

Dell™ SAS RAID Storage Manager

User's Guide

Notes, Notices, and Cautions



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.



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

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Introduction

Dell® SAS RAID Storage Manager works in conjunction with the appropriate libraries and drivers to enable you to configure, monitor, and maintain storage configurations on Dell PERC 5/i and SAS 5/iR controllers. The Dell SAS RAID Storage Manager graphical user interface (GUI) makes it easy for you to create and manage storage configurations.

 **NOTE:** iR stands for *internal RAID* (see the Glossary for more details).

Creating Storage Configurations

Dell SAS RAID Storage Manager enables you to easily configure the controllers, disk drives, and virtual disks on your Dell workstation or SC server. The Configuration Wizard greatly simplifies the process of creating disk groups and virtual disks.

On Dell systems with a PERC 5/i controller, you can use the Configuration Wizard *Auto Configuration* mode to automatically create the optimal configuration with the available hardware. You can use the *Guided Configuration* mode, which asks you a few brief questions about the configuration, and then creates it for you. Or you can use the *Manual Configuration* mode, which gives you complete control over all aspects of the storage configuration.

For Dell systems with a SAS 5/iR controller the Configuration Wizard guides you through several simple steps to create your storage configurations.

Monitoring Storage Devices

Dell SAS RAID Storage Manager displays the status of controllers, virtual disks, and physical disks on your Dell workstation or SC server. System errors and events are recorded in an event log file and are displayed on the screen. Special device icons appear on the screen to notify you of disk failures and other events that require immediate attention.

Maintaining Storage Configurations

On Dell systems with the PERC 5/i controller, you can use Dell SAS RAID Storage Manager to perform system maintenance tasks such as running patrol read operations, updating firmware, and running consistency checks on disk groups that support redundancy.

Comparison of Supported Features

The following table shows the Dell SAS RAID Storage Manager features that are supported by Dell systems using the PERC 5/i controller and by systems using the SAS 5/iR controller:

Table 1-1. Feature Comparison

Feature	PERC 5/i Controller	SAS 5/iR Controller
RAID 0 Configuration	Y	Y
RAID 1 Configuration	Y	Y
RAID 5 Configuration	Y	N
RAID 10 Configuration	Y	N
Hotspare Disks	Y	N
Auto Configuration	Y	N
Assisted Configuration	Y	Y
Manual Configuration	Y	N
Event Monitoring	Y	Y
Device Status Monitoring	Y	Y
Physical/Logical Device View	Y	Y
Device Properties Information	Y	Y
Create/Delete Virtual Disk	Y	Y
Run Patrol Read	Y	N
Rebuild Disk Drive	Y	Y
Background Virtual Disk Initialization	Y	N
Remove Drive	Y	Y
Make Drive Online/Offline	Y	N
Run Consistency Check	Y	N
Scan for New Disk Drives	Y	Y
Update Firmware	Y	N
Save/Add Storage Configuration	Y	Y
Set Adjustable Task Rates	Y	N
Change Virtual Disk Properties	Y	N

Installation

Dell SAS RAID Storage Manager is pre-installed on your Dell system. If you need to reinstall Dell SAS RAID Storage Manager for some reason, this section explains how to do this on the supported operating systems: Microsoft® Windows®, Red Hat® Linux, and SUSE Linux.

Installing Dell SAS RAID Storage Manager on Microsoft Windows

Follow these steps if you need to install Dell SAS RAID Storage Manager on a system running Microsoft Windows 2000, Microsoft Windows Server 2003, or Microsoft Windows XP:

- 1 Insert the CD containing Dell SAS RAID Storage Manager in the CD-ROM drive.
If necessary, find the `setup.exe` file and double click the file name to start the installation program.
- 2 When the Welcome screen appears, click **Next**.
- 3 When the next screen appears, read and accept the user license and click **Next**.
The Customer Information screen appears.
- 4 Enter your user name and organization name. In the bottom part of the screen, select an installation option:
 - If you select **Anyone who uses this computer**, any user with administrative privileges can use this version of Dell SAS RAID Storage Manager to view or change storage configurations.
 - If you select **Only for me (*current username*)**, the Dell SAS RAID Storage Manager shortcuts and associated icons will be available only to the user with this username.
- 5 Click **Next** to continue.
- 6 On the next screen, accept the default Destination Folder, or click **Change** to select a different destination folder. Click **Next** to continue.
- 7 Click **Finish** to complete the installation process.

Windows Installation Error Messages

Microsoft Installer may display error messages during the installation process. The error message text is self explanatory. If you need more information about these messages, see the list of installer error messages on the Microsoft Developers Network (MSDN) website at this address:

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/msi/setup/windows_installer_error_messages.asp

Installing Dell SAS RAID Storage Manager for Linux

Follow these steps if you need to install Dell SAS RAID Storage Manager on a system running Red Hat Linux or SUSE Linux:

- 1 Copy the `SSM_linux_installer...tar.gz` file to a temporary folder.
- 2 Untar the `SSM_linux_installer...tar.gz` file using the following command:

```
tar -zxvf SSM_linux_installer...tar.gz
```

A new disk directory is created.

- 3 Go to the new disk directory.
- 4 In the disk directory, find and read the `readme.txt` file.
- 5 To start the installation, enter the following command:

```
./install.sh
```

Linux Installation Error Messages

The following messages may appear while you are installing Dell SAS RAID Storage Manager on a Linux system:


- **More than one copy of MegaRAID Storage Manager has been installed.**
This message indicates that the user has installed more than one copy of Dell SAS RAID Storage Manager. (This can be done by using the `rpm-force` command to install the rpm file directly, which is not recommended, instead of using the `install.sh` file.) In such cases, the user must uninstall all the rpms manually before installing Dell SAS RAID Storage Manager with the procedure listed above.
- **The version is already installed.**
This message indicates that the version of Dell SAS RAID Storage Manager you are trying to install is already installed on the system.
- **The installed version is newer.**
This message indicates that a version of Dell SAS RAID Storage Manager is already installed on the system, and it is a newer version than the version you are trying to install.
- **Exiting installation.**
This is the message that appears when the installation is complete.
- **RPM Installation Failed**
This message indicates that the installation failed for some reason. Additional message text explains the cause of the failure.


Dell SAS RAID Storage Manager Windows and Menus

This chapter explains how to start Dell SAS RAID Storage Manager and describes the Dell SAS RAID Storage Manager window and menus.

Starting Dell SAS RAID Storage Manager

Follow these steps to start Dell SAS RAID Storage Manager and view the main window:

- 1 Start the program using the method required for your operating system environment:
 - To start Dell SAS RAID Storage Manager on a Microsoft Windows system, select **Start->Programs->Dell SAS RAID Storage Manager**, or double-click the Dell SAS RAID Storage Manager shortcut on the desktop.
 -  **NOTE:** If a warning appears stating that Windows Firewall has blocked some features of the program, click **Unblock** to allow Dell SAS RAID Storage Manager to start. (The Windows Firewall sometimes blocks the operation of programs like Dell SAS RAID Storage Manager that use Java.)
 - To start Dell SAS RAID Storage Manager on a Red Hat Linux system, select **Applications->System Tools->Dell SAS RAID Storage Manager StartupUI**.
 - To start Dell SAS RAID Storage Manager on a SUSE SLES 9 system, select **Start->System->More Programs->Dell SAS RAID Storage Manager**.
- 2 When the Enter UserName & Password window appears, select an access mode from the drop-down menu.
 - Select **Full Access** if you need to both view the current configuration and change the configuration.
 - Select **View Only** if you only need to view and monitor the configuration.
- 3 Enter your user name and password and click **Login**.

 **NOTE:** If the computer is networked, this is not the network login but the login to the computer itself. You must enter the root/administrator username and password in order to use Full Access mode. If your user name and password are correct for the login mode you have chosen, the main Dell SAS RAID Storage Manager window appears.

Dell SAS RAID Storage Manager Window

This section describes the Dell SAS RAID Storage Manager window, which appears when you start Dell SAS RAID Storage Manager.







The following topics describe the panels and menu options that appear in this window:


Physical/Logical View Panel

The left panel of the Dell SAS RAID Storage Manager window displays either the *Physical view* or the *Logical view* of the system and the devices in it, depending on which tab is selected.

- The *Physical view* shows the hierarchy of physical devices in the system. At the top of the hierarchy is the system itself. One or more controllers are installed in the system. Each controller has one or more ports. Disk drives and other devices are attached to the ports.
- The *Logical view* shows the hierarchy of controllers, virtual disks, and disk groups that are defined on the system. (Physical drives also appear in the Logical view, so you can see which physical drives are used by each virtual disk.)

The following icons in the left panel represent the controllers, disk drives, and other devices:

- System 
- Controller 
- Port  RAID
- Disk group 
- Virtual disk 
- Physical drive 

A red circle to the right of an icon indicates that the device has failed. For example, this icon indicates that a disk drive has failed: 

A yellow circle to the right of an icon indicates that a device is running in a degraded state. For example, this icon indicates that a virtual disk is running in a degraded state because a disk drive has failed:



Properties/Operations/Graphical View Panel

The right panel of the Dell SAS RAID Storage Manager window has either two or three tabs, depending on what kind of device is selected in the left panel.

- The *Properties* tab displays information about the selected device. For example, if a controller icon is selected in the left panel the Properties tab lists information such as the controller name, NVRAM size, and device port count. For more information, see *Monitoring Controllers, Monitoring Disk Drives, and Monitoring Virtual Disks*.
- The *Operations* tab lists the operations that can be performed on the device that is selected in the left panel. For example, the virtual disk operations include *Locate Virtual Disk* and *Stop Locating Virtual Disk*. Some types of devices, such as disk groups and ports, do not have operations associated with them. For more information, see *Maintaining and Managing Storage Configurations*.
- The *Graphical* tab can be selected in the right panel if a physical drive or a virtual disk is selected in the left panel. In Graphical View, the device's storage capacity is color coded according to the legend shown on the screen. For example, on a physical drive configured space is blue, available space is white, and reserved space is red. For more information, see *Monitoring Disk Drives and Monitoring Virtual Disks*.

Event Log Panel

The lower part of the Dell SAS RAID Storage Manager window displays the system event log entries. New event log entries appear during the session. Each entry has a timestamp and date, an Error Level indicating the severity of the event, and a brief description of the event. For more information about the Event Log, see *Monitoring System Events*.



NOTE: For some events on Dell systems with a SAS 5/iR controller, the time stamp will be reported as ### since the reported time stamp is not valid.

For more information about the event log entries, see *Events and Messages*.

Menu Bar

Here are brief descriptions of the main selections on the Dell SAS RAID Storage Manager menu bar:

File Menu

The File menu has an Exit option for exiting from Dell SAS RAID Storage Manager. It also has a Rescan option for updating the display in the Dell SAS RAID Storage Manager window. (Rescan is seldom required; the display normally updates automatically.)

Operations Menu

The Operations menu is available when a controller, physical drive, or logical drive is selected in the Dell SAS RAID Storage Manager window. The Operations menu options vary depending on what type of device is selected in the left panel of the Dell SAS RAID Storage Manager window. For example, the **Scan for Foreign Config** option is available only when a controller is selected. The options also vary depending on the current state of the selected device. For example, if you select an offline physical drive, the **Make Drive Online** option appears in the Operations menu.

You can also view the Operations selections on the main window on the Operations tab in the right panel. If an operation requires user inputs before it can be executed, it appears in the Operations tab but not in the Operations menu. A device-specific Operations menu pops up if you right-click a device icon in the left panel.

An Advanced Operations sub-menu is also available. This is where you access the Configuration Wizard and other configuration-related commands. To access this menu, select **Operations->Advanced Operations**.

Group Operations Menu

The Group Operations menu options include Check Consistency (on Dell PERC 5/i controllers only), Initialize, and Show Progress.

Log Menu

The Log menu includes options for saving and clearing the message log. For more information, see *Monitoring System Events*.

Help Menu

On the Help menu you can select **Help->Help** to view the Dell SAS RAID Storage Manager online Help file. You can select **Help->About** to view version information for the Dell SAS RAID Storage Manager.



NOTE: When you use the Dell SAS RAID Storage Manager online Help, you may see a warning message that Internet Explorer has restricted the file from showing active content. If this warning appears, click on the active content warning bar and enable the active content.

Configuration

You use Dell SAS RAID Storage Manager to create storage configurations on Dell systems with PERC 5/i and SAS 5/iR controllers. The Dell SAS 5/iR controller supports RAID 0 and RAID 1 storage configurations. The Dell PERC 5/i controller supports RAID 0, RAID 1, RAID 5, and RAID 10 storage configurations. To learn more about RAID and RAID levels, see the Glossary.

Creating a New Configuration on a SAS 5/iR Controller

You can use the Dell SAS RAID Storage Manager Configuration Wizard to create new configurations on Dell systems with the SAS 5/iR controller.

To start the Dell SAS RAID Storage Manager Configuration Wizard, select a Dell SAS 5/iR controller in the left panel of the Dell SAS RAID Storage Manager window and then select **Operations->Advanced Operations->Configuration-> Configuration Wizard**. The following subsections explain how to create a RAID 0 or RAID 1 configuration on a Dell system with a SAS 5/iR controller:

Creating a RAID 0 Configuration on a SAS 5/iR Controller

Follow these steps to create a RAID 0 configuration on a Dell system with a SAS 5/iR controller:

- 1 In the first window of the Configuration Wizard, select two or more available drives in the left panel. Click the right-arrow button to move the selected drives to the right panel.



NOTICE: Be sure you do not select the disk drive on which the operating system is installed.

- 2 Click **Accept** to accept these drives for the new RAID 0 disk group.



NOTE: To remove a single drive from a proposed disk group, select the drive icon in the right panel of the Dell SAS RAID Storage Manager window and click the left-arrow button.

- 3 Click **Next**. The next Configuration Wizard window appears.
- 4 Select the disk group to use for the new virtual disk.
- 5 In the right panel, select RAID 0 as the RAID level.
- 6 Click **Accept** to accept the configuration of the new virtual disk.





NOTE: Click the **Reclaim** button if you want to undo a virtual disk that you just defined. (For more information, see the *reclaim virtual disk* Glossary entry.)

- 7 Select an available disk for another virtual disk and define its properties, or click **Next** to continue with the next configuration step. (You can define up to two virtual disks.) The virtual disk summary window appears.

- 8 Review the configuration shown in the window. If you want to change something, click **Back** and change the configuration parameters.
- 9 Click **Finish** to accept the configuration and start the initialization process.

Creating a RAID 1 Configuration on a SAS 5/iR Controller

Follow these steps to create a RAID 1 configuration on a Dell system with a SAS 5/iR controller:


- 1 In the first window of the Configuration Wizard, select two available drives in the left panel. Click the right-arrow button to move the selected drives to the right panel.
 **NOTICE:** Be sure you do not select the disk drive on which the operating system is installed.
- 2 Click **Accept** to accept these drives for the new RAID 1 disk group.
- 3 Click **Next**. The next Configuration Wizard window appears.
- 4 Select the disk group to use for the new virtual disk.
- 5 In the right panel of the Dell SAS RAID Storage Manager window, select RAID 1 as the RAID level.
- 6 Click **Accept** to accept the configuration of the new virtual disk, which appears in the window.
 **NOTE:** Click the **Reclaim** button if you want to undo a virtual disk that you just defined. (For more information, see the *reclaim virtual disk* Glossary entry.)
- 7 Select an available disk for another virtual disk and define its properties, or click **Next** to continue with the next configuration step. (You can define up to two virtual disks.) The virtual disk summary window appears.
- 8 Review the configuration shown in the window. If you want to change something, click **Back** and change the configuration parameters.
- 9 Click **Finish** to accept the configuration and start the initialization process.

Creating a New Configuration on a Dell PERC 5/i Controller

You can use the Dell SAS RAID Storage Manager Configuration Wizard to create new storage configurations on Dell systems with the PERC 5/i controller.

To open the Dell SAS RAID Storage Manager Configuration Wizard, select a PERC 5/i controller in the left panel of the Dell SAS RAID Storage Manager window and then select **Operations->Advanced Operations->Configuration-> Configuration Wizard**. The first Configuration Wizard window is a menu of three configuration modes:

- **Auto Configuration** automatically creates an optimal configuration from the available disk drives.
- **Guided Configuration** asks you a few simple questions about what kind of configuration you want and then automatically creates it from the available disk drives.
- **Manual Configuration** gives you the greatest level of control in creating a new virtual disk.

 **NOTE:** You can use Auto, Guided, or Manual mode to create a RAID 0, RAID 1, or RAID 5 configuration. To create a RAID 10 configuration, you must use the Manual Configuration mode.

The following subsections explain how to create storage configurations on a Dell system with a PERC 5/i controller:

- Understanding Virtual Disk Parameters
- Using Auto Configuration on a Dell PERC 5/i Controller
- Using Guided Configuration on a Dell PERC 5/i Controller
- Using Manual Configuration on a Dell PERC 5/i Controller (RAID 0)
- Using Manual Configuration on a Dell PERC 5/i Controller (RAID 1)
- Using Manual Configuration on a Dell PERC 5/i Controller (RAID 5)
- Using Manual Configuration on a Dell PERC 5/i Controller (RAID 10)

Understanding Virtual Disk Parameters

This section describes the Virtual Disk Parameters that you can set when you use the Guided Configuration or Manual Configuration modes of the Configuration Wizard. You do not necessarily need to change these parameters when you create a storage configuration: you can leave them at their default settings.

- **Stripe Size:** Stripe sizes of 8, 16, 32, 64, and 128 Kbytes are supported. For more information, see the *striping* Glossary entry.
- **Read Policy:**
 - Always read ahead:* Read-ahead capability allows the controller to read sequentially ahead of requested data and to store the additional data in cache memory, anticipating that the data will be needed soon. This speeds up reads for sequential data, but there is little improvement when accessing random data.
 - No read ahead:* Disables the read-ahead capability.
 - Adaptive read ahead:* When selected, the controller begins using read-ahead if the two most recent disk accesses occurred in sequential sectors. If the read requests are random, the controller reverts to *No read ahead*.
- **Write Policy:**
 - Write back:* In this mode the controller sends a data transfer completion signal to the host when the controller cache has received all the data in a transaction. This setting is recommended in standard mode.
 - Write through:* In this mode the controller sends a data transfer completion signal to the host when the disk subsystem has received all the data in a transaction.
- **IO Policy:** The IO Policy applies to reads on a specific logical drive. It does not affect the Read-ahead cache.
 - Cached IO:* In this mode, all reads are buffered in cache memory.
 - Direct IO:* In this mode, reads are not buffered in cache memory. Data is transferred to cache and the host concurrently. If the same data block is read again, it comes from cache memory.
- **Access Policy:** Select the type of data access that is allowed for this logical drive: *Read/Write*, *Read Only*, or *Blocked*.

- **Disk Cache Policy:** Select a cache setting for this disk: *Unchanged, Enabled, or Disabled.*
- **Init State:**
 - No Initialization:* The new configuration is not initialized and the existing data on the disks is not overwritten.
 - Fast Initialization:* Dell SAS RAID Storage Manager quickly writes zeroes to the first and last 10 Mbyte regions of the new virtual disk and then completes the initialization in the background. This allows you to start writing data to the virtual disk immediately.
 - Full Initialization:* A complete initialization is done on the new configuration. You cannot write data to the new virtual disk until the initialization is complete. This may take a long time if the disks are large.

Using Auto Configuration on a Dell PERC 5/i Controller

Auto Configuration is the quickest and simplest way to create a new storage configuration on a Dell PERC 5/i controller. When you select Auto Configuration mode on the first Configuration Wizard window, the Configuration wizard creates the best configuration possible using the available physical disks.

Follow these steps to create a new storage configuration in Auto Configuration mode:

- 1 Select a redundancy option from the drop-down menu at the bottom of the Auto Configuration window:
 - **No Redundancy:** The new configuration will have no data redundancy (RAID 0). If a physical disk in the configuration fails, all data will be lost.
 - **With Redundancy:** The new configuration will have data redundancy, either via parity data (RAID 5) or mirrored data (RAID 1). If a physical disk fails, data is still protected.
- 2 Select an Initialization option from the drop-down menu at the bottom of the window:
 - **No Initialization:** The new configuration is not initialized and the existing data on the disks is not overwritten.
 - **Fast Initialization:** Dell SAS RAID Storage Manager quickly writes zeroes to the first and last 10 Mbyte regions of the new virtual disk and then completes the initialization in the background. This allows you to start writing data to the virtual disk immediately.
 - **Full Initialization:** A complete initialization is done on the new configuration. You cannot write data to the new virtual disk until the initialization is complete. This may take a long time if the disks are large.
- 3 Click **Modify** if you want to make changes to the Auto Configuration. For example, you could change the size of a virtual disk.
- 4 Click **Finish**. The new storage configuration will be created and initialized (unless you selected **No Initialization**).

Using Guided Configuration on a Dell PERC 5/i Controller

Guided Configuration provides an easy way to create a new storage configuration. Based on the information that is provided, the Configuration Wizard uses the available disk drives to create an optimal storage configuration.

Follow these steps to create a new storage configuration in Guided Configuration mode:

- 1 Select a redundancy option at the top of the Guided Configuration window:
 - **Redundancy Only:** Create a configuration only if redundancy (RAID 1 or RAID 5) is possible.
 - **Redundancy when possible:** Create a redundant configuration if possible. Otherwise, create a non-redundant configuration.
 - **No Redundancy:** Create a non-redundant configuration.
- 2 Choose whether you want to use existing disk groups (arrays) in the new virtual disk. The options are:
 - **Use Existing Arrays Only**
 - **Don't Use Existing Arrays**
 - **Use Existing and New Arrays**


The first and third options are disabled if there are no available existing disk groups (arrays).


- 3 Select a maximum number of virtual disks to be created. The Configuration Wizard may not be able to create as many virtual disks as you want, depending on the current configuration and the number of virtual disks that have already been created.
- 4 Click **Next** to continue to the next window.
- 5 Change the default volume parameters in this window, if needed.

In the top section of the window you can specify the number of virtual disks to create. You can also choose to use less than the full capacity of this array for the virtual disk(s). (You could do this in order to leave capacity available for other virtual disks that you create later.) To learn about the Stripe Size and other virtual disk parameters, see [Understanding Virtual Disk Parameters](#).
- 6 Click **Next** to continue to the next window.
- 7 Check the configuration that you have just defined. If it is acceptable, click **Finish**. If you want to change something, click **Back** to return to the previous windows.

Using Manual Configuration on a Dell PERC 5/i Controller (RAID 0)

Follow these steps to create a RAID 0 storage configuration using the Manual Configuration mode of the Configuration Wizard:


- 1 In the first Manual Configuration window, select two or more available drives in the left panel. Click the right-arrow button to move the selected drives to the right panel.
 -  **NOTICE:** Be sure you do not select the disk drive on which the operating system is installed.
- 2 Click **Accept** to accept these drives for the new RAID 0 disk group.

 **NOTE:** To remove a single drive from a proposed new disk group, select the drive icon in the right panel and click the left-arrow button.


- 3 Click **Next**. The next Configuration Wizard window appears.

The *Arrays with Free Space* menu lists the new disk group (array) that you just defined, plus any existing disk groups with holes (free space) that could be used for a new configuration.

- 4 From the *Arrays with Free Space* menu, select the disk group to use for the new virtual disk.
- 5 In the right panel, select RAID 0 as the RAID level.
- 6 (Optional) Set *Size (in MB)* to a lower number if you do not want to use the entire available capacity for the new virtual disk.
- 7 (Optional) Change the other Virtual Disk Properties, if necessary. For more information, see *Understanding Virtual Disk Parameters*.

 **NOTE:** You cannot change the default Volume Name if Dell SAS RAID Storage Manager is running in a language that uses the Double Byte Character Set. The default Volume Name must be kept.

- 8 Click **Accept** to accept the configuration of the new virtual disk.


 **NOTE:** Click the **Reclaim** button if you want to undo a virtual disk that you just defined. (For more information, see the *reclaim virtual disk* Glossary entry.)

- 9 Click **Next** to continue with the next configuration step. The Virtual Disk Summary window appears.
- 10 Review the configuration shown in the window. If you want to change something, click **Back** and change the configuration parameters.
- 11 Click **Finish** to accept the configuration and start the initialization process (unless you selected **No Initialization** earlier).

Using Manual Configuration on a Dell PERC 5/i Controller (RAID 1)

Follow these steps to create a RAID 1 storage configuration using the Manual Configuration mode of the Configuration Wizard:



- 1 In the first Manual Configuration window, select two available drives in the left panel. Click the right-arrow button to move the selected drives to the right panel.

 **NOTICE:** Be sure you do not select the disk drive on which the operating system is installed.

- 2 Click **Accept** to accept these drives for the new RAID 1 disk group.
- 3 To add a hotspare to a disk group, select an available drive in the left panel, select the disk group from the drop-down menu, and click **Add HotSpare To**.


To remove a hotspare from a disk group, select it in the right panel and click **Remove HotSpare**.


- 4 Click **Next**. The next Configuration Wizard window appears.
The *Arrays with Free Space* menu lists the new disk group(s) that you just defined, plus any existing disk groups with holes (free space) that could be used for a new configuration.
- 5 Select the disk group to use for the new virtual disk.

- 6 In the right panel, select RAID 1 as the RAID level.
- 7 (Optional) Set *Size (in MB)* to a lower number if you do not want to use the entire available capacity for the new virtual disk.
- 8 (Optional) Change the other Virtual Disk Properties, if necessary. For more information, see *Understanding Virtual Disk Parameters*.
 -  **NOTE:** You cannot change the default Volume Name if Dell SAS RAID Storage Manager is running in a language that uses the Double Byte Character Set. The default Volume Name must be kept.
- 9 Click **Accept** to accept the configuration of the new virtual disk.
 -  **NOTE:** Click the **Reclaim** button if you want to undo a virtual disk that you just defined. (For more information, see the *reclaim virtual disk* Glossary entry.)
- 10 Click **Next** to continue with the next configuration step. The virtual disk summary window appears.
- 11 Review the configuration shown in the window. If you want to change something, click **Back** and change the configuration parameters.
- 12 Click **Finish** to accept the configuration and start the initialization process (unless you selected **No Initialization** earlier).


Using Manual Configuration on a Dell PERC 5/i Controller (RAID 5)

Follow these steps to create a RAID 5 configuration using the Manual Configuration mode of the Configuration Wizard:

- 1 In the first Manual Configuration window, select three or more available drives in the left panel. Click the right-arrow button to move the selected drives to the right panel.
 -  **NOTICE:** Be sure you do not select the disk drive on which the operating system is installed.
- 2 Click **Accept** to accept these drives for the new RAID 5 disk group.
- 3 To add a hotspare to a RAID 5 disk group, select an available drive in the left panel, select the disk group from the drop-down menu, and click **Add HotSpare To**.
To remove a hotspare from a disk group, select it in the right panel and click **Remove HotSpare**.
- 4 Click **Next**. The next Configuration Wizard window appears.
The *Arrays with Free Space* menu lists the new disk group(s) that you just defined, plus any existing disk groups with holes (free space) that could be used for a new configuration.
- 5 Select the disk group to use for the new virtual disk.
- 6 In the right panel, select RAID 5 as the RAID level.
- 7 (Optional) Set *Size (in MB)* to a lower number if you do not want to use the entire available capacity for the new virtual disk.
- 8 (Optional) Change the other Virtual Disk Properties, if necessary. For more information, see *Understanding Virtual Disk Parameters*.

 **NOTE:** You cannot change the default Volume Name if Dell SAS RAID Storage Manager is running in a language that uses the Double Byte Character Set. The default Volume Name must be kept.

9 Click **Accept** to accept the configuration of the new virtual disk.

 **NOTE:** Click the **Reclaim** button if you want to undo a virtual disk that you just defined. (For more information, see the *reclaim virtual disk* Glossary entry.)

10 Click **Next** to continue with the next configuration step. The virtual disk summary window appears.

11 Review the configuration shown in the window. If you want to change something, click **Back** and change the configuration parameters.

12 Click **Finish** to accept the configuration and start the initialization process (unless you selected **No Initialization** earlier).

Using Manual Configuration on a Dell PERC 5/i Controller (RAID 10)

Follow these steps to create a RAID 10 storage configuration using the Manual Configuration mode of the Configuration Wizard:

1 In the first Manual Configuration window, select two available drives in the left panel. Click the right-arrow button to move the selected drives to the right panel.

2 Click **Accept** to accept these drives for a new RAID 1 disk group.

3 Select two more drives for a second RAID 1 disk group, and click **Accept**.

4 Click **Next**. The next Configuration Wizard window appears.


The *Arrays with Free Space* menu lists the new disk groups that you just defined, plus any existing disk groups with holes (free space) that could be used for a new configuration.

5 In the left panel, select the two RAID 1 disk groups from the menu.


6 In the right panel, select RAID 10 as the RAID level.

7 (Optional) Set *Size (in MB)* to a lower number if you do not want to use the entire available capacity for the new virtual disk.

8 (Optional) Change the other Virtual Disk Properties, if necessary. For more information, see *Understanding Virtual Disk Parameters*.

 **NOTE:** You cannot change the default Volume Name if Dell SAS RAID Storage Manager is running in a language that uses the Double Byte Character Set. The default Volume Name must be kept.

9 Click **Accept** to accept the configuration of the new virtual disk.

 **NOTE:** Click the **Reclaim** button if you want to undo a virtual disk that you just defined. (For more information, see the *reclaim virtual disk* Glossary entry.)

10 Click **Next** to continue with the next configuration step. The virtual disk summary window appears.

11 Review the configuration shown in the window. If you want to change something, click **Back** and change the configuration parameters.

- 12 Click **Finish** to accept the configuration and start the initialization process (unless you selected **No Initialization** earlier).

Adding Hotspare Disks

(Dell PERC 5/i controllers only) Hotspares are disk drives that are available to automatically replace failed drives in a RAID 1 or RAID 5 virtual disk. *Dedicated hotspares* are available to only one virtual disk. *Global hotspares* are available to any virtual disk on a specific controller.

To add a global hotspare disk, follow these steps:


- 1 In the left panel of the Dell SAS RAID Storage Manager window, right-click the icon of any unused disk drive.
- 2 Select **Make Global Hotspare**.

You can create dedicated hotspares when you create a new configuration with the Configuration Wizard. To add dedicated hotspares after running the Configuration Wizard, follow these steps:

- 1 Select the **Physical View** tab in the left panel of the Dell SAS RAID Storage Manager window and select the icon of an unused disk drive.
- 2 In the right panel of the Dell SAS RAID Storage Manager window, select the **Operations** tab and select **Make Dedicated Hotspare**.
- 3 In the right panel of the Operations tab, select the disk group (array) to which the hotspare will be dedicated.
- 4 Click **Go** to create the dedicated hotspare.

Changing Adjustable Task Rates

(Dell PERC 5/i controllers only) Follow these steps if you need to change the adjustable rates for rebuilds, patrol reads, and other system tasks that run in the background:

 **NOTE:** Dell recommends that you leave the adjustable task rates at their default settings, in order to achieve the best system performance. If you raise the task rates above the defaults, foreground tasks will run more slowly and it may seem that the system is not responding. If you lower the task rates below the defaults, rebuilds and other background tasks may run very slowly and may not complete within a reasonable time. If you decide to change the values, record the original default value here so you can restore them later, if necessary:

Rebuild Rate: _____

Patrol Rate: _____

Background Initialization Rate: _____

Check Consistency Rate: _____


Reconstruction Rate: _____

- 1 Select the **Physical View** tab in the left panel of the Dell SAS RAID Storage Manager window and select a controller icon.

- 2 In the right panel of the Dell SAS RAID Storage Manager window, select the **Operations** tab and select **Adjustable Task Rates**.

The task rates appear in the right panel.

- 3 Enter changes, as needed, to the task rates for Rebuild Rate, Patrol Rate (for patrol reads), Background Initialization (BGI) Rate (for fast initialization), Check Consistency Rate (for consistency checks), and Reconstruction Rate. Each task rate can be set from 0 to 100. The higher the number, the faster the activity will run in the background, possibly impacting other system tasks.

 **NOTE:** Patrol Read does not report on its progress while it is running. The Patrol Read status is reported in the Event Log only.

- 4 Click **Go** to accept the new task rates.
- 5 When the warning message appears, click **OK** to confirm that you want to change the task rates.


Changing Virtual Disk Properties

(Dell PERC 5/i controllers only) You can change a virtual disk's Read Policy, Write Policy, and other properties at any time after the virtual disk is created. To do this, follow these steps:


- 1 Select a virtual disk icon in the left panel of the Dell SAS RAID Storage Manager window.
- 2 In the right panel, select the **Properties** tab and then select **Set Virtual Disk Properties**.
A list of Virtual Disk Properties appears in the right panel.
- 3 Change the virtual disk properties as needed in the right panel. For information on these properties, see *Understanding Virtual Disk Parameters*.
- 4 Click **Go** to accept the changes.

Changing a Virtual Disk Configuration

(PERC 5/i controllers only) You can use the Dell SAS RAID Storage Manager Reconstruction Wizard to change the configuration of a RAID 0, RAID 1, or RAID 5 virtual disk on a Dell system with a PERC 5/i controller.

 **NOTICE:** Be sure to back up the data on the virtual disk before you change its configuration.


The Reconstruction Wizard allows you to change a virtual disk configuration by adding disk drives to the virtual disk, removing disk drives from it, or changing its RAID level.

 **NOTE:** You cannot change the configuration of a RAID 10 virtual disk. You cannot change a RAID 0, RAID 1, or RAID 5 configuration if two or more virtual disks are defined on a single disk group. (The Logical view tab shows which disk groups and disk drives are used by each virtual disk.)

To start the Reconstruction Wizard, select a virtual disk icon in the left panel of the Dell SAS RAID Storage Manager window and then select **Operations-> Advanced Operations-> Reconstruction Wizard** from the menu. This section has the following subsections explaining the Reconstruction Wizard options:


- Adding a Disk Drive to a Configuration (PERC 5/i Controllers Only)
- Removing a Disk Drive from a Configuration (PERC 5/i Controllers Only)
- Changing the RAID Level of a Configuration (PERC 5/i Controllers Only)

Adding a Disk Drive to a Configuration (PERC 5/i Controllers Only)

 **NOTICE:** Be sure to back up the data on the virtual disk before you add a drive to it.


Follow these steps to add a disk drive to a configuration with the Configuration Wizard:

- 1 Click **Add Drive** on the Configuration Wizard menu screen.
- 2 When the next screen appears, select an available disk drive in the top panel and click the down-arrow button to move it to the Selected Drive list.
- 3 Click **Next** to continue. The next screen appears.
- 4 (Optional) Select a different RAID level for the configuration from the drop-down menu in the lower right of the window.
- 5 Review the information in the window. If everything is acceptable, click **Finish**.

 **NOTE:** If you add a disk drive to a RAID 1 configuration, the RAID level automatically changes to RAID 5.


A Reconstruct operation begins on the virtual disk. You can monitor the progress of the reconstruction in the Group Show Progress window. To do this, select **Group Operations -> Show Progress**.

Removing a Disk Drive from a Configuration (PERC 5/i Controllers Only)

 **NOTICE:** Be sure to back up the data on the virtual disk before you remove a drive from it.

Follow these steps to remove a disk drive from a RAID 1 or RAID 5 configuration with the Configuration Wizard:

- 1 Click **Remove Drive** on the Configuration Wizard menu screen.
This option is not available for RAID 0 configurations.
- 2 When the next screen appears, select a disk drive in the top panel and click the down-arrow button to remove it from the configuration.
- 3 Click **Next** to continue. The next screen appears.
- 4 (Optional) Select a different RAID level from the drop-down menu from the drop-down menu in the lower right of the window.
- 5 Review the information in the window. If everything is acceptable, click **Finish**.

 **NOTE:** If you remove a disk drive from a RAID 5 configuration, the RAID level automatically changes to RAID 0.

A Reconstruct operation begins on the virtual disk. You can monitor the progress of the reconstruction in the Group Show Progress window. To do this, select **Group Operations -> Show Progress**.

Changing the RAID Level of a Configuration (PERC 5/i Controllers Only)

➡ **NOTICE:** Be sure to back up the data on the virtual disk before you change its RAID level.

Follow these steps to change the RAID level of a RAID 1 or RAID 5 configuration with the Configuration Wizard:

- 1 Click **Change RAID Level** on the Configuration Wizard menu screen.
This option is not available for RAID 0 configurations
- 2 When the next screen appears, select a RAID level from the drop-down menu in the lower right corner.
- 3 Review the information in the window. If everything is acceptable, click **Finish**.
A Reconstruct operation begins on the virtual disk. You can monitor the progress of the reconstruction in the Group Show Progress window. To do this, select **Group Operations -> Show Progress**.

Deleting a Virtual Disk

➡ **NOTICE:** Be sure to back up the data on the virtual disk before you delete it. Be sure that the operating system is not installed on this virtual disk.

You can delete virtual disks in order to rearrange the storage space. To delete a virtual disk, follow these steps:

- 1 Back up all user data on the virtual disk you intend to delete.
- 2 In the left panel of the Dell SAS RAID Storage Manager window, select the **Logical** tab and click the icon of the virtual disk you want to delete.
- 3 In the right panel, select the **Operations** tab and select **Delete Virtual Disk**.
- 4 Click **Go**.
- 5 When the warning message appears, click **Yes** to confirm that you want to delete the virtual disk.


Saving a Storage Configuration to Disk

You can save an existing controller configuration to a file so you can apply it to another controller. To save a configuration file, follow these steps:

- 1 Select a controller icon in the left panel of the Dell SAS RAID Storage Manager window.
- 2 On the menu bar, select **Operations->Advanced Operations->Configuration->Save Configuration**.
The Save dialog box appears.
- 3 In the Save dialog box, type a name for the configuration file, or accept the default name (*hostname.cfg*).
- 4 Click **Save** to save the configuration file.

Clearing a Storage Configuration from a Controller

You must clear a storage configuration from a controller before you can create a new configuration on the controller or load a previously saved configuration file.


 **NOTICE:** Before you clear a configuration, be sure to save any data that you want to keep! Clearing a configuration deletes all data from the disks of the existing configuration.

To clear a configuration from a controller, follow these steps:

- 1 Select a controller icon in the left panel of the Dell SAS RAID Storage Manager window.
- 2 On the menu bar, select **Operations->Advanced Operations->Configuration-> Clear Configuration**.
A Warning message appears.
- 3 Click **Yes** to clear the configuration or **No** to cancel the operation.

Adding a Saved Storage Configuration

When you replace a controller, or when you want to duplicate an existing storage configuration on a new controller, you can add a saved configuration to the controller.

 **NOTICE:** When you add a saved configuration to a replacement controller, be sure that the number and size of the physical disks connected to the controller is exactly the same as it was when the configuration was saved.

To add a saved configuration, follow these steps:

- 1 Select a controller icon in the left panel of the Dell SAS RAID Storage Manager window.
- 2 On the menu bar, select **Operations->Advanced Operations->Configuration->Add Saved Configuration**.
A Warning message appears.
- 3 Click **Yes**. When the Open dialog box appears, select the configuration file and click **Open**.
- 4 View the configuration detail, then select **Apply**.
- 5 Confirm the new configuration when prompted.

Monitoring System Events and Storage Devices

The Dell SAS RAID Storage Manager enables you to monitor the status of disk drives, virtual disks, and other storage devices. This chapter explains how to use Dell SAS RAID Storage Manager to perform the following monitoring tasks.

Monitoring System Events

Dell SAS RAID Storage Manager monitors the activity and performance of all controllers in the system and the storage devices connected to them. When an event occurs (such as the creation of a new virtual disk or the removal of a physical drive) an event message appears in the log displayed at the bottom of the Dell SAS RAID Storage Manager window.


Each event in the log includes an error level (Info, Warning, Caution, Fatal, or Dead) a date and timestamp, and a brief description. (For a list of all events, see Appendix A, *Events and Messages*)

The Log menu has three options:

- **Save Log:** Saves the current log to a file.
- **Clear Log:** Clears the current log information.
- **Load Log:** Enables you to load a different log file.



Monitoring Controllers

When Dell SAS RAID Storage Manager is running, you can see the status of all controllers in the left panel of the Dell SAS RAID Storage Manager window. If the controller is operating normally, the

controller icon looks like this: . If the controller has failed, a small red circle appears to the right of the icon. (See *Physical/Logical View Panel* for a complete list of device icons.)

To display complete controller Information, click a controller icon in the left panel of the Dell SAS RAID Storage Manager window and click the **Properties** tab in the right panel. The Properties tab lists information such as Product Name, Serial No., Vendor ID, and Host Port Count. All controller properties are defined in the Glossary.

Monitoring Disk Drives

When Dell SAS RAID Storage Manager is running, you can see the status of all physical disk drives in the left panel of the Dell SAS RAID Storage Manager window. If the disk drive is operating normally, its icon looks like this: . If the disk drive has failed, a small red circle appears to the right of the icon, like this . (See Physical/Logical View Panel for a complete list of device icons.)

To display complete disk drive information, click a disk drive icon in the left panel of the Dell SAS RAID Storage Manager window and click the **Properties** tab in the right panel. The Properties tab lists information such as vendor name, device ID, and physical drive state. All disk drive properties are defined in the Glossary.

To display a graphical view of a disk drive, click on a drive icon in the left panel of the Dell SAS RAID Storage Manager and click the **Graphical View** tab. In Graphical View, the drive's storage capacity is color coded according to the legend shown on the screen: configured space is blue, available space is white, and reserved space is red. When you select a virtual disk from the drop-down menu, the disk space used by that virtual disk is displayed in green.


Running a Patrol Read

(Dell PERC 5/i controllers only) A Patrol Read can be used for all RAID levels and for all hotspare drives. A patrol read is initiated only when the controller is idle for a defined time period and has no other background activities. To start a Patrol Read, follow these steps:

- 1 Click a controller icon in the left panel of the Dell SAS RAID Storage Manager window.
- 2 Select **Operations -> Patrol Read**

To change the Patrol Read settings, follow these steps:

- 1 Click a controller icon in the left panel of the Dell SAS RAID Storage Manager window.
- 2 Select the **Operations** tab in the right panel, and select **Set Patrol Read Properties**.
- 3 Select an Operation Mode for patrol read. The options are
 - **Auto:** Patrol Read runs automatically at the time interval you specify on this screen.
 - **Manual:** Patrol Read runs only when you manually start it by selecting **Start Patrol Read** from the controller Options panel.
 - **Disabled:** Patrol Read does not run at all.
- 4 (Optional) Specify a maximum count of physical drives to include in the patrol read. The count must be between 0 and 255.
- 5 (Optional) Select virtual disks on this controller to **exclude** from the Patrol Read. The existing virtual disks are listed in the gray box. To exclude a virtual disk, check the box next to it.
- 6 (Optional) Change the frequency at which the Patrol Read will run. The default frequency is 7 days (604800 seconds), which is suitable for most configurations.


 **NOTE:** Dell recommends that you leave the Patrol Read frequency and other Patrol Read settings at the default values, in order to achieve the best system performance. If you decide to change the values, record the original default value here so you can restore them later, if necessary:

Patrol Read Frequency: _____

Continuous Patrolling: Enabled/Disabled



Patrol Read Task Rate: _____

- 7 (Optional) Select **Continuous Patrolling** if you want patrol read to run continuously in the background instead of running at periodic intervals. If you select Continuous Patrolling, the time interval field is grayed out.
- 8 Click **Go** to enable these Patrol Read options.

 **NOTE:** Patrol Read does not report on its progress while it is running. The Patrol Read status is reported in the Event Log only.


You can also (optionally) change the Patrol Read *task rate*. The task rate determines the amount of system resources that are dedicated to a Patrol Read when it is running. Dell recommends, however, that you leave the Patrol Read task rate at its default setting. If you raise the task rate above the default, foreground tasks will run more slowly and it may seem that the system is not responding. If you lower the task rate below the default, rebuilds and other background tasks may run very slowly and may not complete within a reasonable time. For more information, about the Patrol Read task rate, see [Changing Adjustable Task Rates](#).

Monitoring Virtual Disks

When Dell SAS RAID Storage Manager is running, you can see the status of all virtual disks. If a virtual disk is operating normally, the icon looks like this: . If the virtual disk is running in degraded mode (for example, if a physical disk has failed) a small yellow circle appears to the right of the icon: . (See [Physical/Logical View Panel](#) for a complete list of device icons.)

(Dell PERC 5/i controllers only) When the Logical tab is selected, the left panel of the Dell SAS RAID Storage Manager window shows which physical disks are used by each virtual disk. The same physical disk can be used by multiple virtual disks.

To display complete virtual disk information, click the **Logical** tab in the left panel, click on a virtual disk icon in the left panel, and click the **Properties** tab in the right panel. All virtual disk properties are defined in the Glossary.

 **NOTE:** (Dell PERC 5/i controllers only) You can change virtual disk properties such as Read Policy, Write Policy, IO Policy, and Access Policy after the virtual disk has been created. For more information, see [Changing Virtual Disk Properties](#).

To display a graphical view of a virtual disk, click on a virtual disk icon in the left panel of the Dell SAS RAID Storage Manager and click the **Graphical View** tab. In Graphical View, the disk group (array) used for this virtual disk is shaded blue to show how much of the disk group capacity is used by this virtual disk. If part of the disk group is shaded white, this indicates that some of the capacity is used by another virtual disk. In a RAID 10 configuration, two disk groups are used by one virtual disk.

Monitoring Rebuilds and Other Processes

Dell SAS RAID Storage Manager allows you to monitor the progress of rebuilds and other lengthy processes in the Group Show Progress window. Open this window by selecting **Group Operations -> Show Progress** on the menu bar.

Operations on virtual disks appear in the left panel of the Group Show Progress window, and operations on physical drives appear in the right panel. The following operations appear in this window.

- Background initialization of a virtual disk (Dell PERC 5/i controllers only)
- Rebuild (see *Rebuilding a Drive*)
- Consistency check (Dell PERC 5/i controllers only) (see *Running a Consistency Check*)

To abort any ongoing process, click the **Abort** button next to the status indicator. Click **Abort All** to abort all ongoing processes. Click **Close** to close the window.

Maintaining and Managing Storage Configurations

This chapter explains how to use Dell SAS RAID Storage Manager to maintain and manage storage configurations.

Initializing a Virtual Disk

(Dell PERC 5/i controllers only) To initialize a virtual disk after completing the configuration process, follow these steps:

- 1 Select the **Logical** tab in the left panel of the Dell SAS RAID Storage Manager window and click the icon of the virtual disk that you want to initialize.
- 2 Select **Group Operations->Initialize**. The Group Initialize dialog box appears.
- 3 Select the virtual disk(s) to initialize.
- 4 Select the **Fast Initialization** check box if you want to use this option. If you leave the box unchecked, Dell SAS RAID Storage Manager will run a Full Initialization on the virtual disk. (For more information, see [Understanding Virtual Disk Parameters](#).)
- 5 Click **Start** to start the initialization.

You can monitor the progress of the initialization. See [Monitoring Rebuilds and Other Processes](#) for more information.

Running a Consistency Check

(Dell PERC 5/i controllers only) You should periodically run a consistency check on fault-tolerant virtual disks. It is especially important to do this if you suspect that the virtual disk consistency data may be corrupted. Be sure to back up the data before running a consistency check if you think the consistency data may be corrupted.

To run a consistency check, follow these steps:

- 1 Select **Group Operations -> Check Consistency**.
The Group Consistency Check window appears.
- 2 Select the virtual disks that you want to check, or click **Select All** to select all virtual disks.
- 3 Click **Start** to begin.

You can monitor the progress of the consistency check. See [Monitoring Rebuilds and Other Processes](#) for more information.



NOTE: You can also run a consistency check by selecting the virtual disk icon in the left panel of the Dell SAS RAID Storage Manager window and selecting the option on the Operation tab in the right panel. If you select the **Automatically fix errors** check box, Dell SAS RAID Storage Manager will automatically fix any consistency data errors that it finds.



Scanning for New Drives

Dell SAS RAID Storage Manager normally detects newly installed disk drives and displays icons for them in the Dell SAS RAID Storage Manager window. If for some reason Dell SAS RAID Storage Manager does not detect a new drive (or drives), you can use the Scan for Foreign Config command to find it. To do this, follow these steps:

- 1 Select a controller icon in the left panel of the Dell SAS RAID Storage Manager window.
- 2 Select **Operations->Scan for Foreign Config**.
If Dell SAS RAID Storage Manager detects any new disk drives, it displays a list of them on the screen.
- 3 Follow the instructions on the screen to complete the disk detection.

Rebuilding a Drive

If a single drive in a RAID 1, RAID 5, or RAID 10 virtual disk fails, the system is protected from data loss. The failed drive must be replaced, and the drive's data must be rebuilt on a new drive to restore the system to fault tolerance. (You can choose to rebuild the data on the failed drive if the drive is still operational.) If a RAID 1 or RAID 5 virtual disk fails on a Dell PERC 5/i system, and if hotspare disks are available, the failed drive is rebuilt automatically without any user intervention.

If a drive has failed, a red circle appears to the right of the disk drive icon: . A small yellow circle appears to the right of the icon of the virtual disk that uses this physical disk: . This indicates that the virtual disk is in a degraded state; the data is still safe, but data could be lost if another drive fails.

Rebuilding a Drive on a Dell SAS 5/iR System

Follow these steps if you need to replace a failed physical drive on a Dell SAS 5/iR system:

- 1 Note the number of the failed drive (0, 1, 2, 3) in the Dell SAS RAID Storage Manager window.
- 2 Shut down the system, disconnect the power cord, and open the computer case.



CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Authorized Service Technicians: Before performing any procedure, see your Product Information Guide for complete information about safety precautions, working inside the computer, and protecting against electrostatic discharge.

- 3 Find the failed disk drive and remove it from the computer case.

You can identify the disk drive by reading the number (0, 1, 2, 3) on the drive cable. This corresponds to the drive number displayed in the Dell SAS RAID Storage Manager window. Also, the drive 0 cable is color coded. For the integrated controller, the hard drive number is on the mother board next to the cable connector.

- 4 Replace the failed disk drive with a new drive of equal or greater capacity.
- 5 Close the computer case, reconnect the power cord, and restart the computer.
- 6 Restart Dell SAS RAID Storage Manager.

When the new drive spins up, the drive icon changes back to normal status, and the rebuild process begins automatically.

Rebuilding a Drive on a Dell PERC 5/i System

Follow these steps if you need to rebuild a physical drive on a Dell PERC 5/i system:

- 1 Right click the icon of the failed drive and select **Rebuild**.
- 2 Click **Yes** when the warning message appears. If the drive is still good, a rebuild will start.
You can monitor the progress of the rebuild in the Group Show Progress window by selecting **Group Operations -> Show Progress**. If the drive cannot be rebuilt, an error message appears. Continue with the next step.
- 3 Shut down the system, disconnect the power cord, and open the computer case.
- 4 Replace the failed disk drive with a new drive of equal capacity.
- 5 Close the computer case, reconnect the power cord, and restart the computer.
- 6 Restart Dell SAS RAID Storage Manager.

When the new drive spins up, the drive icon changes back to normal status, and the rebuild process begins automatically. You can monitor the progress of the rebuild in the Group Show Progress window by selecting **Group Operations->Show Progress**.

Making a Drive Offline or Missing


(Dell PERC 5/i controllers only) If a disk drive is currently part of a redundant configuration and you want to use it in another configuration, you can use Dell SAS RAID Storage Manager commands to remove the disk drive from the first configuration for this purpose. When you do this, **all data on that drive is lost**.

To remove the disk drive from the configuration without harming the data on the virtual disk, follow these steps:

- 1 In the left panel of the Dell SAS RAID Storage Manager window, right-click on the icon of a disk drive in a redundant virtual disk.
- 2 Select **Make drive offline** from the popup menu. The disk drive status changes to Offline.
- 3 Right-click the disk drive icon again and select **Mark physical disk as missing**.

- 4 Select **File->Rescan**. The disk drive status changes to Unconfigured Good. At this point, the data on this disk drive is no longer valid.
- 5 If necessary, create a hotspare disk for the virtual disk from which you have removed the disk drive. (See *Adding Hotspare Disks*.)

When a hotspare is available, the data on the virtual disk will be rebuilt. You can now use the removed disk for another configuration.

 **NOTE:** If Dell SAS RAID Storage Manager detects that a disk drive in a virtual disk has failed, it makes the drive offline. If this happens, you must remove the disk drive and replace it. You cannot make the drive usable for another configuration by using the **Mark physical disk as missing** and **Rescan** commands.

Upgrading the Firmware

(Dell PERC 5/i controllers only) Dell SAS RAID Storage Manager enables you to easily upgrade the controller firmware. The latest firmware packages are available at support.dell.com. The .rom image used for the update is contained in this package.

To upgrade the firmware, follow these steps:

- 1 In the left panel of the Dell SAS RAID Storage Manager window, click on the icon of the Dell PERC 5/i controller you need to upgrade.
- 2 In the right panel, click the **Operations** tab and select **Flash Firmware**.
- 3 Click **Go**.
- 4 Browse for the .rom update file and click **OK**.

Dell SAS RAID Storage Manager displays the version of the existing firmware and the version of the new firmware file.

- 5 When you are prompted to indicate if you want to upgrade the firmware, click **Yes**.
The controller is updated with the new firmware code contained in the .rom file.

Troubleshooting

To get help installing Dell SAS RAID Storage Manager on your Dell™ PERC 5/i or SAS 5/iR system, you can contact your Dell Technical Service representative or access the Dell Support website at support.dell.com.

Windows Installation Error Messages

The Microsoft Installer may display error messages during the installation process when you are installing Dell SAS RAID Storage Manager on a Dell system running under the Microsoft Windows operating system. The error messages are self-explanatory. If you need more information about these messages, see the list of Installer error messages on the Microsoft Developers Network (MSDN) website at this address:

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/msi/setup/windows_installer_error_messages.asp

Linux Installation Error Messages

The messages shown in Table 7-1 may appear while you are installing Dell SAS RAID Storage Manager on a Dell system running under the Red Hat® Linux or SUSE Linux operating system:

Table 7-1. Linux Installation Error Messages

Message	Meaning
More than one copy of MegaRAID Storage Manager has been installed.	You have installed more than one copy of Dell SAS RAID Storage Manager. This can be done by using the <code>rpm -force</code> command to install the <code>rpm</code> file directly, which is not recommended, instead of using the <code>install.sh</code> file. In such cases, you must uninstall all the <code>rpms</code> manually before installing Dell SAS RAID Storage Manager as described in Installation.
The version is already installed.	The version of Dell SAS RAID Storage Manager you are trying to install is already installed on the system. Cancel out of the installation program.
The installed version is newer.	A newer version of Dell SAS RAID Storage Manager is already installed on the system. Cancel out of the installation program.
Exiting installation.	This message appears when the installation is complete. No action is necessary.

Table 7-1. Linux Installation Error Messages (continued)

Message	Meaning
RPM Installation Failed	This message indicates that the installation failed for some reason. Additional message text explains the cause of the failure. Read this message text and take appropriate action.

Other Dell SAS RAID Storage Manager Messages

Table 7-2 lists other messages generated by Dell SAS RAID Storage Manager and explains what should be done to respond to them.

Table 7-2. Dell SAS RAID Storage Manager Messages

Message	Meaning	Action
Message 4007	A Start Rebuild command was issued, but rebuild was not able to start.	See the Dell knowledgebase articles on support.dell.com .
Message 4008	A Make Drive Online command was issued.	See the Dell knowledgebase articles on support.dell.com .
Message 4009	You are attempting to create a virtual disk with a mix of SAS and SATA physical drives	The operation is not supported. Select only SAS or only SATA drives when creating a virtual disk.
Message 8107	You sent a Start Locate or Stop Locate command to a physical drive that is not connected to a backplane (that is, not in a disk enclosure).	The hardware configuration is not supported.
Message 800E	You sent an Undo Prepare Removal command to a physical drive that does not support this command.	The hardware configuration is not supported.
Assisted Configuration Failed!	Dell SAS RAID Storage Manager could not proceed with assisted configuration. This may occur because the underlying hardware resources were changed during the configuration: for example, a drive was removed.	Close the Configuration Wizard and then retry.
Cannot read Foreign Config!	An error occurred while Dell SAS RAID Storage Manager was attempting to read a Foreign Configuration. Dell SAS RAID Storage Manager is unable to read the configuration.	Move the configuration back to the system where it came from and verify the configuration there.

Table 7-2. Dell SAS RAID Storage Manager Messages (continued)

Message	Meaning	Action
No Foreign Configuration is found!	Dell SAS RAID Storage Manager found a data inconsistency while reading a foreign configuration. The foreign configuration is invalid.	Scan the system again to attempt to read the foreign configuration. If this fails, the configuration may be corrupted.
Operation cannot be started while reconstruction is in progress!	You tried to start another operation in Dell SAS RAID Storage Manager while a reconstruction was running.	Wait for the reconstruction operation to complete and then retry the operation.
Guided Configuration failed!	Dell SAS RAID Storage Manager could not proceed with guided configuration. This may occur because the underlying hardware resources were changed during the configuration: for example, a drive was removed.	Close the Configuration Wizard and then retry it.
Storelib Initialization failed	StoreLib (firmware used by Dell SAS RAID Storage Manager) could not be initialized on the system. No SAS hardware or driver is present on the system.	Check the knowledgebase articles on support.dell.com .
No Storage Controller Found!	No controller could be found on the system. No SAS hardware or driver is present on the system.	Verify that the hardware is properly connected, the SAS controller is enabled in the system BIOS (if it is an integrated controller) and the driver is installed in the system. If you have just installed the BIOS, make sure the system has been rebooted.
Clear Configuration failed: Unknown Exception	The Clear Configuration command has failed.	Verify that you want to clear the configuration (this is a non-recoverable operation). Follow the instructions in the SAS 5 User's Guide to perform this task using the controller BIOS utility.
Login failed: Invalid username or password!	The username or password is invalid. User authentication failed because the user entered an invalid user name of password.	The username and password are set up by your local system administrator. Contact your system administrator to verify the password. Note that the administrator/root password is for the local machine, not a domain based administrator password.

Table 7-2. Dell SAS RAID Storage Manager Messages (continued)

Message	Meaning	Action
Auto Configuration failed!	Dell SAS RAID Storage Manager could not proceed with auto configuration. This may occur because the underlying hardware resources were changed during the configuration: for example, a drive was removed.	Close the Configuration Wizard and retry. If this happens repeatedly, verify that the hardware is properly connected.
Cannot create Virtual Disk: Invalid input parameters for creating Virtual Disk.	You have entered some parameters that are not valid for the virtual disk.	Be sure that all the virtual disk parameters are valid, then retry creating the virtual disk.
The drive is not in a state to perform.	The physical drive does not support this command. This may happen when you send an Undo Prepare for Removal command to the wrong physical drive.	This functionality is not supported. Check the state of the physical drive.
Save configuration failed.	The Save Configuration command failed while attempting to save the configuration to a file.	Be sure that you are saving the configuration to the correct location. Be sure there is adequate free space for the file on the disk. Be sure you have write permission on the target.
Reconstruction on this Volume is not allowed!	This virtual disk does not support the Reconstruction command. The system hardware is not allowing any kind of reconstruction.	Verify that the hardware is properly connected and retry.
Fatal Error: Cannot connect to Framework!	A software component of Dell SAS RAID Storage Manager cannot establish a connection to the MSM framework. The Dell SAS RAID Storage Manager GUI is not able to communicate with the server side software component.	Confirm that the device driver is installed and that the system has been rebooted. If the driver is present, uninstall and re-install the application.
Clear Foreign Config failed!	The Clear Foreign Config operation has failed with an error.	Use the controller BIOS configuration utility to execute this task. (See the SAS 5 User's Guide for further instructions.) This is a non-recoverable operation, so be sure that you want to do this before continuing.
No Servers found!	Dell SAS RAID Storage Manager did not find any servers to manage.	Uninstall and reinstall the software application.
Import foreign configuration failed!	An error occurred when Dell SAS RAID Storage Manager attempted to import a foreign configuration	Move the configuration back to the system where it came from and verify the configuration there.

Table 7-2. Dell SAS RAID Storage Manager Messages (continued)

Message	Meaning	Action
Device not responding!	The device is not responding to the command you are sending it.	Re-try the command. Verify that the hardware is connected and is configured properly.
This user does not have Administrator right for this system!	Dell SAS RAID Storage Manager log-in failed because the user does not have administrator rights for this system. This happens only when the user is trying to use Dell SAS RAID Storage Manager with full access rights.	Verify that the username has administrator rights for the local system (not domain based rights). Note that you can log in with view only access if you do not need to change the configuration.

Events and Messages

This Appendix lists the Dell SAS RAID Storage Manager events that may appear in the event log. Dell SAS RAID Storage Manager monitors the activity and performance of all controllers in the workstation and the devices attached to them. When an event occurs, such as the start of an initialization, an event message appears in the log at the bottom of the Dell SAS RAID Storage Manager window.

Each message that appears in the event log has an Error Level that indicates the severity of the event, as shown in Table A-1.

Table A-1. Event Error Levels

Error Level	Meaning
Info	Informational message. No user action is necessary.
Warning	Some component may be close to a failure point.
Caution	A component has failed, but the system has not lost data.
Fatal	A component has failed and data loss has occurred or will occur.
Dead	A catastrophic error has occurred and the controller has died. This event is seen only after the controller has been restarted.

List of System Event Messages

Table A-2 lists all of the Dell SAS RAID Storage Manager event messages. The event message descriptions include placeholders for specific values that are determined when the event is generated. For example, in message #1 in the Event Messages table “%s” is replaced by the firmware version, which is read from the firmware when the event is generated.

Table A-2. Event Messages

Number	Type	Event Text
0x0000	Info	MegaRAID firmware initialization started (PCI ID %04x/%04x/%04x/%04x)
0x0001	Info	MegaRAID firmware version %s
0x0002	Fatal	Unable to recover cache data from TBBU
0x0003	Info	Cache data recovered from TBBU successfully
0x0004	Info	Configuration cleared

Table A-2. Event Messages (continued)

Number	Type	Event Text
0x0005	Warning	Cluster down; communication with peer lost
0x0006	Info	Virtual disk %s ownership changed from %02x to %02x
0x0007	Info	Alarm disabled by user
0x0008	Info	Alarm enabled by user
0x0009	Info	Background initialization rate changed to %d%%
0x000a	Fatal	Controller cache discarded due to memory/battery problems
0x000b	Fatal	Unable to recover cache data due to configuration mismatch
0x000c	Info	Cache data recovered successfully
0x000d	Fatal	Controller cache discarded due to firmware version incompatibility
0x000e	Info	Consistency Check rate changed to %d%%
0x000f	Dead	Fatal firmware error: %s
0x0010	Info	Factory defaults restored
0x0011	Info	Flash downloaded image corrupt
0x0012	Caution	Flash erase error
0x0013	Caution	Flash timeout during erase
0x0014	Caution	Flash error
0x0015	Info	Flashing image: %s
0x0016	Info	Flash of new firmware image(s) complete
0x0017	Caution	Flash programming error
0x0018	Caution	Flash timeout during programming
0x0019	Caution	Flash chip type unknown
0x001a	Caution	Flash command set unknown
0x001b	Caution	Flash verify failure
0x001c	Info	Flush rate changed to %d seconds
0x001d	Info	Hibernate command received from host
0x001e	Info	Event log cleared
0x001f	Info	Event log wrapped
0x0020	Dead	Multi-bit ECC error: ECAR=%x, ELOG=%x, (%s)
0x0021	Warning	Single-bit ECC error: ECAR=%x, ELOG=%x, (%s)
0x0022	Dead	Not enough controller memory

Table A-2. Event Messages (continued)

Number	Type	Event Text
0x0023	Info	Patrol Read complete
0x0024	Info	Patrol Read paused
0x0025	Info	Patrol Read Rate changed to %d%%
0x0026	Info	Patrol Read resumed
0x0027	Info	Patrol Read started
0x0028	Info	Rebuild rate changed to %d%%
0x0029	Info	Reconstruction rate changed to %d%%
0x002a	Info	Shutdown command received from host
0x002b	Info	Test event: '%s'
0x002c	Info	Time established as %s; (%d seconds since power on)
0x002d	Info	User entered firmware debugger
0x002e	Warning	Background Initialization aborted on %s
0x002f	Warning	Background Initialization corrected medium error (%s at %lx
0x0030	Info	Background Initialization completed on %s
0x0031	Fatal	Background Initialization completed with uncorrectable errors on %s
0x0032	Fatal	Background Initialization detected uncorrectable double medium errors (%s at %lx on %s)
0x0033	Caution	Background Initialization failed on %s
0x0034	Progress	Background Initialization progress on %s is %s
0x0035	Info	Background Initialization started on %s
0x0036	Info	Policy change on %s from %s to %s
0x0037	Info	OBSOLETE
0x0038	Warning	Consistency Check aborted on %s
0x0039	Warning	Consistency Check corrected medium error (%s at %lx
0x003a	Info	Consistency Check done on %s
0x003b	Info	Consistency Check done with corrections on %s
0x003c	Fatal	Consistency Check detected uncorrectable double medium errors (%s at %lx on %s)
0x003d	Caution	Consistency Check failed on %s
0x003e	Fatal	Consistency Check failed with uncorrectable data on %s
0x003f	Warning	Consistency Check found inconsistent parity on %s at strip %lx
0x0040	Warning	Consistency Check inconsistency logging disabled on %s (too many inconsistencies)

Table A-2. Event Messages (continued)

Number	Type	Event Text
0x0041	Progress	Consistency Check progress on %s is %s
0x0042	Info	Consistency Check started on %s
0x0043	Warning	Initialization aborted on %s
0x0044	Caution	Initialization failed on %s
0x0045	Progress	Initialization progress on %s is %s
0x0046	Info	Fast initialization started on %s
0x0047	Info	Full initialization started on %s
0x0048	Info	Initialization complete on %s
0x0049	Info	LD Properties updated to %s (form %s)
0x004a	Info	Reconstruction complete on %s
0x004b	Fatal	Reconstruction of %s stopped due to unrecoverable errors
0x004c	Fatal	Reconstruct detected uncorrectable double medium errors (%s at %lx on %s at %lx)
0x004d	Progress	Reconstruction progress on %s is %s
0x004e	Info	Reconstruction resumed on %s
0x004f	Fatal	Reconstruction resume of %s failed due to configuration mismatch
0x0050	Info	Reconstructing started on %s
0x0051	Info	State change on %s from %s to %s
0x0052	Info	PD Clear aborted on %s
0x0053	Caution	PD Clear failed on %s (Error %02x)
0x0054	Progress	PD Clear progress on %s is %s
0x0055	Info	PD Clear started on %s
0x0056	Info	PD Clear completed on %s
0x0057	Warning	Error on %s (Error %02x)
0x0058	Info	Format complete on %s
0x0059	Info	Format started on %s
0x005a	Caution	Hot Spare SMART polling failed on %s (Error %02x)
0x005b	Info	PD inserted: %s
0x005c	Warning	PD %s is not supported
0x005d	Warning	Patrol Read corrected medium error on %s at %lx
0x005e	Progress	Patrol Read progress on %s is %s

Table A-2. Event Messages (continued)

Number	Type	Event Text
0x005f	Fatal	Patrol Read found an uncorrectable medium error on %s at %lx
0x0060	Caution	Predictive failure: CDB: %s
0x0061	Fatal	Patrol Read puncturing bad block on %s at %lx
0x0062	Info	Rebuild aborted by user on %s
0x0063	Info	Rebuild complete on %s
0x0064	Info	Rebuild complete on %s
0x0065	Caution	Rebuild failed on %s due to source drive error
0x0066	Caution	Rebuild failed on %s due to target drive error
0x0067	Progress	Rebuild progress on %s is %s
0x0068	Info	Rebuild resumed on %s
0x0069	Info	Rebuild started on %s
0x006a	Info	Rebuild automatically started on %s
0x006b	Caution	Rebuild stopped on %s due to loss of cluster ownership
0x006c	Fatal	Reassign write operation failed on %s at %lx
0x006d	Fatal	Unrecoverable medium error during rebuild on %s at %lx
0x006e	Info	Corrected medium error during recovery on %s at %lx
0x006f	Fatal	Unrecoverable medium error during recovery on %s at %lx
0x0070	Info	PD removed: %s
0x0071	Warning	Unexpected sense: %s, CDB%s, Sense: %s
0x0072	Info	State change on %s from %s to %s
0x0073	Info	State change by user on %s from %s to %s
0x0074	Warning	Redundant path to %s broken
0x0075	Info	Redundant path to %s restored
0x0076	Info	Dedicated Hot Spare PD %s no longer useful due to deleted array
0x0077	Caution	SAS topology error: Loop detected
0x0078	Caution	SAS topology error: Unaddressable device
0x0079	Caution	SAS topology error: Multiple ports to the same SAS address
0x007a	Caution	SAS topology error: Expander error
0x007b	Caution	SAS topology error: SMP timeout
0x007c	Caution	SAS topology error: Out of route entries

Table A-2. Event Messages (continued)

Number	Type	Event Text
0x007d	Caution	SAS topology error: Index not found
0x007e	Caution	SAS topology error: SMP function failed
0x007f	Caution	SAS topology error: SMP CRC error
0x0080	Caution	SAS topology error: Multiple subtractive
0x0081	Caution	SAS topology error: Table to table
0x0082	Caution	SAS topology error: Multiple paths
0x0083	Fatal	Unable to access device %s
0x0084	Info	Dedicated Hot Spare created on %s (%s)
0x0085	Info	Dedicated Hot Spare %s disabled
0x0086	Caution	Dedicated Hot Spare %s no longer useful for all arrays
0x0087	Info	Global Hot Spare created on %s (%s)
0x0088	Info	Global Hot Spare %s disabled
0x0089	Caution	Global Hot Spare does not cover all arrays
0x008a	Info	Created %s}
0x008b	Info	Deleted %s}
0x008c	Info	Marking LD %s inconsistent due to active writes at shutdown
0x008d	Info	Battery Present
0x008e	Warning	Battery Not Present
0x008f	Info	New Battery Detected
0x0090	Info	Battery has been replaced
0x0091	Caution	Battery temperature is high
0x0092	Warning	Battery voltage low
0x0093	Info	Battery started charging
0x0094	Info	Battery is discharging
0x0095	Info	Battery temperature is normal
0x0096	Fatal	Battery needs to be replacement, SOH Bad
0x0097	Info	Battery relearn started
0x0098	Info	Battery relearn in progress
0x0099	Info	Battery relearn completed
0x009a	Caution	Battery relearn timed out

Table A-2. Event Messages (continued)

Number	Type	Event Text
0x009b	Info	Battery relearn pending: Battery is under charge
0x009c	Info	Battery relearn postponed
0x009d	Info	Battery relearn will start in 4 days
0x009e	Info	Battery relearn will start in 2 day
0x009f	Info	Battery relearn will start in 1 day
0x00a0	Info	Battery relearn will start in 5 hours
0x00a1	Info	Battery removed
0x00a2	Info	Current capacity of the battery is below threshold
0x00a3	Info	Current capacity of the battery is above threshold
0x00a4	Info	Enclosure (SES) discovered on %s
0x00a5	Info	Enclosure (SAF-TE) discovered on %s
0x00a6	Caution	Enclosure %s communication lost
0x00a7	Info	Enclosure %s communication restored
0x00a8	Caution	Enclosure %s fan %d failed
0x00a9	Info	Enclosure %s fan %d inserted
0x00aa	Caution	Enclosure %s fan %d removed
0x00ab	Caution	Enclosure %s power supply %d failed
0x00ac	Info	Enclosure %s power supply %d inserted
0x00ad	Caution	Enclosure %s power supply %d removed
0x00ae	Caution	Enclosure %s SIM %d failed
0x00af	Info	Enclosure %s SIM %d inserted
0x00b0	Caution	Enclosure %s SIM %d removed
0x00b1	Warning	Enclosure %s temperature sensor %d below warning threshold
0x00b2	Caution	Enclosure %s temperature sensor %d below error threshold
0x00b3	Warning	Enclosure %s temperature sensor %d above warning threshold
0x00b4	Caution	Enclosure %s temperature sensor %d above error threshold
0x00b5	Caution	Enclosure %s shutdown
0x00b6	Warning	Enclosure %s not supported; too many enclosures connected to port
0x00b7	Caution	Enclosure %s firmware mismatch
0x00b8	Warning	Enclosure %s sensor %d bad

Table A-2. Event Messages (continued)

Number	Type	Event Text
0x00b9	Caution	Enclosure %s phy %d bad
0x00ba	Caution	Enclosure %s is unstable
0x00bb	Caution	Enclosure %s hardware error
0x00bc	Caution	Enclosure %s not responding
0x00bd	Info	SAS/SATA mixing not supported in enclosure; PD %s disabled
0x00be	Info	Enclosure (SES) hotplug on %s was detected, but is not supported
0x00bf	Info	Clustering enabled
0x00c0	Info	Clustering disabled
0x00c1	Info	PD too small to be used for auto-rebuild on %s
0x00c2	Info	BBU enabled; changing WT virtual disks to WB
0x00c3	Warning	BBU disabled; changing WB virtual disks to WT
0x00c4	Warning	Bad block table on PD %s is 80% full
0x00c5	Fatal	Bad block table on PD %s is full; unable to log block %lx
0x00c6	Info	Consistency Check Aborted due to ownership loss on %s
0x00c7	Info	Background Initialization (BGI) Aborted Due to Ownership Loss on %s
0x00c8	Caution	Battery/charger problems detected; SOH Bad
0x00c9	Warning	Single-bit ECC error: ECAR=%x, ELOG=%x, (%s); warning threshold exceeded
0x00ca	Caution	Single-bit ECC error: ECAR=%x, ELOG=%x, (%s); critical threshold exceeded
0x00cb	Caution	Single-bit ECC error: ECAR=%x, ELOG=%x, (%s); further reporting disabled
0x00cc	Caution	Enclosure %s Power supply %d switched off
0x00cd	Info	Enclosure %s Power supply %d switched on
0x00ce	Caution	Enclosure %s Power supply %d cable removed
0x00cf	Info	Enclosure %s Power supply %d cable inserted
0x00d0	Info	Enclosure %s Fan %d returned to normal
0x00d1	Info	BBU Retention test was initiated on previous boot
0x00d2	Info	BBU Retention test passed
0x00d3	Caution	BBU Retention test failed!
0x00d4	Info	NVRAM Retention test was initiated on previous boot
0x00d5	Info	NVRAM Retention test passed
0x00d6	Caution	NVRAM Retention test failed!

Table A-2. Event Messages (continued)

Number	Type	Event Text
0x00d7	Info	%s test completed %d passes successfully
0x00d8	Caution	%s test FAILED on %d pass. Fail data: errorOffset=%x goodData=%x badData=%x
0x00d9	Info	Self check diagnostics completed
0x00da	Info	Foreign Configuration Detected
0x00db	Info	Foreign Configuration Imported
0x00dc	Info	Foreign Configuration Cleared
0x00dd	Warning	NVRAM is corrupt; reinitializing
0x00de	Warning	NVRAM mismatch occurred
0x00df	Warning	SAS wide port %d lost link on PHY %d
0x00e0	Info	SAS wide port %d restored link on PHY %d
0x00e1	Warning	SAS port %d, PHY %d has exceeded the allowed error rate
0x00e2	Warning	Bad block reassigned on %s at %lx to %lx
0x00e3	Info	Controller Hot Plug detected
0x00e4	Warning	Enclosure %s temperature sensor %d differential detected
0x00e5	Info	Disk test cannot start. No qualifying disks found
0x00e6	Info	Time duration provided by host is not sufficient for self check
0x00e7	Info	Marked Missing for %s on array %d row %d
0x00e8	Info	Replaced Missing as %s on array %d row %d
0x00e9	Info	Enclosure %s Temperature %d returned to normal
0x00ea	Info	Enclosure %s Firmware download in progress
0x00eb	Warning	Enclosure %s Firmware download failed
0x00ec	Warning	%s is not a certified drive
0x00ed	Info	Dirty cache data discarded by user
0x00ee	Info	PDs missing from configuration at boot
0x00ef	Info	VDs missing drives and will go offline at boot: %s
0x00f0	Info	VDs missing at boot: %s
0x00f1	Info	Previous configuration completely missing at boot
0x00f2	Info	Battery charge complete
0x00f3	Info	Enclosure %s fan %d speed changed

Glossary

Access Policy

A virtual disk property indicating what kind of access is allowed for this virtual disk. The possible values are *Read/Write*, *Read Only*, or *Blocked*.

adapter

A device that enables a computer system to access peripheral devices by converting the protocol of one bus or interface to another. An adapter may also provide specialized function. For example, a RAID controller is a type of adapter that provides RAID functions. Adapters may reside on the system board or be an add-in card. Other examples of adapters include network and SCSI adapters.

Alarm Enabled

A controller property that indicates whether the controller's onboard alarm is enabled.

Alarm Present

A controller property that indicates whether the controller has an onboard alarm. If present and enabled, the alarm is sounded for certain error conditions.

array

See *disk group*.

backplane

A hardware component that connects a primary controller board to peripheral devices, such as disk drives, and that typically provides the signal and power connections to the peripherals.

BBU Present

A controller property that indicates whether the controller has an onboard battery backup unit to provide power in case of a power failure.

BGI Rate

A controller property indicating the rate at which the background initialization of virtual disks will be carried out.

BIOS

Basic Input/Output System. The computer BIOS is stored on a flash memory chip. The BIOS controls the following: communications between the microprocessor and peripheral devices, such as the keyboard and the video adapter, and miscellaneous functions, such as system messages.

cache

Fast memory that holds recently accessed data. Use of cache memory speeds subsequent access to the same data. When data is read from or written to main memory, a copy is also saved in cache memory with the associated main memory address. The cache memory software monitors the addresses of subsequent reads to see if the required data is already stored in cache memory. If it is already in cache memory (a cache hit), it is read from cache memory immediately and the main memory read is aborted (or not started). If the data is not cached (a cache miss), it is fetched from main memory and saved in cache memory.

Cache Flush Interval

A controller property that indicates how often the data cache is flushed.

caching

The process of using a high speed memory buffer to speed up a computer system's overall read/write performance. The cache can be accessed at a higher speed than a disk subsystem. To improve read performance, the cache usually contains the most recently accessed data, as well as data from adjacent disk sectors. To improve write performance, the cache may temporarily store data in accordance with its write back policies.

Coerced Size

A physical drive property indicating the size to which a disk drive has been coerced (forced) to make it compatible with other disk drives that are nominally the same size. For example, a 4 Gbyte drive from one manufacturer may be 4,196 Mbytes, and a 4 GB from another manufacturer may be 4,128 Mbytes. These drives could be coerced to a usable size of 4,088 Mbytes each for use in a disk group in a storage configuration.

Coercion Mode

A controller property indicating the size to which disk drives of nominally identical capacity are coerced (forced) in order to make them usable in a storage configuration.

consistency check

An operation that verifies that all stripes in a virtual disk with a redundant RAID level are consistent and that automatically fixes any errors. For RAID 1 disk groups, this operation verifies correct mirrored data for each stripe.

Consistency Check Rate

The rate at which consistency check operations are run on a computer system.

controller

A chip that controls the transfer of data between the microprocessor and memory or between the microprocessor and a peripheral device such as a physical disk. RAID controllers perform RAID functions such as striping and mirroring to provide data protection. Dell SAS RAID Storage Manager runs on the Dell PERC 5/i controller and the SAS 5/iR controller.

Current Write Policy

A virtual disk property that indicates whether the virtual disk currently supports *Write back* or *Write through* mode.

- In Write back mode the controller sends a data transfer completion signal to the host when the controller cache has received all the data in a transaction.
- In Write through mode the controller sends a data transfer completion signal to the host when the disk subsystem has received all the data in a transaction.

Default Write Policy

A virtual disk property indicating whether the default write policy is *Write through* or *Write back*. In Write back mode the controller sends a data transfer completion signal to the host when the controller cache has received all the data in a transaction. In Write through mode the controller sends a data transfer completion signal to the host when the disk subsystem has received all the data in a transaction.

device driver

Software that allows the operating system to control a device such as a printer. Many devices do not work properly if the correct driver is not installed in the computer.

Device ID

A controller or physical disk property indicating the manufacturer-assigned device ID.

Device Port Count

A controller property indicating the number of ports on the controller.

Disk Cache Policy

A virtual disk property indicating whether the virtual disk cache is enabled, disabled, or unchanged from its previous setting.

disk group

A logical grouping of disks attached to a RAID controller on which one or more virtual disks can be created, such that all virtual disks in the disk group use all of the physical disks in the disk group.

disk subsystem

A collection of disks and the hardware that controls them and connects them to one or more controllers. The hardware can include an intelligent controller, or the disks can attach directly to a system I/O bus controller.

fast initialization

A mode of initialization that quickly writes zeroes to the first and last sectors of the virtual disk. This allows you to start writing data to the virtual disk immediately while the initialization is running in the background.

fault tolerance

Fault tolerance is the capability of the disk subsystem to undergo a single drive failure per disk group without compromising data integrity and processing capability. The PERC 5/i controller provides fault tolerance through redundant disk groups in RAID

levels 1, 5, and 10. It also supports hotspare disks and the auto-rebuild feature. SAS 5/iR controllers support RAID 1 redundant disk groups.

firmware

Software stored in read-only memory (ROM) or Programmable ROM (PROM). Firmware is often responsible for the behavior of a system when it is first turned on. A typical example would be a monitor program in a system that loads the full operating system from disk or from a network and then passes control to the operating system.

foreign configuration

A RAID configuration that already exists on a replacement set of physical disks that you install in a computer system. Dell SAS RAID Storage Manager allows you to import the existing configuration to the RAID controller, or you can clear the configuration so you can create a new one.

formatting

The process of writing a specific value to all data fields on a physical disk, to map out unreadable or bad sectors. Because most physical disks are formatted when manufactured, formatting is usually done only if a physical disk generates many media errors.

hole

In Dell SAS RAID Storage Manager a *hole* is a block of empty space in a disk group that can be used to define a virtual disk.

Host Interface

A controller property indicating the type of interface used by the computer host system: for example, *PCIX*.

Host Port Count

A controller property indicating the number of host data ports currently in use.

host system

Any computer system on which the controller is installed. Mainframes, workstations, and standalone desktop systems can all be considered host systems.

hotspare

A standby physical disk that can automatically replace a failed physical disk in a virtual disk and prevent data from being lost. A hotspare can be dedicated to a single redundant disk group or it can be part of the global hotspare pool for all disk groups controlled by the controller.

When a physical disk fails, Dell SAS RAID Storage Manager automatically uses a hotspare to replace it and then rebuilds the data from the failed physical disk to the hotspare. Hotspares can be used in RAID 1, RAID 5, and RAID 10 storage configurations.

initialization

The process of writing zeros to the data fields of a virtual disk and, in fault-tolerant RAID levels, generating the corresponding parity to put the virtual disk in a Ready state. Initialization erases all previous data on the physical disks. Disk groups will work without initializing, but they can fail a consistency check because the parity fields have not been generated.

library

A software component that provides a variety of related functions available to be used by other software modules.

IO Policy

A virtual disk property indicating whether Cached IO or Direct IO is being used. In Cached IO mode, all reads are buffered in cache memory. In Direct IO mode, reads are not buffered in cache memory. Data is transferred to cache and the host concurrently. If the same data block is read again, it comes from cache memory. (The IO Policy applies to reads on a specific logical drive. It does not affect the Read-ahead cache.)

Media Error Count

A physical drive property indicating the number of errors that have been detected on the disk media.

migration

The process of moving virtual disks and hotspare disks from one controller to another by disconnecting the physical disks from one controller and attaching them to another one. The firmware on the new controller will detect and retain the virtual disk information on the physical disks.

mirroring

The process of providing complete data redundancy with two physical disks by maintaining an exact copy of one disk's data on the second physical disk. If one physical disk fails, the contents of the other physical disk can be used to maintain the integrity of the system and to rebuild the failed physical disk.

Name

A virtual disk property indicating the user-assigned name of the virtual disk.

non-redundant configuration

A non-redundant configuration is a RAID 0 virtual disk with data striped across two or more physical disks, but without disk mirroring or parity. This provides for high data throughput but offers no protection in case of a physical disk failure.

NVRAM

Acronym for non-volatile random access memory. A storage system that does not lose the data stored on it when power is removed. NVRAM is used to store firmware and configuration data on the RAID controller.

NVRAM Present

A controller property indicating whether an NVRAM is present on the controller.

NVRAM Size

A controller property indicating the size of the controller's NVRAM.

offline

A physical disk is offline when it is part of a virtual disk but its data is not accessible to the virtual disk.

patrol read

A process that checks the physical disks in a storage configuration for physical disk errors that could lead to drive failure and lost data. The Patrol Read operation can find and sometimes fix any potential problem with physical disks prior to host access. This enhances overall system performance because error recovery during a normal I/O operation may not be necessary.

patrol read rate

The user-defined rate at which patrol read operations are run on a computer system.

physical disk (PD)

A non-volatile, randomly addressable device for storing data. Physical disks are rewritable and commonly referred to as disk drives.

Physical Drive State

A physical drive property indicating the status of the drive. A physical disk can be in one of the following states:

- **Un-configured Good:** A disk accessible to the RAID controller but not configured as a part of a virtual disk or as a hotspare.
- **Hot Spare:** A physical disk that is configured as a hotspare.
- **Online:** A physical disk can be accessed by the RAID controller and will be part of the virtual disk.
- **Rebuild:** A physical disk to which data is being written to restore full redundancy for a virtual disk.
- **Failed:** A physical disk that was originally configured as Online or Hot Spare, but on which the firmware detects an unrecoverable error.
- **Un-configured Bad:** A physical disk on which the firmware detects an unrecoverable error; the physical disk was Un-configured Good or the physical disk could not be initialized.
- **Missing:** A physical disk that was Online, but which has been removed from its location.
- **Offline:** A physical disk that is part of a virtual disk but which has invalid data as far as the RAID configuration is concerned.
- **None:** A physical disk with the unsupported flag set. An Un-configured Good or Offline physical disk that has completed the prepare for removal operation.

Physical Drive Type

A physical drive property indicating the characteristics of the drive.

Product Info

A physical disk property indicating the vendor-assigned model number of the drive.

Product Name

A controller property indicating the manufacturing name of the controller.

RAID

A group of multiple, independent disk drives that provide high performance by increasing the number of disks used for saving and accessing data. A RAID disk group improves input/output (I/O) performance and data availability. The group of disk drives appears to the host system as a single storage unit or as multiple logical disks. Data throughput improves because several physical disks can be accessed simultaneously. RAID configurations also improve data storage availability and fault tolerance. Redundant RAID levels (RAID levels 1, 5, and 10), provide data protection.

RAID 0

RAID 0 uses data striping on two or more disk drives to provide high data throughput, especially for large files in an environment that requires no data redundancy. (Dell PERC 5/i and SAS 5/iR controllers)

RAID 1

RAID 1 uses data mirroring on a pair of disk drives so that data written to one physical disk is simultaneously written to the other physical disk. RAID 1 works well for small databases or other small applications that require complete data redundancy. (Dell PERC 5/i and SAS 5/iR controllers)

RAID 5

RAID 5 uses data striping and parity data across three or more disk drivers (distributed parity) to provide high data throughput and data redundancy, especially for applications that require random access. (Dell PERC 5/i controller only)

RAID 10

RAID 10, a combination of RAID 0 and RAID 1, uses data striping across mirrored spans. It provides high data throughput and complete data redundancy. (Dell PERC 5/i controller only)

RAID Level

A virtual disk property indicating the RAID level of the virtual disk. On Dell PERC 5/i controllers, RAID levels 0, 1, 5, and 10 are supported. On Dell SAS 5/iR controllers, RAID levels 0 and 1 are supported.

Raw Size

A physical drive property indicating the actual full size of the drive, before any Coercion Mode is applied to reduce the size.

Read Policy

A controller attribute indicating the current read policy mode. In *Always read ahead* mode, the controller reads sequentially ahead of requested data and stores the additional data in cache memory, anticipating that the data will be needed soon. This speeds up reads for sequential data, but there is little improvement when accessing random data. In *No read ahead* mode, read-ahead capability is disabled. In *Adaptive read ahead* mode, the controller begins using read-ahead if the two most recent disk accesses occurred in sequential sectors. If the read requests are random, the controller reverts to *No read ahead* mode.

rebuild

The regeneration of all data to a replacement disk in a redundant virtual disk after a physical disk failure. A disk rebuild normally occurs without interrupting normal operations on the affected virtual disk, though some degradation of performance of the disk subsystem can occur.

rebuild rate

The percentage of central processing unit (CPU) resources devoted to rebuilding data onto a new physical disk after a disk in a storage configuration has failed.

reclaim virtual disk

A method of undoing the configuration of a new virtual disk. If you highlight the virtual disk in the Configuration Wizard and click the **Reclaim** button, the individual disk drives are removed from the virtual disk configuration.

reconstruction rate

The user-defined rate at which a reconstruct operation is carried out.

redundancy

A property of a storage configuration that prevents data from being lost when one physical disk fails in the configuration.

redundant configuration

A virtual disk that has redundant data on physical disks in the disk group that can be used to rebuild a failed physical disk. The redundant data can be parity data striped across multiple physical disks in a disk group, or it can be a complete mirrored copy of the data stored on a second physical disk. A redundant configuration protects the data in case a physical disk fails in the configuration.

Revision Level

A physical disk property that indicates the revision level of the disk's firmware.

SAS

Serial Attached SCSI. SAS is a serial, point-to-point, enterprise-level device interface that leverages the Small Computer System Interface (SCSI) protocol set. The SAS interface provides improved performance, simplified cabling, smaller connectors, lower pin count, and lower power requirements when compared to parallel SCSI. The Dell SAS 5/iR controller supports the SAS interface.

SATA

Acronym for Serial Advanced Technology Attachment. A physical storage interface standard. SATA is a serial link that provides point-to-point connections between devices. The thinner serial cables allow for better airflow within the system and permit smaller chassis designs.

SCSI Device Type

A physical drive property indicating the type of the device, such as *Disk Drive*.

Serial No.

A controller property indicating the manufacturer-assigned serial number.

Size

A virtual disk property indicating the amount of storage space on the virtual disk.

Stripe Size

A virtual disk property indicating the data stripe size used in the virtual disk. For storage configurations on Dell PERC 5/i controllers, the stripe size is user-selectable.

striping

A technique used to write data across all physical disks in a virtual disk. Each stripe consists of consecutive virtual disk data addresses that are mapped in fixed-size units to each physical disk in the virtual disk using a sequential pattern. For example, if the virtual disk includes five physical disks, the stripe writes data to physical disks one through five without repeating any of the physical disks. The amount of space consumed by a stripe is the same on each physical disk. Striping by itself does not provide data redundancy. Striping in combination with parity does provide data redundancy.

SubVendor ID

A controller property that lists additional vendor ID information about the controller.

Uncorrectable Error Count

A controller property that lists the number of uncorrectable errors detected on physical disks connected to the controller. If the error count reaches a certain level, a physical disk will be marked as *Failed*.

Vendor ID

A controller property indicating the vendor-assigned ID number of the controller.

Vendor Info

A physical drive property listing the name of the vendor of the drive.

virtual disk (VD)

A storage unit created by a RAID controller from one or more physical disks. Although a virtual disk may be created from several physical disks, it is seen by the operating system as a single disk. Depending on the RAID level used, the virtual disk may retain redundant data in case of a disk failure.

Virtual Disk State

A virtual disk property indicating the condition of the virtual disk. Examples include *Optimal* and *Degraded*.

write-back

In write-back caching mode, the controller sends a data transfer completion signal to the host when the controller cache has received all the data in a disk write transaction. Data is written to the disk subsystem in accordance with policies set up by the controller. These policies include the amount of dirty/clean cache lines, the number of cache lines available, and elapsed time from the last cache flush.

Write Policy

See *Default Write Policy*.

write-through

In write-through caching mode, the controller sends a data transfer completion signal to the host when the disk subsystem has received all the data and has completed the write transaction to the disk.



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