

Dell PowerVault MD3600f and
MD3620f Storage Arrays
Deployment Guide



Notes, Cautions, and Warnings



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



CAUTION: A CAUTION indicates potential damage to hardware or loss of data if instructions are not followed.



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

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Introduction

 **NOTE:** Throughout the document, Dell PowerVault MD3600f series storage array refers to both Dell PowerVault MD3600f and Dell PowerVault MD3620f.

This guide provides information about deploying Dell PowerVault MD3600f and MD3620f storage arrays. The deployment process includes:

- Hardware installation
- Modular Disk Storage Manager (MDSM) software installation
- Initial system configuration

Other information provided include system requirements, storage array organization, and utilities.

 **NOTE:** For more information on product documentation, see support.dell.com/manuals.

MDSM enables an administrator to configure and monitor storage arrays for optimum usability. The version of MDSM included on the PowerVault MD series resource media can be used to manage both the PowerVault MD3600f series and the earlier PowerVault MD series storage arrays. MDSM is compatible with both Microsoft Windows and Linux operating systems.

System Requirements

Before installing and configuring the PowerVault MD3600f series hardware and software, ensure that the supported operating system is installed and minimum system requirements are met. For more information, see the *Support Matrix* at support.dell.com/manuals.

Management Station Requirements

A management station uses MDSM to configure and manage storage arrays across the network. A management station must meet the following minimum system requirements:

- Intel Pentium or an equivalent processor (1333 MHz or faster) with 512 MB RAM (1024 MB recommended)
- 1 GB disk space

- Display resolution of 1024x768 with 16 million colors (1280x1024 32-bit recommended)
- Microsoft Windows, Red Hat Enterprise Linux, or SUSE Linux Enterprise Server.



NOTE: Operating system installations can be either native or hypervisor guest configurations.



NOTE: Supported hypervisors include Microsoft Hyper-V, Citrix XenServer, and VMware. For information about the supported versions, see the *Support Matrix* at support.dell.com/manuals.

- Administrator or equivalent permissions.

Introduction to Storage Arrays

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

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 (for example, through failure of a host server port) does not result in loss of access to data on the storage array.

The storage array is managed by MDSM running on a:

- Host server—On a host server system, MDSM and the storage array communicate management requests and event information using SAS connections.
- Management station—On a management station, MDSM communicates with the storage array either through an Ethernet connection to the storage array management port or through an Ethernet connection to a host server. The Ethernet connection passes management information between the management station and the storage array using SAS connections.

Using MDSM, you can configure the physical disks in the storage array into logical components called disk groups and then divide the disk groups into virtual disks. Disk groups are created in the unconfigured capacity of a storage array. Virtual disks are created in the free capacity of a disk group.

Unconfigured capacity comprises 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 is not assigned to any 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.

For more information about using RAID and managing data in your storage solution, see the *Owner's Manual* at support.dell.com/manuals.

Hardware Installation

Before using this guide, ensure that you review the instructions in the:

- *Getting Started Guide*—The *Getting Started Guide* that shipped with the storage array provides information to configure the initial setup of the system.
- Planning section of the *Owner's Manual*—The planning section provides information about important concepts you should know before setting up your storage solution. See the *Owner's Manual* at support.dell.com/manuals.
- *Configuring Fibre Channel With the Dell PowerVault MD3600f Series Storage Array*—This document provides information about configurations, host bus adapter (HBA) installation, and zoning. See support.dell.com/manuals.

Planning the Storage Configuration

Consider the following 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.

Connecting the Storage Array

The storage array is connected to a host using two hot-swappable RAID controller modules. The RAID controller modules are identified as RAID controller module 0 and RAID controller module 1.

Each RAID controller module has four FCIN (host) port connectors that provide FC connections to the host or node. Each 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 stand-alone system). The SAS Out port allows you to connect the storage array to optional expansion enclosures for additional storage capacity.

For more information, see the *Getting Started Guide* at support.dell.com/manuals.



NOTE: When you connect a host server to a storage array FCIN port connector, any Out port connector of the host bus adapter (HBA) of the server can be used.

Cabling the Storage Array

You can cable the storage array to host servers with:

- Single path data configuration—A single path configuration allows you to connect a maximum of eight hosts. This is a non-redundant configuration.
- Dual path data configuration—A dual path configuration allows you to connect a maximum of four hosts.

You choose the data configuration based on:

- Number of hosts required
- Level of data redundancy required

Redundant and Non-Redundant Configurations

Non-redundant configurations are configurations that provide only a single data path from a host to the storage array. This type of configuration is only recommended for non-critical data storage. Path failure from a failed or removed cable, a failed HBA, or a failed or removed RAID controller module results in loss of host access to storage on the storage array.

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



NOTE: For detailed information about all cabling configurations including direct and SAN-attached hosts, cabling for remote replication environments, the use of zoning, and HBA installation, see *Configuring Fibre Channel With the Dell MD3600f Series Storage Array*, at support.dell.com/manuals.

Cabling PowerVault MD1200 Series Expansion Enclosures

You can expand the capacity of your PowerVault MD3600f series storage array by adding PowerVault MD1200 series expansion enclosures. You can expand the physical disk pool to a maximum of 120 (or 192, if enabled using Premium Feature activation) physical disks using a maximum of seven expansion enclosures.

Expanding With Previously Configured PowerVault MD1200 Series Expansion Enclosures

Use this procedure if your expansion enclosure is directly attached to and configured on a Dell PowerEdge RAID Controller (PERC) H800 adapter. Data from virtual disks created on a PERC H800 adapter cannot be directly migrated to a PowerVault MD3600f series storage array or to a PowerVault MD1200 series expansion enclosure connected to a PowerVault MD3600f series storage array.



CAUTION: If a PowerVault MD1200 series enclosure that was previously attached to PERC H800 adapter is used as an expansion enclosure to a PowerVault MD3600f series storage array, the physical disks of the expansion enclosure are reinitialized and data is lost. You must backup all data on the expansion enclosure before attempting the expansion.

To attach previously configured PowerVault MD1200 series expansion enclosures to the PowerVault MD3200 series storage array:

- 1 Back up all data on the expansion enclosure(s).

- 2 Upgrade the expansion enclosure firmware to the latest version available at support.dell.com while the enclosure is still attached to the PERC H800 controller.

Windows systems users can reference the **DUP.exe** package and Linux kernel users can reference the **DUP.bin** package.

- 3 Ensure that the storage array software is installed and up to date before adding the expansion enclosure(s).

For more information, see the *Support Matrix* at support.dell.com/manuals.

- a Install the software and driver package included on the PowerVault MD series resource media.

For information about installing the software, see "Installing MD Storage Software" on page 19.

- b Update the storage array RAID controller module firmware and NVSRAM to the latest versions available at support.dell.com, using PowerVault MDSM.

- c Click **Tools**→**Upgrade RAID Controller Module Firmware** in the **Enterprise Management Window (EMW)**.

- 4 Stop all I/O and turn off the system and attached units.

- a Stop all I/O to the array and turn off the host systems attached to the storage array.

- b Turn off the storage array.

- c Turn off the expansion enclosure(s) in the affected system.

- 5 Cable the expansion enclosure(s) to the storage array.

- 6 Turn on attached units:

- a Turn on the expansion enclosure(s). Wait for the enclosure status LED to turn blue.

- b Turn on the storage array and wait for the status LED to indicate that the unit is ready:

- If the status LEDs are solid amber, the storage array is still coming online.

- If the status LEDs are blinking amber, there is an error that can be viewed using the PowerVault MDSM.
 - If the status LEDs are solid blue, the storage array is ready.
- c When the storage array is online and ready, turn on any attached host systems.
- 7 After the PowerVault MD1200 series expansion enclosure is configured as an expansion enclosure of the storage array, restore the data that was backed up in step 1.

After the PowerVault MD1200 series expansion enclosures are online, they can be accessed as a part of the storage array.

Expanding With New PowerVault MD1200 Series Expansion Enclosures

Perform the following steps to attach new PowerVault MD1200 series expansion enclosures to a PowerVault MD3600f series storage array:



NOTE: Before adding the expansion enclosure(s), ensure that the storage array software is installed and up to date. For more information, see the *Support Matrix* at support.dell.com/manuals.

- 1 Before adding the expansion enclosure(s), ensure that the storage array software is installed and is up to date. For more information, see the *Support Matrix* at support.dell.com/manuals.
 - a Install the software and driver package included on the PowerVault MD series resource media.
For information about installing the software, see "Installing MD Storage Software" on page 19.
 - b Set up the PowerVault MD1200 series expansion enclosure(s).
For information about setting up the PowerVault MD1200 series expansion enclosure(s), see the *Owner's Manual* at support.dell.com/manuals.
 - c Using PowerVault MDSM, update the RAID controller module firmware and NVSRAM to the latest versions available on support.dell.com.
 - d Click **Tools**→ **Upgrade RAID Controller Module Firmware** from the Enterprise Management Window (EMW).
- 2 Stop I/O and turn off all systems:

- a** Stop all I/O to the storage array and turn off affected host systems attached to the storage array.
 - b** Turn off the storage array.
 - c** Turn off any expansion enclosure(s) in the affected system.
- 3** Cable the expansion enclosure(s) to the storage array.
- 4** Turn on attached units:
 - a** Turn on the expansion enclosure(s). Wait for the enclosure status LED to turn blue.
 - b** Turn on the storage array and wait for the status LED to indicate that the unit is ready:
 - If the status LEDs are solid amber, the storage array is still coming online.
 - If the status LEDs are blinking amber, there is an error that can be viewed using PowerVault MDSM.
 - If the status LEDs are solid blue, the storage array is ready.
 - c** After the storage array is online and ready, turn on any attached host systems.
- 5** Using PowerVault MDSM, update all attached expansion enclosure firmware if it is out of date:
 - a** From the EMW, select the enclosure that you want to update and enter the **Array Management Window (AMW)**.
 - b** Click **Advanced**→ **Maintenance**→ **Download**→ **EMM Firmware**.
 - c** Select **Select All** to update all the attached expansion enclosures simultaneously.

Installing MD Storage Software

The PowerVault MD series resource media contains software and drivers for both Linux and Microsoft Windows operating systems.

The root of the media 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 media, and system requirements for running the software.

For more information on supported hardware and software for Dell PowerVault systems, see the *Support Matrix* located at support.dell.com/manuals.



NOTE: It is recommended that you install all the latest updates available at support.dell.com.

The PowerVault MD3600f series storage software installer provides features that include the core software and providers. The core software feature includes the host-based storage agent, multipath driver, and MD Storage Manager application used to configure, manage and monitor the storage array solution. The providers feature include providers for the Microsoft Virtual Disk Service (VDS) and Microsoft Volume Shadow-Copy Service (VSS) framework.



NOTE: For more information about the Microsoft VDS and Microsoft VSS providers, see the *Owner's Manual* at support.dell.com/manuals.




NOTE: To install the software on a Windows or Linux system, you must have administrative or root privileges.

The PowerVault MD series resource media offers the following installation methods:

- **Graphical Installation (Recommended)**—This is the recommended installation procedure for most users. The installer presents a graphical wizard-driven interface that allows customization of which components are installed.
- **Console Installation**—This installation procedure is useful for Linux users that do not desire to install an X-Window environment on their supported Linux platform.

- Silent Installation—This installation procedure is useful for users that prefer to create scripted installations.

Installing Host Bus Adapters and Drivers

 **NOTE:** Ensure that you read the *Configuring Fibre Channel With the Dell MD3600f Series Storage Array* document before continuing with this procedure.


- 1 Install the host bus adapters (HBAs).
- 2 Connect the cables.
- 3 Install the HBA drivers and the operating system HBA patches/hotfixes.
- 4 Ensure that the recommended HBA settings are applied.

Graphical Installation (Recommended)




The MD Storage Manager application configures, manages, and monitors the storage array. To install the MD storage software:

- 1 Insert the PowerVault MD series resource media.


Depending on your operating system, the installer may launch automatically. If the installer does not launch automatically, navigate to the root directory of the installation media (or downloaded installer image) and run the `md_launcher.exe` file. For Linux-based systems, navigate to the root of the resource media and run the autorun file.

 **NOTE:** By default, Red Hat Enterprise Linux mounts the resource media with the `-noexec mount` option which does not allow you to run executable files. To change this setting, see the **Readme** file in the root directory of the installation media.

- 2 Select **Install MD Storage Software**.
- 3 Read and accept the license agreement.
- 4 Select one of the following installation options from the Install Set dropdown menu:
 - Full (recommended)—Installs the MD Storage Manager (client) software, host-based storage agent, multipath driver, and hardware providers.
 - Host Only—Installs the host-based storage agent and multipath drivers.

- Management—Installs the management software and hardware providers.
 - Custom—Allows you to select specific components.
- 5 Select the PowerVault MD storage array model(s) you are setting up to serve as data storage for this host server.
 - 6 Choose whether to start the event monitor service automatically when the host server reboots or manually.
 -  **NOTE:** This option is applicable only to Windows client software installation.
 - 7 Confirm the installation location and choose **Install**.
 - 8 If prompted, reboot the host server once the installation completes.
 - 9 Start **MD Storage Manager** and discover the array(s).
 -  **NOTE:** If Dynamic Host Configuration Protocol (DHCP) is not used on the network where the PowerVault MD storage array's management ports are connected, it is recommended that you enable IPv6 on the management station to discover the storage array(s).
 - 10 Configure single initiator and multiple target zoning on your Fibre Channel switches.
 - 11 If applicable, activate any premium features purchased with your storage array. If you purchased premium features, see the printed activation card shipped with your storage array.
 -  **NOTE:** The **MD Storage Manager** installer automatically installs the required drivers, firmware, and operating system patches/hotfixes to operate your storage array. These drivers and firmware are also available at support.dell.com. In addition, see the *Support Matrix* at support.dell.com/manuals for any additional settings and/or software required for your specific storage array.

Console Installation

-  **NOTE:** Console installation only applies to Linux systems that are not running a graphical environment.

The autorun script in the root of the resource media detects when there is no graphical environment running and automatically starts the installer in a text-based mode. This mode provides the same options as graphical installation.

Silent Installation

To run silent installation on a Windows system:

- 1 Copy the `custom_silent.properties` file in the `/windows` folder of the installation media or image to a writable location on the host server.
- 2 Modify the `custom_silent.properties` file to reflect the features, models and installation options to be used. Then, save the file.
- 3 Once the `custom_silent.properties` file is revised to reflect your specific installation, run the following command to begin the silent installation:

```
mdss_install.exe -f <host_server_path>\  
custom_silent.properties
```

To run silent installation on a Linux system:



NOTE: On Red Hat Enterprise Linux 6 operating systems, run the following script from the root directory to install prerequisite packages:

```
# md_prereq_install.sh
```

- 1 Copy the `custom_silent.properties` file in the `/windows` folder of the installation media or image to a writable location on the host server.
- 2 Modify the `custom_silent.properties` file to reflect the features, models and installation options to be used. Then, save the file.
- 3 Once the `custom_silent.properties` file is revised, run the following command to begin the installation:

```
./mdss_install.bin -f  
<host_server_path>/custom_silent.properties
```

Enabling Premium Features (Optional)

If you ordered premium features, follow the instructions on the *Premium Features Card* to install the additional features.

Upgrading PowerVault MD Storage Software

To upgrade from a previous version of the PowerVault MD Storage Manager application, uninstall the previous version (see "Uninstalling MD Storage Software" on page 27), and then follow the instructions in "Installing MD Storage Software" on page 19 to install the new version.

Post Installation Tasks

Before using the Dell PowerVault storage array for the first time, complete these initial configuration tasks in the order shown. These tasks are performed using the MD Storage Manager (MDSM) software.

- 1 For out-of-band management, you must set the network configuration for each RAID controller module, including its Internet Protocol (IP) address, subnetwork mask (subnet mask), and gateway.



NOTE: You can set the network configuration using a DHCP server.

- 2 Start MDSM.

- Click **Start**→**Programs**→**Dell**→**MD Storage Manager**→**Modular Disk Storage Manager Client** on Microsoft Windows operating systems.
- Click the **PowerVault MD Storage Manager** desktop icon on Linux operating systems.
- You can also launch PowerVault MD Storage Manager in Linux by running the following commands at the command prompt:

```
cd /opt/dell/mdstoragesoftware/mdstoragemanager  
/client./SMclient
```

- 3 Go to **Setup**→**Add Storage Array** and start the automatic discovery of systems in the Enterprise Management Window (EMW).



NOTE: Only storage arrays configured with IP address on the same subnet as the management stations will be detected.



NOTE: It may take several minutes for the discovery process to complete. Closing the **Automatic Discovery Status** window before this stops the discovery process.

After discovery is complete, a confirmation screen is displayed.

- 4 Click **Close** to close the screen.

Verifying Storage Array Discovery

The **Automatic Discovery** option automatically discovers both in-band and out-of-band arrays and adds the storage arrays to the management domain. If the out-of-band or in-band connections shown on the summary page are not accurate, complete the following steps. For more information, see the *Online Help*.

- 1 Check the hardware and connections for possible problems. For specific procedures on troubleshooting interface problems, see the *Owner's Manual* at support.dell.com/manuals.
- 2 Verify that the array is on the local subnetwork. If it is not, click the new link to manually add it.
- 3 Verify that the status of each storage array is **Optimal**. If any array shows an **Unresponsive** status, complete one of the following steps:
 - a To remove the array from the management domain, highlight the array and then click **Remove link**.
 - b To add an array, click **New link**.
In Linux, click the **Manual** button and click **OK**.
- 4 If the array still shows an **Unresponsive** status, contact Dell.

Initial Setup Tasks

- 1 The name of the first storage array found is displayed in the **Devices** tab of the EMW. To see a list of all storage arrays found on the local network, expand the discovered storage arrays tab in the device pane of the EMW.
- 2 The default name for a newly installed MD3600f series storage array is *Unnamed*. If another name is displayed in MDSM, click the down arrow next to the name and click *Unnamed* in the drop-down list.
- 3 Double-click on the discovered array to launch the array management window and make changes to the configuration of the array.
- 4 Click **Perform Initial Setup Tasks** to see an outline and links to the remaining post-installation tasks. The array is now ready to be configured. See the *Owner's Manual* for information about each task and to perform the necessary configuration steps. Table 4-1 lists the recommended configuration steps that can be accomplished using the *Owner's Manual*.



NOTE: Before configuring the storage array, check the status icons on the **Device** pane to ensure that the enclosures in the storage array are in an **Optimal** status. For more information on the status icons, see the *Owner's Manual* at support.dell.com/manuals.

Table 4-1. Initial Setup Tasks Dialog Box

Task	Purpose
Rename the storage array	To provide a more meaningful name than the software-assigned label, <i>Unnamed</i> .
Set a storage array password	To restrict unauthorized access. MDSM may ask for a password before changing the configuration or performing a destructive operation.
Set up alert notifications	To notify individuals (by e-mail) and/or storage enterprise management consoles, such as Dell Management Console, (by SNMP) when a storage array component degrades or fails, or an adverse environmental condition occurs.
Set up e-mail alerts	
Set up SNMP alerts	
Configure a storage array	To create virtual disks and map them to hosts.

Uninstalling MD Storage Software

Uninstalling MD Storage Software From Windows

Use the **Change/Remove Program** feature to uninstall the Modular Disk Storage Software (MDSM) from Microsoft Windows operating systems other than Microsoft Windows Server 2008:

- 1 Double-click **Add or Remove Programs** from the **Control Panel**.
- 2 Select **Dell MD32xxi** storage software from the list of programs.
- 3 Click **Change/Remove**.

The **Uninstall Complete** window is displayed.

- 4 Follow the instructions on screen.
- 5 Select **Yes** to restart the system, and then click **Done**.

Use the following procedure to uninstall Modular Disk Storage software from Windows Server 2008 GUI versions:

- 1 Double-click **Programs and Features** from the **Control Panel**.
- 2 Select **MD Storage Software** from the list of programs.
- 3 Click **Uninstall/Change**.

The **Uninstall Complete** window is displayed.

- 4 Follow the instructions on screen.
- 5 Select **Yes** to restart the system, then click **Done**.

Use the following procedure to uninstall PowerVault Modular Disk Storage Software on Windows Server 2008 Core versions:

- 1 Navigate to the **Dell\MD Storage Software\Uninstall Dell Modular Disk 32xxi Storage Software** directory.



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

- 2 From the installation directory, type the following command and press <Enter>:

```
Uninstall Modular Disk Storage
```

- 3 From the **Uninstall** window, click **Next** and follow the instructions on the screen.
- 4 Select **Yes** to restart the system, then click **Done**.

Uninstalling MD Storage Software From Linux

- 1 By default, PowerVault 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 uninstallation procedure.
- 2 From the installation directory, open the **Uninstall Dell MD Storage Software** directory.
- 3 Run the file **Uninstall Dell MD Storage Software.exe**.
- 4 From the **Uninstall** window, click **Next**, and follow the instructions 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.

- 5 Click **Done**.

Appendix—Load Balancing

Windows 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, the driver tries to find a path to the current RAID controller module that owns the virtual disk. If that path 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 the following load balance policies to optimize I/O performance:

- Round robin with subset
- Least queue depth with subset

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 in the path group of the RAID controller module that owns the virtual disk.

Changing Load Balance Policies in Windows Server 2008

Load balancing with the PowerVault MD3600 series is only available for Windows Server 2008 or later versions of the operating system. You can change the load balance policies from the default round robin with subset by using one of the following:

- Device Manager options
- Disk Management options

Changing the Load Balance Policy Using Windows Server 2008 Device Manager Options

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

Changing the Load Balance Policy Using the Windows Server 2008 Disk Management Options

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

Setting Load Balance Policies in Linux

Linux only supports round robin based load balancing. For more information, see "Round Robin With Subset" on page 29.

Appendix—Working With SFP Modules and Fiber Optic Cables

Each storage controller can have up to four FC host ports. A small-form-factor pluggable (SFP) module is used to connect a host port to a host or switch. The SFP module is inserted into the port, and then a fiber optic cable is inserted into the SFP module. The other end of the fiber optic cable is connected to an optical interface connector either in a FC HBA on a host or a switch. SFP modules are laser products.



WARNING: Data processing environments can contain equipment transmitting on system links with laser modules that operate at greater than Class 1 power levels. Never look into the end of an optical fiber cable or open receptacle.

Guidelines for Using SFP Modules

The storage array requires SFP modules. SFP modules convert electrical signals to optical signals that are required for FC transmission to and from RAID controller modules. After installing the SFP modules, fiber optic cables are used to connect the storage array to other FC devices. Before installing SFP modules and fiber optic cables, read the following information:

- Use only Dell supported SFPs with the Dell PowerVault MD3600f series storage arrays. Other generic SFPs are not supported and may not work with the storage arrays.
- The SFP module housing has an integral guide key that is designed to prevent you from inserting the SFP module incorrectly.
- Use minimal pressure when inserting an SFP module into a FC port. Forcing the SFP module into a port may damage the SFP module or the port.
- You can install or remove the SFP module while the port is powered on.

- You must install the SFP module into a port before you connect the fiber optic cable.
- You must remove the fiber optic cable from the SFP module before you remove the SFP module from the port.

CAUTION: When handling static-sensitive devices, take precautions to avoid damaging the product from static electricity.

Installing and Removing SFP Modules

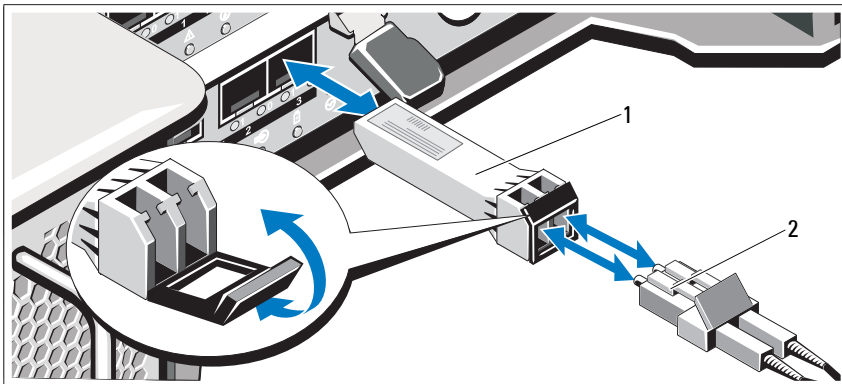
To install SFP modules:

- 1 If all the FC IN ports have an SFP module installed, go to step 5.
- 2 Remove the SFP module from the static protective package.
- 3 Remove the protective cap from the SFP module and SFP port.

NOTE: Store the protective caps for future use.

- 4 Insert the SFP module into the host port until it clicks into place.
- 5 Connect an FC cable. See "Installing and Removing Fibre Channel Cables" on page 36.

Figure B-1. Installing and Removing an SFP Module



1 SFP transceiver

2 Fiber optic cable

To remove SFP modules:

- 1 Remove the FC cable from the SFP module. See "Installing and Removing Fibre Channel Cables" on page 36.



NOTE: To avoid damaging the cable or the SFP module, disconnect the FC cable before removing the SFP module.

- 2 Unlock the SFP module latch. For SFP modules that contain wire tabs, unlock the SFP module latch by pulling the wire latch outward 90°.
- 3 With the SFP module latch in the unlocked position, remove the SFP module. For SFP modules that contain wire tabs, grasp the wire latch and pull the SFP module out of the port.
- 4 Replace the protective cap on the SFP module and the host port.
- 5 Place the SFP module into a static-protective package.

Guidelines for Using Fiber Optic Cables

- Do not route the cable along a folding cable management arm.
- For devices on slide rails, leave enough slack in the cables so they do not bend to a diameter of less than 76 mm (3"), or a radius less than 38 mm (1.5"), when extended or become pinched when retracted.
- Route the cable away from places where it can be damaged by other devices in the rack cabinet.
- Do not use plastic cable ties in place of the provided cable straps.
- Do not over-tighten the cable straps or bend the cables to a diameter of less than 76 mm (3") or a radius less than 38 mm (1.5").
- Do not place excess weight on the cable at the connection point. Ensure that the cable is well supported.

Installing and Removing Fibre Channel Cables



WARNING: Data processing environments can contain equipment transmitting on system links with laser modules that operate at greater than Class 1 power levels. Never look into the end of an optical fiber cable or open receptacle.

Before installing an FC cable, see "Guidelines for Using Fiber Optic Cables" on page 35.

To install an FC cable:

- 1 If applicable, remove the protective cap from the SFP module and store the protective cap for future use.
- 2 Remove the two protective caps from one end of the cable and store them for future use.
- 3 Insert the cable into an SFP module that is installed in the storage array. The cable connector is keyed for correct installation. Holding the connector, push in the cable until it clicks into place.
- 4 Remove the two protective caps from the other end of the cable and store them future use.
- 5 Connect this end of the cable to one of the following devices:
 - An SFP module that is installed in an FC switch port
 - An FC HBA port

To remove an FC cable:

- 1 Press and hold the lever to release the latches before removing the cable from the SFP module. Ensure that the levers are in the released position when removing the cable. Do not grasp the SFP module plastic tab when removing the cable.
- 2 On the end of the cable that connects into the SFP module or HBA, press down and hold the lever to release the latches.
- 3 While pressing down the cable lever, pull the connector to remove the cable from the SFP module.
- 4 Replace the protective caps on the cable ends.
- 5 Replace the protective cap on the SFP module.

Appendix—Hardware Cabling Best Practices


Handling Static-Sensitive Components

Static electricity can damage memory modules, system boards, and other static-sensitive components. To prevent damaging the system, follow these precautions:

- Move and store all components in the static-protective packaging.
- Place components on a grounded surface before removing them from their static-protective packaging.
- Grounded surfaces include static-dissipating mats or grounded workstations.
- Always be properly grounded when touching a static-sensitive component. To properly ground yourself, wear a wrist strap or boot strap made for this purpose.
- Handle the component by its edges. Do not touch solder joints, pins, or printed circuitry.
- Use conductive field service tools.

Host Cabling for Remote Replication

The Remote Replication premium feature provides online, real-time replication of data between storage arrays over a remote distance. In the event of a disaster or a catastrophic failure at one storage array, a second storage array can be promoted to take over responsibility for computing services. The Remote Replication premium feature requires a dedicated host port for replicating data between storage arrays. After the Remote Replication premium feature has been activated, one host I/O port on each RAID controller module is solely dedicated to replicating operations.

 **NOTE:** If Remote Replication is activated, host port 3 on each RAID controller module is dedicated for the communication that occurs between the two storage arrays (primary and secondary virtual disks). If the Remote Replication premium feature is not being used, these host ports are available for ordinary host connections.

Cabling for Performance

Data transfer performance is enhanced by maximizing bandwidth, which is the ability to process more I/O across more channels. Therefore, a configuration that maximizes the number of host channels and the number of drive channels available to process I/O maximizes performance. Faster processing speeds also maximize performance.

In addition to planning a topology that provides maximum performance, choose a RAID level that suits the planned applications.

Single-Controller and Dual-Controller Topologies

While creating a topology for a RAID enclosure that contains only one RAID controller module, attach expansion enclosures that contain only one single environmental services monitor (ESM). Do not attach an expansion enclosure that contains two ESMs to a single-controller RAID enclosure.

Labeling Cables

Cabling is an important part of creating a robust storage array. Labeling the cables identifies system components and drive channels. System maintenance is easier when the cables are correctly identified. Label both ends of each cable. You can use adhesive office labels that are folded in half over the ends of each cable. Mark the labels with the port identifiers to which the cable is connected. Additional information can be provided by using color-coded cable straps (or ties) to group all cables associated with one component or drive channel.

If a component fails, the cables must be disconnected, the failed component replaced, and the cables reattached. Detailed labeling of the cables simplifies the component replacement process.

If you are adding a new expansion enclosure to an existing configuration, correctly labeled cables helps identify where to connect the new enclosure.