are legal, globally unique, iSCSI names.

 **NOTE:** An IQN must be a globally unique identifier of as many as 223 ASCII characters.

For a Linux host initiator — You can find this IQN with the **iscsiadm -m node** command, which lists the IP address and associated iqn for each iSCSI initiator.

For a Solaris host initiator — You can find this IQN with the **iscsi list initiator-node** command.

6. If you are using optional CHAP authentication, ensure that the following two secrets are identical by resetting them to the same value:
  - The secret for the host initiator in the host's iSCSI software.
  - The secret for the iSCSI interface on the iSCSI interface.
7. If you are using optional mutual CHAP authentication, ensure that the following two secrets are identical by resetting them to the same value:
  - The secret for the host initiator in the host's iSCSI software.
  - The secret for the iSCSI interface on the iSCSI interface. You can find this secret in the CHAP section of the **Access Settings** page in Unisphere (**Settings > Access > CHAP**).



# Migrating FC or iSCSI Data

**Topics:**

- [Migrating FC or iSCSI Data to the Storage System](#)

# Migrating FC or iSCSI Data to the Storage System

You can migrate FC or iSCSI disk data to the storage system with either a manual copy or an application-specific tool, if one is available.

## Topics:

- [FC or iSCSI data migration environment and limitations](#)
- [Migrating iSCSI disk data](#)

## FC or iSCSI data migration environment and limitations

The following table outlines the environment for a manual copy migration and an application tool migration of FC or iSCSI data.

**Table 5. Migration environment**

Component	Requirement
Unity storage	LUN sized to accommodate the data in the LUN that you want to migrate and to allow for data growth
Host	Single host with access to the LUN with data to be migrated and also to the LUN for the migrated data
LUN	Single LUN on either a local or attached FC or iSCSI storage device that you migrate in its entirety to the storage system share

The downtime for a manual copy migration is relative to the time required for copying the data from the LUN to the storage system LUN. The downtime for an application-specific tool migration should be less than the downtime for a manual copy.

## Migrating iSCSI disk data

To migrate iSCSI data to a storage system LUN, perform these tasks:

1. [Attach the host or virtual machine to the new storage system LUN](#)
2. [Migrate the data](#)

## Attach the host or virtual machine to the new storage system LUN

### Steps

1. Configure each host or virtual machine initiator that needs access to the LUN to connect to the iSCSI interface (target) with the new LUN, as described in [Windows host — Configuring to connect to an iSCSI interface](#) for a Windows host or virtual machine or [Linux host — Setting up for iSCSI storage](#) for a Linux host.
2. Prepare the new LUN to receive data, as described in [Windows host — Setting up to use iSCSI LUNs](#) for a Windows host or [Linux host — Setting up for iSCSI storage](#) for a Linux host.

## Migrate the data

### Steps

1. If any host or virtual machine applications are actively using the device (LUN) with the data being migrated, stop the applications gracefully.
2. Migrate the data with the method best suited for copying data from the device to the new storage system LUN.  
On a Windows host, this method can be a simple cut and paste or drag and drop operation.
3. When the copy operation is complete:  
On a Windows host:
  - a. Assign a temporary drive letter to the LUN.
  - b. Assign the old drive letter to the LUN to which you copied the data.On a Linux host:
  - a. Unmount the original file system on the device.
  - b. Adjust the host's mount tables, which are typically in **/etc/fstab**, to reflect the new location of the data.
  - c. Mount the new LUN using the **mount -a** or a similar command.
4. Restart the applications on the host.

# General Tasks for Block Hosts

## Topics:

- [Modify Host LUN IDs](#)

## Modify Host LUN IDs

### About this task

You can now specify the Host LUN ID when you create or modify a LUN. If a Host LUN ID was not specified for the LUN at the time it was created, the system automatically assigns a Host LUN ID. You can change the system-assigned Host IDs of the LUNs so that you can achieve the same mapping view of LUNs for each host in a cluster. It also enables you to configure a bootable LUN that will allow a host to boot from the Storage Area Network (SAN).

### Steps

1. Under **Access**, select **Hosts**.
2. Select the relevant host, and then select the **Edit** icon.
3. On the **Host Properties** screen, select the **LUNs** tab.
4. Select **Modify Host LUN IDs**.
5. On the **Modify Host LUN IDs** screen, under **LUN ID**, set the relevant numeric value.  
To configure a bootable LUN, set the value for the relevant LUN to **0**.
6. Click **OK**.

# Setting Up MPIO for a Windows Cluster Using a Storage System

This appendix provides an end-to-end example of a two node Windows Server 2008 R2 cluster in an MPIO multi-path configuration with a storage system.

## Topics:

- [Configuration](#)
- [Setting up cluster nodes \(hosts\)](#)

## Configuration

The components in this configuration are:

- [Two server hosts](#)
- [One storage system](#)

### Two server hosts

Two Server hosts -exhost1, exhost2 - running:

- Windows Server 2008 R2
- Microsoft iSCSI Initiator 2.08
- Failover Clustering
- Multipath I/O

### One storage system

One storage system configured as follows:

- Two iSCSI interfaces (iscsia, iscsib) configured as described in the table below.

 **NOTE:** The second iSCSI interface is optional.

**Table 6. Storage System iSCSI interface configuration**

Name	Details
iscsia	<ul style="list-style-type: none"> <li>◦ <b>IP addresses:</b> 11.222.123.156, 11.222.224.231</li> <li>◦ <b>Target:</b> IQN.192-05.com.emc: fcnev1005000720000-1</li> <li>◦ <b>Storage processor:</b> SP A</li> <li>◦ <b>Ethernet interface:</b> eth3, et2</li> </ul>
iscsib	<ul style="list-style-type: none"> <li>◦ <b>IP addresses:</b> 11.222.123.157, 11.222.224.232</li> <li>◦ <b>Target:</b> IQN.192-05.com.emc: fcnev1005000720000-2</li> <li>◦ <b>Storage processor:</b> SP B</li> <li>◦ <b>Ethernet interface:</b> eth3, et2</li> </ul>

- iSCSI storage resources:
  - cluster\_disk1 (Quorum disk, which is optional, though recommended, for Windows Server 2008 R2)
  - cluster\_disk2 (optional)
  - cluster\_disk3 (optional)

The following figure shows how these components are networked together.

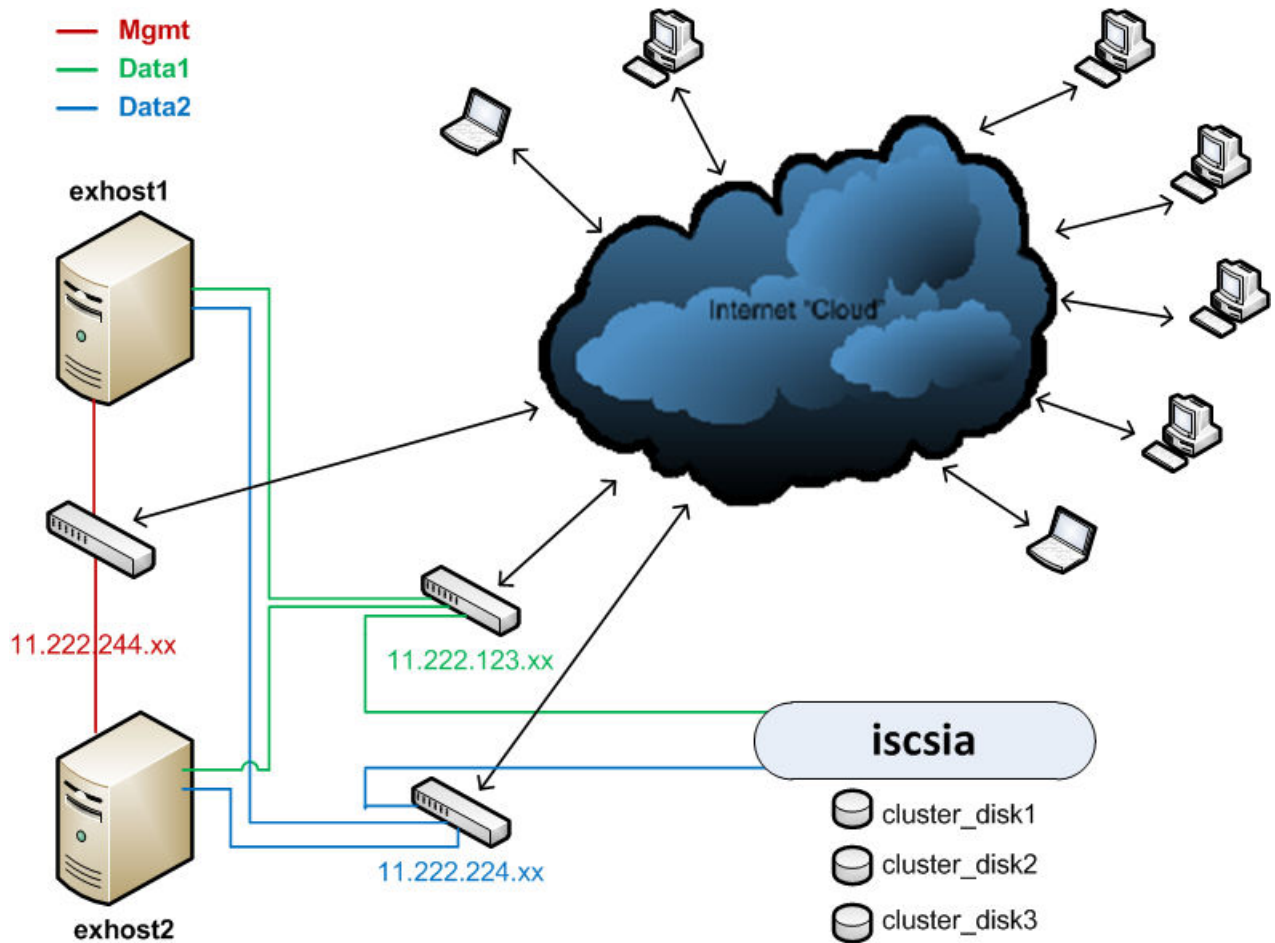


Figure 3. Network configuration

## Setting up cluster nodes (hosts)

### About this task

For simplicity, this section shows only the setup for the single target **iscsia**. It includes the following tasks

### Steps

1. Configure the iSCSI initiator with MPIO on each cluster node
2. Enable MPIO on each cluster node
3. Verify the MPIO settings on each cluster node
4. Present the storage devices to the Primary Node in the cluster
5. Configure the cluster configuration on the Primary Node

## Configure the iSCSI initiator with MPIO on each cluster node

### About this task

On each node in the cluster (**exhost1** and **exhost2**):

### Steps

1. In the Microsoft iSCSI Initiator, select **Discovery > Discover Portal**, add the target portal IP address or the DNS name.

2. Select **Discover Portal > Advanced** and in the **Advanced Settings** dialog box set the following for both the primary and secondary local adapters:
  - **Local adapter** to **Microsoft iSCSI Initiator**.
  - **Initiator IP** to the IP address for the local adapter interface on subnet 11.222.123.xxx for the primary local adapter, and to 11.222.224.xxx for the secondary local adapter.

The host will look for targets on the following portals:

Address	Port	Adapter	IP address
11.222.123.156	3260	Microsoft iSCSI Initiator	11.222.123.xxx
11.222.224.231	3260	Microsoft iSCSI Initiator	11.222.224.xxx

3. Select **Targets > Log On > Connect**, select the following in the Connect to Target dialog box:
  - Add this connection to the list of Favorites
  - Enable multi-path (ensure the Windows MPIO feature is installed first)
4. Select **Connect To Target > Advanced** and in the **Advanced Settings** dialog box, set the following:
  - **Local adapter** to **Microsoft iSCSI Initiator**.
  - **Initiator IP** to the IP address for the local adapter interface on subnet 11.222.123.xxx.
  - **Target portal IP** to **11.222.123.156 / 3260**.
5. Add the secondary session to the existing connection for MPIO:
  - a. Select **Targets > Connect to Target > Advanced**.
  - b. In the **Advanced Settings** dialog box, set the following:
    - **Local adapter** to **Microsoft iSCSI Initiator**.
    - **Initiator IP** to the IP address for the local adapter interface on subnet 11.222.124.xxx.
    - **Target portal IP** to **11.222.224.231 / 3260**.

## Enable MPIO on each cluster node

### About this task

On each node in the cluster (exhost1 and exhost2):

### Steps

1. Click **Start** and enter **MPIO** to launch the control panel applet.
2. Click the **Discover Multi-Path** tab, select **Add support for iSCSI devices**, and click **Add**.
3. Reboot the node when prompted to do so.

## Verify the MPIO settings on each cluster node

### About this task

On each node in the cluster (exhost1 and exhost2):

### Steps

1. After the node finishes rebooting, go to **MPIO Properties > MPIO Devices** and verify that the MPIO hardware IDs (MSInitiator) for the storage system devices were added.

 **NOTE:** Device Hardware ID **MSFT2005iSCSIBusType\_0x9** adds support for all iSCSI devices.

2. Verify the MPIO settings in the Microsoft iSCSI Initiator:
  - a. In the **Targets** tab, select the storage system target and click **Properties**.
  - b. In the **Sessions** tab, select the identifier for the session, click **Devices**.
  - c. In the **Devices** tab, for each storage device (cluster\_disk1, cluster\_disk2, cluster\_disk3), do the following:
    - Select the device and click **MPIO**.
    - In the **MPIO** tab, select the first connection, click **Connections**, and verify the following:

Source Portal	Target Portal
11.222.123.123/xxxx	11.222.123.156/3260

- In the **MPIO** tab, select the second connection, click **Connections**, and verify the following:

Source Portal	Target Portal
11.222.123.224/yyyy	11.222.224.231/3260

## Present the storage devices to the Primary Node in the cluster

On the Primary Node in the cluster (exhost1), format each storage device (cluster\_disk1, cluster\_disk2, cluster\_disk3) and assign a respective letter to each partition. In this example, E is assigned to cluster\_disk1\_ quorum; F is assigned to cluster\_disk2; and, G is assigned to cluster\_disk3.

## Configure the cluster configuration on the Primary Node

### About this task

The steps below follow Microsoft's best practices for clusters.

On the Primary Node (exhost1), in **Failover Cluster Manager**:


### Steps

1. Select **Create a Cluster...** > **Add preferred Domain Joined computers (nodes) to the select servers list** and create an Access Point for administering the cluster and choose the static cluster IP.

For example:

- **Domain:** app.com
- **Node 1:** exhost1.app.com
- **Node 2:** exhost2.app.com
- **Cluster Name:** ex\_cluster1.app.com
- **Network:** 11.222.224.0/xx with address 11.222.224.yyy

2. Configure the network settings:
  - a. Select the cluster (ex\_cluster1).
  - b. Select **Networks** > **Cluster Network #** > **Properties** > **Mgmt Network** > **11.222.224.x** (Cluster Network 3) with the following default settings:
    - **Allow cluster network communications on this network**
    - **Allow clients to connect through this network**
  - c. Select **Networks** > **Cluster Network #** > **Properties** > **Data networks (iscsi)** > **11.222.123.x** (Cluster Network 1) with the following default settings:
    - **Do not allow cluster network communication on this network**
  - d. Select **Networks** > **Cluster Network #** > **Properties** > **Data networks (iscsi)** > **11.222.224.x** (Cluster Network 2) with the following default settings:
    - **Do not allow cluster network communication on this network**
3. Verify dependencies:
  - a. Select the cluster (ex\_cluster1).
  - b. Click **Cluster Core Resources** and verify the following:
    - In the cluster's **Name:ex\_cluster1 Properties** dialog box, verify that the dependencies are **IP address (11.22.224.x) AND cluster\_disk1**.
    - In the cluster's **IP Address: 11.222.224.x Properties** dialog box, verify that the dependencies is **cluster\_disk1**.

 **NOTE:** The Cluster Disk Witness should always be the Quorum disk **cluster\_disk1**, which is the default setting, but it can be changed.