

Dell™ PowerVault™ Modular Disk 3000i Systems Installation Guide

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Notes, Notices



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



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

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Introduction

This guide outlines the steps for configuring the Dell™ PowerVault™ Modular Disk 3000i (MD3000i). This guide also covers installing the MD Storage Manager software and installing and configuring the Microsoft® iSCSI and Linux initiators from the *PowerVault MD3000i Resource CD*, and accessing documentation from the *PowerVault MD Documentation CD*. Other information provided includes system requirements, storage array organization, initial software startup and verification, and discussions of utilities and premium features.

MD Storage Manager enables an administrator to configure and monitor storage arrays for optimum usability. MD Storage Manager operates on both Microsoft® Windows® and Linux operating systems and can send alerts about storage array error conditions by either e-mail or Simple Network Management Protocol (SNMP). These alerts can be set for instant notification or at regular intervals.

System Requirements

Before installing and configuring the MD3000i hardware and MD Storage Manager software, ensure that the operating system is supported and minimum system requirements are met. For more information, refer to the *Dell™ PowerVault™ MD3000i Support Matrix* available on support.dell.com.

Management Station Hardware Requirements

A management station uses MD Storage Manager to configure and manage storage arrays across the network. Any system designated as a management station must be an x86-based system that meets the following minimum requirements:

- Intel® Pentium® or equivalent CPU (133 MHz or faster)
- 128 MB RAM (256 MB recommended)
- 120 MB disk space available
- Administrator or equivalent permissions

- Minimum display setting of 800 x 600 pixels with 256 colors (1024 x 768 pixels with 16-bit color recommended)

Introduction to Storage Arrays

A storage array includes various hardware components, such as physical disks, RAID controller modules, fans, and power supplies, gathered into enclosures. An enclosure containing physical disks accessed through RAID controller modules is called a RAID enclosure.

One or more host servers attached to the storage array can access the data on the storage array. You can also establish multiple physical paths between the host(s) and the storage array so that loss of any single path (through failure of a host server port, for example) does not result in total loss of access to data on the storage array.

The storage array is managed by MD Storage Manager software running either on a host server or a dedicated management station. On a host server system, MD Storage Manager and the storage array communicate management requests and event information directly via iSCSI ports. On a dedicated management station, MD Storage Manager communicates with the storage array either through an Ethernet connection on the RAID controller modules or via the host agent installed on the host server.

Using MD Storage Manager, you configure the physical disks in the storage array into logical components called *disk groups*, then divide the disk groups into *virtual disks*. You can make as many disk groups and virtual disks as your storage array configuration and hardware permit. Disk groups are created in the unconfigured capacity of a storage array, while virtual disks are created in the free capacity of a disk group.

Unconfigured capacity is comprised of the physical disks not already assigned to a disk group. When a virtual disk is created using unconfigured capacity, a disk group is automatically created. If the only virtual disk in a disk group is deleted, the disk group is also deleted. Free capacity is space in a disk group that has not been assigned to a virtual disk.

Data is written to the physical disks in the storage array using RAID technology. RAID levels define the way in which data is written to physical disks. Different RAID levels offer different levels of accessibility, redundancy, and capacity. You can set a specified RAID level for each disk group and virtual disk on your storage array.

You can also provide an additional layer of data redundancy by creating disk groups that have a RAID level other than 0. Hot spares can automatically replace physical disks marked as Failed.

For more information on using RAID and managing data in your storage solution, see the *Dell™ PowerVault™ Modular Disk Storage Manager User's Guide*.

2

Hardware Installation

This chapter provides guidelines for planning the physical configuration of your Dell™ PowerVault™ MD3000i storage array and for connecting one or more hosts to the array. For complete information on hardware configuration, see the *Dell™ PowerVault™ MD3000i Hardware Owner's Manual*.

Storage Configuration Planning

Consider the following items before installing your storage array:

- Evaluate data storage needs and administrative requirements.
- Calculate availability requirements.
- Decide the frequency and level of backups, such as weekly full backups with daily partial backups.
- Consider storage array options, such as password protection and e-mail alert notifications for error conditions.
- Design the configuration of virtual disks and disk groups according to a data organization plan. For example, use one virtual disk for inventory, a second for financial and tax information, and a third for customer information.
- Decide whether to allow space for hot spares, which automatically replace failed physical disks.
- If you will use premium features, consider how to configure virtual disk copies and snapshot virtual disks.

About the Enclosure Connections

The RAID array enclosure is connected to an iSCSI-enabled host server via one or two RAID controller modules. The RAID controller modules are identified as RAID controller module 0 and RAID controller module 1 (see the *PowerVault MD3000i Hardware Owner's Manual* for more information).

Each RAID controller module contains two iSCSI In port connectors that provide direct connections to the host server or switches. iSCSI In port connectors are labeled **In-0** and **In-1** (see the *PowerVault MD3000i Hardware Owner's Manual* for more information).

Each MD3000i RAID controller module also contains an Ethernet management port and a SAS Out port connector. The Ethernet management port allows you to install a dedicated management station (server or standalone system). The SAS Out port allows you to connect the RAID enclosure to an optional expansion enclosure (MD1000) for additional storage capacity.

Cabling the Enclosure

You can connect up to 16 hosts and two expansion enclosures to the storage array.

To plan your configuration, complete the following tasks:

- 1 Evaluate your data storage needs and administrative requirements.
- 2 Determine your hardware capabilities and how you plan to organize your data.
- 3 Calculate your requirements for the availability of your data.
- 4 Determine how you plan to back up your data.

The iSCSI interface provides many versatile host-to-controller configurations. For the purposes of this manual, the most conventional topologies are described. The figures in this chapter are grouped according to the following general categories:

- Direct-attached solutions
- Network-attached (SAN) solutions

Redundancy vs. Nonredundancy

Nonredundant configurations, configurations that provide only a single data path from a host to the RAID enclosure, are recommended only for non-critical data storage. Path failure from a failed or removed cable, a failed NIC, or a failed or removed RAID controller module results in loss of host access to storage on the RAID enclosure.

Redundancy is established by installing separate data paths between the host and the storage array, in which each path is to different RAID controller modules. Redundancy protects the host from losing access to data in the event of path failure, because both RAID controllers can access all the disks in the storage array.

Direct-Attached Solutions

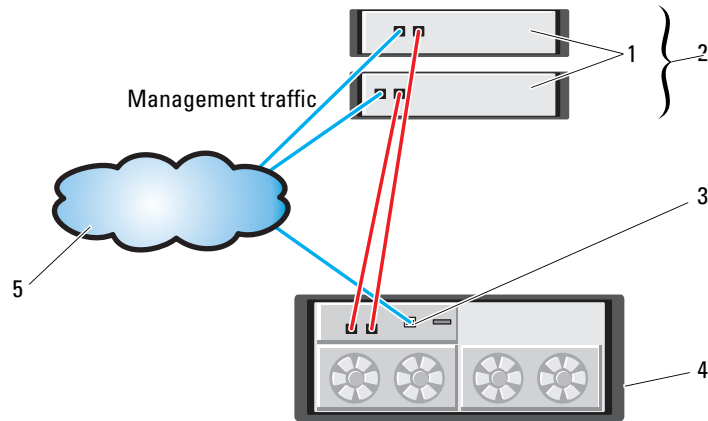
You can cable from the Ethernet ports of your host servers directly to your MD3000i RAID controller iSCSI ports. Direct attachments support single path configurations (for up to four servers) and dual path data configurations (for up to two servers) for both single and dual controller modules.

Single Path Data Configurations

With a single path configuration, a group of heterogeneous clients can be connected to the MD3000i RAID controller through a single physical Ethernet port. Because there is only the single port, there is no redundancy (although each iSCSI portal supports multiple connections). This configuration is supported for both single controller and dual controller modes.

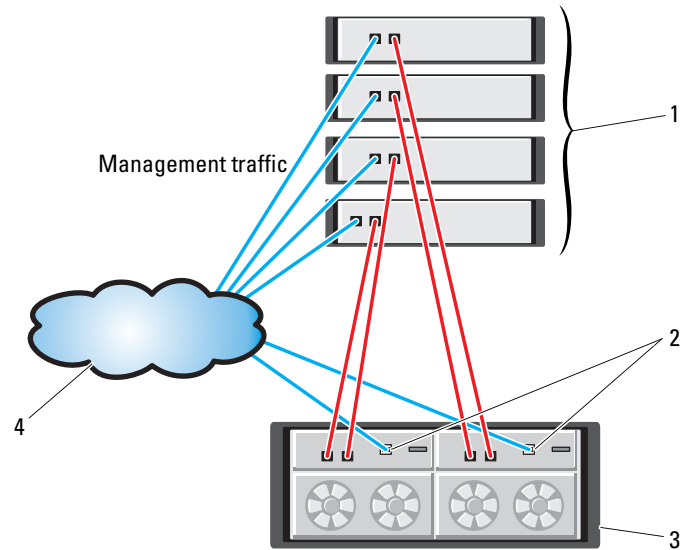
Figure 2-1 and Figure 2-2 show the supported nonredundant cabling configurations to MD3000i RAID controller modules using the single path data configuration. Figure 2-1 shows a single controller array configuration. Figure 2-2 shows how four standalone servers are supported in a dual controller array configuration.

Figure 2-1. One or Two Direct-Attached Servers (or Two-Node Cluster), Single-Path Data, Single Controller (Simplex)



- | | | | | | |
|---|--------------------------------------------|---|--------------------------------------|---|--------------------------|
| 1 | standalone (one or two) host server | 2 | two-node cluster | 3 | Ethernet management port |
| 4 | MD3000i RAID Enclosure (single controller) | 5 | corporate, public or private network | | |

Figure 2-2. Up to Four Direct-Attached Servers, Single-Path Data, Dual Controllers (Duplex)

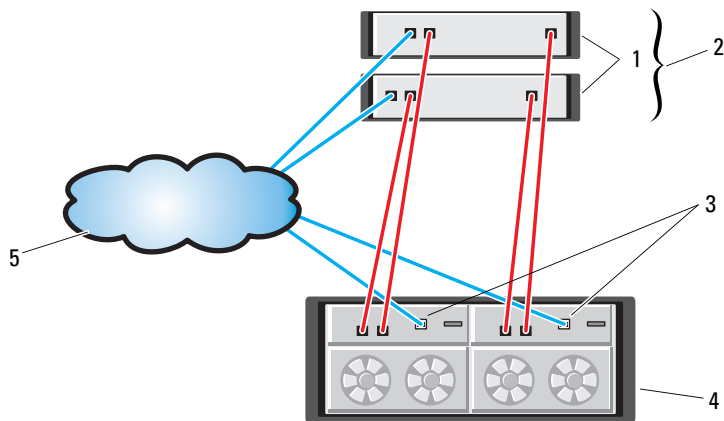


- | | | | | | |
|---|--------------------------------------|---|------------------------------|---|-------------------------------------------|
| 1 | standalone (up to four) host server | 2 | Ethernet management port (2) | 3 | MD3000i RAID Enclosure (dual controllers) |
| 4 | corporate, public or private network | | | | |

Dual Path Data Configuration

In Figure 2-3, up to two servers are directly attached to the MD3000i RAID controller module. If the host server has a second Ethernet connection to the array, it can be attached to the iSCSI ports on the array's second controller. This configuration provides improved availability by allowing two separate physical paths for each host, which ensures full redundancy if one of the paths fail.

Figure 2-3. One or Two Direct-Attached Servers (or Two-Node Cluster), Dual-Path Data, Dual Controllers (Duplex)



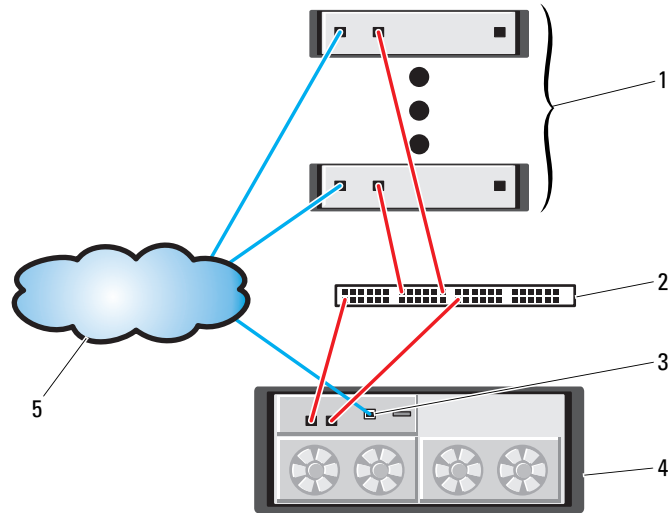
- | | | | | | |
|---|-------------------------------------------|---|--------------------------------------|---|------------------------------|
| 1 | standalone (one or two) host server | 2 | two-node cluster | 3 | Ethernet management port (2) |
| 4 | MD3000i RAID Enclosure (dual controllers) | 5 | corporate, public or private network | | |

Network-Attached Solutions

You can also cable your host servers to the MD3000i RAID controller iSCSI ports through an IP storage area network (SAN) industry-standard 1GB Ethernet switch. By using an IP SAN "cloud" Ethernet switch, the MD3000i RAID controller can support up to 16 hosts simultaneously with multiple connections per session. This solution supports either single- or dual-path data configurations, as well as either single or dual controller modules.

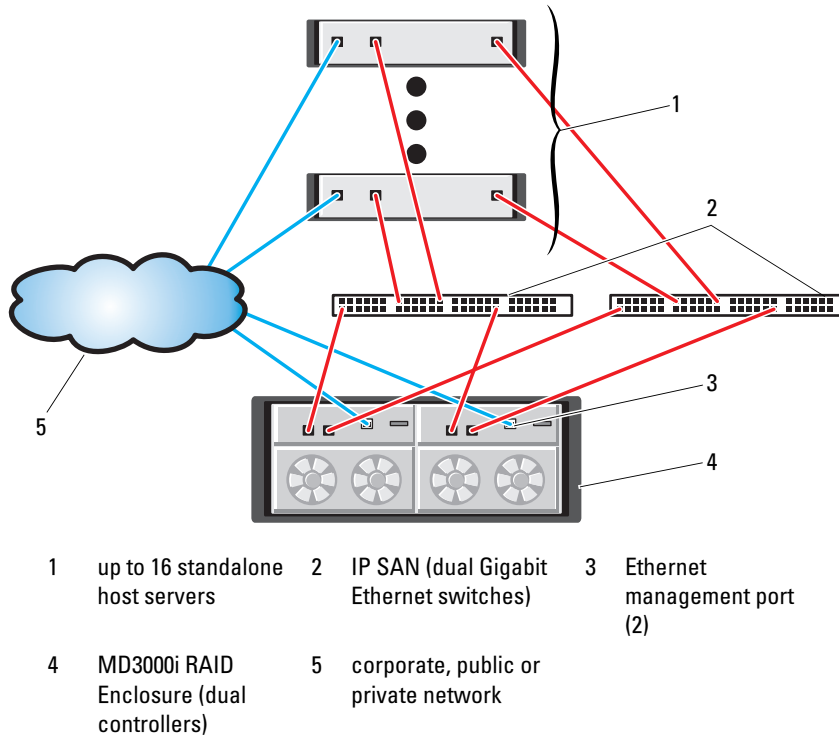
Figure 2-4 shows how up to 16 standalone servers can be attached (via multiple sessions) to a single MD3000i RAID controller module through a network. Hosts that have a second Ethernet connection to the network allow two separate physical paths for each host, which ensures full redundancy if one of the paths fail. Figure 2-5 shows how the same number of hosts can be similarly attached to a dual MD3000i RAID controller array configuration.

Figure 2-4. Up to 16 SAN-Configured Servers, Single-Path Data, Single Controller (Simplex)



- | | | | | | |
|---|--------------------------------------------|---|--------------------------------------|---|--------------------------|
| 1 | up to 16 standalone host servers | 2 | IP SAN (Gigabit Ethernet switch) | 3 | Ethernet management port |
| 4 | MD3000i RAID Enclosure (single controller) | 5 | corporate, public or private network | | |

Figure 2-5. Up to 16 Dual SAN-Configured Servers, Dual-Path Data, Dual Controllers (Duplex)



Attaching MD1000 Expansion Enclosures

One of the features of the MD3000i is the ability to add up to two MD1000 expansion enclosures for additional capacity. This expansion increases the maximum physical disk pool to 45 3.5" SAS and/or SATA II physical disks.


As described in the following sections, you can expand with either a brand new MD1000 or an MD1000 that has been previously configured in a direct-attach solution with a PERC 5/E system.

NOTICE: Ensure that all MD1000 expansion enclosures being connected to the MD3000i are first updated to the latest Dell MD1000 EMM Firmware (available from support.dell.com). Dell MD1000 EMM Firmware versions prior to A03 are not

supported in an MD3000i array; attaching an MD1000 with unsupported firmware causes an uncertified condition to exist on the array. See the following procedure for more information.

Expanding with Previously Configured MD1000 Enclosures

Use this procedure if your MD1000 is now directly attached to and configured on a Dell PERC 5/E system. Data from virtual disks created on a PERC 5 SAS controller cannot be directly migrated to an MD3000i or to an MD1000 expansion enclosure connected to an MD3000i.

 **NOTICE:** If an MD1000 that was previously attached to PERC 5 SAS controller is used as an expansion enclosure to an MD3000i, the physical disks of the MD1000 enclosure will be reinitialized and data will be lost. All data on the MD1000 must be backed up before attempting the expansion.

Perform the following steps to attach previously configured MD1000 expansion enclosures to the MD3000i:

- 1 Back up all data on the MD1000 enclosure(s).
- 2 While the enclosure is still attached to the PERC 5 controller, upgrade the MD1000 firmware to version A03 or above. Windows systems users can reference the **DUP.exe** package; for Linux kernels, users can reference the **DUP.bin** package.
- 3 Before adding the MD1000 enclosure(s), make sure the MD3000i software is installed and up to date. For more information, refer to the *Dell™ PowerVault™ MD3000i Support Matrix* available on support.dell.com.
 - a Install or update (to the latest version available on support.dell.com) the MD Storage Manager on each host server. Install or update (to the latest version available on support.dell.com) the multipath drivers on each host server. The multipath drivers are bundled with Modular Disk Storage Management install. On Windows systems, the drivers are automatically installed when a Full or Host selection is made.
 - b Using the MD Storage Manager, update the MD3000i RAID controller firmware to the latest version available on support.dell.com (**Support→ Download Firmware→ Download RAID Controller Module Firmware**) and the NVSRAM (**Support→ Download Firmware→ Download RAID Controller Module NVSRAM**).
- 4 Stop I/O and turn off all systems:

- a Stop all I/O to the array and turn off affected host systems attached to the MD3000i.
 - b Turn off the MD3000i.
 - c Turn off the MD1000 enclosure(s).
- 5** Referencing the applicable configuration for your rack (Figure 2-1 through Figure 2-5), cable the MD1000 enclosure(s) to the MD3000i.
- 6** Turn on attached units:
- a Turn on the MD1000 expansion enclosure(s). Wait for the enclosure status LED to light blue.
 - b Turn on the MD3000i and wait for the status LED to indicate that the unit is ready:
 - If the status LEDs light a solid amber, the MD3000i is still coming online.
 - If the status LEDs are blinking amber, there is an error that can be viewed using the MD Storage Manager.
 - If the status LEDs light a solid blue, the MD3000i is ready.
 - c After the MD3000i is online and ready, turn on any attached host systems.
- 7** After the MD1000 is configured as the expansion enclosure to the MD3000i, restore the data that was backed up in step 1.

After they are online, the MD1000 enclosures are available for use within the MD3000i system.

Expanding with New MD1000 Enclosures

Perform the following steps to attach new MD1000 expansion enclosures to the MD3000i:

- 1** Before adding the MD1000 enclosure(s), make sure the MD3000i software is installed and up to date. For more information, refer to the *Dell™ PowerVault™ MD3000i Support Matrix* available on support.dell.com.
 - a Install or update (to the latest version available on support.dell.com) the MD Storage Manager on each host server.
 - b Install or update (to the latest version available on support.dell.com) the multipath drivers on each host server.

Software Installation

- I The *PowerVault MD Documentation* CD contains all documentation pertinent to MD3000i hardware and MD Storage Manager software. The *MD3000i Resource* CD contains software and drivers for both Linux and Microsoft® Windows® operating systems.

The *MD3000i Resource* CD also contains a **readme.txt** file covering changes to the software, updates, fixes, patches, and other important data applicable to both Linux and Windows operating systems. The **readme.txt** file also specifies requirements for accessing documentation, information regarding versions of the software on the CD, and system requirements for running the software.

For more information on supported hardware and software for Dell™ PowerVault™ systems, refer to the *Dell™ PowerVault™ MD3000i Support Matrix* located at support.dell.com.

Dell recommends installing all the latest updates available at support.dell.com.


System Assembly and Startup

Use the following procedure to assemble and start your system for the first time:

- 1 Install the NIC(s) in each host server that you attach to the MD3000i storage array, unless the NIC was factory installed. For general information on setting up your IP addresses, see *Guidelines for Configuring Your Network for iSCSI*.
- 2 Cable the storage array to the host server(s), either directly or via a switch.
- 3 Cable the Ethernet management ports on the storage array to either the management network (iSCSI-attached host server) or dedicated management station (non-iSCSI).
- 4 Power on the storage array and wait for the status LED to turn blue.
- 5 Start up each host server that is cabled to the storage array.

Install the iSCSI Initiator Software (iSCSI-attached Host Servers Only)


To configure iSCSI later in this document (see "*Array Setup and iSCSI Configuration*"), you must install the Microsoft iSCSI initiator on any host server that will access your storage array *before* you install the MD Storage Manager software.

 **NOTE:** Windows Server® 2008 contains a built-in iSCSI initiator. If your system is running Windows Server 2008, you do not need to install the iSCSI initiator as shown in this section. Skip directly to "Installing MD Storage Software."

Depending on whether you are using a Windows Server 2003 operating system or a Linux operating system, refer to the following steps for downloading and installing the iSCSI initiator.

Installing the iSCSI Initiator on a Windows Host Server

- 1 Refer to the *Dell™ PowerVault™ MD3000i Support Matrix* on support.dell.com for the latest version and download location of the Microsoft iSCSI Software Initiator software.
- 2 From the host server, download the iSCSI Initiator software.
- 3 Once the installation begins and the **Microsoft iSCSI Initiator Installation** setup panel appears, select **Initiator Service and Software Initiator**.
- 4 DO NOT select **Microsoft MPIO Multitpathing Support for iSCSI**.


 **NOTICE:** Make sure the **Microsoft MPIO Multitpathing Support for iSCSI** option is NOT selected. Using this option will cause the iSCSI initiator setup to function improperly.

- 5 Accept the license agreement and finish the install.

 **NOTE:** If you are prompted to do so, reboot your system.

Installing the iSCSI Initiator on a Linux Host Server

Follow the steps in this section to install the iSCSI initiator on a Linux server.

 **NOTE:** All appropriate Linux iSCSI initiator patches are installed using the MD3000i Resource CD during MD Storage Manager Software installation.

Installing the iSCSI Initiator on a RHEL 4 System


You can install the iSCSI initiator software on Red Hat® Enterprise Linux® 4 systems either during or after operating system installation.

To install the iSCSI initiator during RHEL 4 installation:

- 1 When the **Package Installation Defaults** screen is displayed, select the **Customize the set of Packages to be installed** option. Click **Next** to go to the **Package Group Selection** screen.
- 2 In the **Servers** list, select the **Network Servers** package and click **Details** to display a list of Network Server applications.
- 3 Select the **iscsi-initiator-utils - iSCSI daemon and utility programs** option.
- 4 Click **OK**, then **Next** to continue with the installation.

To install the iSCSI initiator after RHEL 4 installation:

- 1 From the desktop, click **Applications**→**System Settings**→**Add Remove Applications**. The **Package Group Selection** screen is displayed.
- 2 In the **Servers** list, select the **Network Servers** package and click **Details** to display a list of Network Server applications.
- 3 Select the **iscsi-initiator-utils - iSCSI daemon and utility programs** option.
- 4 Click **Close**, then **Update**.

 **NOTE:** Depending upon your installation method, the system will ask for the required source to install the package.

Installing the iSCSI Initiator on a RHEL 5 System

You can install the iSCSI initiator software on Red Hat Enterprise Linux 5 systems either during or after operating system installation. With this version of the Linux software, you can also elect to install the iSCSI initiator after the operating system installation via the command line.

To install the iSCSI initiator during RHEL 5 installation:

- 1 When the **Package Installation Defaults** screen is displayed, select the **Customize now** option.
- 2 Click **Next** to go to the **Package Group Selection** screen.

- 3 Select **Base System**, then select the **Base** option.
- 4 Click **Optional Packages**.
- 5 Select the **iscsi-initiator-utils** option.
- 6 Click **OK**, then **Next** to continue with the installation.

To install the iSCSI initiator after RHEL 5 installation:

- 1 From the desktop, select **Applications**→**Add/Remove Software**. The **Package Manager** screen is displayed.
- 2 In the **Package Manager** screen, select the **Search** tab.
- 3 Search for **iscsi-initiator-utils**.
- 4 When it is displayed, select the **iscsi-initiator-utils** option.
- 5 Click **Apply**.



NOTE: Depending upon your installation method, the system will ask for the required source to install the package.



NOTE: This method might not work if network access is not available to a Red Hat Network repository.

To install the iSCSI initiator after RHEL 5 installation via the command line:

- 1 Insert the RHEL 5 installation CD 1 or DVD. If your media is not automounted, you must manual mount it. The **iscsi-initiatorutils.rpm** file is located in the **Server** or **Client** subdirectory.
- 2 Run the following command:

```
rpm -i /path/to/media/Server/iscsi-  
initiatorutils.rpm
```

Installing the iSCSI Initiator on a SLES 9 System

You can install the iSCSI initiator software on SUSE® Linux Enterprise Servers (SLES) 9 SP3 systems either during or after operating system installation.

To install the iSCSI initiator during SLES 9 installation:

- 1 At the **YaST Installation Settings** screen, click **Change**.
- 2 Click **Software**, then select **Detailed Selection** to see a complete list of packages.

3 Select **Various Linux Tools**, then select `linux-iscsi`.

4 Click **Accept**.

If a dependencies window is displayed, click **Continue** and proceed with the installation.

To install the iSCSI initiator after SLES 9 installation:

1 From the **Start** menu, select **System YaST**.

2 Select **Software**, then **Install and Remove Software**.

3 In the Search box, enter `linux-iscsi`.

4 When the `linux-iscsi` module is displayed, select it.

5 Click on **Check Dependencies** to determine if any dependencies exist.

6 If no dependencies are found, click **Accept**.

Installing the iSCSI Initiator on a SLES 10 SP1 System

You can install the iSCSI initiator software on SUSE Linux Enterprise Server Version 10 systems either during or after operating system installation.

To install the iSCSI initiator during SLES 10 SP1 installation:

1 At the YaST **Installation Settings** screen, click **Change**.

2 Click **Software**, then select **Search**.

3 In the Search box, enter `iscsi`.

4 When the `open-iscsi` and `yast2-iscsi-client` modules are displayed, select them.

5 Click **Accept**.

6 If a dialog box regarding dependencies appears, click **Continue** and proceed with installation.

Installing the iSCSI initiator after SLES 10 SP1 installation:

1 Select **Desktop**→ **YaST**→ **Software**→ **Software Management**.

2 Select **Search**.


3 In the Search box, enter `iscsi`.

- 4 When the `open-iscsi` and `yast2-iscsi-client` modules are displayed, select them.
- 5 Click **Accept**.

Supported Link Rates and Autonegotiation

MD3000i iSCSI ports are 1000 Base-TX and require autonegotiation to always be present and enabled. The iSCSI ports can operate at 1 Gb/sec full duplex, 100 Mb/sec full duplex, or 100 Mb/sec half duplex (if the other half of the link is autonegotiation enabled).

To avoid network performance problems, always run at 1Gb/sec.


 **NOTE:** A 10 Mb/sec link rate is not supported.

Installing MD Storage Software

The MD3000i Storage Software provides the host-based storage agent, multipath driver, and MD Storage Manager application used to operate and manage the storage array solution. The MD Storage Manager application is installed on a host server to configure, manage, and monitor the storage array.


When installing from the CD, three installation types are available:

- **Typical (Full installation)** — This package installs both the management station and host server software. It includes the necessary host-based storage agent, multipath driver, and MD Storage Manager software. Select this option if you plan to use MD Storage Manager on the host server to configure, manage, and monitor the storage array.
- **Management Station** — This package installs the MD Storage Manager software, which is needed to configure, manage, and monitor the storage array. Select this option if you plan to use MD Storage Manager to manage the storage array from a standalone system that is connected to the storage array only via the Ethernet management ports.
- **Host** — This package installs the necessary storage agent and multipath driver on a host server connected to the storage array. Select this option on all host servers that are connected to a storage array but will NOT use MD Storage Manager for any storage array management tasks.


 **NOTE:** Dell recommends using the Host installation type if the host server is running Windows Server 2008 Core version.

Installing MD Storage Software on an iSCSI-attached Host Server (Windows)


To install MD Storage Manager on a Windows system, you must have administrative privileges to install MD Storage Manager files and program packages to the `C:\Program Files\Dell\MD Storage Manager` directory.

 **NOTE:** A minimum version of the Storport driver must be installed on the host server before installing the MD Storage Manager software. A hotfix with the minimum supported version of the Storport driver is located in the `\windows\Windows_2003_2008\hotfixes` directory on the MD3000i Resource CD. The MD Storage Manager installation will test for the minimum Storport version and will require you to install it before proceeding.


Complete the following steps to install MD Storage Manager on an iSCSI-connected host server:

- 1 Close all other programs before installing any new software.
 - 2 Insert the CD, if necessary, and navigate to the main menu.
 -  **NOTE:** If the host server is running Windows Server 2008 Core version, navigate to the CD drive and run the `setup.bat` utility.
 - 3 From the main menu, select **Install MD3000i Storage Software**.
The Installation Wizard appears.
 - 4 Click **Next**.
 - 5 Accept the terms of the License Agreement, and click **Next**.
The screen shows the default installation path.
 - 6 Click **Next** to accept the path, or enter a new path and click **Next**.
 - 7 Select an installation type:
 - **Typical (Full installation)** — This package installs both the management station and host software. It includes the necessary host-based storage agent, multipath driver, and MD Storage Manager software. Select this option if you plan to use MD Storage Manager on the host server to configure, manage, and monitor the storage array.
- OR


- Host — This package installs the necessary storage agent and multipath driver on a host server connected to the storage array. Select this option on all hosts that are connected to a storage array but will NOT use MD Storage Manager for any storage array management tasks.

 **NOTE:** Dell recommends using the Host installation type if the host server is running Windows Server 2008 Core version.

- 8 Click **Next**.
- 9 If the **Overwrite Warning** dialog appears, click **OK**. The software currently being installed automatically replaces any existing versions of MD Storage Manager.
- 10 If you selected Typical (full) installation in step 6, a screen appears asking whether to restart the event monitor automatically or manually after rebooting. You should configure only one system (either a host or a management station) to automatically restart the event monitor.


 **NOTE:** The event monitor notifies the administrator of problem conditions with the storage array. MD Storage Manager can be installed on more than one system, but running the event monitor on multiple systems can cause multiple alert notifications to be sent for the same error condition. To avoid this issue, enable the event monitor only on a single system that monitors your storage arrays. For more information on alerts, the event monitor, and manually restarting the event monitor, see the *User's Guide*.

- 11 The **Pre-Installation Summary** screen appears, showing the installation destination, the required disk space, and the available disk space. If the installation path is correct, click **Install**.
- 12 When the installation completes, click **Done**.
- 13 A screen appears asking if you want to restart the system now. Select **No, I will restart my system myself**.
- 14 If you are setting up a cluster host, double-click the **MD3000i Stand Alone to Cluster.reg** file located in the `windows\utility` directory of the MD3000i Resource CD. This merges the file into the registry of each node.


 **NOTE:** Windows clustering is only supported on Windows Server 2003 and Windows Server 2008.

If you are reconfiguring a cluster node into a stand alone host, double-click the **MD3000i Cluster to Stand Alone.reg** file located in the

windows\utility directory of the MD3000i Resource CD. This merges the file into the host registry.


 **NOTE:** These registry files set the host up for the correct failback operation.

- 15 If you have third-party applications that use the Microsoft Volume Shadow-copy Service (VSS) or Virtual Disk Service (VDS) Application Programming Interface (API), install the VDS_VSS package located in the windows\VDS_VSS directory on the MD3000i Resource CD. Separate versions for 32-bit and 64-bit operating systems are provided. The VSS and VDS provider will engage only if it is needed.
- 16 Set the path for the command line interface (CLI), if required. See the *MD Storage Manager CLI Guide* for more information.
- 17 Install MD Storage Manager on all other Windows hosts attached to the MD3000i array.
- 18 If you have not yet cabled your MD3000i storage array, do so at this time.
- 19 After the MD3000i has initialized, reboot each host attached to the array.

 **NOTE:** If you are not installing MD Storage Manager directly from the *Resource CD* (for example, if you are instead installing MD Storage Manager from a shared network drive), you must manually apply iSCSI updates to the Windows system registry. To apply these updates, go to the \windows\Windows_2003_2008\iSCSI_reg_changer directory on the *Resource CD* and run the iSCSI_reg_changer_Win2k3.bat or iSCSI_reg_changer_Win2k8.bat file. The iSCSI Initiator must be installed before you make these updates.

Installing MD Storage Software on an iSCSI-attached Host Server (Linux)


MD Storage Manager can be installed and used only on Linux distributions that utilize the RPM Package Manager format, such as Red Hat® or SUSE®. The installation packages are installed by default in the /opt/dell/mdstoragemanager directory.

 **NOTE:** Root privileges are required to install the software.

Follow these steps to install MD Storage Manager software on an iSCSI-connected host server:

- 1 Close all other programs before installing any new software.

- 2 Insert the CD. For some Linux installations, when you insert a CD into a drive, a screen appears asking if you want to run the CD. Select **Yes** if the screen appears. Otherwise, double-click on the **autorun** script in the top directory or, from within a terminal window, run `./install.sh` from the **linux** directory on the CD.

 **NOTE:** On RHEL 5 operating systems, CDs are automounted with the `-noexec` mount option. This option does not allow you to run any executable directly from the CD. To complete this step, you must unmount the CD, then manually remount it. Then, you can run these executables. The command to unmount the CD-ROM is:

```
umount CD_device_node
```


The command to manually mount CD is:

```
mount CD_device_node mount_directory
```

- 3 At the CD main menu, type `2` and press **Enter**.
The installation wizard appears.
- 4 Click **Next**.
- 5 Accept the terms of the License Agreement and click **Next**.
- 6 Select an installation type:
 - **Typical (Full installation)** — This package installs both the management station and host options. It includes the necessary host-based storage agent, multipath driver, and MD Storage Manager software. Select this option if you plan to use MD Storage Manager on the host server to configure, manage, and monitor the storage array.


OR

 - **Host** — This package installs the necessary storage agent and multipath driver on a host server connected to the storage array. Select this option on all hosts that are connected to a storage array but will **NOT** use MD Storage Manager for any storage array management tasks.
- 7 Click **Next**.

- 8 If the **Overwrite Warning** dialog appears, click **OK**. The software currently being installed automatically replaces any existing versions of MD Storage Manager.
- 9 The **Multipath Warning** dialog box may appear to advise that this installation requires an RDAC MPP driver. If this screen appears, click **OK**. Installation instructions for the RDAC MPP driver are given in step 13.
- 10 If you selected Typical (full) installation in step 6, a screen appears asking whether to restart the event monitor automatically or manually after rebooting. You should configure only one system (either a host or a management station) to automatically restart the event monitor.
 -  **NOTE:** The event monitor notifies the administrator of problem conditions with the storage array. MD Storage Manager can be installed on more than one system, but running the event monitor on multiple systems can cause multiple alert notifications to be sent for the same error condition. To avoid this issue, enable the event monitor only on a single system which monitors your MD3000i arrays. For more information on alerts, the event monitor, and manually restarting the event monitor, see the *User's Guide*.
- 11 The **Pre-Installation Summary** screen appears showing the installation destination, the required disk space, and the available disk space. If the installation path is correct, click **Install**.
- 12 When the installation completes, click **Done**.
- 13 At the `install the multi-pathing driver [y/n]?` prompt, answer `y` (yes).
- 14 When the RDAC driver installation is complete, quit the menu and restart the system.
- 15 Install MD Storage Manager on all other hosts attached to the MD3000i array.
- 16 Reboot each host attached to the array.

Installing a Dedicated Management Station (Windows and Linux)

Optionally, you can manage your storage array over the network via a dedicated system attached to the array via the Ethernet management port. If you choose this option, follow these steps to install MD Storage Manager on that dedicated system.

- 1** (Windows) From the CD main menu, select **Install MD3000i Storage Software**.
- 2** (Linux) From the CD main menu, type `2` and press **Enter**.
The Installation Wizard appears.
- 3** Click **Next**.
- 4** Accept the terms of the License Agreement and click **Next**.
- 5** Click **Next** to accept the default installation path (Windows), or enter a new path and click **Next**.
- 6** Select **Management Station** as the installation type. This option installs only the MD Storage Manager software used to configure, manage and monitor a MD3000i storage array.
- 7** Click **Next**.
- 8** If the **Overwrite Warning** dialog appears, click **OK**. The software currently being installed automatically replaces any existing versions of MD Storage Manager.
- 9** A screen appears asking whether to restart the event monitor automatically or manually after rebooting. You should configure only one system (either a host or a management station) to automatically restart the event monitor.
 **NOTE:** The event monitor notifies the administrator of problem conditions with the storage array. MD Storage Manager can be installed on more than one system, but running the event monitor on multiple systems can cause multiple alert notifications to be sent for the same error condition. To avoid this issue, enable the event monitor only on a single system that monitors your MD3000i arrays. For more information on alerts, the event monitor, and manually restarting the event monitor, see the MD Storage Manager *User's Guide*.
- 10** The **Pre-Installation Summary** screen appears showing the installation destination, the required disk space, and the available disk space. If the installation path is correct, click **Install**.
- 11** When the installation completes, click **Done**.
A screen appears asking if you want to restart the system now.
- 12** Restart the system.

- 13** Set the path for the command line interface (CLI), if required. See the *MD Storage Manager CLI Guide* for more information.

MD3000i Configuration Utility

The *Resource CD* now features an MD3000i Configuration Utility, which is a unified graphical user interface (GUI) that facilitates the configuration of MD3000i storage arrays and host server initiators. This utility assists users by gathering information about arrays via discovery mechanisms and autopopulating fields with the discovered data.

You can launch the MD3000i Configuration Utility by performing the following steps:

- 1** Place the CD in the drive. On Windows operating systems:
 - a** If autorun is enabled, the installer will autorun. Select the **MD3000i Configuration Utility** option.
 - b** If autorun is not enabled, run `setup.bat`. Select the **MD3000i Configuration Utility** option.
- 2** On supported Linux operating systems:
 - a** Mount the CD.
 - b** If autorun is enabled, the installer will autorun. Select the **MD3000i Configuration Utility** option.
 - c** If autorun is not enabled, run the `autorun` file. Select the **MD3000i Configuration Utility** option.

Documentation for Windows Systems

Viewing the *PowerVault MD Documentation* CD Contents

- 1 Insert the CD. If autorun is disabled, navigate to the CD and double-click `setup.exe`.



NOTE: On a server running Windows Server 2008 Core version, navigate to the CD and run the `setup.bat` utility. Only the MD3000i Readme can be viewed on Windows Server 2008 Core versions. Other MD3000i documentation cannot be viewed or installed.

A screen appears showing the following items:

```
View MD3000i Readme
View Product Documentation
Install MD3000i Documentation
iSCSI Setup Instructions
```

- 2 To view the `readme.txt` file, click the first bar.
The `readme.txt` file appears in a separate window.
- 3 Close the window after viewing the file to return to the menu screen.
- 4 To view the manuals from the CD, open the HTML versions from the `/docs/` folder on the CD, or select **View Product Documentation**.

Installing the Manuals

- 1 Insert the CD, if necessary, and select **Install MD3000i Documentation** in the main menu.

A second screen appears.

- 2 Click **Next**.
- 3 Accept the License Agreement and click **Next**.
- 4 Select the installation location or accept the default and click **Next**.
- 5 Click **Install**.

The installation process begins.

- 6 When the process completes, click **Finish** to return to the main menu.
- 7 To view the installed documents, go to **My Computer** and navigate to the installation location.



NOTE: The MD3000i Documentation cannot be installed on Windows Server 2008 Core versions.

Documentation for Linux Systems

Viewing the *PowerVault MD Documentation CD Contents*

- 1 Insert the CD.
For some Linux distributions, a screen appears asking if you want to run the CD. Select **Yes** if the screen appears. If no screen appears, execute `./install.sh` within the `linux` folder on the CD.
- 2 A menu screen appears showing the following items:
 - 1 View MD3000i Readme
 - 2 Install MD3000i Documentation
 - 3 View MD3000i Documentation
 - 4 iSCSI Setup Instructions
 - 5 Dell Support
 - 6 View End User License Agreement
- 3 If you want to view the `readme.txt` file, type `1` and press **Enter**.
The file appears in a separate window. Close the window after viewing the file to return to the menu screen.
- 4 To view another document, type `3` and press **Enter**.
A second menu screen appears with the following selections:
MD3000i Owner's Manual
MD3000i Installation Guide
MD Storage Manager CLI Guide
MD Storage Manager User's Guide

 **NOTE:** To view the documents from the CD, you must have a web browser installed on the system.

- 5 Type the number of the document you want and press **Enter**.
The document opens in a browser window.
- 6 Close the document when you are finished. The system returns to the documentation menu described in step 4.
- 7 Select another document or type `q` and press **Enter** to quit. The system returns to the main menu screen.


Installing the Manuals

- 1 Insert the CD, if necessary, and from the menu screen, type `2` and press **Enter**.
- 2 A screen appears showing the default location for installation. Press **Enter** to accept the path shown, or enter a different path and press **Enter**.
- 3 When installation is complete, press any key to return to the main menu.
- 4 To view the installed documents, open a browser window and navigate to the installation directory.

4


Array Setup and iSCSI Configuration

To use the storage array, you must configure iSCSI on both the host server(s) and the storage array. Step-by-step instructions for configuring iSCSI are described in this section. However, before proceeding here, you must have already installed the iSCSI initiator and the MD Storage Manager software. If you have not, refer to *Software Installation* and complete those procedures before attempting to configure iSCSI.

 **NOTE:** Although some of these steps shown in this section can be performed in MD Storage Manager from a management station, the iSCSI initiator must be installed and configured on each host server.

Before You Start

Before you begin configuring iSCSI, you should fill out the iSCSI Configuration Worksheet (Table 4-1 and Table 4-2). Gathering this type of information about your network prior to starting the configuration steps should help you complete the process in less time.

 **NOTE:** If you are running Windows Server 2008, RHEL 5 Update 1, or SLES 10 SP1 and elect to use IPv6, use Table 4-2 to define your settings on the host server and storage array controller iSCSI ports.

Terminology

The table below outlines the terminology used in the iSCSI configuration steps later in this section.

Table 4-1. Standard Terminology Used in iSCSI Configuration

Term	Definition
CHAP (Challenge Handshake Authentication Protocol)	An optional security protocol used to control access to an iSCSI storage system by restricting use of the iSCSI data ports on both the host server and storage array. For more information on the types of CHAP authentication supported, see <i>Understanding CHAP Authentication</i> .
host or host server	A server connected to the storage array via iSCSI ports.
host server port	iSCSI port on the host server used to connect it to the storage array.
iSCSI initiator	The iSCSI-specific software installed on the host server that controls communications between the host server and the storage array.
iSCSI host port	The iSCSI port (two per controller) on the storage array.
iSNS (Microsoft Internet Storage Naming Service)	An automated discovery, management and configuration tool used by some iSCSI devices.
management station	The system from which you manage your host server/storage array configuration.
storage array	The enclosure containing the storage data accessed by the host server.
target	An iSCSI port on the storage array that accepts and responds to requests from the iSCSI initiator installed on the host server.

iSCSI Configuration Worksheet

The iSCSI Configuration Worksheet (Table 4-1 or Table 4-2) helps you plan your configuration. Recording host server and storage array IP addresses at a single location will help you configure your setup faster and more efficiently.

Guidelines for Configuring Your Network for iSCSI provides general network setup guidelines for both Windows and Linux environments. It is recommended that you review these guidelines before completing the worksheet.

Figure 4-1. iSCSI Configuration Worksheet (IPv4 settings)

A	host server	
	cntl. 0 cntl. 1	Mutual CHAP Secret _____
B	MD3000i	
	192.168.130.101 (In 0 default)	Target CHAP Secret _____
	192.168.131.101 (In 1 default)	
	192.168.128.101 (Mgmt network port)	
	192.168.128.102 (Mgmt network port)	
	192.168.128.102 (Mgmt network port)	
	192.168.130.102 (In 0 default)	
<i>If you need additional space for more than one host server, use an additional sheet.</i>		
A	Subnet	
Static IP address (host server)	<i>(should be different for each NIC)</i>	Default gateway
iSCSI port 1	_____	_____
iSCSI port 2	_____	_____
iSCSI port 3	_____	_____
iSCSI port 4	_____	_____
Management port	_____	_____
Management port	_____	_____
B	Subnet	
Static IP address (storage array)	Default gateway	
iSCSI controller 0, In 0	_____	_____
iSCSI controller 0, In 1	_____	_____
Management port, cntnl. 0	_____	_____
iSCSI controller 1, In 0	_____	_____
iSCSI controller 1, In 1	_____	_____
Management port, cntnl. 1	_____	_____

Figure 4-2. iSCSI Configuration Worksheet (IPv6 settings)

A	<div style="text-align: center;">host server</div> <div style="display: flex; justify-content: space-around; margin-top: 20px;"> cntl. 0 cntl. 1 </div> <div style="text-align: right; margin-top: 10px;">MD3000i</div>	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">Mutual CHAP Secret _____</div> <div style="border: 1px solid black; padding: 5px;">Target CHAP Secret _____</div>
B	<i>If you need additional space for more than one host server, use an additional sheet.</i>	
A	Host iSCSI port 1 Link Local IP Address _____ Routable IP Address _____ Subnet Prefix _____ Gateway _____	Host iSCSI port 2 Link Local IP Address _____ Routable IP Address _____ Subnet Prefix _____ Gateway _____
B	iSCSI controller 0, In 0 IP Address FE80 : 0000 : 0000 : 0000 : ____ : ____ : ____ : ____ Routable IP Address 1 ____ : ____ : ____ : ____ : ____ : ____ : ____ : ____ Routable IP Address 2 ____ : ____ : ____ : ____ : ____ : ____ : ____ : ____ Router IP Address ____ : ____ : ____ : ____ : ____ : ____ : ____ : ____ iSCSI controller 0, In 1 IP Address FE80 : 0000 : 0000 : 0000 : ____ : ____ : ____ : ____ Routable IP Address 1 ____ : ____ : ____ : ____ : ____ : ____ : ____ : ____ Routable IP Address 2 ____ : ____ : ____ : ____ : ____ : ____ : ____ : ____ Router IP Address ____ : ____ : ____ : ____ : ____ : ____ : ____ : ____ iSCSI controller 1, In 0 IP Address FE80 : 0000 : 0000 : 0000 : ____ : ____ : ____ : ____ Routable IP Address 1 ____ : ____ : ____ : ____ : ____ : ____ : ____ : ____ Routable IP Address 2 ____ : ____ : ____ : ____ : ____ : ____ : ____ : ____ Router IP Address ____ : ____ : ____ : ____ : ____ : ____ : ____ : ____ iSCSI controller 1, In 1 IP Address FE80 : 0000 : 0000 : 0000 : ____ : ____ : ____ : ____ Routable IP Address 1 ____ : ____ : ____ : ____ : ____ : ____ : ____ : ____ Routable IP Address 2 ____ : ____ : ____ : ____ : ____ : ____ : ____ : ____ Router IP Address ____ : ____ : ____ : ____ : ____ : ____ : ____ : ____	

Configuring iSCSI on Your Storage Array

The following sections contains step-by-step instructions for configuring iSCSI on your storage array. However, before beginning, it is important to understand where each of these steps occur in relation to your host server/storage array environment.

Table 4-2 below shows each specific iSCSI configuration step and where it occurs.

Table 4-2. Host Server vs. Storage Array

This step is performed on the HOST SERVER using the Microsoft or Linux iSCSI Initiator:	This step is performed on the STORAGE ARRAY using MD Storage Manager:
	Step 1: <i>Discover the storage array</i>
	Step 2: <i>Configure the iSCSI ports on the storage array</i>
Step 3: <i>Perform target discovery from the iSCSI initiator</i>	
	Step 4: <i>Configure host access</i>
	Step 5: <i>(Optional) Configure CHAP authentication on the storage array</i>
Step 6: <i>(Optional) Configure CHAP authentication on the host server</i>	
Step 7: <i>Connect to the storage array from the host server</i>	
	Step 8: <i>(Optional) Set up in-band management</i>

Using iSNS

iSNS (Internet Storage Naming Service) Server, supported only on Windows iSCSI environments, eliminates the need to manually configure each individual storage array with a specific list of initiators and target IP addresses. Instead, iSNS automatically discovers, manages, and configures all iSCSI devices in your environment.

For more information on iSNS, including installation and configuration, see www.microsoft.com.

Step 1: Discover the Storage Array (Out-of-band management only)

Default Management Port Settings

By default, the storage array management ports will be set to DHCP configuration. If the controller(s) on your storage array is unable to get IP configuration from a DHCP server, it will timeout after ten seconds and fall back to a default static IP address. The default IP configuration is:

Controller 0: IP: 192.168.128.101 Subnet Mask: 255.255.255.0

Controller 1: IP: 192.168.128.102 Subnet Mask: 255.255.255.0



NOTE: No default gateway is set.



NOTE: If DHCP is not used, initial configuration of the management station must be performed on the same physical subnet as the storage array. Additionally, during initial configuration, at least one network adapter must be configured on the same IP subnet as the storage array's default management port (192.168.128.101 or 192.168.128.102). After initial configuration (management ports are configured using MD Storage Manager), the management station's IP address can be changed back to its previous settings.



NOTE: This procedure applies to out-of-band management only. If you choose to set up in-band management, you must complete this step and then refer to *Step 8: (Optional) Set Up In-Band Management*.

You can discover the storage array automatically or manually. Choose one and complete the steps below.

Automatic Storage Array Discovery

- 1 Launch MD Storage Manager.

If this is the first storage array to be set up, the **Add New Storage Array** window appears.

- 2 Choose **Automatic** and click **OK**.

It may take several minutes for the discovery process to complete. Closing the discovery status window before the discovery process completes will cancel the discovery process.

After discovery is complete, a confirmation screen appears. Click **Close** to close the screen.

Manual Storage Array Discovery

- 1 Launch MD Storage Manager.
If this is the first storage array to be set up, the **Add New Storage Array** window appears.
- 2 Select **Manual** and click **OK**.
- 3 Select **Out-of-band management** and enter the host server name(s) or IP address(es) of the iSCSI storage array controller.
- 4 Click **Add**.

Out-of-band management should now be successfully configured.

After discovery is complete, a confirmation screen appears. Click **Close** to close the screen.

Set Up the Array

- 1 When discovery is complete, the name of the first storage array found appears under the **Summary** tab in MD Storage Manager.
- 2 The default name for the newly discovered storage array is *Unnamed*. If another name appears, click the down arrow next to that name and choose **Unnamed** in the drop-down list.
- 3 Click the **Initial Setup Tasks** option to see links to the remaining post-installation tasks. For more information about each task, see the *User's Guide*. Perform these tasks in the order shown in Table 4-3.


 **NOTE:** Before configuring the storage array, check the status icons on the **Summary** tab to make sure the enclosures in the storage array are in an **Optimal** status. For more information on the status icons, see **Troubleshooting Tools**.

Table 4-3. Initial Storage Array Setup Tasks

Task	Purpose	Information Needed
<p>Rename the storage array.</p> <p>NOTE: If you need to physically find the device, click Blink the storage array on the Initial Setup Tasks dialog box or click the Tools tab and choose Blink. Lights on the front of the storage array blink intermittently to identify the array. Dell recommends blinking storage arrays to ensure that you are working on the correct enclosure.</p>	<p>To provide more a meaningful name than the software-assigned label of Unnamed.</p>	<p>A unique, clear name with no more than 30 characters that may include letters, numbers, and no special characters other than underscore (<u> </u>), minus (-), or pound sign (#).</p> <p>NOTE: MD Storage Manager does not check for duplicate names. Names are not case sensitive.</p>
<p>Set a storage array password.</p>	<p>To restrict unauthorized access, MD Storage Manager asks for a password before changing the configuration or performing a destructive operation.</p>	<p>A case-sensitive password that meets the security requirements of your enterprise.</p>

Table 4-3. Initial Storage Array Setup Tasks (continued)

Task	Purpose	Information Needed
Set the management port IP addresses on each controller.	To set the management port IP addresses to match your public network configuration. Although DHCP is supported, static IP addressing is recommended.	In MD Storage Manager, select Initial Setup Tasks → Configure Ethernet Management Ports , then specify the IP configuration for each management port on the storage array controllers. NOTE: If you change a management port IP address, you may need to update your management station configuration and/or repeat storage array discovery.
Set up alert notifications. Set up e-mail alerts. Set up SNMP alerts.	To arrange to notify individuals (by e-mail) and/or storage management stations (by SNMP) when a storage array component degrades or fails, or an adverse environmental condition occurs.	E-mail — Sender (sender's SMTP gateway and e-mail address) and recipients (fully qualified e-mail addresses) SNMP — (1) A community name, a known set of storage management stations set by administrator as an ASCII string in the management console (default: "public"), and (2) a trap destination, IP address or host name of a management console running an SNMP service
NOTE: The Status area in the Summary tab shows if alerts have been set for the selected array.		

Step 2: Configure the iSCSI Ports on the Storage Array


By default, the iSCSI ports on the storage array are set to the following IPv4 settings:

Controller 0, Port 0: IP: 192.168.130.101 Subnet Mask: 255.255.255.0 Port: 3260

Controller 0, Port 1: IP: 192.168.131.101 Subnet Mask: 255.255.255.0 Port: 3260


Controller 1, Port 0: IP: 192.168.130.102 Subnet Mask: 255.255.255.0 Port: 3260


Controller 1, Port 1: IP: 192.168.131.102 Subnet Mask: 255.255.255.0 Port: 3260

 **NOTE:** No default gateway is set.

To configure the iSCSI ports on the storage array, complete the following steps:

- 1 From MD Storage Manager, click the **iSCSI** tab, then select **Configure iSCSI Host Ports**.
- 2 Configure the iSCSI ports on the storage array.

 **NOTE:** Using static IPv4 addressing is recommended, although DHCP is supported.

 **NOTE:** IPv4 is enabled by default on the iSCSI ports. You must enable IPv6 to configure IPv6 addresses.

 **NOTE:** IPv6 is supported only on controllers that will connect to host servers running Windows Server 2008, RHEL 5 Update 1, or SLES 10 SP1.


The following settings are available (depending on your specific configuration) by clicking the **Advanced** button:

- **Virtual LAN (VLAN) support**
A VLAN is a network of different systems that behave as if they are connected to the same segments of a local area network (LAN) and are supported by the same switches and routers. When configured as a VLAN, a device can be moved to another location without being reconfigured. To use VLAN on your storage array, obtain the VLAN ID from your network administrator and enter it here.
- **Ethernet priority**

This parameter is set to determine a network access priority.

- **TCP listening port**

The port number the controller on the storage array uses to listen for iSCSI logins from host server iSCSI initiators.

 **NOTE:** The TCP listening port for the iSNS server is the port number the storage array controller uses to connect to an iSNS server. This allows the iSNS server to register the iSCSI target and portals of the storage array so that the host server initiators can identify them.

- **Jumbo frames**

Jumbo Ethernet frames are created when the maximum transmission units (MTUs) are larger than 1500 bytes per frame. This setting is adjustable port-by-port.

- 3** To enable ICMP PING responses for all ports, select **Enable ICMP PING responses**.
- 4** Click **OK** when all iSCSI storage array port configurations are complete.
- 5** Test the connection by performing a ping command on each iSCSI storage array port.

Step 3: Perform Target Discovery from the iSCSI Initiator

This step identifies the iSCSI ports on the storage array to the host server. Select the set of steps in one of the following sections (Windows or Linux) that corresponds to your operating system.

If you are using Windows Server 2003 or Windows Server 2008 GUI version

- 1 Click **Start**→**Programs**→**Microsoft iSCSI Initiator** or **Start**→**All Programs**→**Administrative Tools**→**iSCSI Initiator**.
- 2 Click the **Discovery** tab.
- 3 Under **Target Portals**, click **Add** and enter the **IP address** or **DNS name** of the iSCSI port on the storage array.
- 4 If the iSCSI storage array uses a custom TCP port, change the **Port number**. The default is 3260.
- 5 Click **Advanced** and set the following values on the **General** tab:
 - **Local Adapter:** Must be set to **Microsoft iSCSI Initiator**.
 - **Source IP:** The source IP address of the host you want to connect with.
 - **Data Digest and Header Digest:** Optionally, you can specify that a digest of data or header information be compiled during transmission to assist in troubleshooting.
 - **CHAP logon information:** Leave this option unselected and do not enter CHAP information at this point, unless you are adding the storage array to a SAN that has target CHAP already configured.



NOTE: IPSec is not supported.

Click **OK** to exit the **Advanced** menu, and **OK** again to exit the **Add Target Portals** screen.

- 6 To exit the **Discovery** tab, click **OK**.

If you plan to configure **CHAP authentication**, do not perform discovery on more than one iSCSI port at this point. Stop here and go to the next step, Step 4: Configure Host Access.

If you do not plan to configure CHAP authentication, repeat step 1 thorough step 6 (above) for all iSCSI ports on the storage array.

If you are using Windows Server 2008 Core Version

- 1 Set the iSCSI initiator service to start automatically:
`sc \\<server_name> config msiscsi start= auto`
- 2 Start the iSCSI service:
`sc start msiscsi`
- 3 Add a target portal:
`iscsicli QAddTargetPortal
<IP_address_of_iSCSI_port_on_storage_array>`

If you are using Linux Server

Configuration of the iSCSI initiator for Red Hat® Enterprise Linux® version 4 and SUSE® Linux Enterprise Server 9 distributions is performed by modifying the `/etc/iscsi.conf` file, which is installed by default when you install MD Storage Manager. You can edit the file directly, or replace the default file with a sample file included on the *MD3000i Resource CD*.

To use the sample file included on the CD:

- 1 Save the default `/etc/iscsi.conf` file by naming it to another name of your choice.
- 2 Copy the appropriate sample file from `/linux/etc` on the CD to `/etc/iscsi.conf`.
- 3 Rename the sample file to `iscsi.conf`.
- 4 Edit the `iscsi.conf` file and replace the IP address entries shown for `DiscoveryAddress=` with the IP addresses assigned to the iSCSI ports on your storage array:

For example, if your MD3000i has two iSCSI controllers (four iSCSI ports), you will need to add four IP addresses:

```
DiscoveryAddress=<your_storage_array_IP_address>
```

```
DiscoveryAddress=<your_storage_array_IP_address>
```

```
DiscoveryAddress=<your_storage_array_IP_address>
```

```
DiscoveryAddress=<your_storage_array_IP_address>
```

If you elect not to use the sample file on the CD, edit the existing default `/etc/iscsi.conf` file as shown in the previous example.

- 5 Edit (or add) the following entries to the `/etc/iscsi.conf` file:

```
HeaderDigest=never
DataDigest=never
LoginTimeout=15
IdleTimeout=15
PingTimeout=5
ConnFailTimeout=144
AbortTimeout=10
ResetTimeout=30
Continuous=no
InitialR2T=no
ImmediateData=yes
MaxRecvDataSegmentLength=65536
FirstBurstLength=262144
MaxBurstLength=16776192
```

- 6 Restart the iSCSI daemon by executing the following command from the console:

```
/etc/init.d/iscsi restart
```

- 7 Verify that the server can connect to the storage array by executing this command from a console:

```
iscsi -ls
```

If successful, an iSCSI session has been established to each iSCSI port on the storage array. Sample output from the command should look similar to this:

```
*****
```

```

SFNet iSCSI Driver Version ...4:0.1.11-3(02-May-2006)
*****
TARGET NAME           : iqn.1984-
05.com.dell:powervault.6001372000f5f0e600000000463b9292
TARGET ALIAS         :
HOST ID              : 2
BUS ID               : 0
TARGET ID            : 0
TARGET ADDRESS       : 192.168.0.110:3260,1
SESSION STATUS       : ESTABLISHED AT Wed May  9 18:20:27 CDT 2007
SESSION ID           : ISID 00023d000001 TSIH 5
*****
TARGET NAME           : iqn.1984-
05.com.dell:powervault.6001372000f5f0e600000000463b9292
TARGET ALIAS         :
HOST ID              : 3
BUS ID               : 0
TARGET ID            : 0
TARGET ADDRESS       : 192.168.0.111:3260,1
SESSION STATUS       : ESTABLISHED AT Wed May  9 18:20:28 CDT 2007
SESSION ID           : ISID 00023d000002 TSIH 4

```

If you are using RHEL 5 or SLES 10 SP1

Configuration of the iSCSI initiator for RHEL version 5 and SLES 10 SP1 distributions is done by modifying the `/etc/iscsi/iscsid.conf` file, which is installed by default when you install MD Storage Manager. You can edit the file directly, or replace the default file with a sample file included on the *MD3000i Resource CD*.

To use the sample file included on the CD:

- 1 Save the default `/etc/iscsi/iscsid.conf` file by naming it to another name of your choice.
- 2 Copy the appropriate sample file from `/linux/etc` on the CD to `/etc/iscsi/iscsid.conf`.
- 3 Rename the sample file to `iscsid.conf`.
- 4 Edit the following entries in the `/etc/iscsi/iscsid.conf` file:
 - a Edit (or verify) that the `node.startup = manual` line is disabled.

- b** Edit (or verify) that the `node.startup = automatic` line is enabled. This will enable automatic startup of the service at boot time.
 - c** Verify that the following time-out value is set to **144**:
`node.session.timeo.replacement_timeout = 144`
 - d** Save and close the `/etc/iscsi/iscsid.conf` file.
- 5** From the console, restart the iSCSI service with the following command:
`service iscsi start`
- 6** Verify that the iSCSI service is running during boot using the following command from the console:
`chkconfig iscsi on`
- 7** To display the available iscsi targets at the specified IP address, use the following command:
`iscsiadm -m discovery -t st -p
<IP_address_of_iSCSI_port>`
- 8** After target discovery, use the following command to manually login:
`iscsiadm -m node -l`

This logon will be performed automatically at startup if automatic startup is enabled.
- 9** Manually log out of the session using the following command:
`iscsiadm -m node -T <initiator_username> -p
<target_ip> -u`

Step 4: Configure Host Access

This step specifies which host servers will access virtual disks on the storage array. You should perform this step:

- before mapping virtual disks to host servers
- any time you connect new host servers to the storage array

- 1 Launch MD Storage Manager.
- 2 Click on the **Configure** tab, then select **Configure Host Access (Manual)**.
- 3 At **Enter host name**, enter the host server to be available to the storage array for virtual disk mapping.

This can be an informal name, not necessarily a name used to identify the host server to the network.

- 4 In the **Select host type** drop-down menu, select the host type.
Click **Next**.
- 5 If your iSCSI initiator shows up in the list of **Known iSCSI initiators**, make sure it is highlighted and click **Add** and then **Next**. Otherwise, click **New** and enter the **iSCSI initiator name**.

– In Windows, the iSCSI initiator name can be found on the **General** tab of the **iSCSI Initiator Properties** window.

– In Linux, the iSCSI initiator name can be found in the `etc/initiatorname.iscsi` file or by using the `iscsi-iname` command.

Click **Next**.

- 6 Choose whether or not the host server will be part of a host server group that will share access to the same virtual disks as other host servers. Select **Yes** only if the host is part of a Microsoft cluster.

Click **Next**.

- 7 Click **Finish**.

Understanding CHAP Authentication

Before proceeding to either *Step 5: Configure CHAP Authentication on the Storage Array (optional)* or *Step 6: Configure CHAP Authentication on the Host Server (optional)*, it would be useful to gain an overview of how CHAP authentication works.

What is CHAP?

Challenge Handshake Authentication Protocol (CHAP) is an optional iSCSI authentication method where the storage array (target) authenticates iSCSI initiators on the host server. Two types of CHAP are supported: *target* CHAP and *mutual* CHAP.

Target CHAP

In target CHAP, the storage array authenticates all requests for access issued by the iSCSI initiator(s) on the host server via a CHAP secret. To set up target CHAP authentication, you enter a CHAP secret on the storage array, then configure each iSCSI initiator on the host server to send that secret each time it attempts to access the storage array.

Mutual CHAP

In addition to setting up target CHAP, you can set up mutual CHAP in which both the storage array *and* the iSCSI initiator authenticate each other. To set up mutual CHAP, you configure the iSCSI initiator with a CHAP secret that the storage array must send to the host server in order to establish a connection. In this two-way authentication process, both the host server and the storage array are sending information that the other must validate before a connection is allowed.

CHAP is an optional feature and is not required to use iSCSI. However, if you do not configure CHAP authentication, any host server connected to the same IP network as the storage array can read from and write to the storage array.



NOTE: If you elect to use CHAP authentication, you should configure it on both the storage array (using MD Storage Manager) and the host server (using the iSCSI initiator) before preparing virtual disks to receive data. If you prepare disks to receive data before you configure CHAP authentication, you will lose visibility to the disks once CHAP is configured.

CHAP Definitions

To summarize the differences between target CHAP and mutual CHAP authentication, see Table 4-4.

Table 4-4. CHAP Types Defined

CHAP Type	Description
Target CHAP	Sets up accounts that iSCSI initiators use to connect to the target storage array. The target storage array then authenticates the iSCSI initiator.
Mutual CHAP	Applied <i>in addition</i> to target CHAP, mutual CHAP sets up an account that a target storage array uses to connect to an iSCSI initiator. The iSCSI initiator then authenticates the target.

How CHAP Is Set Up

The next two steps in your iSCSI configuration, *Step 5: Configure CHAP Authentication on the Storage Array (optional)* and *Step 6: Configure CHAP Authentication on the Host Server (optional)*, offer step-by-step procedures for setting up CHAP on your storage array and host server.

Step 5: Configure CHAP Authentication on the Storage Array (optional)

If you are configuring CHAP authentication of any kind (either target-only or target *and* mutual), you must complete this step and *Step 6: Configure CHAP Authentication on the Host Server (optional)*.

If you are **not** configuring any type of CHAP, skip these steps and go to *Step 7: Connect to the Target Storage Array from the Host Server*.



NOTE: If you choose to configure mutual CHAP authentication, you must first configure target CHAP.

Remember, in terms of iSCSI configuration, the term *target* always refers to the storage array.

Configuring Target CHAP Authentication on the Storage Array

- 1 From MD Storage Manager, click the iSCSI tab, then **Change Target Authentication**.


Make a selection based on the following:

Table 4-5. CHAP Settings

Selection	Description
None	This is the default selection. If None is the only selection, the storage array will allow an iSCSI initiator to log on without supplying any type of CHAP authentication.
None and CHAP	The storage array will allow an iSCSI initiator to log on with or without CHAP authentication.
CHAP	If CHAP is selected and None is deselected, the storage array will require CHAP authentication before allowing access.

- 2 To configure a CHAP secret, select **CHAP** and select **CHAP Secret**.
- 3 Enter the **Target CHAP secret** (or **Generate Random Secret**), confirm it in **Confirm Target CHAP Secret** and click **OK**.

Although the storage array allows sizes from 12 to 57 characters, many initiators only support CHAP secret sizes up to 16 characters (128-bit).


 **NOTE:** Once entered, a CHAP secret is not retrievable. Make sure you record the secret in an accessible place. If Generate Random Secret is used, copy and past the secret into a text file for future reference since the same CHAP secret will be used to authenticate any new host servers you may add to the storage array. If you forget this CHAP secret, you must disconnect all existing hosts attached to the storage array and repeat the steps in this chapter to re-add them.

4 Click OK.


Configuring Mutual CHAP Authentication on the Storage Array

The initiator secret must be unique for each host server that connects to the storage array and must not be the same as the target CHAP secret.

- 1 From MD Storage Manager, click on the **iSCSI** tab, then select **Enter Mutual Authentication Permissions**.
- 2 Select an initiator on the host server and click the **CHAP Secret**.
- 3 Enter the **Initiator CHAP secret**, confirm it in **Confirm initiator CHAP secret**, and click **OK**.

 **NOTE:** In some cases, an initiator CHAP secret may already be defined in your configuration. If so, use it here.

4 Click Close.

 **NOTE:** To remove a CHAP secret, you must delete the host initiator and re-add it.

Step 6: Configure CHAP Authentication on the Host Server (optional)

If you configured CHAP authentication in *Step 5: Configure CHAP Authentication on the Storage Array (optional)*, complete the following steps. If not, skip to *Step 7: Connect to the Target Storage Array from the Host Server*.


Select the set of steps in one of the following sections (Windows or Linux) that corresponds to your operating system.

If you are using Windows Server 2003 or Windows Server 2008 GUI version

- 1** Click **Start**→ **Programs**→ **Microsoft iSCSI Initiator** or **Start**→ **All Programs**→ **Administrative Tools**→ **iSCSI Initiator**.
- 2** If you are NOT using mutual CHAP authentication:
 - skip to the step 4 below
- 3** If you are using mutual CHAP authentication:
 - click the **General** tab
 - select **Secret**
 - at **Enter a secure secret**, enter the mutual CHAP secret you entered for the storage array
- 4** Click the **Discovery** tab.
- 5** Under **Target Portals**, select the IP address of the iSCSI port on the storage array and click **Remove**.


The iSCSI port you configured on the storage array during target discovery should disappear. You will reset this IP address under CHAP authentication in the steps that immediately follow.
- 6** Under **Target Portals**, click **Add** and re-enter the **IP address or DNS name** of the iSCSI port on the storage array (removed above).
- 7** Click **Advanced** and set the following values on the **General** tab:
 - **Local Adapter**: Should always be set to **Microsoft iSCSI Initiator**.
 - **Source IP**: The source IP address of the host you want to connect with.

- **Data Digest and Header Digest:** Optionally, you can specify that a digest of data or header information be compiled during transmission to assist in troubleshooting.
- **CHAP logon information:** Enter the target CHAP authentication username and secret you entered (for the host server) on the storage array.
- **Perform mutual authentication:** If mutual CHAP authentication is configured, select this option.

 **NOTE:** IPsec is not supported.

8 Click OK.

If discovery session failover is desired, repeat step 5 and step 6 (in this step) for all iSCSI ports on the storage array. Otherwise, single-host port configuration is sufficient.

 **NOTE:** If the connection fails, make sure that all IP addresses are entered correctly. Mistyped IP addresses are a common cause of connection problems.

If you are using Windows Server 2008 Core Version

1 Set the iSCSI initiator services to start automatically (if not already set):

```
sc \\<server_name> config msiscsi start= auto
```

2 Start the iSCSI service (if necessary):

```
sc start msiscsi
```

3 If you are not using mutual CHAP authentication, skip to step 4.

4 Enter the mutual CHAP secret you entered for the storage array:

```
iscsicli CHAPSecret <secret>
```

5 Remove the target portal that you configured on the storage array during target discovery:

```
iscsicli RemoveTargetPortal <IP_address>  
<TCP_listening_port>
```

You will reset this IP address under CHAP authentication in the following steps.

6 Add the target portal with CHAP defined:

```
iscsicli QAddTargetPortal
<IP_address_of_iSCSI_port_on_storage_array>
[CHAP_username]
[CHAP_password]
```

where

[CHAP_username] is the initiator name

[CHAP_password] is the target CHAP secret

If discovery session failover is desired, repeat step 5 for all iSCSI ports on the storage array. Otherwise, single-host port configuration is sufficient.

If you are using Linux Server

- 1 Edit the `/etc/iscsi.conf` file to add an `OutgoingUsername=` and `OutgoingPassword=` entry after each `DiscoveryAddress=` entry. `OutgoingUsername` is the iSCSI initiator name entered in Step 4: Configure Host Access, and the `OutgoingPassword` is the CHAP secret created in Step 5: Configure CHAP Authentication on the Storage Array (optional).

For example, your edited `/etc/iscsi.conf` file might look like this:

```
DiscoveryAddress=172.168.10.6
OutgoingUsername=iqn.1987-05.com.cisco:01.742b2d31b3e
OutgoingPassword=0123456789abcdef
DiscoveryAddress=172.168.10.7
OutgoingUsername=iqn.1987-05.com.cisco:01.742b2d31b3e
OutgoingPassword=0123456789abcdef
DiscoveryAddress=172.168.10.8
OutgoingUsername=iqn.1987-05.com.cisco:01.742b2d31b3e
OutgoingPassword=0123456789abcdef
DiscoveryAddress=172.168.10.9
OutgoingUsername=iqn.1987-05.com.cisco:01.742b2d31b3e
OutgoingPassword=0123456789abcdef
```

If you are using Mutual CHAP authentication on Linux Server

If you are configuring Mutual CHAP authentication in Linux, you must also add an `IncomingUsername=` and `IncomingPassword=` entry after each `OutgoingPassword=` entry. The **IncomingUsername** is the iSCSI target name, which can be viewed in MD Storage Manager by accessing the iSCSI tab and clicking **Change Target Identification**.

For example, your edited `/etc/iscsi.conf` file might look like this:

```
DiscoveryAddress=172.168.10.6
OutgoingUsername=iqn.1987-05.com.cisco:01.742b2d31b3e
OutgoingPassword=0123456789abcdef
IncomingUsername=iqn.1984-
05.com.dell:powervault.6001372000f5f0e600000000463b9292
IncomingPassword=abcdef0123456789
DiscoveryAddress=172.168.10.7
OutgoingUsername=iqn.1987-05.com.cisco:01.742b2d31b3e
OutgoingPassword=0123456789abcdef
IncomingUsername=iqn.1984-
05.com.dell:powervault.6001372000f5f0e600000000463b9292
IncomingPassword=abcdef0123456789
DiscoveryAddress=172.168.10.8
OutgoingUsername=iqn.1987-05.com.cisco:01.742b2d31b3e
OutgoingPassword=0123456789abcdef
IncomingUsername=iqn.1984-
05.com.dell:powervault.6001372000f5f0e600000000463b9292
IncomingPassword=abcdef0123456789
DiscoveryAddress=172.168.10.9
OutgoingUsername=iqn.1987-05.com.cisco:01.742b2d31b3e
OutgoingPassword=0123456789abcdef
IncomingUsername=iqn.1984-
05.com.dell:powervault.6001372000f5f0e600000000463b9292
IncomingPassword=abcdef0123456789
```

If you are using RHEL 5 or SLES 10 SP1

- 1 To enable CHAP (optional), the following line needs to be enabled in your `/etc/iscsi/iscsid.conf` file.
`node.session.auth.authmethod = CHAP`
- 2 To set a username and password for CHAP authentication of the initiator by the target(s), edit the following lines as shown:

```
node.session.auth.username =  
<iscsi_initiator_username>  
  
node.session.auth.password =  
<CHAP_initiator_password>
```

- 3** If you are using Mutual CHAP authentication, you can set the username and password for CHAP authentication of the target(s) by the initiator by editing the following lines:

```
node.session.auth.username_in =  
<iscsi_target_username>  
  
node.session.auth.password_in =  
<CHAP_target_password>
```

- 4** To set up discovery session CHAP authentication, first uncomment the following line:

```
discovery.sendtargets.auth.authmethod = CHAP
```

- 5** Set a username and password for a discovery session CHAP authentication of the initiator by the target(s) by editing the following lines:

```
discovery.sendtargets.auth.username =  
<iscsi_initiator_username>  
  
discovery.sendtargets.auth.password =  
<CHAP_initiator_password>
```

- 6** To set the username and password for discovery session CHAP authentication of the target(s) by the initiator for Mutual CHAP, edit the following lines:

```
discovery.sendtargets.auth.username =  
<iscsi_target_username>  
  
discovery.sendtargets.auth.password_in =  
<CHAP_target_password>
```

- 7** As a result of steps 1 through 6, the final configuration contained in the `/etc/iscsi/iscsid.conf` file might look like this:

```
node.session.auth.authmethod = CHAP  
  
node.session.auth.username = iqn.2005-  
03.com.redhat01.78b1b8cad821
```

```
node.session.auth.password = password_1
node.session.auth.username_in= iqn.1984-
05.com.dell:powervault.123456
node.session.auth.password_in = test1234567890
discovery.sendtargets.auth.authmethod = CHAP
discovery.sendtargets.auth.username = iqn.2005-
03.com.redhat01.78b1b8cad821
discovery.sendtargets.auth.password = password_1
discovery.sendtargets.auth.username = iqn.1984-
05.com.dell:powervault.123456
discovery.sendtargets.auth.password_in =
test1234567890
```


If you are using SLES10 SP1 via the GUI

- 1** Select **Desktop**→ **YaST**→ **iSCSI Initiator**.
- 2** Click **Service Start**, then select **When Booting**.
- 3** Select **Discovered Targets**, then select **Discovery**.
- 4** Enter the IP address of the port.
- 5** Click **Next**.
- 6** Select any target that is not logged in and click **Log in**.
- 7** Choose one:
 - If you are not using CHAP authentication, select **No Authentication**. Proceed to step 8.or
 - If you are using CHAP authentication, enter the CHAP username and password. To enable Mutual CHAP, select and enter the Mutual CHAP username and password.
- 8** Repeat step 7 for each target until at least one connection is logged in for each controller.
- 9** Go to **Connected Targets**.
- 10** Verify that the targets are connected and show a status of **true**.

Step 7: Connect to the Target Storage Array from the Host Server


If you are using Windows Server 2003 or Windows Server 2008 GUI

- 1 Click Start→ Programs→ Microsoft iSCSI Initiator or Start→ All Programs→ Administrative Tools→ iSCSI Initiator.
- 2 Click the **Targets** tab.
If previous target discovery was successful, the *iqn* of the storage array should be displayed under **Targets**.
- 3 Click **Log On**.
- 4 Select **Automatically restore this connection when the system boots**.
- 5 Select **Enable multi-path**.
- 6 Click **Advanced** and configure the following settings under the **General** tab:
 - **Local Adapter:** Must be set to **Microsoft iSCSI Initiator**.
 - **Source IP:** The source IP address of the host server you want to connect from.
 - **Target Portal:** Select the iSCSI port on the storage array controller that you want to connect to.
 - **Data Digest and Header Digest:** Optionally, you can specify that a digest of data or header information be compiled during transmission to assist in troubleshooting.
 - **CHAP logon information:** If CHAP authentication is required, select this option and enter the **Target secret**.
 - **Perform mutual authentication:** If mutual CHAP authentication is configured, select this option.
- 7 Click **OK**.

 **NOTE:** IPsec is not supported.


To support storage array controller failover, the host server must be connected to at least one iSCSI port on each controller. Repeat step 3 through step 8 for each iSCSI port on the storage array that you want to

establish as failover targets (the **Target Portal** address will be different for each port you connected to).

 **NOTE:** To enable the higher throughput of multipathing I/O, the host server must connect to both iSCSI ports on each controller, ideally from separate host-side NICs. Repeat step 3 through step 7 for each iSCSI port on each controller. If using a duplex MD3000i configuration, then LUNs should also be balanced between the controllers.

The **Status** field on the **Targets** tab should now display as **Connected**.

- 8 Click **OK** to close the Microsoft iSCSI initiator.

 **NOTE:** MD3000i supports only round robin load-balancing policies.

If you are using Windows Server 2008 Core Version

- 1 Set the iSCSI initiator services to start automatically (if not already set):

```
sc \\<server_name> config msiscsi start= auto
```

- 2 Start the iSCSI service (if necessary):

```
sc start msiscsi
```

- 3 Log on to the target:

```
iscsicli PersistentLoginTarget <Target_Name>  
<Report_To_PNP> <Target_Portal_Address>  
<TCP_Port_Number_Of_Target_Portal> * * *  
<Login_Flags> * * * * * <Username> <Password>  
<AuthType> * <Mapping_Count>
```

where

<Target_Name> is the target name as displayed in the target list. Use the `iscsicli ListTargets` command to display the target list.

<Report_To_PNP> is `T`, which exposes the LUN to the operating system as a storage device.

<Target_Portal_Address> is the IP address of the iSCSI port on the controller being logged in to.


<TCP_Port_Number_Of_Target_Portal> is 3260.

<Login_Flags> is 0x2 to enable multipathing for the target on the initiator. This value allows more than one session to be logged in to a target at one time.

<Username> is the initiator name.

<Password> is the target CHAP secret.

<Authtype> is either 0 for no authentication, 1 for Target CHAP, or 2 for Mutual CHAP.

 **NOTE:** <Username>, <Password> and <Authtype> are optional parameters. They can be replaced with an asterisk (*) if CHAP is not used.

<Mapping_Count> is 0, indicating that no mappings are specified and no further parameters are required.

* * * An asterisk (*) represents the default value of a parameter.

For example, your logon command might look like this:

```
iscsicli PersistentLoginTarget
iqn.1984-
05.com.dell:powervault.6001372000ffe3330000000046
72edf2 3260 T 192.168.130.101 * * * 0x2 * * * * *
* * * * 0
```

To view active sessions to the target, use the following command:

```
iscsicli SessionList
```

To support storage array controller failover, the host server must be connected to at least one iSCSI port on each controller. Repeat step 3 for each iSCSI port on the storage array that you want to establish as a failover target. (The Target_Portal_Address will be different for each port you connect to).

PersistentLoginTarget does not initiate a login to the target until after the system is rebooted. To establish immediate login to the target, substitute LoginTarget for PersistentLoginTarget.



NOTE: Refer to the *Microsoft iSCSI Software Initiator 2.x User's Guide* for more information about the commands used in the previous steps. For more information about Windows Server 2008 Server Core, refer to the Microsoft Developers Network (MSDN). Both resources are available at www.microsoft.com.

If you are using a Linux Server

If you configured CHAP authentication in the previous steps, you must restart iSCSI from the Linux command line as shown below. If you did not configure CHAP authentication, you do not need to restart iSCSI.

```
/etc/init.d/iscsi restart
```

Verify that the host server is able to connect to the storage array by running the `iscsi -ls` command as you did in target discovery. If the connection is successful, an iSCSI session will be established to each iSCSI port on the storage array.

Sample output from the command should look similar to this:

```
*****
SFNet iSCSI Driver Version ...4:0.1.11-3 (02-May-2006)
*****
TARGET NAME           : iqn.1984-
05.com.dell:powervault.6001372000f5f0e600000000463b9292
TARGET ALIAS          :
HOST ID                : 2
BUS ID                 : 0
TARGET ID              : 0
TARGET ADDRESS        : 192.168.0.110:3260,1
SESSION STATUS        : ESTABLISHED AT Wed May  9 18:20:27 CDT 2007
SESSION ID             : ISID 00023d000001 TSIH 5
*****
TARGET NAME           : iqn.1984-
05.com.dell:powervault.6001372000f5f0e600000000463b9292
TARGET ALIAS          :
HOST ID                : 3
BUS ID                 : 0
TARGET ID              : 0
TARGET ADDRESS        : 192.168.0.111:3260,1
SESSION STATUS        : ESTABLISHED AT Wed May  9 18:20:28 CDT 2007
SESSION ID             : ISID 00023d000002 TSIH 4
```

Viewing the status of your iSCSI connections

In MD Storage Manager, clicking the **iSCSI** tab and then **Configure iSCSI Host Ports** will show the status of each iSCSI port you attempted to connect and the configuration state of all IP addresses. If either displays **Disconnected** or **Unconfigured**, respectively, check the following and repeat the iSCSI configuration steps:

- Are all cables securely attached to each port on the host server and storage array?
- Is TCP/IP correctly configured on all target host ports?
- Is CHAP set up correctly on both the host server and the storage array?

To review optimal network setup and configuration settings, see *Guidelines for Configuring Your Network for iSCSI*.

Step 8: (Optional) Set Up In-Band Management

Out-of-band management (see *Step 1: Discover the Storage Array (Out-of-band management only)*) is the recommended method for managing the storage array. However, to optionally set up in-band management, use the steps shown below.

The default iSCSI host port IPv4 addresses are shown below for reference:

Controller 0, Port 0: IP: 192.168.130.101

Controller 0, Port 1: IP: 192.168.131.101

Controller 1, Port 0: IP: 192.168.130.102

Controller 1, Port 1: IP: 192.168.131.102



NOTE: The management station you are using must be configured for network communication to the same IP subnet as the MD3000i host ports.



NOTE: By default, the MD3000i host ports are not IPv6 enabled. To use IPv6 for in-band management, you must first connect either out-of-band, or in-band using the default IPv4 addresses. Once this is done, you can enable IPv6 and begin step 1 below using the IPv6 addresses.

- 1 Establish an iSCSI session to the MD3000i RAID storage array.
- 2 In either Windows or Linux, restart the **SMagent** service.
- 3 Launch MD Storage Manager.
If this is the first storage array to be set up for management, the **Add New Storage Array** window will appear. Otherwise, click **New**.
- 4 Select **Manual** and click **OK**.
- 5 Select **In-band management** and enter the host server name(s) or IP address(es) of the host server that is running the MD Storage Manager software.
- 6 Click **Add**.

In-band management should now be successfully configured.

Load Balancing

Load Balance Policy

Multi-path drivers select the I/O path to a virtual disk through a specific RAID controller module. When the multi-path driver receives a new I/O to process, the driver tries to find a path to the current RAID controller module that owns the virtual disk. If the path to the current RAID controller module that owns the virtual disk cannot be found, the multi-path driver migrates the virtual disk ownership to the secondary RAID controller module. When multiple paths to the RAID controller module that owns the virtual disk exist, you can choose a load balance policy to determine which path is used to process I/O. Multiple options for setting the load balance policies let you optimize I/O performance when mixed host interfaces are configured.

You can choose one of these load balance policies to optimize I/O performance:

- Round robin with subset
- Least queue depth with subset
- Least path weight with subset (Windows operating systems only)

Round Robin with Subset

The round robin with subset I/O load balance policy routes I/O requests, in rotation, to each available data path to the RAID controller module that owns the virtual disks. This policy treats all paths to the RAID controller module that owns the virtual disk equally for I/O activity. Paths to the secondary RAID controller module are ignored until ownership changes. The basic assumption for the round-robin policy is that the data paths are equal. With mixed host support, the data paths might have different bandwidths or different data transfer speeds.

Least Queue Depth with Subset

The least queue depth with subset policy is also known as the least I/Os or least requests policy. This policy routes the next I/O request to a data path that has the least outstanding I/O requests queued. For this policy, an I/O request is simply a command in the queue. The type of command or the number of blocks that are associated with the command are not considered.

The least queue depth with subset policy treats large block requests and small block requests equally. The data path selected is one of the paths in the path group of the RAID controller module that owns the virtual disk.


Least Path Weight with Subset

The least path weight with subset policy assigns a weight factor to each data path to a virtual disk. An I/O request is routed to the path with the lowest weight value to the RAID controller module that owns the virtual disk. If more than one data path to the virtual disk has the same weight value, the round-robin with subset path selection policy is used to route I/O requests between the paths with the same weight value. The least path weight with subset load balance policy is not supported on Linux operating systems.

Setting Load Balance Policies on the Linux Operating System

Two options are available for setting the load balance policies on the Linux operating system:

- Using the **mppUtil** command
- Using the `mpp.conf` file

 **NOTE:** The only load balancing policy options for Linux are 0x0 (round robin) and 0x1 (least queue depth).

The **mppUtil** command has the option of implementing the changes immediately; however, the changes do not persist after rebooting the host.

- 1** Are you using the **mppUtil** command?
 - Yes – Go to step 2.
 - No – Go to step 5.
- 2** Do you want to implement the change immediately without having the change persist after rebooting the host?
 - Yes – Go to step 3.
 - No – Go to step 4.

- 3** Run this command:

```
mppUtil -o LoadBalancePolicy=n
```

where n is 0 for round robin or 1 for least queue depth. The changes take effect immediately and affect only the in-memory state of the load balance policy. The changes will not persist after rebooting the host. You are finished with this procedure.

- 4 Run this command:

```
mppUtil -o LoadBalancePolicy=n, SaveSettings
```

where n is 0 for round robin or 1 for least queue depth. The `SaveSettings` parameter lets the load balance setting persist after rebooting the host. Go to step 6 to complete the procedure.

- 5 Edit the `mpp.conf` file to update the `LoadBalancePolicy` variable. Set the `LoadBalancePolicy` variable to 0 for round robin or 1 for least queue depth. Go to step 6 to complete the procedure.
- 6 Run this command to make sure that the changes are persistent:

```
mppUpdate
```

The `mppUpdate` command rebuilds the RAM disk image with the new load balance policy settings. The new settings will be used after rebooting the host.

Changing Load Balance Policies on the Windows 2008 Operating System

Load balancing with the MD3000i is only available for Windows Server 2008 and later versions of the operating system. You can change the load balance policies from the default round robin with subset by using either the:

- Device Manager
- Disk Management

Changing the Load Balance Policy Using Windows 2008 Device Manager

- 1 From the desktop of the host, right-click **My Computer** and select **Manage** to open the **Computer Management** dialog.
- 2 Click **Device Manager** to show the list of devices attached to the host.
- 3 Right-click on the multi-path disk device for which you want to set the load balance policies, then select **Properties**.
- 4 From the **MPIO** tab, select the load balance policy that you want to set for this disk device.

Changing the Load Balance Policy Using Windows 2008 Disk Management

- 1** From the desktop of the host, right-click **My Computer** icon and click **Manage** to open the **Computer Management** dialog.
- 2** Click **Disk Management** to show the list of virtual disks attached to the host.
- 3** Right-click on the virtual disk for which you want to set the load balance policy, then click **Properties**.

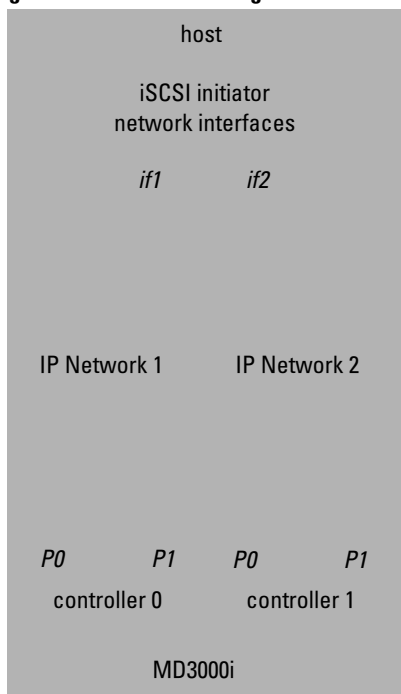
From the **MPIO** tab, select the load balance policy that you want to set for this virtual disk.

Increasing Bandwidth With Multiple iSCSI Sessions

The MD3000i in a duplex configuration supports two active/active asymmetric redundant controllers. Each controller has two 1 Gbps Ethernet ports that support iSCSI. The bandwidth of the two ports on the same controller can be aggregated to provide optimal performance. A host can be configured to simultaneously use the bandwidth of both the ports on a controller to access virtual disks owned by the controller. The multi-path failover driver that Dell provides for the MD3000i can be used to configure the MD3000i so that all ports are used for simultaneous I/O access. If the multi-path driver detects multiple paths to the same virtual disk through the ports on the same controller, it load-balances I/O access from the host across all ports on the controller.

Figure 4-3 illustrates how the initiator can be configured to take advantage of the load balancing capabilities of the multi-path failover driver.

Figure 4-3. Initiator Configuration



IP Addresses

Host
If1: IP_Addr_If1
If2: IP_Addr_If2

MD3000i Controller 0

P0: IP_Addr_C0_P0
P1: IP_Addr_C0_P1

MD3000i Controller 1

P0: IP_Addr_C1_P0
P1: IP_Addr_C1_P1

TCP Connections

To MD3000i Controller 0

T01: IP_Addr_If1 / IP_Addr_C0_P0
T02: IP_Addr_If2 / IP_Addr_C1_P1

To MD3000i Controller 1

T11: IP_Addr_If1 / IP_Addr_C1_P0
T12: IP_Addr_If2 / IP_Addr_C1_P1

iSCSI Sessions

To MD3000i Controller 0

Session 00: T01
Session 01: T02

To MD3000i Controller 1

Session 10: T11
Session 11: T12

Two sessions with one TCP connection are configured from the host to each controller (one session per port), for a total of four sessions. The multi-path failover driver balances I/O access across the sessions to the ports on the same controller. In a duplex configuration, with virtual disks on each controller, creating sessions using each of the iSCSI data ports of both controllers increases bandwidth and provides load balancing.

Stopping and Starting iSCSI Services

Should it become necessary to manually stop the iSCSI services in Linux, certain steps must be followed to maintain parallel processing between the RAID storage array and the host server. MPP (multi-path driver) is partially unloaded when the iSCSI services are stopped.

To ensure orderly shutdown of the iSCSI services, take the following actions:


- 1 Stop all I/O.
- 2 Unmount all correlated filesystems.
- 3 Unload all modules in correct order.

Internally, these tasks can be handled by the `mppiscsi_unmountall` script, which:

- stops all pending I/O on each iSCSI-mounted devices via the `fuser` command
- unmounts all iSCSI-mounted devices
- unloads the `mpp_Vhba` module
- unloads the iSCSI module

Likewise, to ensure orderly startup of the iSCSI services, these actions must occur in the following order:

- 1 Load the `mpp_Vhba` module (if not already).
- 2 Load the iSCSI modules.

 **NOTE:** Unloading the iSCSI modules stops all I/O on the iSCSI devices.

Premium Features

If you purchased premium features for your storage array, you can set them up at this point. Click **Tools**→ **View/Enable Premium Features** or **View and Enable Premium Features** on the **Initial Setup Tasks** dialog box to review the features available.

Premium features supported by MD Storage Manager include:

- 32 Partition Support
- Snapshot
- Enhanced Snapshot
- Snapshot and Virtual Disk Copy
- Enhanced Snapshot and Virtual Disk Copy
- Virtual Disk Copy

To install and enable these premium features, you must first purchase a feature key file for each feature and then specify the storage array that will host them. The *Premium Feature Activation Card* that shipped in the same box as your storage array gives instructions for this process.

For more information on using these premium features, see the *User's Guide*.

Troubleshooting Tools

The MD Storage Manager establishes communication with each managed array and determines the current array status. When a problem occurs on a storage array, MD Storage Manager provides several ways to troubleshoot the problem:

- **Recovery Guru** — The Recovery Guru diagnoses critical events on the storage array and recommends step-by-step recovery procedures for problem resolution. To access the Recovery Guru using MD Storage Manager, click **Support**→ **Recover from Failure**. The Recovery Guru can also be accessed from the **Status** area of the **Summary** page.
- **Storage Array Profile** — The Storage Array Profile provides an overview of your storage array configuration, including firmware versions and the current status of all devices on the storage array. To access the Storage

Array Profile, click **Support**→ **View storage array profile**. The profile can also be viewed by clicking the **Storage array profile** link in the **Hardware Components** area of the **Summary** tab.

- **Status Icons** — Status icons identify the six possible health status conditions of the storage array. For every non-Optimal status icon, use the Recovery Guru to detect and troubleshoot the problem.
 - **Optimal** — Every component in the managed array is in the desired working condition.
 - **Needs Attention** — A problem exists with the managed array that requires intervention to correct it.
 - **Fixing** — A Needs Attention condition has been corrected and the managed array is currently changing to an Optimal status.
 - **Unresponsive** — The storage management station cannot communicate with the array, one controller, or both controllers in the storage array. Wait at least five minutes for the storage array to return to an Optimal status following a recovery procedure.
 - **Contacting Device** — MD Storage Manager is establishing contact with the array.
 - **Needs Upgrade** — The storage array is running a level of firmware that is no longer supported by MD Storage Manager.
- **Support Information Bundle** — The **Gather Support Information** link on the **Support** tab saves all storage array data, such as profile and event log information, to a file that you can send if you seek technical assistance for problem resolution. It is helpful to generate this file before you contact Dell support with MD3000i-related issues.

Uninstalling Software

The following sections contain information on how to uninstall MD Storage Manager software from both host and management station systems.

Uninstalling From Windows

Use the Change/Remove Program feature to uninstall MD Storage Manager from a Microsoft® Windows® operating systems other than Windows Server 2008:

- 1 From the Control Panel, double-click **Add or Remove Programs**.
- 2 Select MD Storage Manager from the list of programs.
- 3 Click **Change/Remove**, and follow the prompts to complete the uninstallation process.

The **Uninstall Complete** window appears.

- 4 Select **Yes** to restart the system, and then click **Done**.

Use the following procedure to uninstall MD Storage Manager on Windows Server® 2008 GUI versions:


- 1 From the **Control Panel**, double-click **Programs and Features**.
- 2 Select **MD Storage Manager** from the list of programs.
- 3 Click **Uninstall/Change**, then follow the prompts to complete the uninstallation process.

The **Uninstall Complete** window appears.

- 4 Select **Yes** to restart the system, then click **Done**.

Use the following procedure to uninstall MD Storage Manager on Windows Server 2008 Core versions:

- 1 Navigate to the **\Program Files\Dell\MD Storage Manager\Uninstall Dell_MD_Storage_Manager** directory.

 **NOTE:** By default, MD Storage Manager is installed in the \Program Files\Dell\MD Storage Manager directory. If another directory was used during installation, navigate to that directory before beginning the uninstall procedure.

- 2 From the installation directory, type (command is case sensitive):
`Uninstall Dell_MD_Storage_Manager`
and press **Enter**.
- 3 From the **Uninstall** window, click **Next** and follow the on-screen instructions.
- 4 Select **Yes** to restart the system, then click **Done**.

Uninstalling From Linux

Use the following procedure to uninstall MD Storage Manager from a Linux system.

- 1 By default, MD Storage Manager is installed in the `/opt/dell/mdstoragemanager` directory. If another directory was used during installation, navigate to that directory before beginning the Uninstall procedure.
- 2 From the installation directory, type
`./uninstall_dell_mdstoragemanager`
and press **Enter**.
- 3 From the **Uninstall** window, click **Next**, and follow the instructions that appear on the screen.
While the software is uninstalling, the **Uninstall** window is displayed. When the uninstall procedure is complete, the **Uninstall Complete** window is displayed.
- 4 Click **Done**.

6


Guidelines for Configuring Your Network for iSCSI

This section gives general guidelines for setting up your network environment and IP addresses for use with the iSCSI ports on your host server and storage array. Your specific network environment may require different or additional steps than shown here, so make sure you consult with your system administrator before performing this setup.

Windows Host Setup

If you are using a Windows host network, the following section provides a framework for preparing your network for iSCSI.

To set up a Windows host network, you must configure the IP address and netmask of each iSCSI port connected to the storage array. The specific steps depend on whether you are using a Dynamic Host Configuration Protocol (DHCP) server, static IP addressing, Domain Name System (DNS) server, or Windows Internet Name Service (WINS) server.

 **NOTE:** The server IP addresses must be configured for network communication to the same IP subnet as the storage array management and iSCSI ports.

If using a DHCP server

- 1** On the **Control Panel**, select **Network connections** or **Network and Sharing Center**. Then click **Manage network connections**.
- 2** Right-click the network connection you want to configure and select **Properties**
- 3** On the **General** tab (for a local area connection) or the **Networking** tab (for all other connections), select **Internet Protocol (TCP/IP)**, and then click **Properties**.
- 4** Select **Obtain an IP address automatically**, then **OK**.


If using Static IP addressing

- 1** On the **Control Panel**, select **Network connections** or **Network and Sharing Center**. Then click **Manage network connections**.
- 2** Right-click the network connection you want to configure and select **Properties**.
- 3** On the **General** tab (for a local area connection) or the **Networking** tab (for all other connections), select **Internet Protocol (TCP/IP)**, and then click **Properties**.
- 4** Select **Use the following IP address** and enter the IP address, subnet mask, and default gateway addresses.

If using a DNS server

- 1** On the **Control Panel**, select **Network connections** or **Network and Sharing Center**. Then click **Manage network connections**.
- 2** Right-click the network connection you want to configure and select **Properties**.
- 3** On the **General** tab (for a local area connection) or the **Networking** tab (for all other connections), select **Internet Protocol (TCP/IP)**, and then click **Properties**.
- 4** Select **Obtain DNS server address automatically** or enter the preferred and alternate DNS server IP addresses and click **OK**.

If using a WINS server

 **NOTE:** If you are using a DHCP server to allocate WINS server IP addresses, you do not need to add WINS server addresses.

- 1** On the **Control Panel**, select **Network connections**.
- 2** Right-click the network connection you want to configure and select **Properties**.
- 3** On the **General** tab (for a local area connection) or the **Networking** tab (for all other connections), select **Internet Protocol (TCP/IP)**, and then click **Properties**.
- 4** Select **Advanced**, then the **WINS** tab, and click **Add**.
- 5** In the **TCP/IP WINS server** window, type the IP address of the WINS server and click **Add**.

- 6 To enable use of the `Lmhosts` file to resolve remote NetBIOS names, select **Enable LMHOSTS lookup**.
- 7 To specify the location of the file that you want to import into the `Lmhosts` file, select **Import LMHOSTS** and then select the file in the **Open** dialog box
- 8 Enable or disable NetBIOS over TCP/IP.

If using Windows 2008 Core Version

On a server running Windows 2008 Core version, use the `netsh interface` command to configure the iSCSI ports on the host server.

Linux Host Setup

If you are using a Linux host network, the following section provides a framework for preparing your network for iSCSI.

To set up a Linux host network, you must configure the IP address and netmask of each iSCSI port connected to the storage array. The specific steps depend on whether you are configuring TCP/IP using Dynamic Host Configuration Protocol (DHCP) or configuring TCP/IP using a static IP address.



NOTE: The server IP addresses must be configured for network communication to the same IP subnet as the storage array management and iSCSI ports.

Configuring TCP/IP on Linux using DHCP (root users only)

- 1 Edit the `/etc/sysconfig/network` file as follows:

```
NETWORKING=yes  
  
HOSTNAME=mymachine.mycompany.com
```
- 2 Edit the configuration file for the connection you want to configure, either `/etc/sysconfig/network-scripts/ifcfg-ethX` (for RHEL) or `/etc/sysconfig/network/ifcfg-eth-id-XX:XX:XX:XX:XX` (for SUSE).

```
BOOTPROTO=dhcp
```

Also, verify that an IP address and netmask are *not* defined.
- 3 Restart network services using the following command:

```
/etc/init.d/network restart
```

Configuring TCP/IP on Linux using a Static IP address (root users only)

- 1** Edit the `/etc/sysconfig/network` file as follows:

```
NETWORKING=yes  
HOSTNAME=mymachine.mycompany.com  
GATEWAY=255.255.255.0
```

- 2** Edit the configuration file for the connection you want to configure, either `/etc/sysconfig/network-scripts/ifcfg-ethX` (for RHEL) or `/etc/sysconfig/network/ifcfg-eth-id-XX:XX:XX:XX:XX` (for SUSE).

```
BOOTPROTO=static  
BROADCAST=192.168.1.255  
IPADDR=192.168.1.100  
NETMASK=255.255.255.0  
NETWORK=192.168.1.0  
ONBOOT=yes  
TYPE=Ethernet  
HWADDR=XX:XX:XX:XX:XX:XX  
GATEWAY=192.168.1.1
```

- 3** Restart network services using the following command:

```
/etc/init.d/network restart
```

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