



**Marvell. Moving Forward Faster**



# Marvell RAID Utility

## User Manual

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# 1

## GETTING STARTED

This chapter contains the following sections:

- [Overview](#)
- [Installing the Marvell RAID Utility \(MRU\)](#)

## 1.1 Overview

The Marvell RAID Utility (MRU) is a browser-based RAID management utility for Marvell RAID controllers. It can create and manage RAID virtual disks and arrays, using storage and enclosure devices connected to the RAID controller.

This section discusses the following:

- [Software Components](#)
- [System Requirements](#)
- [Supported Browsers](#)
- [Supported Operating Systems](#)
- [Supported RAID Controllers](#)
- [Supported RAID Levels](#)

### 1.1.1 Software Components

The MRU installation package includes the following components:

- **Marvell RAID Utility (MRU)**  
MRU is a browser-based utility which can create and manage RAID virtual disks and arrays. It can control both local and remote RAID controllers.
- **Tray Application for Windows**  
The tray application appears as an icon in the Windows System Tray and has right-click menu options for controlling MRU.
- **Marvell RAID Command Line Interface (CLI)**  
The CLI uses a command line interface and can control local RAID controllers.

**Note:** The Marvell BIOS Configuration Utility (a built-in component of Marvell RAID controllers) can also create and manage RAID virtual disks and arrays. Documentation for the Marvell BIOS Configuration Utility is available separately on the Marvell Extranet.

### 1.1.2 System Requirements

MRU has the following system requirements:

- Local/remote RAID controller (with drivers installed)
- Network connection (for remote controllers)
- Supported browser (see 1.1.3, [Supported Browsers](#))
- Supported operating system (see section 1.1.4, [Supported Operating Systems](#))

### 1.1.3 Supported Browsers

MRU supports the following browsers:

- Microsoft Internet Explorer 6.0 (and higher)
- Firefox 3.0 (and higher)



### 1.1.4 Supported Operating Systems

MRU supports the following Windows and Linux operating Systems:

#### Windows

- Windows XP
- Windows Server 2003
- Windows Vista
- Windows Server 2008
- Windows 7

#### Linux

- Red Hat Enterprise Linux (RHEL) Server 5.x
- Fedora Linux 8
- Fedora Linux 9
- SUSE Linux Enterprise Server (SLES) 9
- SUSE Linux Enterprise Server (SLES) 10
- SUSE Linux Enterprise Server (SLES) 11

### 1.1.5 Supported RAID Controllers

MRU supports the following types of RAID controllers:

- IO Controllers (see Chapter 3, [MRU for IO Controllers \(IOC\)](#))
- IO Processors (see Chapter 4, [MRU for IO Processors \(IOP\)](#))
- RAID-On-Chip Controllers (see Chapter 5, [MRU for RAID-On-Chip \(ROC\) Controllers](#))

### 1.1.6 Supported RAID Levels

MRU supports the following RAID levels:

- RAID 0 (Striping)
- RAID 1 (Disk Mirroring)
- RAID 1E (Data Mirroring and Striping)
- RAID 5 (Striping with Single Parity)
- RAID 6 (Striping with Dual Parity)
- RAID 10 (Disk Mirroring and Striping)
- RAID 50 (Striping RAID 5 Arrays)
- RAID 60 (Striping RAID 6 Arrays)

**Note:** Marvell RAID controllers support different sets of RAID levels depending on the hardware model and OEM software package. Some software packages, depending on OEM selections, support limited RAID levels by design. Check with the OEM vendor for information specific to your controller.

## 1.2 Installing the Marvell RAID Utility (MRU)

This section discusses the following:

- [Installing the RAID Controller](#)
- [Connecting Physical Disks](#)
- [Installing MRU in Windows](#)
- [Installing MRU in Linux](#)

### 1.2.1 Installing the RAID Controller

Before installing MRU, install the RAID controller in the system. Refer to the RAID controller HBA (Host Bus Adapter) or evaluation board documentation for hardware and software installation instructions.

### 1.2.2 Connecting Physical Disks

After installing the RAID controller, connect physical disks to the RAID controller.

#### To connect physical disks

1. Select a RAID level that is best suited for your application.  
For information on RAID levels, see Appendix B, [Selecting a RAID Level](#).
2. Connect the required number of physical disks, as specified in Table 1-1, to available ports on the controller either directly or through a backplane/enclosure. Refer to the RAID controller HBA or evaluation board documentation for installation instructions.

Table 1-1 lists the minimum number of physical disks required for each RAID level and controller type.

**Table 1-1 Minimum Number of Physical Disks**

Controller	Minimum Number of Physical Disks Required for RAID Level							
	0	1	1E	5	6	10	50	60
IO Controller (IOC)	2	2	n/a	3	n/a	4	n/a	n/a
IO Processor (IOP)	2	2	3	3	4	4	6	8
RAID-On-Chip (ROC) Controller	2	2	3	3	4	4	6	8

**Note:** Installing disks of similar capacity enhances RAID performance.

3. Power-up the physical disks.

**Note:** To create virtual disks and arrays, only use physical disks connected to a single controller.

## 1.2.3 Installing MRU in Windows

This section discusses the following:

- [Verifying RAID Controller Drivers Installation](#)
- [Installing MRU in Windows](#)

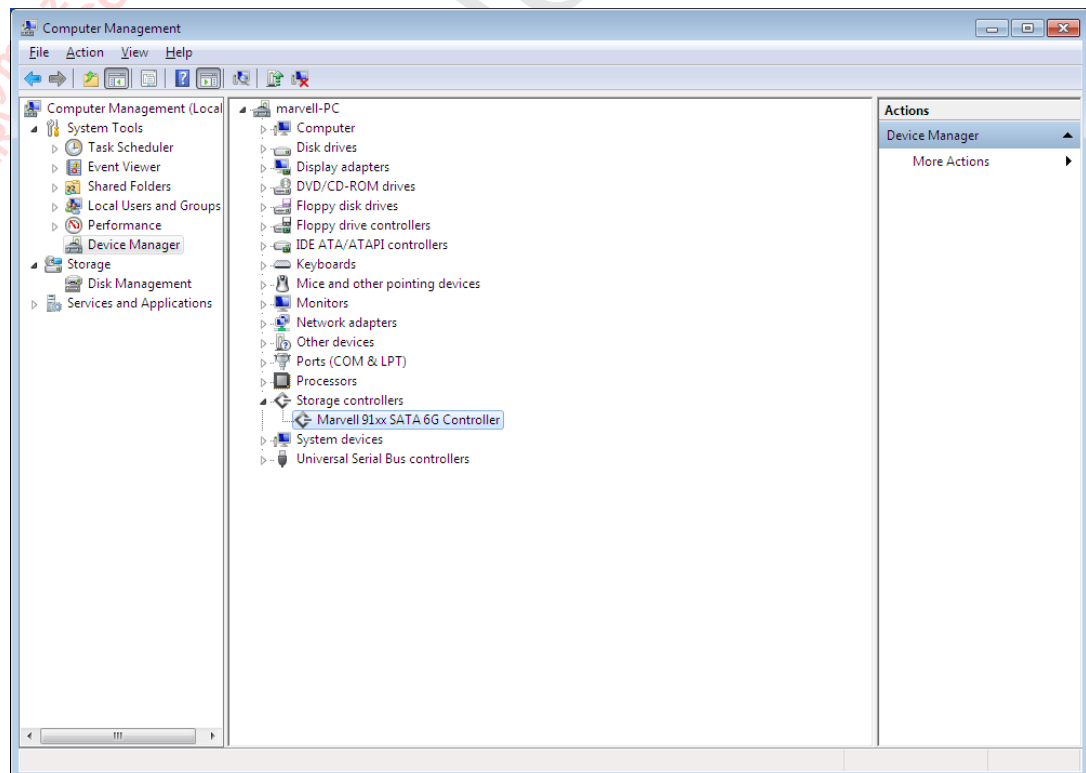
### 1.2.3.1 Verifying RAID Controller Drivers Installation

Before installing MRU, verify that the drivers for the RAID controller are installed. If the drivers are installed correctly, the controller is listed in the Windows Device Manager.

#### To verify drivers installation

1. From the **Start** menu, right-click **My Computer**, and select **Manage**.  
The **Computer Management** utility appears, as shown in Figure 1-1.
2. Browse to **System Tools > Device Manager**.
3. If the drivers are installed correctly, the RAID controller is listed under one of the following categories:
  - **SCSI and RAID controllers** (for Windows XP and Windows Server 2003)
  - **Storage controllers** (for Windows Vista, Windows Server 2008, and Windows 7).

**Figure 1-1 Device Manager (Windows 7)**



**Note:** Figure 1-1 shows the Device Manager on Windows 7 with an example RAID controller (Marvell 91xx SATA 6G Controller) installed.

### 1.2.3.2 Installing MRU in Windows

This section describes the procedure for installing MRU in Windows.

#### To install MRU in Windows

1. Verify that the drivers for the RAID controller are installed, as described in section 1.2.3.1, [Verifying RAID Controller Drivers Installation](#).
2. Run **MRUSetup.exe**.

The **MRU Setup Wizard** appears, as shown in Figure 1-2.

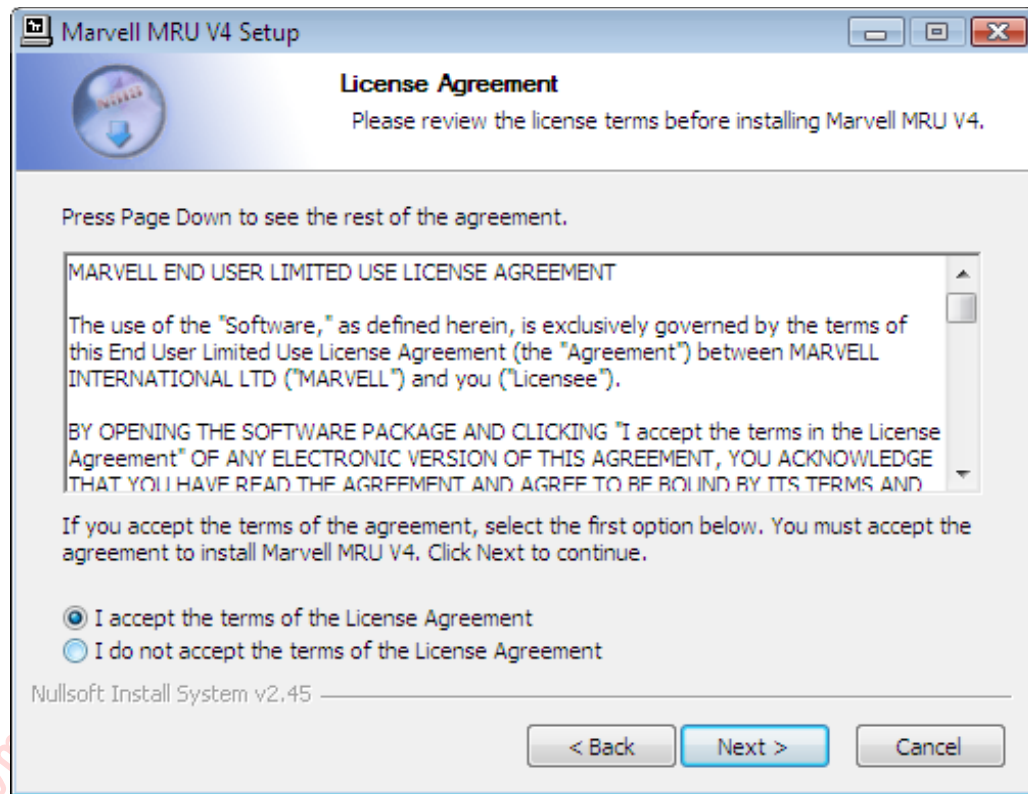
Figure 1-2 MRU Setup Wizard



3. Select **Next**, as shown in Figure 1-2.

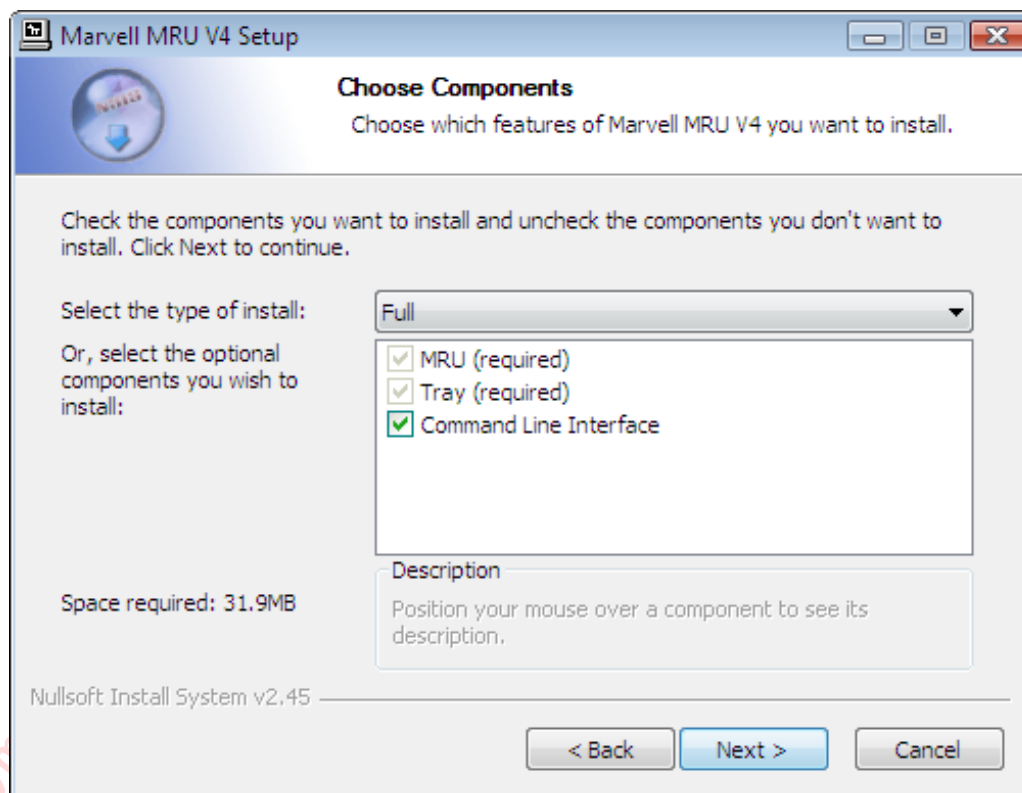
The **License Agreement** window appears, as shown in Figure 1-3.

Figure 1-3 License Agreement



4. Read the **License Agreement**.  
Select **I accept the terms of the License Agreement**, as shown in Figure 1-3.
5. Select **Next**, as shown in Figure 1-3, to continue with the installation.  
The **Choose Components** window appears, as shown in Figure 1-4.

Figure 1-4 Choose Components



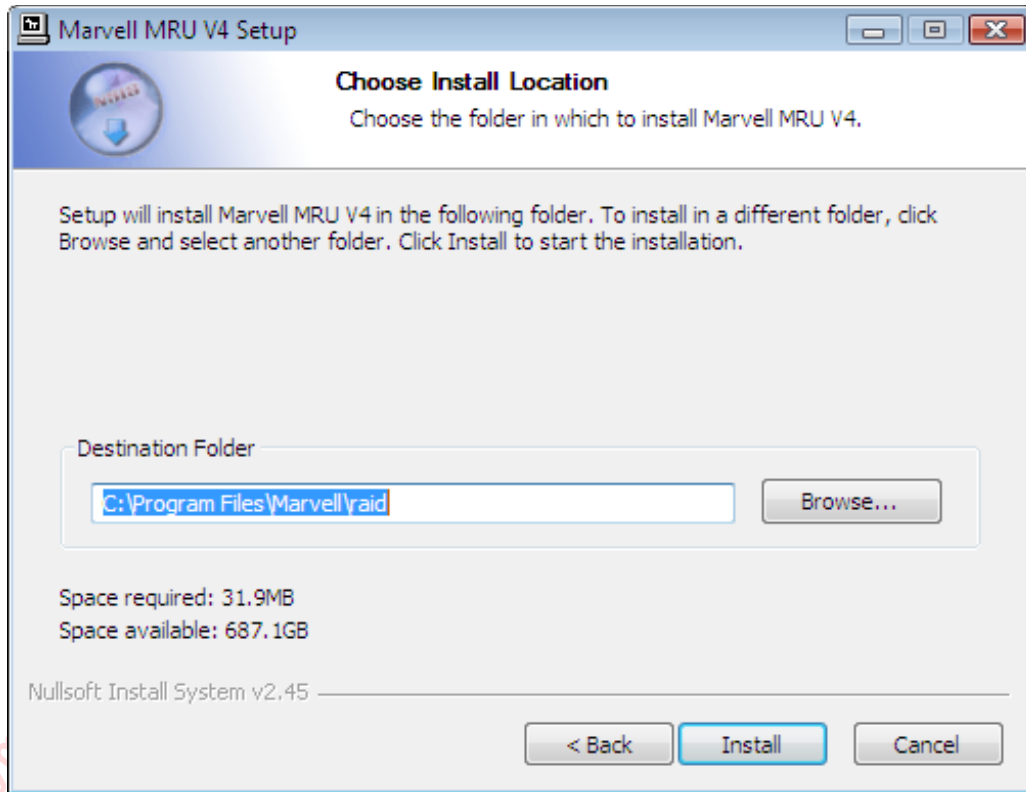
**Note:** Installation of the Command Line Interface utility is optional and disabled by default. Check the component if you wish to install it.

6. Select **Next**, as shown in Figure 1-4.

The **Choose Install Location** window appears, as shown in Figure 1-5, with the default location displayed in the **Destination Folder** field.

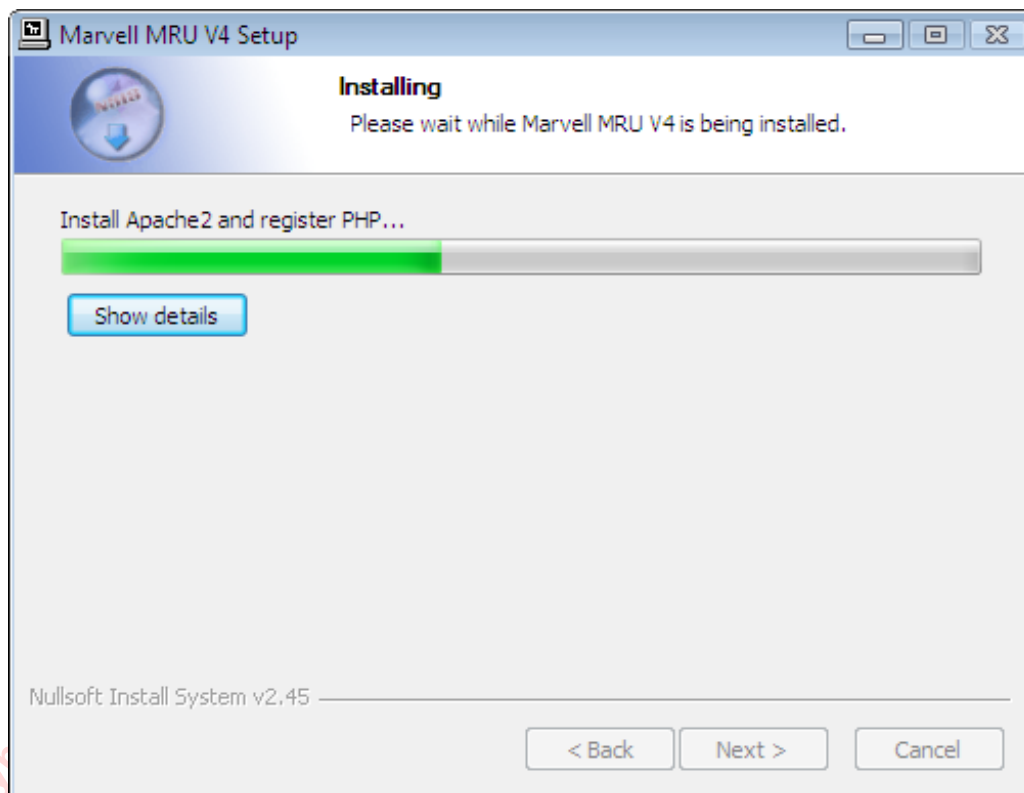
7. Select **Browse**, as shown in Figure 1-5, to specify an alternate folder if required.

Figure 1-5 Choose Install Location



8. Select **Install**, as shown in Figure 1-5, to begin installation.  
The installation wizard displays progress, as shown in Figure 1-6.

Figure 1-6 Installation Progress

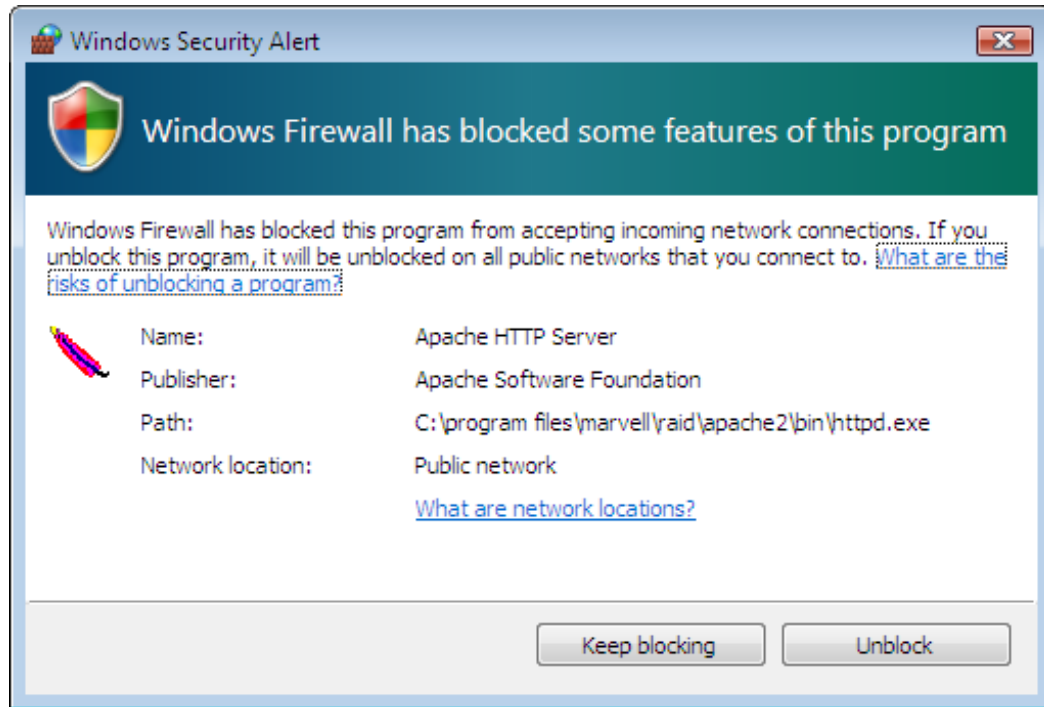


9. After installing the Apache2 HTTP Server (which is a built-in component of the installation package), the installation triggers a **Windows Security Alert** on some versions of Windows, as shown in Figure 1-7.

Select **Unblock** to continue.



Figure 1-7 Windows Security Alert

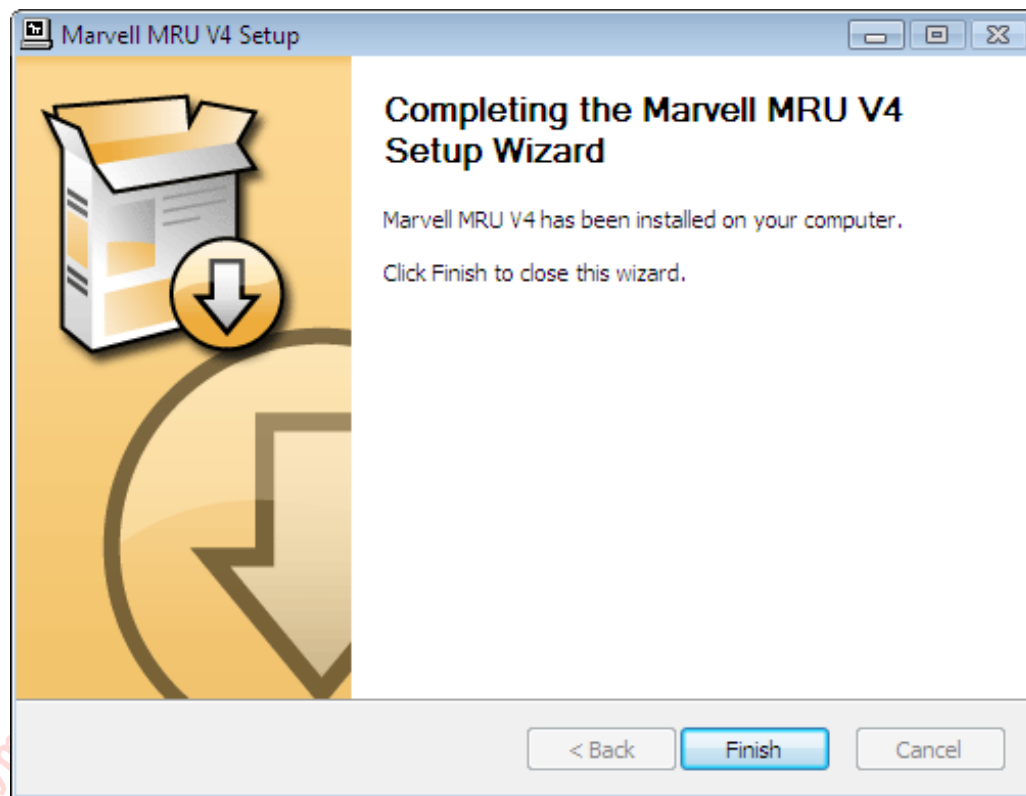


**Note:** Figure 1-7 shows the Security Alert that appears in Windows Vista. The alert is similar for other Windows operating systems.

10. When the installation is complete, the wizard confirms the completion, as shown in Figure 1-8.

Click **Finish**, as shown in Figure 1-8. MRU is now installed.

Figure 1-8 Installation Complete



## 1.2.4 Installing MRU in Linux

This section discusses the following:

- [Verifying RAID Controller Drivers Installation](#)
- [Installing MRU in Linux](#)

### 1.2.4.1 Verifying RAID Controller Drivers Installation

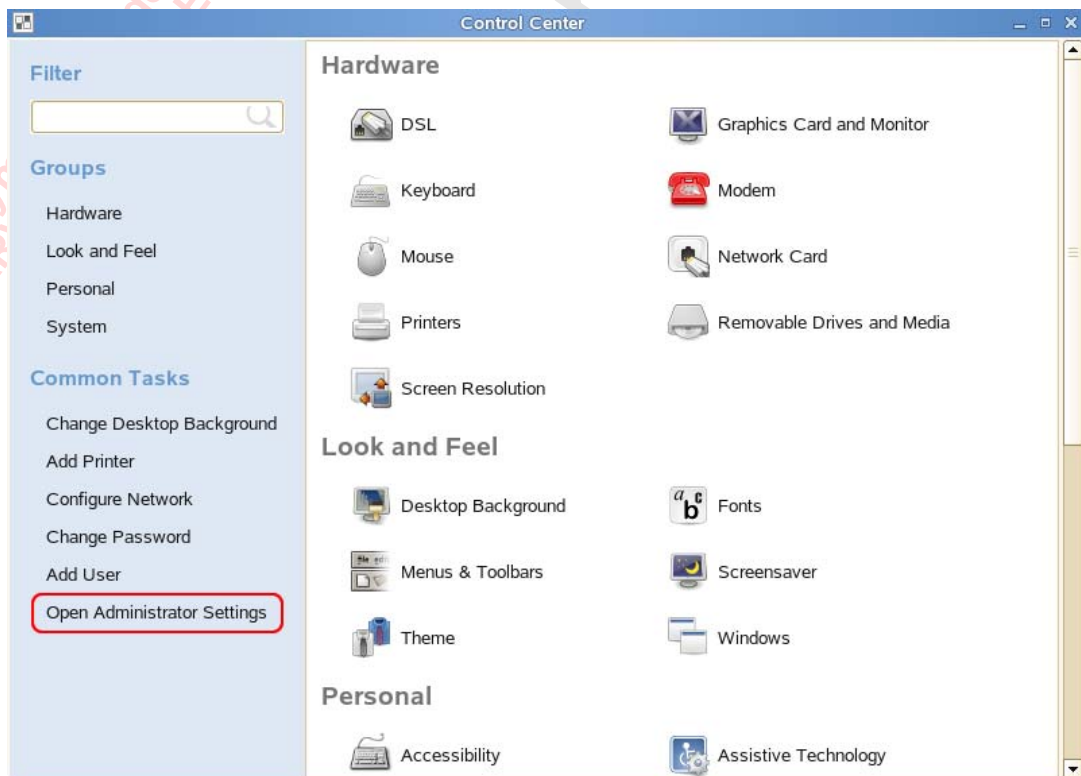
Before installing MRU, verify that the drivers for the controller are installed.

**Note:** The procedure described in this section is specific to 32-bit SUSE Enterprise Linux Server (SLES) 10. The procedure is similar for other Linux distributions.

#### To verify drivers installation

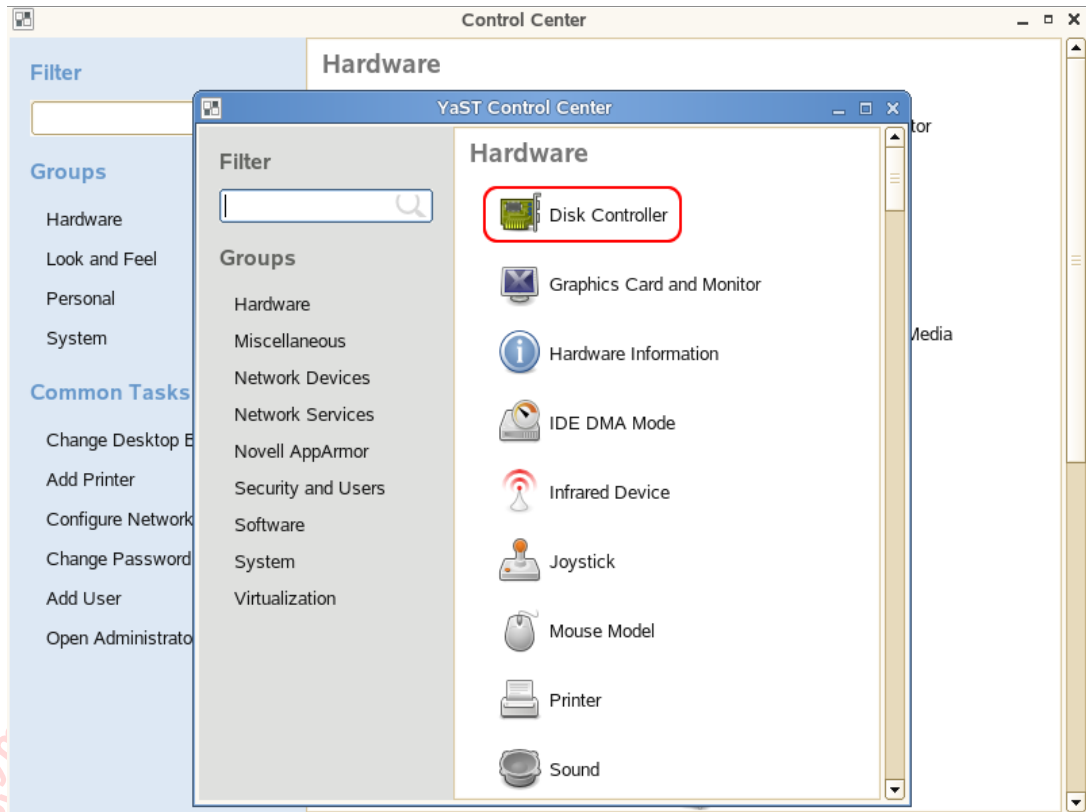
1. From the **Computer** menu, select **Control Center**.
2. Select **Open Administrator Settings**, as shown in Figure 1-9.  
The Administrator Settings **Control Center** appears, as shown in Figure 1-10.

**Figure 1-9 Control Center**



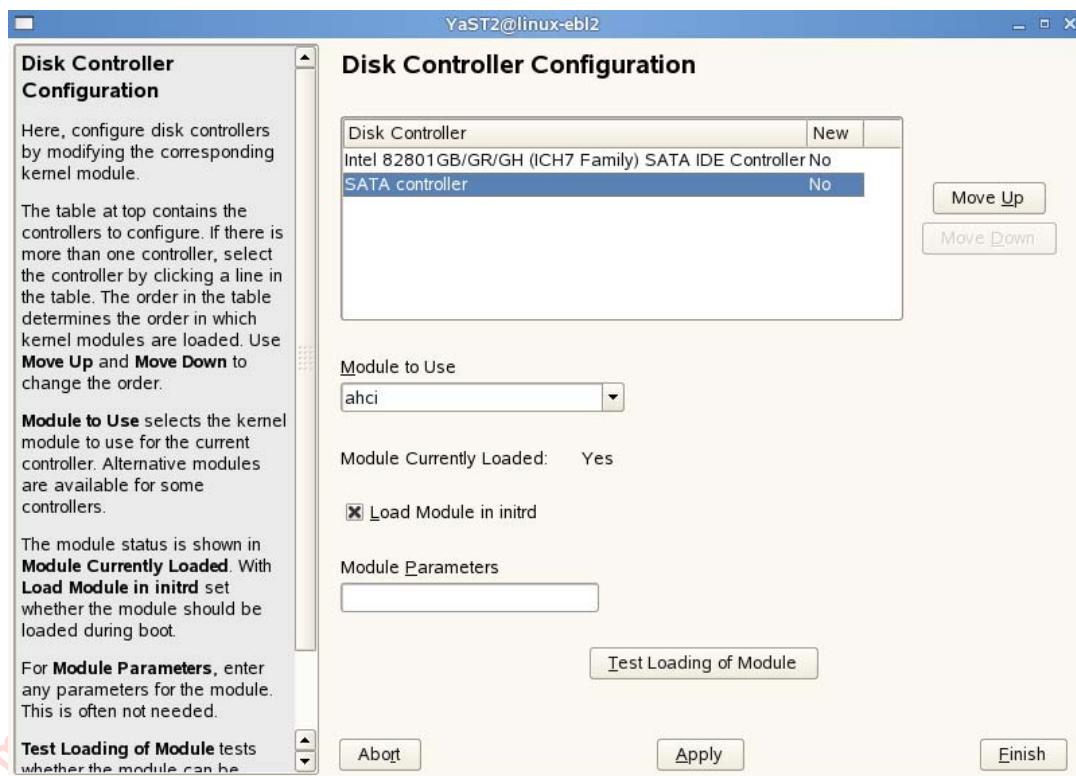
3. Select **Disk Controller**, as shown in Figure 1-10.

Figure 1-10 Administrator Settings



4. The **Disk Controller Configuration** window appears, as shown in Figure 1-11, listing all disk controllers recognized by Linux.  
Check the list to verify if the RAID controller is installed.

Figure 1-11 Disk Controller Configuration



### 1.2.4.2 Installing MRU in Linux

This section describes the procedure for installing MRU on Linux.

**Note:** The procedure described in this section is specific to 32-bit SUSE Enterprise Linux Server (SLES) 10. The procedure is similar for other Linux distributions.

#### To install MRU in Linux

1. Verify that the drivers for the RAID controller are installed, as described in section 1.2.4.1, [Verifying RAID Controller Drivers Installation](#).
2. Table 1-2 lists the **RPM** (Red Hat Package Manager) installation files for 32-bit and 64-bit OS architectures.

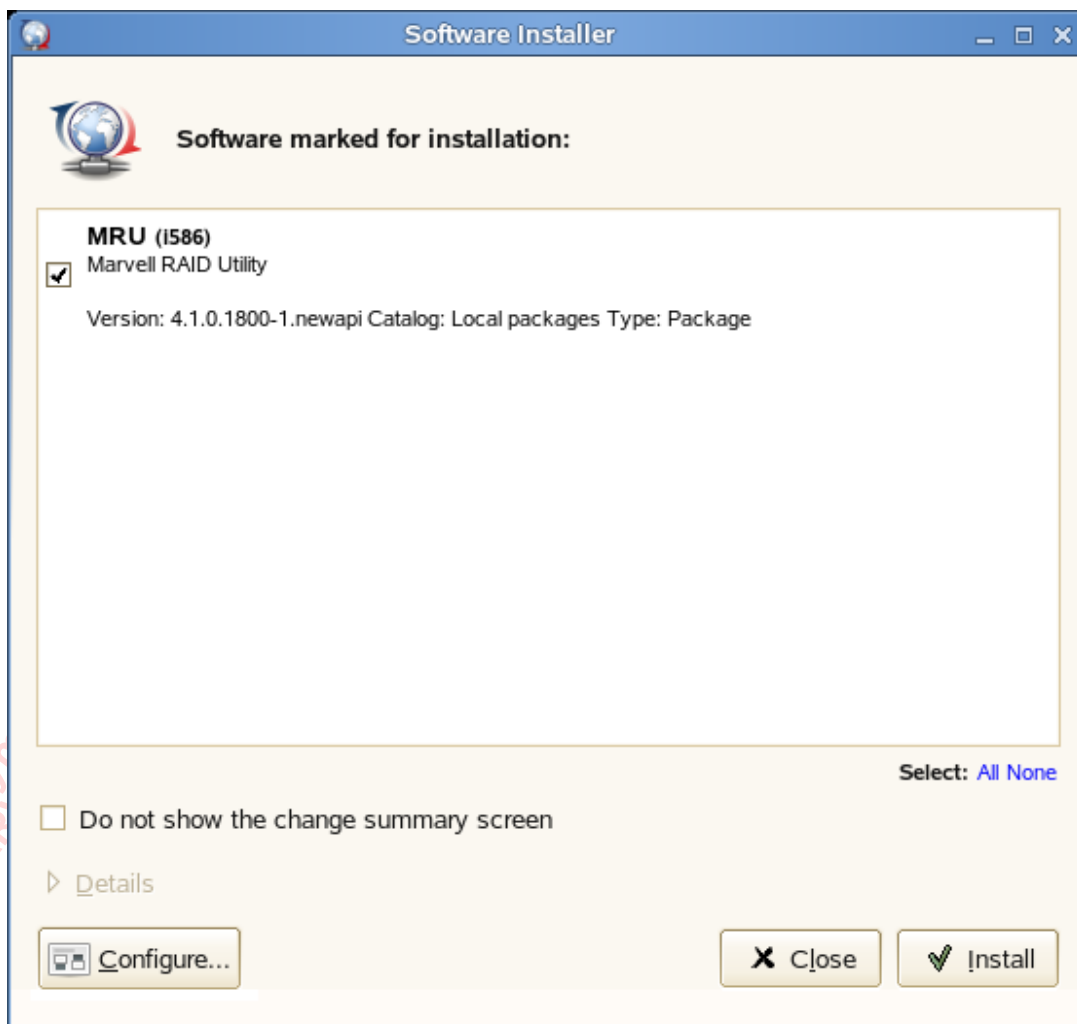
Table 1-2 RPM Installation File

OS Architecture	File Name Ends With Extension
32-bit	.i586.rpm
64-bit	.x86_64.rpm

Run the appropriate **RPM** file to begin installation of MRU.

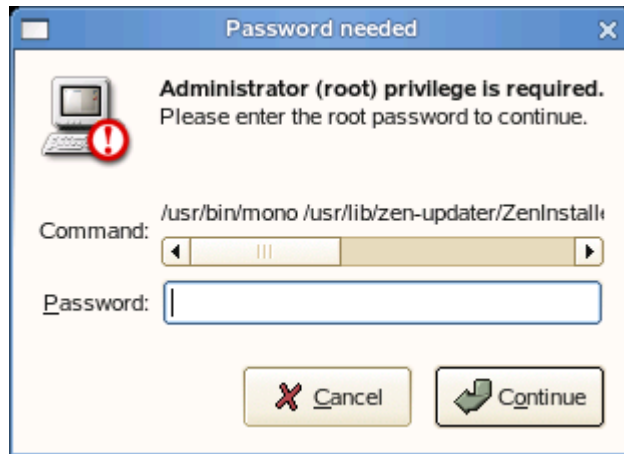
3. The **MRU Software Installer** appears, as shown in Figure 1-12.

Figure 1-12 MRU Software Installer



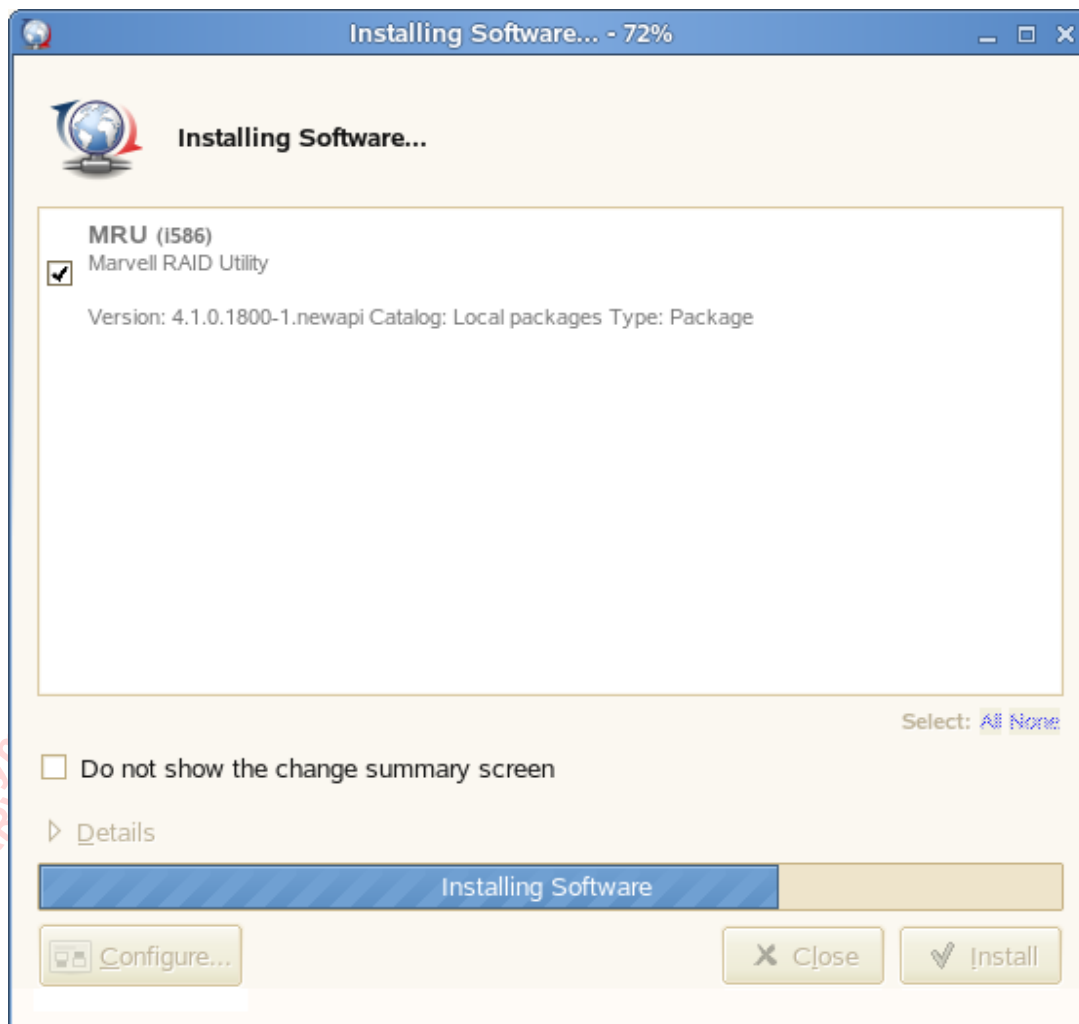
4. Select **Install**, as shown in Figure 1-12.  
 A dialog box appears, as shown in Figure 1-13, requesting for the **Administrator (root) Password**.

Figure 1-13 Administrator Password



5. Type the password and select **Continue**, as shown in Figure 1-13.  
The **MRU Software Installer** indicates installation progress, as shown in Figure 1-14.

Figure 1-14 Installation Progress



6. When installation is complete, the wizard confirms the completion, as shown in Figure 1-15. Click **Close** to finish. MRU is now installed.

Figure 1-15 Installation Complete





## 2 MARVELL RAID UTILITY (MRU)

This chapter contains the following sections:

- Overview
- Enabling Scripting
- Opening MRU
- Tray Application for Windows
- Login
- User Interface
- Logout

## 2.1 Overview

The Marvell RAID Utility (MRU) is a browser-based RAID management utility for Marvell RAID controllers. It can create and manage RAID virtual disks and arrays, using storage and enclosure devices connected to the RAID controller. This chapter provides an introduction to MRU and an overview of its user interface. In the chapters that follow, MRU is described in detail for each of the following controllers:

- IO Controllers (see Chapter 3, [MRU for IO Controllers \(IOC\)](#))
- IO Processors (see Chapter 4, [MRU for IO Processors \(IOP\)](#))
- RAID-On-Chip Controllers (see Chapter 5, [MRU for RAID-On-Chip \(ROC\) Controllers](#))

## 2.2 Enabling Scripting

Before opening MRU, verify that Active Scripting or JavaScript is enabled in the browser. This section discusses the following:

- [Enabling Active Scripting in Internet Explorer](#)
- [Verifying JavaScript is Enabled in Firefox](#)

### 2.2.1 Enabling Active Scripting in Internet Explorer

This section describes the procedure to enable Active Scripting in Internet Explorer.

**Note:** Active Scripting might be disabled by default for some versions of Windows.

#### To enable Active Scripting in Internet Explorer

1. From the menu bar, select **Tools > Internet Options**, as shown in Figure 2-1. The **Internet Options** dialog box appears, with the **General** tab selected, as shown in Figure 2-2.

Figure 2-1 Internet Explorer Tools Menu

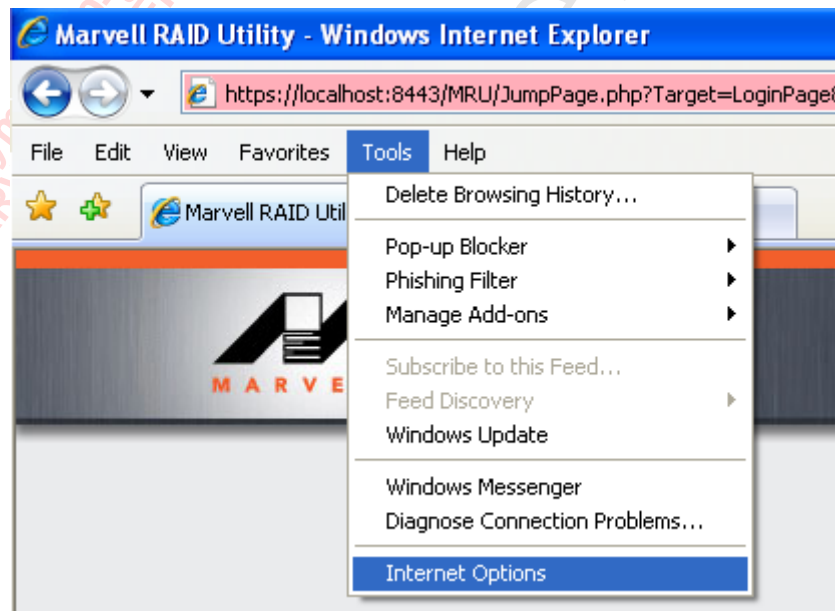
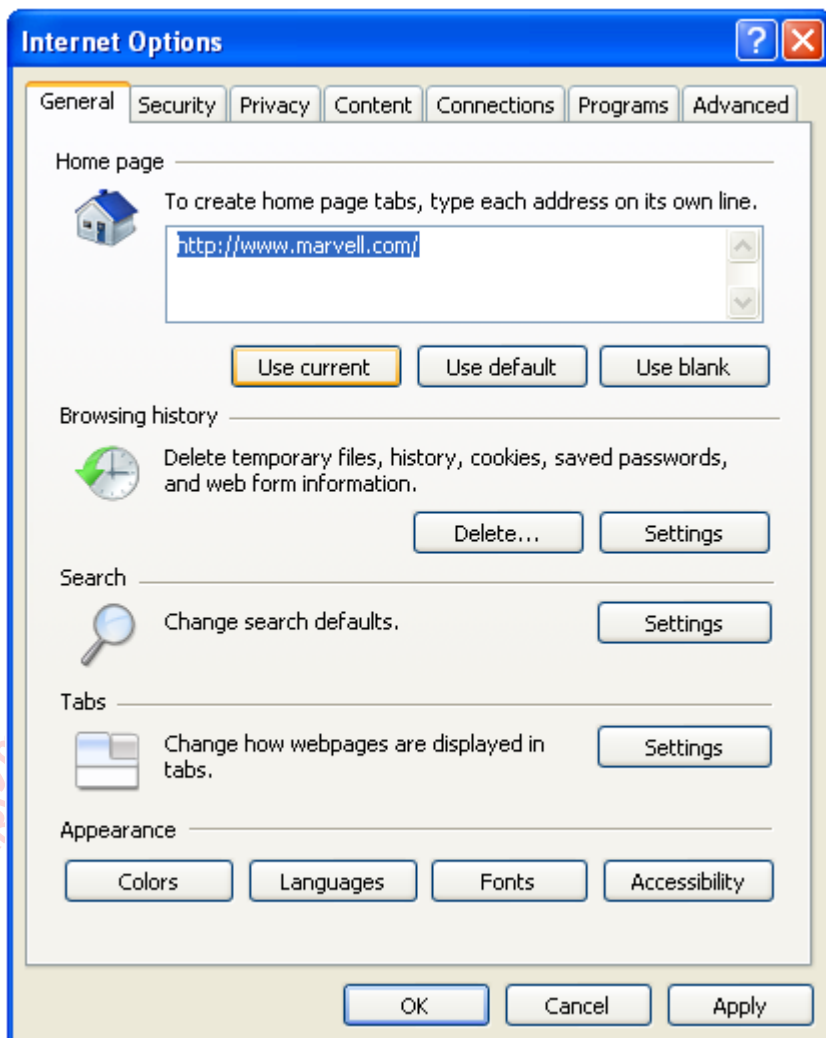
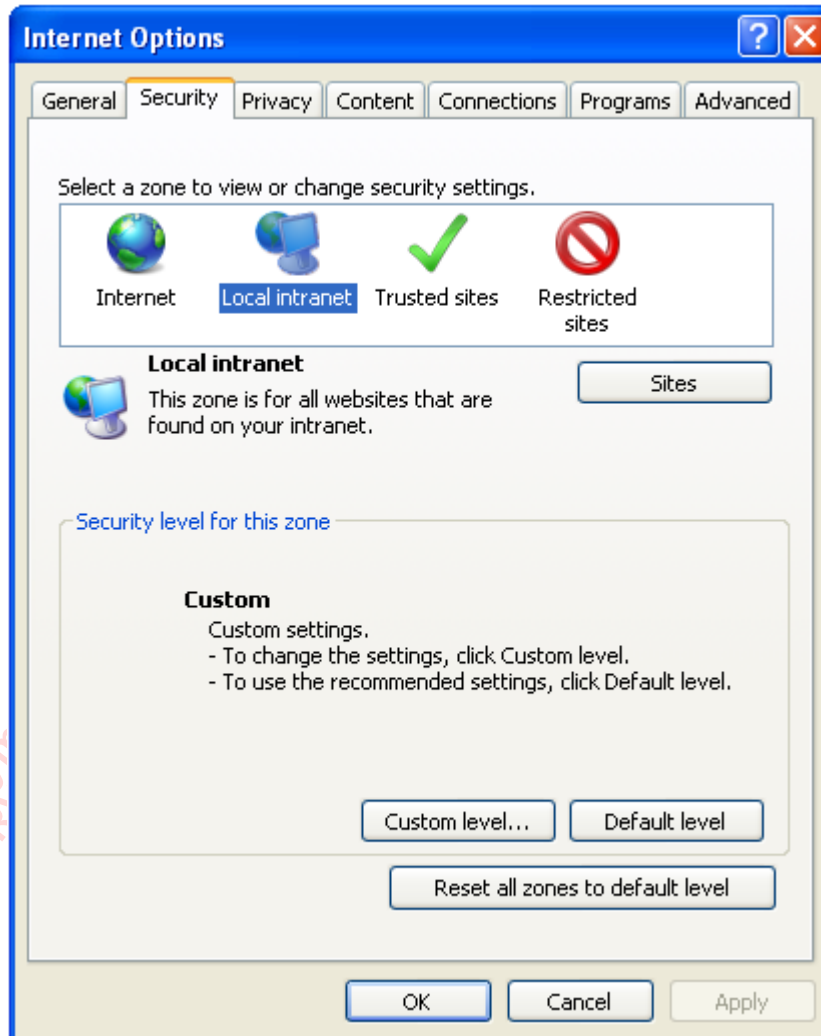


Figure 2-2 Internet Options



2. Select the **Security** tab, as shown in Figure 2-3.

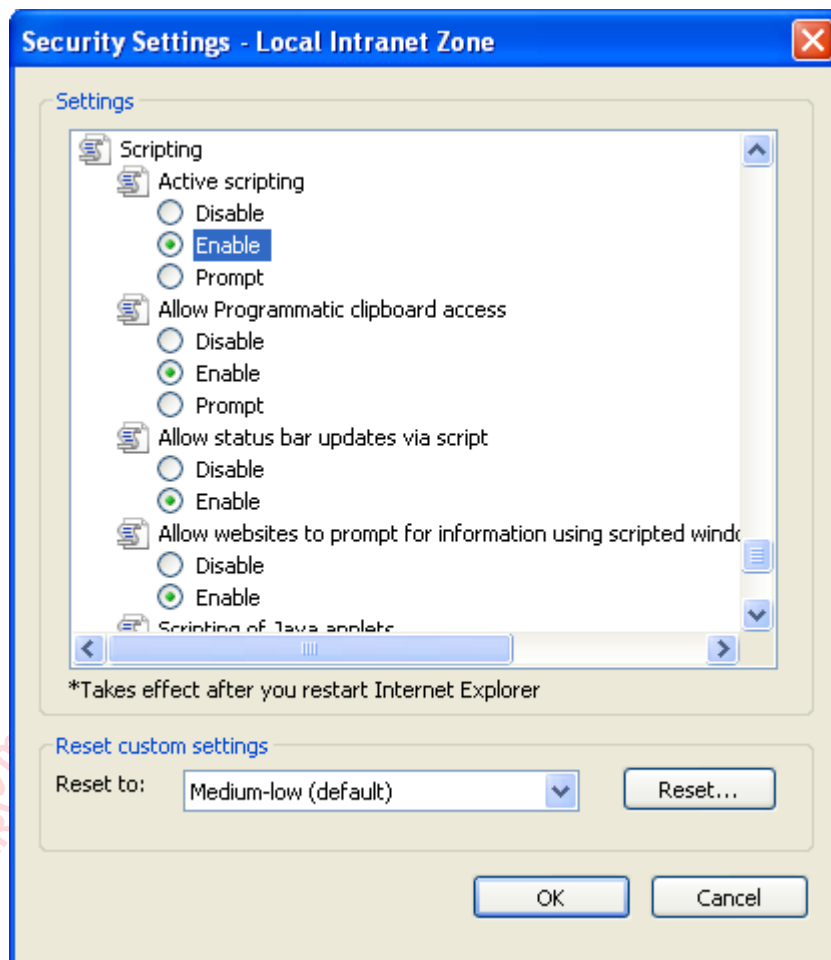
Figure 2-3 Security



3. Select **Local Intranet** under **Select a zone to view or change security settings**.
4. Select **Custom level...**, as shown in Figure 2-3.

The **Security Settings - Local Intranet Zone** dialog box appears, as shown in Figure 2-4.

Figure 2-4 Security Settings - Internet Zone



5. In the list of settings, browse to **Scripting > Active scripting**.
6. Select **Enable** to enable **Active scripting** as shown in Figure 2-4.
7. Select **OK** to confirm the selection.  
This closes the **Security Settings - Local Intranet Zone** dialog box.
8. Select **OK** to exit the **Internet Options** dialog.

## 2.2.2 Verifying JavaScript is Enabled in Firefox

This section describes the procedure to verify that JavaScript is enabled in Firefox.

**Note:** Javascript is enabled by default in Firefox. If MRU does not open in Firefox, verify that Javascript is enabled.

### To verify that JavaScript is enabled in Firefox

1. From the menu bar, select **Tools > Options...**, as shown in Figure 2-5.  
The **Options** dialog box appears, with the **Main** tab selected, as shown in Figure 2-6.

Figure 2-5 Firefox Tools Menu

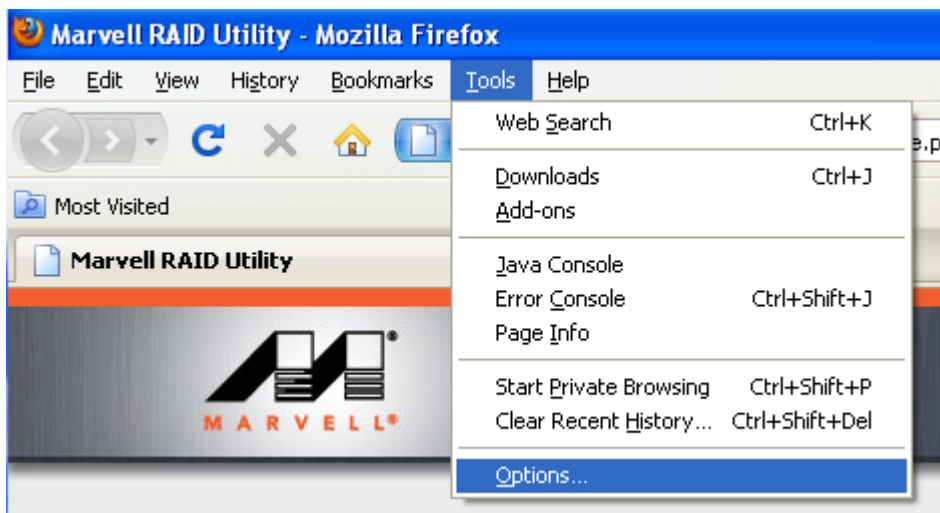
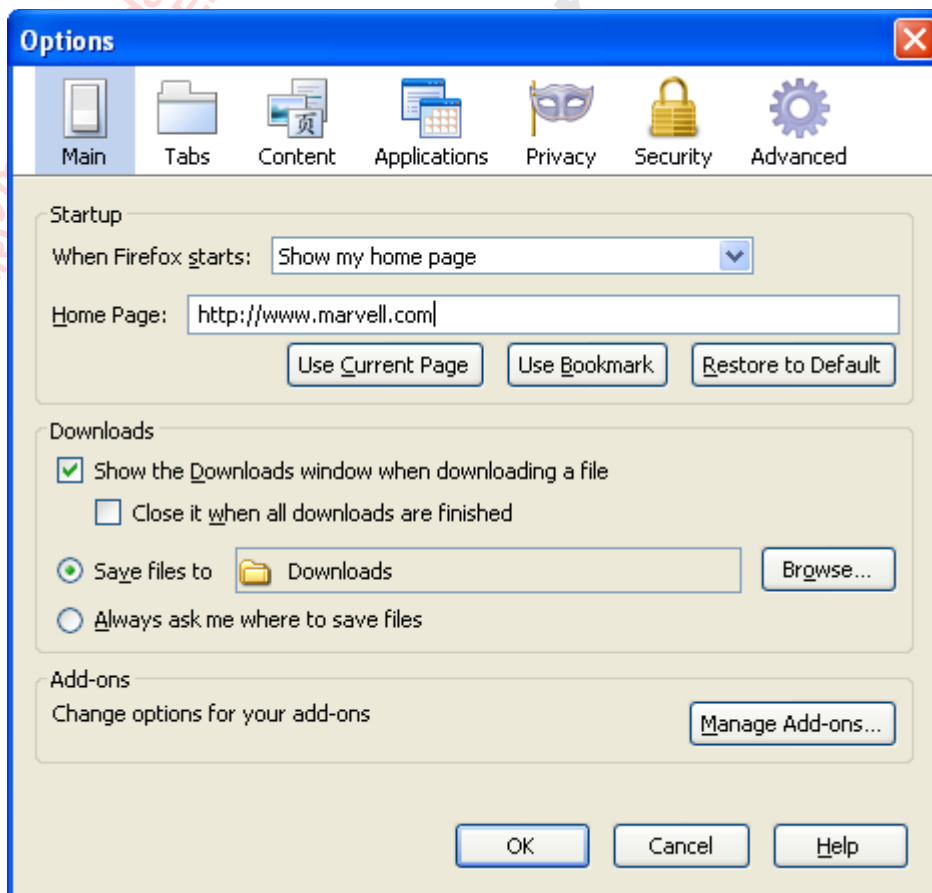
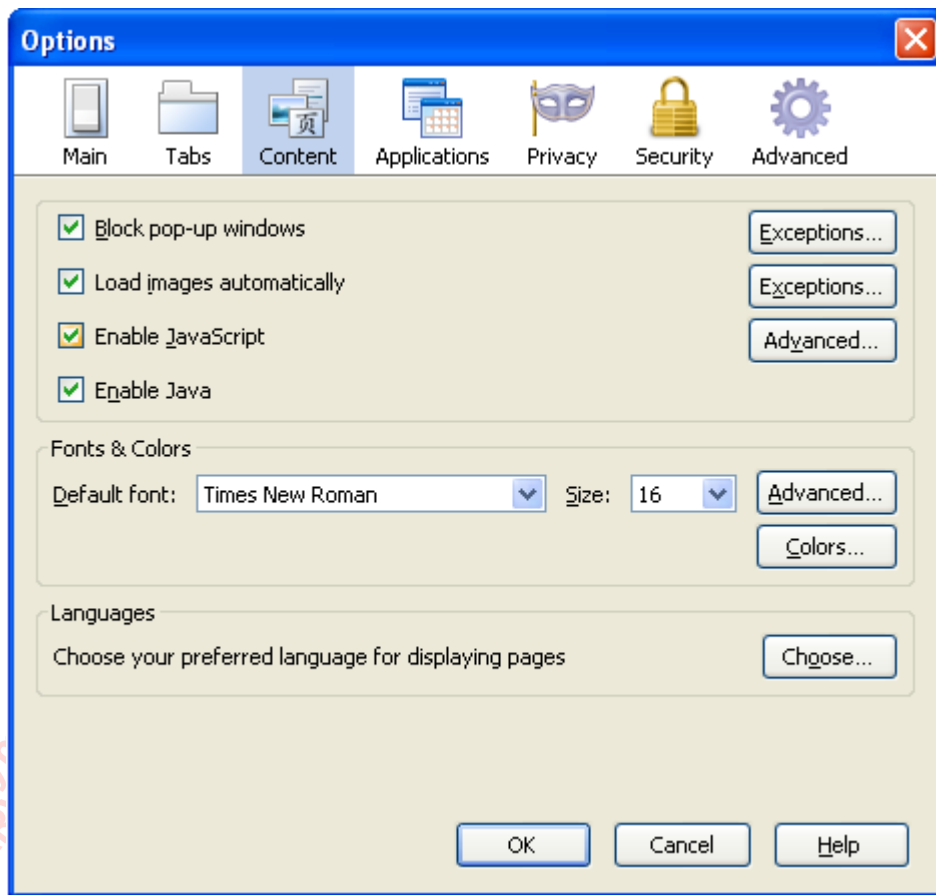


Figure 2-6 Firefox Options Dialog



2. Select the **Content** tab, as shown in Figure 2-6.
3. As shown in Figure 2-7, **Enable Javascript** should be selected by default. Enable Javascript if it is disabled.

Figure 2-7 Content



4. Select **OK** to confirm the selection.  
This closes the **Options** dialog.



## 2.3 Opening MRU

This section discusses the following:

- [Opening MRU in Windows](#)
- [Opening MRU in Linux](#)

### 2.3.1 Opening MRU in Windows

This section describes the procedure to open MRU in Windows.

#### To open MRU in Windows

1. Verify that Active Scripting or JavaScript is enabled in the default browser, as described in section 2.2, [Enabling Scripting](#).
2. Open MRU.

The MRU can be opened using any of the following methods:

- Double-click the desktop shortcut for MRU, as shown in Figure 2-8.

**Figure 2-8 MRU Desktop Shortcut**



**OR**

- Right-click the desktop shortcut for MRU, and select **Open**.

**OR**

- Double-click the MRU Tray Application icon.

**OR**

- Right-click the MRU Tray Application icon, and select **Open MRU**.

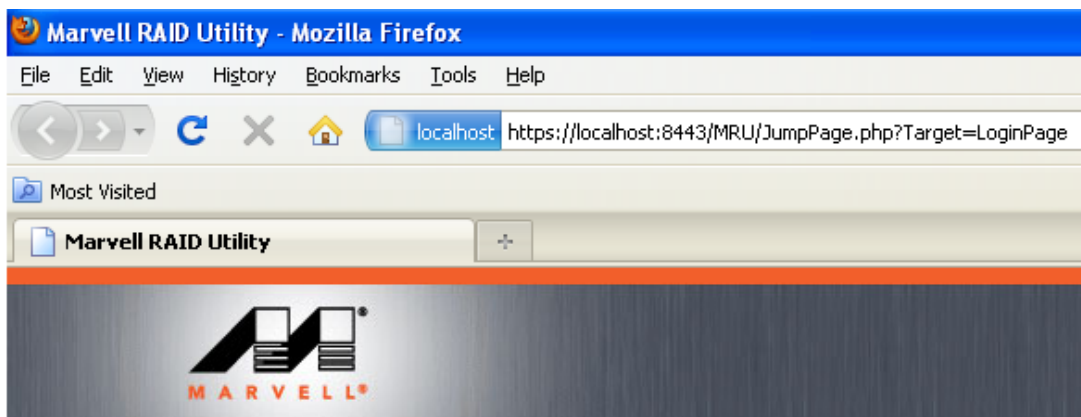
3. Upon opening, the **Login** page appears, as described in section 2.5, [Login](#).

#### To control a local RAID controller

4. By default, MRU uses the following URL to select the default local RAID controller (if any) installed on the local system.

`https://localhost:8443/MRU/JumpPage.php?Target=LoginPage`

Figure 2-9 Windows: Local RAID controller



**Note:** If MRU does not open the login page, replace `localhost` in the URL with the IP address of the local RAID controller (127.0.0.1).

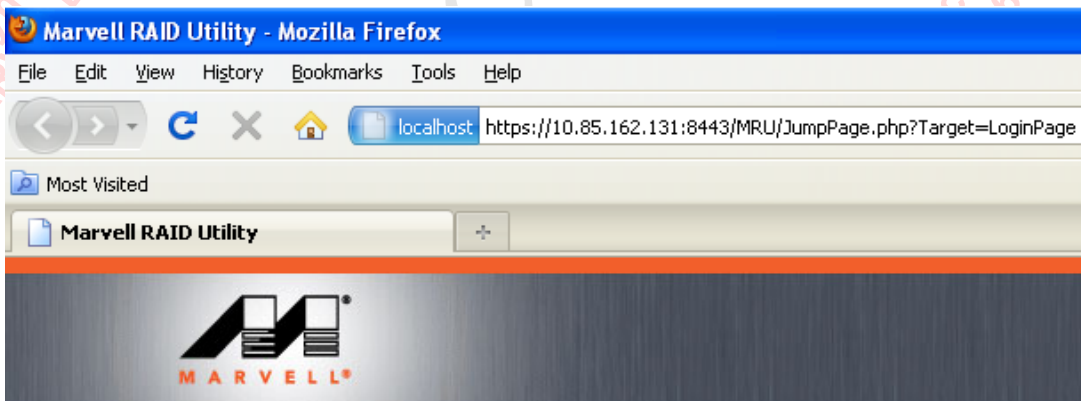
#### To control a remote RAID controller

5. Type the following URL the browser address bar.

`https://ip_address:8443/MRU/JumpPage.php?Target=LoginPage`

**Note:** Replace `ip_address` with the IP address of the remote RAID controller.

Figure 2-10 Windows: Remote RAID Controller



**Note:** Alternatively, you can use the System Name instead of the IP address in most internal network environments.

## 2.3.2 Opening MRU in Linux

This section describes the procedure to open MRU in Linux.

### To open MRU in Linux

1. Verify that JavaScript is enabled in Firefox, as described in section 2.2.2, [Verifying JavaScript is Enabled in Firefox](#).

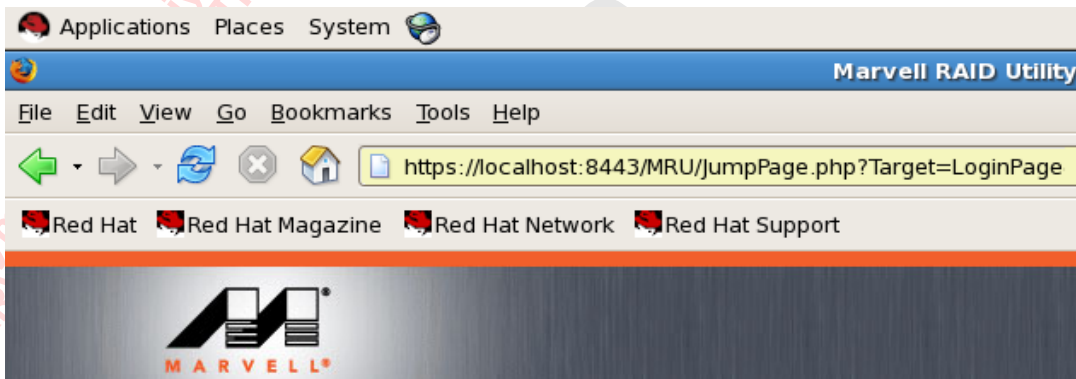
### To control a local RAID controller

2. Open Firefox.
3. Type the following URL in the browser address bar.

`https://localhost:8443/MRU/JumpPage.php?Target=LoginPage`

**Note:** If MRU does not open the login page, replace `localhost` in the URL with the IP address of the local RAID controller (`127.0.0.1`).

Figure 2-11 Linux: Local RAID Controller



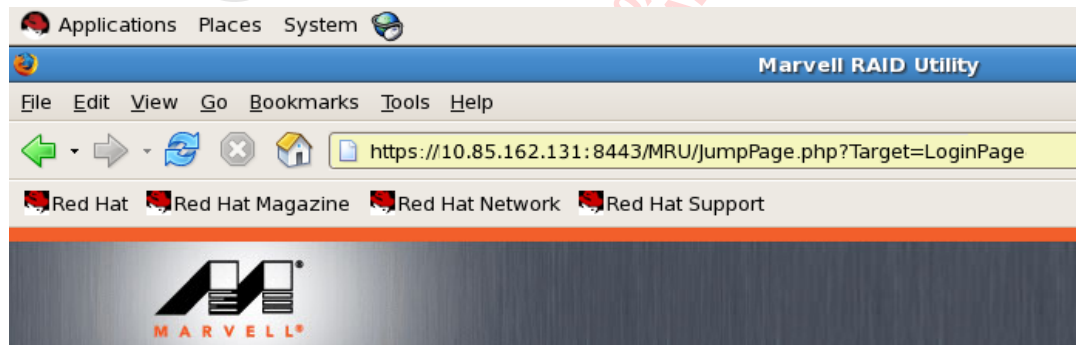
### To control a remote RAID controller

4. Type the following URL the browser address bar.

`https://ip_address:8443/MRU/JumpPage.php?Target=LoginPage`

**Note:** Replace `ip_address` with the IP address of the remote RAID controller.

Figure 2-12 Linux: Remote RAID Controller



**Note:** Alternatively, you can use the System Name instead of the IP address in most internal network environments.

## 2.4 Tray Application for Windows

When MRU opens in Windows, the Tray Application appears in the System Tray, as shown in Figure 2-13.

Figure 2-13 Tray Application



The Tray Application provides right-click menu options for controlling the MRU, as shown in Figure 2-14. The menu has options for performing the following tasks:

- Open MRU
- Enable/Disable Alarm
- Enable/Disable Pop-up Event Messages
- View Version Information
- Exit MRU

Figure 2-14 Tray Application: Right-click Menu



### 2.4.1 Open MRU

Select **Open MRU** to open MRU in the system's default browser.

**Note:** You can also open MRU by double-clicking the Tray Application icon.

### 2.4.2 Enable/Disable Alarm

The audible alarm is disabled by default. To enable the audible alarm for critical and warning events, select **Enable Alarm**. The alarm is played through speakers connected to the Line Out jack on the computer's sound card. On RAID controller HBAs and evaluation boards with on-board buzzer, the hardware buzzer is also sounded.

**Note:** The audible alarm uses the file `c:\program files\marvell\raid\tray\alarm.wav`.

### 2.4.3 Enable/Disable Pop-up Event Messages

Event messages are pop-up messages that appear above the System Tray. Event messages are enabled by default.

Select **Enable Event Messages** and **Disable Event Messages** to toggle between enable/disable states.

Figure 2-15 Tray Application: Pop-up Event Message



#### 2.4.4 View Version Information

Select **About RAID Tray** to view version information for the MRU Tray Application.

#### 2.4.5 Exit MRU

Select **Exit** to exit MRU (and the Tray Application).

## 2.5 Login

This section discusses the following:

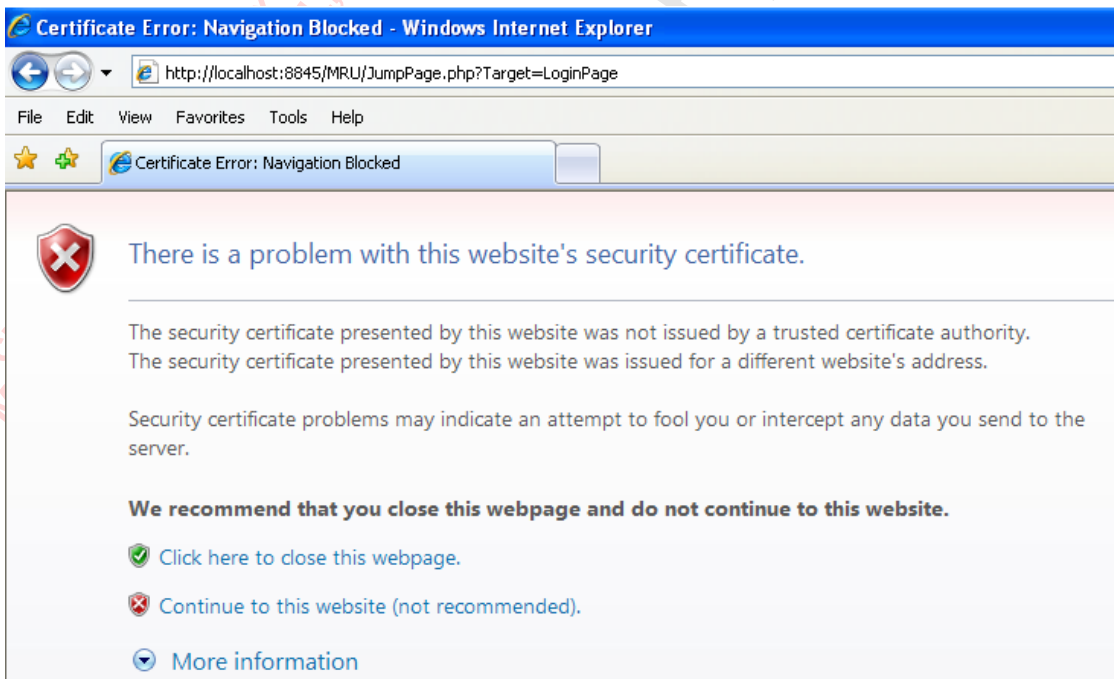
- [Security Warning](#)
- [Login Page](#)

### 2.5.1 Security Warning

**Note:** This section only applies to Internet Explorer.

When opening MRU in some versions of Windows, Internet Explorer may detect a problem with the security certificate for the MRU web page, as shown in Figure 2-16. Select **Continue to this website (not recommended)**, as shown in Figure 2-16, to continue opening MRU.

**Figure 2-16 Internet Explorer: Website Security Certificate Warning**



### 2.5.2 Login Page

When MRU opens, it prompts for the user's operating system (or network) credentials, as shown in Figure 2-17. Users with administrator privileges are granted full read/modify permission in MRU. Users without administrator privileges are granted view-only permission in MRU.

Figure 2-17 MRU Login



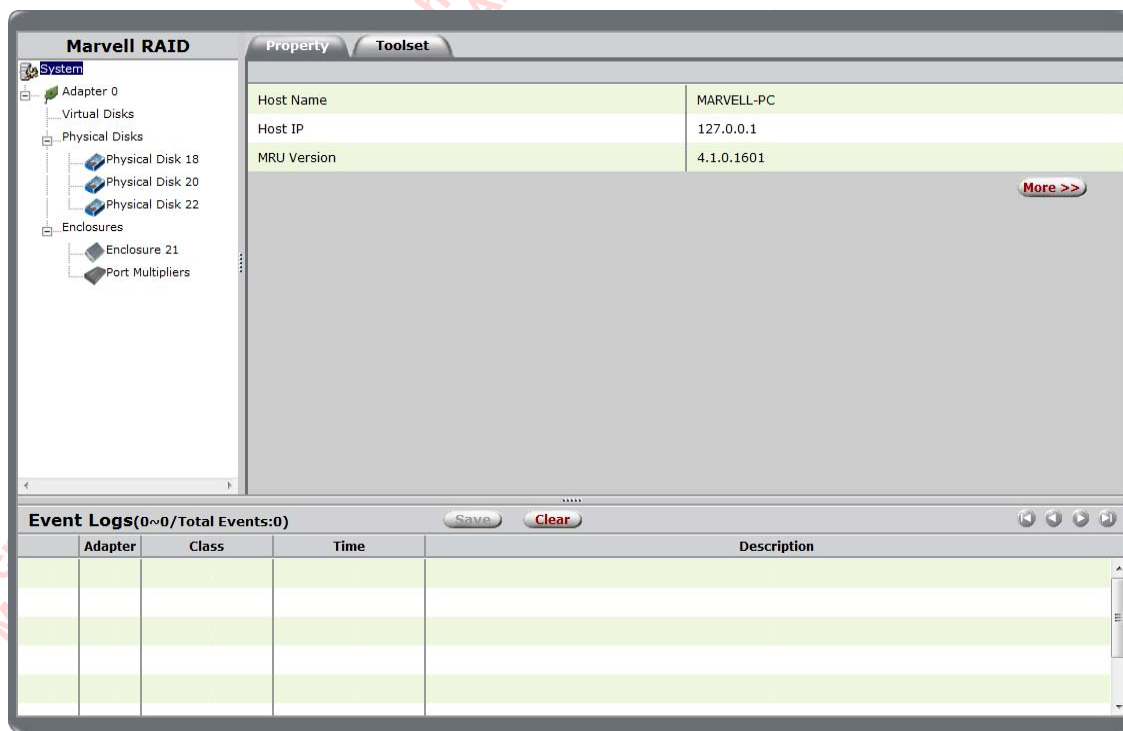
The image shows a login window for the Marvell RAID Utility (MRU). The window has a light blue background with a faint image of a person in a suit. It contains two text input fields: one for the username, labeled '\* Username' with a hint '(Domain\UserName)', and one for the password, labeled '\* Password'. Below these fields is a checkbox labeled 'Remember password'. At the bottom center is a 'Login' button.

## 2.6 User Interface

The MRU user interface, as shown in Figure 2-18, contains the following three panes:

- System
- Properties
- Event Logs

Figure 2-18 MRU User Interface



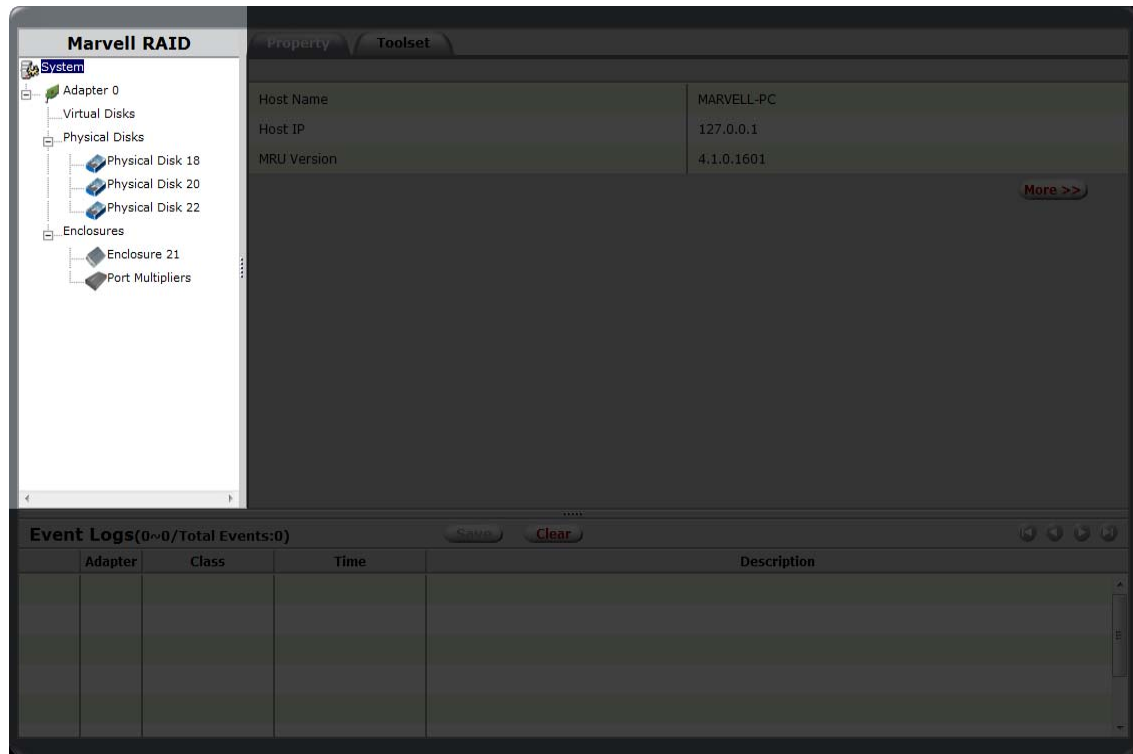
### 2.6.1 System

As shown in Figure 2-19, the System pane uses a *tree* view to list and show the relationships between the various physical/virtual devices attached to the system. This list includes the following devices:

- Adapter
- Physical Disk
- Virtual Disk
- Array
- Enclosures
- Battery



Figure 2-19 System Pane

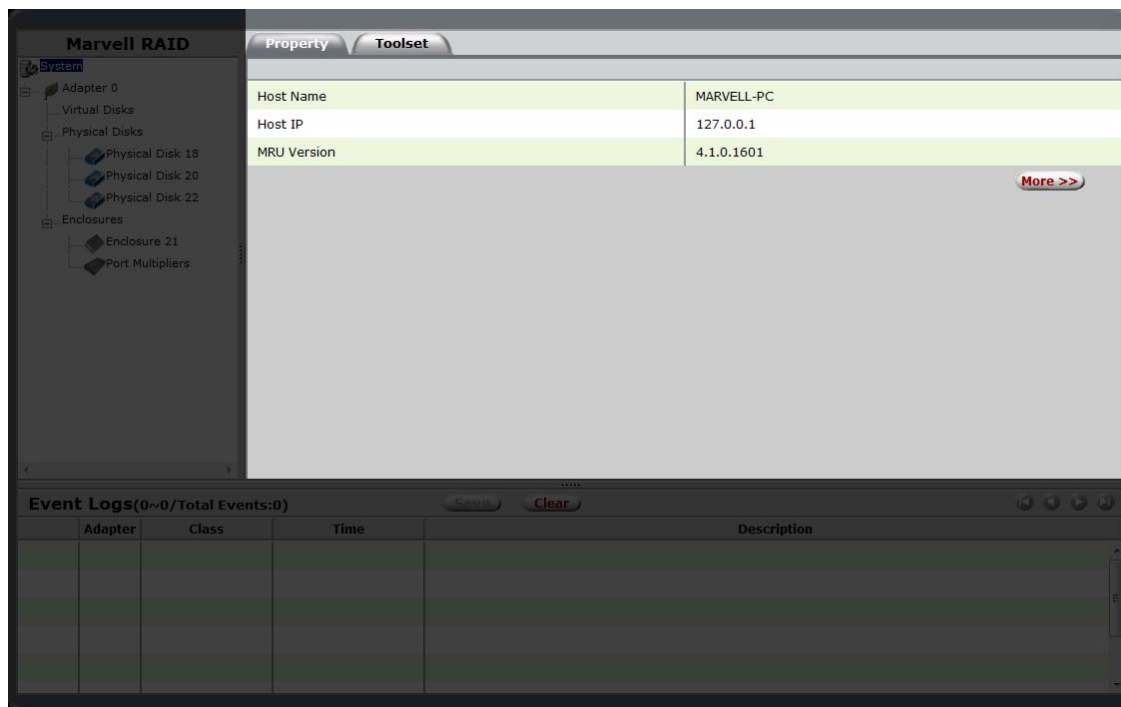


## 2.6.2 Properties

As shown in Figure 2-20, the Properties pane lists the properties of the device selected in the System pane. The Properties pane contains tabs at the top. Depending on the device selected in the System pane, one of more of the following tabs appear:

- **Property**  
Select Property to view/modify the properties of the device selected in the System pane.
- **Toolset**  
Roll-over the Toolset tab to view a menu of options related to the general functioning of MRU.
- **Operation**  
Roll-over the Operation tab to view a menu of operations that can be performed on the device selected in the System pane.
- **Create VD**  
Create VD is only available during the virtual disk (VD) creation process. This tab allows you to configure the virtual disk.

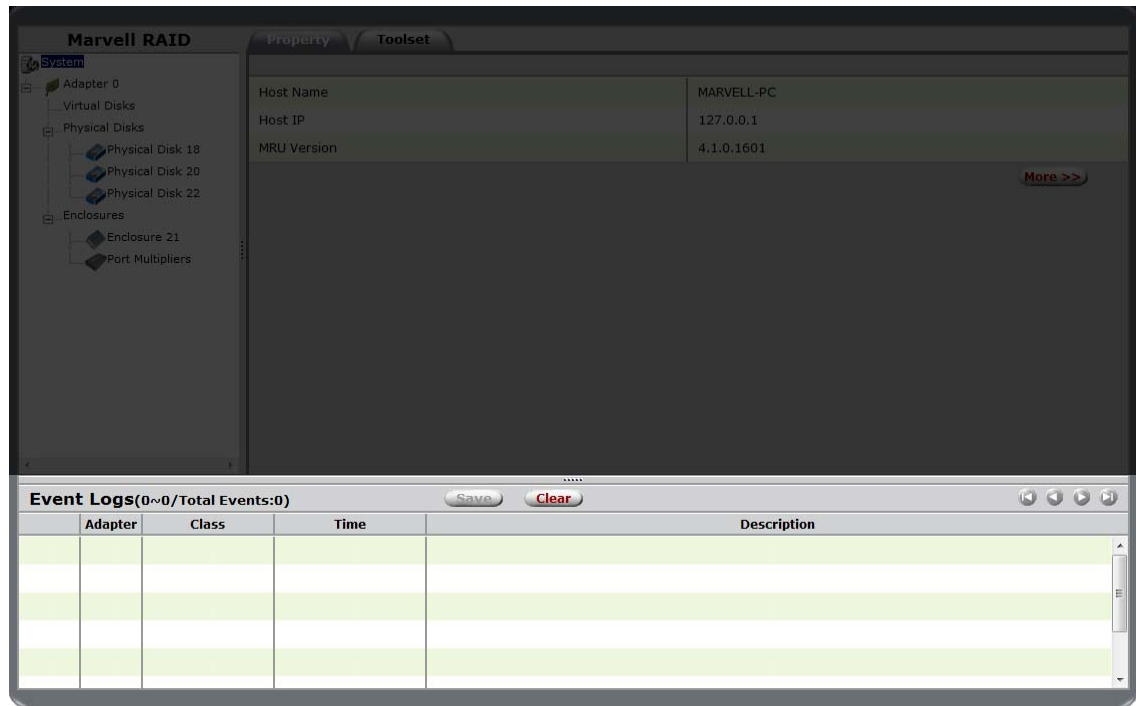
Figure 2-20 Properties Pane



### 2.6.3 Event Logs

As shown in Figure 2-21, the Events Logs pane lists adapter events. The events are categorized into informational, warning, and error events. For information on the icons used for different event types, see Appendix C, [Icons used in MRU](#).

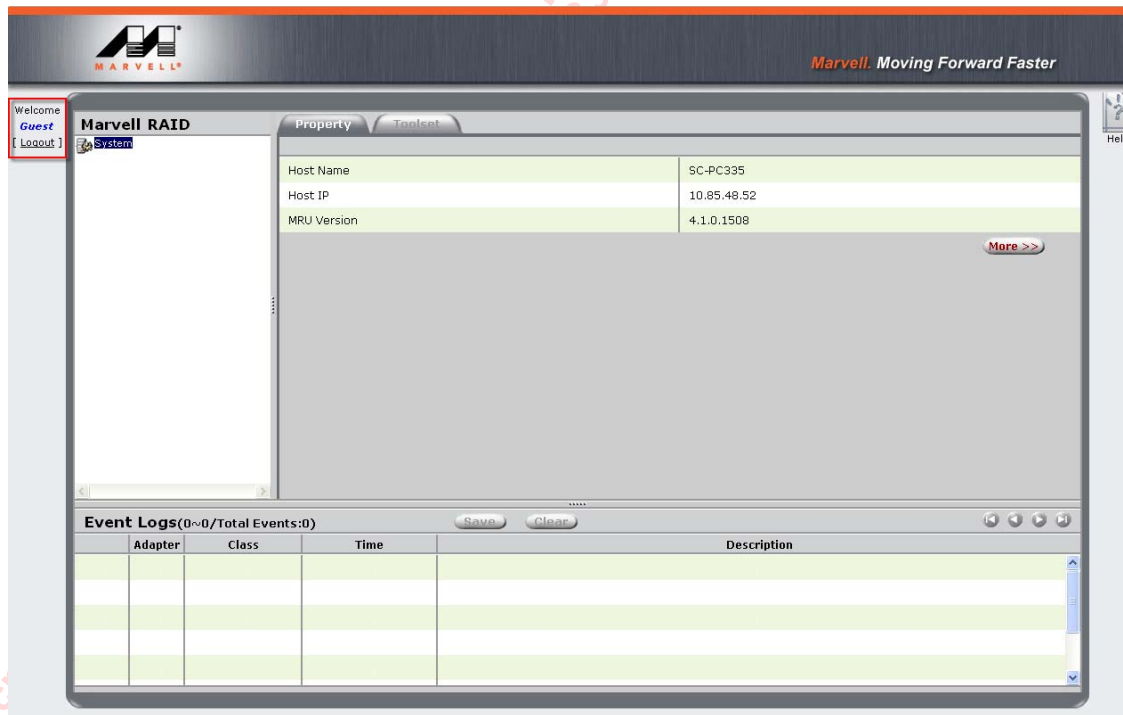
Figure 2-21 Event Logs Pane



## 2.7 Logout

Select **Logout**, as shown in Figure 2-22, to logout of MRU.

Figure 2-22 MRU Logout



**Note:** To exit MRU, right-click the Tray Application, and select Exit MRU.

# 3

## MRU FOR IO CONTROLLERS (IOC)

This chapter contains the following sections:

- Overview
- Creating Virtual Disk
- Importing Virtual Disk
- Managing Virtual Disk
- Managing Physical Disks
- Managing Enclosures
- Monitoring Virtual Disk
- Migrating Virtual Disk
- Rebuilding Degraded Virtual Disk
- Deleting Virtual Disk
- Updating RAID Controller BIOS

## 3.1 Overview

This chapter describes the MRU for IO Controllers (IOCs) such as the Marvell 88SE63xx/88SE64xx SAS controllers. IOCs can create and manage RAID 0, 1, 5, and 10 virtual disks.

**Note:** Marvell RAID controllers support different sets of RAID levels depending on the hardware model and OEM software package. Some software packages, depending on OEM selections, support limited RAID levels by design. Check with the OEM vendor for information specific to your controller.

## 3.2 Creating Virtual Disk

This section discusses the following:

- Optimizing Virtual Disk for Performance/Reliability
- Customizing Virtual Disk for your Application

### 3.2.1 Optimizing Virtual Disk for Performance/Reliability

This section describes the procedure to quickly create a virtual disk that is optimized for either best read/write performance or best fault tolerance (reliability).

**Note:** This is particularly useful if you are new to RAID technology and are not sure about which RAID level suits your application the most.

**To quickly create virtual disk optimized for performance/reliability**

1. Select **Adapter**.
2. Roll-over the **Operation** tab, and select **Quick Create VD**, as shown in Figure 3-1.  
The **Create Options** screen appears, as shown in Figure 3-2.

**Figure 3-1 Quick Create VD**

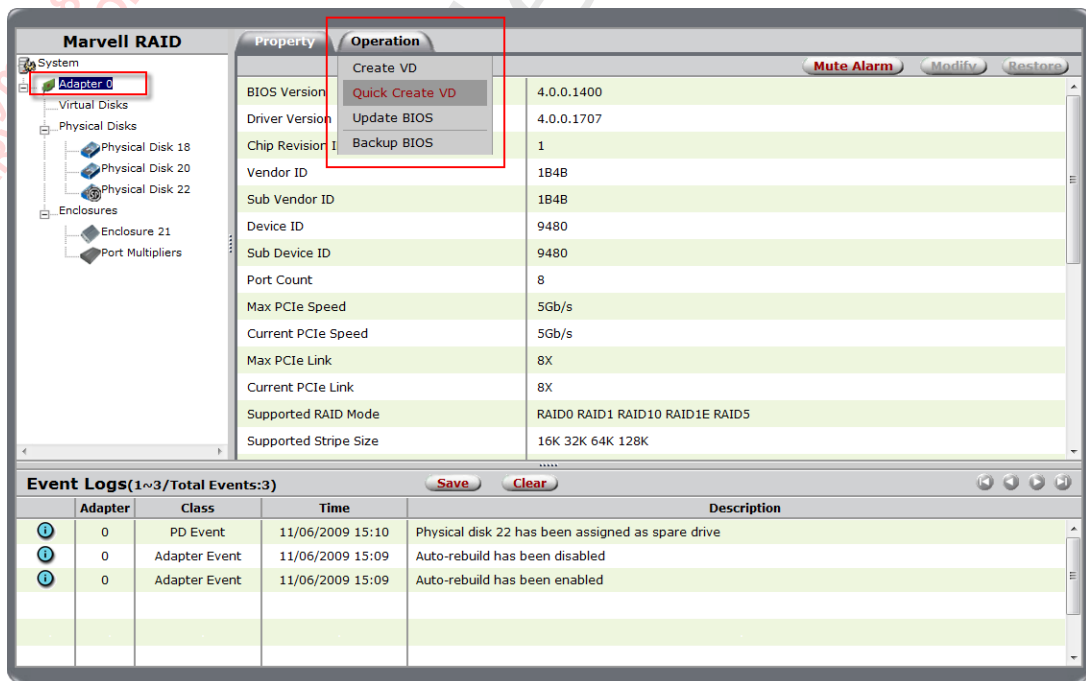
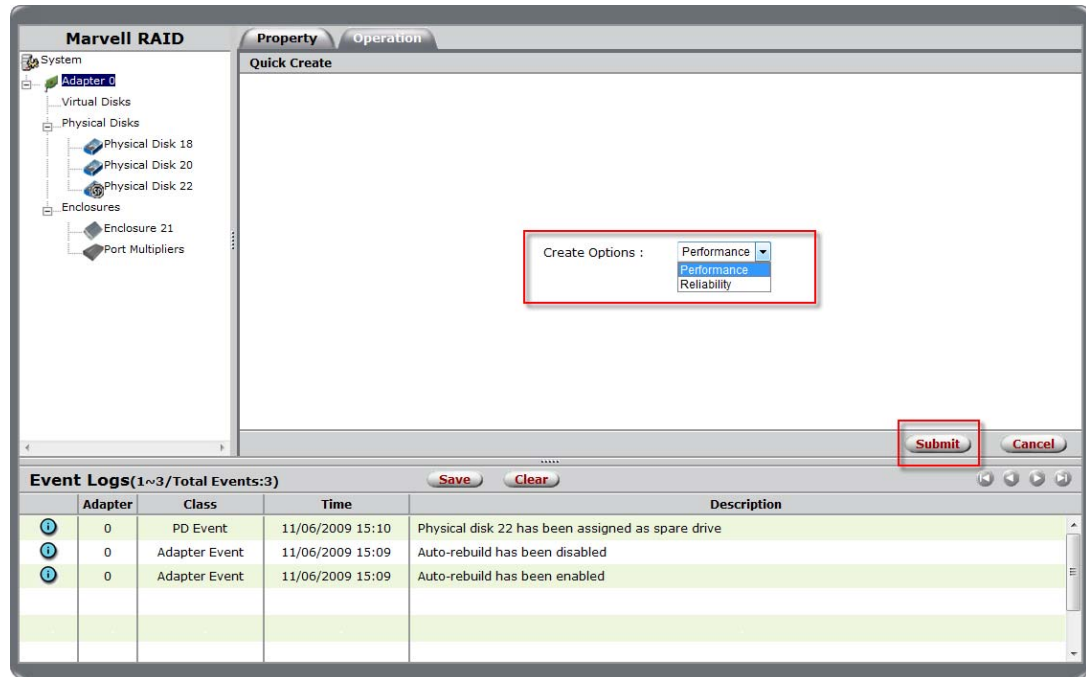


Figure 3-2 Create Options

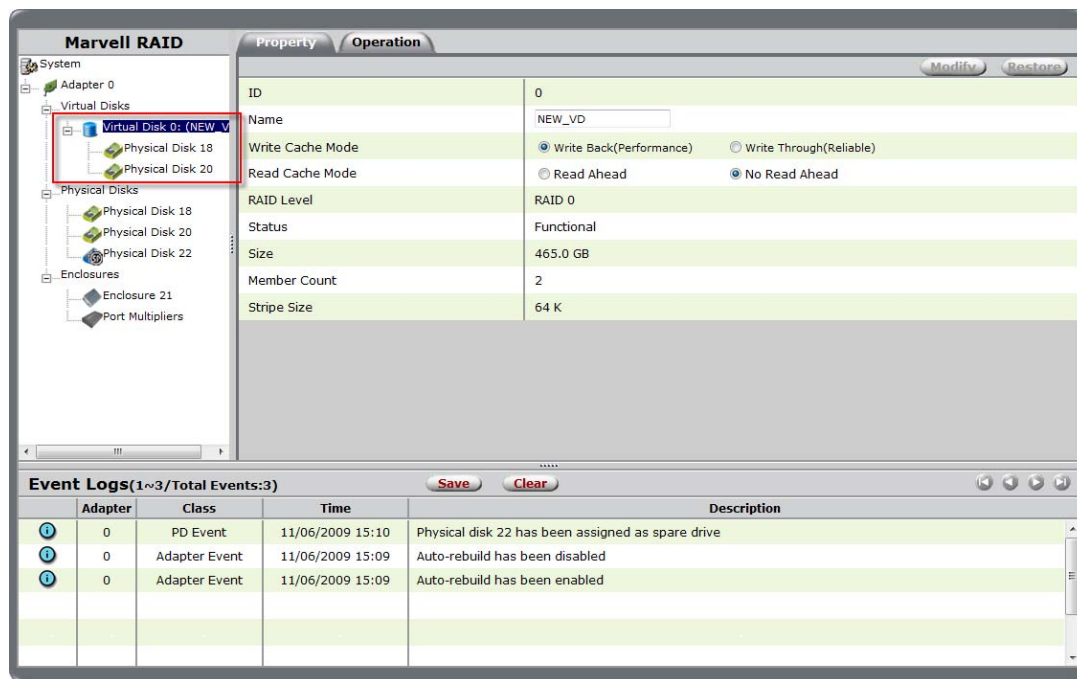


3. As shown in Figure 3-2, select one of the following options:
  - Select **Performance** for creating a virtual disk that is optimized for best read and write performance.
  - Select **Reliability** for creating a virtual disk that is optimized for best fault tolerance.

Based on the performance/reliability selection and the capabilities of the RAID controller, MRU creates a suitable virtual disk using some or all available physical disks.
4. After creating the virtual disk, MRU displays the **Property** tab for the new **Virtual Disk**, as shown in Figure 3-3.



Figure 3-3 VD Created



### 3.2.2 Customizing Virtual Disk for your Application

This section describes the procedure to create a custom virtual disk that is most suitable for your application.

**To create a custom virtual disk most suitable for your application**

1. Select **Adapter**.
2. Roll-over the **Operation** tab, and select **Create VD**, as shown in Figure 3-4.  
The **Create New VD** screen appears, as shown in Figure 3-5.

Figure 3-4 Create VD

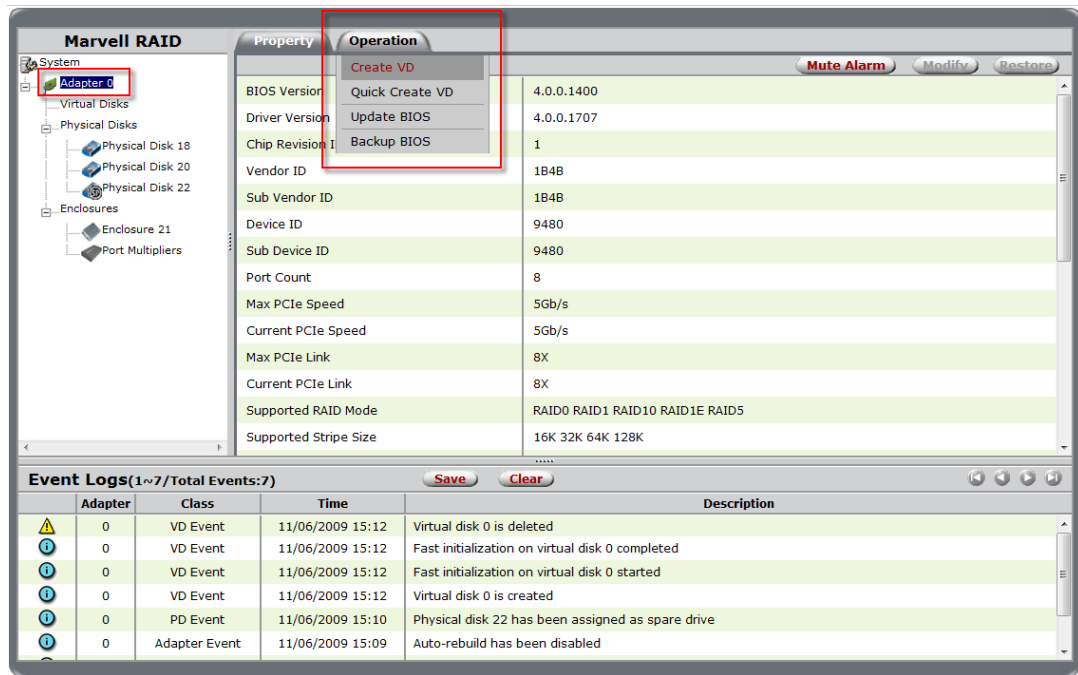
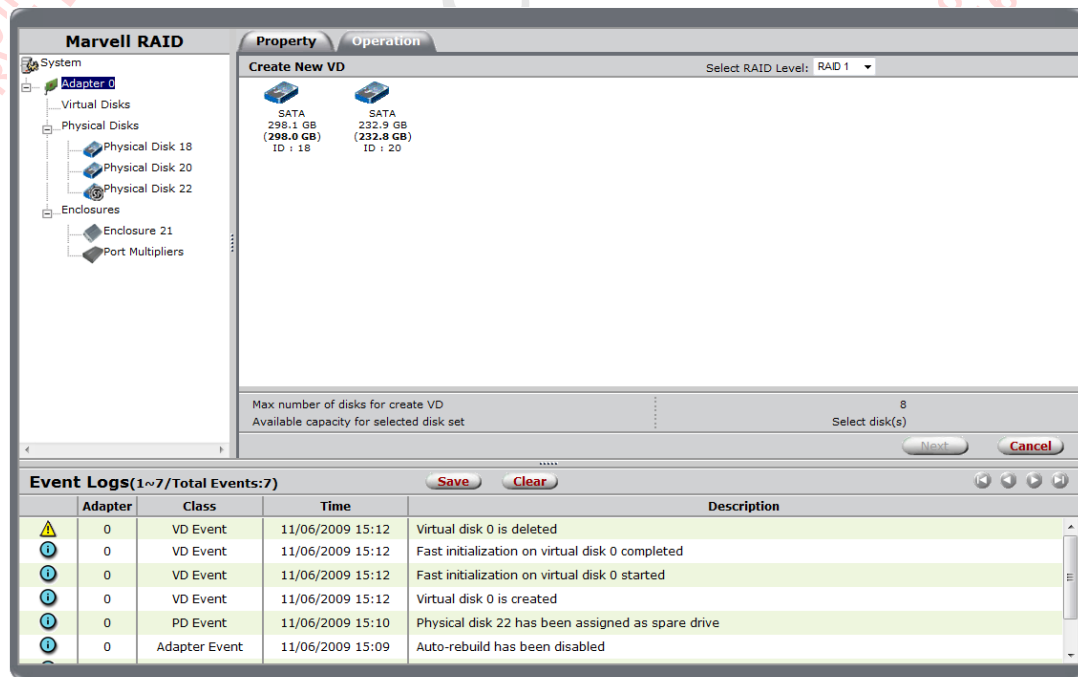
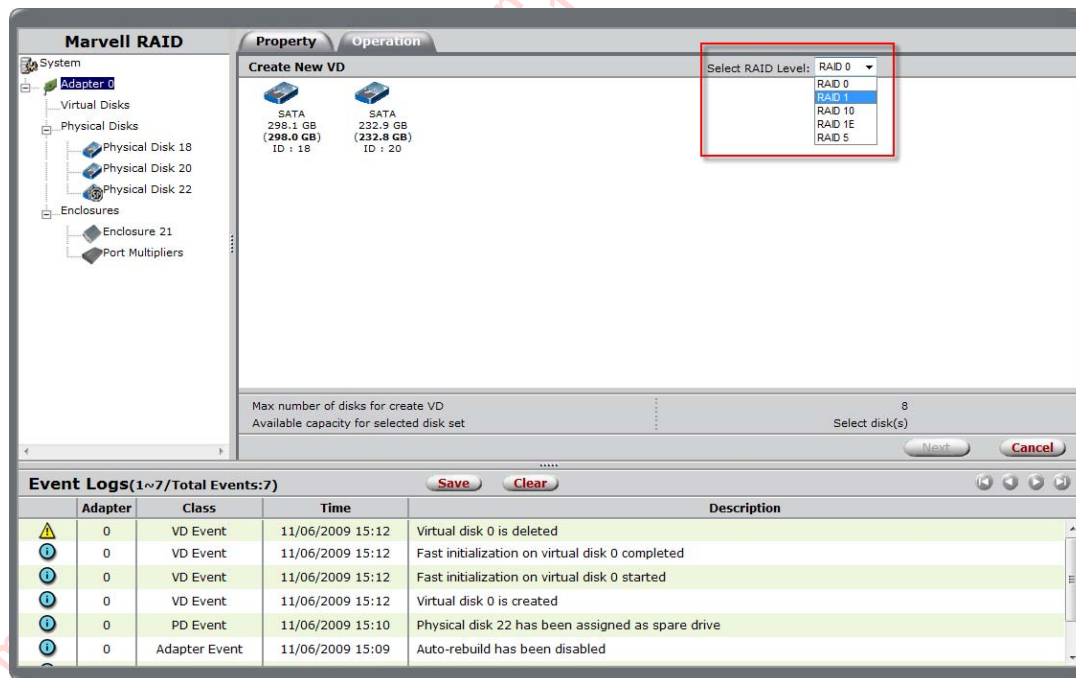


Figure 3-5 Create New VD



3. Select RAID Level suitable for your application, as shown in Figure 3-6.  
For information on RAID levels, see Appendix B, [Selecting a RAID Level](#).

Figure 3-6 Select RAID Level



**Note:** Marvell RAID controllers support different sets of RAID levels depending on the hardware model and OEM software package. Some software packages, depending on OEM selections, support limited RAID levels by design. Check with the OEM vendor for information specific to your controller.

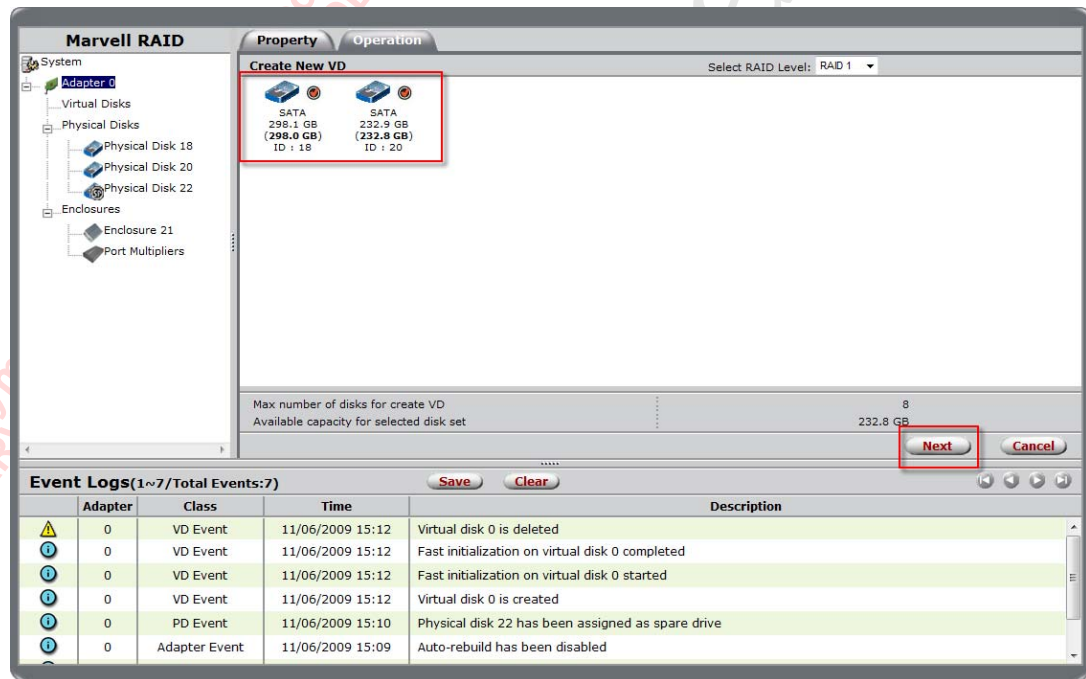
4. Table 3-1 lists the minimum number of physical disks required for different RAID levels.

**Table 3-1 Minimum Number of Physical Disks**

Controller	Minimum Number of Physical Disks Required for RAID Level							
	0	1	1E	5	6	10	50	60
IO Controller (IOC)	2	2	n/a	3	n/a	4	n/a	n/a

Add the required number of physical disks for the selected RAID level from the list of available physical disks, as shown in Figure 3-6. When selected, a check-mark appears to the right of the physical disk, as shown in Figure 3-7.

**Figure 3-7 Select Physical Disks**

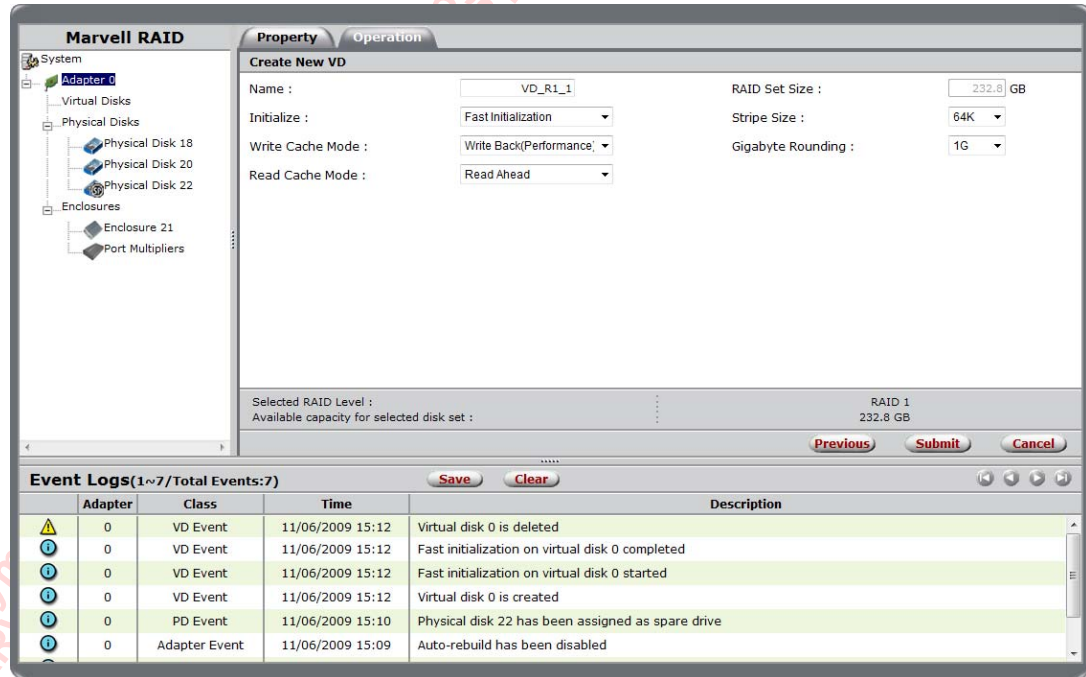


5. After selecting the physical disks, select **Next** as shown in Figure 3-7.

The **Create New VD** screen now presents options to configure the virtual disk, as shown in Figure 3-8.

**Note:** Next is grayed-out until the minimum required number of physical disks are selected.

Figure 3-8 Create New VD



Adapter	Class	Time	Description
0	VD Event	11/06/2009 15:12	Virtual disk 0 is deleted
0	VD Event	11/06/2009 15:12	Fast initialization on virtual disk 0 completed
0	VD Event	11/06/2009 15:12	Fast initialization on virtual disk 0 started
0	VD Event	11/06/2009 15:12	Virtual disk 0 is created
0	PD Event	11/06/2009 15:10	Physical disk 22 has been assigned as spare drive
0	Adapter Event	11/06/2009 15:09	Auto-rebuild has been disabled

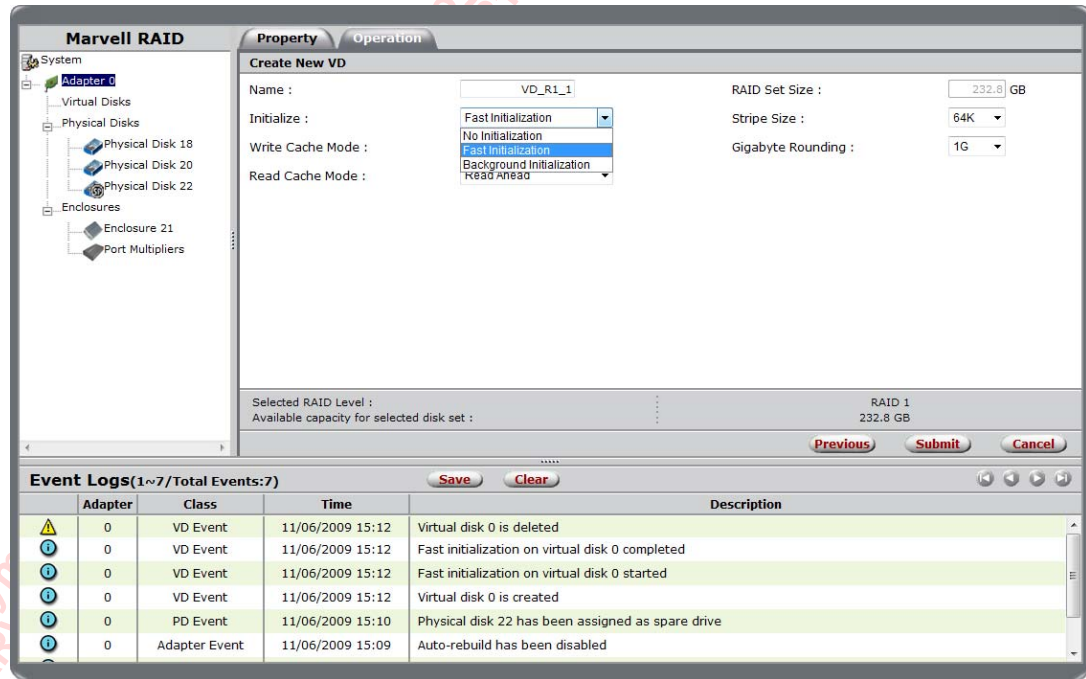
6. As shown in Figure 3-8, MRU assigns a default name to the virtual disk. You can type a new name in the **Name** field.

7. After selecting the Name, select the **Initialization** method for the virtual disk.

As shown in Figure 3-9, MRU has three options for Initialization, with the default being **Fast Initialization**.

**Note:** For information on Initialization, see Appendix D, [Glossary](#).

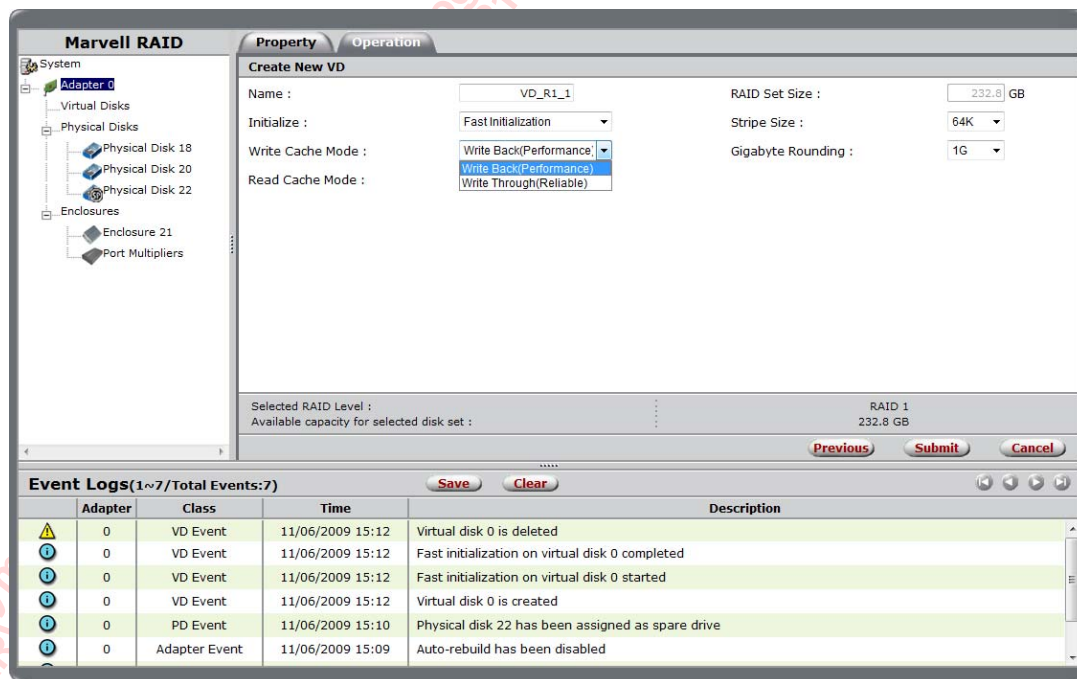
**Figure 3-9 Initialization**



8. After selecting the Initialization method, select **Write Cache Mode** for the virtual disk.  
As shown in Figure 3-10, MRU has two options for Write Cache Mode, with the default being **Write Back (Performance)**.

**Note:** For information on Write Cache Mode, see Appendix D, [Glossary](#).

**Figure 3-10 Write Cache Mode**

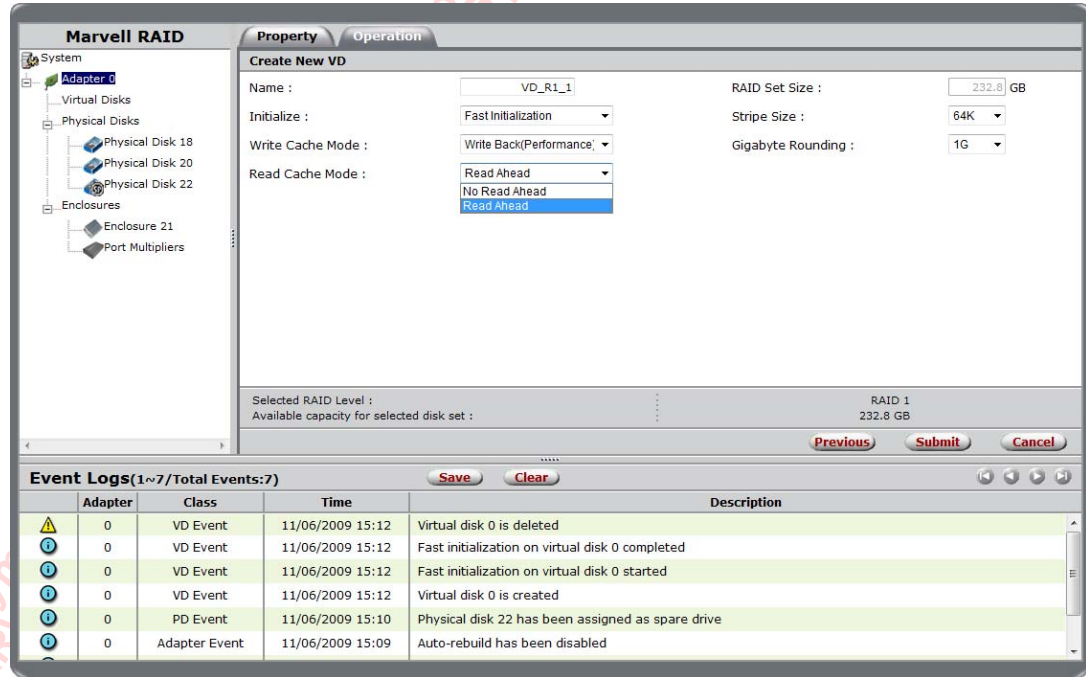




9. After selecting Write Cache Mode, select **Read Cache Mode** for the virtual disk.  
As shown in Figure 3-11, MRU has two options for Read Cache Mode, with the default being **Read Ahead** (Performance).

**Note:** For information on Read Cache Mode, see Appendix D, [Glossary](#).

**Figure 3-11 Read Cache Mode**



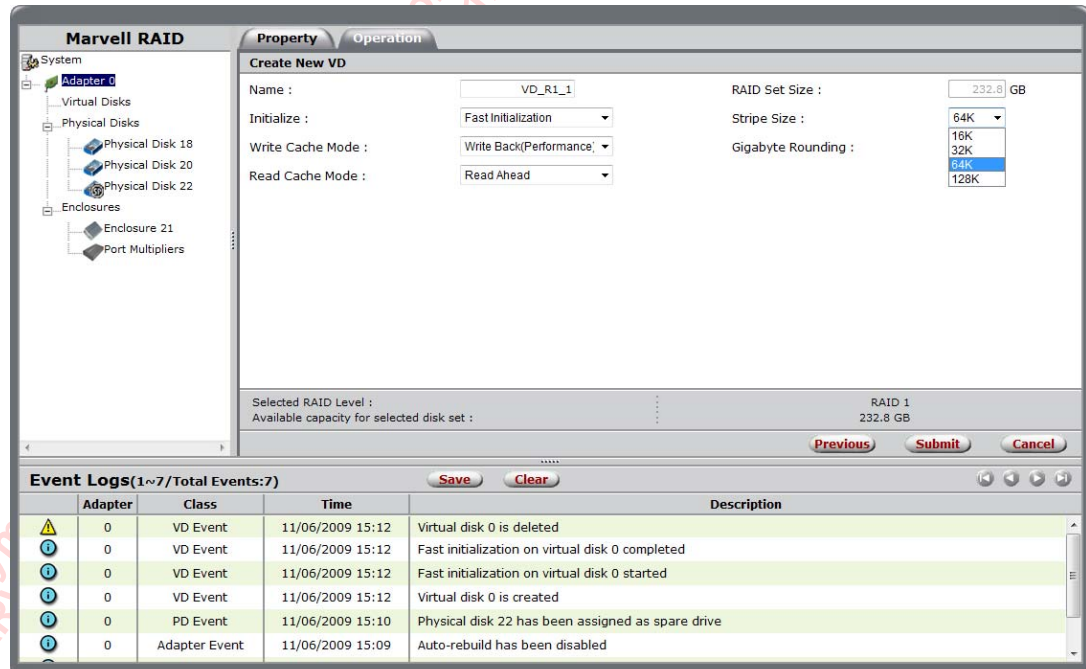


- After selecting Read Cache Mode, select **Stripe Size** for the virtual disk.

As shown in Figure 3-12, the RAID controller being used has four options for Stripe Size, with the default being **64K**.

**Note:** Availability of Stripe Sizes depends on the capabilities of the controller. For information on Stripe Size, see Appendix D, [Glossary](#).

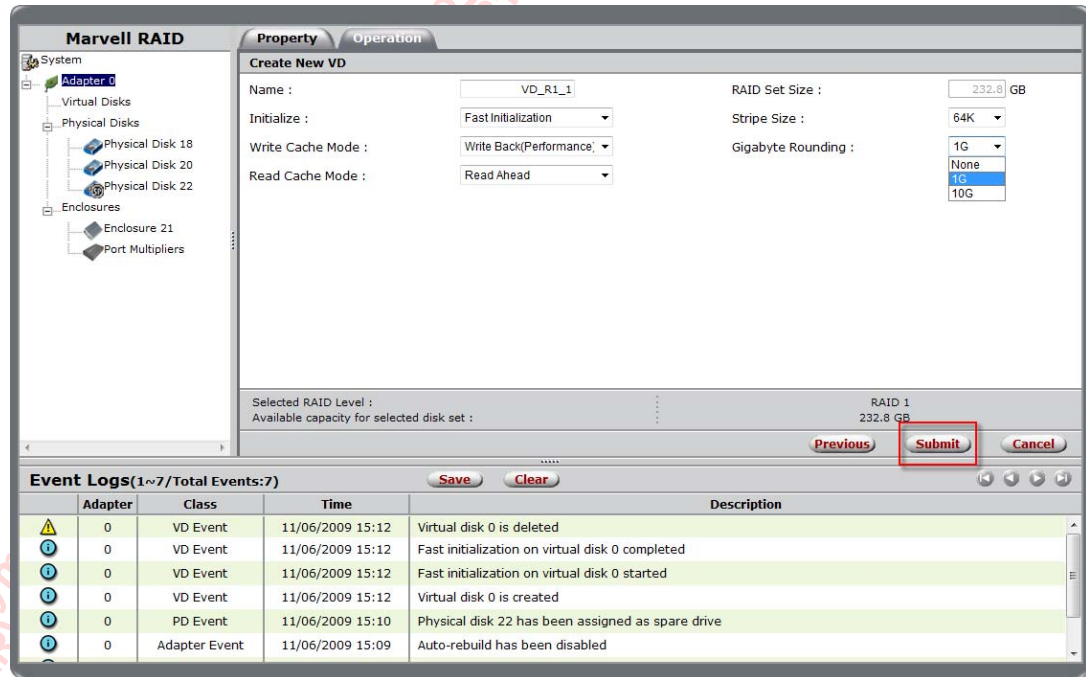
**Figure 3-12 Stripe Size**



11. After selecting Stripe Size, select the **Gigabyte Rounding** for the virtual disk.  
As shown in Figure 3-13, the RAID controller being used has three options for Gigabyte Rounding, with the default being **1G**.

**Note:** For information on Gigabyte Rounding, see Appendix D, [Glossary](#).

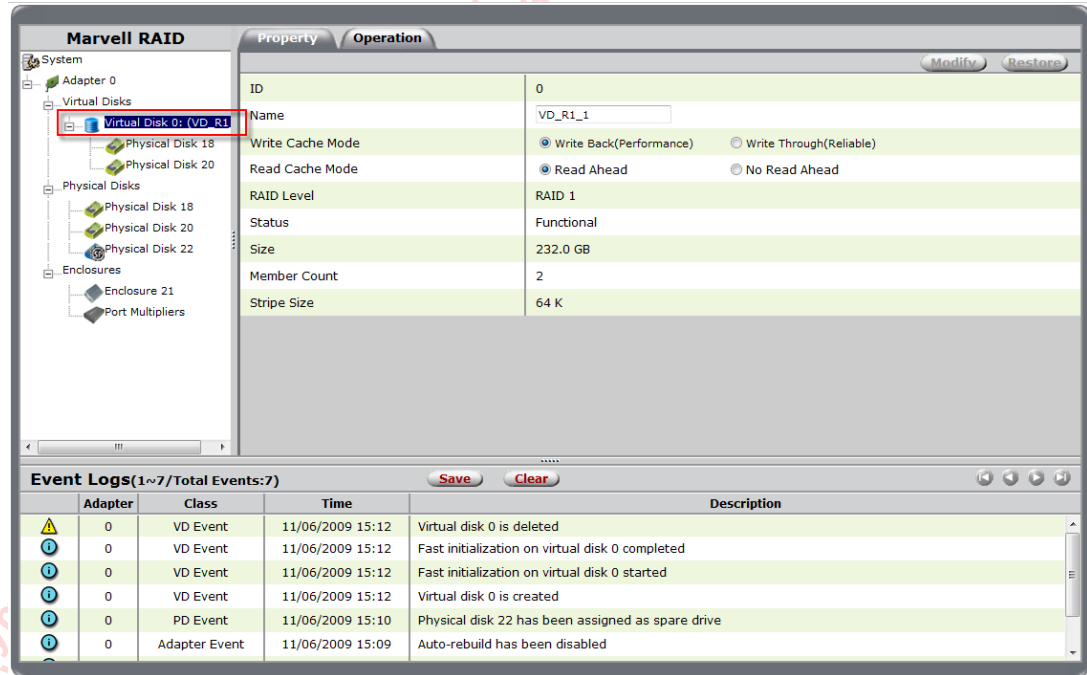
**Figure 3-13 Gigabyte Rounding**



12. After selecting Gigabyte Rounding, select **Submit** to create the virtual disk.

MRU creates the virtual disk and displays the **Property** tab for the new virtual disk, as shown in Figure 3-14.

Figure 3-14 VD Created



### 3.3 Importing Virtual Disk

Some Marvell IOCs such as the 88SE63xx/88SE64xx support importing of virtual disks created with other Marvell RAID controllers. If the IOC on your OEM host board supports importing of virtual disks, then the foreign virtual disk is recognized by the controller, as shown in Figure 3-15. To import this virtual disk, select **Operation > Import Virtual Disk**, as shown in Figure 3-16. However, if the IOC on your OEM host board does not support importing of virtual disks, then the physical disks comprising the foreign virtual disk are simply recognized as Foreign Physical Disks, as shown in Figure 3-17. To release these physicals disks from their foreign status, see section 3.5.6, [Erasing RAID Configuration Data on Foreign Physical Disk](#).

Figure 3-15 Foreign Virtual Disk

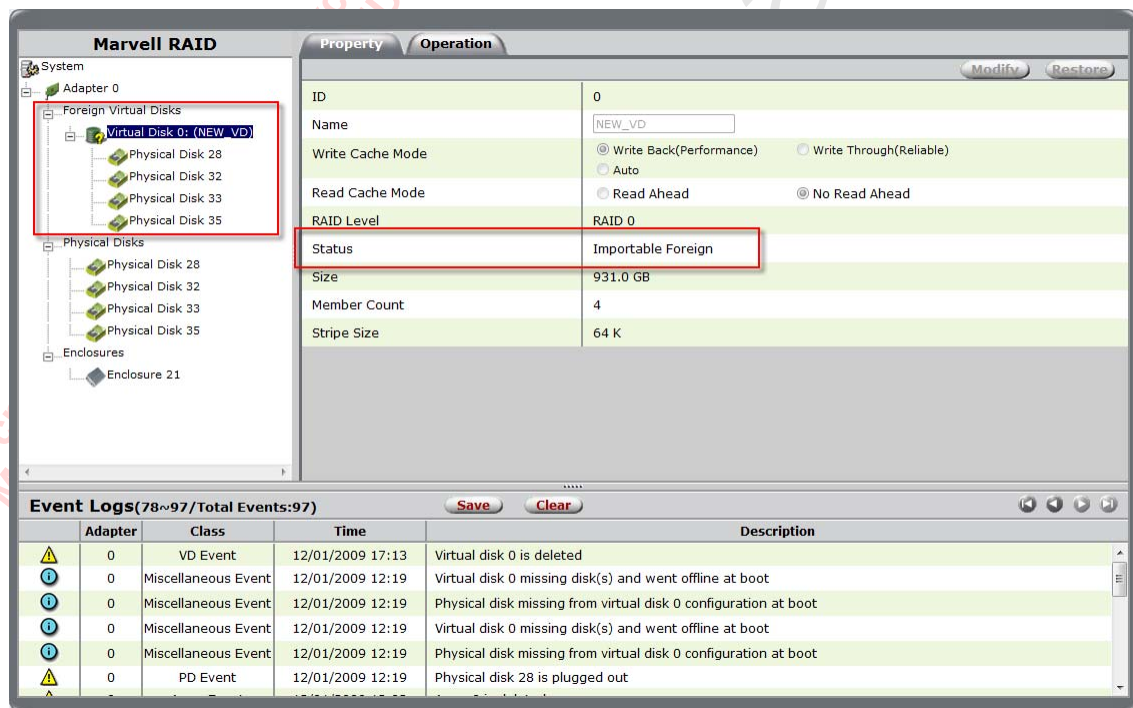


Figure 3-16 Import Virtual Disk

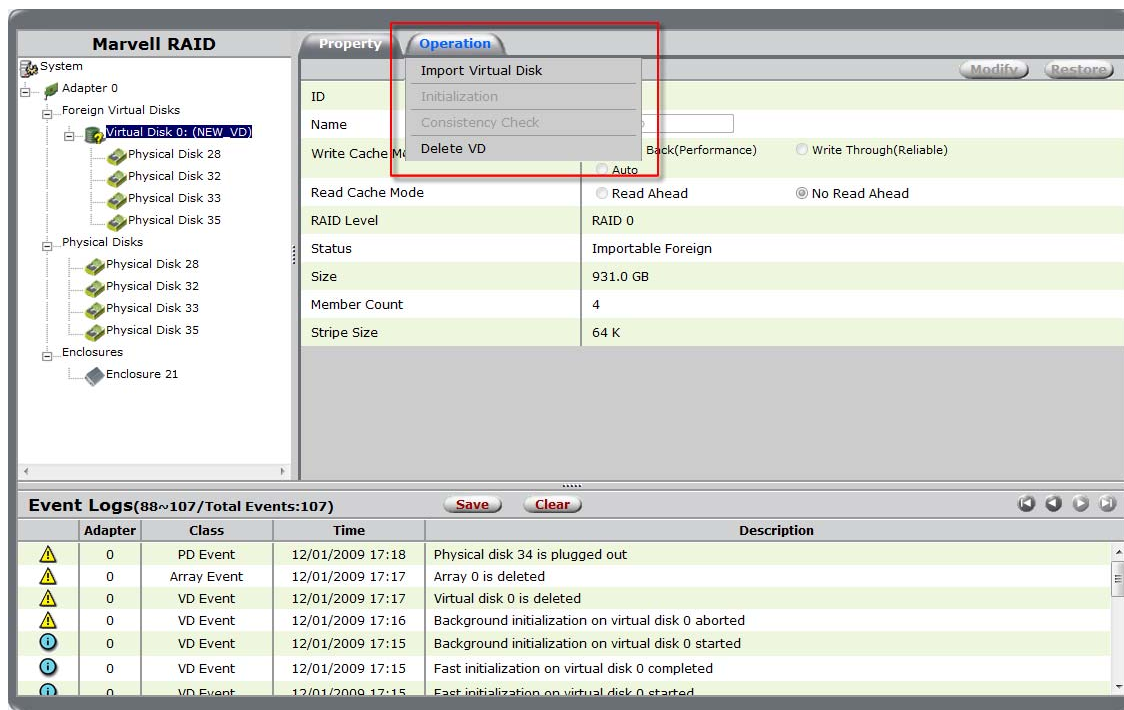
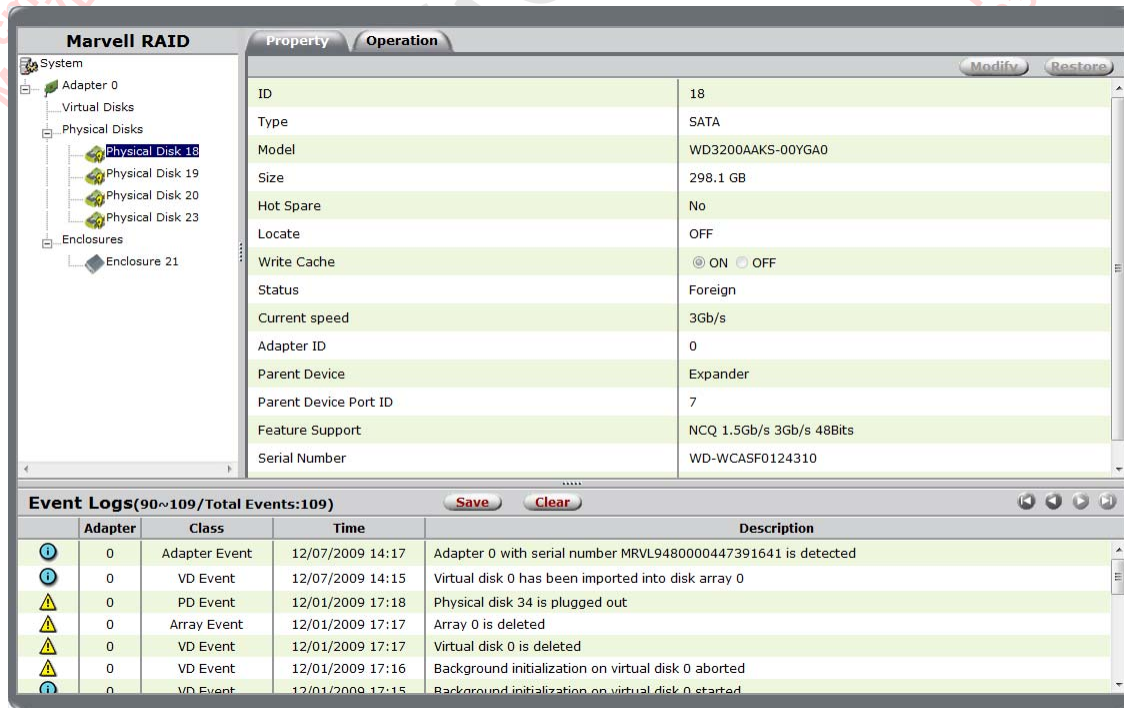


Figure 3-17 Foreign Physical Disks



## 3.4 Managing Virtual Disk

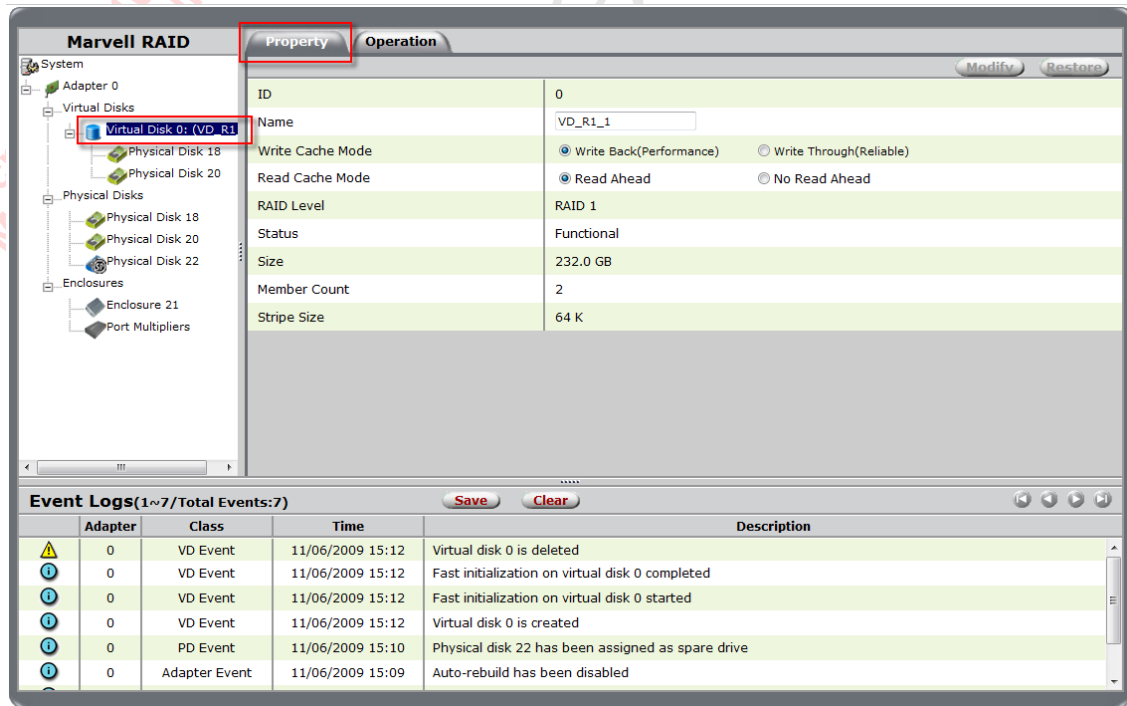
This section discusses the following:

- Viewing Properties of Virtual Disk
- Renaming Virtual Disk
- Modifying Cache Modes for Virtual Disk
- Initializing Virtual Disk
- Checking/Fixing Consistency of Virtual Disk
- Scheduling Background Activities
- Controlling Rate of Background Activities

### 3.4.1 Viewing Properties of Virtual Disk

To view the properties of a virtual disk, select the Virtual Disk (**Virtual Disk 0: (VD\_R1\_1)** in this example) in the list of system devices, as shown in Figure 3-18. Upon selection, MRU displays the **Property** tab for the virtual disk.

Figure 3-18 Properties of Virtual Disk



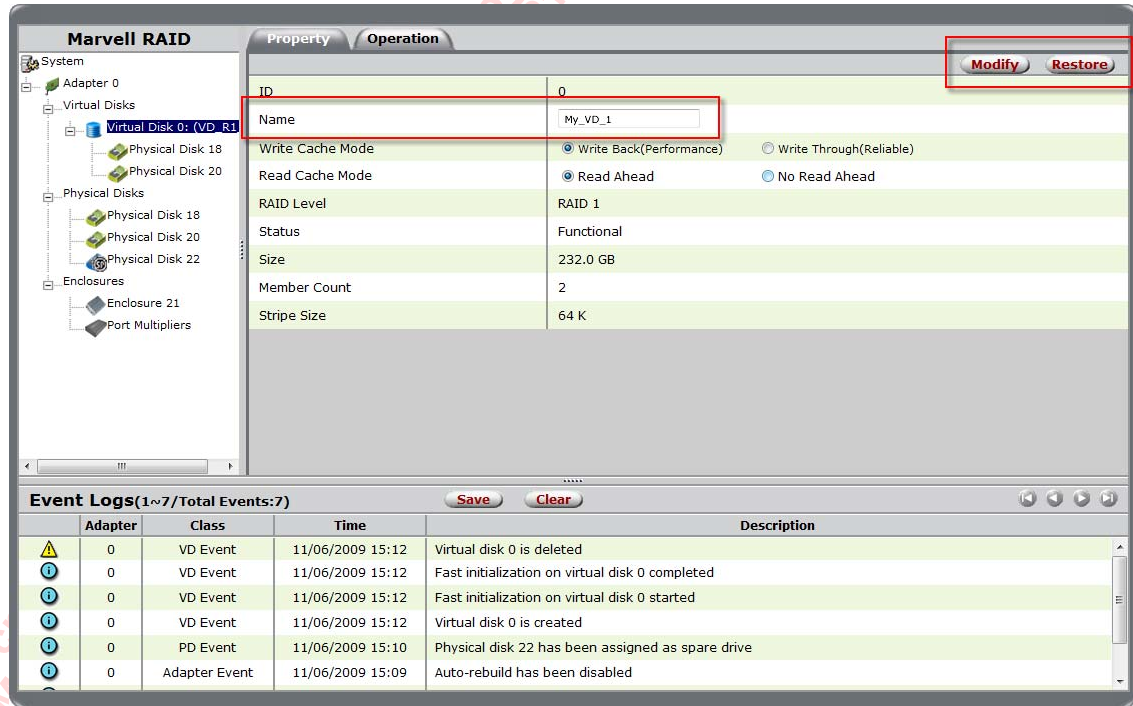
MRU uses different icons to indicate the status of the virtual disk. For more information, see Appendix C, [Icons used in MRU](#).



### 3.4.2 Renaming Virtual Disk

The name for a virtual disk can be modified from the **Property** tab for the **Virtual Disk**, as shown in Figure 3-19. Type a new name in the **Name** field and select **Modify** to confirm changes.

Figure 3-19 Renaming Virtual Disk

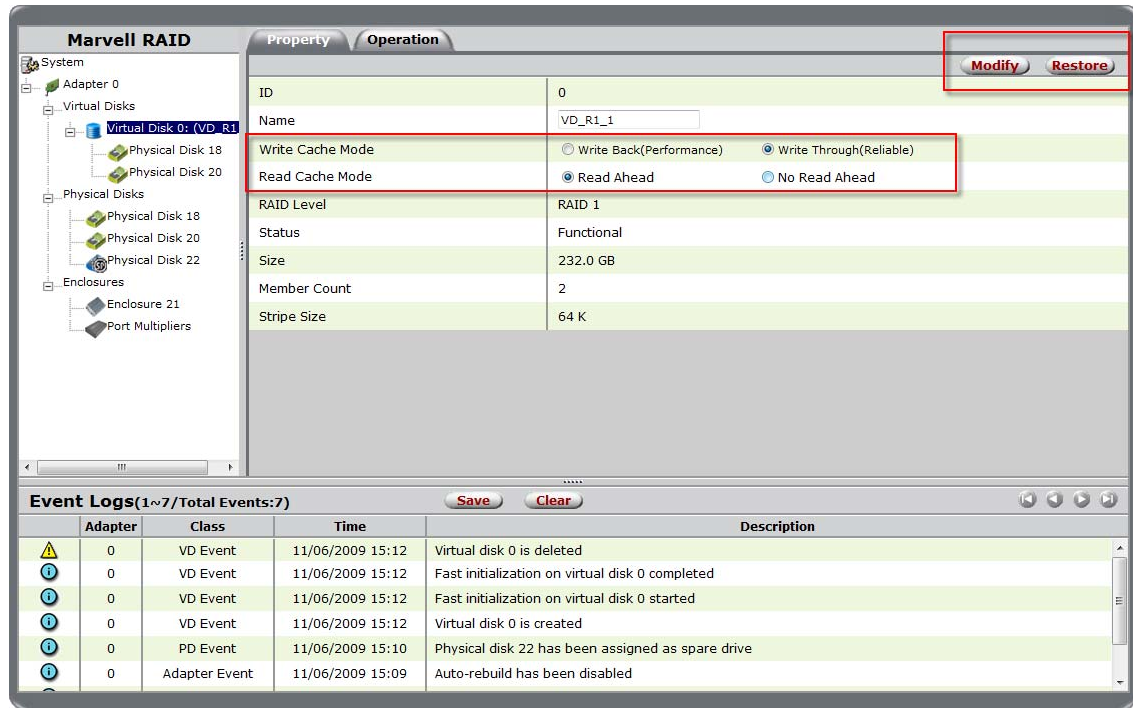


**Note:** Modify is grayed-out until the settings change.

### 3.4.3 Modifying Cache Modes for Virtual Disk

The **Write Cache Mode** and **Read Cache Mode** for a virtual disk can be modified from the **Property** tab for the **Virtual Disk**, as shown in Figure 3-20. Select between the options provided for each mode, and select **Modify** to confirm changes.

Figure 3-20 Modifying Cache Modes



**Note:** Modify is grayed-out until the settings change.

### 3.4.4 Initializing Virtual Disk

This section describes the procedure for initializing a virtual disk.

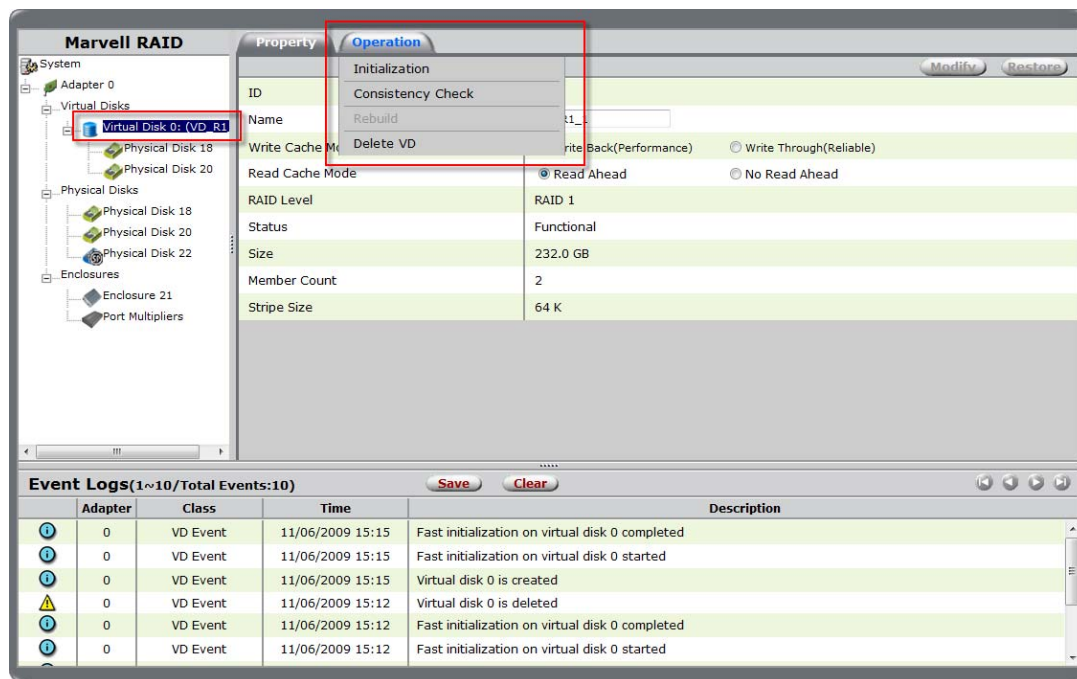
**Note:** For information on Initialization, see Appendix D, [Glossary](#).

#### To initialize virtual disk

1. Select the **Virtual Disk** from the list of system devices.
2. Roll-over the **Operation** tab, and select **Initialization**, as shown in Figure 3-21.  
The **Initialization Options** screen appears, as shown in Figure 3-21.

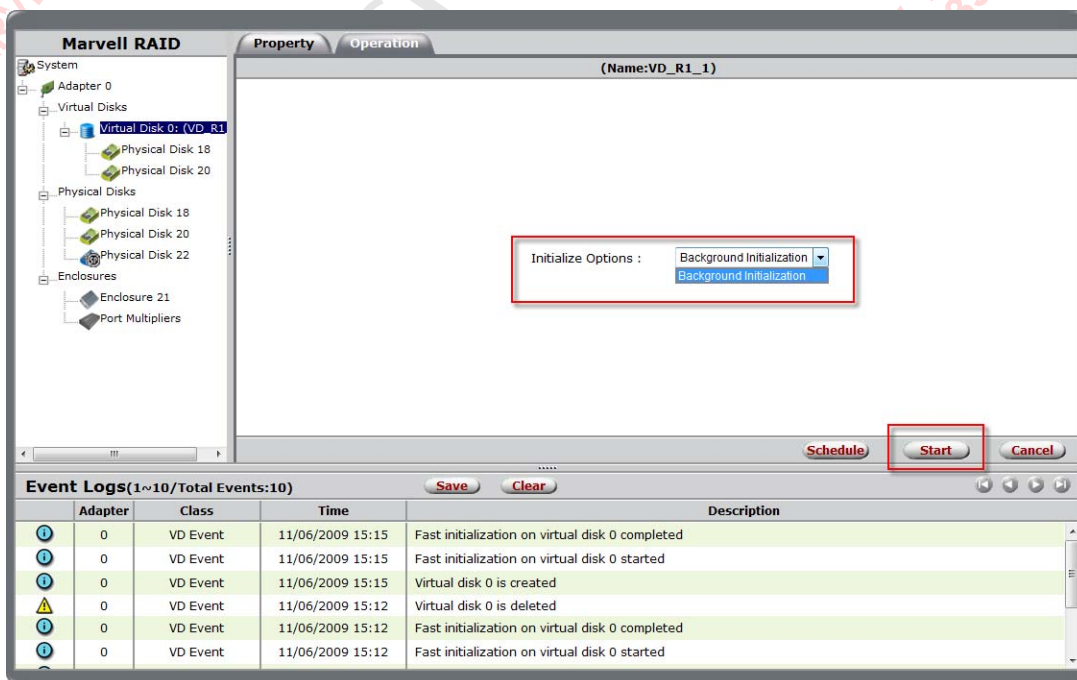


Figure 3-21 Virtual Disk Operation Tab



3. Select **Background Initialization**, as shown in Figure 3-21.

Figure 3-22 Initialization Options



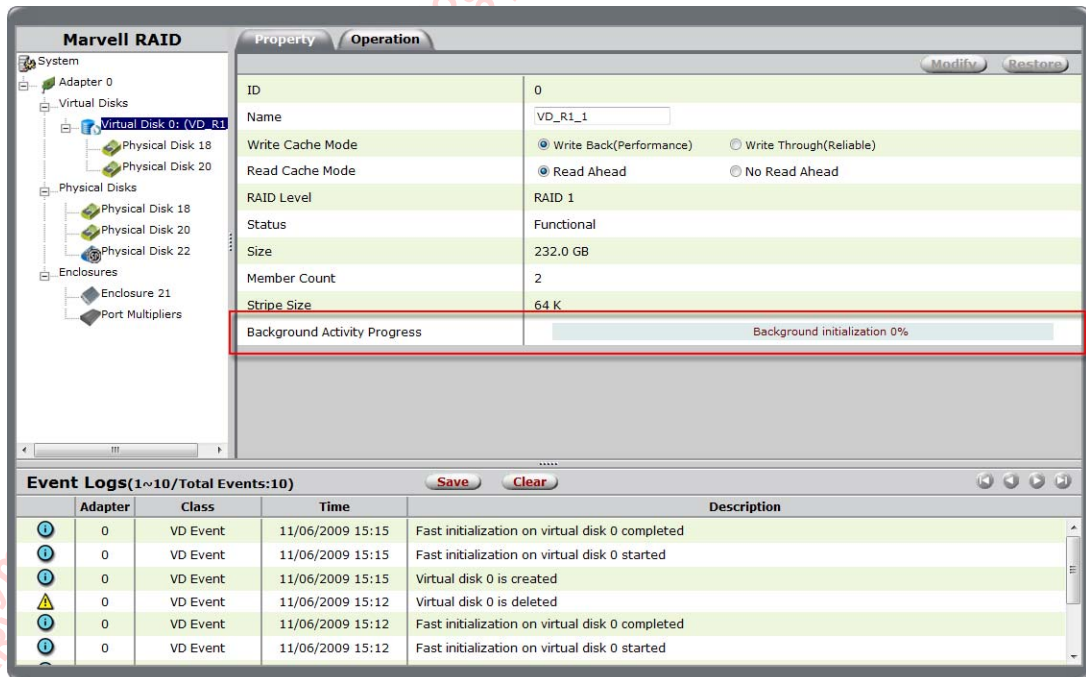
**Note:** Fast Initialization is only available during the virtual disk creation process. For information on Fast Initialization, see Appendix D, [Glossary](#).

4. Select **Start** to begin background initialization, as shown in Figure 3-22.

**Note:** To schedule background initialization, see 3.4.6, [Scheduling Background Activities](#)

MRU displays **Background Activity Progress** in the **Property** tab for the **Virtual Disk**, as shown in Figure 3-23.

Figure 3-23 Initialization Status



**Note:** To set the rate of background initialization, see 3.4.7, [Controlling Rate of Background Activities](#).

5. Options to **Pause**, **Resume**, and **Stop** Background Initialization are available in the **Operation** tab for the **Virtual Disk**.

### 3.4.5 Checking/Fixing Consistency of Virtual Disk

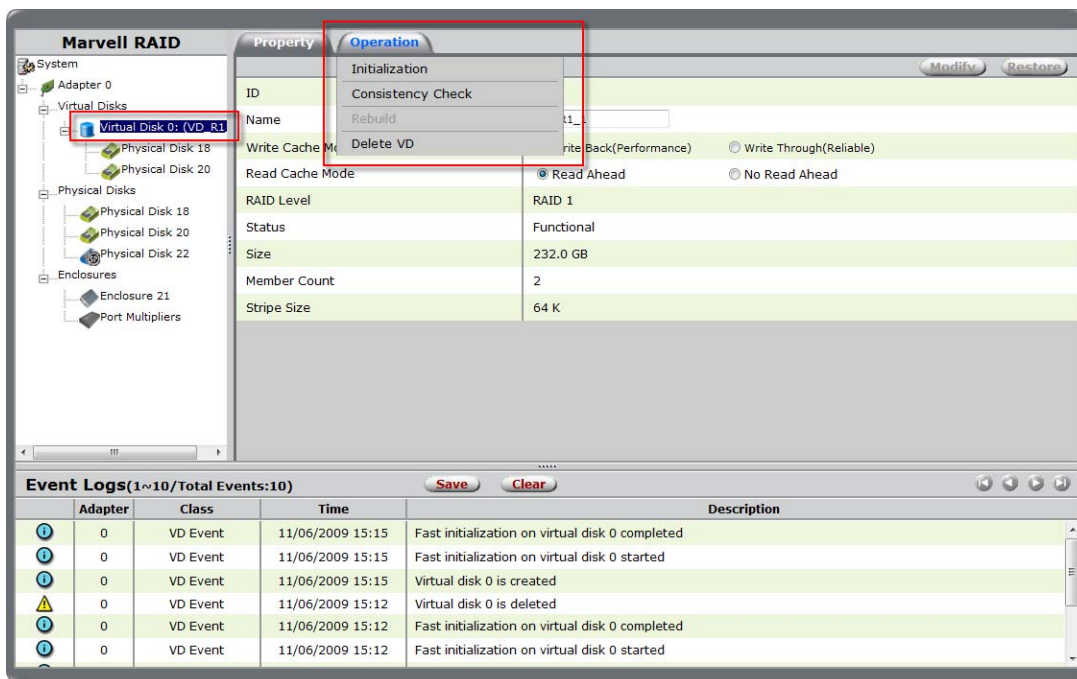
This section describes the procedure for checking and fixing consistency of a virtual disk.

**Note:** For information on Consistency Check, see Appendix D, [Glossary](#).

#### To check/fix consistency of virtual disk

1. Perform a Background Initialization of the virtual disk before checking/fixing consistency, as described in section 3.4.4, [Initializing Virtual Disk](#).
2. Select the **Virtual Disk** from the list of system devices.
3. Roll-over the **Operation** tab, and select **Consistency Check**, as shown in Figure 3-24. The **Consistency Check Options** screen appears, as shown in Figure 3-25.

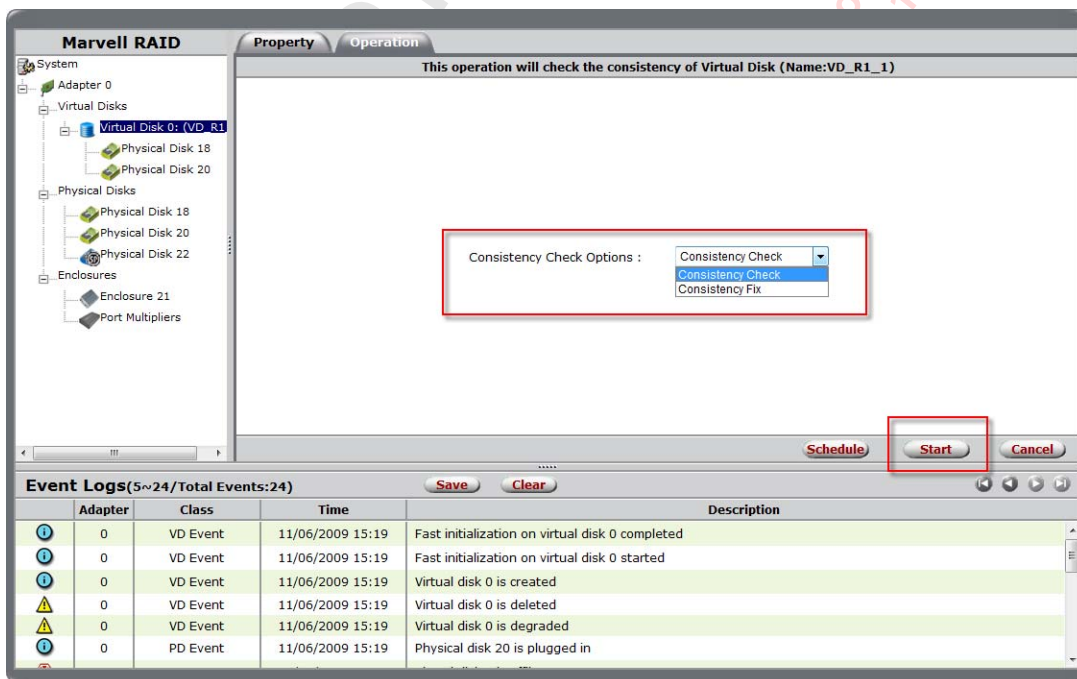
Figure 3-24 Virtual Disk Operation Tab



4. As shown in Figure 3-25, select one of the following options:

- Select **Consistency Check** to check and report data inconsistencies.
- Select **Consistency Fix** to check, report, and resolve data inconsistencies.

Figure 3-25 Consistency Check Options

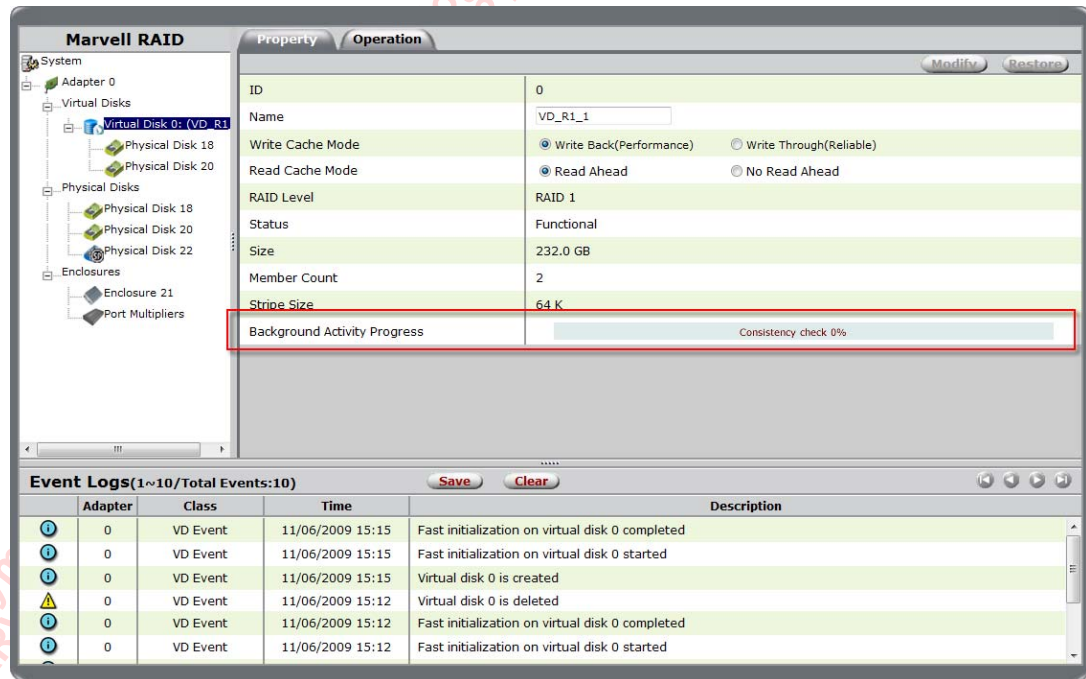


5. Select **Start** to begin consistency check/fix, as shown in Figure 3-25.

**Note:** To schedule background initialization, see 3.4.6, [Scheduling Background Activities](#)

MRU displays **Background Activity Progress** in the **Property** tab for the **Virtual Disk**, as shown in Figure 3-26.

Figure 3-26 Consistency Check Status



**Note:** To set the rate of background consistency check, see 3.4.7, [Controlling Rate of Background Activities](#).

6. Options to **Pause**, **Resume**, and **Stop** Consistency Check/Fix are available in the **Operation** tab for the **Virtual Disk**.

### 3.4.6 Scheduling Background Activities

As a maintenance procedure for the virtual disk, MRU can schedule background activities such as initialization and consistency check. This section describes the procedure to schedule background activities in MRU.

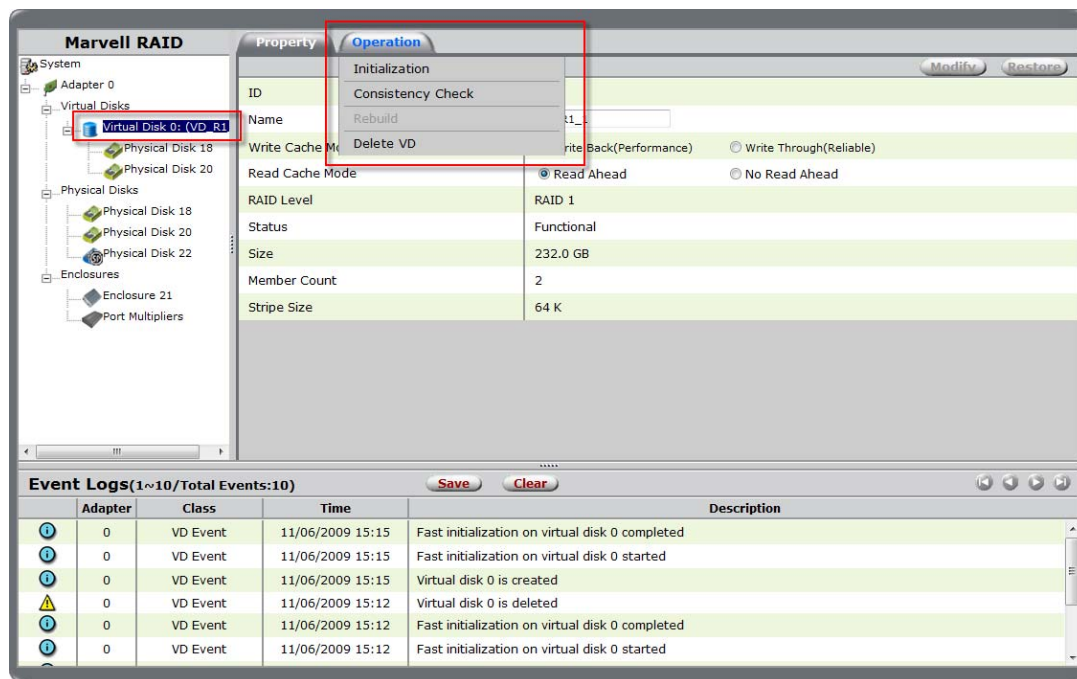
#### To schedule background activities

1. Select the **Virtual Disk** from the list of system devices.
2. Roll-over the **Operation** tab, and select one of the following background activities, as shown in Figure 3-27:
  - Select **Initialization** to schedule background initialization for virtual disk.
  - Select **Consistency Check** to schedule consistency check/fix for virtual disk.

The Background Activity Options (**Initialization Options** in this example) screen appears, as shown in Figure 3-28.

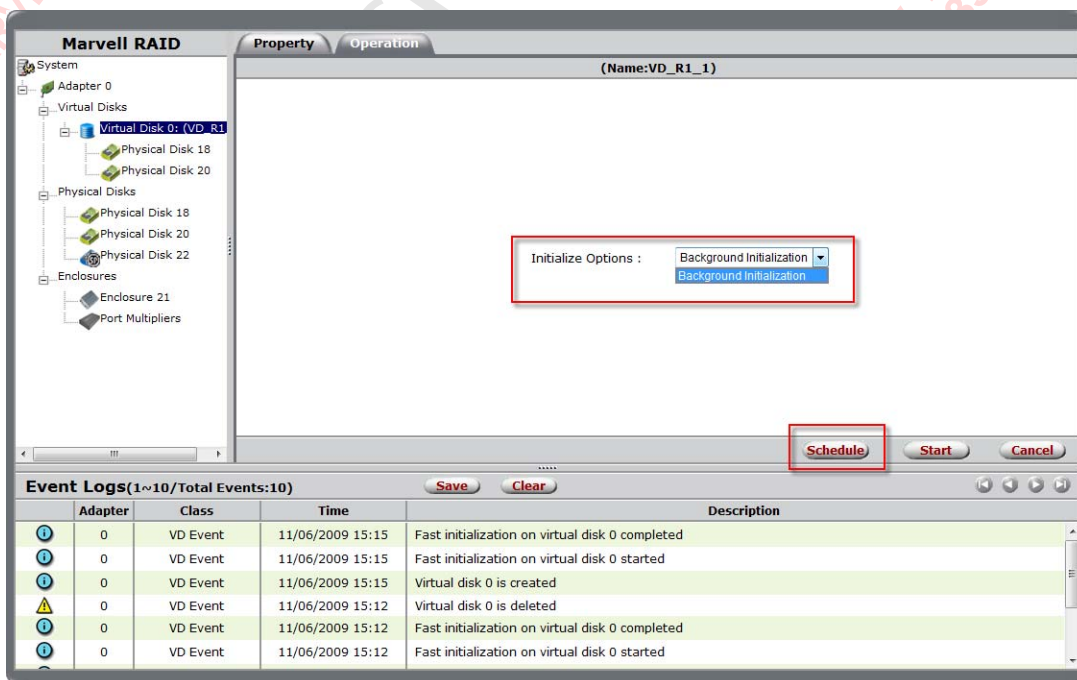


Figure 3-27 Selecting Background Activity



3. Select **Background Initialization**, as shown in Figure 3-28.

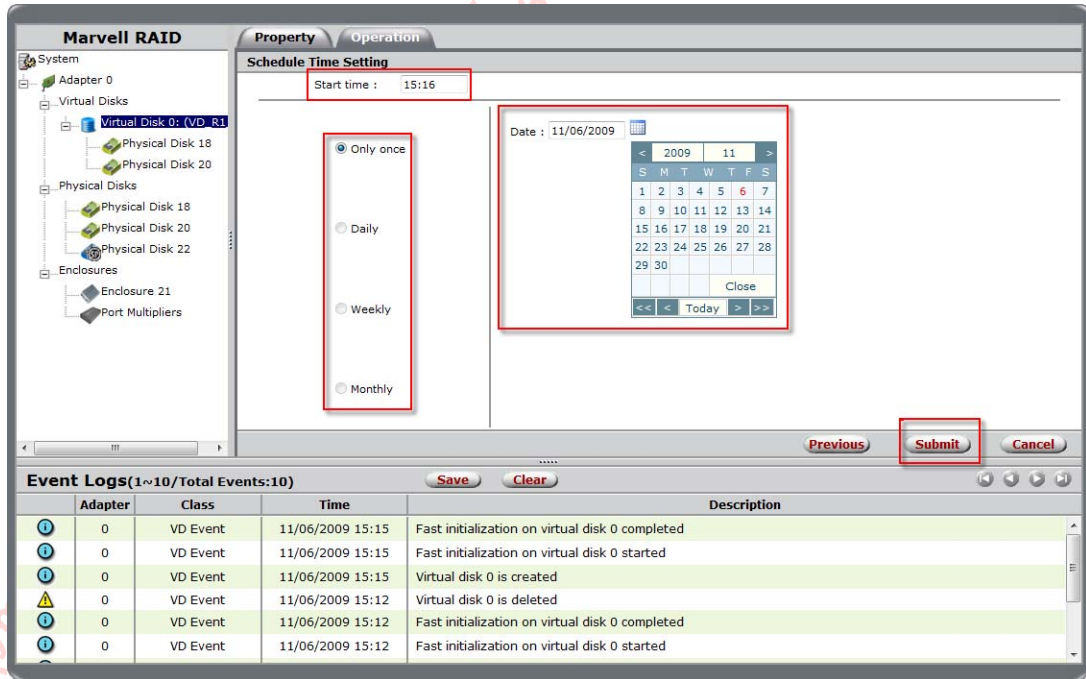
Figure 3-28 Scheduling Activity



4. Select **Schedule** to schedule background initialization, as shown in Figure 3-28. The **Schedule Time Setting** window appears, as shown in Figure 3-29.

5. As shown in Figure 3-29, select the **Start time** and **Date** for the first occurrence.  
By default, MRU runs the activity **Only once**. Choose between the available options (Daily, Weekly, Monthly) to schedule the background activity on a periodic basis.

Figure 3-29 Selecting Date and Time

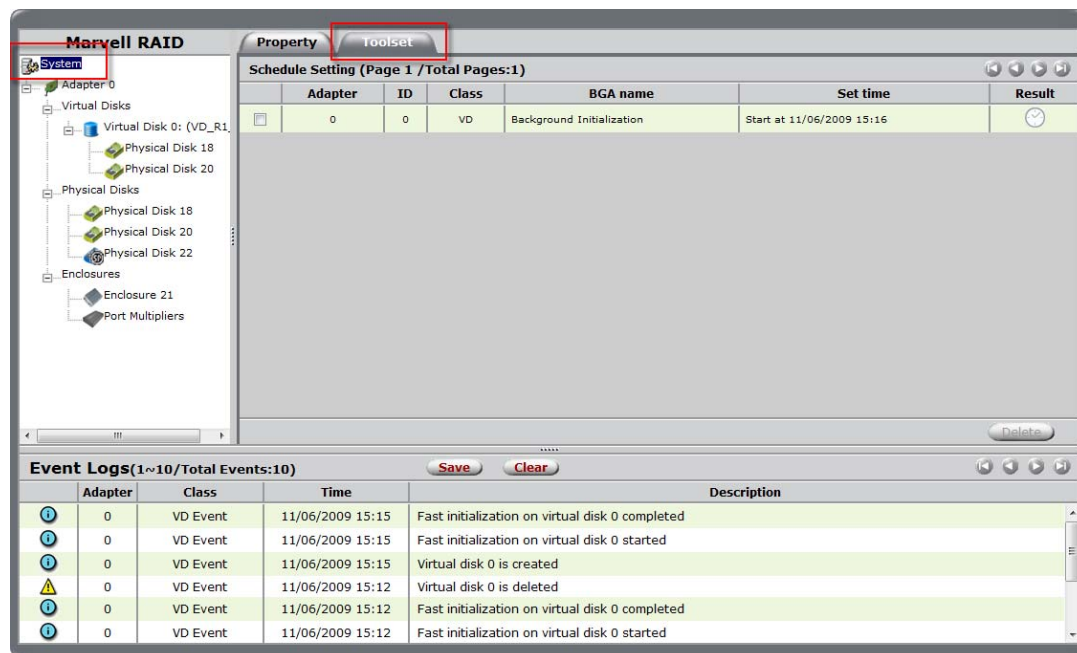


6. After scheduling the activity, select **Submit** to confirm changes, as shown in Figure 3-29.

The **Schedule Setting** window appears, as shown in Figure 3-30, listing details of the scheduled activity.

**Note:** Schedule Setting is now listed as an option in the System > Toolset menu. Use this option to view the list of scheduled activities.

Figure 3-30 Schedule Setting



**Note:** Schedule Setting is *not* listed in the System > Toolset menu *until* an activity is scheduled.

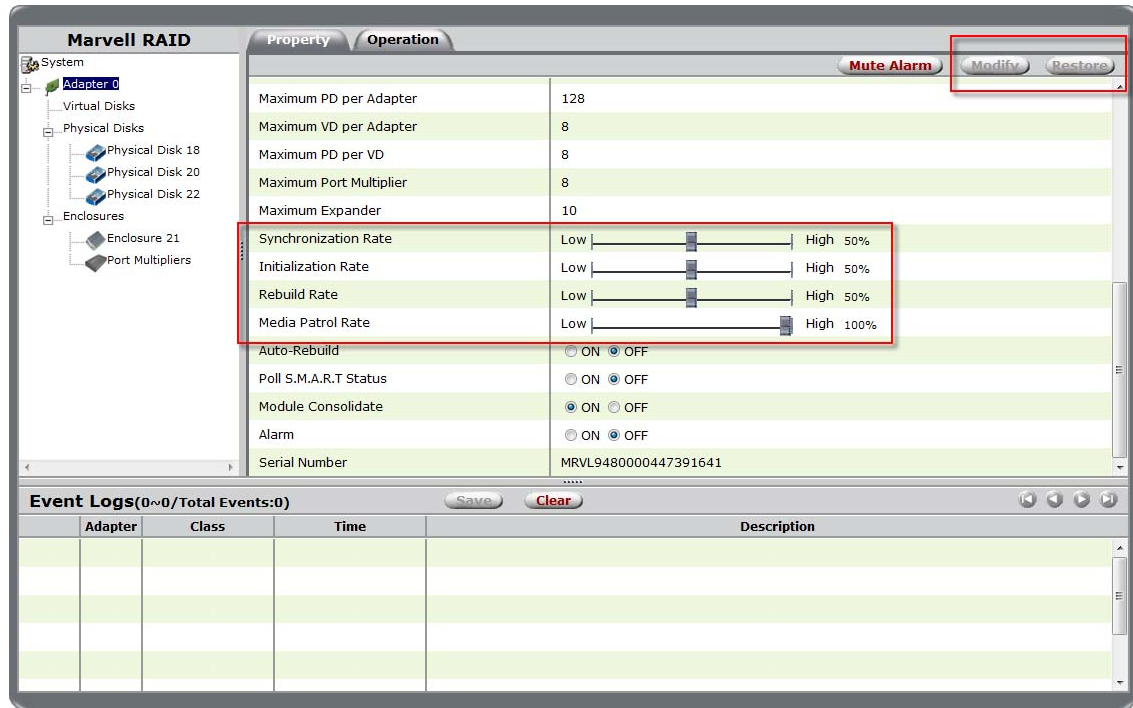
### 3.4.7 Controlling Rate of Background Activities

The controller prioritizes background activities based on the specified control rates. When background activities are in progress, the controller is still available to the OS for normal operations. However, the response time may be slower depending on the background activity control rate.

The rate of various background activities can be modified from the **Property** tab for the **Adapter**, as shown in Figure 3-31. Move the slider to adjust the rates and then select **Modify** to confirm changes.

**Note:** For information on Synchronization Rate, Initialization Rate, Rebuild Rate, and Media Patrol Rate, see Appendix D, [Glossary](#).

Figure 3-31 Controlling Rate of Background Activities



**Note:** Modify is grayed-out until the settings change.



## 3.5 Managing Physical Disks

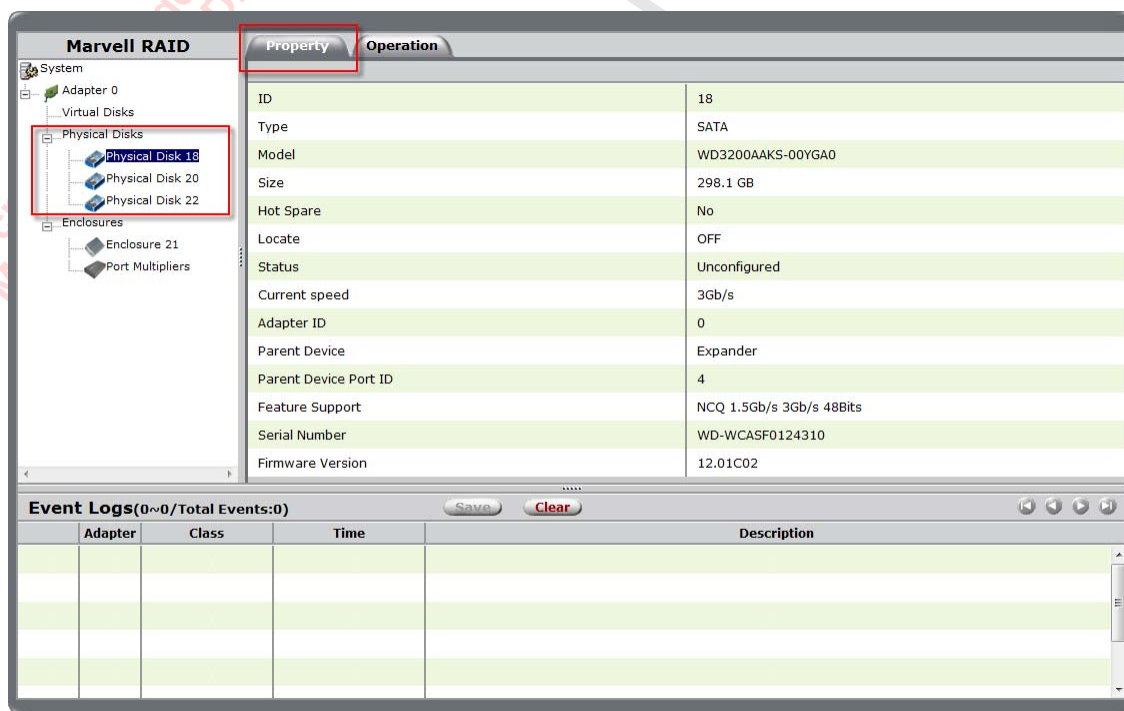
This section discusses the following:

- Viewing Properties of Physical Disk
- Locating Physical Disk in Enclosure
- Starting Media Patrol
- Releasing an Offline Physical Disk from Virtual Disk
- Assigning Physical Disk as Global Spare Drive
- Erasing RAID Configuration Data on Foreign Physical Disk

### 3.5.1 Viewing Properties of Physical Disk

To view the properties of a physical disk, select the **Physical Disk** in the list of system devices, as shown in Figure 3-32. Upon selection, MRU displays the **Property** tab for the physical disk.

Figure 3-32 Properties of Physical Disk



**Note:** The properties of a physical disk can not be edited.

MRU uses different icons to indicate the status of the physical disk. For more information, see Appendix C, [Icons used in MRU](#).

### 3.5.2 Locating Physical Disk in Enclosure

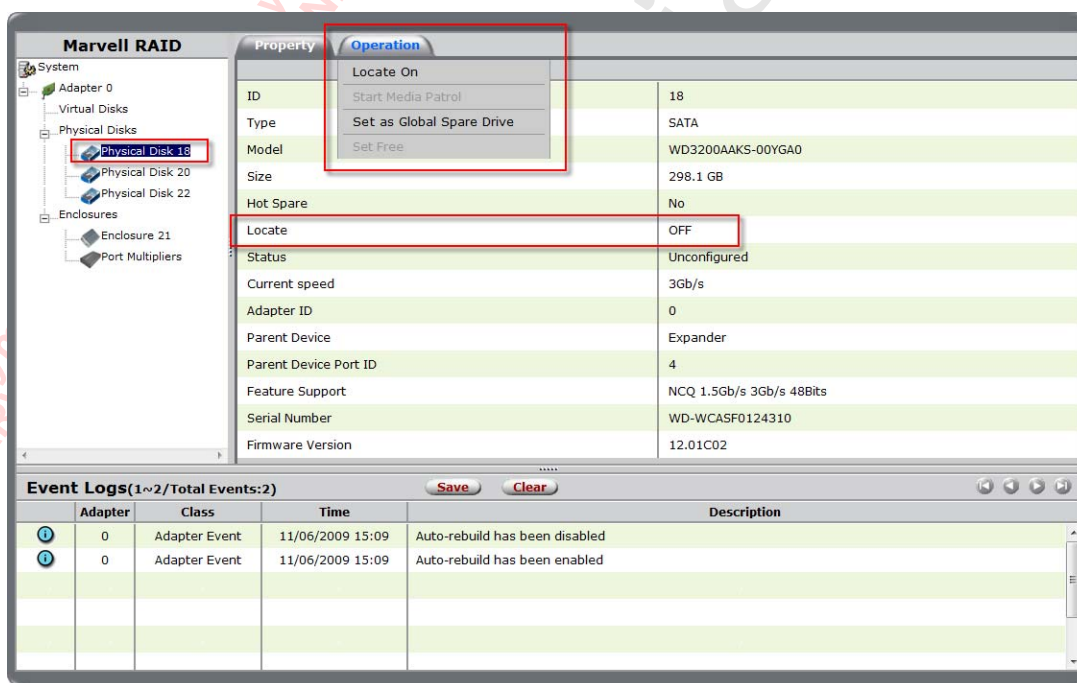
The Locate feature helps you identify a physical disk in an enclosure containing many physical disks. It works either by switching the LED on the physical disk ON or making it blink. The behavior of the Locate feature is determined by the design of the enclosure.

**Note:** The enclosure must support this feature for it to work.

#### To locate a physical disk

1. Select the **Physical Disk**, in the list of system devices, as shown in Figure 3-33.
2. Roll-over the **Operation** tab, and select **Locate On** to turn Locate on, as shown in Figure 3-33.

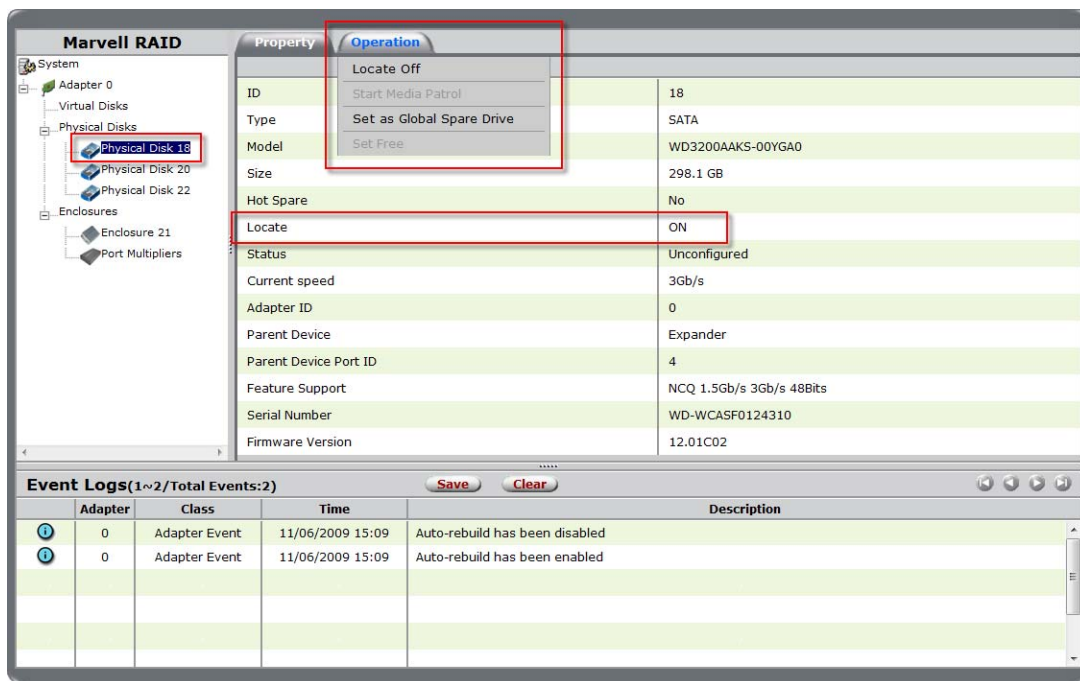
Figure 3-33 Turn Locate On



#### To turn Locate off for a physical disk

1. Select the **Physical Disk**, in the list of system devices, as shown in Figure 3-34.
2. Roll-over the **Operation** tab, and select **Locate Off** to turn Locate off, as shown in Figure 3-34.

Figure 3-34 Turn Locate Off



### 3.5.3 Starting Media Patrol

This section describes the procedure for starting media patrol on a configured physical disk (that is part of a virtual disk) or a spare drive.

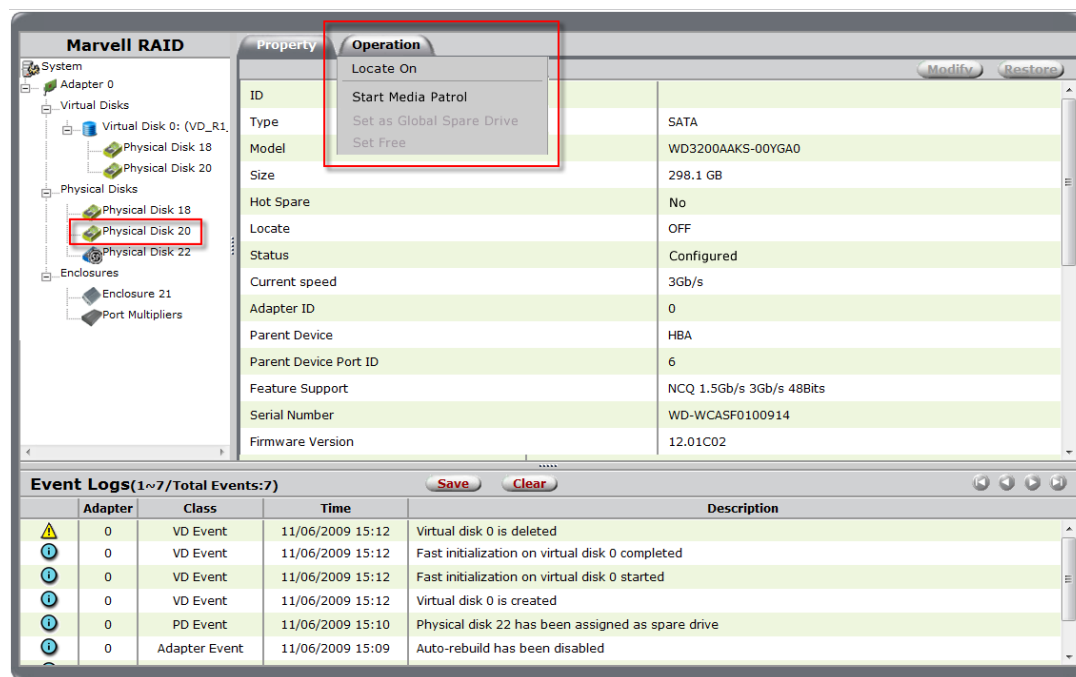
**Note:** For information on Media Patrol, see Appendix D, [Glossary](#).

#### To start media patrol

1. Select the **Physical Disk** in the list of system devices.
2. Roll-over the **Operation** tab, and select **Start Media Patrol** as shown in Figure 3-35.

MRU displays **Background Activity Progress** in the **Property** tab for the **Physical Disk**.

Figure 3-35 Starting Media Patrol



- Options to **Pause**, **Resume**, and **Stop** Media Patrol are available in the **Operation** tab for the **Virtual Disk**.

### 3.5.4 Releasing an Offline Physical Disk from Virtual Disk

This section describes the procedure for releasing an offline physical disk from a virtual disk. For information on offline physical disks, see Appendix C, [Icons used in MRU](#).

#### To release an offline physical disk

- Select offline **Physical Disk** in the list of system devices.
- Roll-over the **Operation** tab, and select **Set Free**.

The physical disk is now released from the virtual disk.

### 3.5.5 Assigning Physical Disk as Global Spare Drive

You can assign spare drives that can be used for [Rebuilding Degraded Virtual Disk](#). Global spare drives can be used by any virtual disk. Only an unconfigured physical disk can be assigned as a spare drive. A physical disk which is either fully or partially configured cannot be used as a spare drive.

#### To assign physical disk as global spare drive

- Select **Physical Disk**.
- Roll-over the **Operation** tab, and select **Set as Global Spare Drive**, as shown in Figure 3-36. MRU confirms the assignment as shown in Figure 3-37.

Figure 3-36 Assigning Physical Disk as Global Spare Drive

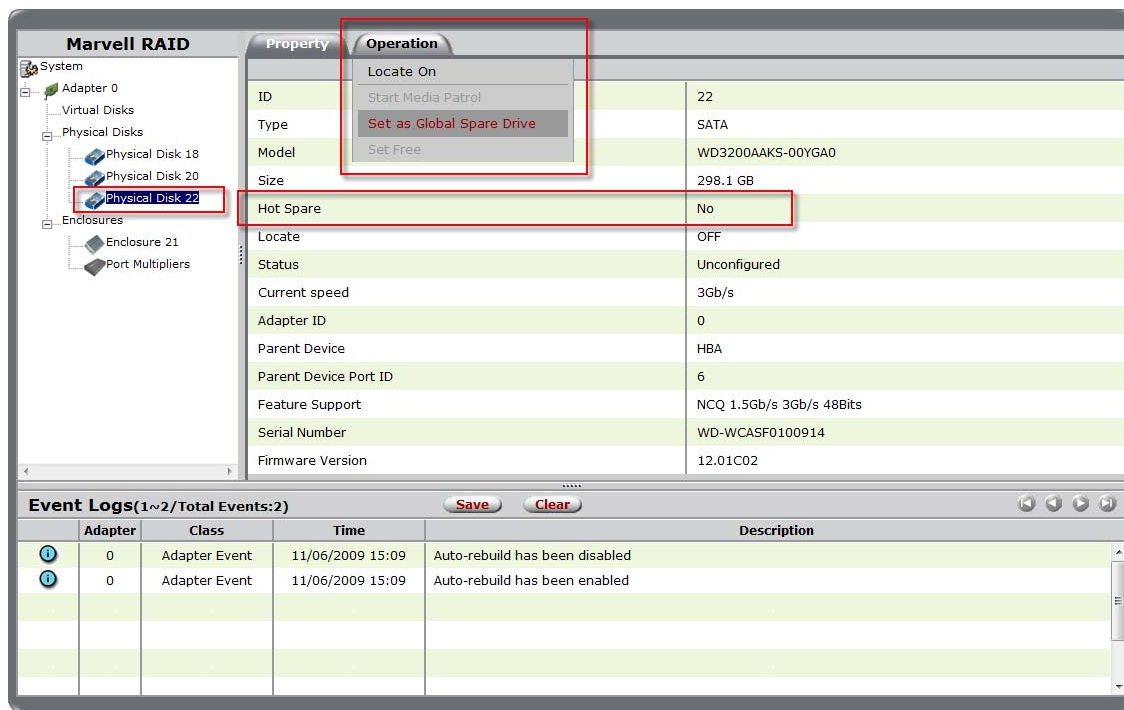
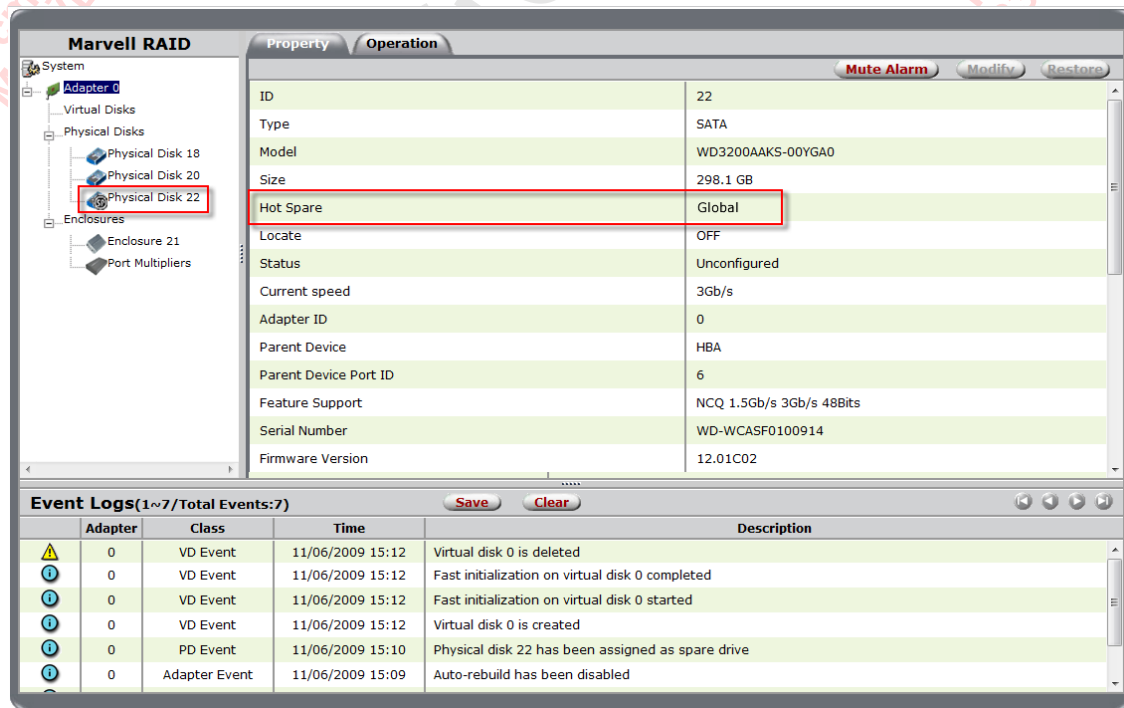


Figure 3-37 Spare Confirmation



### To release a physical disk from spare drive status


1. Select an unconfigured **Spare Drive**.
2. Roll-over the **Operation** tab, and select **Unset as Global Spare Drive**.  
MRU confirms the change by updating the **Status** of the physical disk in the Property tab.

### 3.5.6 Erasing RAID Configuration Data on Foreign Physical Disk

This section describes the procedure to erase RAID configuration data (if any) on a foreign physical disk.

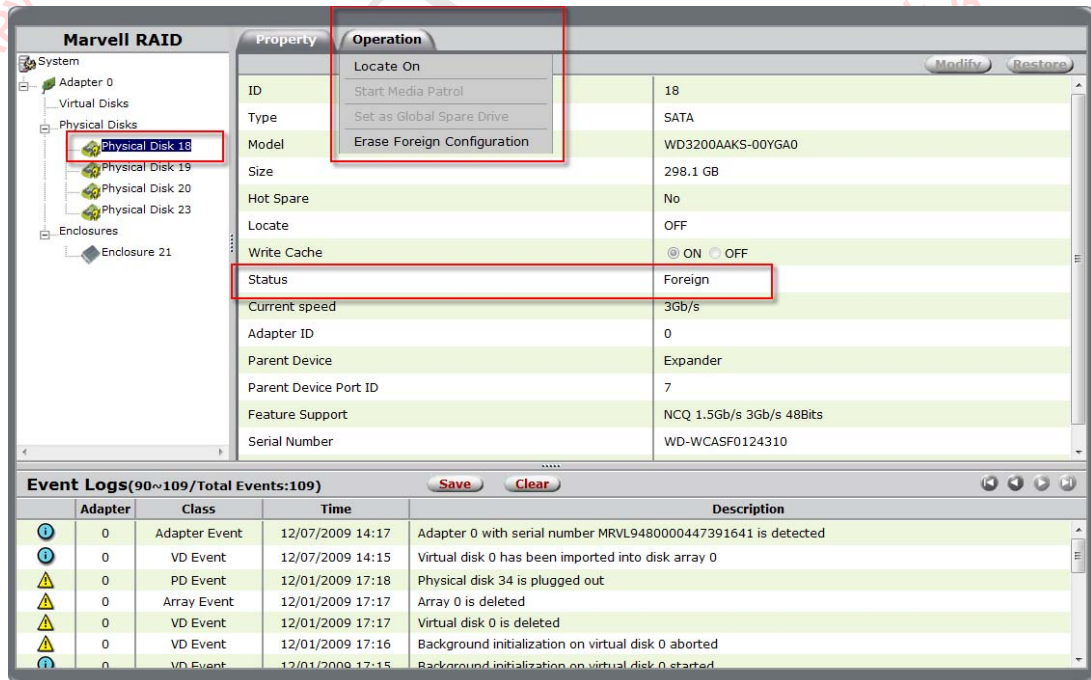
**Note:** The RAID controller stores RAID configuration data on all physical disks that are part of a virtual disk. RAID configuration data must be erased on the physical disk before it can be used with another virtual disk.

#### To erase RAID configuration data

**WARNING**  If the physical disk was originally part of another virtual disk, erasing RAID configuration data may damage that virtual disk, depending on its fault tolerance capabilities.

1. Select foreign **Physical Disk** in the list of system devices, as shown in Figure 3-38.
2. Rollover the **Operation** tab, and select **Erase Foreign Configuration**, as shown in Figure 3-38.

Figure 3-38 Erasing RAID Configuration Data on Foreign Physical Disk





## 3.6 Managing Enclosures

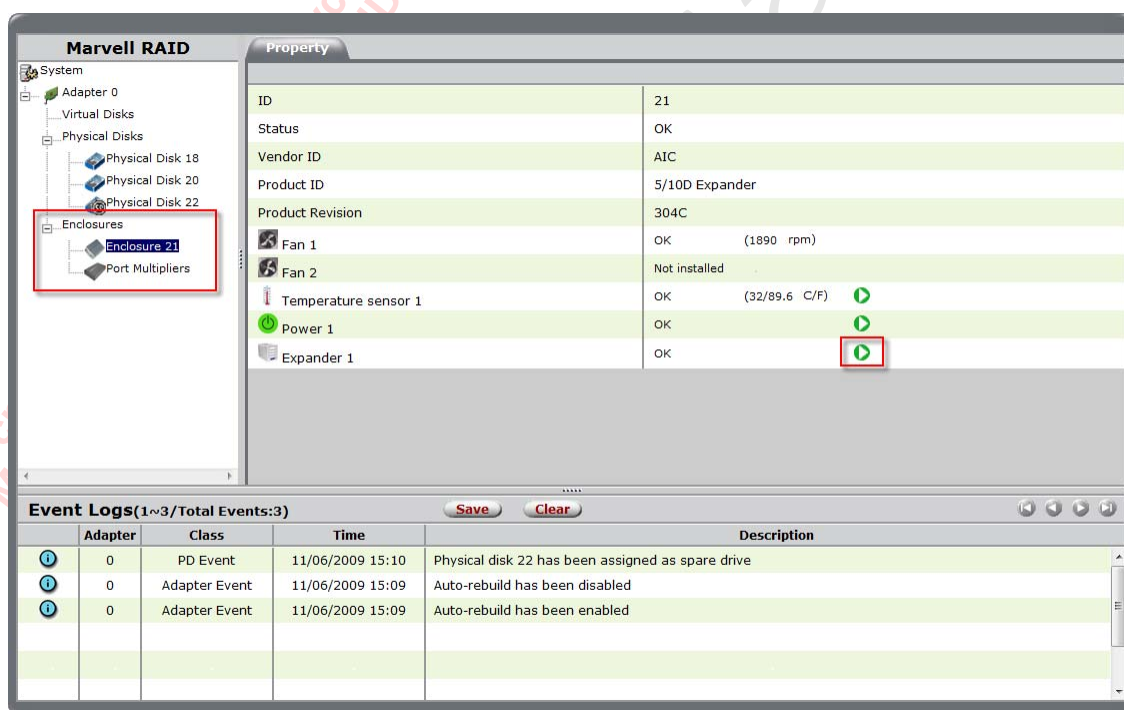
This section discusses the following:

- Viewing Properties of Expander
- Viewing Properties of Port Multiplier

### 3.6.1 Viewing Properties of Expander

To view the properties of an expander, select the **Enclosure** in the list of system devices, as shown in Figure 3-39. Upon selection, MRU displays the **Property** tab for the Enclosure.

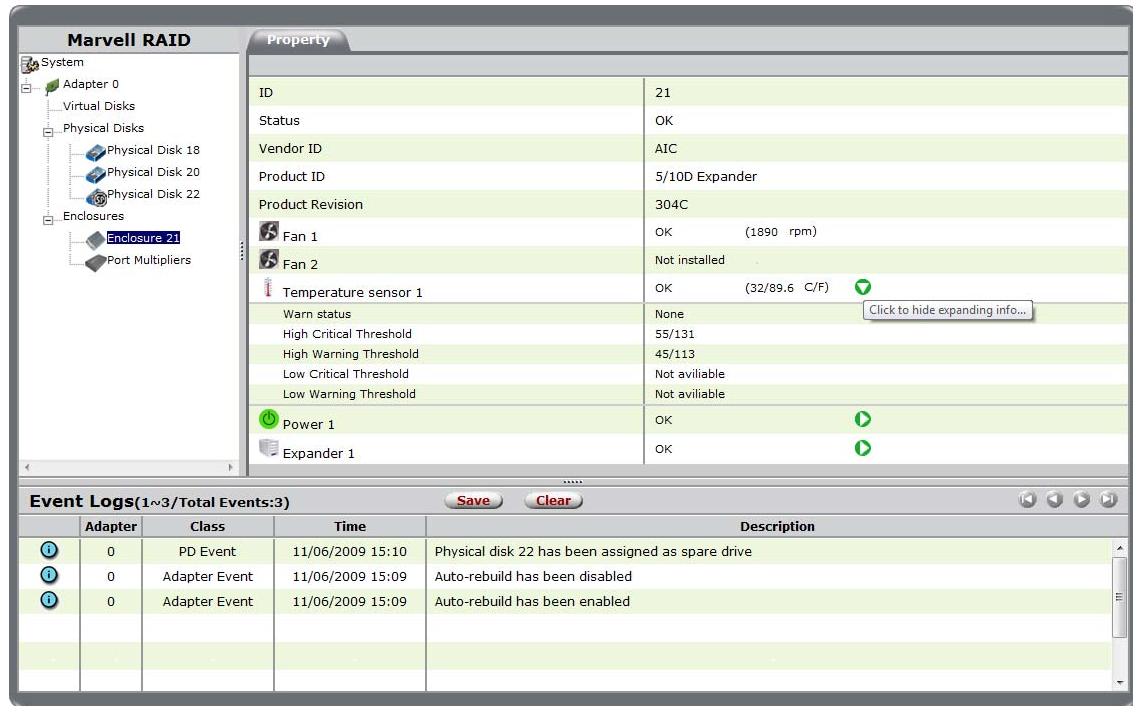
Figure 3-39 Properties of Expander



By default, the detailed properties of enclosure elements are hidden. Click the arrow, as shown in Figure 3-39, to view detailed properties.

Figure 3-40 shows the detailed properties for Expander 1. Click the arrow, as shown in Figure 3-40, to hide details.

Figure 3-40 Detailed Properties of Expander



### 3.6.2 Viewing Properties of Port Multiplier

To view the properties of a port multiplier, select **Port Multipliers** in the list of system devices. Upon selection, MRU displays the **Property** tab listing all port multipliers connected to the RAID controller, as shown in Figure 3-41.

Select **[Detail>>]**, as shown in Figure 3-41, to view detailed properties of the port multiplier.



Figure 3-41 Properties of Port Multiplier

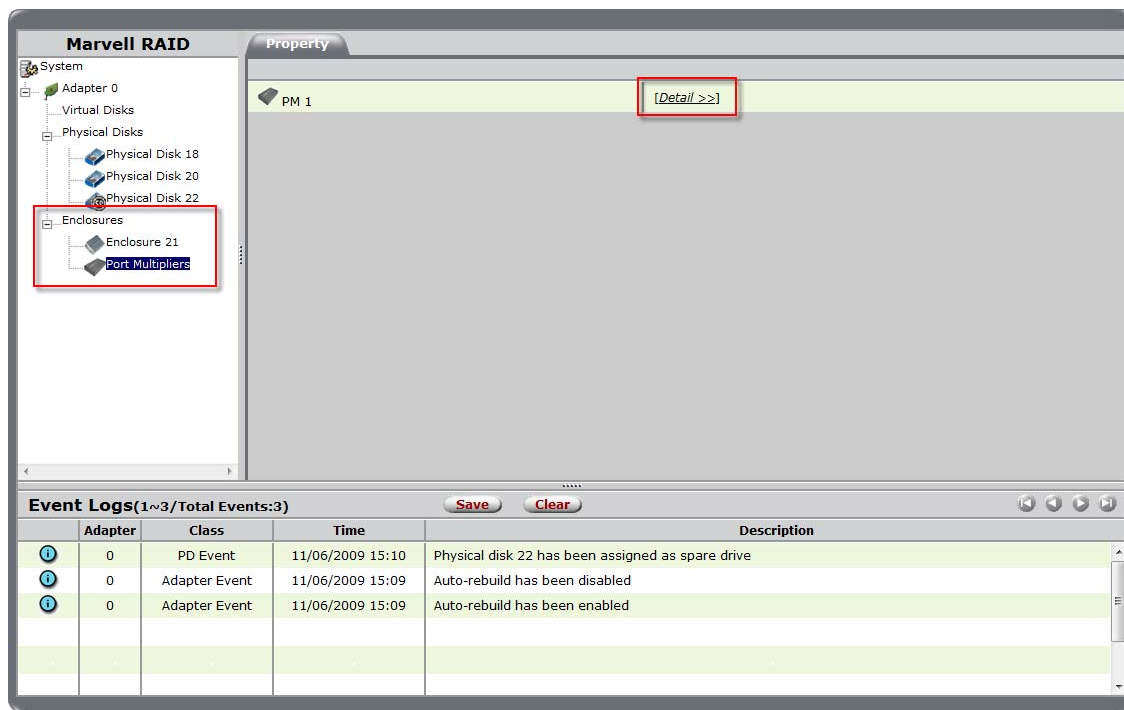
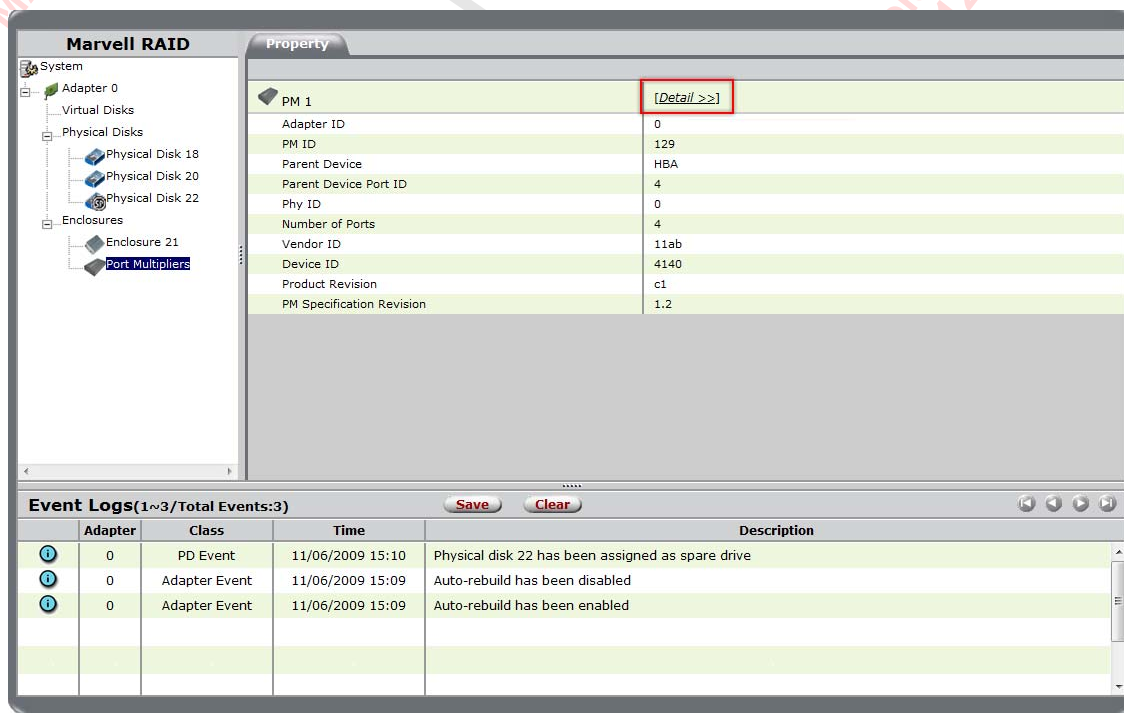


Figure 3-42 shows detailed properties of port multiplier PM 1. Select **[Detail>>]**, as shown in Figure 3-42, to hide details.

Figure 3-42 Detailed Properties of Port Multiplier



## 3.7 Monitoring Virtual Disk

This section discusses the following:

- [Receiving E-mail Event Notifications](#)
- [Viewing Events using Windows Event Viewer](#)
- [Enabling Alarm for Critical Events](#)

### 3.7.1 Receiving E-mail Event Notifications

MRU can send event notifications to a user's email account. This requires a working SMTP email server. This involves the following two steps:

- [Configuring SMTP E-mail Server Settings](#)
- [Selecting Event Notifications](#)

#### 3.7.1.1 Configuring SMTP E-mail Server Settings

This section describes the procedure to configure SMTP e-mail server settings in MRU.

**To configure SMTP e-mail server settings**

1. Select **System** in the list of system devices.
2. Roll-over the **Toolset** tab, and select **Email Setting**, as shown in Figure 3-43.

The **Email Setting** window appears, as shown in Figure 3-44.

Figure 3-43 System Toolset Menu

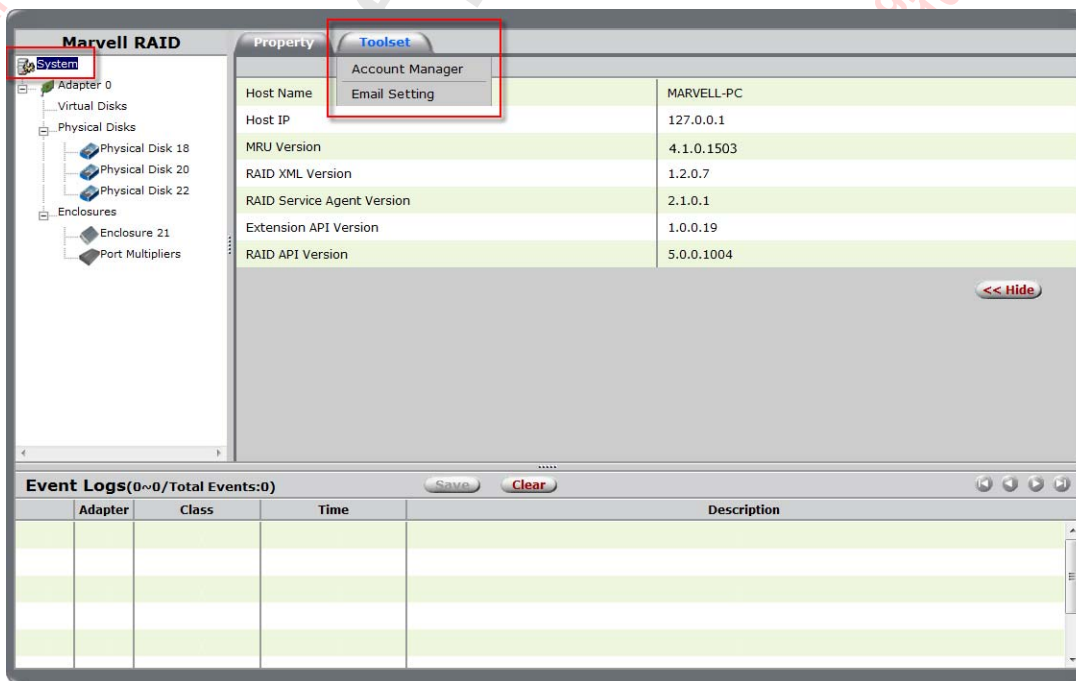
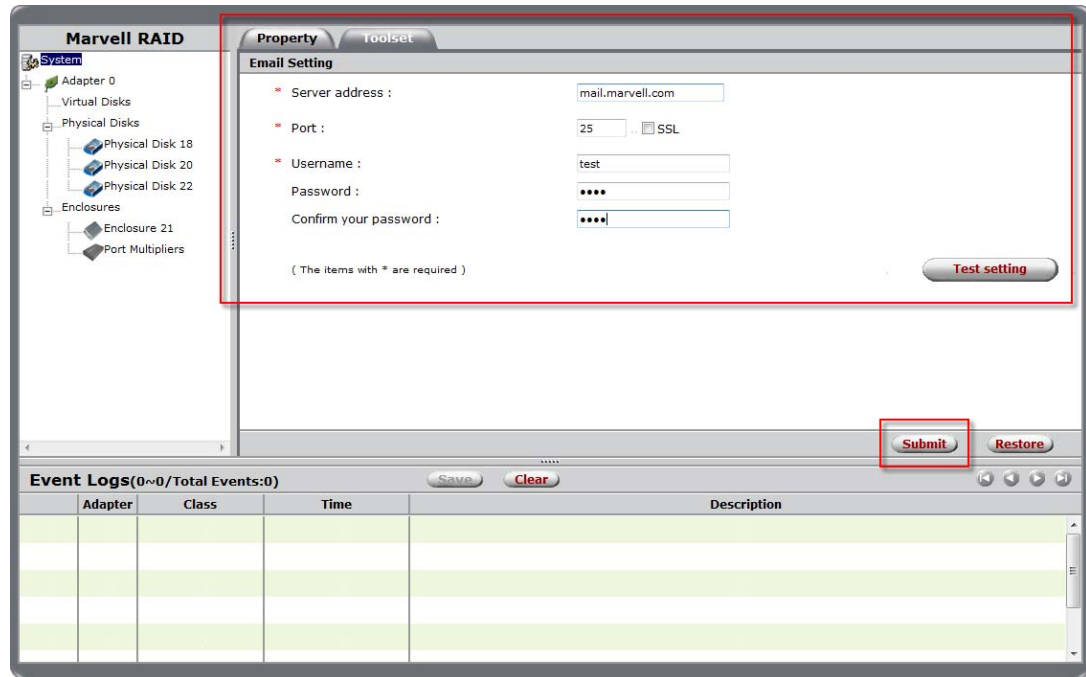


Figure 3-44 Email Settings



3. Configure the email server settings, and select **Test setting**, as shown in Figure 3-44. MRU sends a test mail to the configured email address. If the test mail is received, the settings are working correctly.
4. Select **Submit** to save settings. MRU confirms changes with the message **Setting updated successfully!**

### 3.7.1.2 Selecting Event Notifications

This section describes the procedure for selecting event types (information, error, warning) that trigger email notifications.

**Note:** For information on the icons used for different event types, see Appendix C, [Icons used in MRU](#).

#### To receive e-mail event notifications

1. Select **System** in the list of system devices.
2. Roll-over the **Toolset** tab, and select **Account Manager**, as shown in Figure 3-45. The **Account Manage** window appears, as shown in Figure 3-46.

Figure 3-45 System Toolset Menu

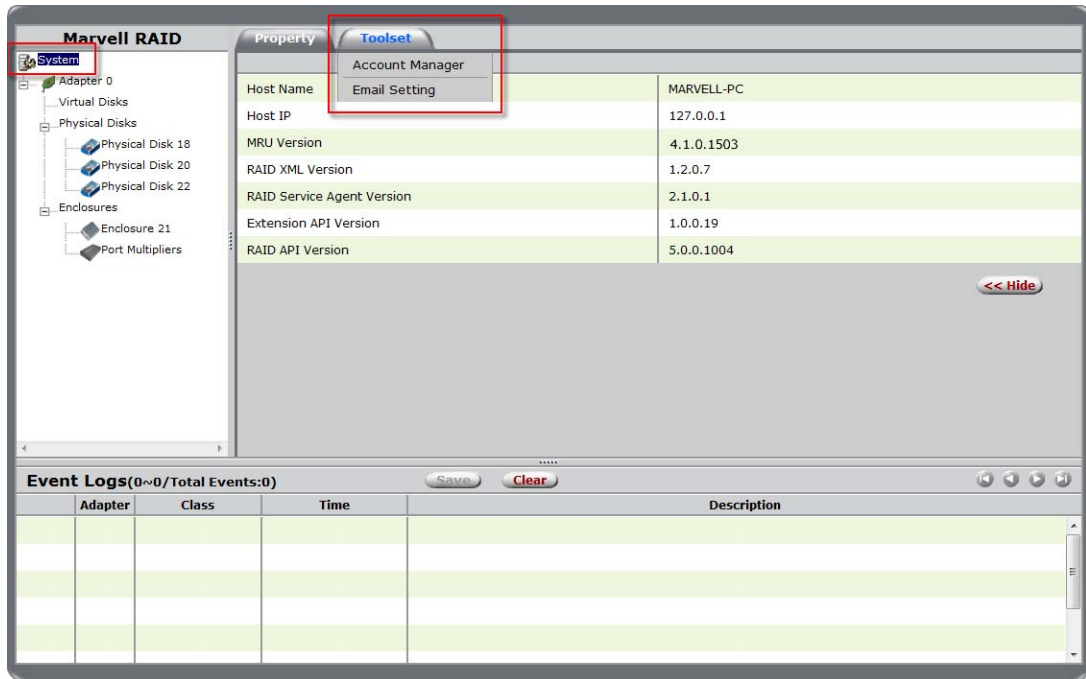
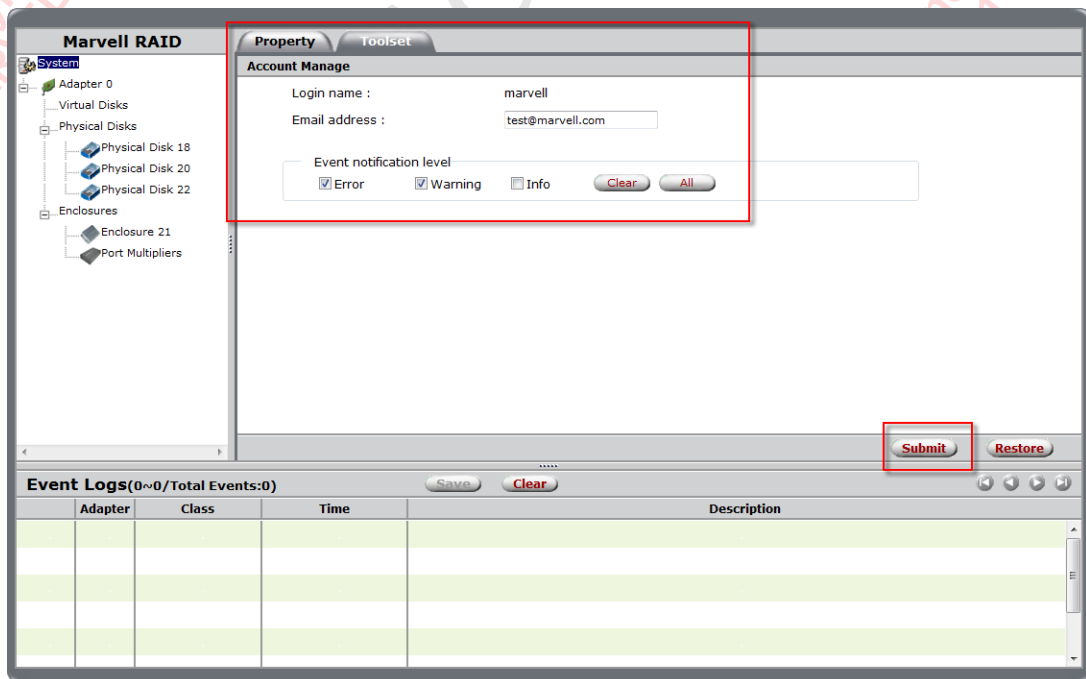


Figure 3-46 Account Manage



3. Type the **E-mail address**, as shown in Figure 3-46.

**Note:** The E-mail address must be valid for the SMTP server configured in Email Setting.

4. Specify the event types that trigger email notifications by selecting options for **Event notification level**, as shown in Figure 3-46.
  5. Select **Submit** to save settings.
- MRU confirms changes with the message **Account updated successfully!**

### 3.7.2 Viewing Events using Windows Event Viewer

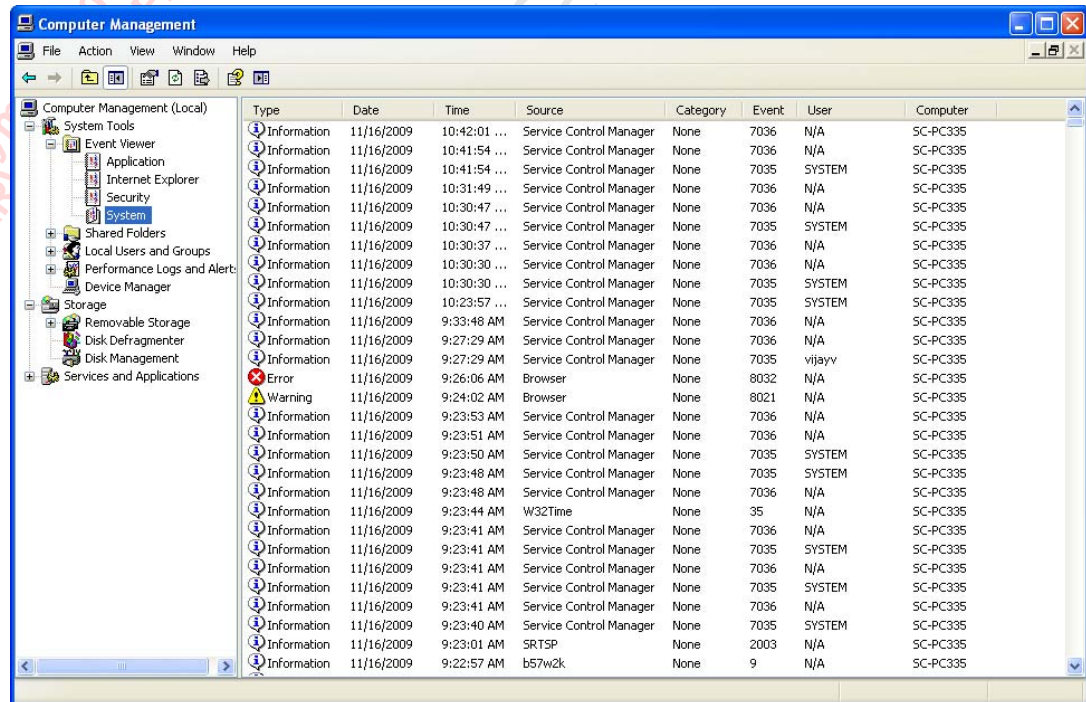
**Note:** This section applies only to Windows OS.

In Windows, MRU events can also be viewed in the Event Viewer (since adapter events are triggered by the OS/driver).

#### To view events in the Windows Event Viewer

1. From the **Start** menu, right-click **My Computer**, and select **Manage**.  
The **Computer Management** utility appears, as shown in Figure 3-47.
2. Browse to **System Tools > Event Viewer > System** to view all system events including that of MRU, as shown in Figure 3-47.

Figure 3-47 Event Viewer (Windows XP)



### 3.7.3 Enabling Alarm for Critical Events

MRU can play an audible alarm when critical events (warning and error) occur. When a hardware buzzer is present, the buzzer is also sounded. The audible alarm is disabled by default.

The alarm can be enabled/disabled from the following two locations:

- The **Property** tab for the **Adapter** provides options to enable/disable/mute the alarm, as shown in Figure 3-48.
- In Windows, you can also use the **Tray Application**, as shown in Figure 3-49.

Figure 3-48 Enabling Alarm using MRU

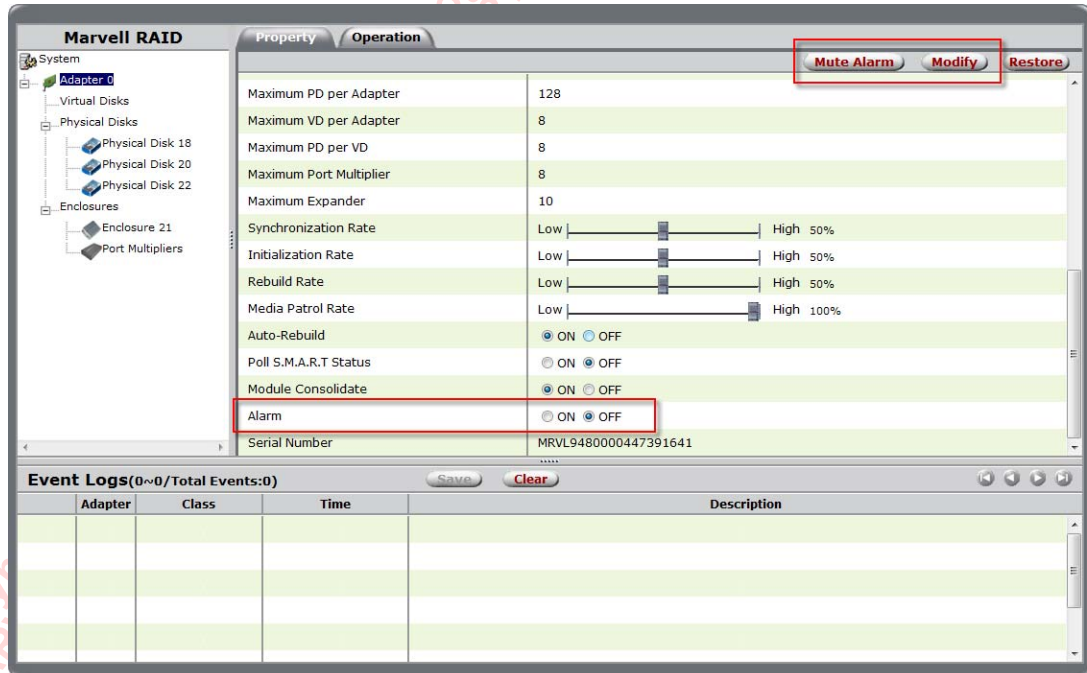


Figure 3-49 Enabling Alarm using Tray Application



**Note:** See 2.4.2, [Enable/Disable Alarm](#) for information on enabling/disabling alarm using the Tray Application.



## 3.8 Migrating Virtual Disk

This section discusses the following:

- [Migrating Virtual Disk to Higher RAID Level](#)
- [Expanding Disk Capacity on Operating Virtual Disk](#)

### 3.8.1 Migrating Virtual Disk to Higher RAID Level

It is not possible to migrate a virtual disk to another RAID level. If you wish to change the RAID level for an operating virtual disk, create a new virtual disk with the desired configuration and transfer data from the existing virtual disk.

**Note:** RAID-On-Chip controllers support migration of arrays to a higher RAID Level. See 5.9.1, [Migrating Array to Higher RAID Level](#).

### 3.8.2 Expanding Disk Capacity on Operating Virtual Disk

It is not possible to expand disk capacity on an operating virtual disk. If you wish to expand capacity, create a new virtual disk with the desired configuration and transfer data from the existing virtual disk.

**Note:** RAID-On-Chip controllers support capacity expansion of operating arrays. See 5.9.1, [Migrating Array to Higher RAID Level](#).

## 3.9 Rebuilding Degraded Virtual Disk

MRU can rebuild a fault-tolerant virtual disk by reconstructing data from parity or mirror information from the member physical disks. When a virtual disk becomes degraded due to the failure of one or more physical disks, MRU updates the status of the virtual disk to Degraded. The degraded virtual disk can be rebuilt in the following ways:

- Automatically Rebuilding Degraded Virtual Disk
- Manually Rebuilding Degraded Virtual Disk

### 3.9.1 Automatically Rebuilding Degraded Virtual Disk

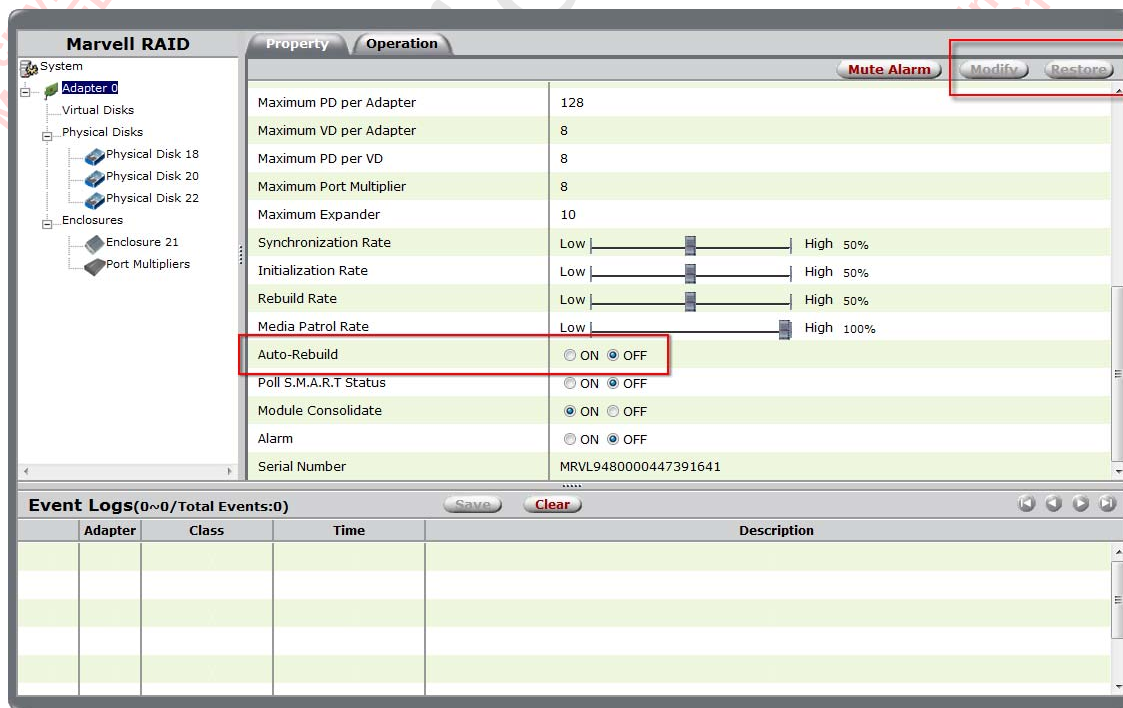
This section discusses the following:

- Enabling Auto-Rebuild
- Auto-Rebuild with Hot Spare
- Auto-Rebuild with Hot Swap

#### 3.9.1.1 Enabling Auto-Rebuild

Auto-Rebuild is disabled by default. You can enable **Auto-Rebuild** in the **Property** tab for the **Adapter**, as shown in Figure 3-50. After enabling Auto-Rebuild, select **Modify** to confirm the change.

Figure 3-50 Enabling Auto-Rebuild



**Note:** If your degraded virtual disk does not auto-rebuild even when a global spare drive is available, verify that the spare drive is suitable for the virtual disk.



### 3.9.1.2 Auto-Rebuild with Hot Spare

When Auto-Rebuild is enabled and a suitable global spare drive is available, MRU can automatically rebuild a virtual disk when it becomes degraded. To assign a physical disk as a global spare drive, see section 3.5.5, [Assigning Physical Disk as Global Spare Drive](#).

### 3.9.1.3 Auto-Rebuild with Hot Swap

In the absence of a global spare drive, you can auto-rebuild by hot-swapping another physical disk in the same location. MRU automatically rebuilds the virtual disk when it detects an online physical disk at that location.

## 3.9.2 Manually Rebuilding Degraded Virtual Disk

This section describes the procedure for manually rebuilding a degraded virtual disk when Auto-Rebuild is disabled.

### To manually rebuild a degraded virtual disk

1. Select the degraded **Virtual Disk** in the list of system devices, as shown in Figure 3-51.
2. Roll-over the **Operation** tab, and select **Rebuild**, as shown in Figure 3-51.

MRU displays available global spare drives, as shown in Figure 3-52.

**Note:** To assign a physical disk as a global spare drive, see section 3.5.5, [Assigning Physical Disk as Global Spare Drive](#).

Figure 3-51 Degraded Virtual Disk

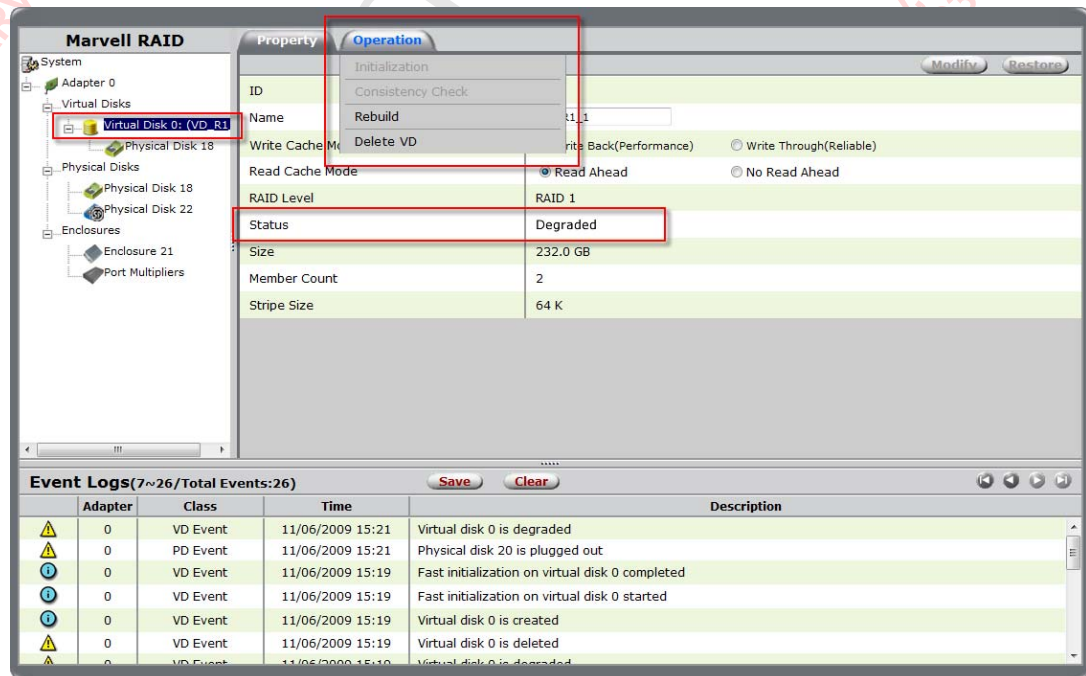
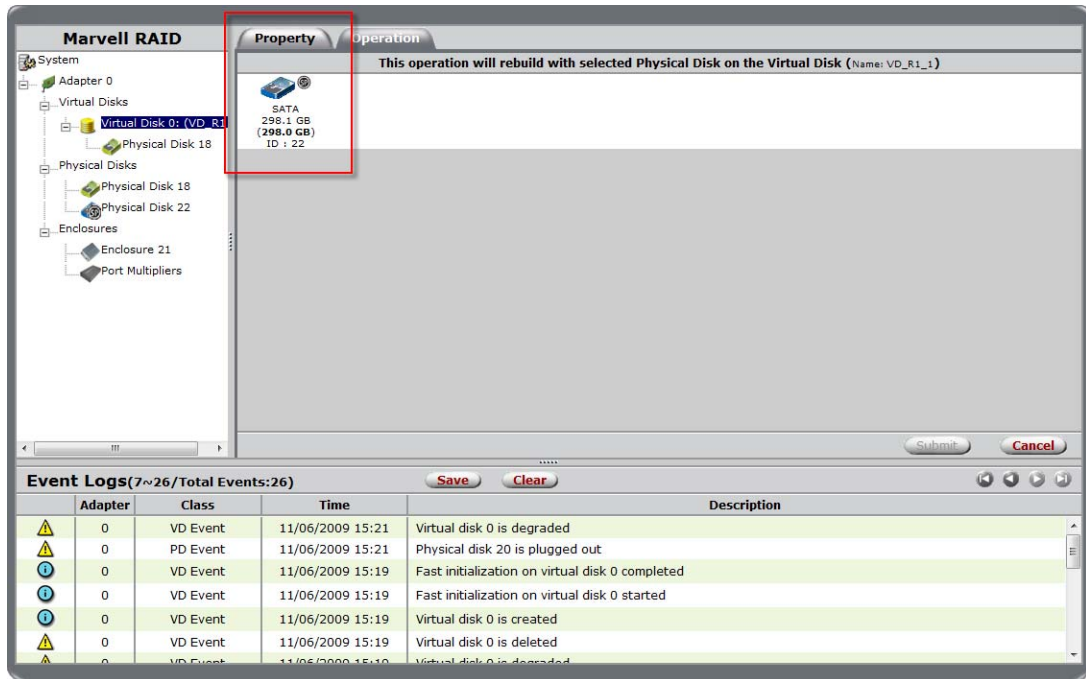


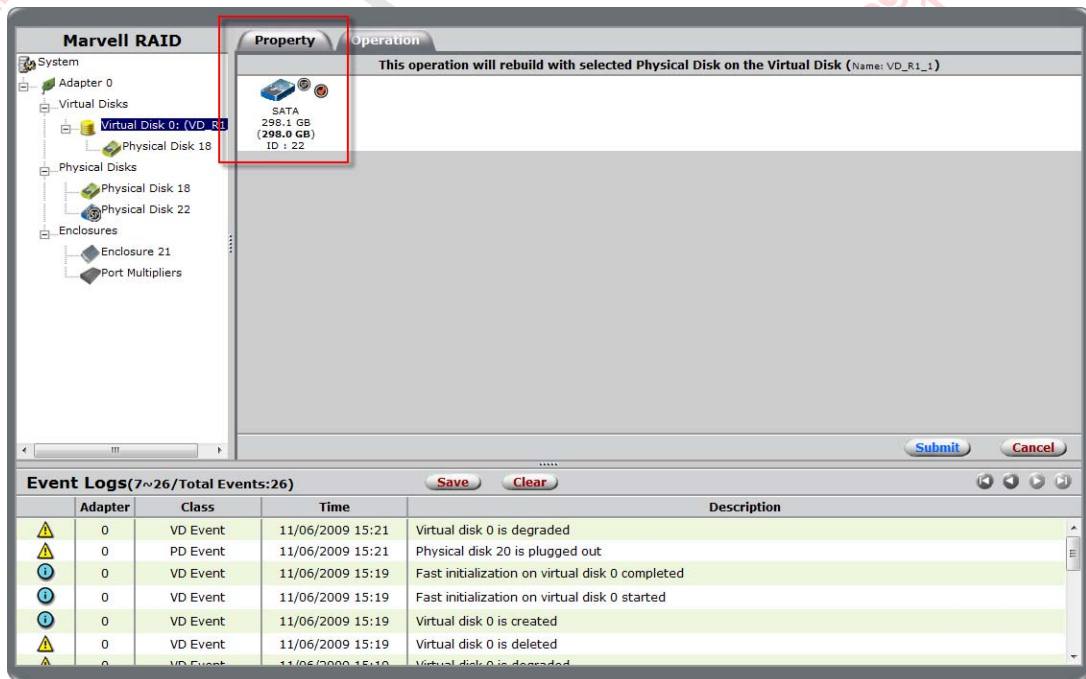
Figure 3-52 Available Global Spare Drives



3. Select **Spare Drive(s)** from the list, as shown in Figure 3-52.

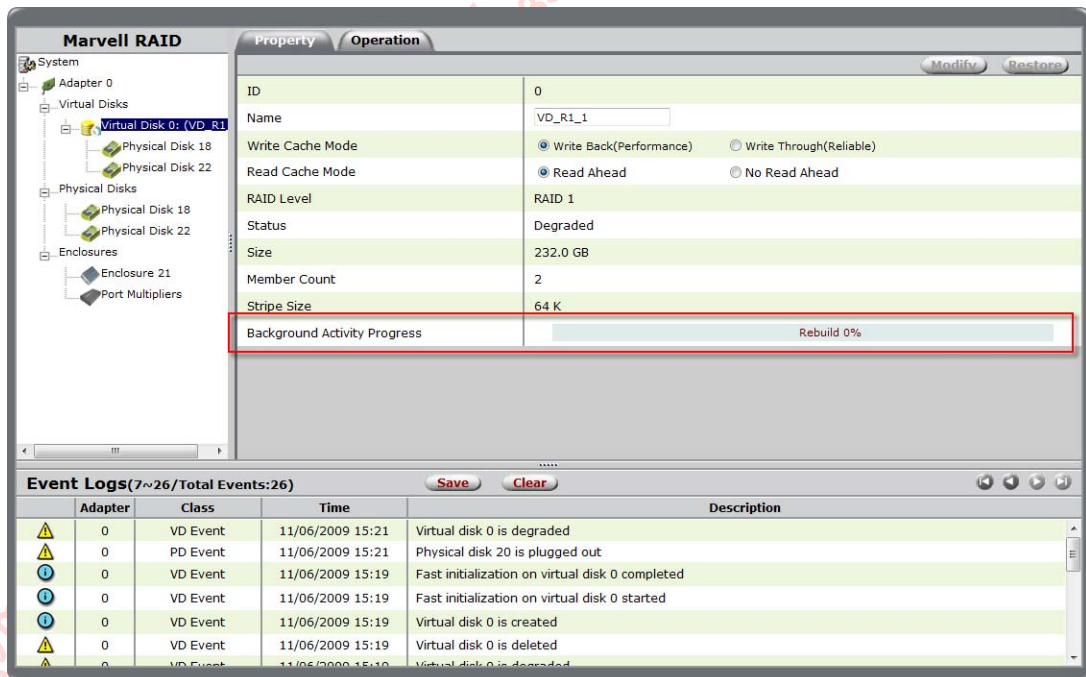
When a spare drive is selected, a check mark is placed next to it, as shown in Figure 3-53.

Figure 3-53 Select Spare Drive



4. Select **Submit** to begin the rebuild process, as shown in Figure 3-53.  
MRU displays the **Background Activity Progress** in the **Property** tab for the **Virtual Disk**, as shown in Figure 3-54.

**Figure 3-54 Rebuild Status**



5. Options to **Pause**, **Resume**, and **Stop** Rebuild are available in the **Operation** tab for the **Virtual Disk**.

## 3.10 Deleting Virtual Disk

This section describes the procedure for deleting a virtual disk.

**Note:** After deleting a virtual disk, the physical disks constituting the virtual disk become available for use in other virtual disks.

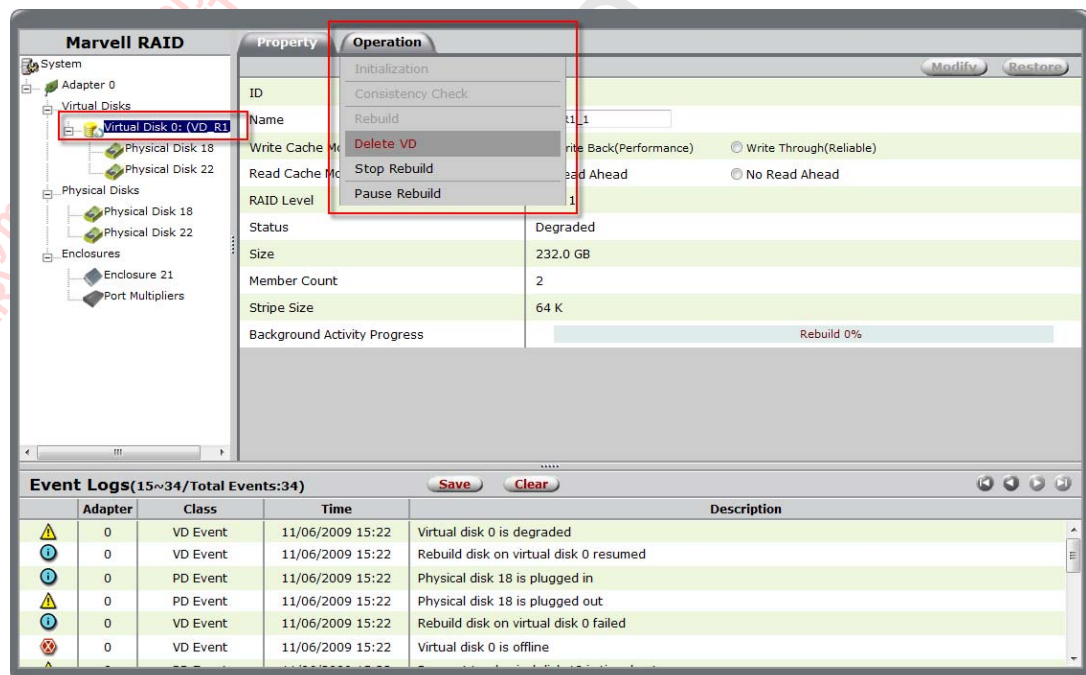
### To delete a virtual disk

**WARNING** Deleting a virtual disk permanently erases all data on the virtual disk. However, you can choose to keep partition information on the virtual disk.



1. Select the **Virtual Disk** in the list of system of devices.  
The **Property** tab for the Virtual Disk appears.
2. Roll-over the **Operation** tab and select **Delete VD**, as shown in Figure 3-55.

Figure 3-55 Delete VD



3. MRU displays the warning **All data on this virtual disk will be erased once it is deleted!**  
Select **OK** to acknowledge the warning.
4. MRU requests confirmation of deletion with a pop-up message **Are you sure you want to delete this virtual disk?**  
Select **OK** to confirm deletion.
5. MRU displays a pop-up message asking **Do you want to delete the partition information if this has one?**  
Select **OK** to delete partition information or **Cancel** to keep partition information.

## 3.11 Updating RAID Controller BIOS

The RAID controller BIOS can be updated using MRU. Before updating the BIOS, it is recommended that you backup the existing BIOS. This is useful if you need to revert to the existing BIOS for any reason.

This section discusses the following:

- Backup BIOS
- Update BIOS

### 3.11.1 Backup BIOS

This section describes the procedure to backup the existing RAID controller BIOS image.

To backup BIOS

1. Select **Adapter**.
2. Roll-over the **Operation** tab, and select **Backup BIOS**, as shown in Figure 3-56.

A **File Download** dialog appears, as shown in Figure 3-57.

Figure 3-56 Backup BIOS

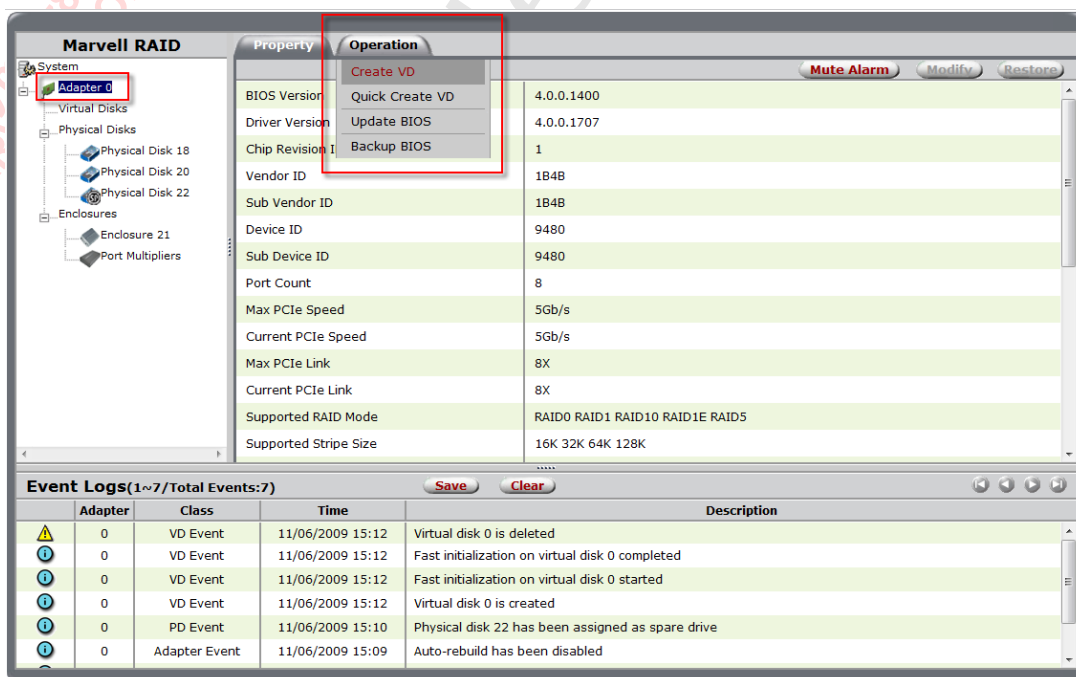
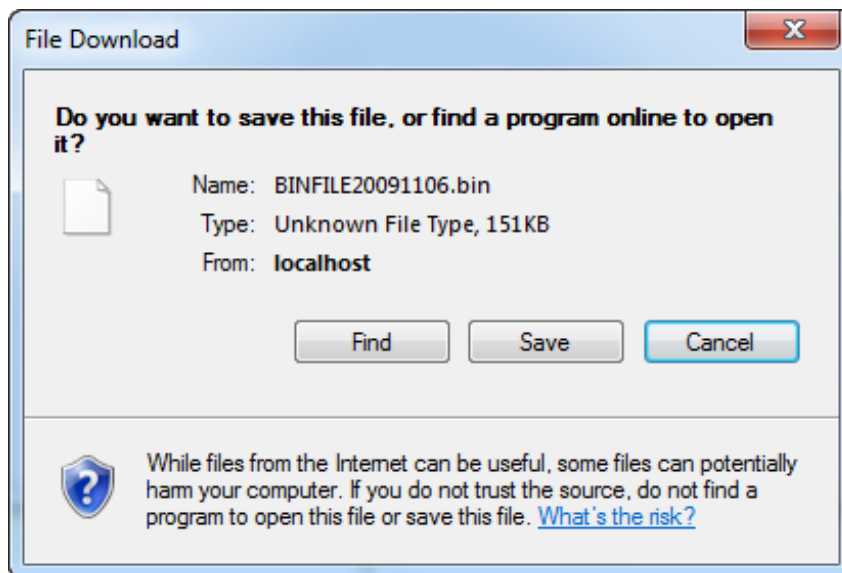


Figure 3-57 Backup Existing BIOS Image



3. Select **Save** and follow on-screen instructions to save the file to the desired location.

### 3.11.2 Update BIOS

This section describes the procedure to update the RAID controller BIOS image.

#### To Update the BIOS

1. Backup the BIOS, as described in section 3.11.1, [Backup BIOS](#).
2. Select **Adapter**.
3. Roll-over the **Operation** tab, and select **Update BIOS**, as shown in Figure 3-58.

A **Update BIOS** dialog appears, as shown in Figure 3-59.



Figure 3-58 Update BIOS

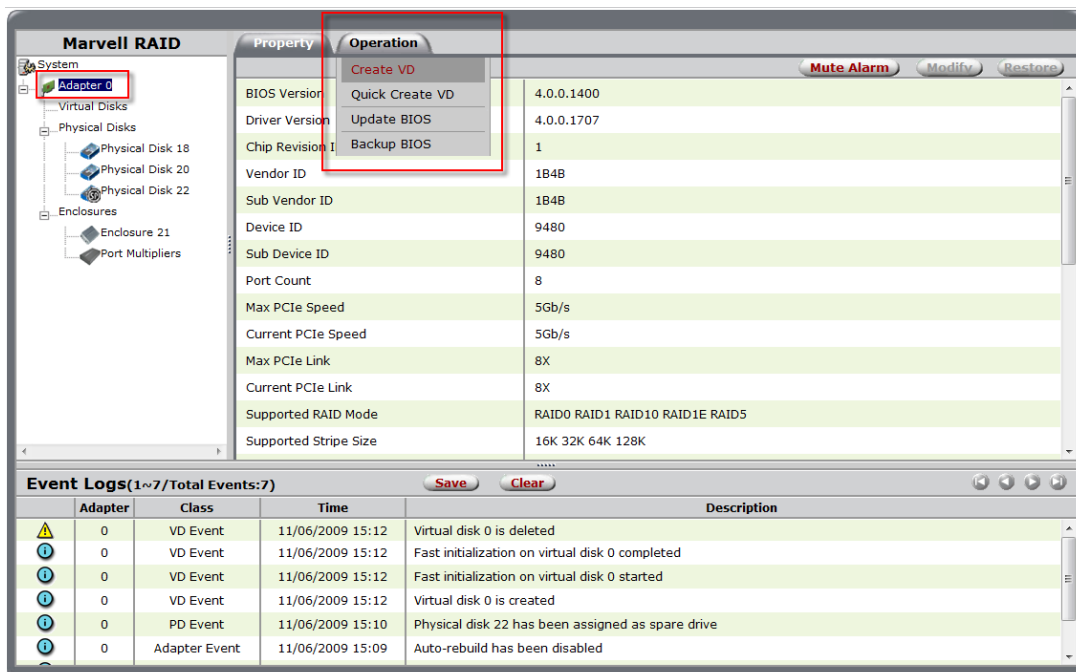
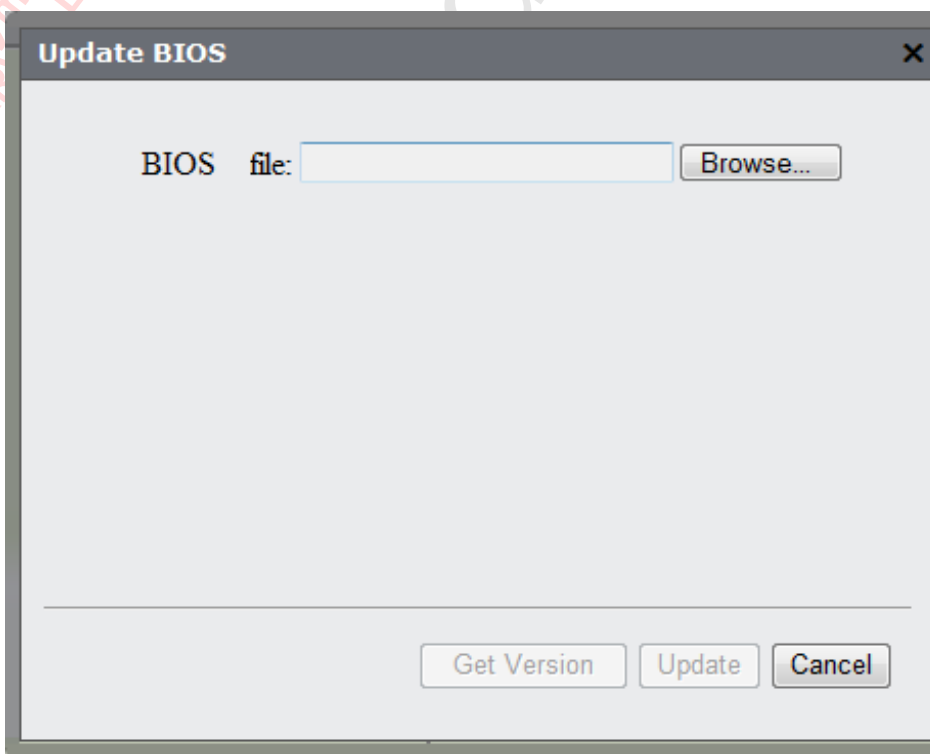


Figure 3-59 Update BIOS Image



4. **Browse** to the location of the BIOS image, and select **Update** to update BIOS image.



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# 4

## MRU FOR IO PROCESSORS (IOP)

This chapter contains the following sections:

- Overview
- Creating Virtual Disk
- Managing Virtual Disk
- Managing Physical Disks
- Managing Enclosures
- Monitoring Virtual Disk
- Migrating Virtual Disk
- Rebuilding Degraded Virtual Disk
- Deleting Virtual Disk

## 4.1 Overview

An IO Processor (IOP) is similar to an IOC, except that it contains an on-board CPU that enables hardware RAID functionality. At this time, MRU supports the Marvell 88SE91xx 6 Gbps SATA RAID IOP can create and manage RAID 0 and RAID 1 virtual disks.

**Note:** MRU v4.1.1503 is an early build that does not offer complete support for 88SE91xx IOP. The Marvell BIOS Utility (MBU) for 88SE91xx offers more flexibility for creating and managing virtual disks. For more information, see Appendix A, [MBU for 88SE91xx IO Processor \(IOP\)](#). Check the OEM website for an updated version of MRU that offers enhanced support for the 88SE91xx.

## 4.2 Creating Virtual Disk

This section discusses the following:

- Optimizing Virtual Disk for Performance/Reliability
- Customizing Virtual Disk for your Application

### 4.2.1 Optimizing Virtual Disk for Performance/Reliability

This section describes the procedure to quickly create a virtual disk that is optimized for either best read/write performance or best fault tolerance (reliability).

**Note:** This is particularly useful if you are new to RAID technology and are not sure about which RAID level suits your application the most.

**To quickly create virtual disk optimized for performance/reliability**

1. Select **Adapter**.
2. Roll-over the **Operation** tab, and select **Quick Create VD**, as shown in Figure 4-1.  
The **Create Options** screen appears, as shown in Figure 4-2.

**Figure 4-1 Quick Create VD**

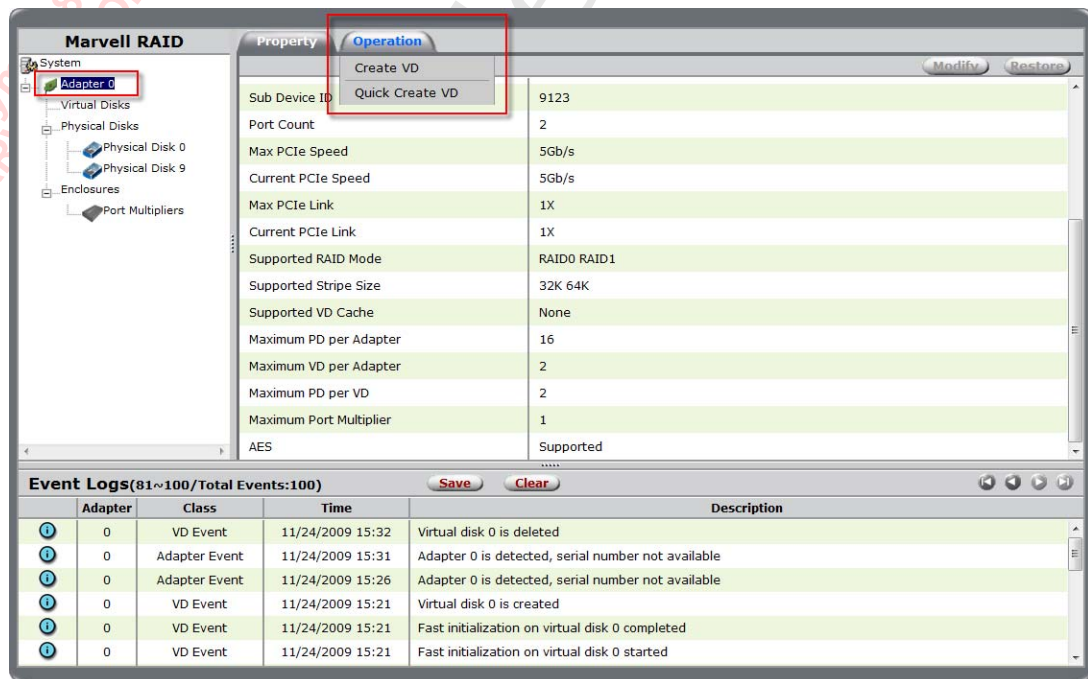
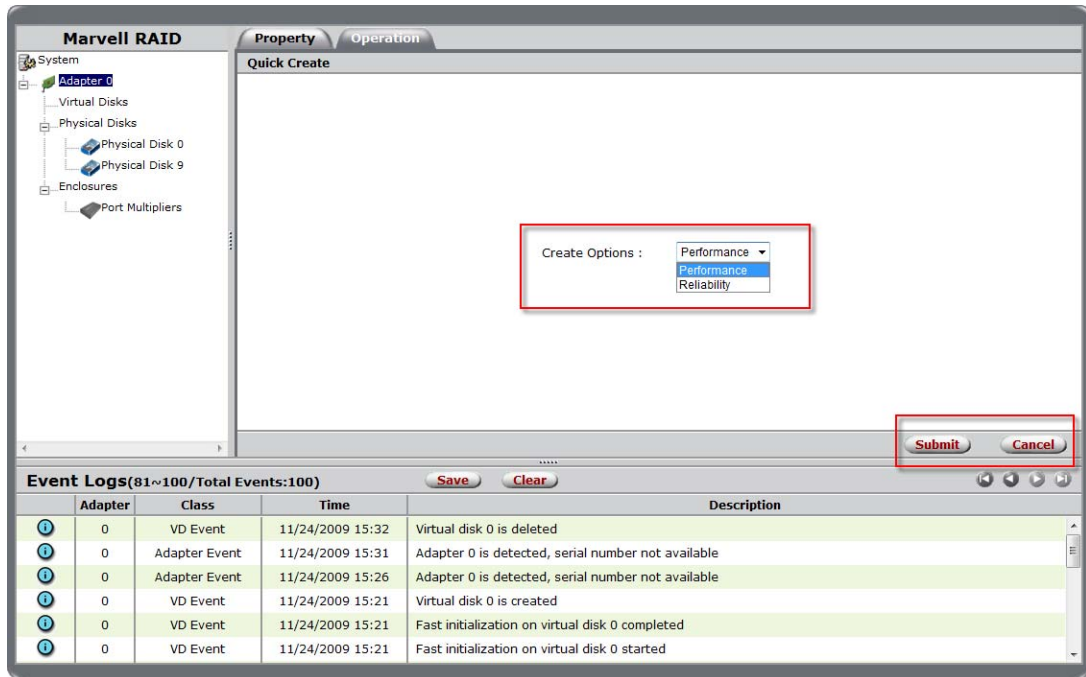


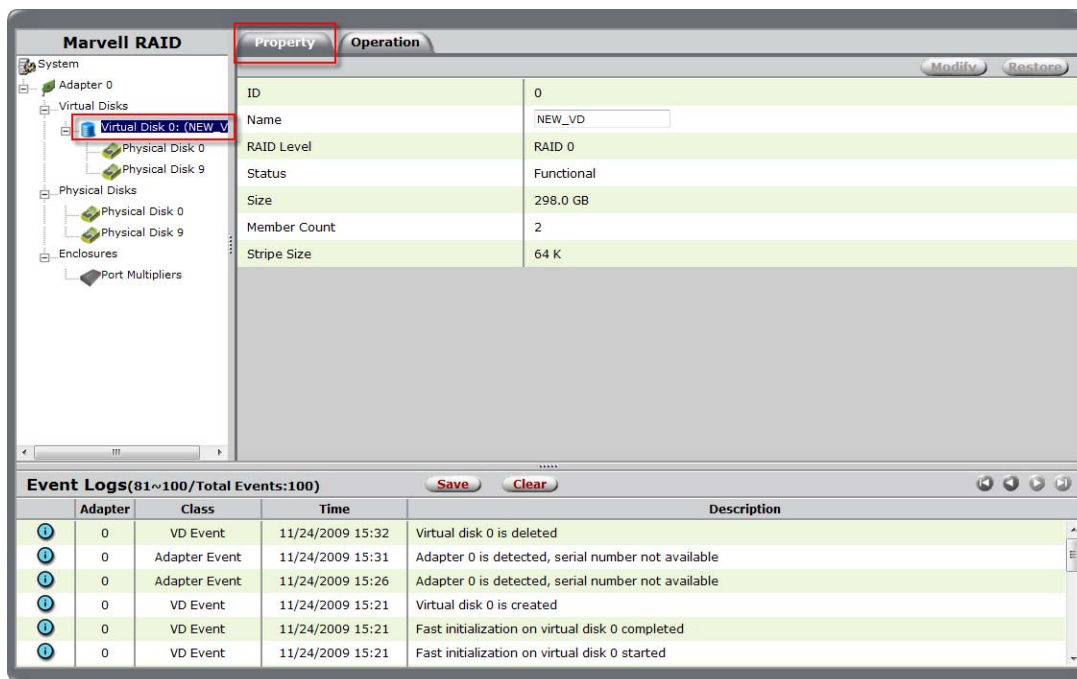
Figure 4-2 Create Options



3. As shown in Figure 4-2, select one of the following options:
  - Select **Performance** for creating a virtual disk that is optimized for best read and write performance.
  - Select **Reliability** for creating a virtual disk that is optimized for best fault tolerance.

Based on the performance/reliability selection and the capabilities of the RAID controller, MRU creates a suitable virtual disk using some or all available physical disks.
4. After creating the virtual disk, MRU displays the **Property** tab for the new **Virtual Disk**, as shown in Figure 4-3.

Figure 4-3 VD Created



## 4.2.2 Customizing Virtual Disk for your Application

This section describes the procedure to create a custom virtual disk that is most suitable for your application.

**Note:** MRU v4.1.1503 is an early build that does not offer complete support for 88SE91xx IOP. The Marvell BIOS Utility (MBU) for 88SE91xx offers more flexibility for creating and managing virtual disks. For more information, see Appendix A, [MBU for 88SE91xx IO Processor \(IOP\)](#). Check the OEM website for an updated version of MRU that offers enhanced support for the 88SE91xx.

**To create a custom virtual disk most suitable for your application**

1. Select **Adapter**.
2. Roll-over the **Operation** tab, and select **Create VD**, as shown in Figure 4-4.  
The **Create New VD** screen appears, as shown in Figure 4-5.

Figure 4-4 Create VD

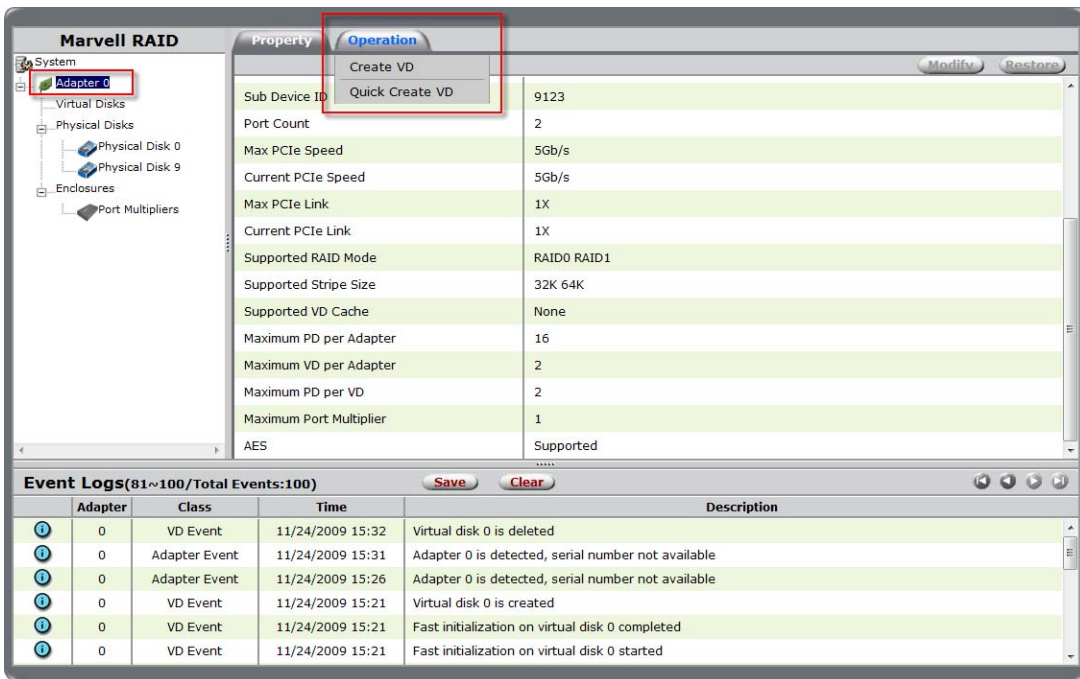
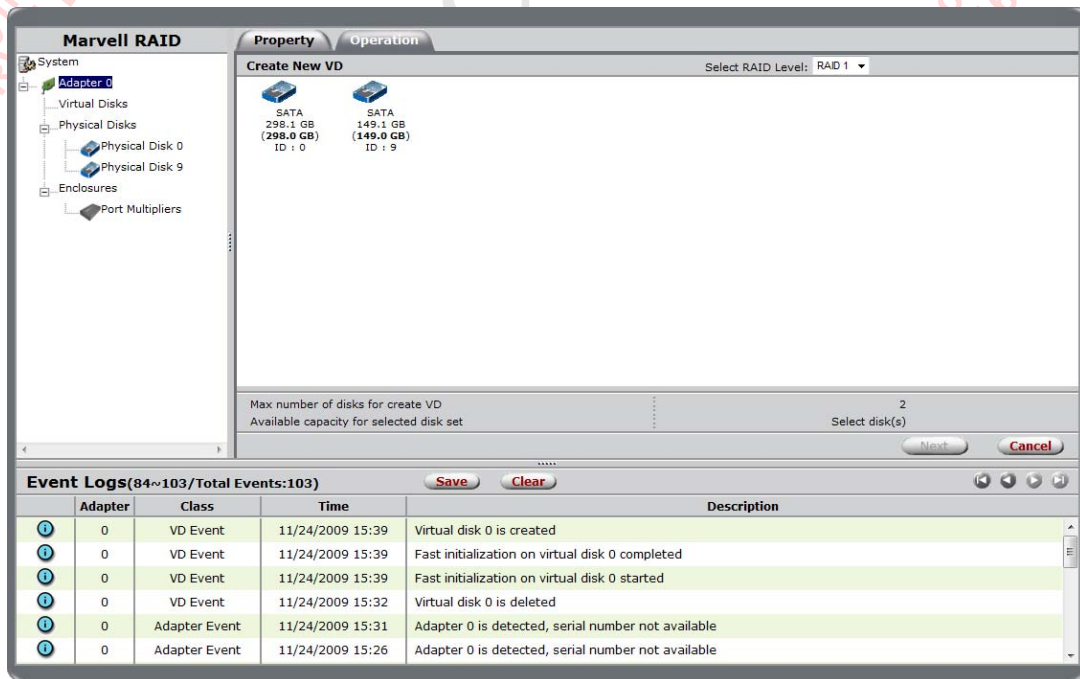


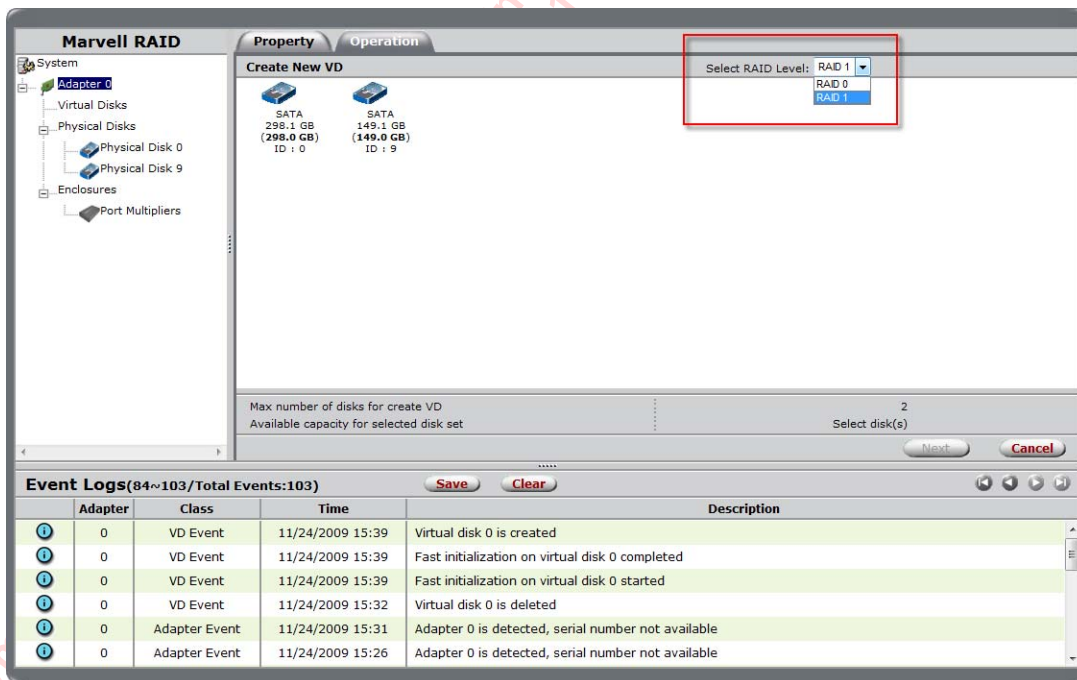
Figure 4-5 Create New VD





3. **Select RAID Level** suitable for your application, as shown in Figure 4-6.  
For information on RAID levels, see Appendix B, [Selecting a RAID Level](#).

Figure 4-6 Select RAID Level



**Note:** Marvell RAID controllers support different sets of RAID levels depending on the hardware model and OEM software package. Some software packages, depending on OEM selections, support limited RAID levels by design. Check with the OEM vendor for information specific to your controller.



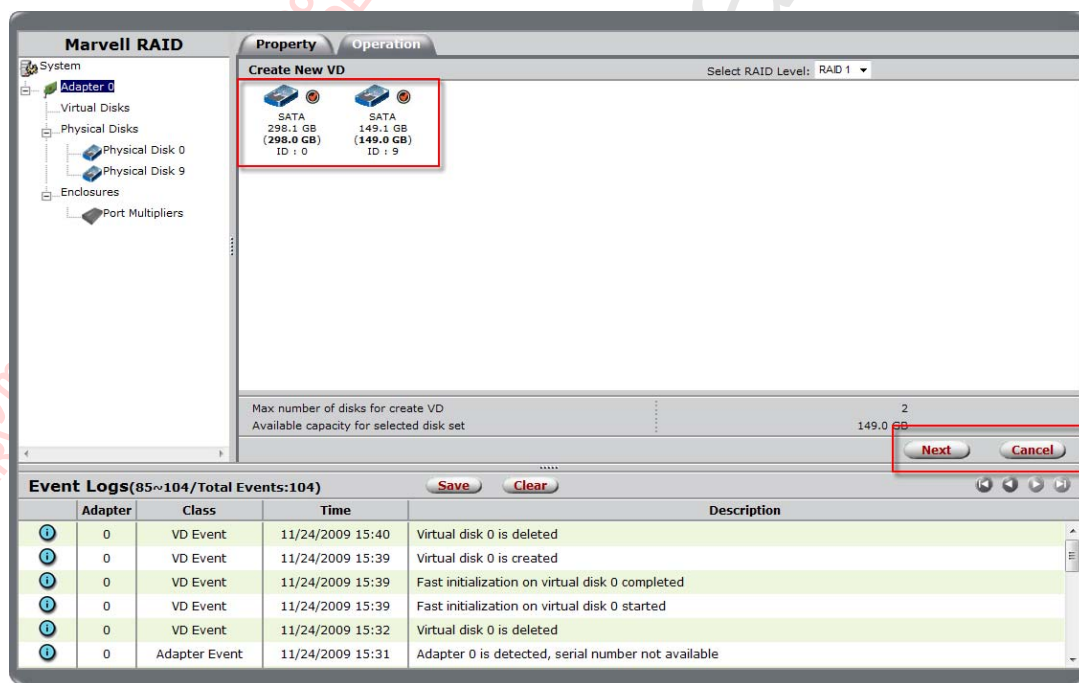
4. Table 4-1 lists the minimum number of physical disks required for different RAID levels.

**Table 4-1 Minimum Number of Physical Disks**

Controller	Minimum Number of Physical Disks Required for RAID Level							
	0	1	1E	5	6	10	50	60
IO Processor (IOP)	2	2	3	3	4	4	6	8

Add the required number of physical disks for the selected RAID level from the list of available physical disks, as shown in Figure 4-6. When selected, a check-mark appears to the right of the physical disk, as shown in Figure 4-7.

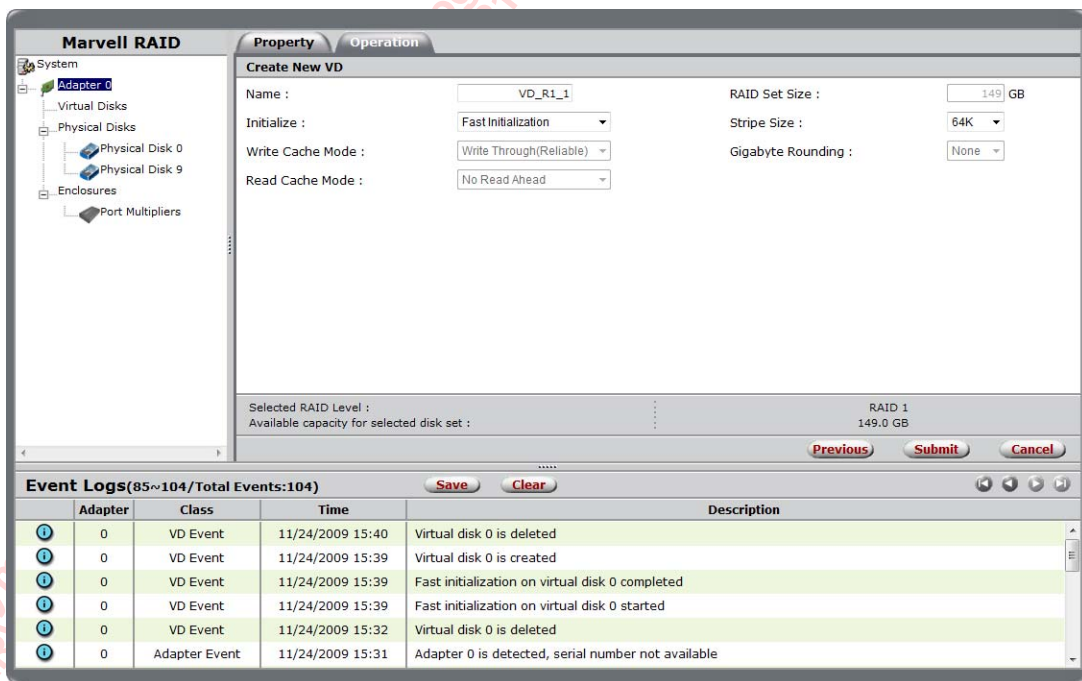
**Figure 4-7 Select Physical Disks**



- After selecting the physical disks, select **Next** as shown in Figure 4-7.  
The **Create New VD** screen now presents options to configure the virtual disk, as shown in Figure 4-8.

**Note:** Next is grayed-out until the minimum required number of physical disks are selected.

Figure 4-8 Create New VD



Adapter	Class	Time	Description
0	VD Event	11/24/2009 15:40	Virtual disk 0 is deleted
0	VD Event	11/24/2009 15:39	Virtual disk 0 is created
0	VD Event	11/24/2009 15:39	Fast initialization on virtual disk 0 completed
0	VD Event	11/24/2009 15:39	Fast initialization on virtual disk 0 started
0	VD Event	11/24/2009 15:32	Virtual disk 0 is deleted
0	Adapter Event	11/24/2009 15:31	Adapter 0 is detected, serial number not available

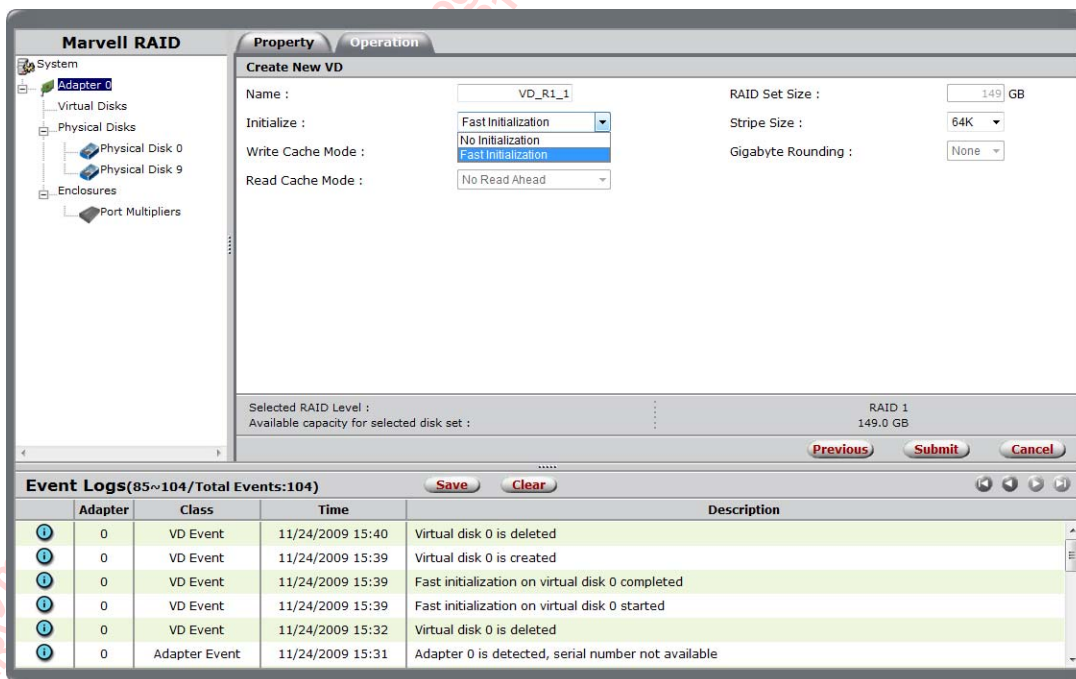
- As shown in Figure 4-8, MRU assigns a default name to the virtual disk. You can type a new name in the **Name** field.

7. After selecting the Name, select the **Initialization** method for the virtual disk.

As shown in Figure 4-9, MRU has three options for Initialization, with the default being **Fast Initialization**.

**Note:** For information on Initialization, see Appendix D, [Glossary](#).

**Figure 4-9 Initialization**



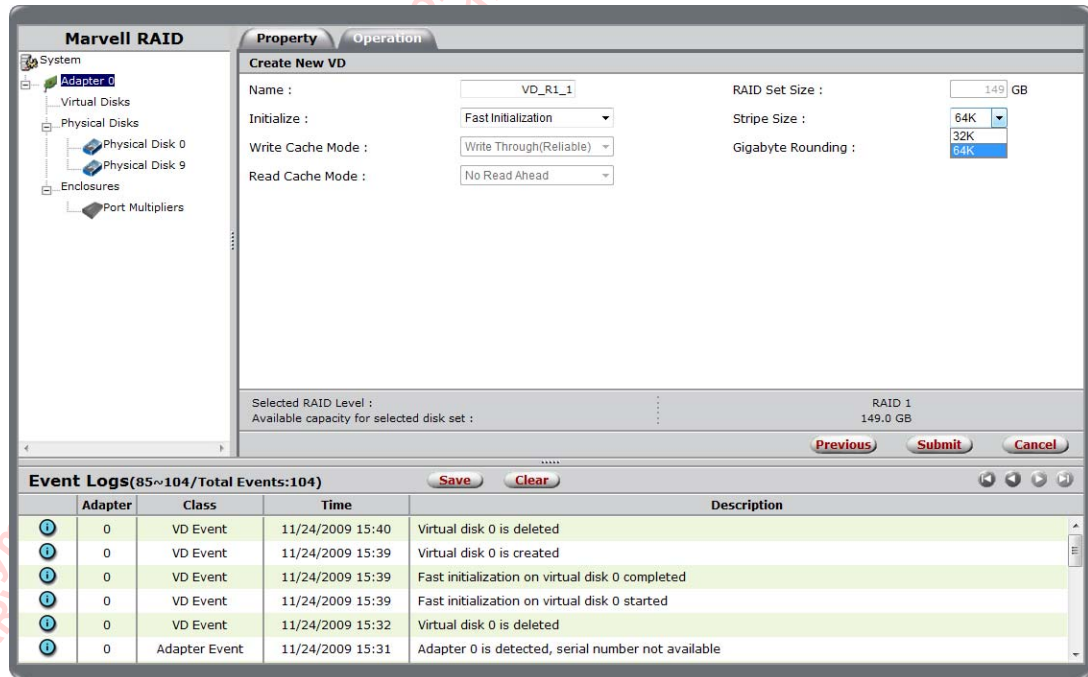
Adapter	Class	Time	Description
0	VD Event	11/24/2009 15:40	Virtual disk 0 is deleted
0	VD Event	11/24/2009 15:39	Virtual disk 0 is created
0	VD Event	11/24/2009 15:39	Fast initialization on virtual disk 0 completed
0	VD Event	11/24/2009 15:39	Fast initialization on virtual disk 0 started
0	VD Event	11/24/2009 15:32	Virtual disk 0 is deleted
0	Adapter Event	11/24/2009 15:31	Adapter 0 is detected, serial number not available

8. After selecting the Name, select **Stripe Size** for the virtual disk.

As shown in Figure 4-10, the RAID controller being used has four options for Stripe Size, with the default being **64K**.

**Note:** Availability of Stripe Sizes depends on the capabilities of the controller. For information on Stripe Size, see Appendix D, [Glossary](#).

**Figure 4-10 Stripe Size**

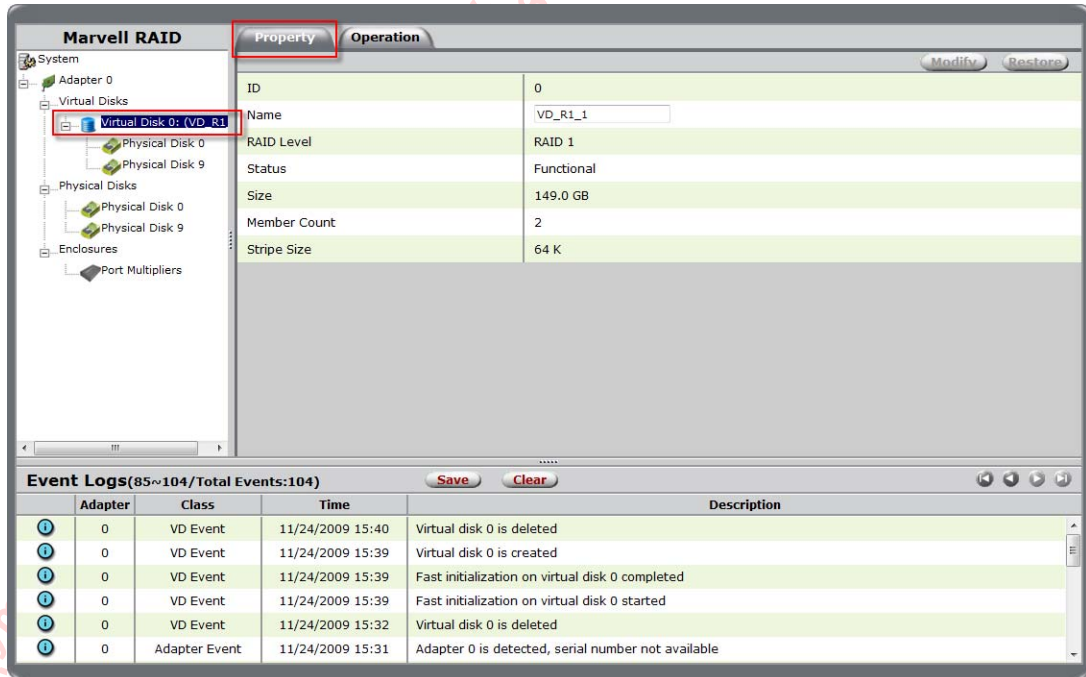


**Note:** The MBU for 88SE91xx supports selection of Gigabyte Rounding. For more information, see Appendix A, [MBU for 88SE91xx IO Processor \(IOP\)](#)

9. After selecting Stripe Size, select **Submit** to create the virtual disk.

MRU creates the virtual disk and displays the **Property** tab for the new virtual disk, as shown in Figure 4-11.

Figure 4-11 VD Created



## 4.3 Managing Virtual Disk

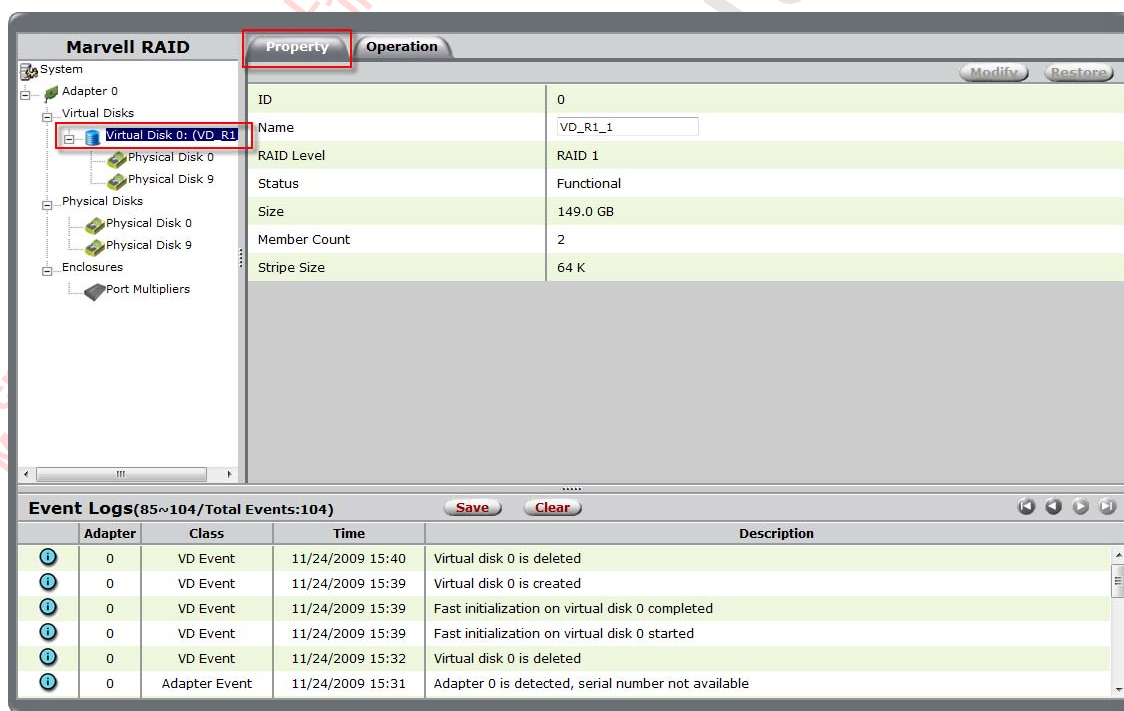
This section discusses the following:

- Viewing Properties of Virtual Disk
- Renaming Virtual Disk

### 4.3.1 Viewing Properties of Virtual Disk

To view the properties of a virtual disk, select the Virtual Disk (**Virtual Disk 0: (VD\_R1\_1)** in this example) in the list of system devices, as shown in Figure 4-12. Upon selection, MRU displays the **Property** tab for the virtual disk.

Figure 4-12 Properties of Virtual Disk



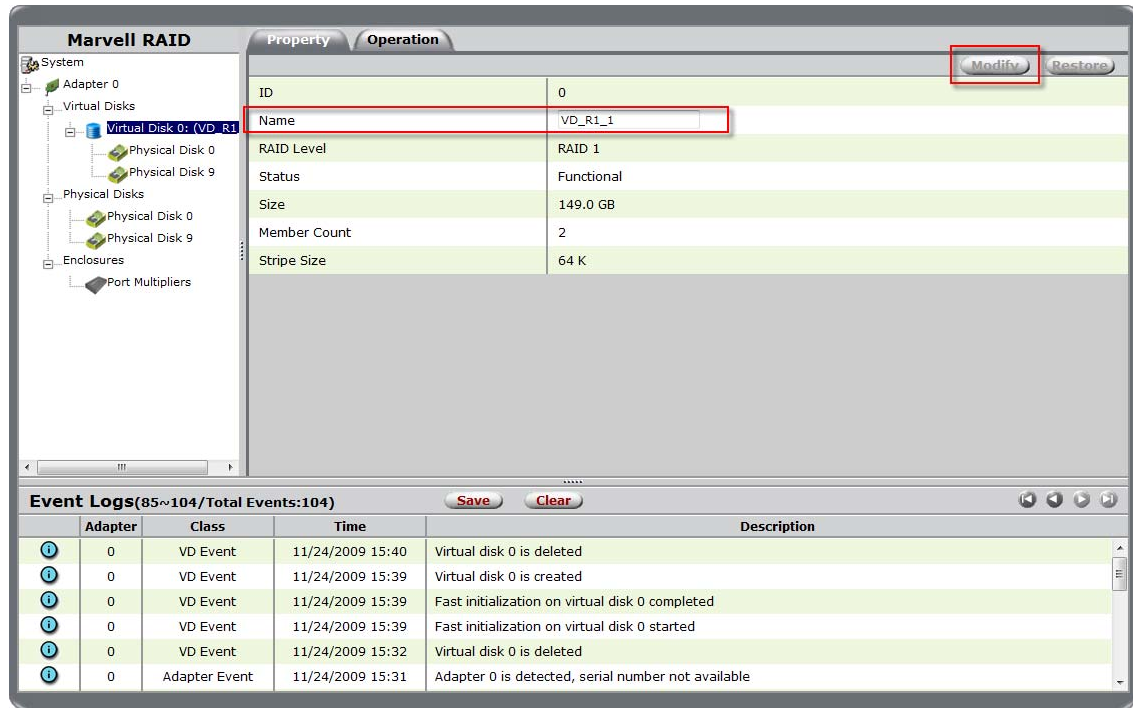
MRU uses different icons to indicate the status of the virtual disk. For more information, see Appendix C, [Icons used in MRU](#).

### 4.3.2 Renaming Virtual Disk

The name for a virtual disk can be modified from the **Property** tab for the **Virtual Disk**, as shown in Figure 4-13. Type a new name in the **Name** field and select **Modify** to confirm changes.



Figure 4-13 Renaming Virtual Disk



**Note:** Modify is grayed-out until the settings change.



## 4.4 Managing Physical Disks

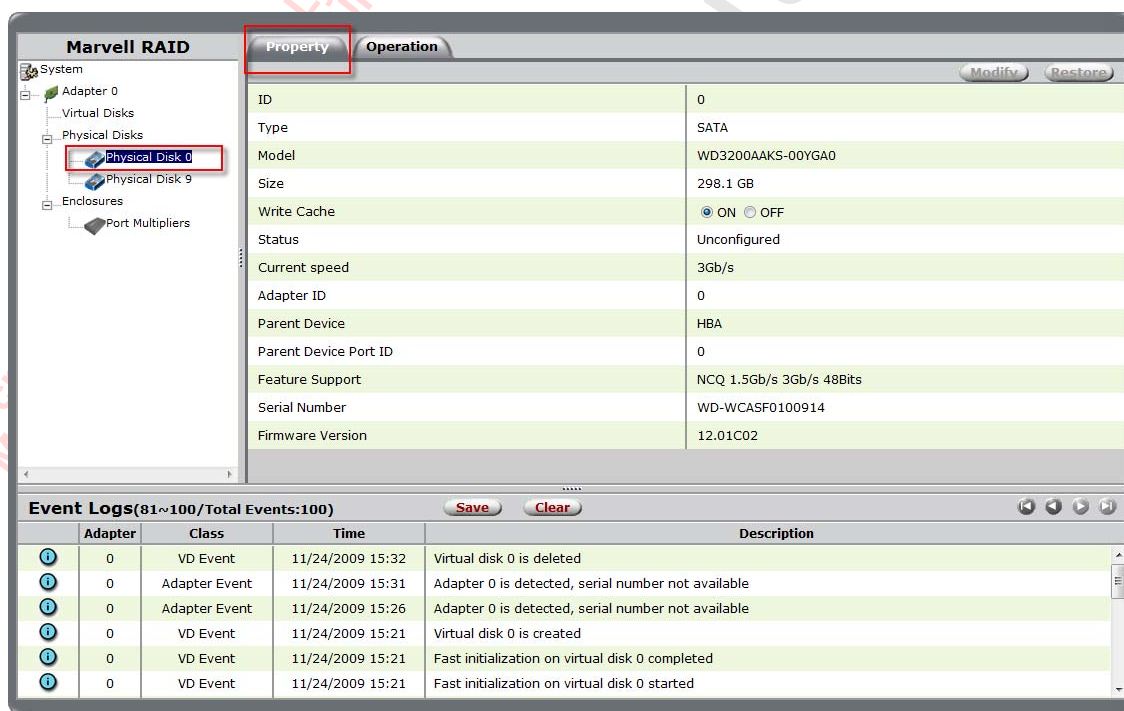
This section discusses the following:

- Viewing Properties of Physical Disk
- Erasing RAID Configuration Data on Foreign Physical Disk

### 4.4.1 Viewing Properties of Physical Disk

To view the properties of a physical disk, select the **Physical Disk** in the list of system devices, as shown in Figure 4-14. Upon selection, MRU displays the **Property** tab for the physical disk.

Figure 4-14 Properties of Physical Disk



**Note:** The properties of a physical disk can not be edited.

MRU uses different icons to indicate the status of the physical disk. For more information, see Appendix C, [Icons used in MRU](#).

### 4.4.2 Erasing RAID Configuration Data on Foreign Physical Disk

This section describes the procedure to erase RAID configuration data (if any) on a foreign physical disk.

**Note:** The RAID controller stores RAID configuration data on all physical disks that are part of a virtual disk. RAID configuration data must be erased on the physical disk before it can be used with another virtual disk.

## To erase RAID configuration data

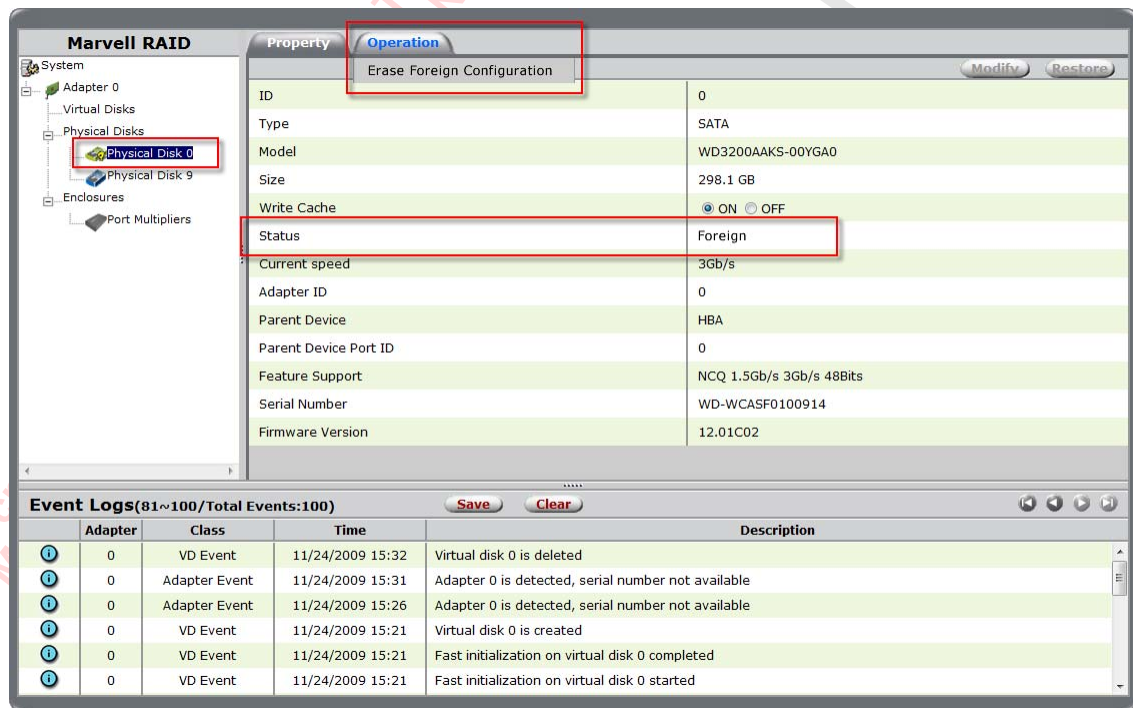
### WARNING



If the physical disk was originally part of another virtual disk, erasing RAID configuration data may damage that virtual disk, depending on its fault tolerance capabilities.

1. Select foreign **Physical Disk** in the list of system devices, as shown in Figure 4-15.
2. Rollover the **Operation** tab, and select **Erase Foreign Configuration**, as shown in Figure 4-15.

Figure 4-15 Erasing RAID Configuration Data on Physical Disk



## 4.5 Managing Enclosures

This section discusses the following:

- Viewing Properties of Port Multiplier

### 4.5.1 Viewing Properties of Port Multiplier

To view the properties of a port multiplier, select **Port Multipliers** in the list of system devices. Upon selection, MRU displays the **Property** tab listing all port multipliers connected to the RAID controller, as shown in Figure 4-16.

Select **[Detail>>]**, as shown in Figure 4-16, to view detailed properties of the port multiplier.

Figure 4-16 Properties of Port Multiplier

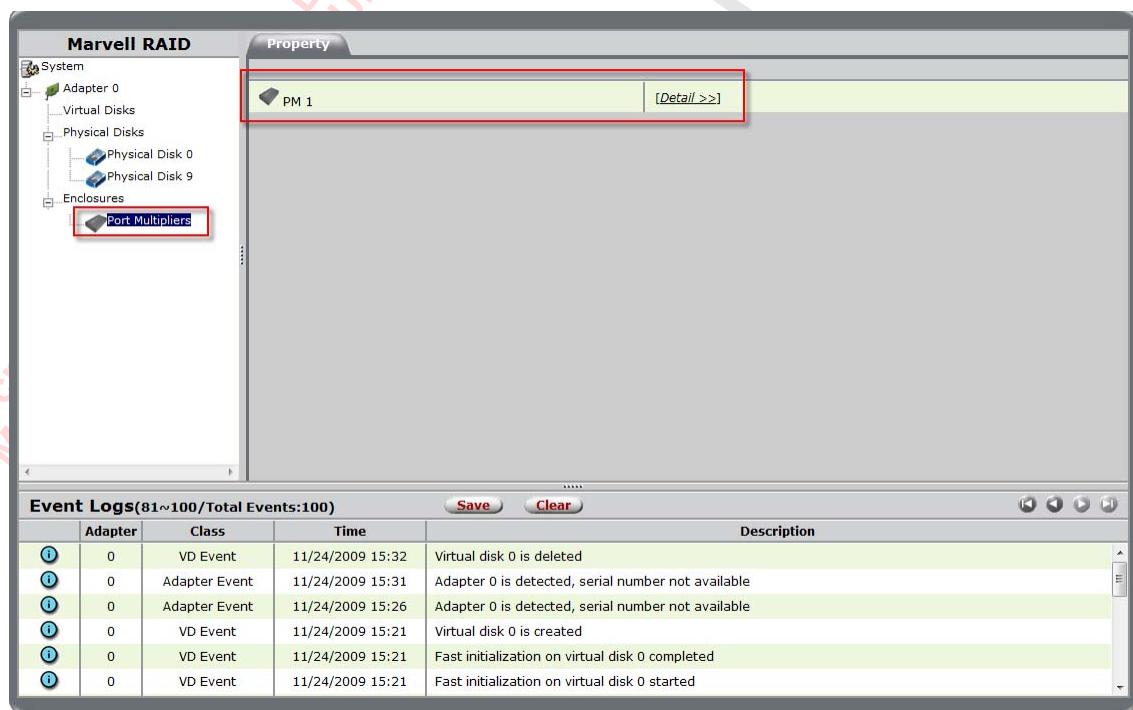
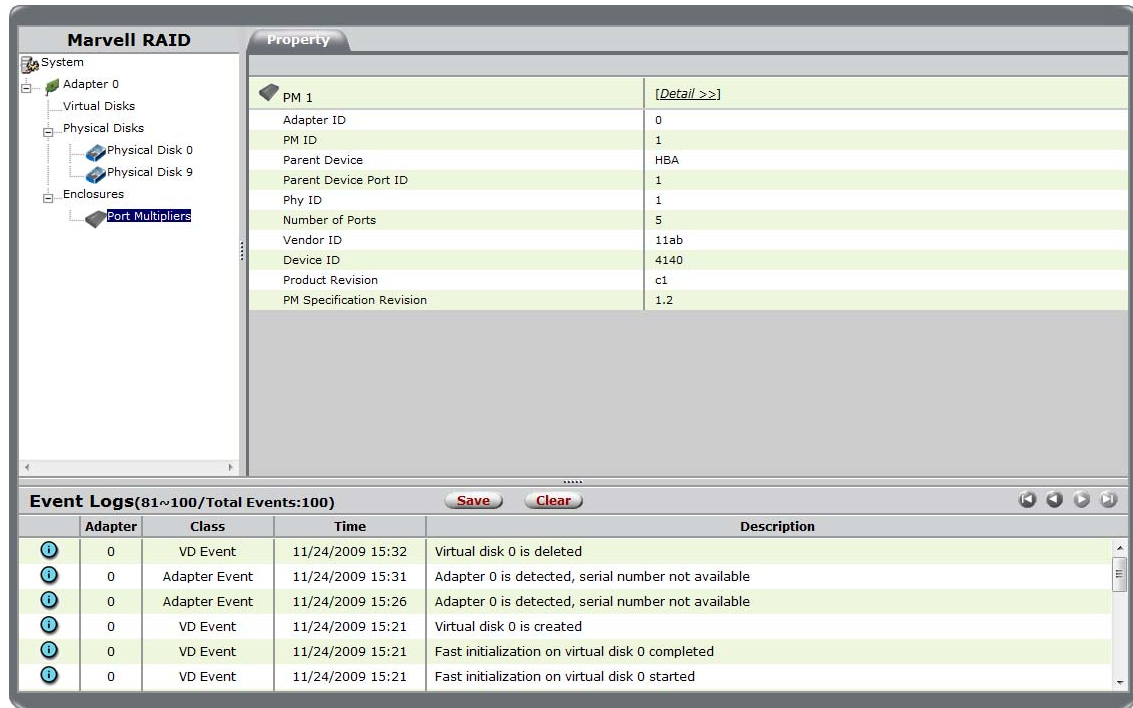


Figure 4-17 shows detailed properties of port multiplier PM 1. Select **[Detail>>]**, as shown in Figure 4-17, to hide details.

Figure 4-17 Detailed Properties of Port Multiplier



**Marvell RAID**

**Property**

Property	Value
Adapter ID	0
PM ID	1
Parent Device	HBA
Parent Device Port ID	1
Phy ID	1
Number of Ports	5
Vendor ID	11ab
Device ID	4140
Product Revision	c1
PM Specification Revision	1.2

**Event Logs(81~100/Total Events:100)**

Adapter	Class	Time	Description
0	VD Event	11/24/2009 15:32	Virtual disk 0 is deleted
0	Adapter Event	11/24/2009 15:31	Adapter 0 is detected, serial number not available
0	Adapter Event	11/24/2009 15:26	Adapter 0 is detected, serial number not available
0	VD Event	11/24/2009 15:21	Virtual disk 0 is created
0	VD Event	11/24/2009 15:21	Fast initialization on virtual disk 0 completed
0	VD Event	11/24/2009 15:21	Fast initialization on virtual disk 0 started

## 4.6 Monitoring Virtual Disk

This section discusses the following:

- Receiving E-mail Event Notifications
- Viewing Events using Windows Event Viewer
- Enabling Alarm for Critical Events

### 4.6.1 Receiving E-mail Event Notifications

MRU can send event notifications to a user's email account. This requires a working SMTP email server. This involves the following two steps:

- Configuring SMTP E-mail Server Settings
- Selecting Event Notifications

#### 4.6.1.1 Configuring SMTP E-mail Server Settings

This section describes the procedure to configure SMTP e-mail server settings in MRU.

**To configure SMTP e-mail server settings**

1. Select **System** in the list of system devices.
2. Roll-over the **Toolset** tab, and select **Email Setting**, as shown in Figure 4-18.

The **Email Setting** window appears, as shown in Figure 4-19.

**Figure 4-18 System Toolset Menu**

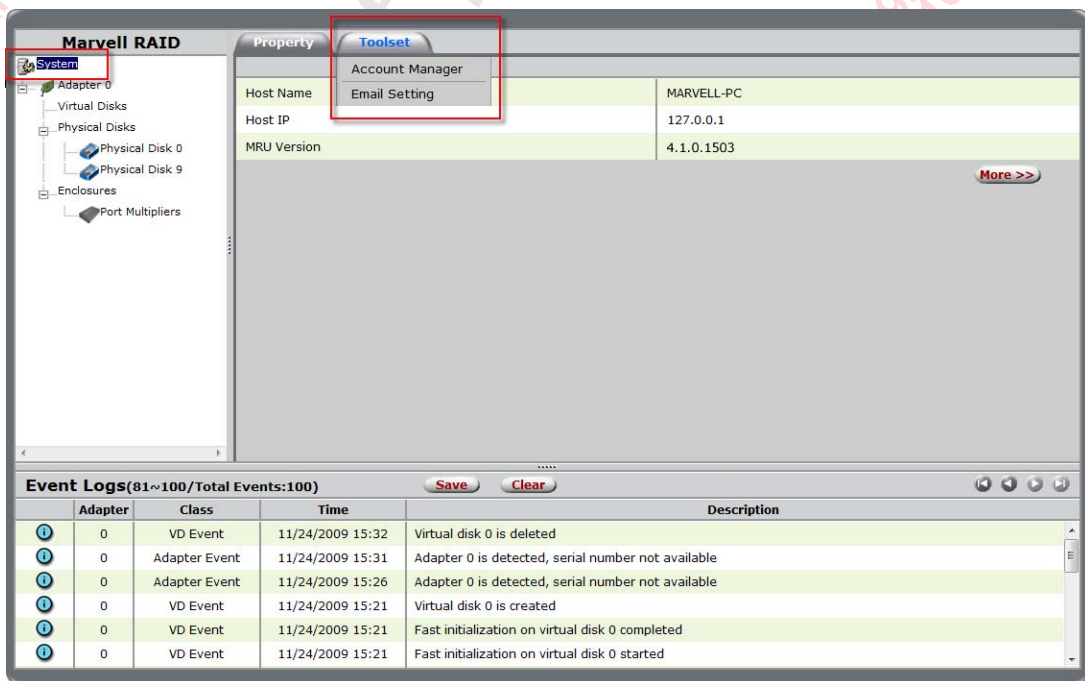
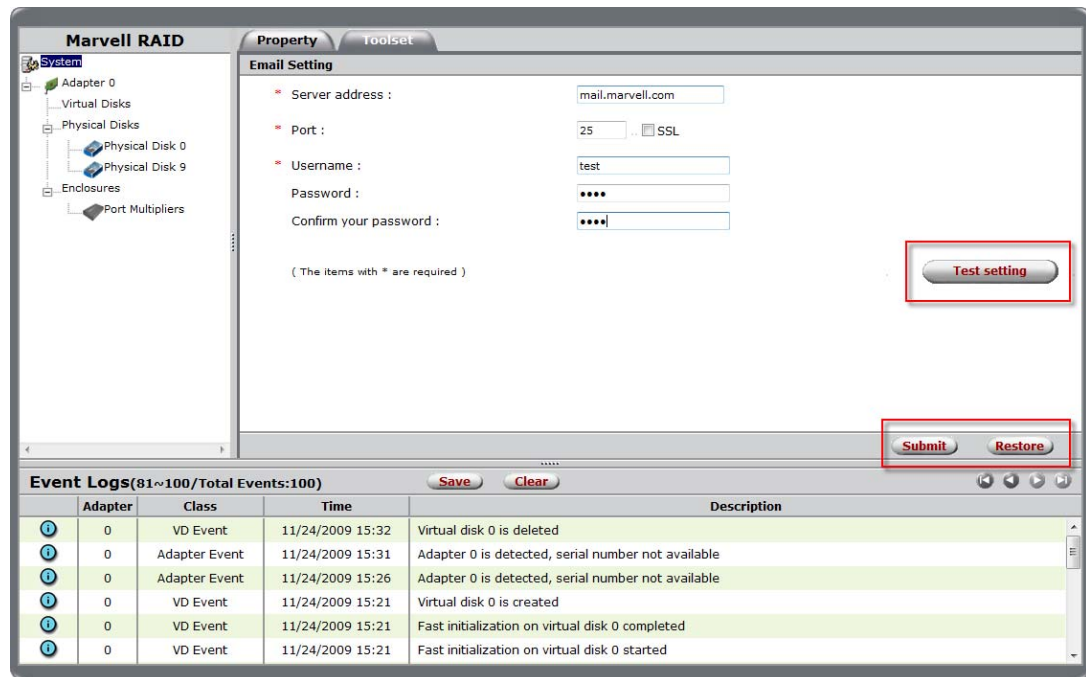


Figure 4-19 Email Settings



Adapter	Class	Time	Description
0	VD Event	11/24/2009 15:32	Virtual disk 0 is deleted
0	Adapter Event	11/24/2009 15:31	Adapter 0 is detected, serial number not available
0	Adapter Event	11/24/2009 15:26	Adapter 0 is detected, serial number not available
0	VD Event	11/24/2009 15:21	Virtual disk 0 is created
0	VD Event	11/24/2009 15:21	Fast initialization on virtual disk 0 completed
0	VD Event	11/24/2009 15:21	Fast initialization on virtual disk 0 started

3. Configure the email server settings, and select **Test setting**, as shown in Figure 4-19. MRU sends a test mail to the configured email address. If the test mail is received, the settings are working correctly.
4. Select **Submit** to save settings.  
MRU confirms changes with the message **Setting updated successfully!**

#### 4.6.1.2 Selecting Event Notifications

This section describes the procedure for selecting event types (information, error, warning) that trigger email notifications.

**Note:** For information on the icons used for different event types, see Appendix C, [Icons used in MRU](#).

##### To receive e-mail event notifications

1. Select **System** in the list of system devices.
2. Roll-over the **Toolset** tab, and select **Account Manager**, as shown in Figure 4-20.  
The **Account Manage** window appears, as shown in Figure 4-21.



Figure 4-20 System Toolset Menu

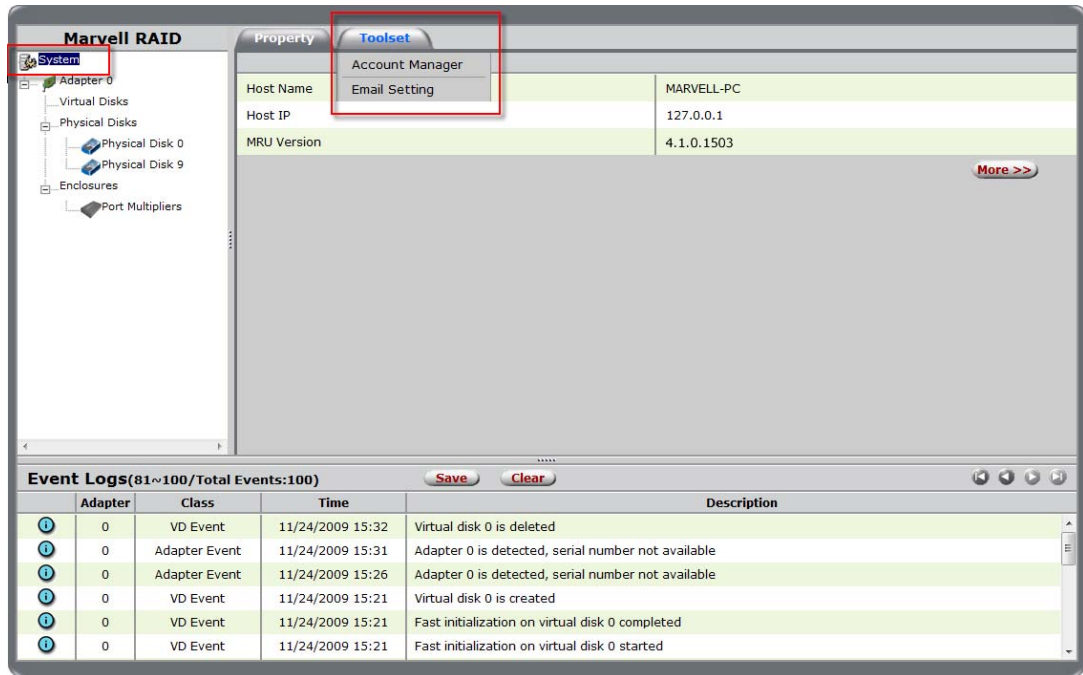
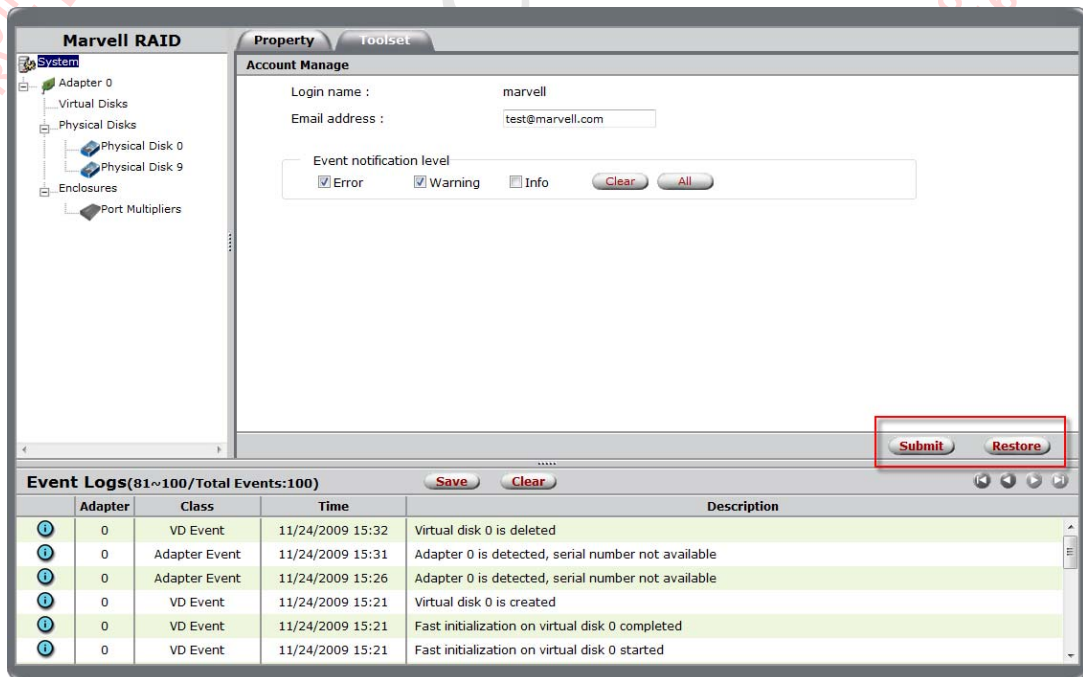


Figure 4-21 Account Manage



3. Type the **E-mail address**, as shown in Figure 4-21.

**Note:** The E-mail address must be valid for the SMTP server configured in Email Setting.



4. Specify the event types that trigger email notifications by selecting options for **Event notification level**, as shown in Figure 4-21.
  5. Select **Submit** to save settings.
- MRU confirms changes with the message **Account updated successfully!**

#### 4.6.2 Viewing Events using Windows Event Viewer

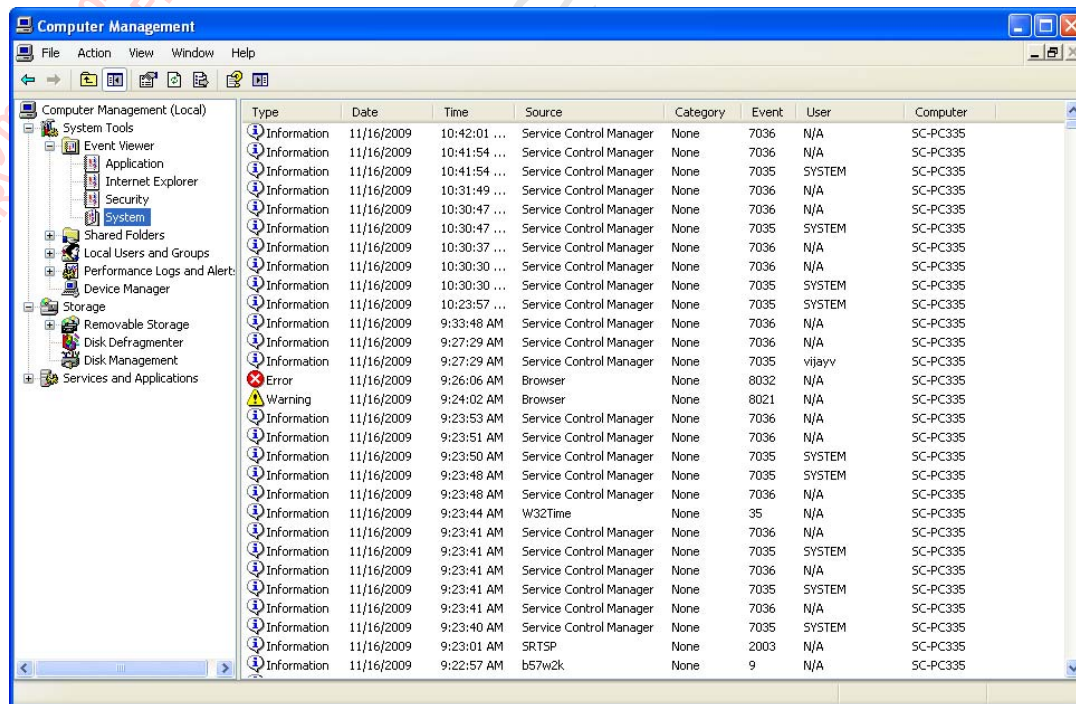
**Note:** This section applies only to Windows OS.

In Windows, MRU events can also be viewed in the Event Viewer (since adapter events are triggered by the OS/driver).

##### To view events in the Windows Event Viewer

1. From the **Start** menu, right-click **My Computer**, and select **Manage**.  
The **Computer Management** utility appears, as shown in Figure 4-22.
2. Browse to **System Tools > Event Viewer > System** to view all system events including that of MRU, as shown in Figure 4-22.

Figure 4-22 Event Viewer (Windows XP)



#### 4.6.3 Enabling Alarm for Critical Events

MRU can play an audible alarm when critical events (warning and error) occur. When a hardware buzzer is present, the buzzer is also sounded. The audible alarm is disabled by default. The alarm can be enabled/disabled using the Tray Application, as shown in Figure 4-23.

Figure 4-23 Enabling Alarm using Tray Application



**Note:** See 2.4.2, [Enable/Disable Alarm](#) for information on enabling/disabling alarm using the Tray Application.

## 4.7 Migrating Virtual Disk

This section discusses the following:

- [Migrating Virtual Disk to Higher RAID Level](#)
- [Expanding Disk Capacity on Operating Virtual Disk](#)

### 4.7.1 Migrating Virtual Disk to Higher RAID Level

It is not possible to migrate a virtual disk to another RAID level. If you wish to change the RAID level for an operating virtual disk, create a new virtual disk with the desired configuration and transfer data from the existing virtual disk.

**Note:** RAID-On-Chip controllers support migration of arrays to a higher RAID Level. See 5.9.1, [Migrating Array to Higher RAID Level](#).

### 4.7.2 Expanding Disk Capacity on Operating Virtual Disk

It is not possible to expand disk capacity on an operating virtual disk. If you wish to expand capacity, create a new virtual disk with the desired configuration and transfer data from the existing virtual disk.

**Note:** RAID-On-Chip controllers support capacity expansion of operating arrays. See 5.9.1, [Migrating Array to Higher RAID Level](#).

## 4.8 Rebuilding Degraded Virtual Disk

At this time, MRU cannot initiate, pause, resume, stop, or complete rebuilding of virtual disks. To rebuild virtual disks created with 88SE91xx, use the MBU as described in Appendix A, [MBU for 88SE91xx IO Processor \(IOP\)](#).

## 4.9 Deleting Virtual Disk

This section describes the procedure for deleting a virtual disk.

**Note:** After deleting a virtual disk, the physical disks constituting the virtual disk become available for use in other virtual disks.

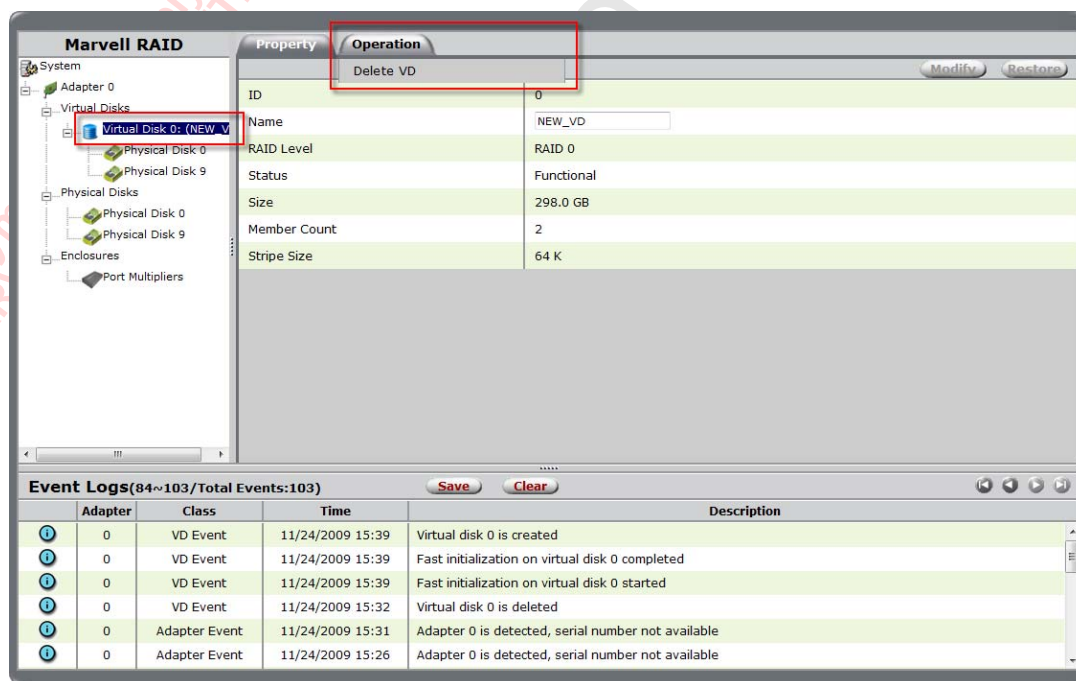
### To delete a virtual disk

**WARNING** Deleting a virtual disk permanently erases all data on the virtual disk. However, you can choose to keep partition information on the virtual disk.



1. Select the **Virtual Disk** in the list of system of devices.  
The **Property** tab for the Virtual Disk appears.
2. Roll-over the **Operation** tab and select **Delete VD**, as shown in Figure 4-24.

Figure 4-24 Delete VD



3. MRU displays the warning **All data on this virtual disk will be erased once it is deleted!**  
Select **OK** to acknowledge the warning.
4. MRU requests confirmation of deletion with a pop-up message **Are you sure you want to delete this virtual disk?**  
Select **OK** to confirm deletion.
5. MRU displays a pop-up message asking **Do you want to delete the partition information if this has one?**  
Select **OK** to delete partition information or **Cancel** to keep partition information.

# 5

## MRU FOR RAID-ON-CHIP (ROC) CONTROLLERS

This chapter contains the following sections:

- Overview
- Creating Array
- Importing Virtual Disk to Array
- Managing Array
- Managing Physical Disks
- Managing Enclosures
- Managing Battery Backup Unit (BBU)
- Monitoring Array
- Migrating Array
- Rebuilding Degraded Array
- Deleting Array
- Updating RAID Controller BIOS

## 5.1 Overview

This chapter describes the MRU for RAID-On-Chip (ROC) controllers such as the Marvell 88RC8180. ROCs can create and manage RAID 0, 1, 1E, 5, 10, 50, and 60 arrays. They contain an on-board CPU which enables hardware RAID functionality.



## 5.2 Creating Array

This section discusses the following:

- Creating Array
- Creating Virtual Disk

### 5.2.1 Creating Array

This section describes the procedure for creating an array.

**To create an array**

1. Select **Adapter** in the list of system devices, as shown in Figure 5-1.
2. Rollover the **Operation** tab and select **Create Array**, as shown in Figure 5-1.

The **Create New Array** page appears as shown in Figure 5-2.

**Figure 5-1 Create Array**

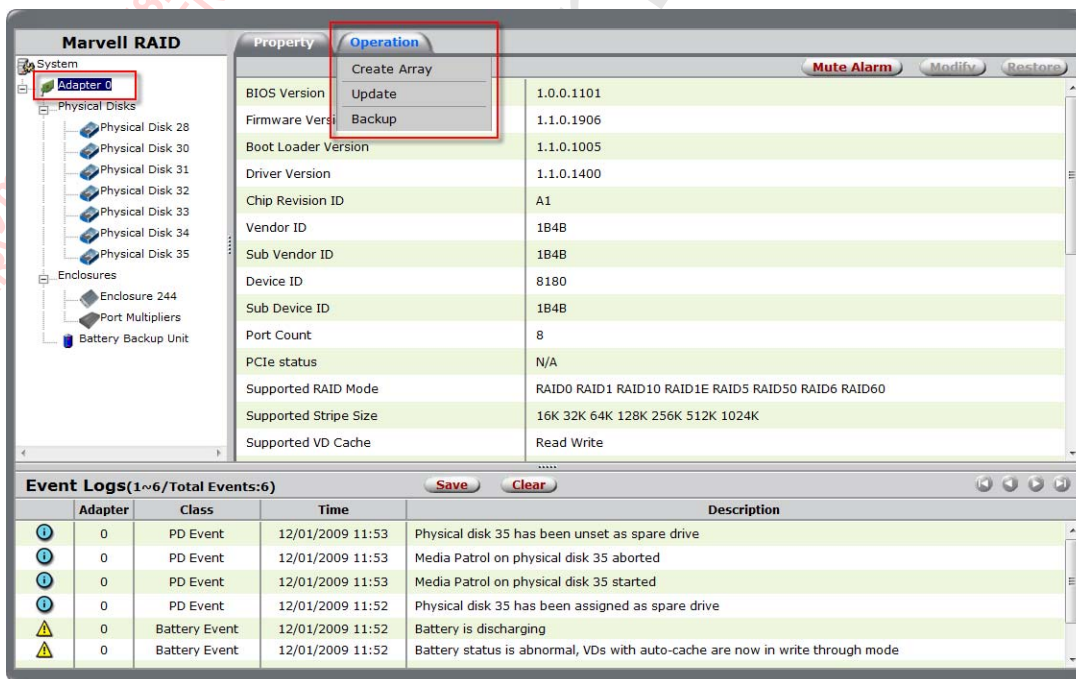
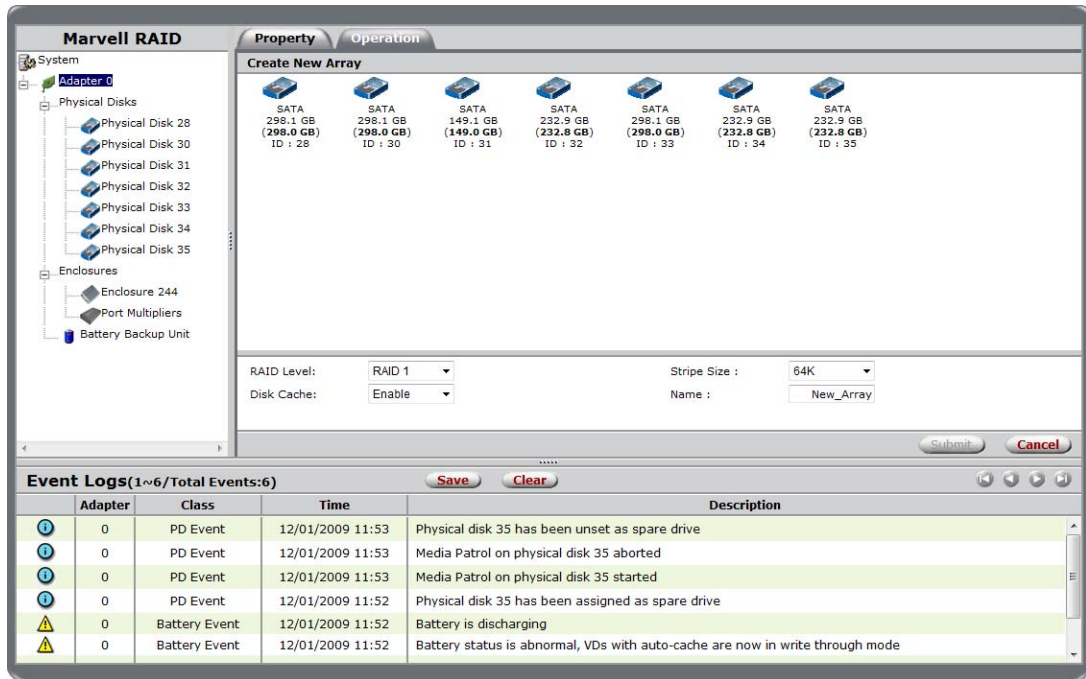
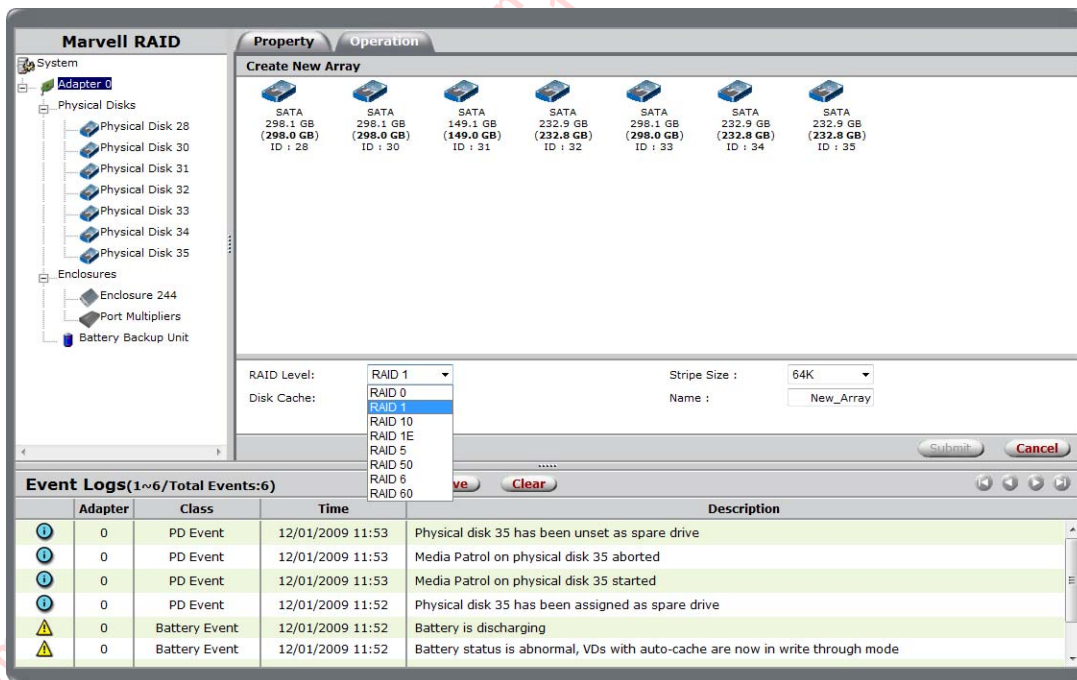


Figure 5-2 Create New Array



3. Select the **RAID Level** suitable for your application, as shown in Figure 5-2.  
For information on RAID levels, see Appendix B, [Selecting a RAID Level](#).

Figure 5-3 Select RAID Level



**Note:** Marvell RAID controllers support different sets of RAID levels depending on the hardware model and OEM software package. Some software packages, depending on OEM selections, support limited RAID levels by design. Check with the OEM vendor for information specific to your controller.

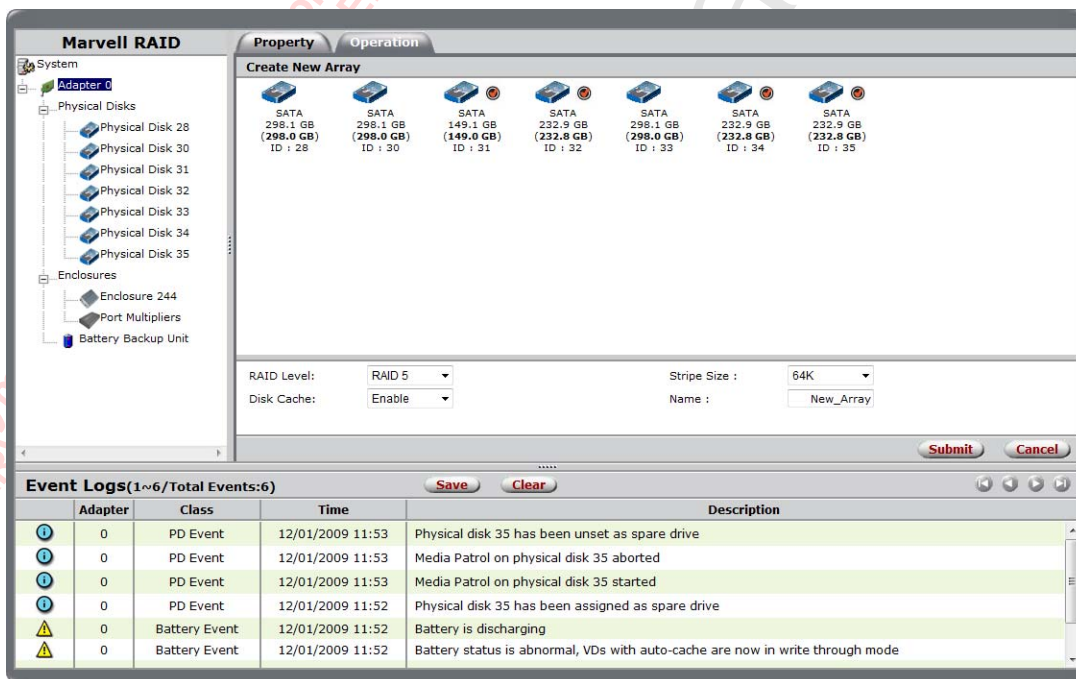
4. Table 5-1 lists the minimum number of physical disks required for different RAID levels.

**Table 5-1 Minimum Number of Physical Disks**

Controller	Minimum Number of Physical Disks Required for RAID Level							
	0	1	1E	5	6	10	50	60
RAID-On-Chip (ROC) Controller	2	2	3	3	4	4	6	8

Add the required number of physical disks for the selected RAID level from the list of available physical disks, as shown in Figure 5-3. When selected, a check-mark appears to the right of the physical disk, as shown in Figure 5-4.

**Figure 5-4 Select Physical Disks**

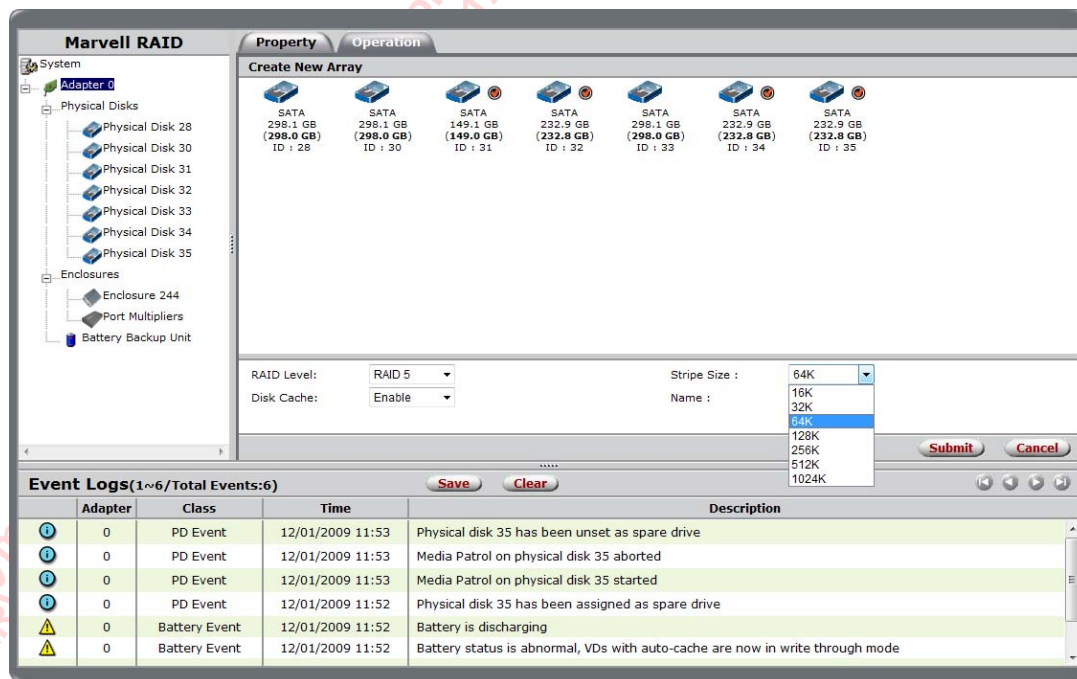


5. After selecting physical disks, select **Stripe Size** for the array.

As shown in Figure 5-5, the RAID controller in this example has seven options for Stripe Size, with the default being **64K**.

**Note:** Availability of Stripe Sizes varies with controllers. For information on Stripe Size, see Appendix D, [Glossary](#).

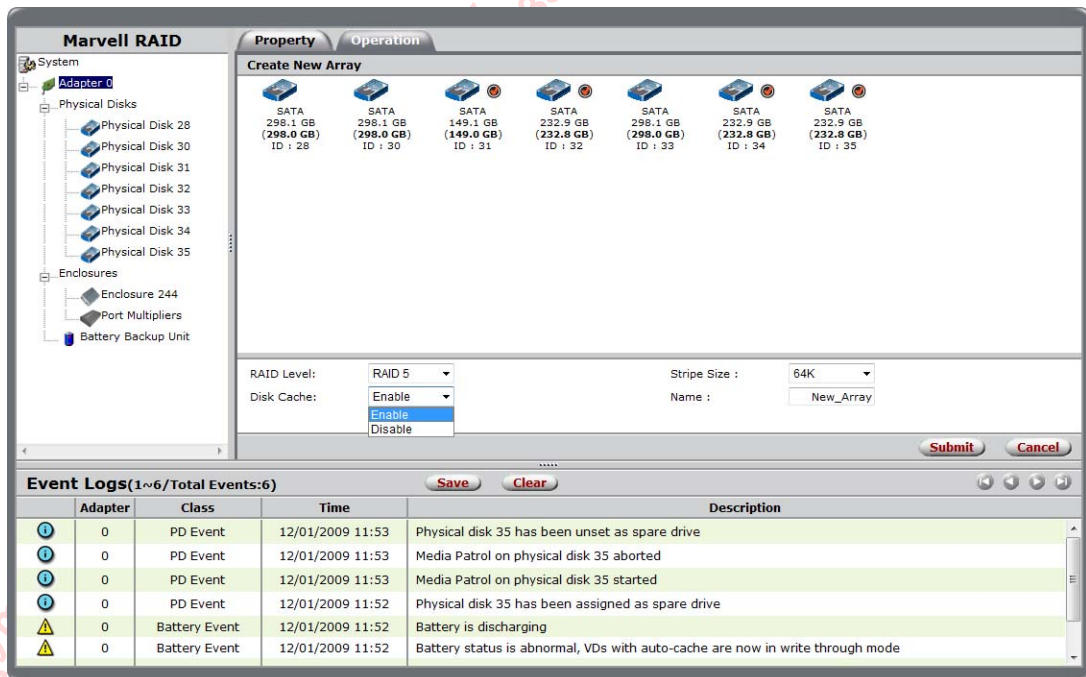
**Figure 5-5 Select Stripe Size**



6. After selecting Stripe Size, enable/disable Disk Write Cache for the array by selecting **Disk Cache**.

As shown in Figure 5-6, Disk Cache is enabled by default.

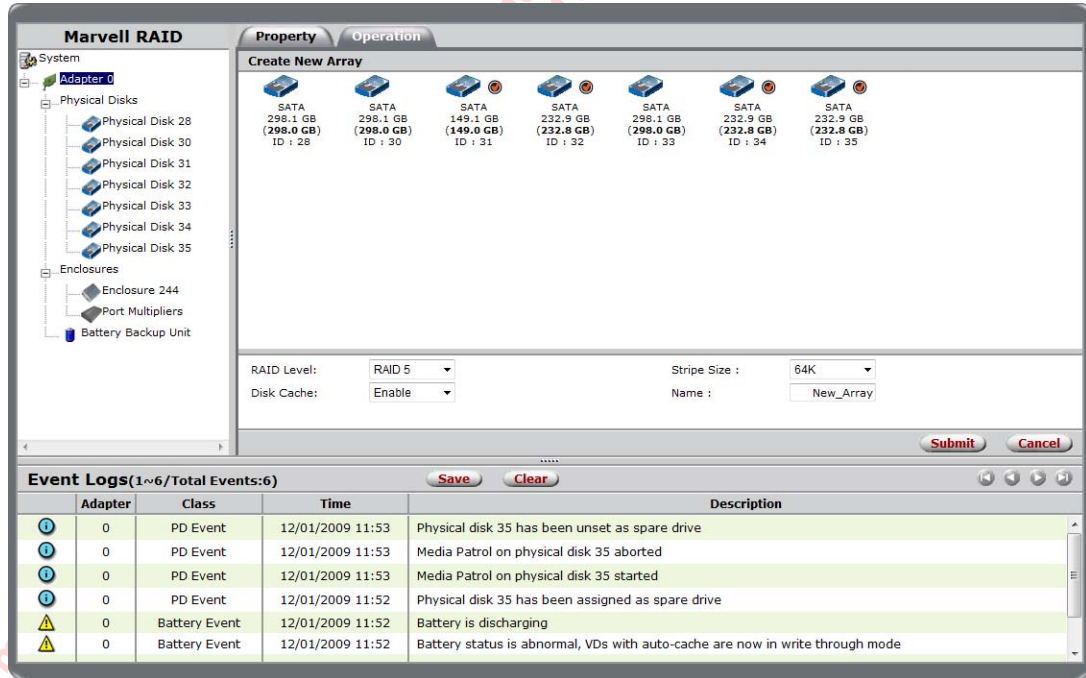
Figure 5-6 Disk Cache





7. After selecting Disk Cache, type a name for the Array in the Name field.  
As shown in Figure 5-7, MRU assigns a default name to the array which you can change.

Figure 5-7 Name



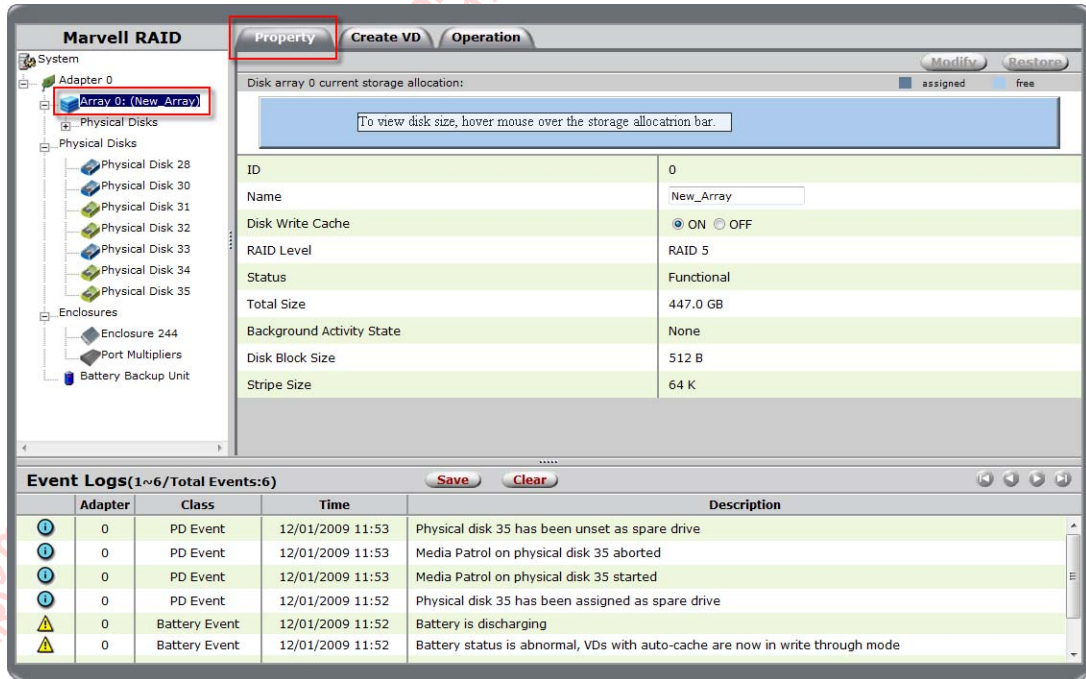


8. Click **Submit** at the bottom of the screen, as shown in Figure 5-7.

If the chosen RAID level does not support the selected combination of drives, the Submit button remains grayed out.

A new array link appears in your left navigation panel, displaying the new array properties, as shown in Figure 5-8.

**Figure 5-8 Array Created**



## 5.2.2 Creating Virtual Disk

This section describes the procedure for creating a virtual disk on an array.

### To create a virtual disk

1. Select the **Array** in the list of system of devices, as shown in Figure 5-9.
2. Select the **Create VD** tab, as shown in Figure 5-9.

The **Create Virtual Disk** screen appears as shown in Figure 5-10.

Figure 5-9 Array

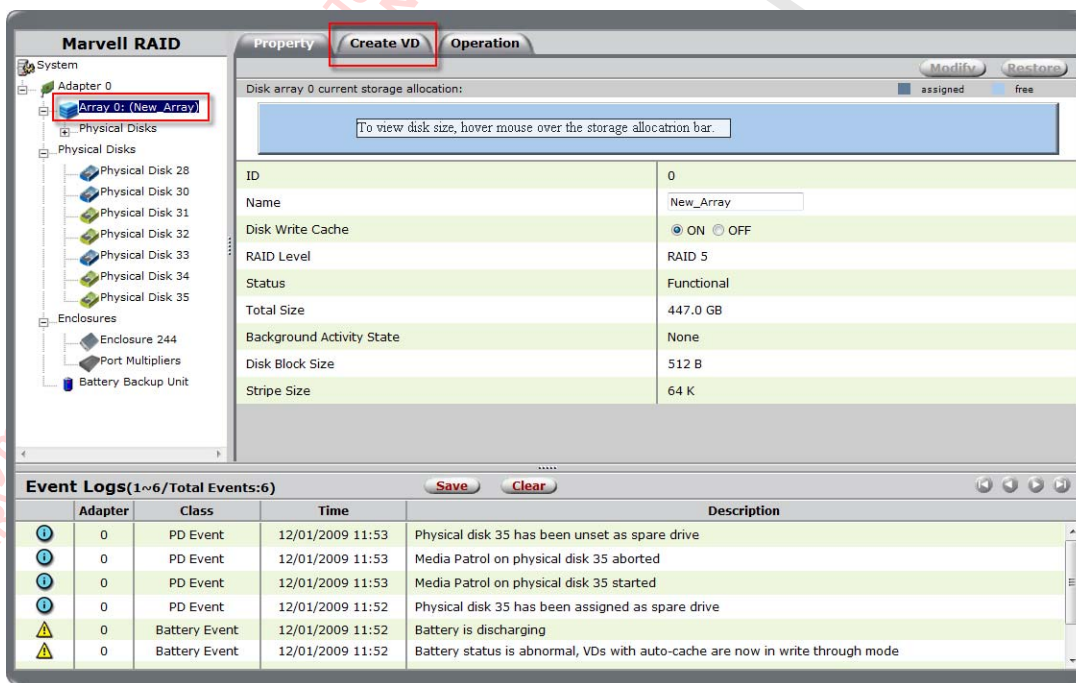
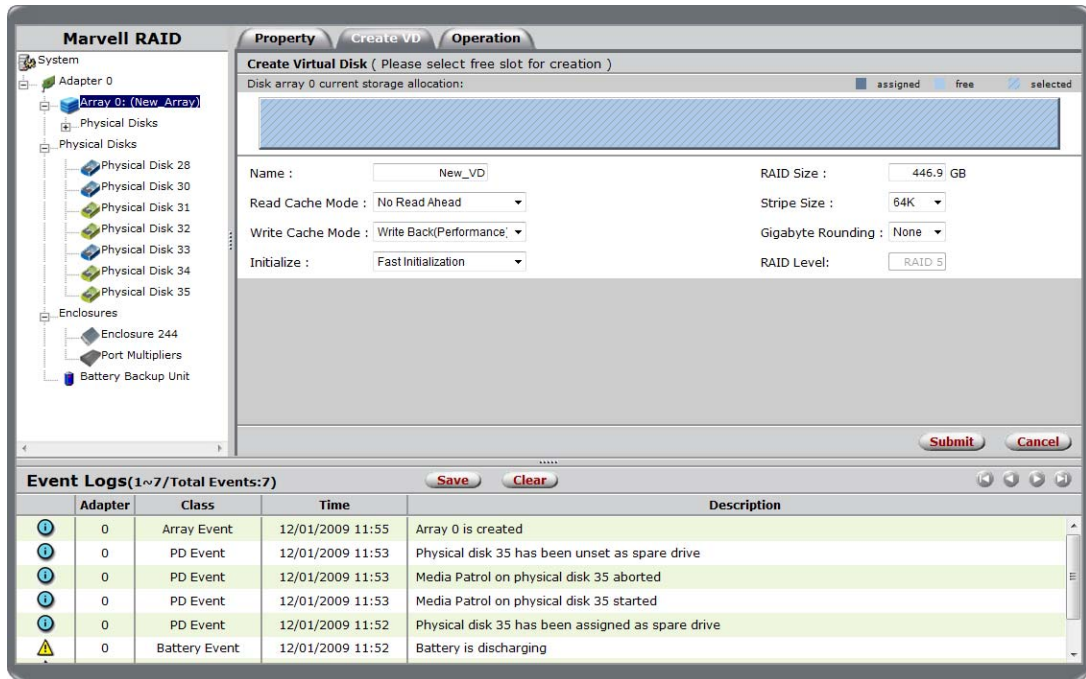


Figure 5-10 Create Virtual Disk



Adapter	Class	Time	Description
0	Array Event	12/01/2009 11:55	Array 0 is created
0	PD Event	12/01/2009 11:53	Physical disk 35 has been unset as spare drive
0	PD Event	12/01/2009 11:53	Media Patrol on physical disk 35 aborted
0	PD Event	12/01/2009 11:53	Media Patrol on physical disk 35 started
0	PD Event	12/01/2009 11:52	Physical disk 35 has been assigned as spare drive
0	Battery Event	12/01/2009 11:52	Battery is discharging

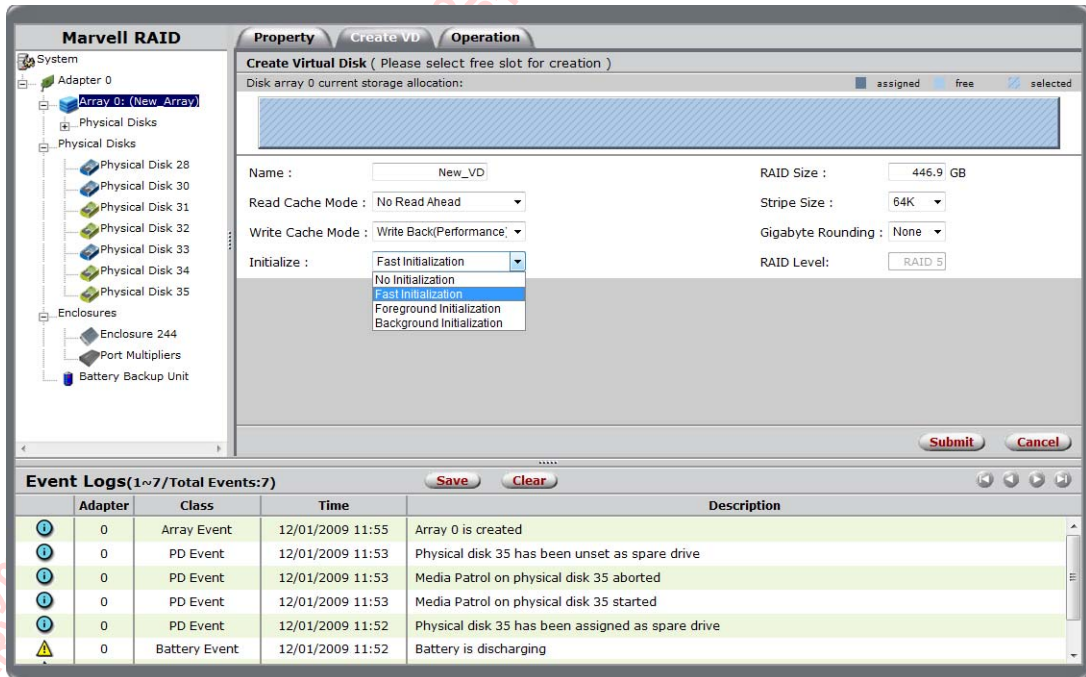
- As shown in Figure 5-10, MRU assigns a default name to the virtual disk. You can type a new name in the **Name** field.

4. After selecting the Name, select the **Initialization** method for the virtual disk.

As shown in Figure 5-11, MRU has four options for Initialization, with the default being **Fast Initialization**.

**Note:** For information on Initialization, see Appendix D, [Glossary](#).

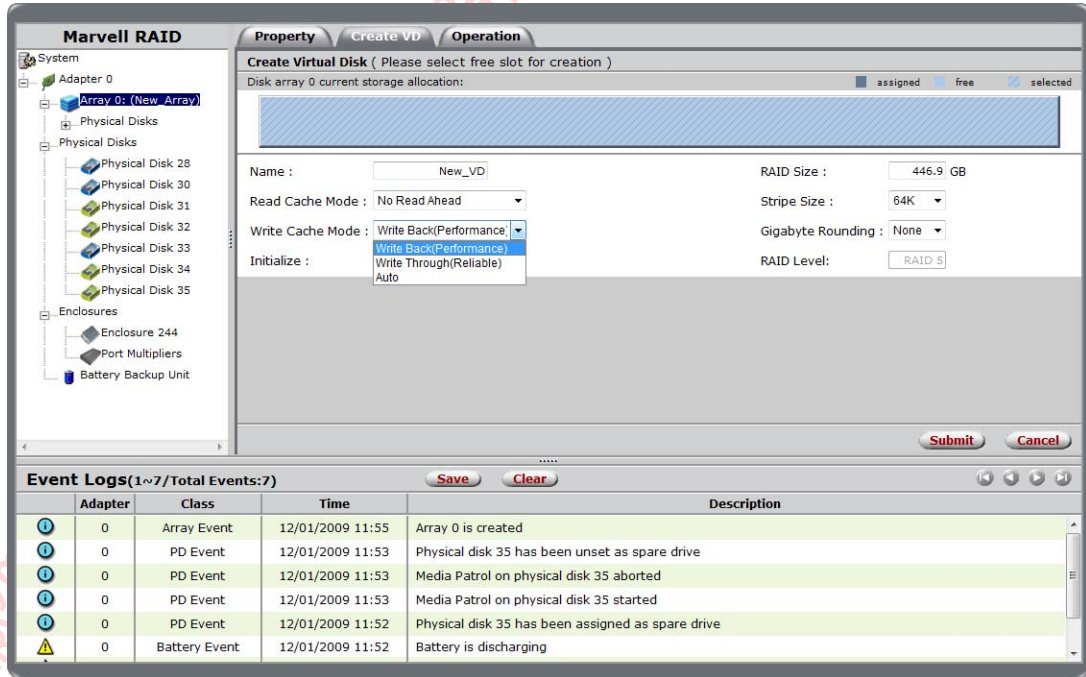
**Figure 5-11 Initialization**



- After selecting the Initialization method, select **Write Cache Mode** for the virtual disk.  
As shown in Figure 5-12, MRU has three options for Write Cache Mode, with the default being **Write Back (Performance)**.

**Note:** For information on Write Cache Mode, see Appendix D, [Glossary](#).

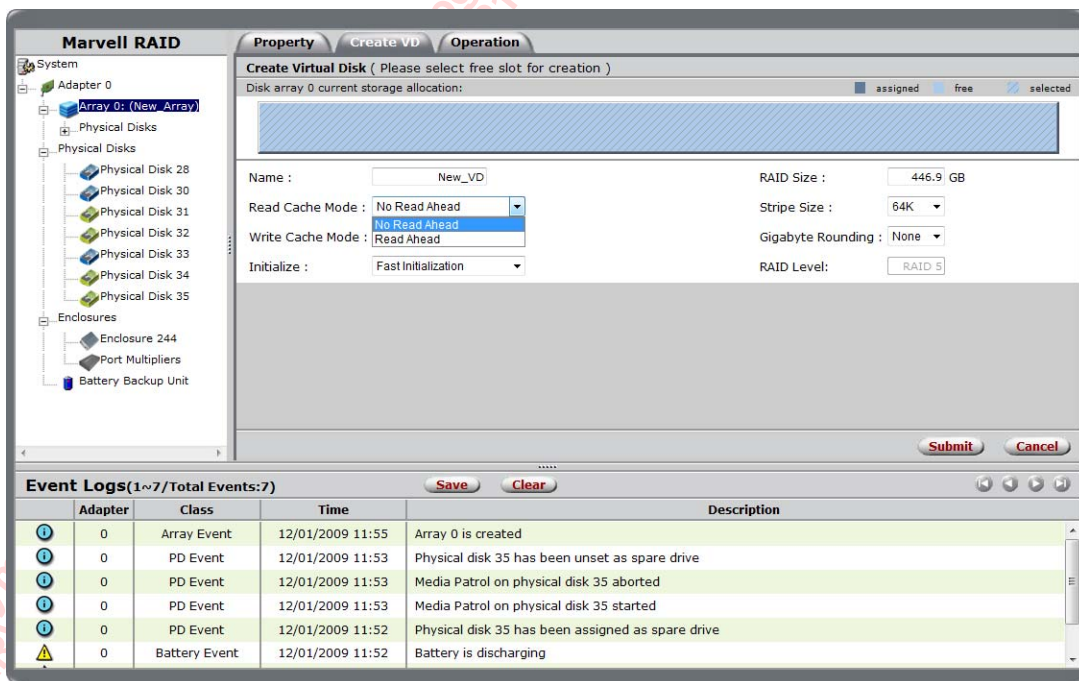
**Figure 5-12 Write Cache Mode**



- After selecting Write Cache Mode, select **Read Cache Mode** for the virtual disk.  
As shown in Figure 5-13, MRU has two options for Read Cache Mode, with the default being **Read Ahead** (Performance).

**Note:** For information on Read Cache Mode, see Appendix D, [Glossary](#).

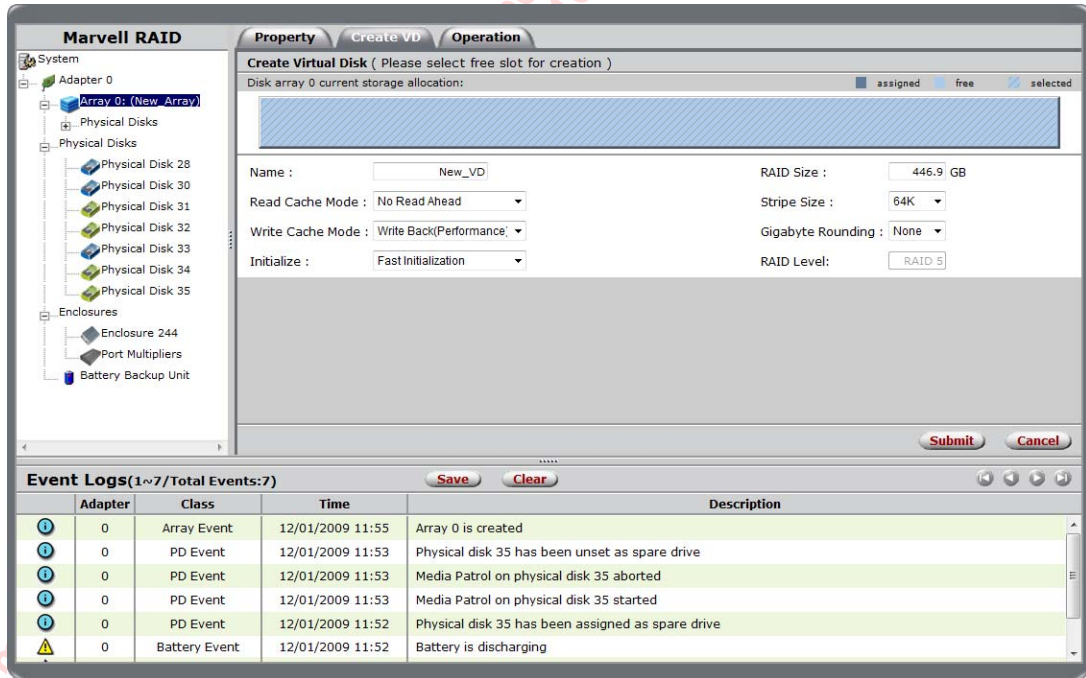
**Figure 5-13 Read Cache Mode**





- After selecting Read Cache Mode, specify the **RAID Size** of the virtual disk, as shown in Figure 5-14.

Figure 5-14 RAID Size



**Note:** Hover the mouse over the array storage allocation bar to view the size of the array. If you have already created one or more virtual disks, they are displayed as segments in the storage allocation bar and sized proportional to their disk capacity. Hover the mouse over individual segments to view the virtual disk's name and size.

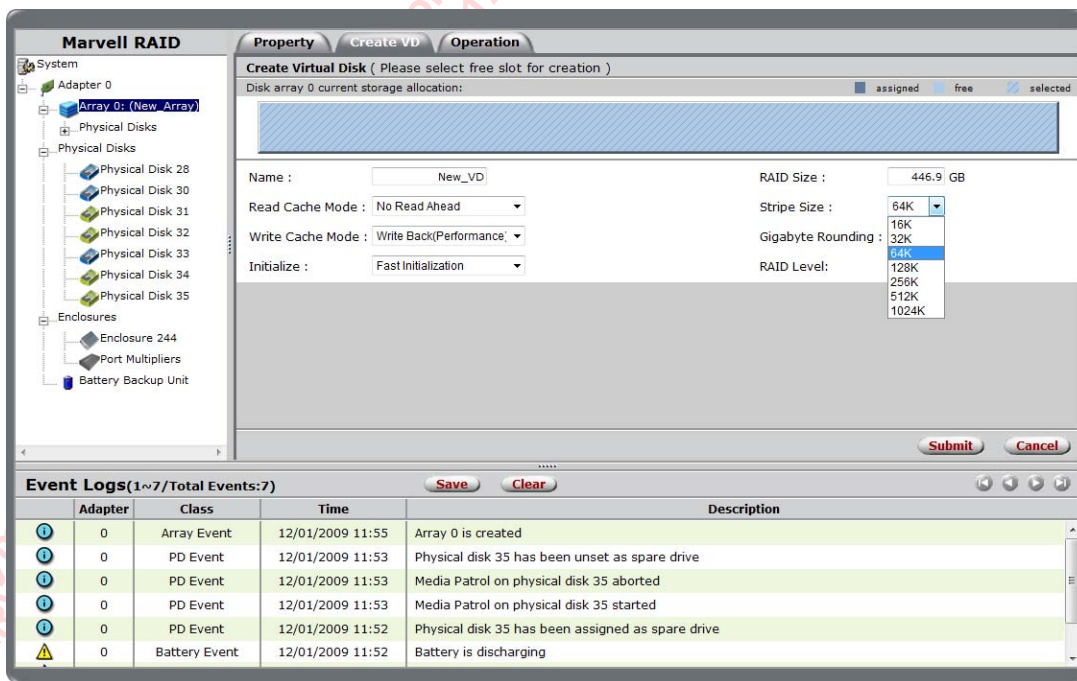


8. After specifying the RAID Size, select **Stripe Size** for the virtual disk.

As shown in Figure 5-15, the RAID controller being used has four options for Stripe Size, with the default being **64K**.

**Note:** Availability of Stripe Sizes depends on the capabilities of the controller. For information on Stripe Size, see Appendix D, [Glossary](#).

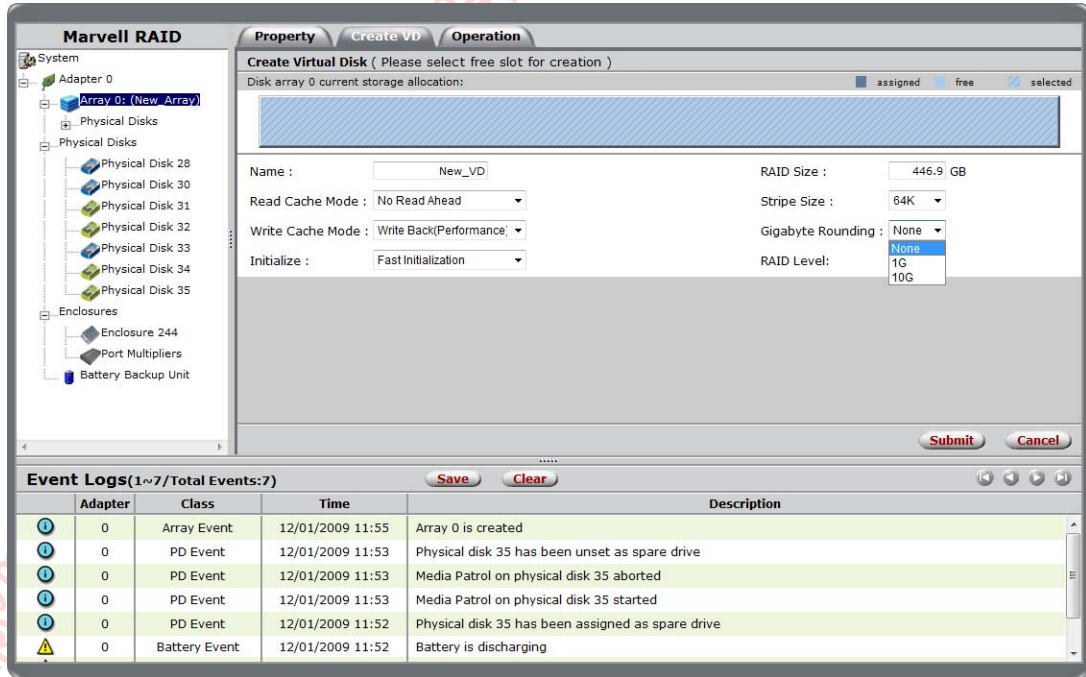
**Figure 5-15 Stripe Size**



9. After selecting Stripe Size, select the **Gigabyte Rounding** for the virtual disk.  
As shown in Figure 5-16, the RAID controller being used has three options for Gigabyte Rounding, with the default being **None**.

**Note:** For information on Gigabyte Rounding, see Appendix D, [Glossary](#).

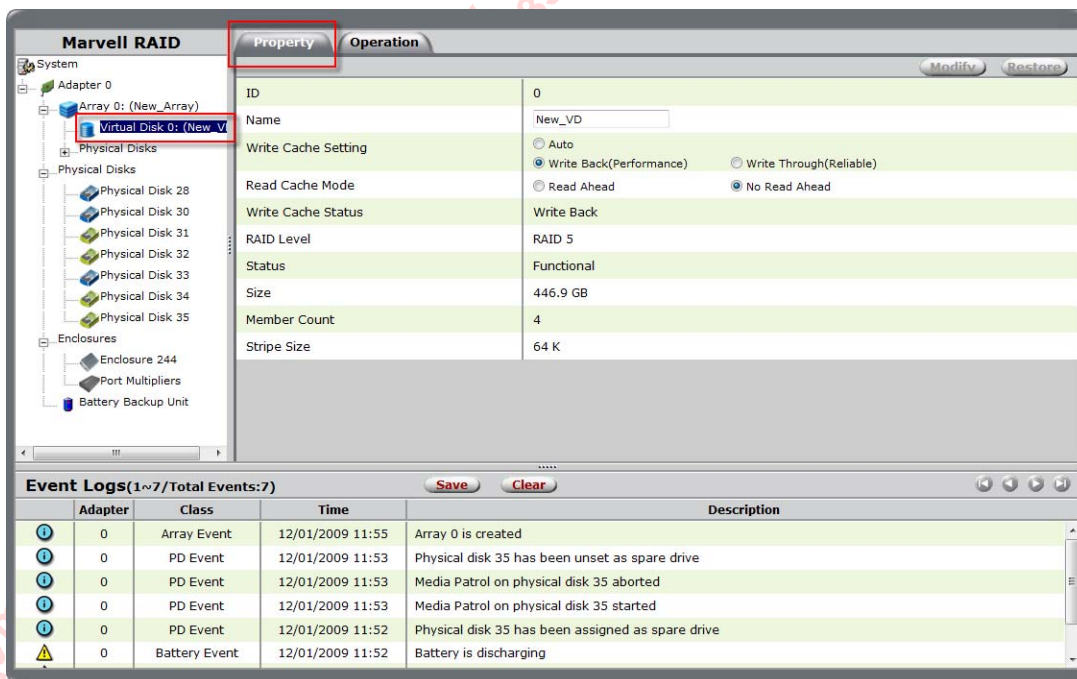
**Figure 5-16 Gigabyte Rounding**



10. After selecting Gigabyte Rounding, select **Submit** to create the virtual disk.

MRU creates the virtual disk and displays the **Property** tab for the new virtual disk, as shown in Figure 5-17.

Figure 5-17 VD Created



## 5.3 Importing Virtual Disk to Array

Some Marvell ROCs such as the 88RC8180 support importing of virtual disks created with other Marvell RAID controllers. If the ROC on your OEM host board supports importing of virtual disks, then the foreign virtual disk is recognized by the controller, as shown in Figure 5-18. To import this virtual disk, select **Operation > Import Virtual Disk**, as shown in Figure 5-19. However, if the ROC on your OEM host board does not support importing of virtual disks, then the physical disks comprising the foreign virtual disk are simply recognized as Foreign Physical Disks. To release these physicals disks from their foreign status, see section 5.5.7, [Erasing RAID Configuration Data on Foreign Physical Disk](#).

Figure 5-18 Foreign Virtual Disk

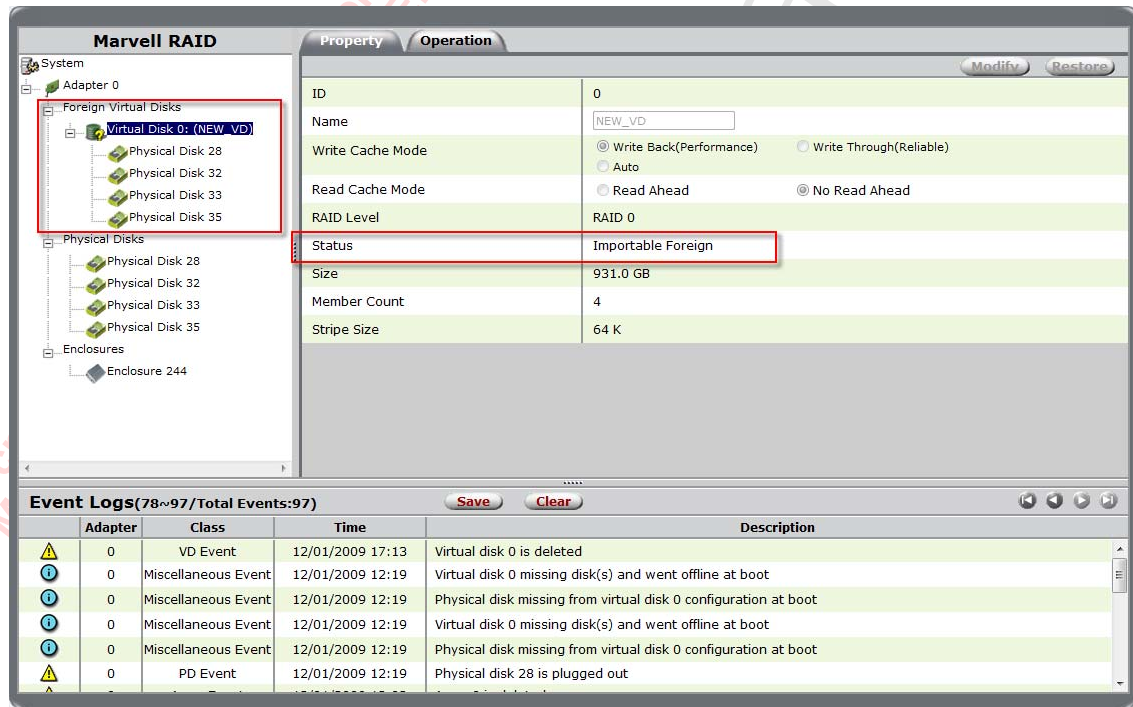


Figure 5-19 Import Virtual Disk

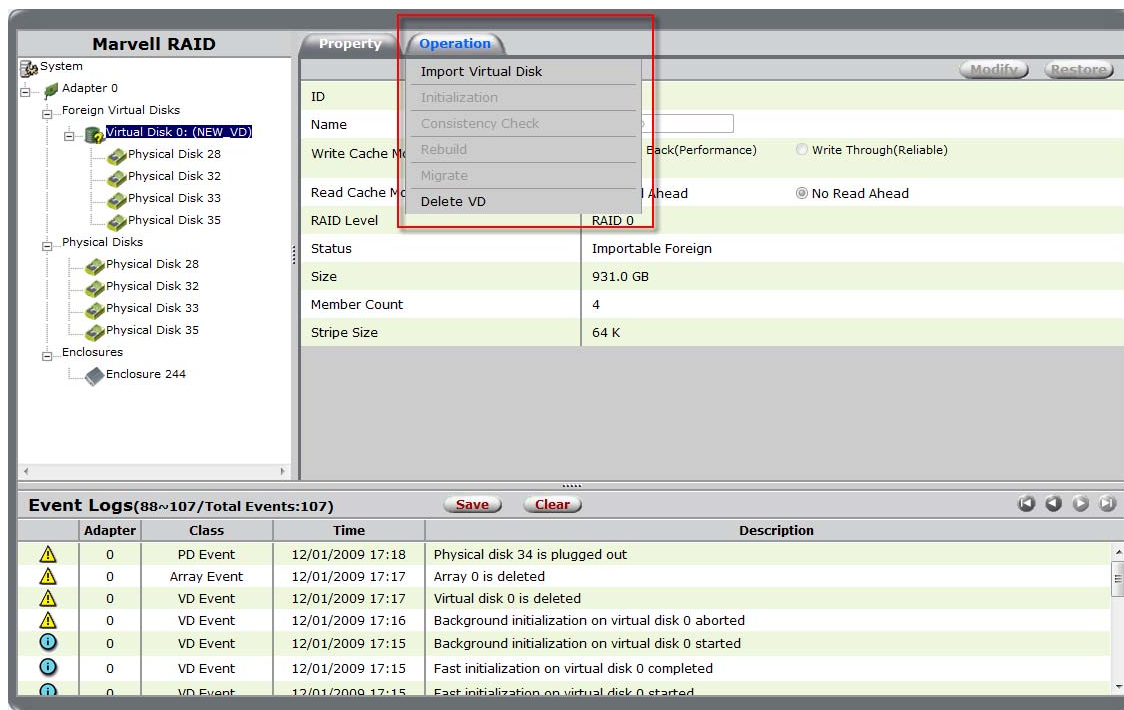
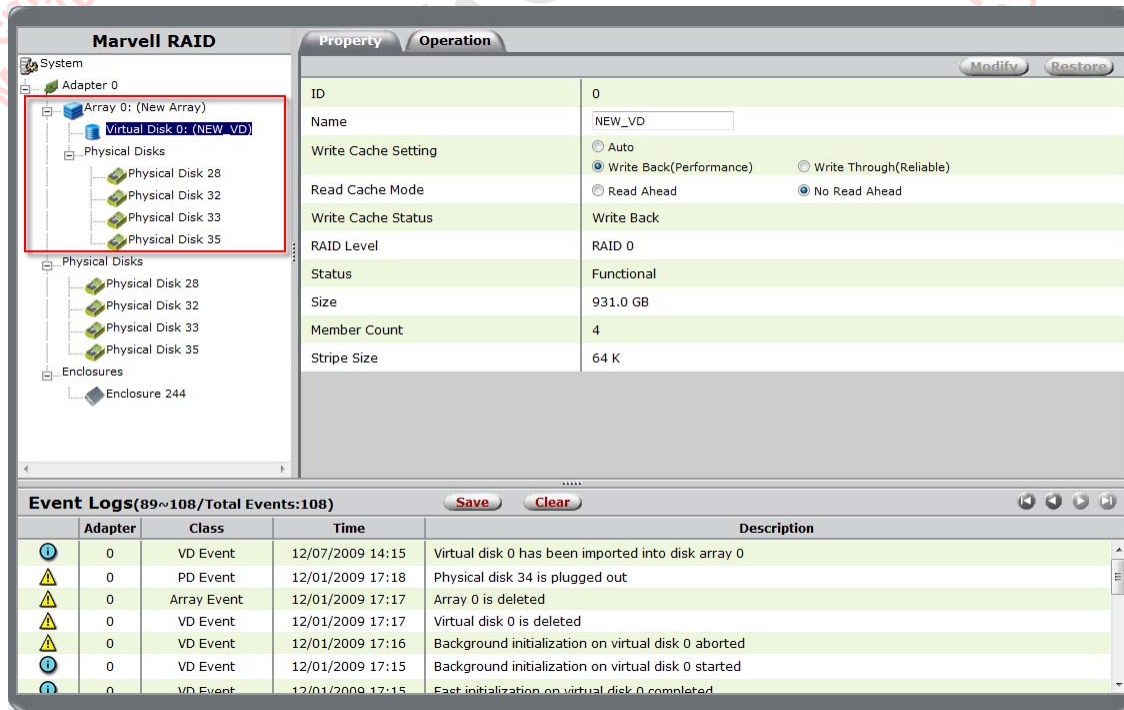


Figure 5-20 Virtual Disk Imported to Array





## 5.4 Managing Array

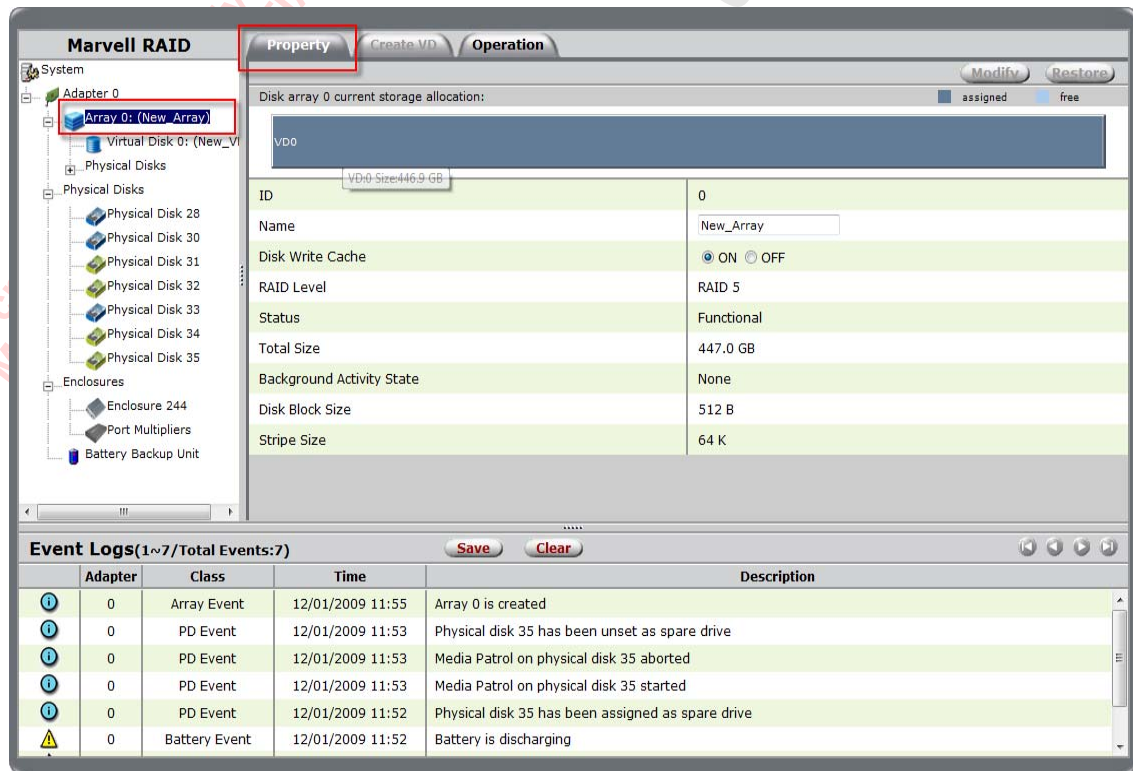
This section discusses the following:

- Viewing Properties of Array
- Renaming Array
- Modifying Disk Write Cache for Array
- Managing Virtual Disk

### 5.4.1 Viewing Properties of Array

To view the properties of an array, select the Array (**Array 0: (New\_Array)** in this example) in the list of system devices, as shown in Figure 5-21. Upon selection, MRU displays the **Property** tab for the array.

Figure 5-21 Properties of Array



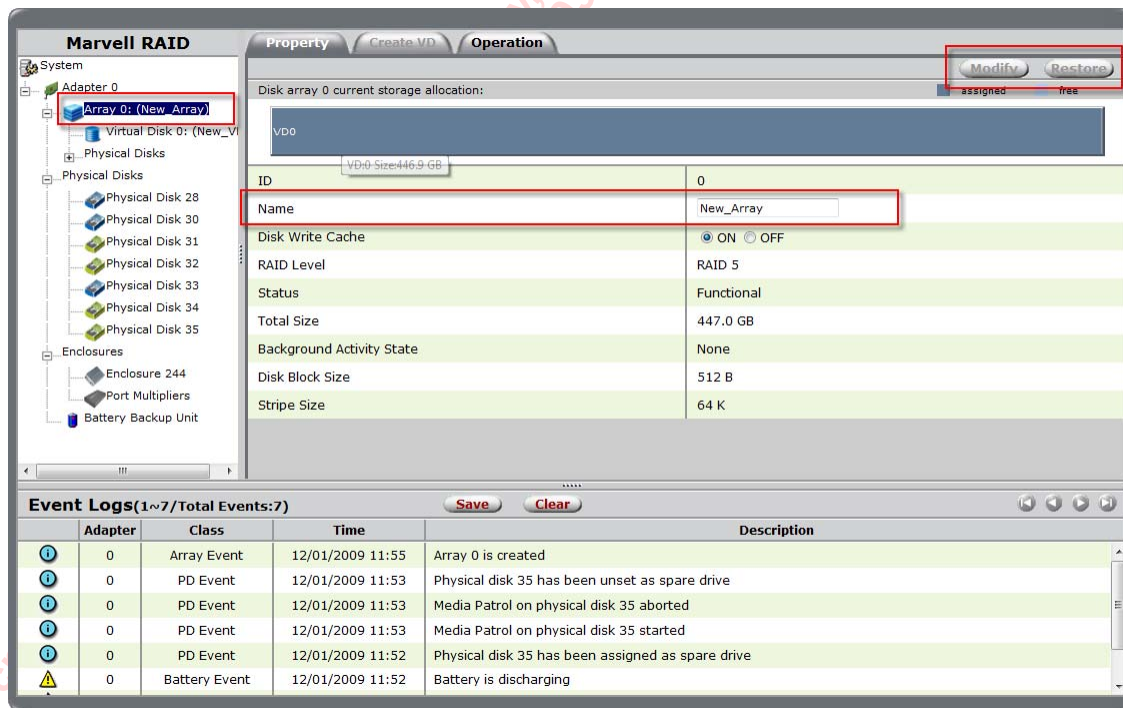
**Note:** Hover the mouse over the array storage allocation bar to view the size of the array. If you have already created one or more virtual disks, they are displayed as segments in the storage allocation bar and sized proportional to their disk capacity. Hover the mouse over individual segments to view the virtual disk's name and size.

MRU uses different icons to indicate the status of the array. For more information, see Appendix C, [Icons used in MRU](#).

## 5.4.2 Renaming Array

The name for an array can be modified from the **Property** tab for the **Array**, as shown in Figure 5-22. Type a new name in the **Name** field and select **Modify** to confirm changes.

Figure 5-22 Renaming Array



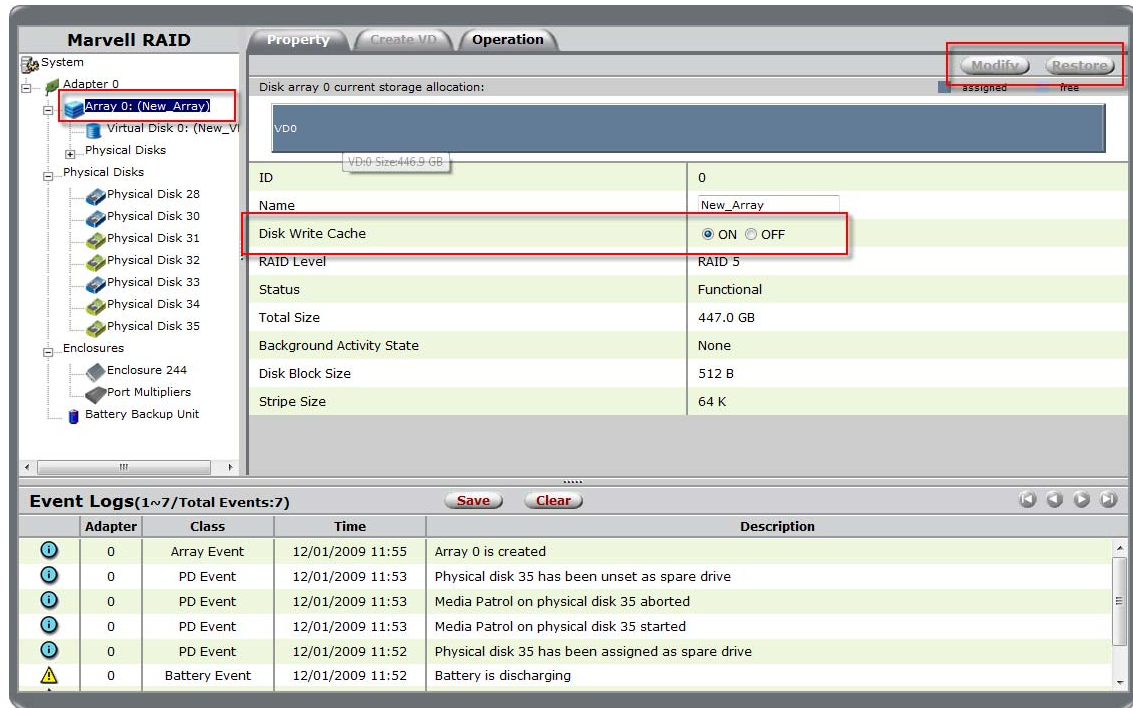
**Note:** Modify is grayed-out until the settings change.

## 5.4.3 Modifying Disk Write Cache for Array

The **Disk Write Cache** for an array can be modified from the **Property** tab for the **Array**, as shown in Figure 5-23. Select between **ON** and **OFF** to enable and disable Disk Write Cache. Select **Modify** to confirm changes.



Figure 5-23 Modifying Disk Write Cache



**Note:** Modify is grayed-out until the settings change.

## 5.4.4 Managing Virtual Disk

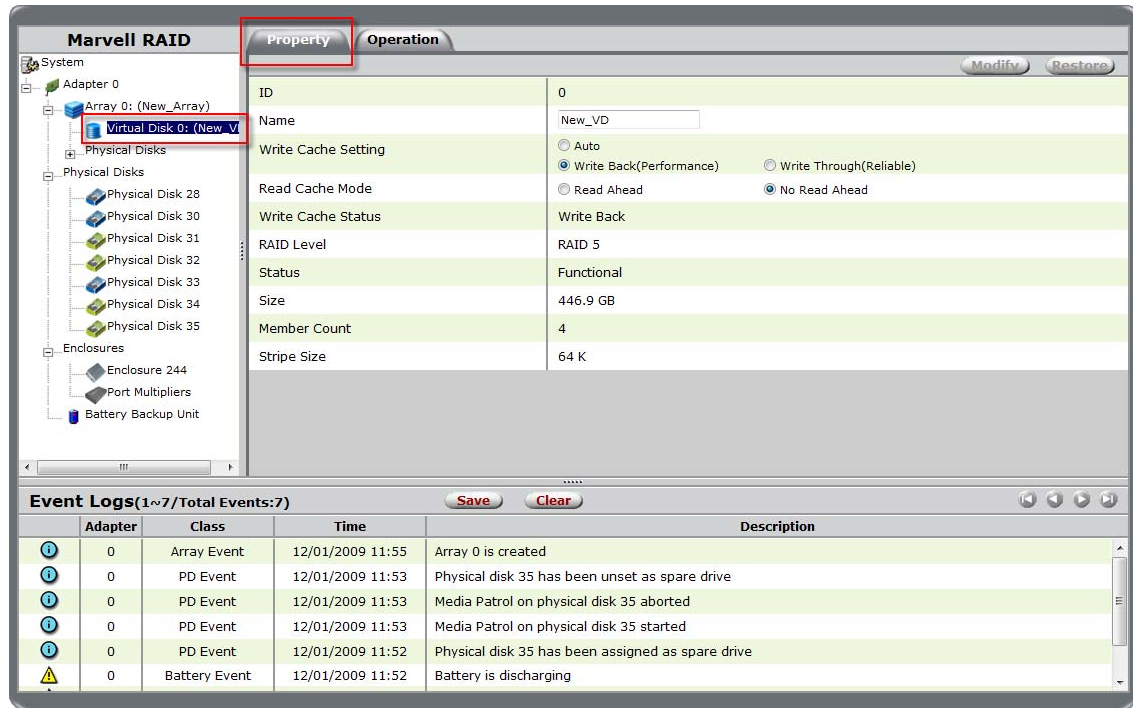
This section discusses the following:

- Viewing Properties of Virtual Disk
- Renaming Virtual Disk
- Modifying Cache Modes for Virtual Disk
- Initializing Virtual Disk
- Checking/Fixing Consistency of Virtual Disk
- Scheduling Background Activities
- Controlling Rate of Background Activities

### 5.4.4.1 Viewing Properties of Virtual Disk

To view the properties of a virtual disk, select the Virtual Disk (**Virtual Disk 0: (VD1)** in this example) in the list of system devices, as shown in Figure 5-24. Upon selection, MRU displays the **Property** tab for the virtual disk.

Figure 5-24 Properties of Virtual Disk

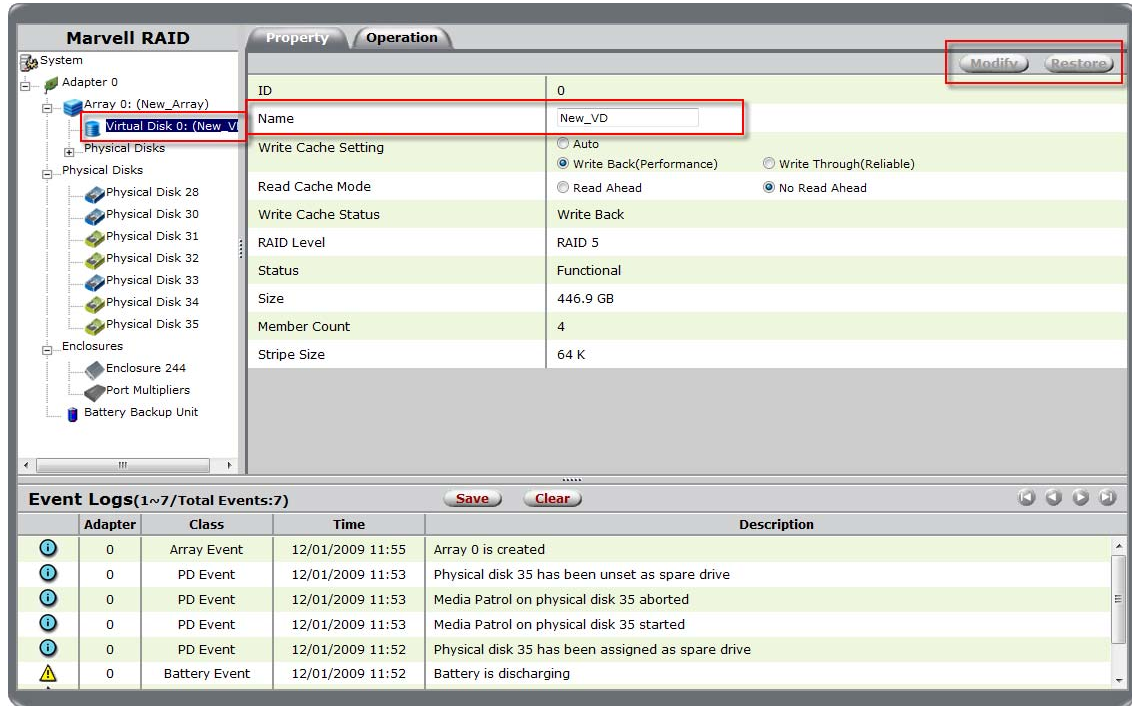


MRU uses different icons to indicate the status of the virtual disk. For more information, see Appendix C, [Icons used in MRU](#).

#### 5.4.4.2 Renaming Virtual Disk

The name for a virtual disk can be modified from the **Property** tab for the **Virtual Disk**, as shown in Figure 5-25. Type a new name in the **Name** field and select **Modify** to confirm changes.

Figure 5-25 Renaming Virtual Disk

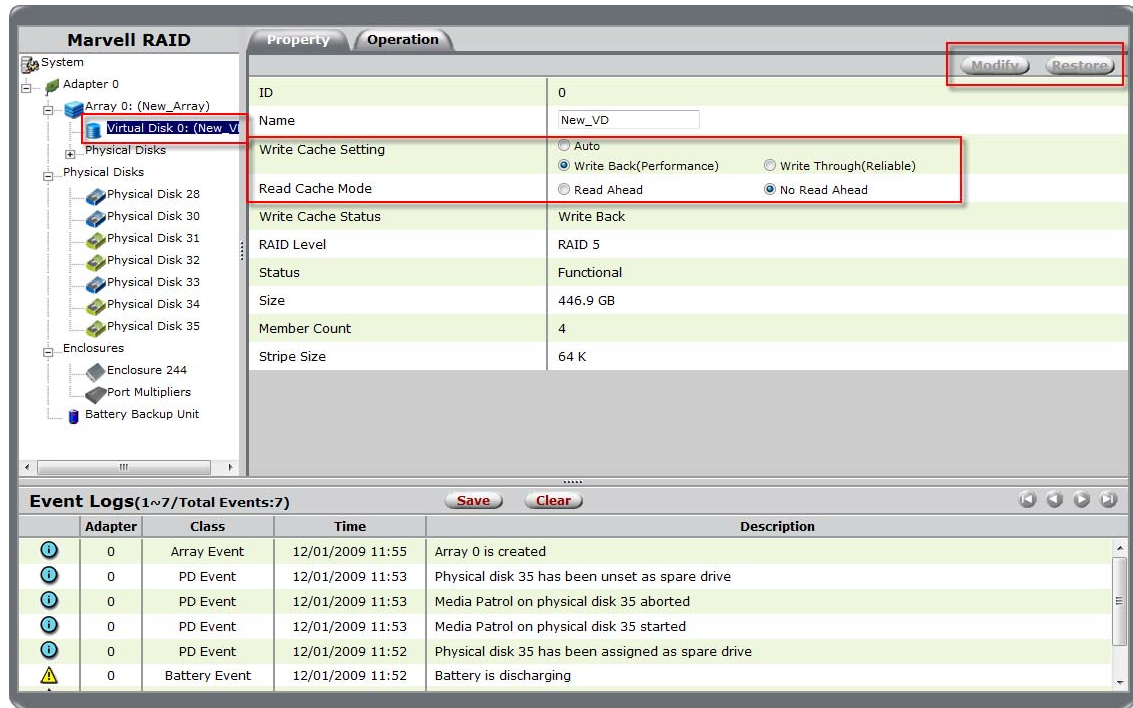


**Note:** Modify is grayed-out until the settings change.

#### 5.4.4.3 Modifying Cache Modes for Virtual Disk

The **Write Cache Mode** and **Read Cache Mode** for a virtual disk can be modified from the **Property** tab for the **Virtual Disk**, as shown in Figure 5-26. Select between the options provided for each mode, and select **Modify** to confirm changes.

Figure 5-26 Modifying Cache Modes



**Note:** Modify is grayed-out until the settings change.

#### 5.4.4.4 Initializing Virtual Disk

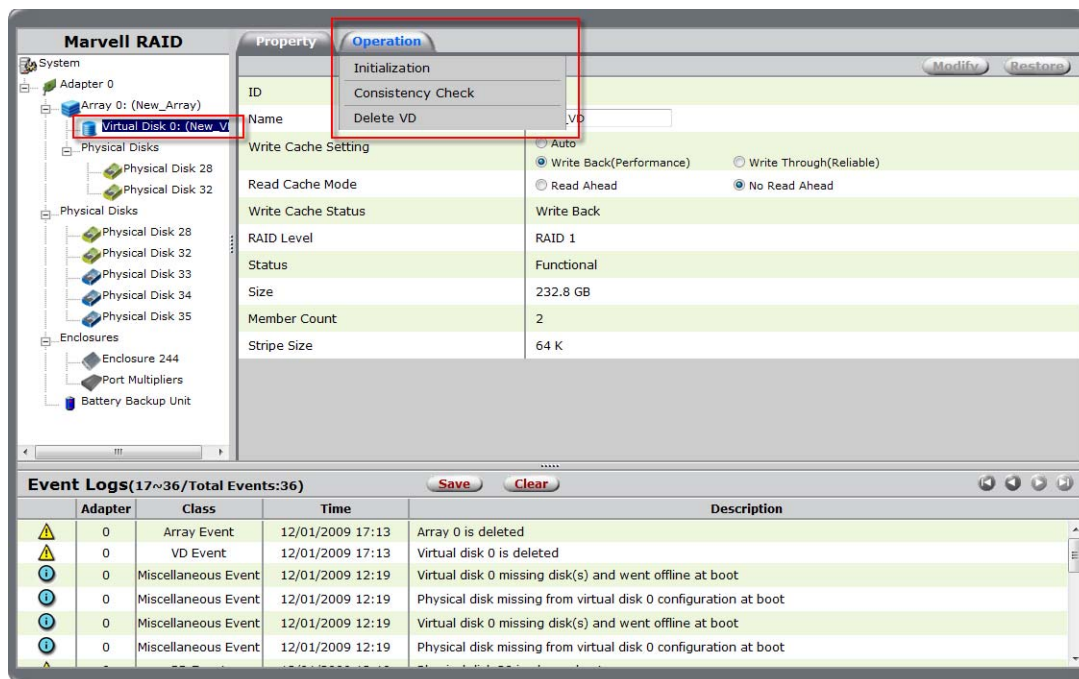
This section describes the procedure for initializing a virtual disk.

**Note:** For information on Initialization, see Appendix D, [Glossary](#).

##### To initialize virtual disk

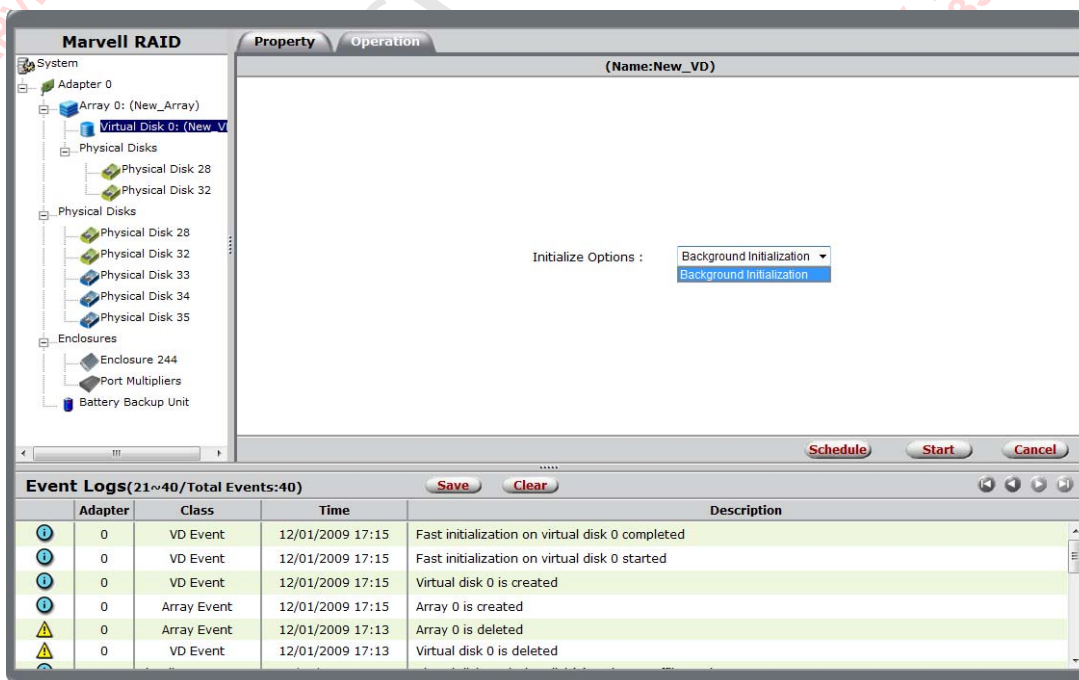
1. Select the **Virtual Disk** from the list of system devices.
2. Roll-over the **Operation** tab, and select **Initialization**, as shown in Figure 5-27.  
The **Initialization Options** screen appears, as shown in Figure 5-28.

Figure 5-27 Virtual Disk Operation Tab



3. Select **Background Initialization**, as shown in Figure 5-28.

Figure 5-28 Initialization Options



**Note:** Fast Initialization is only available during the virtual disk creation process. For information on Fast Initialization, see Appendix D, [Glossary](#).

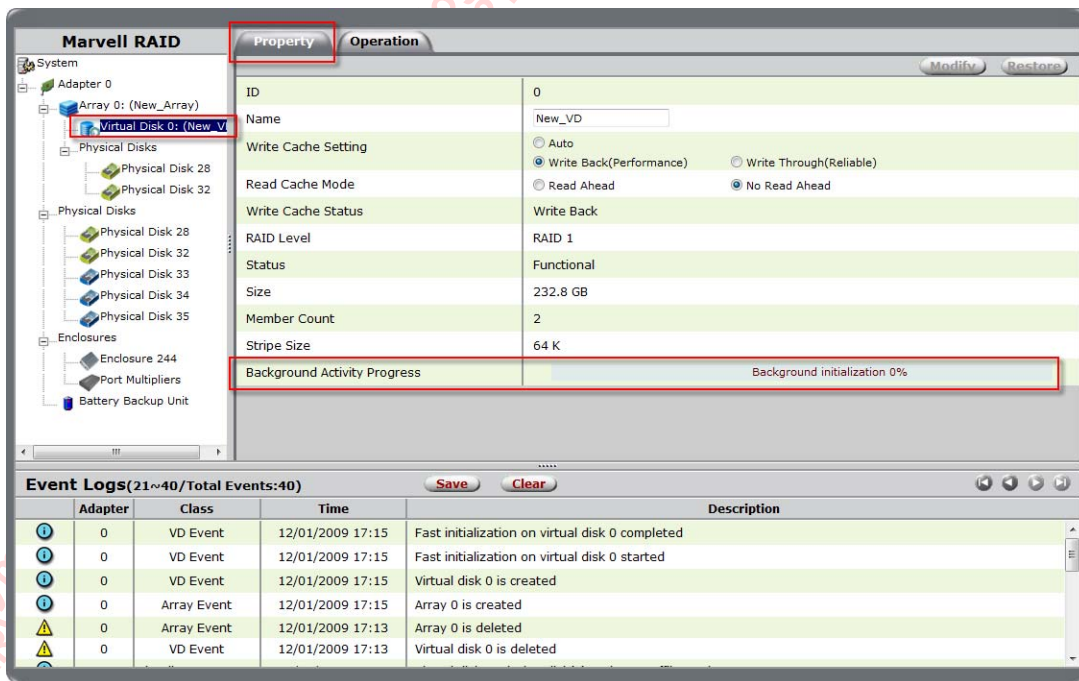


4. Select **Start** to begin background initialization, as shown in Figure 5-29.

**Note:** To schedule background initialization, see 5.4.4.6, [Scheduling Background Activities](#)

MRU displays **Background Activity Progress** in the **Property** tab for the **Virtual Disk**, as shown in Figure 5-29.

**Figure 5-29 Initialization Status**



**Note:** To set the rate of background initialization, see 5.4.4.7, [Controlling Rate of Background Activities](#).

5. Options to **Pause**, **Resume**, and **Stop** Background Initialization are available in the **Operation** tab for the **Virtual Disk**.

#### 5.4.4.5 Checking/Fixing Consistency of Virtual Disk

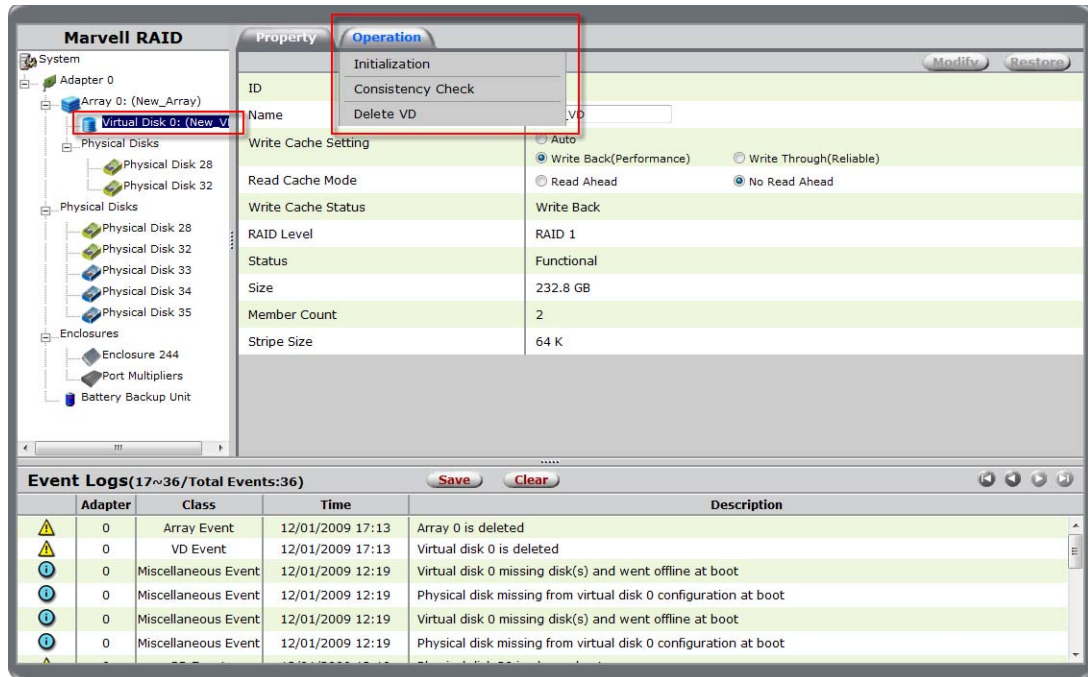
This section describes the procedure for checking and fixing consistency of a virtual disk.

**Note:** For information on Consistency Check, see Appendix D, [Glossary](#).

##### To check/fix consistency of virtual disk

1. Perform a Background Initialization of the virtual disk before checking/fixing consistency, as described in section 5.4.4.4, [Initializing Virtual Disk](#).
2. Select the **Virtual Disk** from the list of system devices.
3. Roll-over the **Operation** tab, and select **Consistency Check**, as shown in Figure 5-30. The **Consistency Check Options** screen appears, as shown in Figure 5-31.

Figure 5-30 Virtual Disk Operation Tab

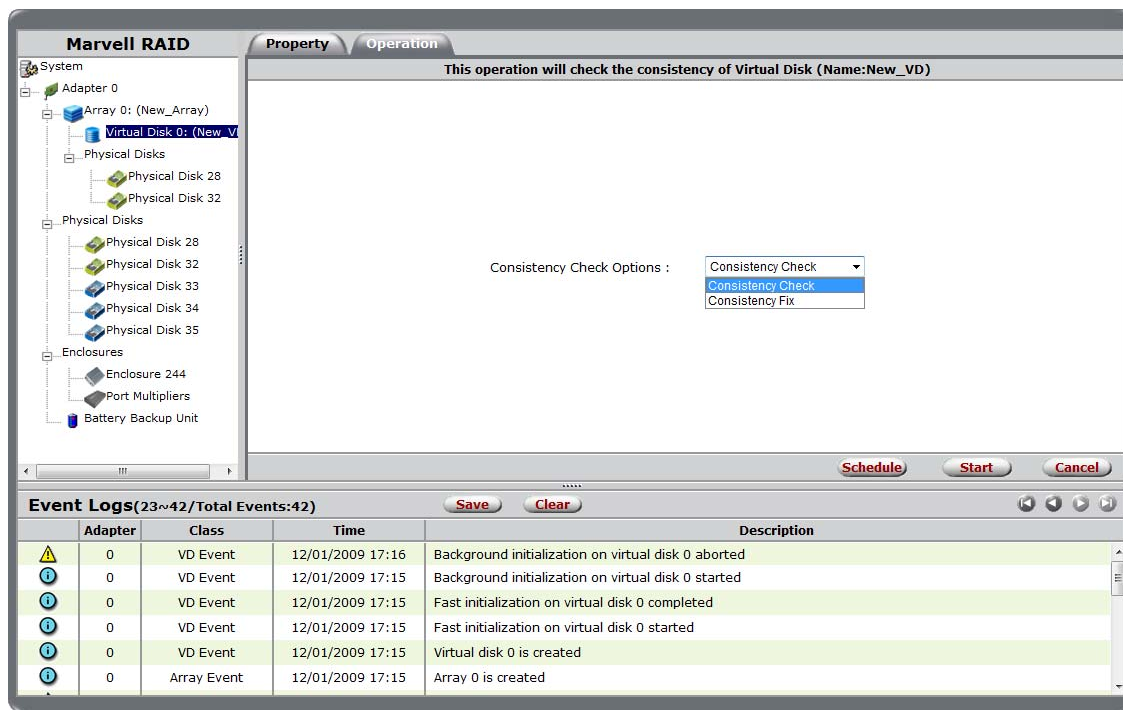


4. As shown in Figure 5-31, select one of the following options:

- Select **Consistency Check** to check and report data inconsistencies.
- Select **Consistency Fix** to check, report, and resolve data inconsistencies.



Figure 5-31 Consistency Check Options



5. Select **Start** to begin consistency check/fix, as shown in Figure 5-31.

**Note:** To schedule background initialization, see 5.4.4.6, [Scheduling Background Activities](#)

MRU displays **Background Activity Progress** in the **Property** tab for the **Virtual Disk**.

6. Options to **Pause**, **Resume**, and **Stop** Consistency Check/Fix are available in the **Operation** tab for the **Virtual Disk**.

#### 5.4.4.6 Scheduling Background Activities

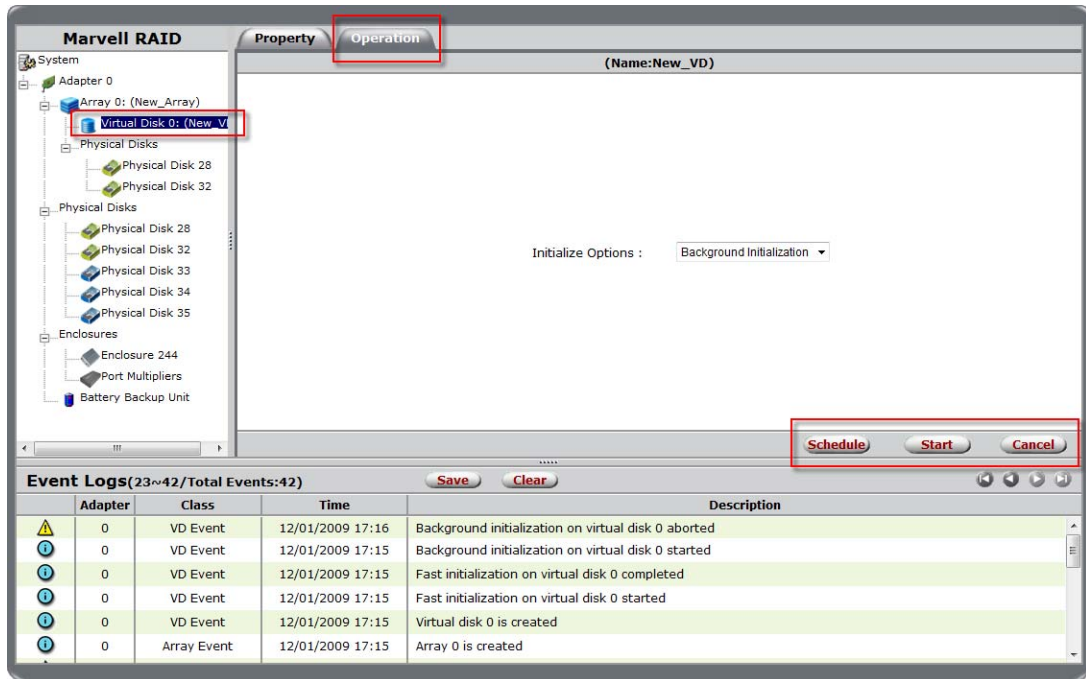
As a maintenance procedure for the virtual disk, MRU can schedule background activities such as initialization and consistency check. This section describes the procedure to schedule background activities in MRU.

##### To schedule background activities

1. Select the **Virtual Disk** from the list of system devices.
2. Roll-over the **Operation** tab, and select one of the following background activities:
  - Select **Initialization** to schedule background initialization for virtual disk.
  - Select **Consistency Check** to schedule consistency check/fix for virtual disk.

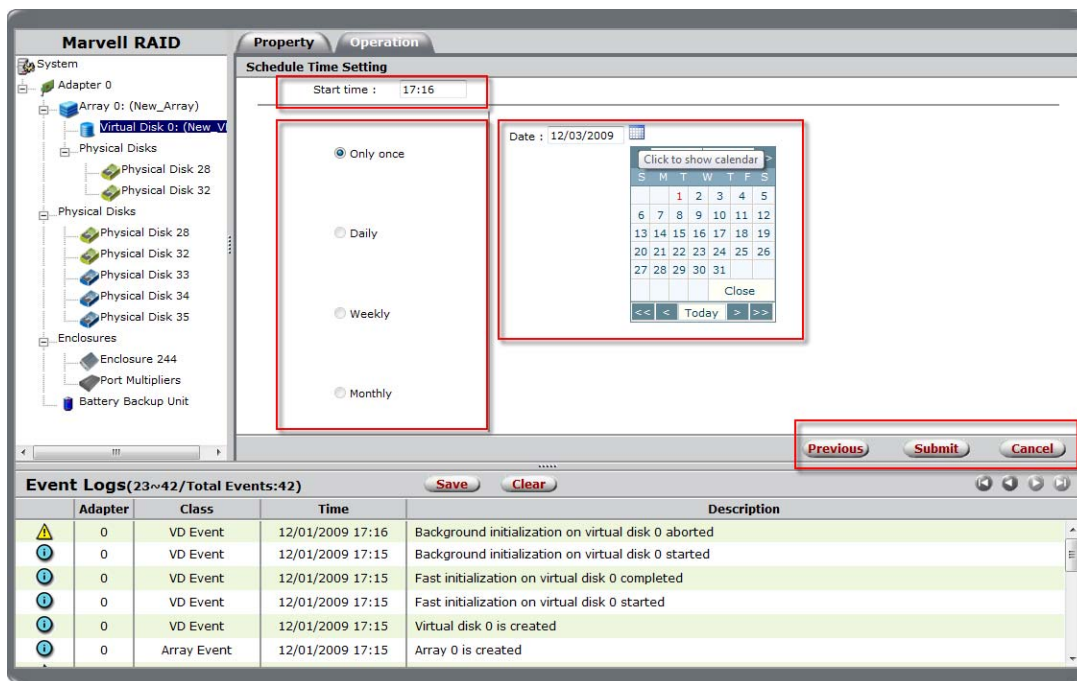
The Background Activity Options (**Initialization Options** in this example) screen appears, as shown in Figure 5-32.

Figure 5-32 Selecting Background Activity



3. Select **Background Initialization**, as shown in Figure 5-32.
4. Select **Schedule** to schedule background initialization, as shown in Figure 5-32. The **Schedule Time Setting** window appears, as shown in Figure 5-32.
5. As shown in Figure 5-33, select the **Start time** and **Date** for the first occurrence. By default, MRU runs the activity **Only once**. Choose between the available options (Daily, Weekly, Monthly) to schedule the background activity on a periodic basis.

Figure 5-33 Selecting Date and Time

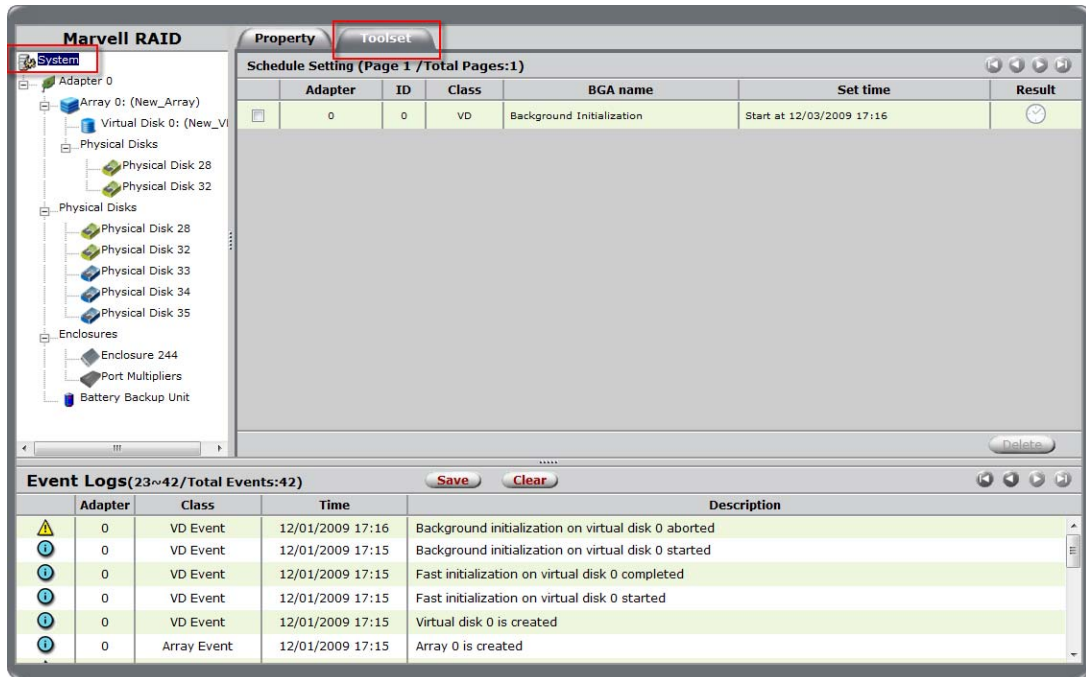


- After scheduling the activity, select **Submit** to confirm changes, as shown in Figure 5-33.

The **Schedule Setting** window appears, as shown in Figure 5-34, listing details of the scheduled activity.

**Note:** Schedule Setting is now listed as an option in the System > Toolset menu. Use this option to view the list of scheduled activities.

Figure 5-34 Schedule Setting



**Note:** Schedule Setting is *not* listed in the System > Toolset menu *until* an activity is scheduled.

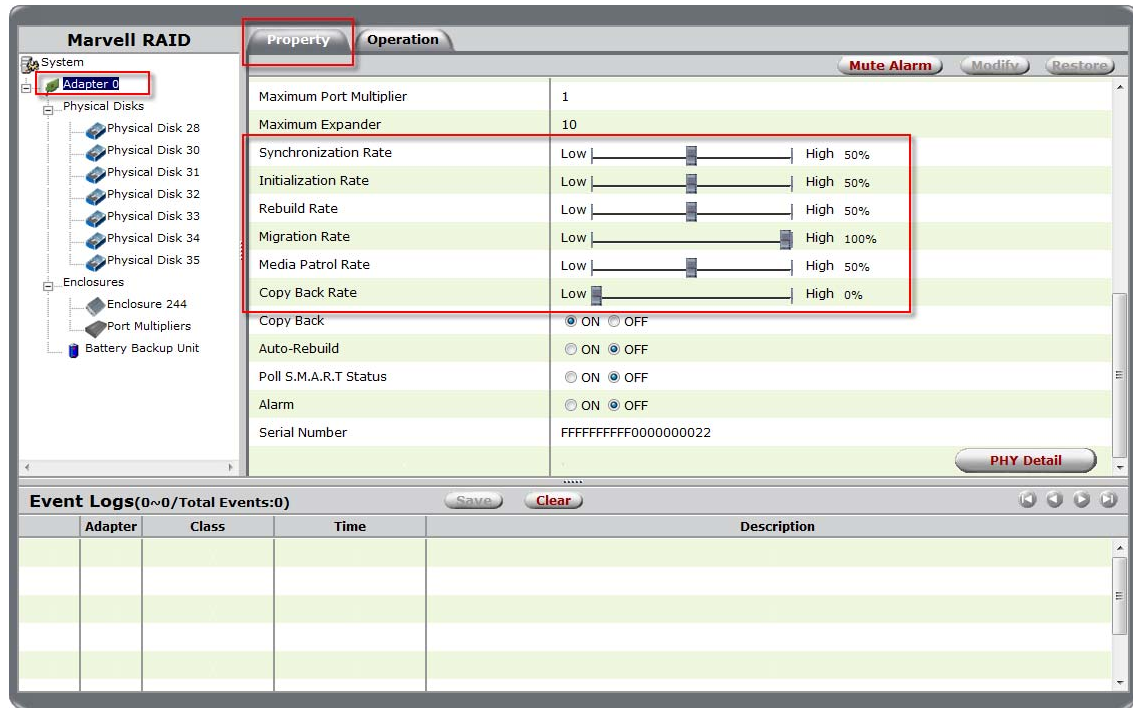
#### 5.4.4.7 Controlling Rate of Background Activities

The controller prioritizes background activities based on the specified control rates. When background activities are in progress, the controller is still available to the OS for normal operations. However, the response time may be slower depending on the background activity control rate.

The rate of various background activities can be modified from the **Property** tab for the **Adapter**, as shown in Figure 5-35. Move the slider to adjust the rates and then select **Modify** to confirm changes.

**Note:** For information on Synchronization Rate, Initialization Rate, Rebuild Rate, and Media Patrol Rate, see Appendix D, [Glossary](#).

Figure 5-35 Controlling Rate of Background Activities



**Note:** Modify is grayed-out until the settings change.

## 5.5 Managing Physical Disks

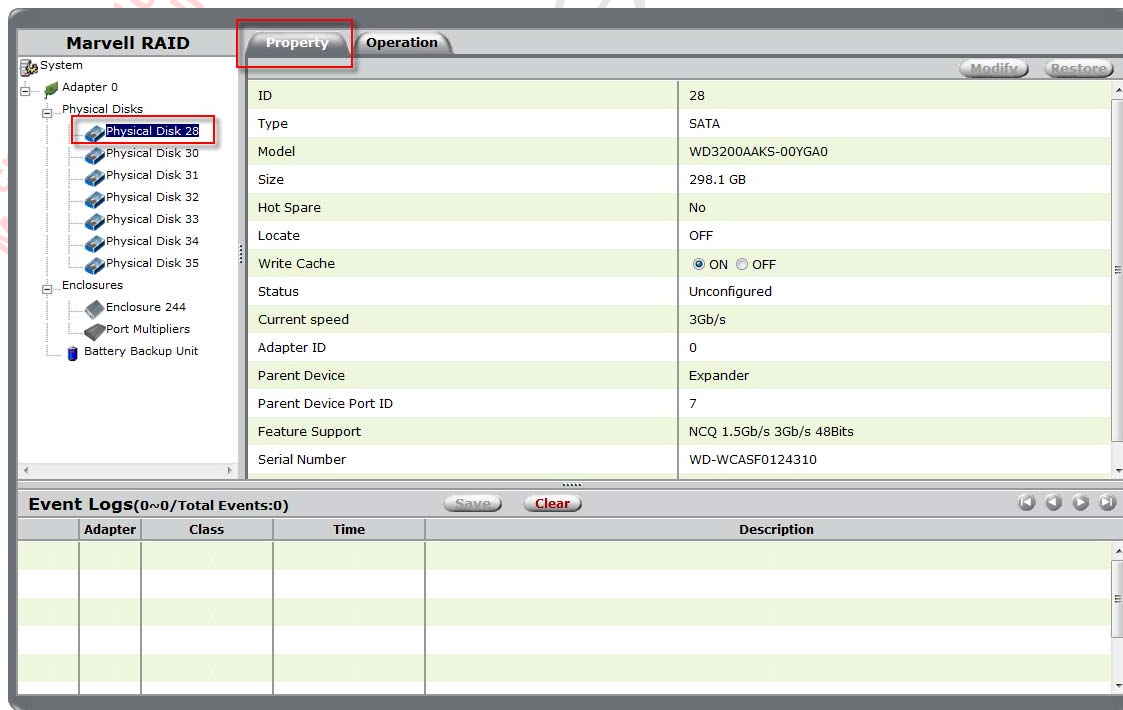
This section discusses the following:

- Viewing Properties of Physical Disk
- Locating Physical Disk in Enclosure
- Starting Media Patrol
- Releasing an Offline Physical Disk from Virtual Disk
- Assigning Physical Disk as Global Spare Drive
- Assigning Physical Disk as Dedicated Spare Drive
- Erasing RAID Configuration Data on Foreign Physical Disk

### 5.5.1 Viewing Properties of Physical Disk

To view the properties of a physical disk, select the **Physical Disk** in the list of system devices, as shown in Figure 5-36. Upon selection, MRU displays the **Property** tab for the physical disk.

Figure 5-36 Properties of Physical Disk



MRU uses different icons to indicate the status of the physical disk. For more information, see Appendix C, [Icons used in MRU](#).



## 5.5.2 Locating Physical Disk in Enclosure

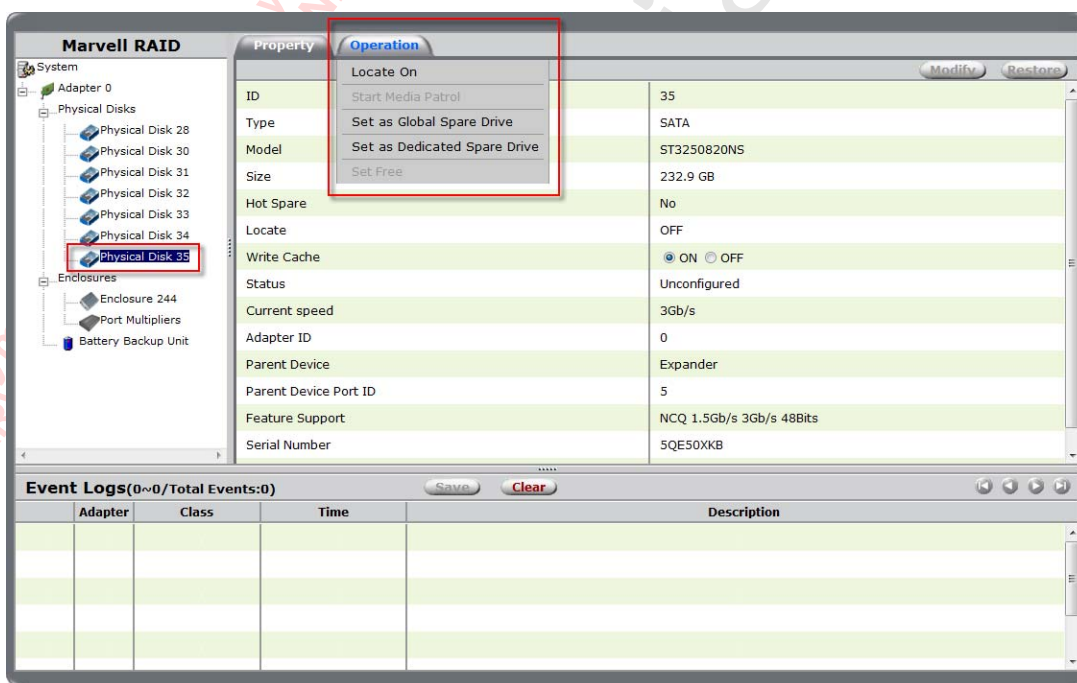
The Locate feature helps you identify a physical disk in an enclosure containing many physical disks. It works either by switching the LED on the physical disk on or making it blink. The behavior of the Locate feature is determined by the design of the enclosure.

**Note:** The enclosure must support this feature for it to work.

### To locate a physical disk

1. Select the **Physical Disk**, in the list of system devices, as shown in Figure 5-37.
2. Roll-over the **Operation** tab, and select **Locate On** to turn Locate on, as shown in Figure 5-37.

Figure 5-37 Turn Locate On

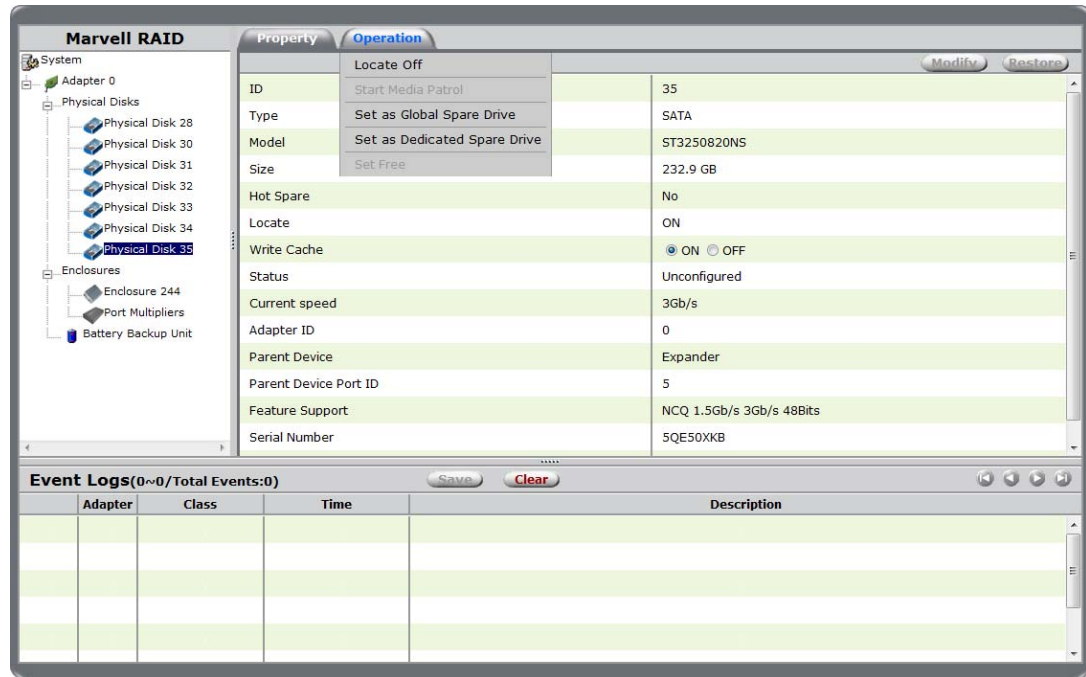


### To turn Locate off for a physical disk

1. Select the **Physical Disk**, in the list of system devices, as shown in Figure 5-38.
2. Roll-over the **Operation** tab, and select **Locate Off** to turn Locate off, as shown in Figure 5-38.



Figure 5-38 Turn Locate Off



### 5.5.3 Starting Media Patrol

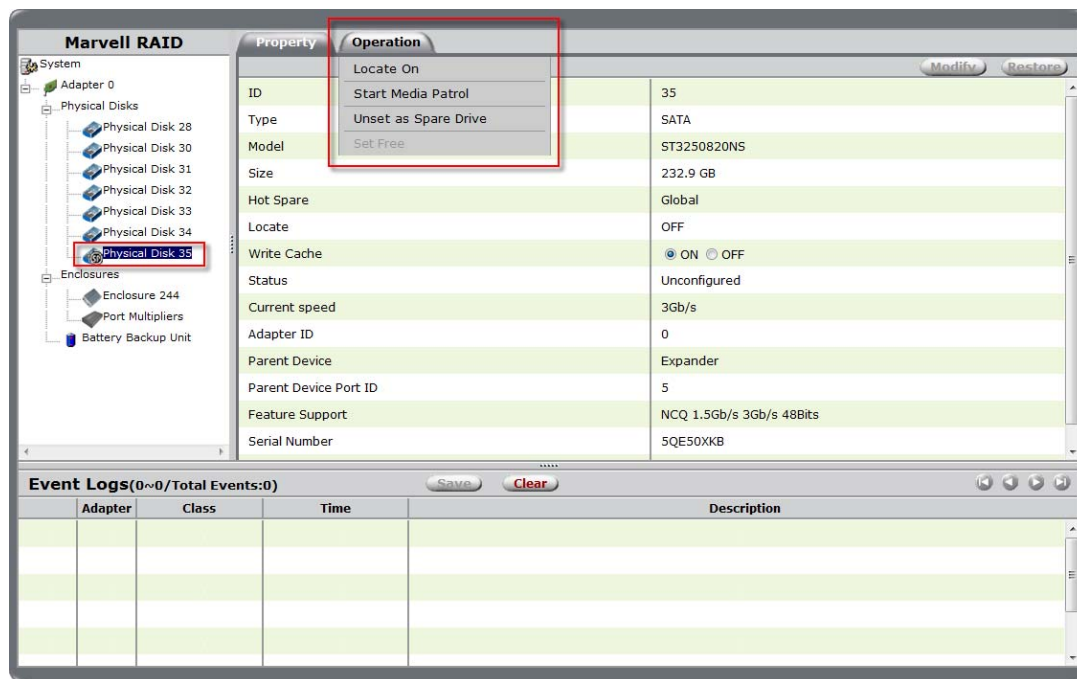
This section describes the procedure for starting media patrol on a configured physical disk (that is part of a virtual disk) or a spare drive.

**Note:** For information on Media Patrol, see Appendix D, [Glossary](#).

#### To start media patrol

1. Select the **Physical Disk** in the list of system devices.
2. Roll-over the **Operation** tab, and select **Start Media Patrol** as shown in Figure 5-39.  
MRU displays **Background Activity Progress** in the **Property** tab for the **Physical Disk**.

Figure 5-39 Starting Media Patrol



- Options to **Pause**, **Resume**, and **Stop** Media Patrol are available in the **Operation** tab for the **Virtual Disk**.

### 5.5.4 Releasing an Offline Physical Disk from Virtual Disk

This section describes the procedure for releasing an offline physical disk from a virtual disk. For information on offline physical disks, see Appendix C, [Icons used in MRU](#).

#### To release an offline physical disk

- Select offline **Physical Disk** in the list of system devices.
- Rollover the **Operation** tab, and select **Set Free**.

The physical disk is now released from the virtual disk.

### 5.5.5 Assigning Physical Disk as Global Spare Drive

You can assign spare drives that can be used for [Rebuilding Degraded Array](#). Global spare drives can be used by any array. Only an unconfigured physical disk can be assigned as a spare drive. A physical disk which is either fully or partially configured cannot be used as a spare drive.

#### To assign physical disk as global spare drive

- Select **Physical Disk**.
- Roll-over the **Operation** tab, and select **Set as Global Spare Drive**, as shown in Figure 5-40. MRU confirms the assignment as shown in Figure 5-41.

Figure 5-40 Assigning Physical Disk as Global Spare Drive

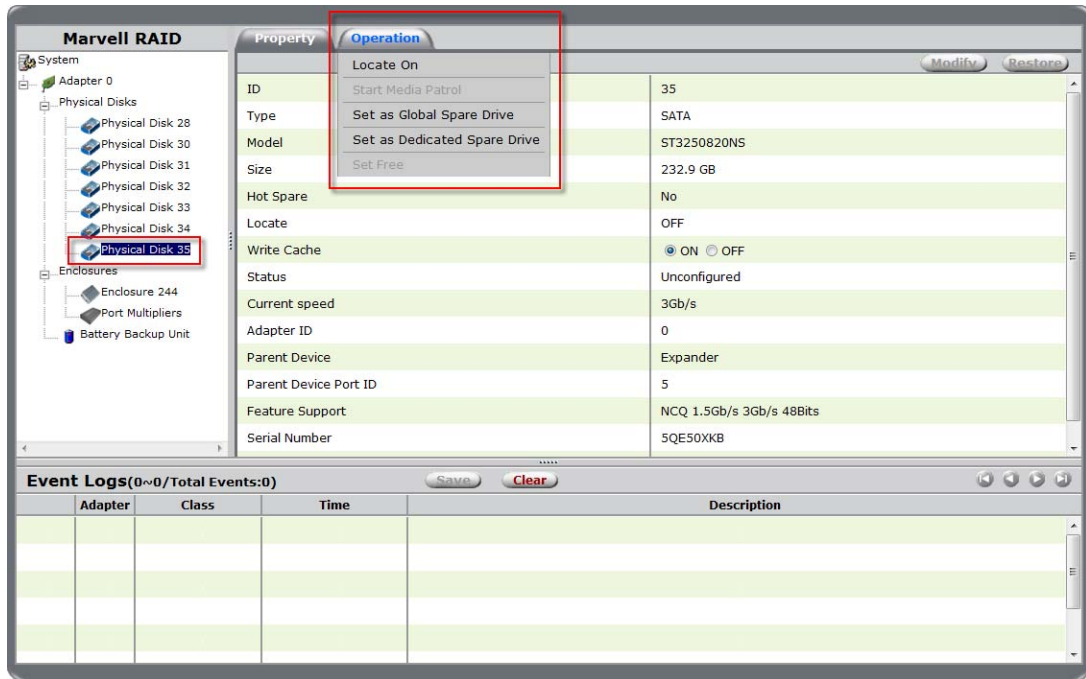
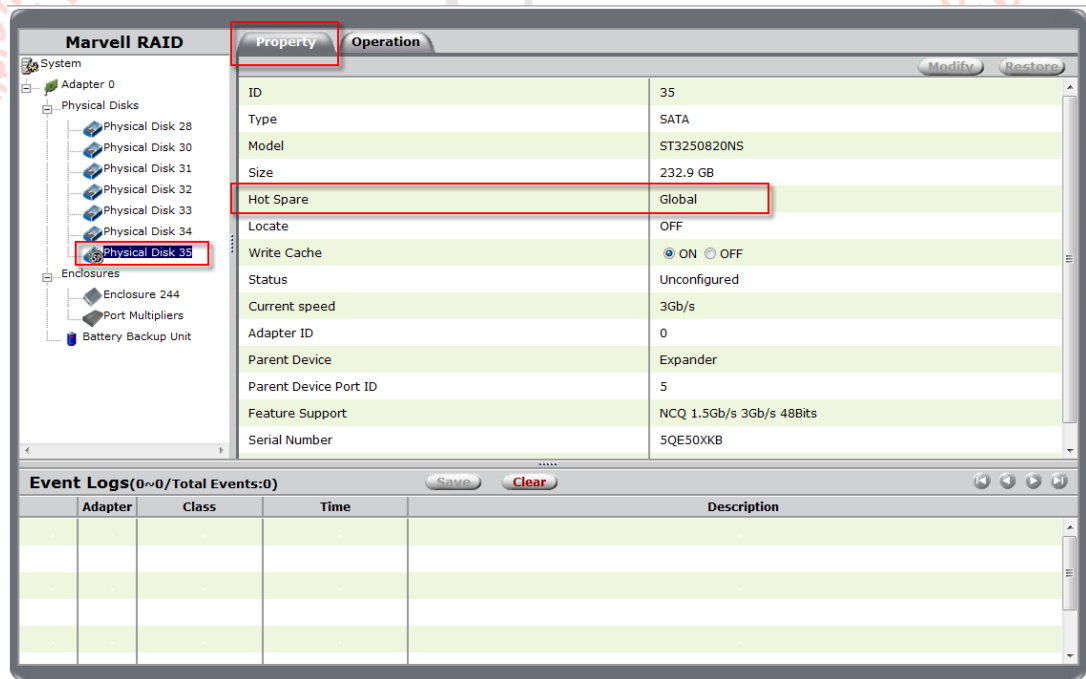


Figure 5-41 Spare Confirmation



### To release a physical disk from spare drive status

1. Select an unconfigured **Global Spare Drive**.
2. Roll-over the **Operation** tab, and select **Unset as Global Spare Drive**.  
MRU confirms the change by updating the **Status** of the physical disk in the Property tab.

## 5.5.6 Assigning Physical Disk as Dedicated Spare Drive

You can assign spare drives that can be used for **Rebuilding Degraded Array**. Dedicated spare drives are used exclusively for rebuilding a specific array. Only an unconfigured physical disk can be assigned as a spare drive. A physical disk which is either fully or partially configured cannot be used as a spare drive.

### To assign physical disk as global spare drive

1. Select **Physical Disk**.
2. Roll-over the **Operation** tab, and select **Set as Dedicated Spare Drive**, as shown in Figure 5-42.

A screen appears, as shown in Figure 5-43, prompting you to select the array.

**Figure 5-42 Assigning Physical Disk as Dedicated Spare Drive**

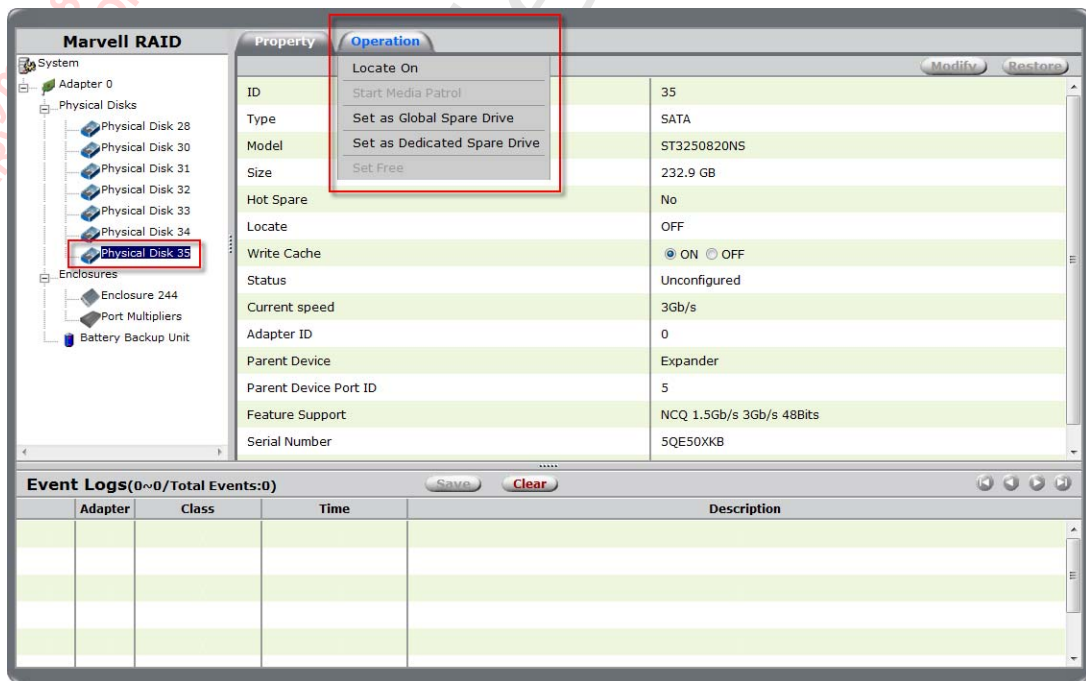
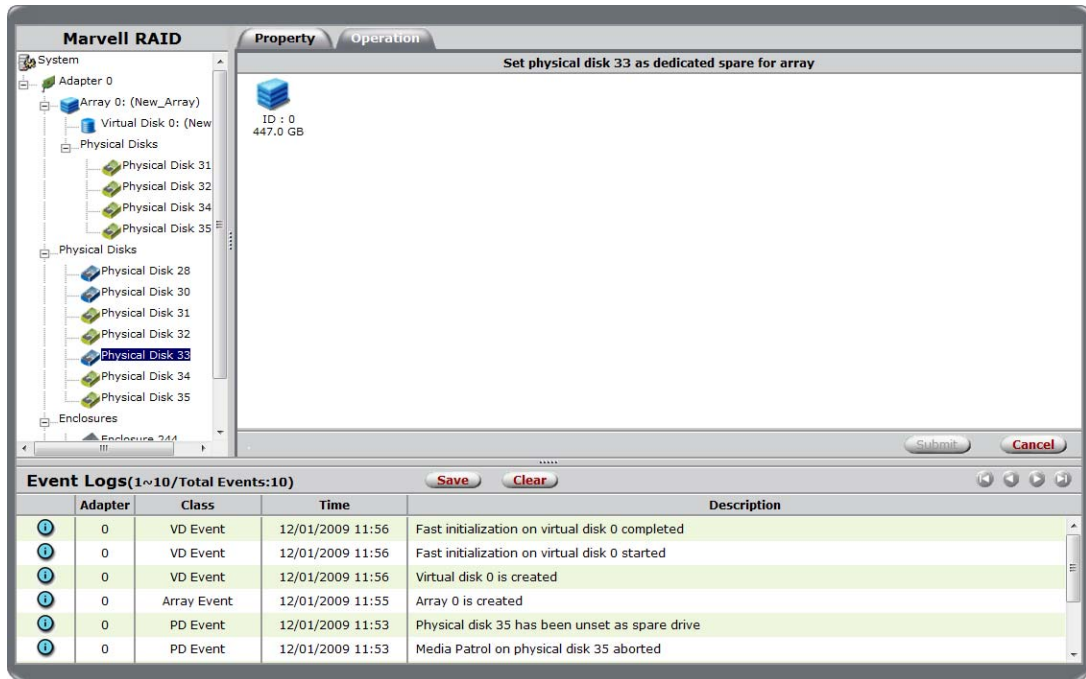


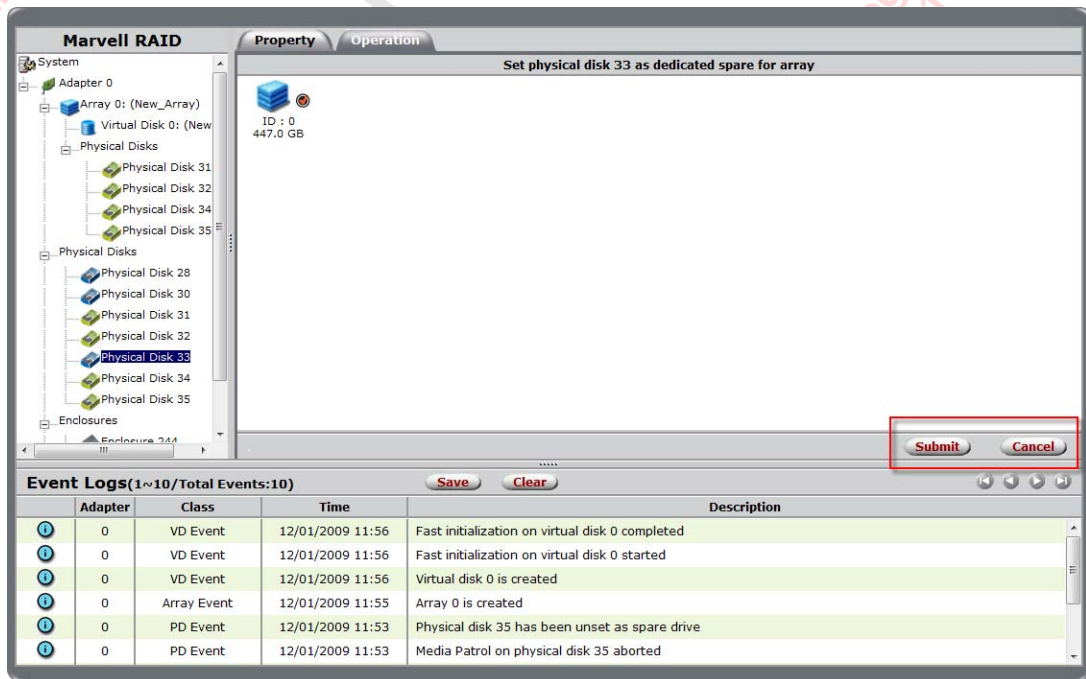
Figure 5-43 Select Array



3. Select the array by clicking on it., as shown in Figure 5-43.

Upon selection, an check-mark appears next to the array icon, as shown in Figure 5-44.

Figure 5-44 Array Selected



4. Click Submit, as shown in Figure 5-44, to create the dedicated spare drive.  
MRU confirms the change by updating the **Status** of the physical disk in the Property tab.

#### To release a physical disk from spare drive status


1. Select an unconfigured **Dedicated Spare Drive**.
2. Roll-over the **Operation** tab, and select **Unset as Dedicated Spare Drive**.  
MRU confirms the change by updating the **Status** of the physical disk in the Property tab.

### 5.5.7 Erasing RAID Configuration Data on Foreign Physical Disk

This section describes the procedure to erase RAID configuration data (if any) on a foreign physical disk.

**Note:** The RAID controller stores RAID configuration data on all physical disks that are part of a virtual disk. RAID configuration data must be erased on the physical disk before it can be used with another virtual disk.

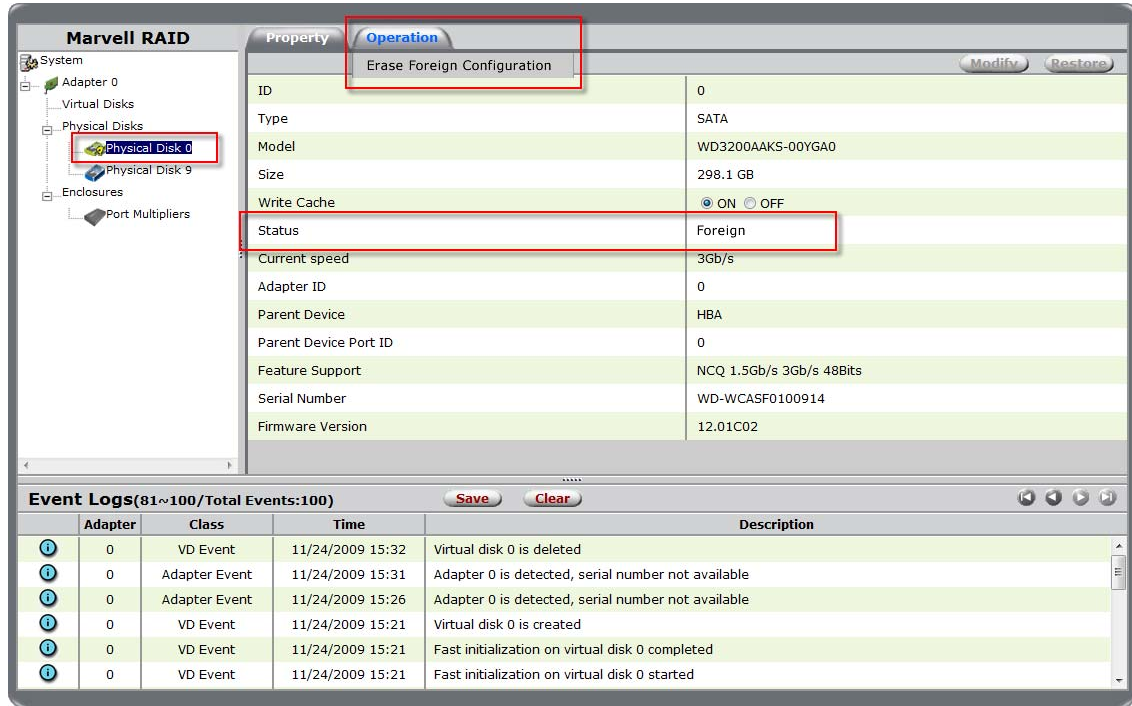
#### To erase RAID configuration data

**WARNING**  If the physical disk was originally part of another virtual disk, erasing RAID configuration data may damage that virtual disk, depending on its fault tolerance capabilities.

1. Select foreign **Physical Disk** in the list of system devices, as shown in Figure 5-45.
2. Rollover the **Operation** tab, and select **Erase Foreign Configuration**, as shown in Figure 5-45.



Figure 5-45 Erasing RAID Configuration Data on Physical Disk



## 5.6 Managing Enclosures

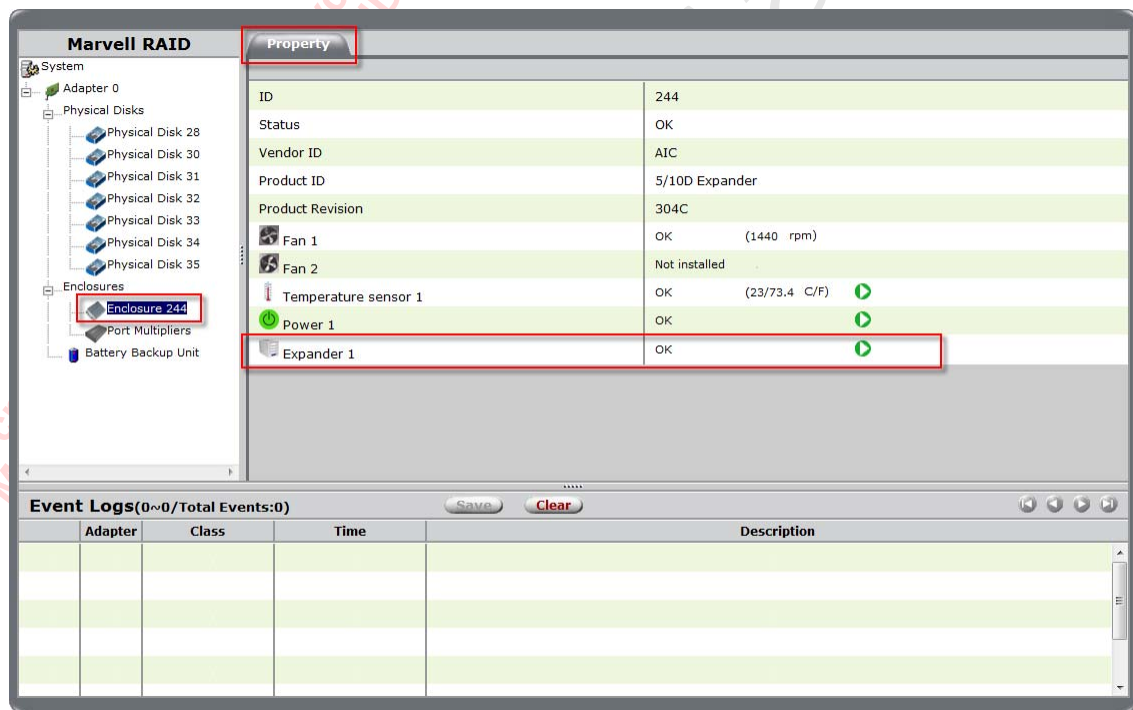
This section discusses the following:

- Viewing Properties of Expander
- Viewing Properties of Port Multiplier

### 5.6.1 Viewing Properties of Expander

To view the properties of an expander, select the **Enclosure** in the list of system devices, as shown in Figure 5-46. Upon selection, MRU displays the **Property** tab for the Enclosure.

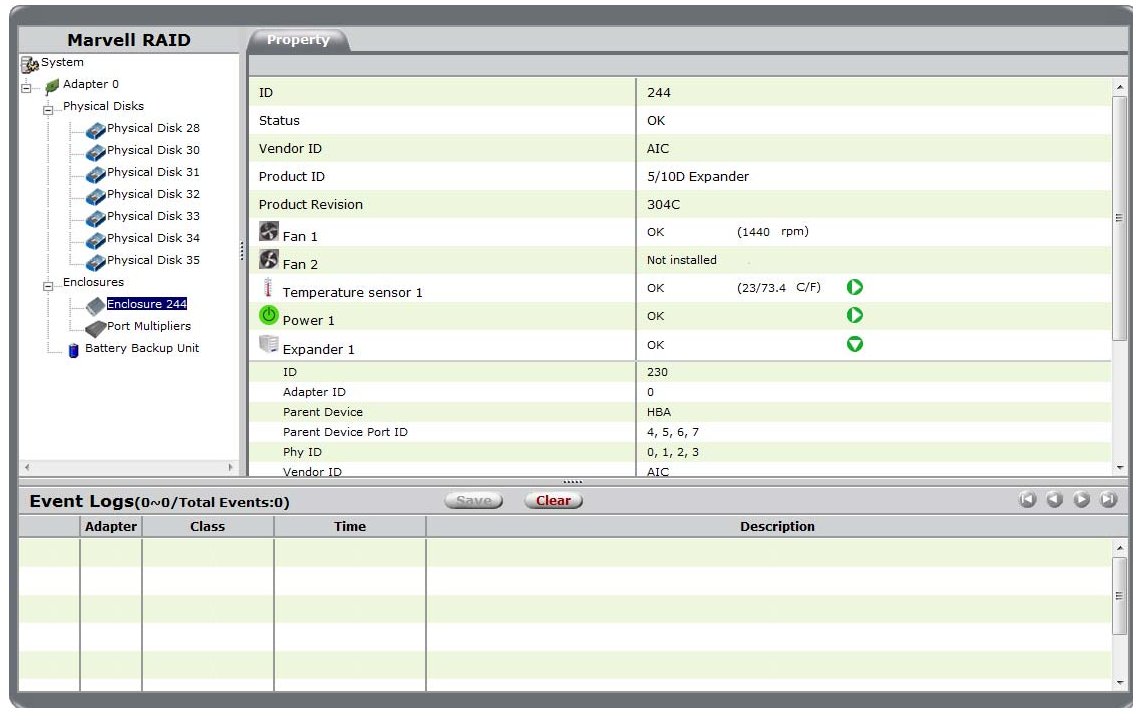
Figure 5-46 Properties of Expander



By default, the detailed properties of enclosure elements are hidden. Click the arrow, as shown in Figure 5-46, to view detailed properties.

Figure 5-47 shows the detailed properties for Expander 1. Click the arrow, as shown in Figure 5-47, to hide details.

Figure 5-47 Detailed Properties of Expander



## 5.6.2 Viewing Properties of Port Multiplier

To view the properties of a port multiplier, select **Port Multipliers** in the list of system devices. Upon selection, MRU displays the **Property** tab listing all port multipliers connected to the RAID controller, as shown in Figure 5-48.

Select **[Detail>>]**, as shown in Figure 5-48, to view detailed properties of the port multiplier.

Figure 5-48 Properties of Port Multiplier

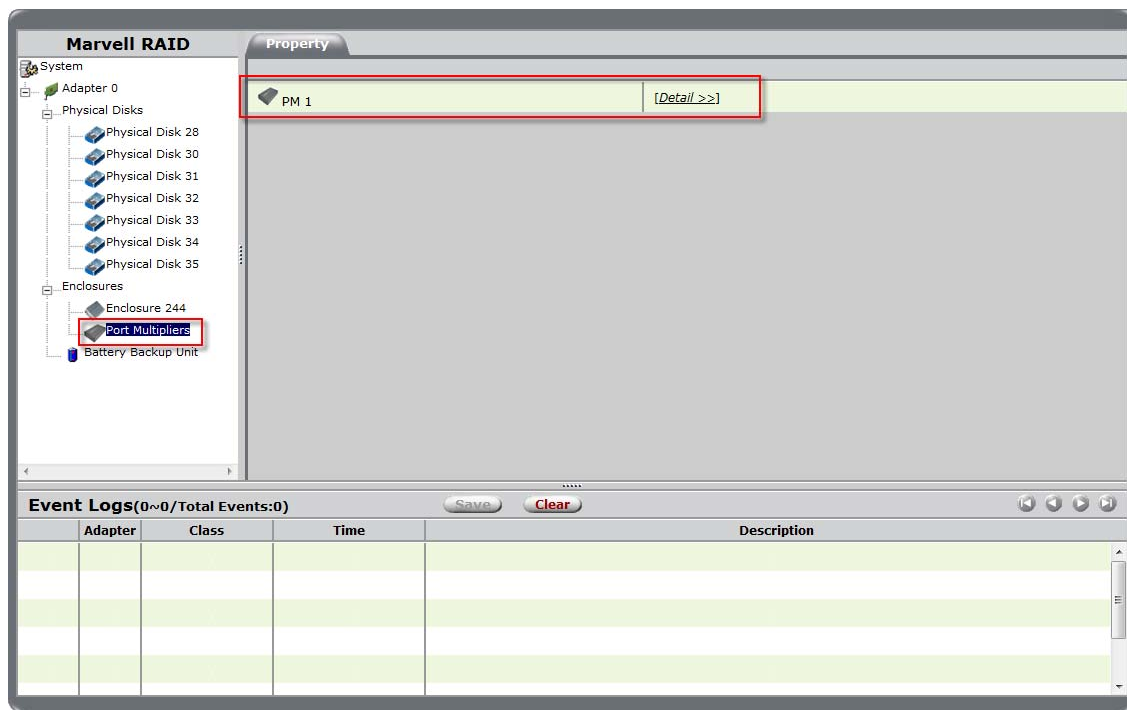
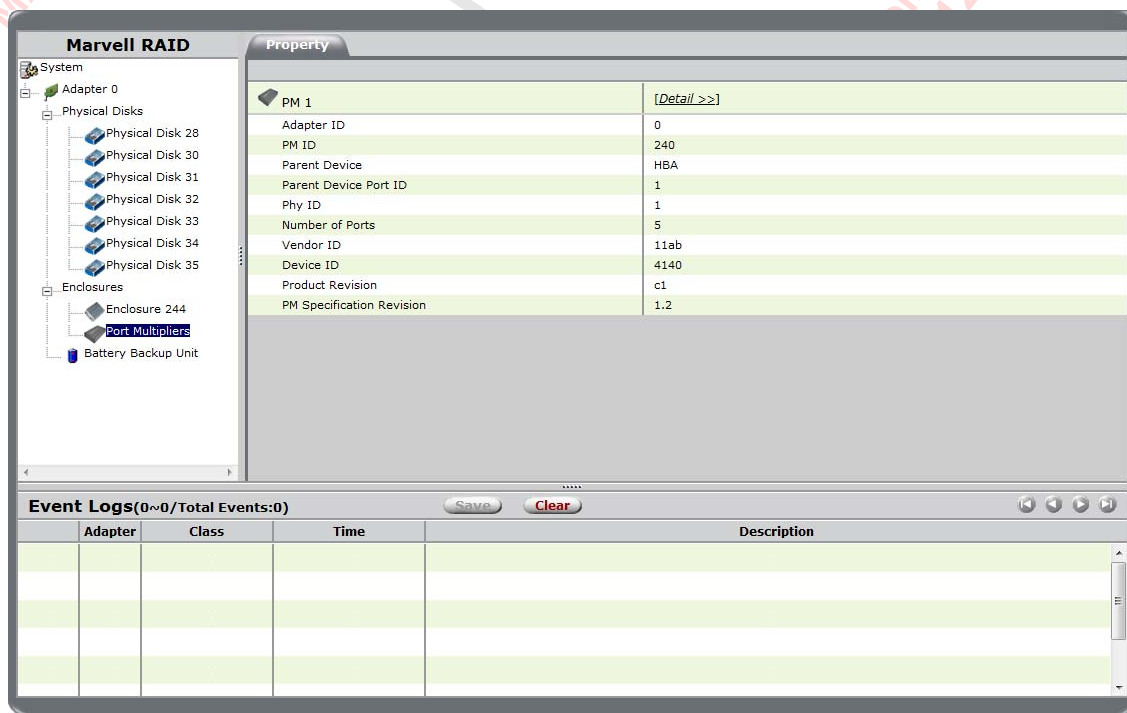


Figure 5-49 shows detailed properties of port multiplier PM 1. Select **[Detail>>]**, as shown in Figure 5-49, to hide details.

Figure 5-49 Detailed Properties of Port Multiplier



## 5.7 Managing Battery Backup Unit (BBU)

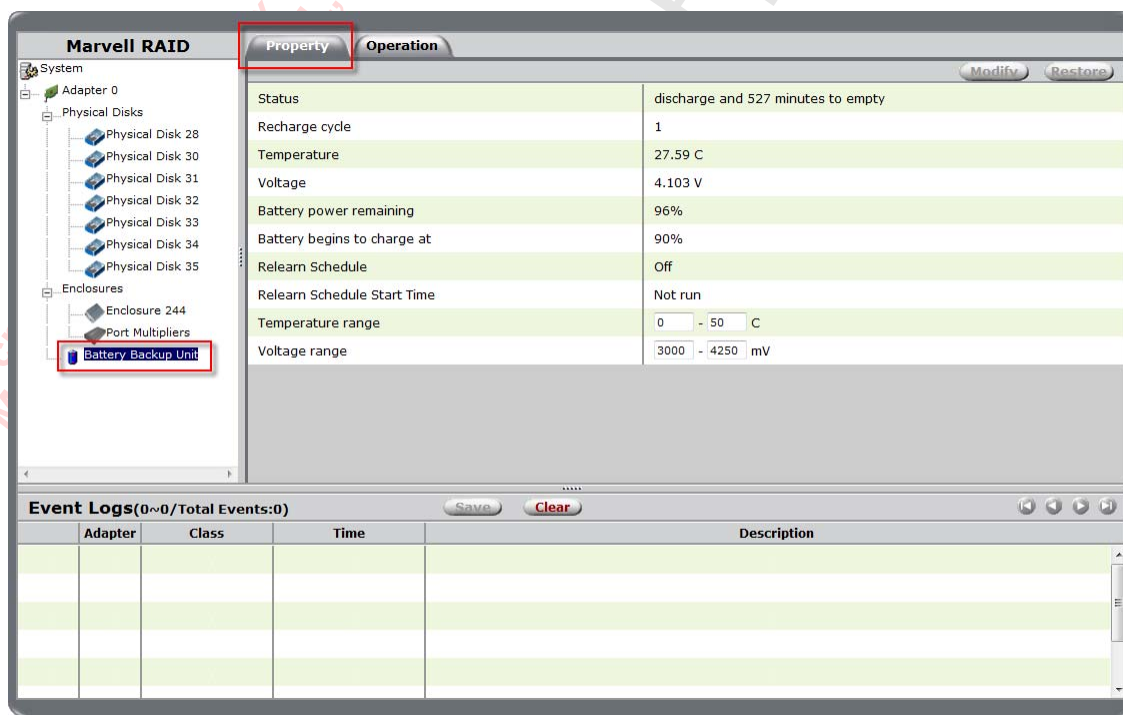
This section discusses the following:

- Viewing Properties of BBU
- Scheduling Relearn for BBU
- Configuring BBU Alerts

### 5.7.1 Viewing Properties of BBU

To view the properties of the BBU, select **Battery Backup Unit** in the list of system devices. Upon selection, MRU displays the **Property** tab for the BBU connected to the RAID controller, as shown in Figure 5-50.

Figure 5-50 Properties of BBU



### 5.7.2 Scheduling Relearn for BBU

This section describes the procedure for scheduling BBU Relearn. For more information on Relearn, see Appendix D, [Glossary](#).

#### To schedule relearn for BBU

1. Select **Battery Backup Unit** in the list of system devices, as shown in Figure 5-51.
2. Rollover the **Operation** tab, and select **Schedule Relearn**, as shown in Figure 5-51.
3. The Schedule Time Setting screen appears, as shown in Figure 5-52.

Figure 5-51 Schedule Relearn

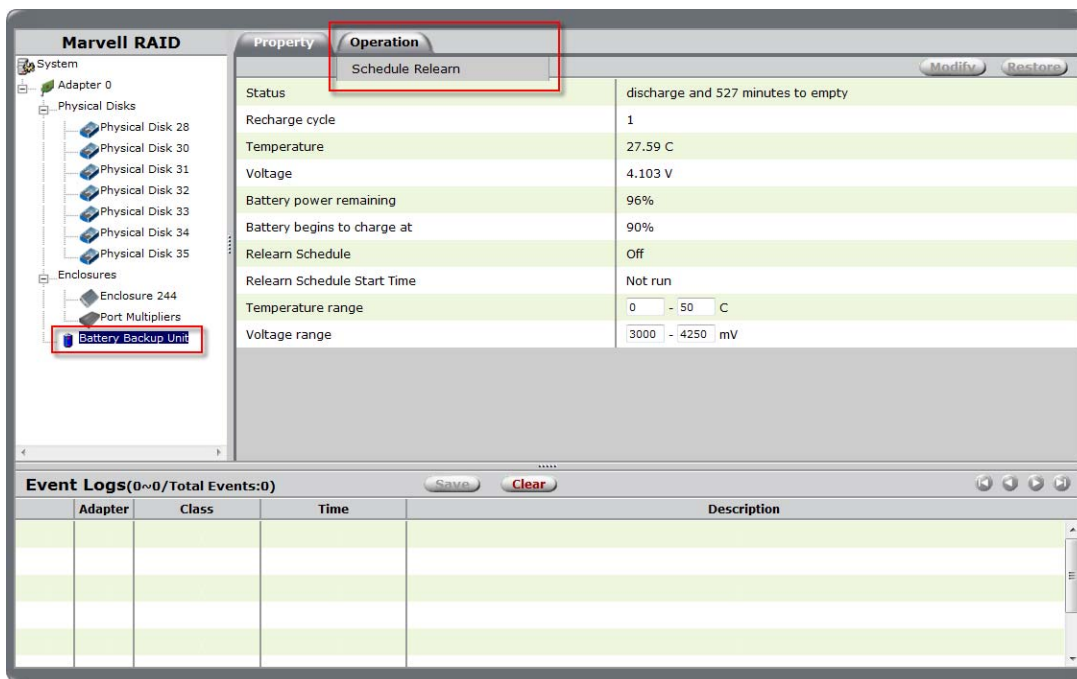
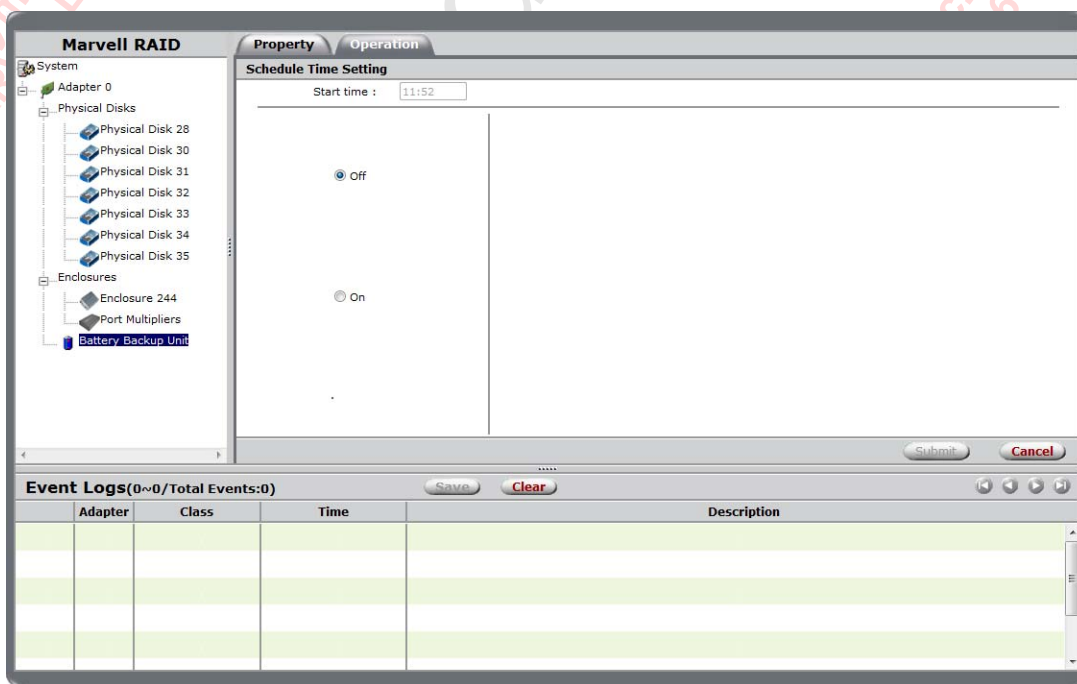


Figure 5-52 Schedule Time Setting



4. Select **On** to enable scheduling, as shown in Figure 5-52.
5. Type the time-period (in days) for repeating the Relearn procedure in the **Recur every \_\_\_ day(s)** field, as shown in Figure 5-52.



6. Select **Submit**, as shown in Figure 5-53.

MRU confirms the selection by updating **Relearn Schedule** in the **Property** tab for the BBU, as shown in Figure 5-54.

Figure 5-53 Recurrence

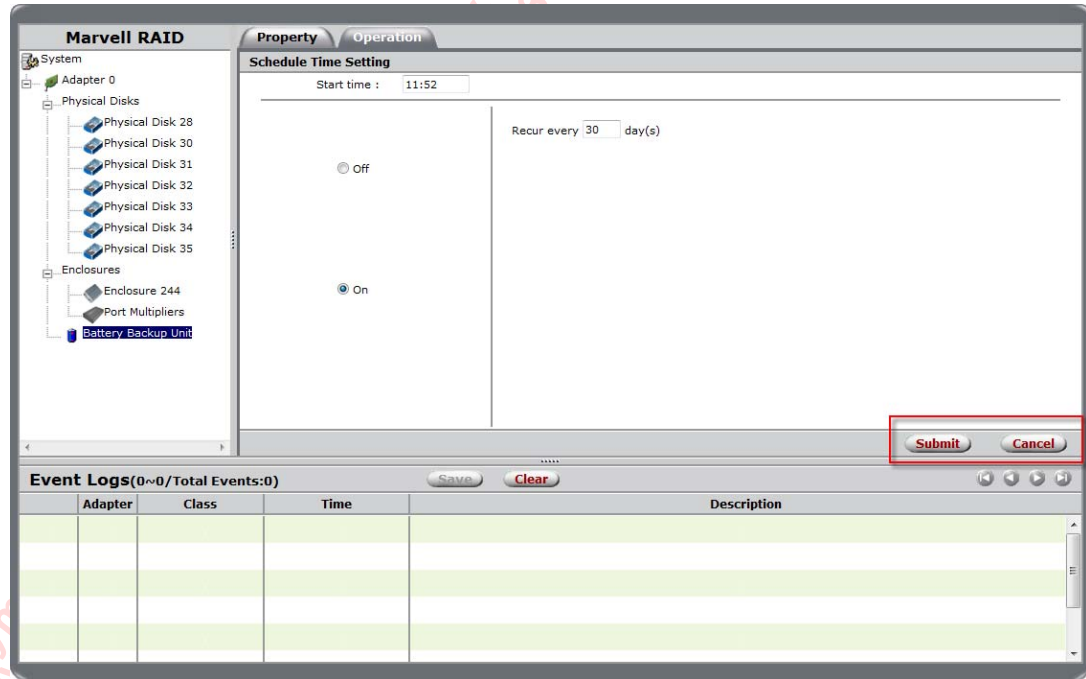
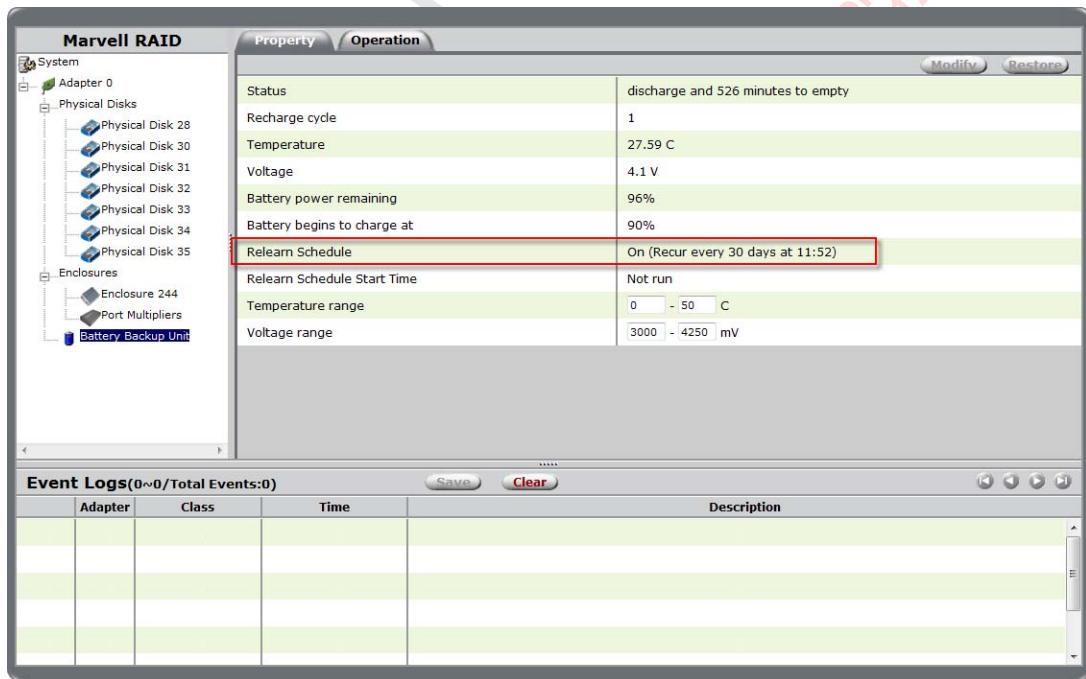


Figure 5-54 Relearn Status

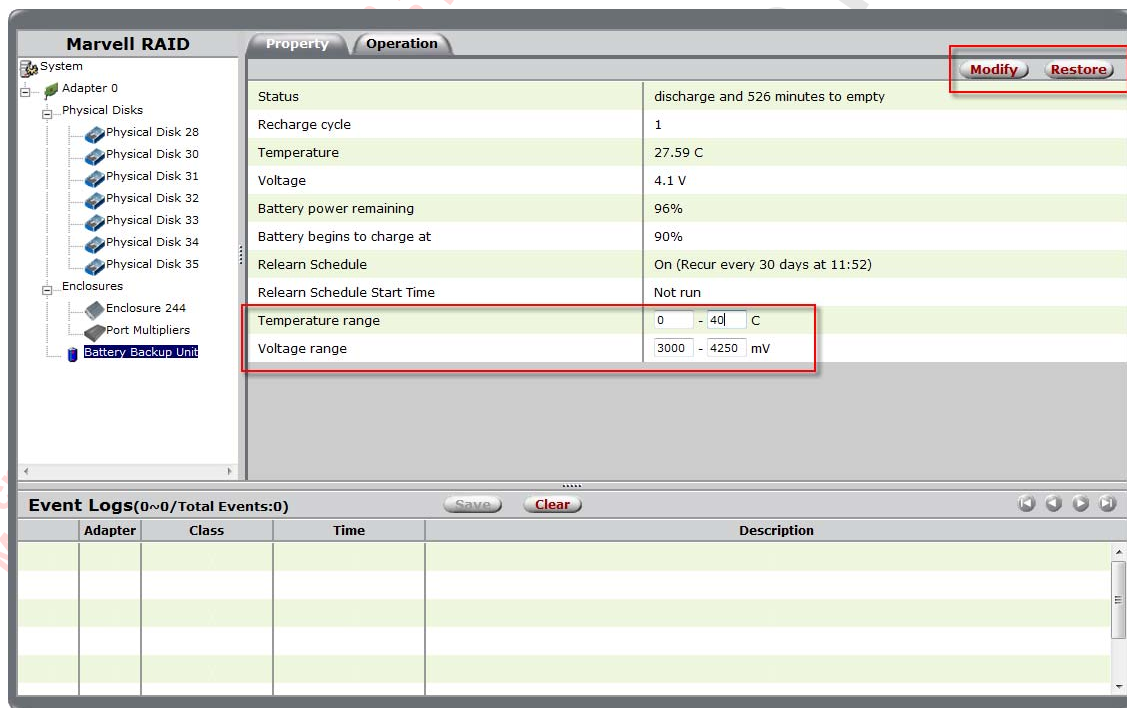


### 5.7.3 Configuring BBU Alerts

MRU generates Warning and Error events based on Temperature and Voltage readings of the BBU. The Property tab for the Battery Backup Unit lists the default operating Temperature range and Voltage range. If the BBU temperature and/or voltage readings are outside these limits (not including them), then MRU updates the Events Logs with Warning and Error events as appropriate.

To change the threshold settings, edit the values in the text fields provided for **Temperature range** and **Voltage range**, as shown in Figure 5-55. Select **Modify** to confirm changes.

Figure 5-55 Configuring BBU Threshold Settings



Marvell RAID	
Property	Operation
Status	discharge and 526 minutes to empty
Recharge cycle	1
Temperature	27.59 C
Voltage	4.1 V
Battery power remaining	96%
Battery begins to charge at	90%
Relearn Schedule	On (Recur every 30 days at 11:52)
Relearn Schedule Start Time	Not run
Temperature range	0 - 40 C
Voltage range	3000 - 4250 mV

Event Logs(0~0/Total Events:0)				
Adapter	Class	Time	Description	

## 5.8 Monitoring Array

This section discusses the following:

- [Receiving E-mail Notifications](#)
- [Viewing Events using Windows Event Viewer](#)
- [Enabling Alarm for Critical Events](#)

### 5.8.1 Receiving E-mail Notifications

MRU can send event notifications to a user's email account. This requires a working SMTP email server. This involves the following two steps:

- [Configuring SMTP E-mail Server Settings](#)
- [Selecting Event Notifications](#)

#### 5.8.1.1 Configuring SMTP E-mail Server Settings

This section describes the procedure to configure SMTP e-mail server settings in MRU.

**To configure SMTP e-mail server settings**

1. Select **System** in the list of system devices.
2. Roll-over the **Toolset** tab, and select **Email Setting**, as shown in Figure 5-56.

The **Email Setting** window appears, as shown in Figure 5-57.

Figure 5-56 System Toolset Menu

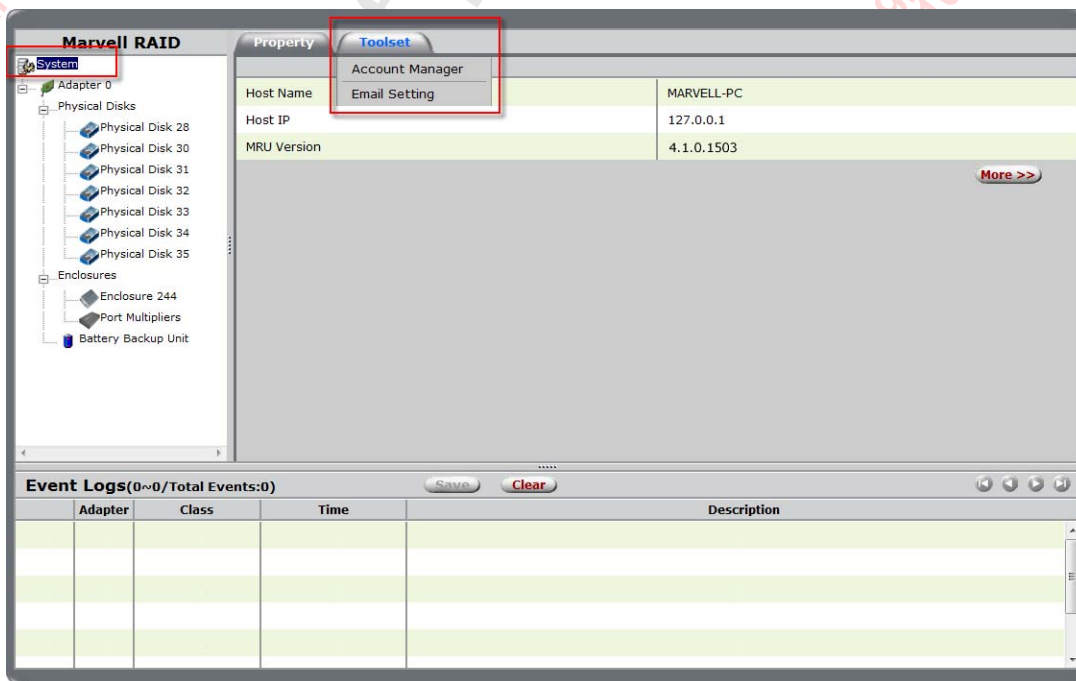
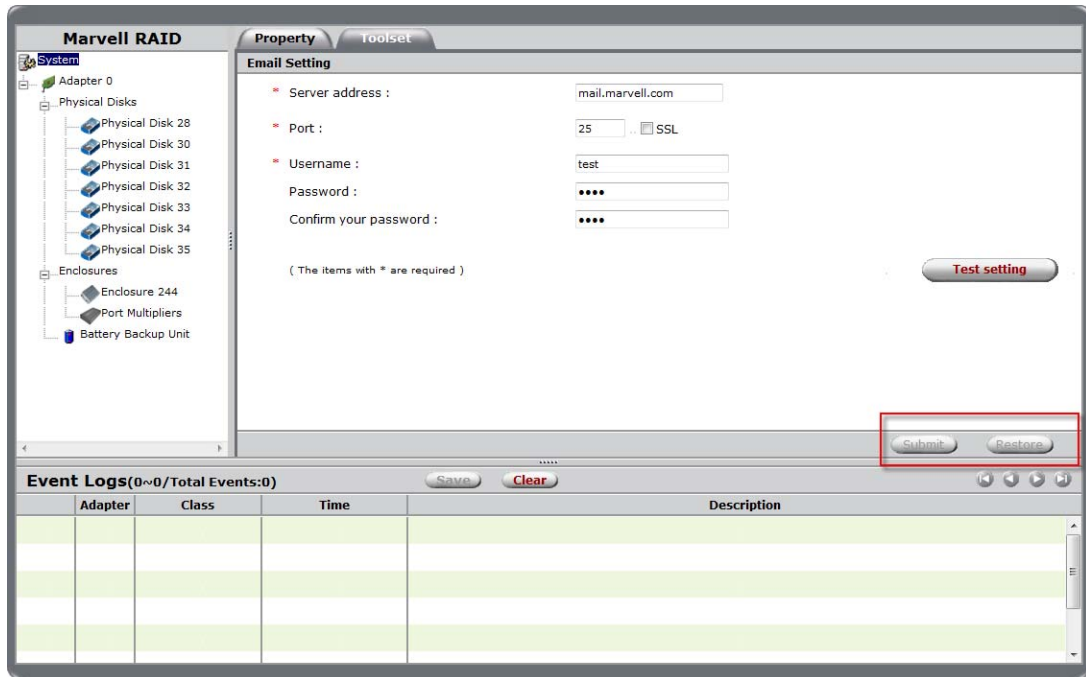


Figure 5-57 Email Settings



3. Configure the email server settings, and select **Test setting**, as shown in Figure 5-57. MRU sends a test mail to the configured email address. If the test mail is received, the settings are working correctly.
4. Select **Submit** to save settings.  
MRU confirms changes with the message **Setting updated successfully!**

#### 5.8.1.2 Selecting Event Notifications

This section describes the procedure for selecting event types (information, error, warning) that trigger email notifications.

**Note:** For information on the icons used for different event types, see Appendix C, [Icons used in MRU](#).

##### To receive e-mail event notifications

1. Select **System** in the list of system devices.
2. Roll-over the **Toolset** tab, and select **Account Manager**, as shown in Figure 5-58.  
The **Account Manage** window appears, as shown in Figure 5-59.

Figure 5-58 System Toolset Menu

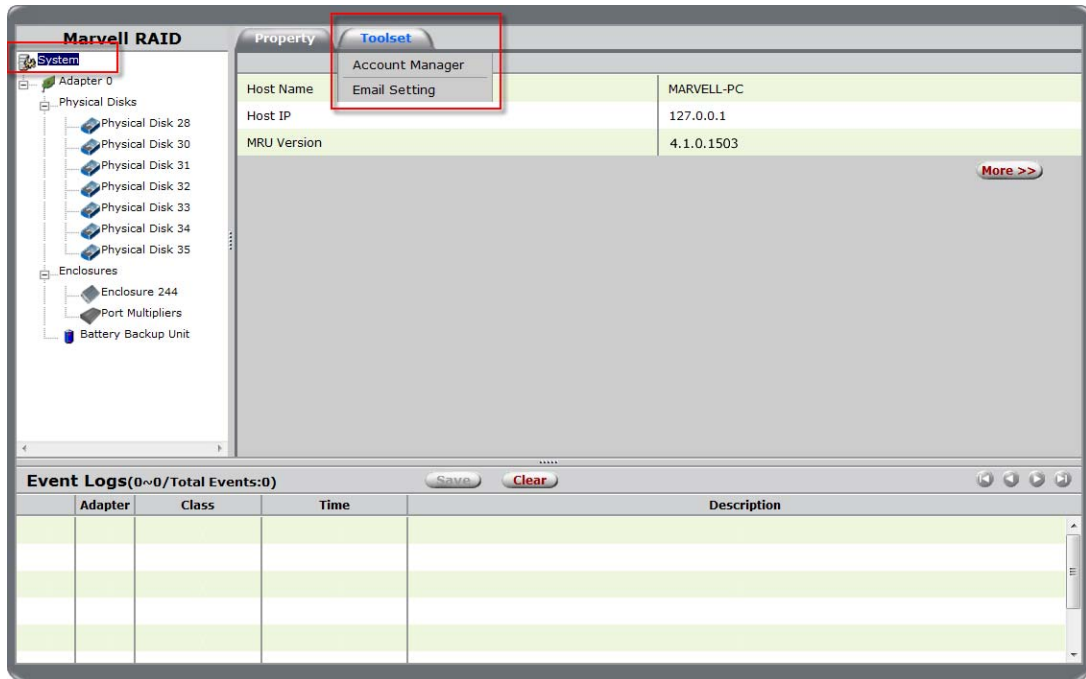
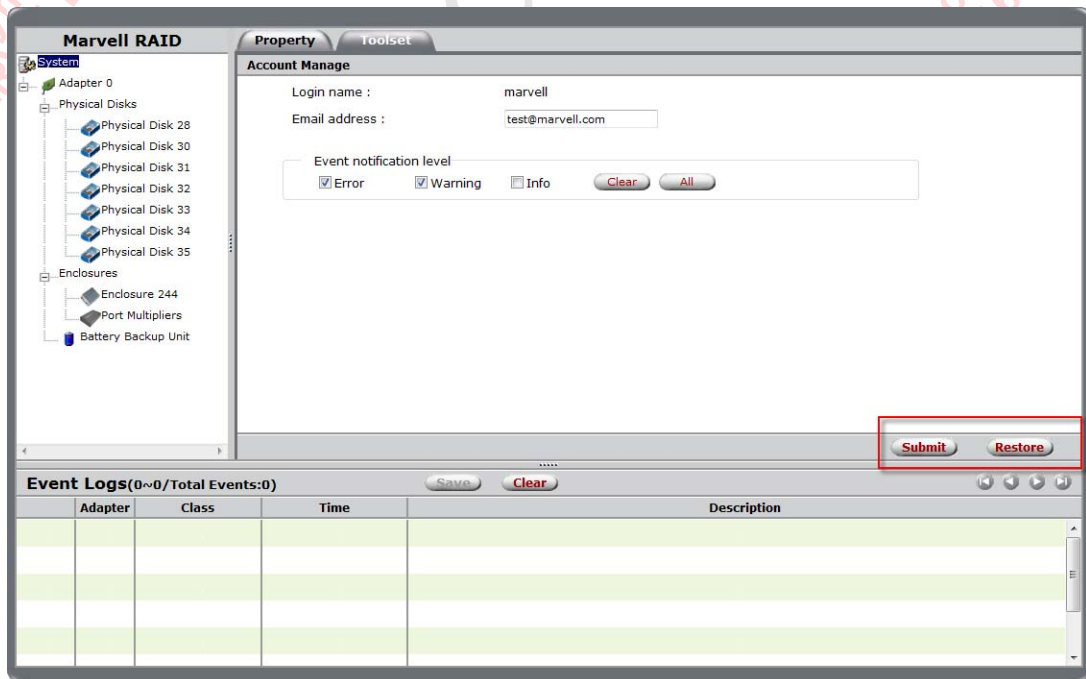


Figure 5-59 Account Manage



3. Type the **E-mail address**, as shown in Figure 5-59.

**Note:** The E-mail address must be valid for the SMTP server configured in Email Setting.

4. Specify the event types that trigger email notifications by selecting options for **Event notification level**, as shown in Figure 5-59.
  5. Select **Submit** to save settings.
- MRU confirms changes with the message **Account updated successfully!**

### 5.8.2 Viewing Events using Windows Event Viewer

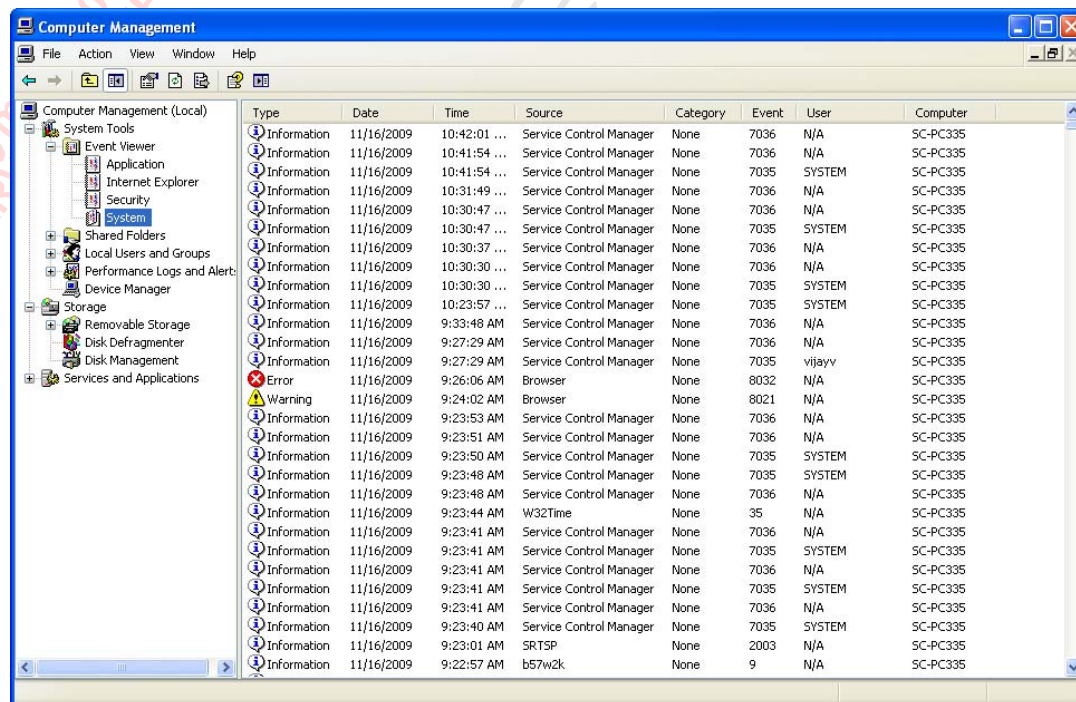
**Note:** This section applies only to Windows OS.

In Windows, MRU events can also be viewed in the Event Viewer (since adapter events are triggered by the OS/driver).

#### To view events in the Windows Event Viewer

1. From the **Start** menu, right-click **My Computer**, and select **Manage**.  
The **Computer Management** utility appears, as shown in Figure 5-60.
2. Browse to **System Tools > Event Viewer > System** to view all system events including that of MRU, as shown in Figure 5-60.

**Figure 5-60 Event Viewer (Windows XP)**



### 5.8.3 Enabling Alarm for Critical Events

MRU can play an audible alarm when critical events (warning and error) occur. When a hardware buzzer is present, the buzzer is also sounded. The audible alarm is disabled by default.



The alarm can be enabled/disabled from the following two locations:

- The **Property** tab for the **Adapter** provides options to enable/disable/mute the alarm, as shown in Figure 5-61.
- In Windows, you can also use the **Tray Application**, as shown in Figure 5-62.

Figure 5-61 Enabling Alarm using MRU

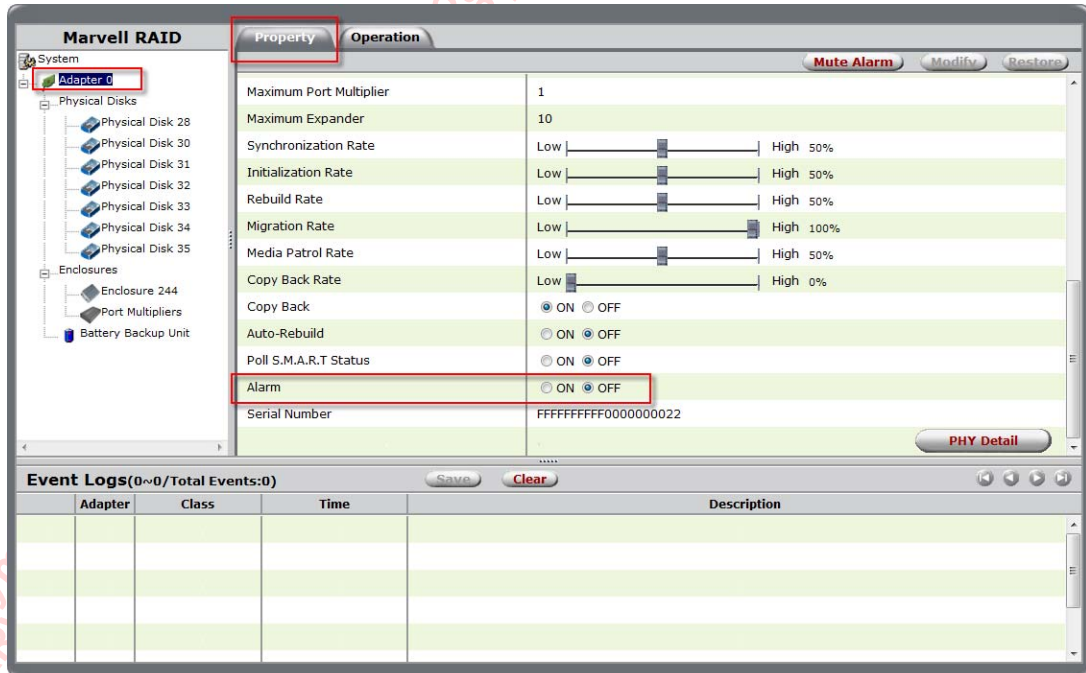


Figure 5-62 Enabling Alarm using Tray Application



**Note:** See 2.4.2, [Enable/Disable Alarm](#) for information on enabling/disabling alarm using the Tray Application.

## 5.9 Migrating Array

This section discusses the following:

- Migrating Array to Higher RAID Level
- Expanding Disk Capacity on Operating Array

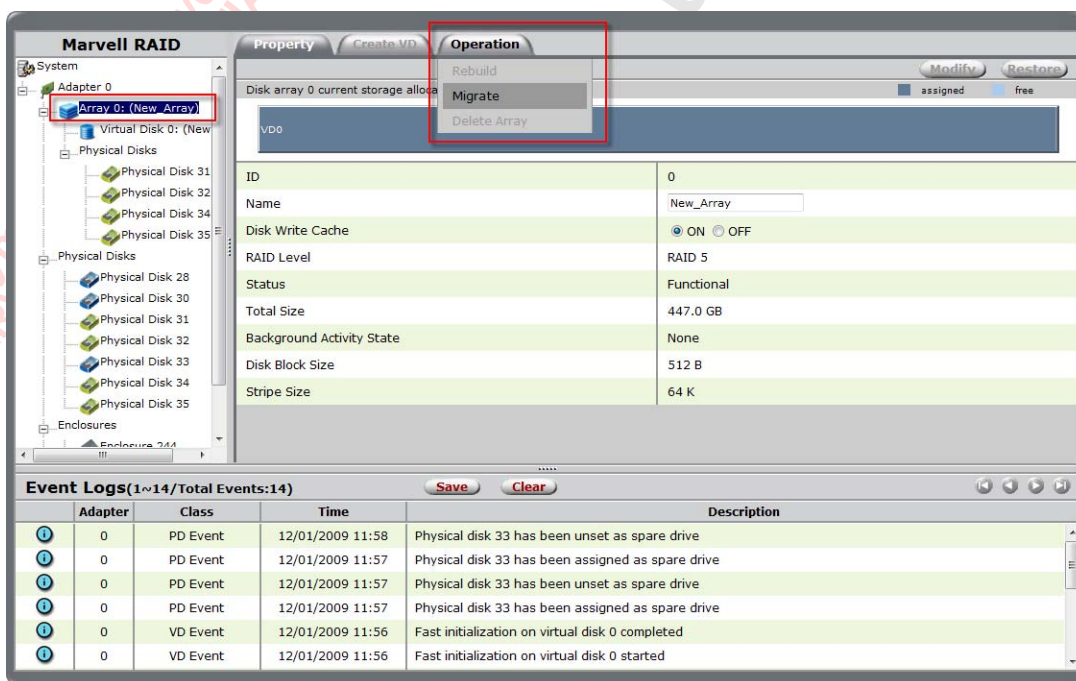
### 5.9.1 Migrating Array to Higher RAID Level

This section describes the procedure for migrating an array to a higher RAID level.

To migrate an array

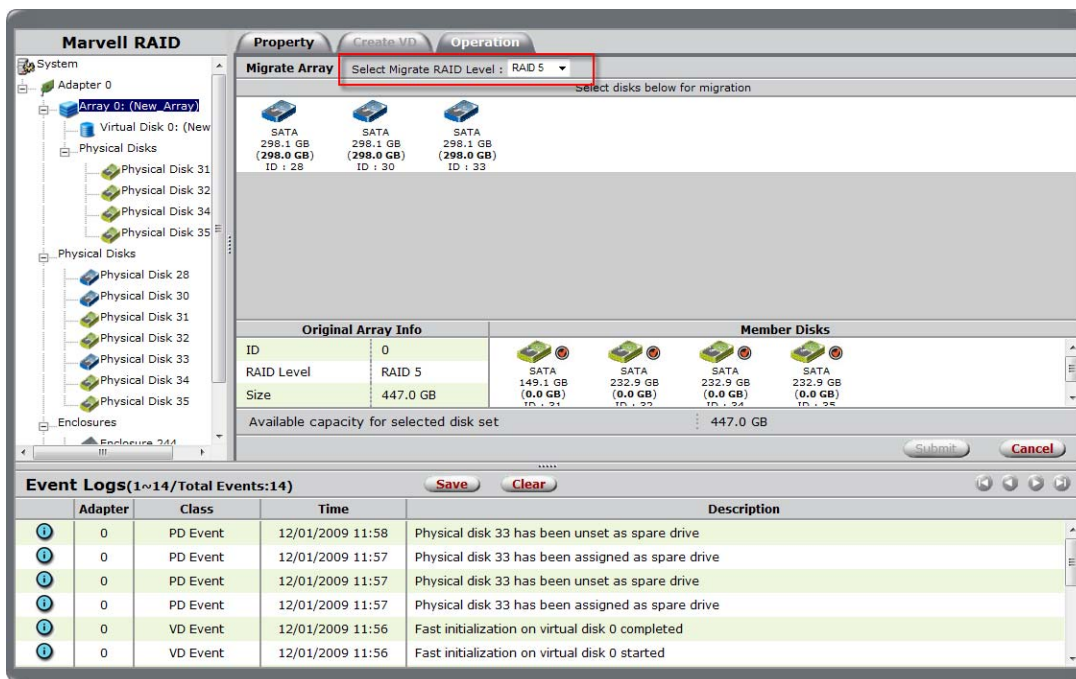
3. Select the **Array** in the list of system devices, as shown in Figure 5-63.
4. Rollover the **Operation** tab, and select **Migrate**, as shown in Figure 5-63.

Figure 5-63 Array Operation Tab



5. Select the **RAID level**, as shown in Figure 5-64.

Figure 5-64 Migrate Array



6. The available physical drives are displayed, as shown in Figure 5-64. Click on the specific drives to add physical disks to the array depending on the RAID level.

Table 5-2 lists the minimum number of physical disks required for different RAID levels.

Table 5-2 Minimum Number of Physical Disks

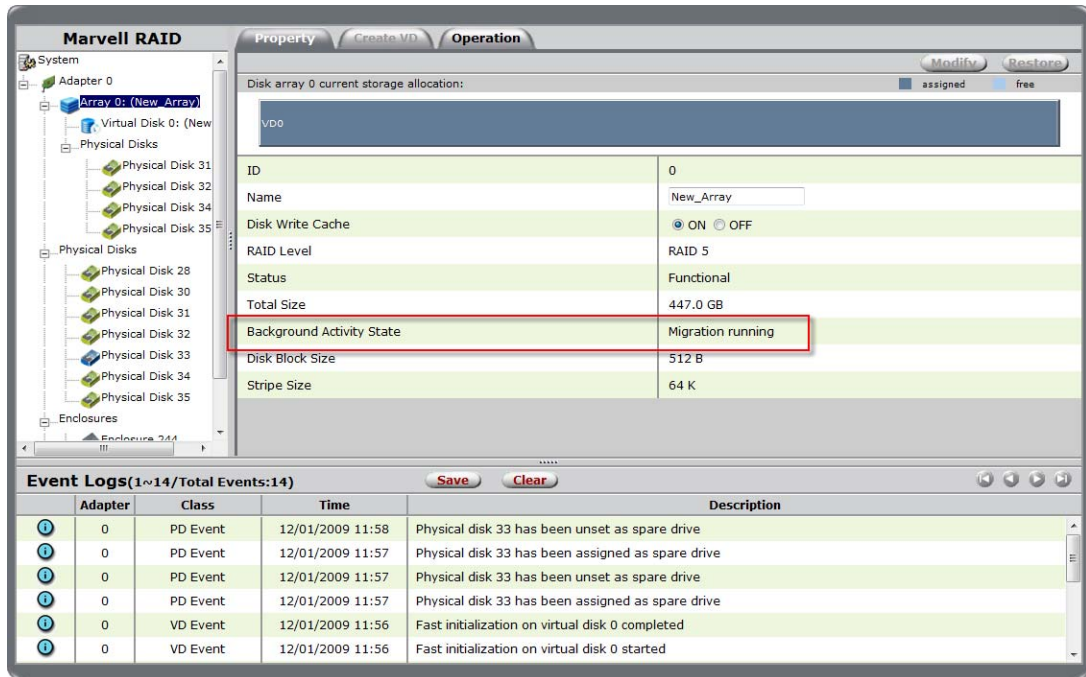
Controller	Minimum Number of Physical Disks Required for RAID Level							
	0	1	1E	5	6	10	50	60
RAID-On-Chip (ROC) Controller	2	2	3	3	4	4	6	8

7. Click **Submit**, as shown in Figure 5-64.

If the chosen RAID level does not support the combination of selected drives, the **Submit** button remains grayed out.

You are redirected to the array properties tab where migration status is displayed, as shown in Figure 5-65.

Figure 5-65 MRU Array Property Tab



## 5.9.2 Expanding Disk Capacity on Operating Array

This section describes the procedure for expanding the disk capacity on an operating array without changing the RAID level.

### To extend the capacity of an array

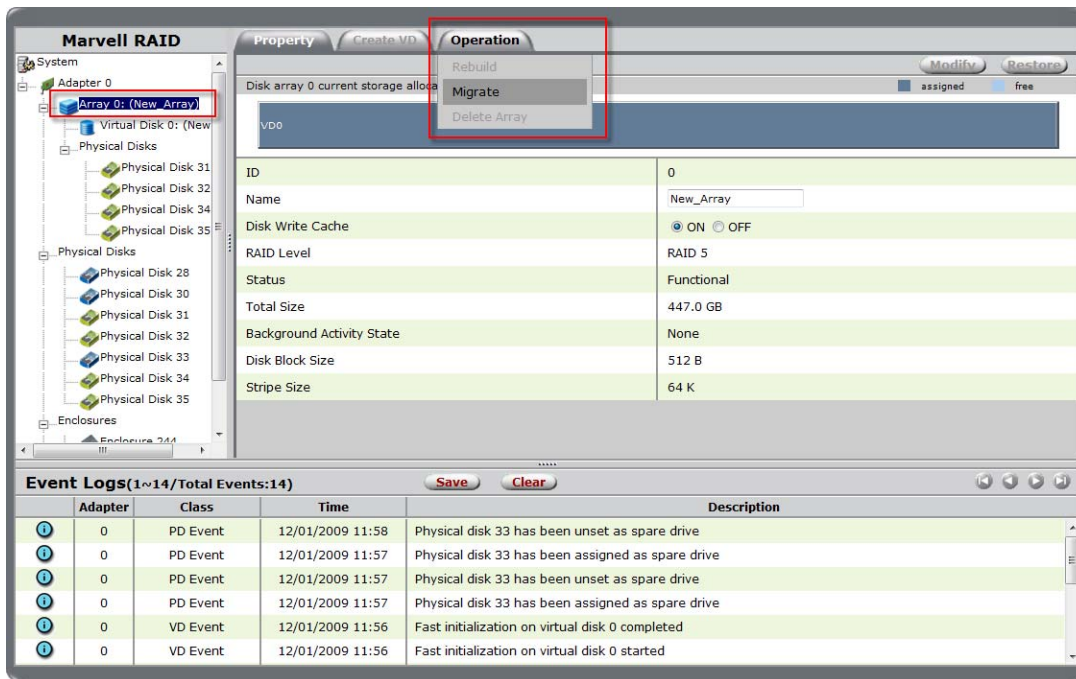
1. Select the Array in the list of system devices, as shown in Figure 5-66.

The Array Property tab appears, as shown in Figure 5-66.

**Note:** Hover the mouse over the array storage allocation bar to view the size of the array. If you have already created one or more virtual disks, they are displayed as segments in the storage allocation bar and sized proportional to their disk capacity. Hover the mouse over individual segments to view the virtual disk's name and size.

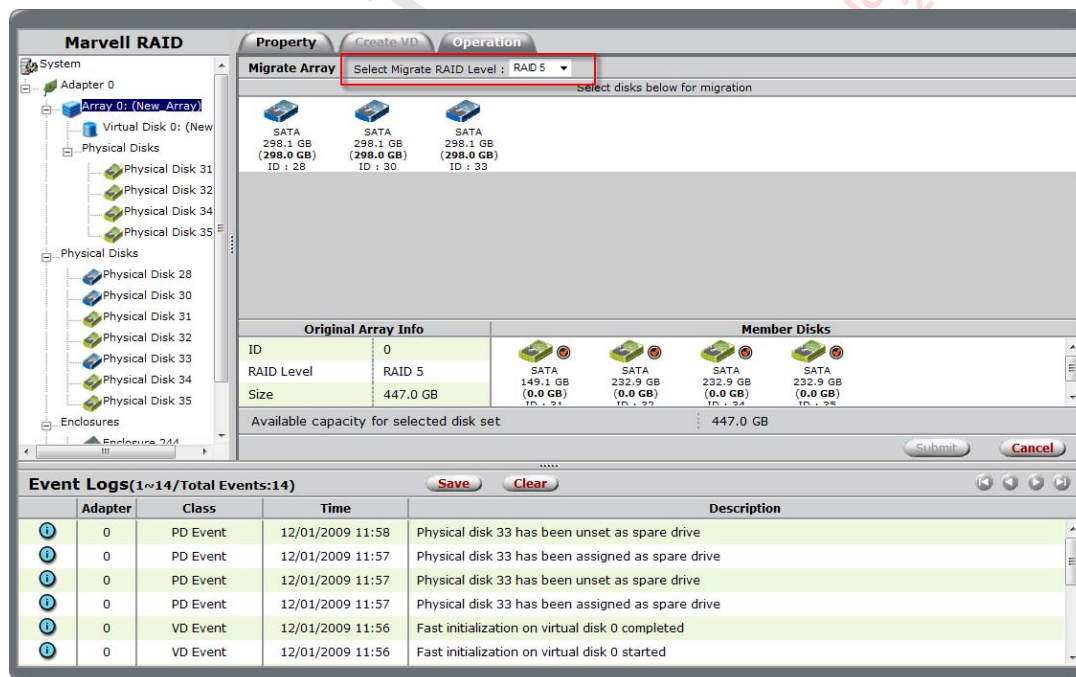
2. Rollover the **Operation** tab and select **Migrate**, as shown in Figure 5-66.

Figure 5-66 MRU Array Operation Tab



- The drop-down menu at the top displays the current RAID level for the array as shown in Figure 5-67. Do not change the RAID level as you intend to increase capacity for the current level.

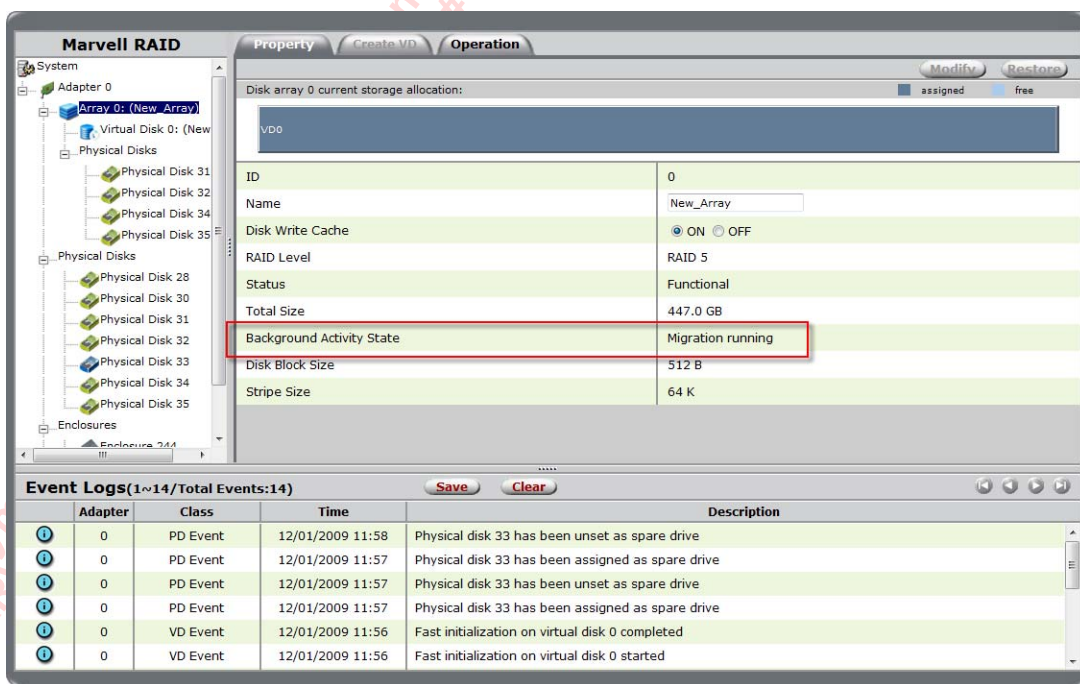
Figure 5-67 Migrate Array





4. The available physical drives are displayed, as shown in Figure 5-67. Click on the specific drives to add them to the array. You may add any number of drives depending on the required array size.
5. Click **Submit**, as shown in Figure 5-67.  
You are redirected to the array properties tab where migration status is displayed, as shown in Figure 5-68.

**Figure 5-68 MRU Array Property Tab**





## 5.10 Rebuilding Degraded Array

MRU can rebuild a fault-tolerant array by reconstructing data from parity or mirror information from the member physical disks. When an array becomes degraded due to the failure of one or more physical disks, MRU updates the status of the array to Degraded. The degraded array can be rebuilt in the following ways:

- Automatically Rebuilding Degraded Array
- Manually Rebuilding Degraded Array

### 5.10.1 Automatically Rebuilding Degraded Array

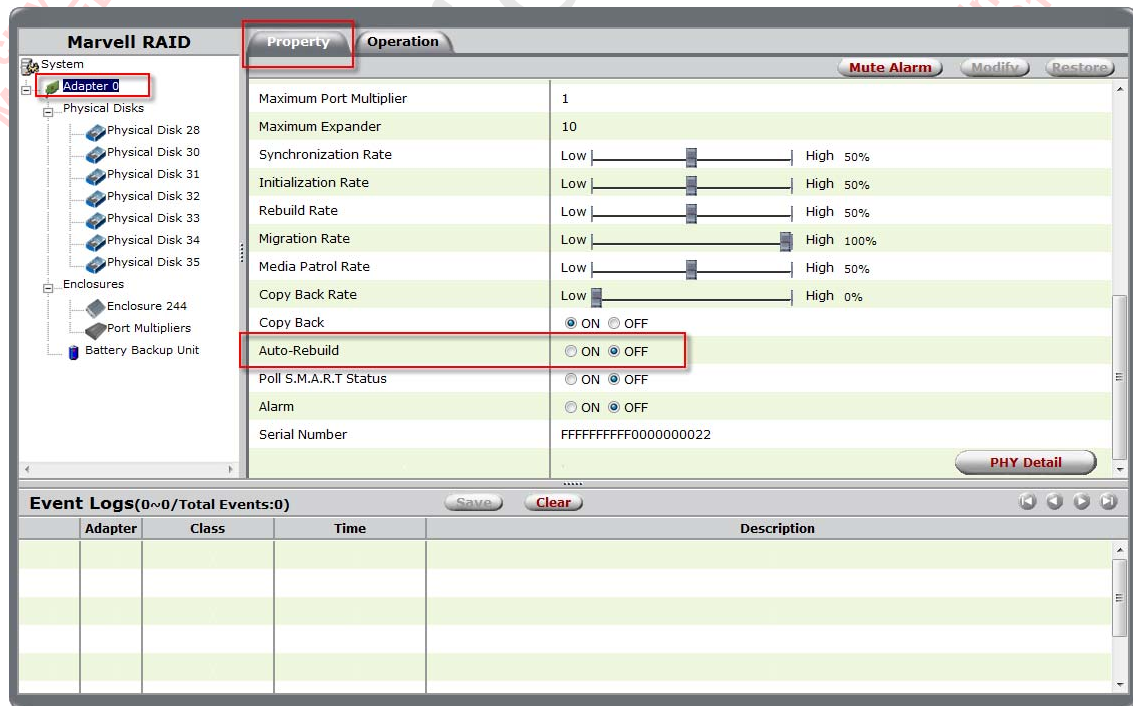
This section discusses the following:

- Enabling Auto-Rebuild
- Auto-Rebuild with Hot Spare
- Auto-Rebuild with Hot Swap

#### 5.10.1.1 Enabling Auto-Rebuild

Auto-Rebuild is disabled by default. You can enable **Auto-Rebuild** in the **Property** tab for the **Adapter**, as shown in Figure 5-69. After enabling Auto-Rebuild, select **Modify** to confirm the change.

Figure 5-69 Enabling Auto-Rebuild



**Note:** If your degraded array does not auto-rebuild even when a global/dedicated spare drive is available, verify that the spare drive is suitable for the array.

### 5.10.1.2 Auto-Rebuild with Hot Spare

When Auto-Rebuild is enabled and a suitable global/dedicated spare drive is available, MRU can automatically rebuild a virtual disk when it becomes degraded. To assign a physical disk as a global/dedicated spare drive, see sections 5.5.5, [Assigning Physical Disk as Global Spare Drive](#) and 5.5.6, [Assigning Physical Disk as Dedicated Spare Drive](#).

### 5.10.1.3 Auto-Rebuild with Hot Swap

In the absence of a global/dedicated spare drive, you can auto-rebuild by hot-swapping another physical disk in the same location. MRU automatically rebuilds the array when it detects an online physical disk at that location.

## 5.10.2 Manually Rebuilding Degraded Array

This section describes the procedure for manually rebuilding a degraded array when Auto-Rebuild is disabled and a dedicated spare drive is not available.

### To manually rebuild a degraded virtual disk

1. Select the degraded **Array** in the list of system devices, as shown in Figure 5-70.
2. Roll-over the **Operation** tab, and select **Rebuild**, as shown in Figure 5-70.

MRU displays available global spare drives, as shown in Figure 5-71.

**Note:** To assign a physical disk as a global/dedicated spare drive, see sections 5.5.5, [Assigning Physical Disk as Global Spare Drive](#) and 5.5.5, [Assigning Physical Disk as Global Spare Drive](#).

Figure 5-70 Degraded Array

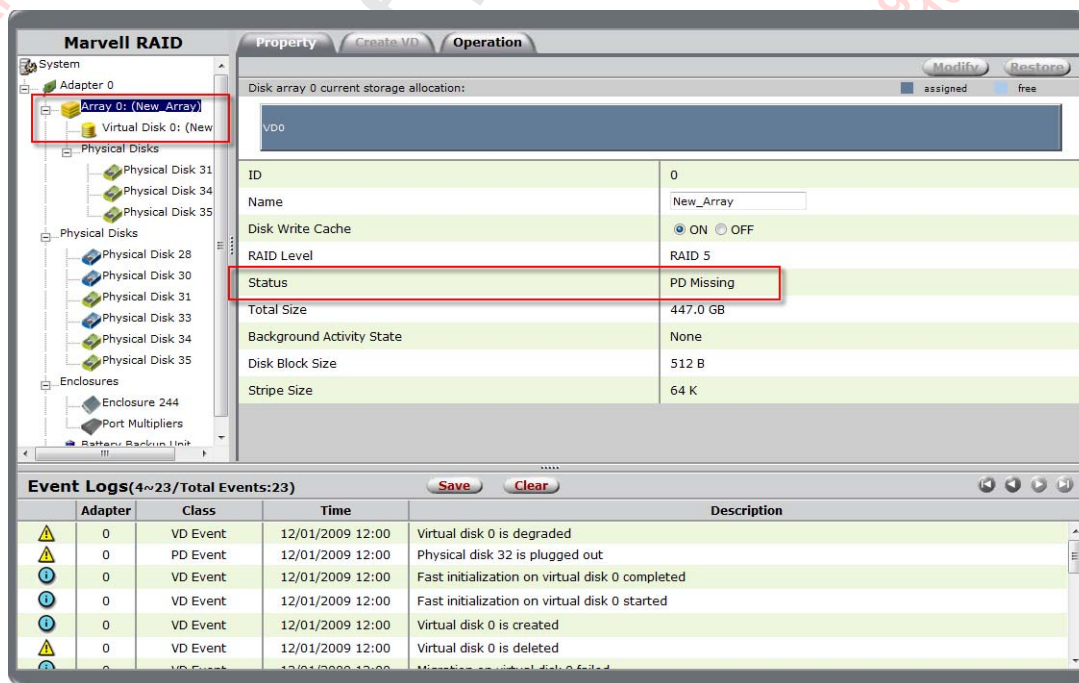
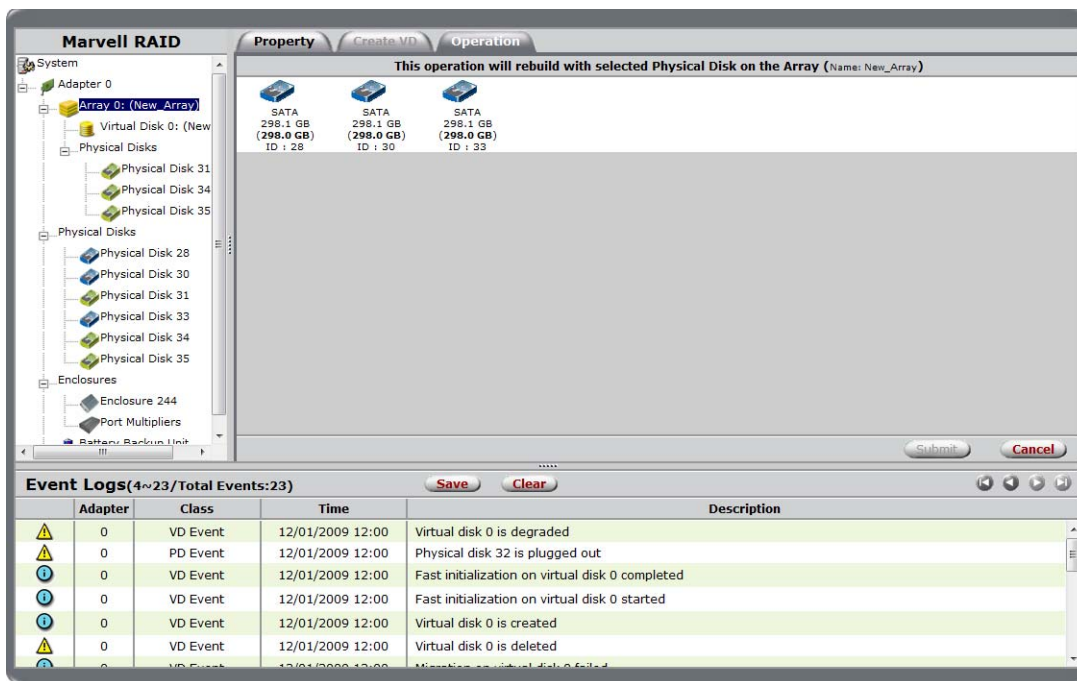


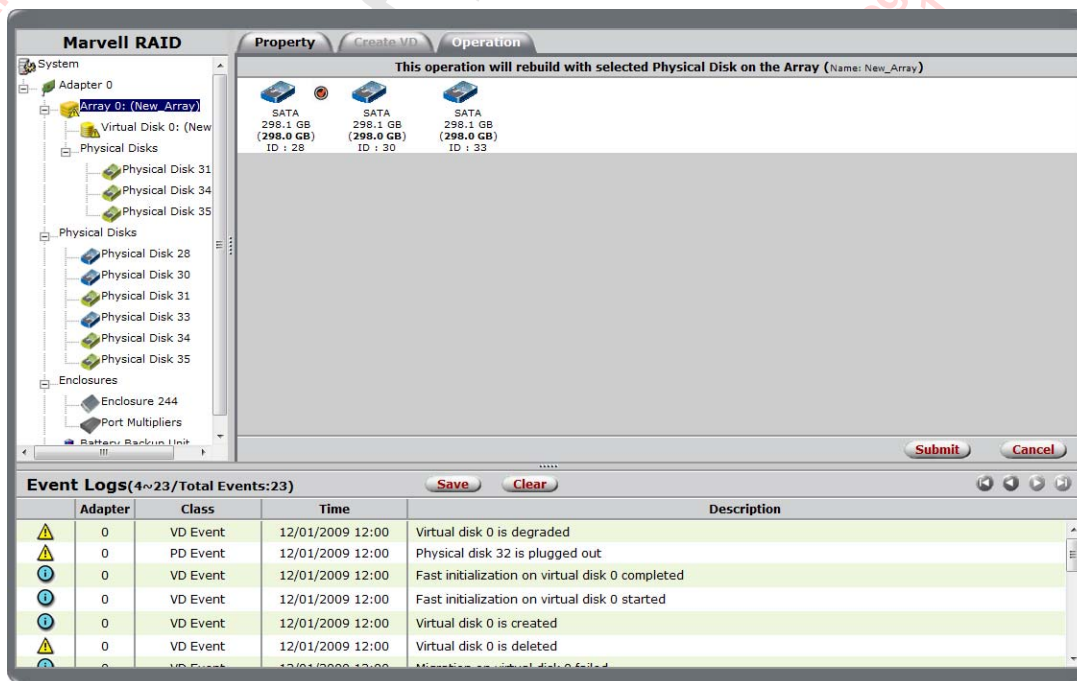
Figure 5-71 Available Physical Disks



3. Select **Spare Drive(s)** from the list, as shown in Figure 5-71.

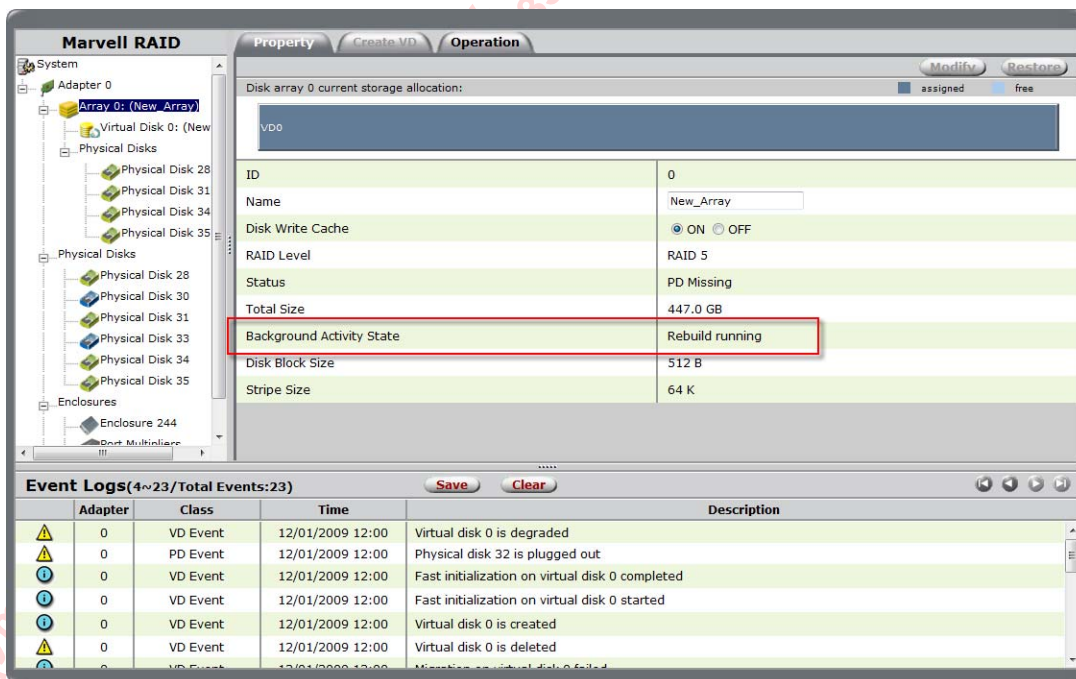
When a spare drive is selected, a check mark is placed next to it, as shown in Figure 5-72.

Figure 5-72 Select Spare Drive



4. Select **Submit** to begin the rebuild process, as shown in Figure 5-72.  
MRU displays the **Background Activity Progress** in the **Property** tab for the **Virtual Disk**, as shown in Figure 5-73.

Figure 5-73 Rebuild Status



5. Options to **Pause**, **Resume**, and **Stop** Rebuild are available in the **Operation** tab for the **Array**.

## 5.11 Deleting Array

This section discusses the following:

- Deleting Virtual Disk
- Deleting Array

### 5.11.1 Deleting Virtual Disk

This section describes the procedure for deleting a virtual disk on array.

**Note:** After deleting a virtual disk, the physical disks constituting the virtual disk become available for use in other virtual disks.

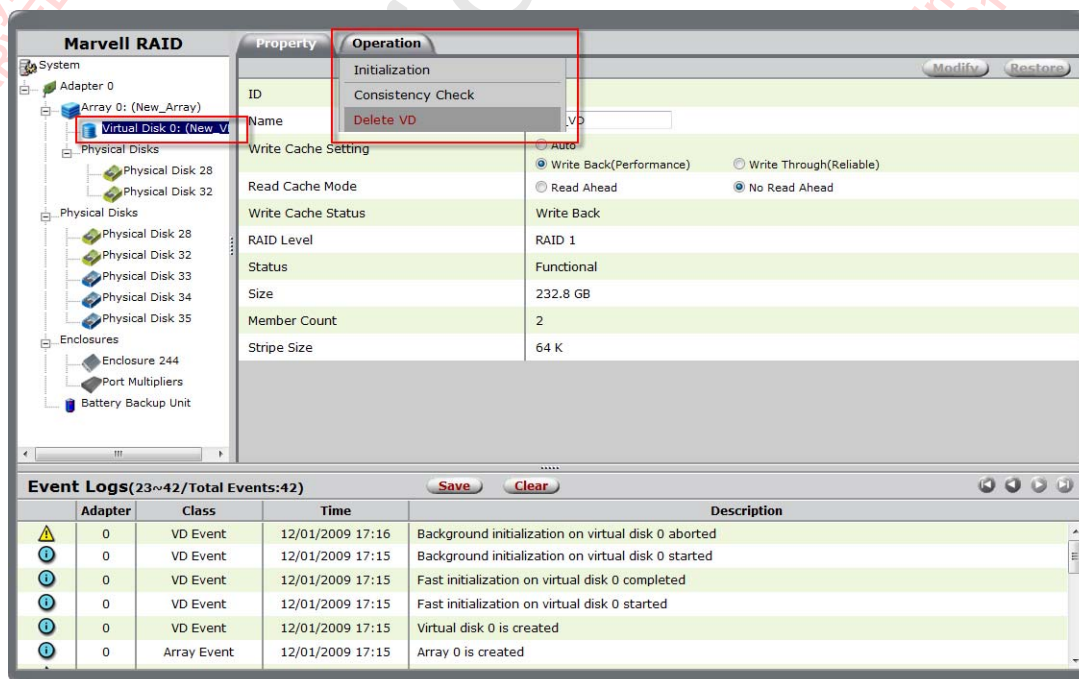
To delete a virtual disk



**WARNING** Deleting a virtual disk permanently erases all data on the virtual disk. However, you can choose to keep partition information on the virtual disk.

1. Select **Array > Virtual Disk** in the list of system of devices.  
The **Property** tab for the Virtual Disk appears.
2. Roll-over the **Operation** tab and select **Delete VD**, as shown in Figure 5-74.

Figure 5-74 Delete VD



3. MRU displays the warning **All data on this virtual disk will be erased once it is deleted!**  
Select **OK** to acknowledge the warning.



4. MRU requests confirmation of deletion with a pop-up message **Are you sure you want to delete this virtual disk?**  
Select **OK** to confirm deletion.
5. MRU displays a pop-up message asking **Do you want to delete the partition information if this has one?**  
Select **OK** to delete partition information or **Cancel** to keep partition information.

### 5.11.2 Deleting Array

This section describes the procedure for deleting an array. You must delete all virtual disks on an array, as described in section 5.11.1, [Deleting Virtual Disk](#), before you can delete the array.

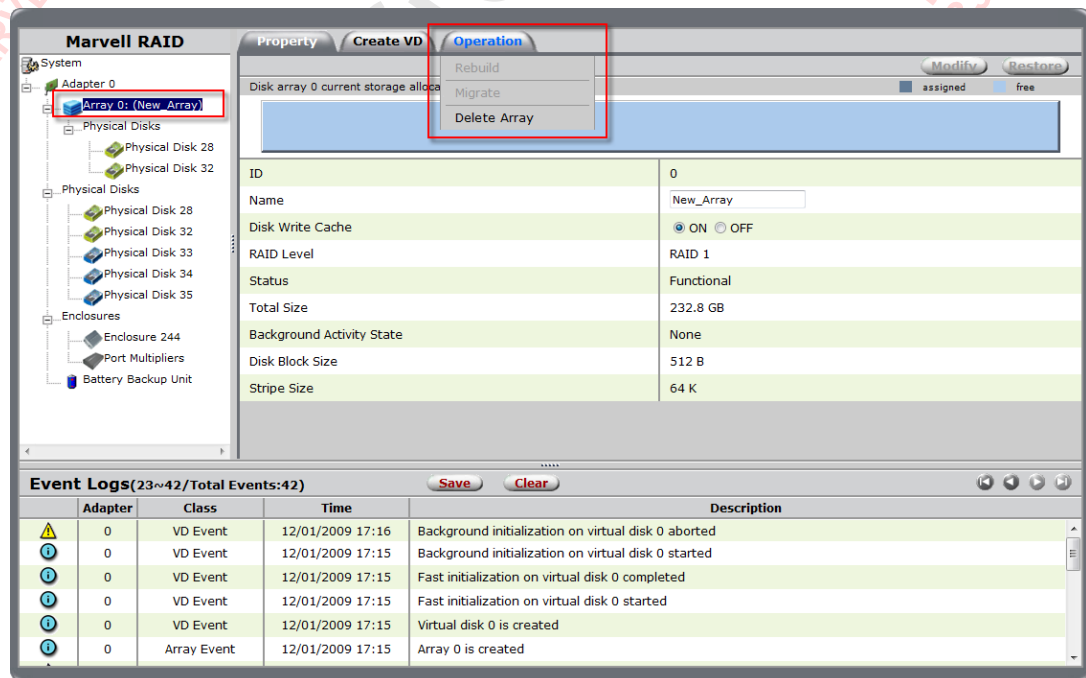
#### To delete an array

**WARNING** Deleting an array permanently erases all data on the array.



1. Select **Array** in the list of system of devices.  
The **Property** tab for the Array appears.
2. Roll-over the **Operation** tab and select **Delete Array**, as shown in Figure 5-74.

Figure 5-75 Delete Array





3. MRU requests confirmation of deletion with a pop-up message **Are you sure you want to delete this array?**

Select **OK** to confirm deletion.

8cmymtbz810-gd8biy0x \* Lycom Technology, Inc.  
MARVELL CONFIDENTIAL, UNDER NDA# 12103316

Confidential

8cmymtbz810-gd8biy0x \* Lycom Technology, Inc.  
MARVELL CONFIDENTIAL, UNDER NDA# 12103316

## 5.12 Updating RAID Controller BIOS

The RAID controller BIOS can be updated using MRU. Before updating the BIOS, it is recommended that you backup the existing BIOS. This is useful if you need to revert to the existing BIOS for any reason.

This section discusses the following:

- Backup BIOS
- Update BIOS

### 5.12.1 Backup BIOS

This section describes the procedure to backup the existing RAID controller BIOS image.

To backup BIOS

1. Select **Adapter**.
2. Roll-over the **Operation** tab, and select **Backup BIOS**, as shown in Figure 5-76.

A **File Download** dialog appears, as shown in Figure 5-77.

Figure 5-76 Backup BIOS

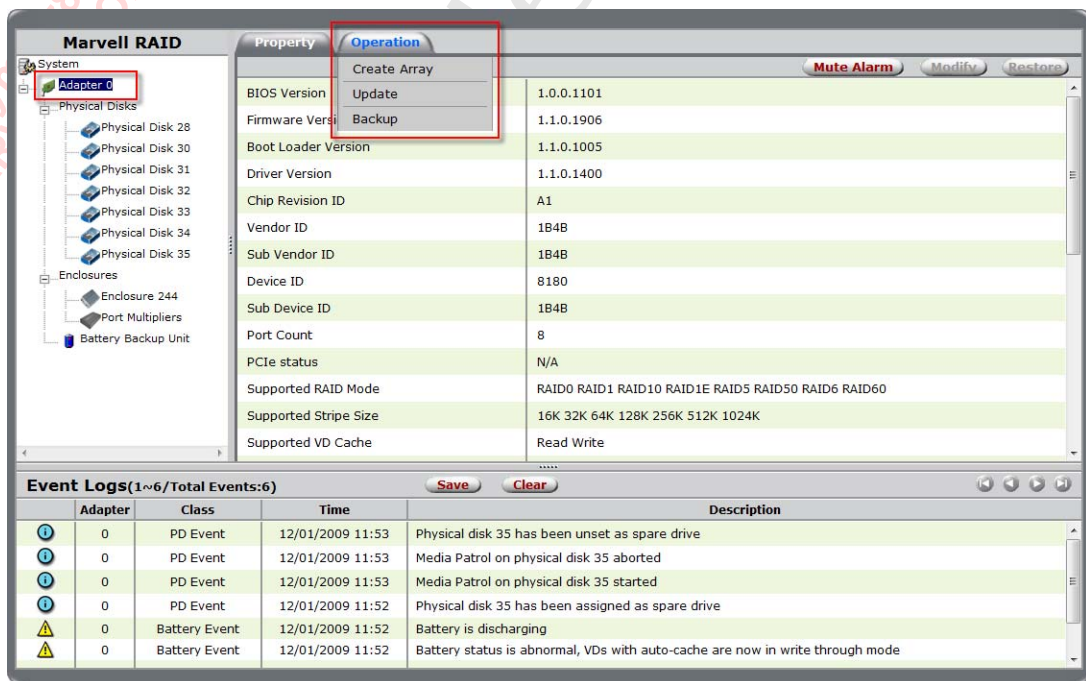
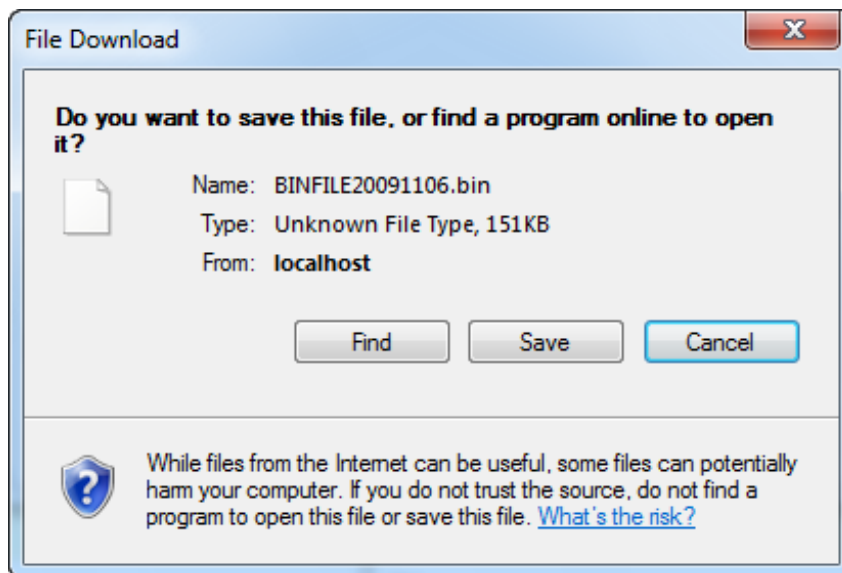


Figure 5-77 Backup Existing BIOS Image



3. Select **Save** and follow on-screen instructions to save the file to the desired location.

### 5.12.2 Update BIOS

This section describes the procedure to update the RAID controller BIOS image.

#### To Update the BIOS

1. Backup the BIOS, as described in section 5.12.1, [Backup BIOS](#).
2. Select **Adapter**.
3. Roll-over the **Operation** tab, and select **Update BIOS**, as shown in Figure 5-78.

A **Update BIOS** dialog appears, as shown in Figure 5-79.

Figure 5-78 Update BIOS

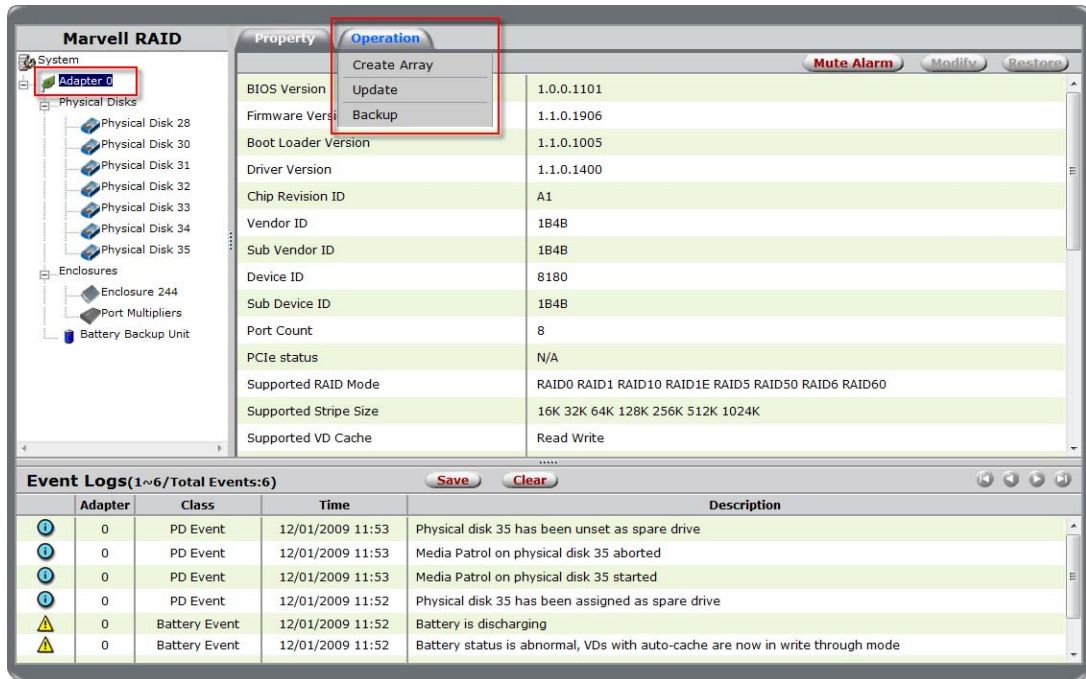
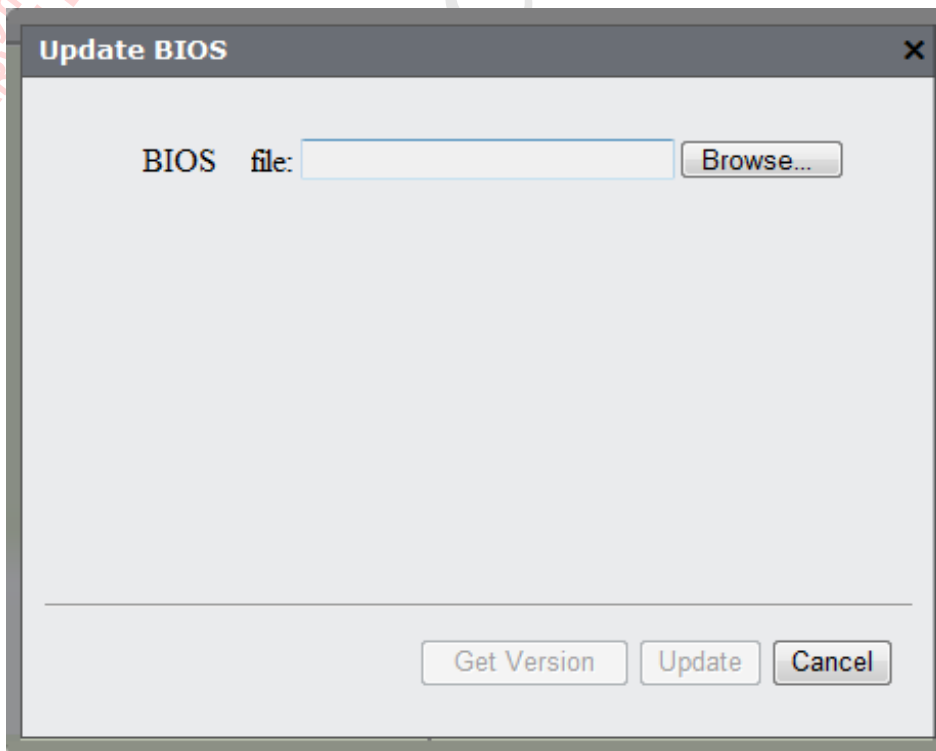


Figure 5-79 Update BIOS Image



4. **Browse** to the location of the BIOS image, and select **Update** to update BIOS image.



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# 6 MARVELL RAID COMMAND LINE INTERFACE (CLI)

This chapter contains the following sections:

- Overview
- Opening CLI
- Abbreviations
- Command Parameters
- List of CLI Commands
- CLI Help
- Selecting Adapter\*
- Managing Adapter
- Creating Virtual Disk/Array
- Importing Virtual Disk
- Managing Virtual Disk/Array
- Monitoring Virtual Disk/Array
- Migrating Array
- Rebuilding Virtual Disk/Array
- Deleting Virtual Disk/Array
- Managing Physical Disks
- Managing Enclosures
- Managing the RAID Controller Driver
- Updating BIOS, Firmware, and Flash Configuration
- Saving CLI Output
- Exiting CLI



## 6.1 Overview

The Marvell Command Line Interface (CLI) is used to control local RAID controllers using a command line interface.

**Note:** The CLI is an optional component in the MRU installation package and is not installed by default. To install the CLI, see 1.2, [Installing the Marvell RAID Utility \(MRU\)](#).

## 6.2 Opening CLI

This section describes the procedure to open CLI in Windows and Linux.

- Windows
- Linux

### 6.2.1 Windows

This section describes the procedure to open CLI in Windows.

#### To open CLI in Windows

1. The CLI can be opened using one of the following methods:
  - From the **Start** menu, browse to **Programs > Marvell > MarvellCLI**.  
The **MarvellCLI** command prompt appears.
  - OR
  - Double-click the desktop shortcut for MarvellCLI, as shown in Figure 6-1.

Figure 6-1 MarvellCLI Desktop Shortcut



OR

- Right-click the desktop shortcut for **MarvellCLI**, and select **Open**.
2. Type `help` for a complete list of available commands, as shown in Figure 6-2.
  3. Type `exit` to close **MarvellCLI**.

Figure 6-2 MarvellCLI in Windows



```

CLI Version: 4.1.0.2   RaidAPI Version: 5.0.0.1004
Welcome to Marvell RAID Command Line Interface.

> help

Legend:
[options] - the options within [] are optional.
<x|y|z>    - choose one of the x, y or z.
[<x|y|z>] - choose none or one of the x, y or z.

Abbreviation:
UD - Virtual Disk
Array - Disk Array
PD - Physical Disk
BGA - BackGround Activity

Type '-output [filename]' to output to a file.
Type 'help' to display this page.
Type 'help command' to display the help page of 'command'.
Type 'command -h' to display help for 'command'.

Command name is not case sensitive and may be abbreviated if the
abbreviation is unique.
Most commands support both short (-) and long (--) options. Long option
names may be abbreviated if the abbreviation is unique. A long option
may take a parameter of the form '--arg=param' or '--arg param'.
Option name is case sensitive, option parameter is not.

COMMAND    BRIEF DESCRIPTION
-----
?           :Get brief help for all commands.
help        :Get brief help for all commands or detail help for one command.
adapter     :Default adapter the following CLI commands refers to.
assign      :Assign a disk as spare drive.
cc          :Start, stop, pause or resume UD Consistency Check.
create      :Create virtual disk.
delete      :Delete virtual disk or spare drive.
event       :Get the current events.
get         :Get configuration information of UD, PD, Array, HBA or Driver.
info        :Display adapter(hba), virtual disk(vd), disk array,
             physical disk(pd), Port multiplexer(pm), expander(exp),
             block disk(blk) or spare drive information.
init        :Start, stop, pause or resume UD initialization.
migrate     :Start, pause or resume UD migration.
rebuild     :Start, stop, pause, resume or restart rebuilding UD.
set         :Set configuration parameters of UD, PD, HBA or Driver.
pause       :Pause all background activities on specified controller.
enc         :Get enclosure, enclosure element or enclosure config information.
import      :Import a virtual disk.
locate      :Locate the specified PD.
flash       :Update or backup flash image.
mp          :Start, stop, pause or resume media patrol for a physical disk.
flashrw     :Read flash contents in unit of byte, or write the pattern byte to
             flash offset, or compare flash contents with the pattern.
             for testing purpose.
  
```

## 6.2.2 Linux

The section describes the procedure to open CLI in Linux.

### To open CLI in Linux

1. Right-click the **Desktop** and select **Open Terminal** from the pop-up menu.

The Linux **Terminal** appears, as shown in Figure 6-3.

Figure 6-3 Linux Terminal



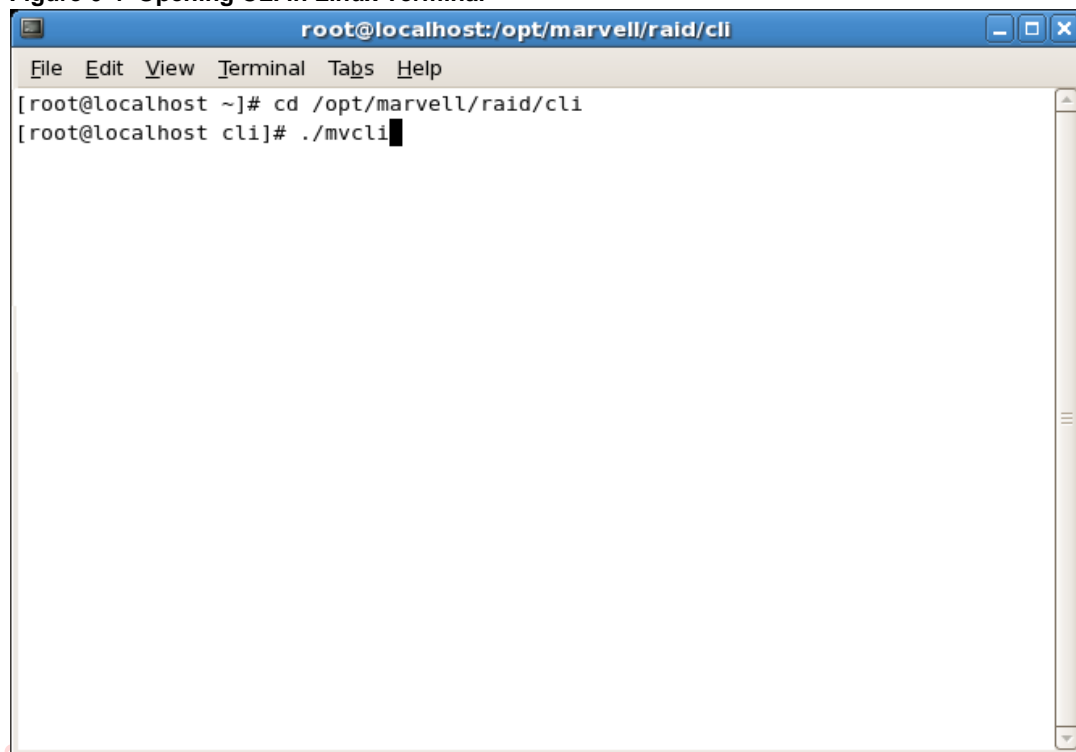
**Note:** Figure 6-3 shows the Terminal window for SUSE Enterprise Linux Server (SLES) 10. The procedure to open the Terminal and its command line interface is similar for other Linux distributions.

2. Type the following commands in the Linux **Terminal** window, as shown in Figure 6-4.

```
cd /opt/marvell/raid/cli
```

```
./mvcli
```

Figure 6-4 Opening CLI in Linux Terminal



3. Type `help` for a complete list of available commands.
4. Type `exit` to close **MarvelICLI**.

## 6.3 Abbreviations

Table 6-1 lists common abbreviations used in CLI.

**Table 6-1 Abbreviations used in CLI**

Abbreviation	Description
array	Disk Array
bbu	Battery Backup Unit
bga	Background Activity
blk	Disk Block
exp	Expander
hba	Host Bus Adapter
pd	Physical Disk
pm	Port Multiplier
vd	Virtual Disk



## 6.4 Command Parameters

Table 6-2 describes the general syntax for CLI command parameters.

**Note:** Command parameters are options appended at the end of a command.

**Table 6-2 Command Parameters**

Parameter Syntax	Parameter Description
[x]	A parameter enclosed within square brackets [] is optional.
[<x y z>]	For some optional parameters, CLI provides two or more options for selection. When using an optional parameter with multiple options (x, y, and z in this example), specify one of the parameter options (x, y, or z) in the command.
<x y z>	A parameter enclosed within angular brackets <> is required. Specify one of the parameter options (x, y, or z in this example) in the command.

**Note:** Square [] and angular <> brackets are only used to differentiate between optional and required parameters. The brackets are *not* part of the command parameter syntax.

## 6.5 List of CLI Commands

Table 6-3 lists all CLI commands.

**Note:** Some commands may not be supported all RAID controllers and operating systems. Type `help` in CLI for a full list of supported commands.

**Table 6-3 Commands in CLI**

Command	IOC	IOP	ROC	Description
<b>CLI Help</b>				
<code>?</code>	✓	✓	✓	Get brief help for all commands.
<code>help</code>	✓	✓	✓	Get brief help for a specific command.
<b>Selecting Adapter</b>				
<code>adapter</code>	✓	✓	✓	Select the adapter/controller on which CLI commands are executed.
<b>Managing Adapter</b>				
<code>get</code>	✓	✓	✓	Get configuration information of VD, PD, array, HBA, or driver.
<code>info</code>	✓	✓	✓	Display information on adapter ( <code>hba</code> ), virtual disk ( <code>vd</code> ), disk array, physical disk ( <code>pd</code> ), Port multiplexer ( <code>pm</code> ), expander ( <code>exp</code> ), block disk ( <code>blk</code> ) or spare drive information.
<code>pause</code>	✓	✓	✓	Pause all background activities on specified adapter/controller.
<code>set -o hba</code>	✓	✓	✓	Set configuration parameters of HBA.
<code>set -o aes</code>	✗	✓	✗	Set configuration for AES encryption
<code>set -o aeslink</code>	✗	✓	✗	Set configuration for AES Link
<b>Creating Virtual Disk/Array</b>				
<code>create</code>	✓	✓	✓	Create virtual disk.
<b>Importing Virtual Disk</b>				
<code>import</code>	✓	✓	✓	Import a virtual disk created with another RAID controller.
<b>Managing Virtual Disk/Array</b>				
<code>cc</code>	✓	✓	✓	Start, stop, pause, or resume consistency check for a virtual disk.
<code>copyback</code>	✗	✗	✓	Pause or resume copy back operation on array.
<code>get</code>	✓	✓	✓	Get configuration information of VD, PD, array, HBA, or driver.
<code>info</code>	✓	✓	✓	Display information on adapter ( <code>hba</code> ), virtual disk ( <code>vd</code> ), disk array, physical disk ( <code>pd</code> ), Port multiplexer ( <code>pm</code> ), expander ( <code>exp</code> ), block disk ( <code>blk</code> ) or spare drive information.
<code>init</code>	✓	✓	✓	Start, stop, pause, or resume VD initialization
<code>set -o vd</code>	✓	✓	✓	Set configuration parameters of VD.

Table 6-3 Commands in CLI (continued)

Command	IOC	IOP	ROC	Description
<b>Monitoring Virtual Disk/Array</b>				
<code>event</code>	✓	✓	✓	Get list of current events.
<b>Migrating Array</b>				
<code>migrate</code>	✗	✗	✓	Start, pause, or resume migration of arrays.
<b>Rebuilding Virtual Disk/Array</b>				
<code>rebuild</code>	✓	✓	✓	Start, stop, pause, resume, or restart rebuilding virtual disk/array.
<b>Deleting Virtual Disk/Array</b>				
<code>delete</code>	✓	✓	✓	Delete virtual disk/array or spare drive.
<b>Managing Physical Disks</b>				
<code>assign</code>	✓	✓	✓	Assign a disk as a spare drive.
<code>delete</code>	✓	✓	✓	Delete virtual disk or spare drive.
<code>get</code>	✓	✓	✓	Get configuration information of VD, PD, array, HBA, or driver.
<code>info</code>	✓	✓	✓	Display information on adapter (hba), virtual disk (vd), disk array, physical disk (pd), Port multiplexer (pm), expander (exp), block disk (blk) or spare drive information.
<code>locate</code>	✓	✓	✓	Locate the specified physical disk.
<code>mp</code>	✓	✓	✓	Start, stop, pause, or resume media patrol for a physical disk.
<code>set -o pd</code>	✓	✓	✓	Set configuration parameters of PD.
<b>Managing Enclosures</b>				
<code>enc</code>	✓	✓	✓	Get information on enclosure, enclosure element, or enclosure configuration.
<code>info</code>	✓	✓	✓	Display information on adapter (hba), virtual disk (vd), disk array, physical disk (pd), Port multiplexer (pm), expander (exp), block disk (blk) or spare drive information.
<b>Managing the RAID Controller Driver</b>				
<code>get</code>	✓	✓	✓	Get configuration information of VD, PD, array, HBA, or driver.
<code>set -o driver</code>	✓	✓	✓	Set configuration parameters of driver.
<b>Updating BIOS, Firmware, and Flash Configuration</b>				
<code>flash</code>	✓	✓	✓	Update or backup flash image.
<code>flashrw</code>	✓	✓	✓	Read flash contents (in bytes), or write a pattern byte to flash offset, or compare flash contents with the pattern (for testing purposes).
<b>Saving CLI Output</b>				
<code>-output</code>	✓	✓	✓	Output CLI text to a file.

Table 6-3 Commands in CLI (continued)

Command	IOC	IOP	ROC	Description
Exiting CLI				
<code>exit</code>	✓	✓	✓	Exit CLI.

## 6.6 CLI Help

Table 6-4 lists the commands used for CLI Help.

Table 6-4 CLI Help

Command	IOC	IOP	ROC	Description
<code>?</code>	✓	✓	✓	Get brief help for all commands.
<code>help</code>	✓	✓	✓	Get brief help for a specific command.

### 6.6.1 ?

For a full list of supported CLI commands and descriptions, type `?` or `help` in CLI, as shown in Figure 6-5.

Figure 6-5 CLI command: ?

```

MarvellCLI
CLI Version: 4.1.0.2   RaidAPI Version: 5.0.0.1004
Welcome to Marvell RAID Command Line Interface.

> help

Legend:
[options] - the options within [] are optional.
<x|y|z>    - choose one of the x, y or z.
[<x|y|z>]  - choose none or one of the x, y or z.

Abbreviation:
UD - Virtual Disk
Array - Disk Array
PD - Physical Disk
BGA - BackGround Activity

Type '-output [filename]' to output to a file.
Type 'help' to display this page.
Type 'help command' to display the help page of 'command'.
Type 'command -h' to display help for 'command'.

Command name is not case sensitive and may be abbreviated if the
abbreviation is unique.
Most commands support both short (-) and long (--) options. Long option
names may be abbreviated if the abbreviation is unique. A long option
may take a parameter of the form '--arg=param' or '--arg param'.
Option name is case sensitive, option parameter is not.

COMMAND    BRIEF DESCRIPTION
-----
?           :Get brief help for all commands.
help        :Get brief help for all commands or detail help for one command.
adapter     :Default adapter the following CLI commands refers to.
assign      :Assign a disk as spare drive.
cc          :Start, stop, pause or resume UD Consistency Check.
create      :Create virtual disk.
delete      :Delete virtual disk or spare drive.
event       :Get the current events.
get         :Get configuration information of UD, PD, Array, HBA or Driver.
info        :Display adapter(hba), virtual disk(vd), disk array,
            physical disk(pd), Port multiplexer(pm), expander(exp),
            block disk(hlk) or spare drive information.
init        :Start, stop, pause or resume UD initialization.
migrate     :Start,pause or resume UD migration.
rebuild     :Start, stop, pause, resume or restart rebuilding UD.
set         :Set configuration parameters of UD, PD, HBA or Driver.
pause       :Pause all background activities on specified controller.
enc         :Get enclosure, enclosure element or enclosure config information.
import      :Import a virtual disk.
locate      :Locate the specified PD.
flash       :Update or backup flash image.
mp          :Start, stop, pause or resume media patrol for a physical disk.
flashrw     :Read flash contents in unit of byte, or write the pattern byte to
            flash offset,or compare flash contents with the pattern.
            for testing purpose.

```

## 6.6.2 help

For help on a specific command, type `help` followed by the command name. For example, type `help adapter` for help on the `adapter` command.

**Note:** For a complete list of supported CLI commands and descriptions, type `help`.



## 6.7 Selecting Adapter

Table 6-5 lists the command used for selecting adapters.

Table 6-5 Selecting Adapter

Command	IOC	IOP	ROC	Description
<code>adapter</code>	✓	✓	✓	Select the adapter/controller on which CLI commands are executed.

### 6.7.1 adapter

Use `adapter` to select the adapter/controller on which CLI commands are executed. The `adapter` command is useful when there is more than one controller installed in the system.

The syntax for the `adapter` command (including all required and optional parameters) is as follows:

```
adapter -i <adapter ID>
```

Table 6-6 describes the required and optional parameters for the `adapter` command.

Table 6-6 Command Parameters: adapter

Syntax	Description
<b>Required Parameter</b>	
<code>-i &lt;adapter ID&gt;</code>	Use to specify ID of controller on which CLI commands are executed.  <b>Note:</b> If this parameter is not included in the command line, CLI displays the ID of the controller on which it executes commands.
<b>Optional Parameters</b>	
<code>[-h]</code>	Use to display help text for the <code>adapter</code> command.
<b>Examples</b>	
<code>adapter -i 2</code>	Configure CLI to execute commands on controller 2.
<code>adapter</code>	Display ID of adapter/controller on which CLI executes commands.

## 6.8 Managing Adapter

Table 6-7 lists the commands used for managing adapters.

Table 6-7 Managing Adapter

Command	IOC	IOP	ROC	Description
<code>get</code>	✓	✓	✓	Get configuration information of VD, PD, array, HBA, or driver.
<code>info</code>	✓	✓	✓	Display information on adapter (hba), virtual disk (vd), disk array, physical disk (pd), Port multiplexer (pm), expander (exp), block disk (blk) or spare drive information.
<code>pause</code>	✓	✓	✓	Pause all background activities on specified adapter/controller.
<code>set -o hba</code>	✓	✓	✓	Set configuration parameters of HBA.
<code>set -o aes</code>	✗	✓	✗	Set configuration for AES encryption
<code>set -o aeslink</code>	✗	✓	✗	Set configuration for AES Link

### 6.8.1 get

Use `get` to display the properties of virtual disks, physical disks, arrays, HBA (adapter/controller), and the driver.

The syntax for the `get` command (including all required and optional parameters) is as follows:

```
get -o <vd|array|pd|hba|aes|aeslink|driver> [-i <VD id|array id|PD id|HBA id|aes port id>] [-h]
```

Table 6-8 describes the required and optional parameters for the `get` command.

Table 6-8 Command Parameters: `get`

Syntax	Description
<b>Required Parameter</b>	
<code>-o</code>	Use one of the following options to select the object:
<code>&lt;vd array pd hba aes aeslink driver&gt;</code>	<ul style="list-style-type: none"> <li>• <code>vd</code> (virtual disk)</li> <li>• <code>array</code> (disk array)</li> <li>• <code>pd</code> (physical disk)</li> <li>• <code>hba</code> (adapter/controller)</li> <li>• <code>aes</code> (AES)</li> <li>• <code>aeslink</code> (AES link)</li> <li>• <code>driver</code> (driver)</li> </ul>
<b>Note:</b> CLI does not support <code>get -o driver</code> in Linux.	
<b>Optional Parameters</b>	
<code>[-i &lt;VD id array id PD id HBA id aes port id&gt;]</code>	Use to specify object ID.
<b>Note:</b> This parameter is not applicable to objects <code>aeslink</code> and <code>driver</code> . If this parameter is not included in the command line for all other objects, CLI displays properties for all instances of the object.	

Table 6-8 Command Parameters: **get** (continued)

Syntax	Description
[-h]	Use to display help text on <b>get</b> command.
<b>Example</b>	
<code>get -o hba -i 1</code>	Display properties of adapter/controller 1.

## 6.8.2 info

Use **info** for information on all hardware and software components.

The syntax for the **info** command (including all required and optional parameters) is as follows:

`info -o <hba|vd|pd|array|pm|exp|blk|spare|bbu> [-i <id>] [-h]`

Table 6-9 describes the required and optional parameters for the **info** command.

Table 6-9 Command Parameters: **info**

Syntax	Description
<b>Required Parameter</b>	
-o <hba vd pd array pm exp blk spare bbu>	Use one of the following options to select the object: <ul style="list-style-type: none"> <li>• hba (adapter/controller)</li> <li>• vd (virtual disk)</li> <li>• pd (physical disk)</li> <li>• pm (port multiplexer)</li> <li>• exp (expander)</li> <li>• spare (spare drives)</li> <li>• bbu (battery backup unit)</li> </ul>
<b>Optional Parameters</b>	
[-i <id>]	Use to specify object ID. <b>Note:</b> If this parameter is not included in the command line, CLI displays information for all instances of the object.
[-h]	Use to display help text on <b>info</b> command.
<b>Example</b>	
<code>info -o hba</code>	Display information on all HBAs.

## 6.8.3 pause

Use **pause** to pause all background activities on the selected controller.

The syntax for the **pause** command (including all required and optional parameters) is as follows:

`pause -c <controller id> [-h]`

Table 6-10 describes the required and optional parameters for the `pause` command.

**Table 6-10 Command Parameters: `pause`**

Syntax	Description
<b>Required Parameter</b>	
<code>-c &lt;controller id&gt;</code>	Use to specify controller ID.
<b>Optional Parameter</b>	
<code>[-h]</code>	Use to display help text on <code>pause</code> command.
<b>Example</b>	
<code>pause -c 1</code>	Pause all background activities on controller 1.

#### 6.8.4 `set -o hba`

The syntax for the `set -o hba` command (including all required and optional parameters) is as follows:

```
set -o hba [<--autorebuildon|--autorebuildoff>] [--optimizeon|--optimizeoff]
[<--smarton|--smartoff>] [<--alarmon|--alarmoff>]
[<--virtualatapidisable|--virtualatapienable>]
[<--moduleconsolidateon|--moduleconsolidateoff>] [-r <BGA rate>]
```

Table 6-11 describes the required and optional parameters for the `set -o hba` command.

**Table 6-11 Command Parameters: `set -o hba`**

Syntax	Description
<b>Required Parameter</b>	
None	n/a
<b>Optional Parameters</b>	
<code>[&lt;--autorebuildon --autorebuildoff&gt;]</code>	Use one of the following options to enable/disable auto rebuild: <ul style="list-style-type: none"> <li><code>--autorebuildon</code> (enable)</li> <li><code>--autorebuildoff</code> (disable)</li> </ul>
<code>[--optimizeon --optimizeoff]</code>	Use one of the following options to enable/disable optimization: <ul style="list-style-type: none"> <li><code>--optimizeon</code> (enable)</li> <li><code>--optimizeoff</code> (disable)</li> </ul>
<code>[&lt;--smarton --smartoff&gt;]</code>	Use one of the following options to enable/disable S.M.A.R.T.: <ul style="list-style-type: none"> <li><code>--smarton</code> (enable)</li> <li><code>--smartoff</code> (disable)</li> </ul>
<code>[&lt;--alarmon --alarmoff&gt;]</code>	Use one of the following options to enable/disable alarm <ul style="list-style-type: none"> <li><code>--alarmon</code> (enable)</li> <li><code>--alarmoff</code> (disable)</li> </ul>

Syntax	Description
[<--virtualatapidisable --virtualatapienable>]	Use one of the following options to enable/disable Virtual ATA PI: <ul style="list-style-type: none"> <li>--virtualatapidisable (disable)</li> <li>--virtualatapienable (enable)</li> </ul>
[<--moduleconsolidateon --moduleconsolidateoff>]	Use one of the following options to enable/disable module consolidation: <ul style="list-style-type: none"> <li>--moduleconsolidateon (enable)</li> <li>--moduleconsolidateoff (disable)</li> </ul>
[-r <BGA rate>]	Use to specify the BGA (background activity) rate (between 0 and 100).
<b>Example</b>	
set -o hba --autorebuildon --smarton --alarmon	Enable auto rebuild, S.M.A.R.T, and alarm on the HBA.

Table 6-12 describes the required and optional parameters for the `set -o aes` command.

Syntax	Description
<b>Required Parameters</b>	
-i <port id>	Use to specify Port ID
--aeson --aesoff	Use one of the following options to enable/disable AES: <ul style="list-style-type: none"> <li>• --aeson* (enable AES)</li> <li>• --aesoff (disable AES)</li> </ul>
--k key	Replace key with a key-phrase that will generate the AES key for encryption.
<b>Optional Parameters</b>	
--keyclear --key128 --key256	Use one of the following options to specify the AES key bit-level: <ul style="list-style-type: none"> <li>• --keyclear (use to clear encryption)</li> <li>• --key128 (128-bit)</li> <li>• --key256 (256-bit)</li> </ul>
[-h]	Use to display help text on set - o aes command.

Table 6-12 Command Parameters: `set -o aes` (continued)

Syntax	Description
<b>Example</b>	
<code>set -o aes -i 1 --aeson --key128 -k marvell</code>	Enable 128-bit AES encryption on port 1 using key-phrase marvell.

### 6.8.6 `set -o aeslink`

The syntax for the `set -o aeslink` command (including all required and optional parameters) is as follows:

```
set -o aeslink -i <port id> -e <entry id> [-h]
```

Table 6-13 describes the required and optional parameters for the `set -o aeslink` command.

Table 6-13 Command Parameters: `set -o aeslink`

Syntax	Description
<b>Required Parameters</b>	
<code>-i &lt;port id&gt;</code>	Use to specify Port ID.
<code>-e &lt;entry id&gt;</code>	Use to specify Entry ID.
<b>Optional Parameter</b>	
<code>[-h]</code>	Use to display help text on <code>set -o aeslink</code> command.
<b>Example</b>	
<code>set -o aeslink -i 2 -e 1</code>	Enable (configured) AES encryption on port 2 for entry 1.



## 6.9 Creating Virtual Disk/Array

Table 6-14 lists the command used for creating virtual disk/arrays.

Table 6-14 Creating Virtual Disk/Array

Command	IOC	IOP	ROC	Description
<code>create</code>	✓	✓	✓	Create virtual disk.

### 6.9.1 create

Use `create` to create a virtual disk.

The syntax for the `create` command (including all required and optional parameters) is as follows:

```
create -o <vd> -d <PD id list> -r <0|1|10|1E|5|50|6|60> [-n <name>] [-b
<16|32|64|128>] [-w <wt|wb>] [-p <none|ra>] [-i <quick|none>] [-g <0|1|10>]
[--waiveconfirmation] [-h]
```

Table 6-15 describes the required and optional parameters for the `create` command.

Table 6-15 Command Parameters: create

Syntax	Description
<b>Required Parameter</b>	
<code>-o &lt;vd&gt;</code>	Use to specify object as virtual disk.
<code>-d &lt;PD id list&gt;</code>	Use to specify IDs of physical disks. <b>Note:</b> Separate IDs by , (comma).
<code>-r &lt;0 1 10 1E 5 50 6 60&gt;</code>	Use one of the following options to select the RAID level for the virtual disk: <ul style="list-style-type: none"> <li>• 0</li> <li>• 1</li> <li>• 10</li> <li>• 1E</li> <li>• 5</li> <li>• 50</li> <li>• 6</li> <li>• 60</li> </ul> <b>Note:</b> Marvell RAID controllers support different sets of RAID levels depending on the hardware model and OEM software package. Some software packages, depending on OEM selections, support limited RAID levels by design. Check with the OEM vendor for information specific to your controller.
<b>Optional Parameters</b>	
<code>[-n &lt;name&gt;]</code>	Use to specify name for virtual disk. <b>Note:</b> If this parameter is not included in the command line, CLI uses the default name Logical RAID.

Table 6-15 Command Parameters: create (continued)

Syntax	Description
<code>[-b &lt;16   32   64   128&gt;]</code>	<p>Use one of the following options to select the stripe block size in KB:</p> <ul style="list-style-type: none"> <li>16 (16 KB)</li> <li>32 (32 KB)</li> <li>64 (64 KB)</li> <li>128 (128 KB)</li> </ul> <p><b>Note:</b> Support for different stripe sizes depends on the capabilities of the controller and RAID level. If this parameter is not included in the command line, CLI uses the default stripe size 64.</p>
<code>[-w &lt;wt   wb&gt;]</code>	<p>Use one of the following options to select the write cache mode for the virtual disk:</p> <ul style="list-style-type: none"> <li>wt (Write Through, Performance)</li> <li>wb (Write Back, Reliable)</li> </ul> <p><b>Note:</b> If this parameter is not included in the command line, CLI uses the default write cache mode wb.</p>
<code>[-p &lt;none   ra&gt;]</code>	<p>Use one of the following options to enable/disable Read Ahead for the virtual disk:</p> <ul style="list-style-type: none"> <li>none (No Read Ahead)</li> <li>ra (Enable Read Ahead)</li> </ul> <p><b>Note:</b> If this parameter is not included in the command line, CLI uses the default setting none.</p>
<code>[-i &lt;quick   none&gt;]</code>	<p>Use one of the following options to configure initialization for the virtual disk:</p> <ul style="list-style-type: none"> <li>quick (Fast Initialization)</li> <li>none (No Initialization)</li> </ul> <p><b>Note:</b> If this parameter is not included in the command line, CLI uses the default initialization type quick.</p>
<code>[-g &lt;0   1   10&gt;]</code>	<p>Use one of the following to select Gigabyte Rounding for the virtual disk:</p> <ul style="list-style-type: none"> <li>0 (0 GB)</li> <li>1 (1 GB)</li> <li>10 (10 GB)</li> </ul> <p><b>Note:</b> If this parameter is not included in the command line, CLI uses the default gigabyte rounding setting 0.</p>
<code>[--waiveconfirmation]</code>	Use to waive step requiring user confirmation of virtual disk creation.
<code>[-h]</code>	Use to display help text for the create command.
<b>Example</b>	
<pre>create -o vd -r0 -d 0,2,4 -n "My VD" -b 32 -g 0 -w wb -p ra</pre>	Create a RAID 0 virtual disk named My VD using physical disks 0, 2, and 4, with stripe size of 32 KB, gigabyte rounding of 0 GB, Write Back cache mode and Read Ahead.

## 6.10 Importing Virtual Disk

Table 6-16 lists the command used for importing virtual disks.

**Table 6-16 Importing Virtual Disk**

Command	IOC	IOP	ROC	Description
<code>import</code>	✓	✓	✓	Import a virtual disk created with another RAID controller.

### 6.10.1 import

Use `import` to import a virtual disk created with another RAID controller.

**Note:** The controller must support this feature.

The syntax for the `import` command (including all required and optional parameters) is as follows:

```
import -i <VD ID>
```

Table 6-17 describes the required and optional parameters for the `import` command.

**Table 6-17 Command Parameters: import**

Syntax	Description
<b>Required Parameter</b>	
<code>-i &lt;VD ID&gt;</code>	Use to specify virtual disk ID.
<b>Optional Parameter</b>	
None	n/a
<b>Example</b>	
<code>import -i 1</code>	Import virtual disk 1.

## 6.11 Managing Virtual Disk/Array

Table 6-18 lists the commands used for managing virtual disks/arrays.

**Table 6-18 Managing Virtual Disk/Array**

Command	IOC	IOP	ROC	Description
<code>cc</code>	✓	✓	✓	Start, stop, pause, or resume consistency check for a virtual disk.
<code>copyback</code>	✗	✗	✓	Pause or resume copy back operation on array.
<code>get</code>	✓	✓	✓	Get configuration information of VD, PD, array, HBA, or driver.
<code>info</code>	✓	✓	✓	Display information on adapter (hba), virtual disk (vd), disk array, physical disk (pd), Port multiplexer (pm), expander (exp), block disk (blk) or spare drive information.
<code>init</code>	✓	✓	✓	Start, stop, pause, or resume VD initialization
<code>set -o vd</code>	✓	✓	✓	Set configuration parameters of VD.

### 6.11.1 cc

Use `cc` to start, stop, pause, or resume consistency check for a virtual disk.

The syntax for the `cc` command (including all required and optional parameters) is as follows:

```
cc [-o <vd>] [-a <start|stop|pause|resume>] [-l <id>] [-t <sync|check>] [-h]
```

Table 6-19 describes the required and optional parameters for the `cc` command.

**Table 6-19 Command Parameters: cc**

Syntax	Description
<b>Required Parameter</b>	
None	n/a
<b>Optional Parameters</b>	
<code>[-o &lt;vd&gt;]</code>	Use to specify object as virtual disk. <b>Note:</b> If this parameter is not included in the command line, CLI uses the default object <code>vd</code> .
<code>[-a &lt;start stop pause resume&gt;]</code>	Use one of the following options to control consistency check for the virtual disk: <ul style="list-style-type: none"> <li>• start</li> <li>• stop</li> <li>• pause</li> <li>• resume</li> </ul> <b>Note:</b> If this parameter is not included in the command line, CLI uses the default action <code>start</code> .
<code>[-l &lt;id&gt;]</code>	Use to specify virtual disk ID. <b>Note:</b> If this parameter is not included in the command line, CLI performs the specified action on all virtual disks.

Table 6-19 Command Parameters: `cc` (continued)

Syntax	Description
<code>[-t &lt;sync check&gt;]</code>	Use one of the following options to enable/disable synchronization: <ul style="list-style-type: none"> <li><code>sync</code> (consistency check with synchronization)</li> <li><code>check</code> (consistency check only)</li> </ul> <b>Note:</b> If this parameter is not included in the command line, CLI uses the default initialization type <code>sync</code> .
<code>[-h]</code>	Use to display help text for the <code>cc</code> command.
<b>Example</b>	
<code>cc -a start -l 0 -t sync</code>	Start consistency check on virtual disk 0 and synchronize.

### 6.11.2 copyback

**Note:** The `copyback` command is supported only on RAID-On-Chip (ROC) controllers.

Use `copyback` to pause and resume the copy back operation on an array.

The syntax for the `copyback` command (including all required and optional parameters) is as follows:

```
copyback -a <pause|resume> -l <id> [-h]
```

Table 6-20 describes the required and optional parameters for the `copyback` command.

Table 6-20 Command Parameters: `copyback`

Syntax	Description
<b>Required Parameters</b>	
<code>-a &lt;pause resume&gt;</code>	Use one of the following options to control the copyback operation: <ul style="list-style-type: none"> <li><code>pause</code></li> <li><code>resume</code></li> </ul>
<code>-l &lt;id&gt;</code>	Use to specify array ID.
<b>Optional Parameter</b>	
<code>[-h]</code>	Use to display help text for the <code>copyback</code> command.
<b>Examples</b>	
<code>copyback -a pause -l 0</code>	Pauses copyback operation on array 0.

### 6.11.3 get

Use `get` to display the properties of virtual disks, physical disks, arrays, HBA (adapter/controller), and the driver.

The syntax for the `get` command (including all required and optional parameters) is as follows:

```
get -o <vd|array|pd|hba|aes|aeslink|driver> [-i <VD id|array id|PD id|HBA id|aes port id>] [-h]
```

Table 6-21 describes the required and optional parameters for the `get` command.

**Table 6-21 Command Parameters: get**

Syntax	Description
<b>Required Parameter</b>	
<code>-o</code> <code>&lt;vd array pd hba aes aeslink driver&gt;</code> <code>&gt;</code>	Use one of the following options to select the object: <ul style="list-style-type: none"> <li>• <code>vd</code> (virtual disk)</li> <li>• <code>array</code> (disk array)</li> <li>• <code>pd</code> (physical disk)</li> <li>• <code>hba</code> (adapter/controller)</li> <li>• <code>aes</code> (AES)</li> <li>• <code>aeslink</code> (AES link)</li> <li>• <code>driver</code> (driver)</li> </ul> <b>Note:</b> CLI does not support <code>get -o driver</code> in Linux.
<b>Optional Parameters</b>	
<code>[-i &lt;VD id array id PD id HBA id aes port id&gt;]</code>	Use to specify object ID. <b>Note:</b> This parameter is not applicable to objects <code>aeslink</code> and <code>driver</code> . If this parameter is not included in the command line for all other objects, CLI displays properties for all instances of the object.
<code>[-h]</code>	Use to display help text on <code>get</code> command.
<b>Example</b>	
<code>get -o vd -i 2</code>	Display properties of virtual disk 2.

#### 6.11.4 info

Use `info` for information on all hardware and software components.

The syntax for the `info` command (including all required and optional parameters) is as follows:

```
info -o <hba|vd|pd|array|pm|exp|blk|spare|bbu> [-i <id>] [-h]
```

Table 6-22 describes the required and optional parameters for the `info` command.

**Table 6-22 Command Parameters: info**

Syntax	Description
<b>Required Parameter</b>	
<code>-o</code> <code>&lt;hba vd pd array pm exp blk spare bbu&gt;</code> <code>&gt;</code>	Use one of the following options to select the object: <ul style="list-style-type: none"> <li>• <code>hba</code> (adapter/controller)</li> <li>• <code>vd</code> (virtual disk)</li> <li>• <code>pd</code> (physical disk)</li> <li>• <code>pm</code> (port multiplexer)</li> <li>• <code>exp</code> (expander)</li> <li>• <code>spare</code> (spare drives)</li> <li>• <code>bbu</code> (battery backup unit)</li> </ul>



Table 6-22 Command Parameters: info (continued)

Syntax	Description
<b>Optional Parameters</b>	
<code>[-i &lt;id&gt;]</code>	Use to specify object ID. <b>Note:</b> If this parameter is not included in the command line, CLI displays information for all instances of the object.
<code>[-h]</code>	Use to display help text on <code>info</code> command.
<b>Example</b>	
<code>info -o vd -i 1</code>	Display information on virtual disk 1.

### 6.11.5 init

Use `init` to start, stop, pause, or resume background initialization for a virtual disk.

The syntax for the `init` command (including all required and optional parameters) is as follows:

```
init [-o <vd>] [-a <start|stop|pause|resume>] -l <id>
```

Table 6-23 describes the required and optional parameters for the `init` command.

Table 6-23 Command Parameters: init

Syntax	Description
<b>Required Parameter</b>	
<code>-l &lt;id&gt;</code>	Use to specify ID of virtual disk.
<b>Optional Parameters</b>	
<code>[-o &lt;vd&gt;]</code>	Use to specify object as virtual disk. <b>Note:</b> If this parameter is not included in the command line, CLI uses the default object <code>vd</code> .
<code>[-a &lt;start stop pause resume&gt;]</code>	Use one of the following options to control background initialization of the virtual disk: <ul style="list-style-type: none"> <li>• <code>start</code></li> <li>• <code>stop</code></li> <li>• <code>pause</code></li> <li>• <code>resume</code></li> </ul> <b>Note:</b> If this parameter is not included in the command line, CLI uses the default action <code>start</code> .
<code>[-h]</code>	Use to display help text on <code>init</code> command.
<b>Example</b>	
<code>init -a start -l 0</code>	Start full initialization on virtual disk 0.

### 6.11.6 set -o vd

The syntax for the `set -o vd` command (including all required and optional parameters) is as follows:

```
set -o vd -i <VD id> [-n <new name>] [<--writeback|--writethrough>]
[<--readaheadon|--readaheadoff>] [--setfree] [-h]
```

Table 6-24 describes the required and optional parameters for the `set -o vd` command.

**Table 6-24 Command Parameters: set -o vd**

Syntax	Description
<b>Required Parameter</b>	
<code>-i &lt;VD id&gt;</code>	Use to specify virtual disk ID.
<b>Optional Parameters</b>	
<code>[-n &lt;new name&gt;]</code>	Use to specify new name for virtual disk. If the name has blank characters, enclose <code>&lt;new name&gt;</code> in quotes. <b>Note:</b> To delete the current name, set <code>&lt;new name&gt;</code> to <code>.</code> ( <i>dot</i> ).
<code>[&lt;--writeback --writethrough&gt;]</code>	Use one of the following options to select the write cache mode: <ul style="list-style-type: none"> <li><code>--writeback</code> (Write Back, Performance)</li> <li><code>--writethrough</code> (Write Through, Reliable)</li> </ul>
<code>[&lt;--readaheadon --readaheadoff&gt;]</code>	Use one of the following options to enable/disable Read Ahead: <ul style="list-style-type: none"> <li><code>--readaheadon</code> (Enable Read Ahead)</li> <li><code>--readaheadoff</code> (Disable Read Ahead)</li> </ul>
<code>[--setfree]</code>	Use to release an offline disk from a virtual disk.
<code>[-h]</code>	Use to display help text on <code>set -o vd</code> command.
<b>Example</b>	
<code>set -o vd -i 2 --readaheadon --writethrough</code>	Enable Read Ahead and Write Through cache mode on virtual disk 2.

## 6.12 Monitoring Virtual Disk/Array

Table 6-25 lists the command used for monitoring virtual disks/arrays.

Table 6-25 Monitoring Virtual Disk/Array

Command	IOC	IOP	ROC	Description
<code>event</code>	✓	✓	✓	Get list of current events.

### 6.12.1 event

Type `event` for a list of current events from the events log.

**Note:** The event command does not have any required or optional parameters.

## 6.13 Migrating Array

Table 6-26 lists the command used for migrating arrays.

**Table 6-26 Migrating Array**

Command	IOC	IOP	ROC	Description
<code>migrate</code>	x	x	✓	Start, pause, or resume migration of arrays.

### 6.13.1 migrate

Use `migrate` to initialize and control the migration procedure for arrays.

**Note:** Migration must include all physical disks of the array and can be performed only if migrating to a higher RAID level or expanding capacity in the same RAID level.

The syntax for the `migrate` command (including all required and optional parameters) is as follows:

```
migrate [-a <start|pause|resume|size>] -l <id> [-r <0|1|10|1E|5|50|6|60>]
[-q <# parity disks>] [-d <PDid list>] [-h]
```

Table 6-27 describes the required and optional parameters for the `migrate` command.

**Table 6-27 Command Parameters: migrate**

Syntax	Description
<b>Required Parameter</b>	
<code>-l &lt;id&gt;</code>	Use to specify array ID.
<b>Optional Parameters</b>	
<code>[-a &lt;start pause resume size&gt;]</code>	<p>Use one of the following options to control migration of array:</p> <ul style="list-style-type: none"> <li>• start</li> <li>• pause</li> <li>• resume</li> <li>• size</li> </ul> <p><b>Note:</b> If this parameter is not included in the command line, CLI uses the default action start.</p>

Table 6-27 Command Parameters: migrate (continued)

Syntax	Description
<code>[-r &lt;0 1 10 1E 5 50 6 60&gt;]</code>	<p>Use one of the following options to select the RAID level for migration:</p> <ul style="list-style-type: none"> <li>• 0</li> <li>• 1</li> <li>• 10</li> <li>• 1E</li> <li>• 5</li> <li>• 50</li> <li>• 6</li> <li>• 60</li> </ul> <p><b>Note:</b> Marvell RAID controllers support different sets of RAID levels depending on the hardware model and OEM software package. Some software packages, depending on OEM selections, support limited RAID levels by design. Check with the OEM vendor for information specific to your controller.</p>
<code>[-q &lt;# parity disks&gt;]</code>	<p>Use to specify the number of parity disks for RAID 6 and RAID 60.</p> <p><b>Note:</b> If this parameter is not included in the command line, CLI uses the default value (2 for RAID 6, and 4 for RAID 60).</p>
<code>[-d &lt;PDId list&gt;]</code>	<p>Use to specify the IDs of additional disks when starting migration (-a start).</p> <p><b>Note:</b> Separate IDs by , (comma).</p>
<code>[-h]</code>	Use to display help text on migrate command.
<b>Example</b>	
<code>migrate -a start -l 0 -r10 -d1,2,3,4</code>	Migrate array 0 to RAID 10 by adding physical disks 1, 2, 3, and 4.

## 6.14 Rebuilding Virtual Disk/Array

Table 6-28 lists the command used for rebuilding virtual disks/arrays.

Table 6-28 Rebuilding Virtual Disk/Array

Command	IOC	IOP	ROC	Description
<code>rebuild</code>	✓	✓	✓	Start, stop, pause, resume, or restart rebuilding virtual disk/array.

### 6.14.1 rebuild

Use `rebuild` to start, stop, pause, resume, or restart rebuilding of a virtual disk.

The syntax for the `rebuild` command including all required and optional parameters for is as follows:

```
rebuild [-a <start|stop|pause|resume|restart>] -l <id> [-d <PDid>] [-h]
```

Table 6-29 describes the required and optional parameters for the `rebuild` command.

Table 6-29 Command Parameters: rebuild

Syntax	Description
<b>Required Parameter</b>	
<code>-l &lt;id&gt;</code>	Use to specify ID of degraded virtual disk.
<b>Optional Parameters</b>	
<code>[-a &lt;start stop pause resume restart&gt;]</code>	Use one of the following options to control rebuilding of the virtual disk: <ul style="list-style-type: none"> <li>• start</li> <li>• stop</li> <li>• pause</li> <li>• resume</li> <li>• restart</li> </ul> <p><b>Note:</b> If this parameter is not included in the command line, CLI uses the default action start.</p>
<code>[-d &lt;PDid&gt;]</code>	Use when starting rebuild ( <code>-a start</code> ) to specify the ID of the failed physical disk.
<code>[-h]</code>	Use to display help text on <code>rebuild</code> command.
<b>Example</b>	
<code>rebuild -a start -l 0 -d 5</code>	Rebuild virtual disk by replacing failed physical disk 5. <b>Note:</b> Use <code>assign</code> to assign global and dedicated spare drives.

## 6.15 Deleting Virtual Disk/Array

Table 6-30 lists the command used for deleting virtual disks/arrays.

Table 6-30 Deleting Virtual Disk/Array

Command	IOC	IOP	ROC	Description
<code>delete</code>	✓	✓	✓	Delete virtual disk/array or spare drive.

### 6.15.1 delete

Use `delete` to delete a virtual disk or release a physical disk from its spare status.

The syntax for the `delete` command (including all required and optional parameters) is as follows:

```
delete -o <vd|array|spare> -i <id> [-f] [--waiveconfirmation] [-h]
```

Table 6-31 describes the required and optional parameters for the `delete` command.

Table 6-31 Command Parameters: delete

Syntax	Description
<b>Required Parameter</b>	
<code>-o &lt;vd array spare&gt;</code>	Use one of the following options to select the object to be deleted: <ul style="list-style-type: none"> <li><code>vd</code> (virtual disk)</li> <li><code>array</code> (array)</li> <li><code>spare</code> (spare drive)</li> </ul>
<code>-i &lt;id&gt;</code>	Use to specify object ID.
<b>Optional Parameters</b>	
<code>[-f]</code>	Use to force deletion of virtual disk or array even if rebuild or migration is in progress.
<code>[--waiveconfirmation]</code>	Use to waive step requiring user confirmation of object deletion.
<code>[-h]</code>	Use to display help text for the <code>delete</code> command.
<b>Examples</b>	
<code>delete -o vd -i 4</code>	Delete virtual disk 4 after prompting for confirmation.



## 6.16 Managing Physical Disks

Table 6-32 lists the commands used for managing physical disks.

**Table 6-32 Managing Physical Disks**

Command	IOC	IOP	ROC	Description
<code>assign</code>	✓	✓	✓	Assign a disk as a spare drive.
<code>delete</code>	✓	✓	✓	Delete virtual disk or spare drive.
<code>get</code>	✓	✓	✓	Get configuration information of VD, PD, array, HBA, or driver.
<code>info</code>	✓	✓	✓	Display information on adapter (hba), virtual disk (vd), disk array, physical disk (pd), Port multiplexer (pm), expander (exp), block disk (blk) or spare drive information.
<code>locate</code>	✓	✓	✓	Locate the specified physical disk.
<code>mp</code>	✓	✓	✓	Start, stop, pause, or resume media patrol for a physical disk.
<code>set -o pd</code>	✓	✓	✓	Set configuration parameters of PD.

### 6.16.1 assign

Use `assign` to assign a physical disk as a spare drive.

The syntax for the `assign` command (including all required and optional parameters) is as follows:

```
assign -o <hba|array> -d <PD id> [-a <array id>] [--waiveconfirmation] [-h]
```

Table 6-33 describes the required and optional parameters for the `assign` command.

**Table 6-33 Command Parameters: assign**

Syntax	Description
<b>Required Parameter</b>	
<code>-o &lt;hba array&gt;</code>	Use one of the following options to assign a physical disk as either a global spare drive or dedicated spare drive: <ul style="list-style-type: none"> <li><code>hba</code> (global spare drive)</li> <li><code>array</code> (dedicated spare drive)</li> </ul> <b>Note:</b> If this parameter is not included in the command line, CLI uses the default object <code>hba</code> .
<code>-d &lt;PD id&gt;</code>	Use to specify ID of physical disk which is assigned as spare drive.
<b>Optional Parameters</b>	
<code>[-a &lt;array id&gt;]</code>	Use when creating a dedicated spare drive ( <code>-o array</code> ). <b>Note:</b> This is applicable only for RAID-On-Chip (ROC) controllers.

**Table 6-33 Command Parameters: assign** (continued)

Syntax	Description
[--waiveconfirmation]	Use to waive step requiring user confirmation of spare drive assignment.
[-h]	Use to display help text for the assign command.
<b>Example</b>	
assign -o array -a 3 -d 2	Assign physical disk 2 as a dedicated spare drive to array 3 after receiving user confirmation.

## 6.16.2 delete

Use `delete` to delete a virtual disk or release a physical disk from its spare status.

The syntax for the `delete` command (including all required and optional parameters) is as follows:

```
delete -o <vd|array|spare> -i <id> [-f] [--waiveconfirmation] [-h]
```

Table 6-31 describes the required and optional parameters for the `delete` command.

**Table 6-34 Command Parameters: delete**

Syntax	Description
<b>Required Parameter</b>	
-o <vd array spare>	Use one of the following options to select the object to be deleted: <ul style="list-style-type: none"> <li>vd (virtual disk)</li> <li>array (array)</li> <li>spare (spare drive)</li> </ul>
-i <id>	Use to specify object ID.
<b>Optional Parameters</b>	
[-f]	Use to force deletion of virtual disk or array even if rebuild or migration is in progress.
[--waiveconfirmation]	Use to waive step requiring user confirmation of object deletion.
[-h]	Use to display help text for the delete command.
<b>Examples</b>	
delete -o spare -i 3	Release physical disk 3 from spare status.

## 6.16.3 get

Use `get` to display the properties of virtual disks, physical disks, arrays, HBA (adapter/controller), and the driver.

The syntax for the `get` command (including all required and optional parameters) is as follows:

```
get -o <vd|array|pd|hba|aes|aeslink|driver> [-i <VD id|array id|PD id|HBA id|aes port id>] [-h]
```

Table 6-35 describes the required and optional parameters for the `get` command.

**Table 6-35 Command Parameters: `get`**

Syntax	Description
<b>Required Parameter</b>	
<code>-o</code> <code>&lt;vd array pd hba aes aeslink driver&gt;</code> <code>&gt;</code>	Use one of the following options to select the object: <ul style="list-style-type: none"> <li><code>vd</code> (virtual disk)</li> <li><code>array</code> (disk array)</li> <li><code>pd</code> (physical disk)</li> <li><code>hba</code> (adapter/controller)</li> <li><code>aes</code> (AES)</li> <li><code>aeslink</code> (AES link)</li> <li><code>driver</code> (driver)</li> </ul> <b>Note:</b> CLI does not support <code>get -o driver</code> in Linux.
<b>Optional Parameters</b>	
<code>[-i &lt;VD id array id PD id HBA id aes port id&gt;]</code>	Use to specify object ID. <b>Note:</b> This parameter is not applicable to objects <code>aeslink</code> and <code>driver</code> . If this parameter is not included in the command line for all other objects, CLI displays properties for all instances of the object.
<code>[-h]</code>	Use to display help text on <code>get</code> command.
<b>Example</b>	
<code>get -o pd -i 2</code>	Display properties of physical disk 2.

#### 6.16.4 info

Use `info` for information on all hardware and software components.

The syntax for the `info` command (including all required and optional parameters) is as follows:

```
info -o <hba|vd|pd|array|pm|exp|blk|spare|bbu> [-i <id>] [-h]
```

Table 6-36 describes the required and optional parameters for the `info` command.

**Table 6-36 Command Parameters: info**

Syntax	Description
<b>Required Parameter</b>	
<code>-o</code> <code>&lt;hba vd pd array pm exp blk spare bbu&gt;</code>	Use one of the following options to select the object: <ul style="list-style-type: none"> <li>• <code>hba</code> (HBA)</li> <li>• <code>vd</code> (virtual disk)</li> <li>• <code>pd</code> (physical disk)</li> <li>• <code>pm</code> (port multiplexer)</li> <li>• <code>exp</code> (expander)</li> <li>• <code>spare</code> (spare drives)</li> <li>• <code>bbu</code> (battery backup unit)</li> </ul>
<b>Optional Parameters</b>	
<code>[-i &lt;id&gt;]</code>	Use to specify object ID. <b>Note:</b> If this parameter is not included in the command line, CLI displays information for all instances of the object.
<code>[-h]</code>	Use to display help text on <code>info</code> command.
<b>Examples</b>	
<code>info -o exp</code>	Display information on all expanders
<code>info -o pm</code>	Display information on all port multipliers.

### 6.16.5 locate

Use `locate` to locate a physical disk in an enclosure or backplane.

**Note:** The `locate` command works for enclosures and backplanes that support the `locate` feature. When `locate` is turned on, the LED of the physical disk glows or blinks depending on the design of the enclosure.

The syntax for the `locate` command (including all required and optional parameters) is as follows:

```
locate -o <pd> -i <PD ID> -a <on|off>
```

Table 6-37 describes the required and optional parameters for the `locate` command.

**Table 6-37 Command Parameters: locate**

Syntax	Description
<b>Required Parameters</b>	
<code>-o &lt;pd&gt;</code>	Use to specify object as physical disk.
<code>-i &lt;PD ID&gt;</code>	Use to specify physical disk ID.

Table 6-37 Command Parameters: locate (continued)

Syntax	Description
-a <on/off>	Use one of the following options to turn locate on and off: <ul style="list-style-type: none"> <li>on (turn locate on)</li> <li>off (turn locate off)</li> </ul>
Optional Parameter	
[-h]	Use to display help text on locate command.
Example	
locate -o pd -i 1 -a on	Turn locate on for physical disk 1.

### 6.16.6 mp

Use `mp` to start, stop, pause, or resume media patrol for a configured physical disk (that is part of a virtual disk) or a spare drive.

The syntax for the `mp` command (including all required and optional parameters) is as follows:

```
mp [-a <start|stop|pause|resume>] -d <PDid> [-h]
```

Table 6-38 describes the required and optional parameters for the `mp` command.

Table 6-38 Command Parameters: mp

Syntax	Description
Required Parameters	
[-a <start stop pause resume>]	Use one of the following options to control media patrol for a physical disk: <ul style="list-style-type: none"> <li>start</li> <li>stop</li> <li>pause</li> <li>resume</li> </ul> <p><b>Note:</b> If this parameter is not included in the command line, CLI uses the default action <code>start</code>.</p>
-d <PDid>	Use to specify physical disk ID.
Optional Parameter	
[-h]	Use to display help text for the <code>mp</code> command.
Example	
mp -a pause -d 0	Pause media patrol on physical disk 0.

### 6.16.7 set -o pd

The syntax for the `set -o pd` command (including all required and optional parameters) is as follows:

```
set -o <pd> -i <PD id> [--cacheon|--cacheoff] [-h]
```

Table 6-39 describes the required and optional parameters for the `set -o pd` command.

**Table 6-39 Command Parameters: `set -o pd`**

Syntax	Description
<b>Required Parameter</b>	
<code>-i &lt;PD id&gt;</code>	Use to specify physical disk ID.
<b>Optional Parameters</b>	
<code>[&lt;--cacheon --cacheoff&gt;]</code>	Use one of the following options to enable/disable caches: <ul style="list-style-type: none"> <li><code>--cacheon</code> (enable cache)</li> <li><code>--cacheoff</code> (disable cache)</li> </ul>
<code>[-h]</code>	Use to display help text for the <code>set -o pd</code> command.
<b>Example</b>	
<code>set -o pd -i 3 --cacheon</code>	Enable cache on physical disk 3.

## 6.17 Managing Enclosures

Table 6-40 lists the commands used for managing enclosures.

**Table 6-40 Managing Enclosures**

Command	IOC	IOP	ROC	Description
<code>enc</code>	✓	✓	✓	Get information on enclosure, enclosure element, or enclosure configuration.
<code>info</code>	✓	✓	✓	Display information on adapter (hba), virtual disk (vd), disk array, physical disk (pd), Port multiplexer (pm), expander (exp), block disk (blk) or spare drive information.

### 6.17.1 `enc`

Use `enc` to display properties of an enclosure, enclosure element, or enclosure configuration.

The syntax for the `enc` command (including all required and optional parameters) is as follows:

```
enc -o <enc|ele|elecfg> -i <enclosure ID> -e <element ID> -t
<dev|arydev|pow|fan|tpr|dor|alm|dpl|vlt>
```

Table 6-41 describes the required and optional parameters for the `enc` command.

**Table 6-41 Command Parameters: `enc`**

Syntax	Description
<b>Required Parameters</b>	
<code>-o &lt;enc ele elecfg&gt;</code>	Use one of the following options to select the object: <ul style="list-style-type: none"> <li><code>enc</code> (enclosure info)</li> <li><code>ele</code> (element info)</li> <li><code>elecfg</code> (element configuration)</li> </ul>
<code>-i &lt;enclosure ID&gt;</code>	Use to specify enclosure ID when using the following parameter: <code>-o &lt;enc&gt;</code>
<code>-e &lt;element ID&gt;</code>	Use to specify element ID when using the following parameter: <code>-o &lt;ele&gt;</code>
<code>-t</code> <code>&lt;dev arydev pow fan tpr dor alm dpl vlt&gt;</code>	Use to specify Element Type only when using the following parameter: <code>-o &lt;ele&gt;</code> The Element Type options are as follows: <ul style="list-style-type: none"> <li><code>dev</code> (Device)</li> <li><code>arydev</code> (Array device)</li> <li><code>pow</code> (Power)</li> <li><code>fan</code> (Cooling)</li> <li><code>tpr</code> (Temperature)</li> <li><code>dor</code> (Door)</li> <li><code>alm</code> (Alarm)</li> <li><code>dpl</code> (Display)</li> <li><code>vlt</code> (Voltage sensor)</li> </ul>
<b>Optional Parameter</b>	



Table 6-41 Command Parameters: enc (continued)

Syntax	Description
None	n/a
<b>Example</b>	
enc -o ele -e 5 -t vlt	Display information on the voltage sensor of enclosure element 5.

### 6.17.2 info

Use `info` for information on all hardware and software components.

The syntax for the `info` command (including all required and optional parameters) is as follows:

```
info -o <hba|vd|pd|array|pm|exp|blk|spare|bbu> [-i <id>] [-h]
```

Table 6-42 describes the required and optional parameters for the `info` command.

Table 6-42 Command Parameters: info

Syntax	Description
<b>Required Parameter</b>	
-o <hba vd pd array pm exp blk spare bbu>	Use one of the following options to select the object: <ul style="list-style-type: none"> <li>• hba (HBA)</li> <li>• vd (virtual disk)</li> <li>• pd (physical disk)</li> <li>• pm (port multiplexer)</li> <li>• exp (expander)</li> <li>• spare (spare drives)</li> <li>• bbu (battery backup unit)</li> </ul>
<b>Optional Parameters</b>	
[-i <id>]	Use to specify object ID. <b>Note:</b> If this parameter is not included in the command line, CLI displays information for all instances of the object.
[-h]	Use to display help text on <code>info</code> command.
<b>Examples</b>	
info -o exp	Display information on all expanders.
info -o pm -i 1	Display information on port multiplier 1.

## 6.18 Managing the RAID Controller Driver

Table 6-43 lists the commands used for managing the RAID controller driver.

**Table 6-43 Managing the RAID Controller Driver**

Command	IOC	IOP	ROC	Description
<code>get</code>	✓	✓	✓	Get configuration information of VD, PD, array, HBA, or driver.
<code>set -o driver</code>	✓	✓	✓	Set configuration parameters of driver.

### 6.18.1 get

Use `get` to display the properties of virtual disks, physical disks, arrays, HBA (adapter/controller), and the driver.

The syntax for the `get` command (including all required and optional parameters) is as follows:

```
get -o <vd|array|pd|hba|aes|aeslink|driver> [-i <VD id|array id|PD id|HBA id|aes port id>] [-h]
```

Table 6-21 describes the required and optional parameters for the `get` command.

**Table 6-44 Command Parameters: get**

Syntax	Description
<b>Required Parameter</b>	
<code>-o</code> <code>&lt;vd array pd hba aes aeslink driver&gt;</code> <code>&gt;</code>	Use one of the following options to select the object: <ul style="list-style-type: none"> <li>• <code>vd</code> (virtual disk)</li> <li>• <code>array</code> (disk array)</li> <li>• <code>pd</code> (physical disk)</li> <li>• <code>hba</code> (adapter/controller)</li> <li>• <code>aes</code> (AES)</li> <li>• <code>aeslink</code> (AES link)</li> <li>• <code>driver</code> (driver)</li> </ul> <b>Note:</b> CLI does not support <code>get -o driver</code> in Linux.
<b>Optional Parameters</b>	
<code>[-i &lt;VD id array id PD id HBA id aes port id&gt;]</code>	Use to specify object ID. <b>Note:</b> This parameter is not applicable to objects <code>aeslink</code> and <code>driver</code> . If this parameter is not included in the command line for all other objects, CLI displays properties for all instances of the object.
<code>[-h]</code>	Use to display help text on <code>get</code> command.
<b>Example</b>	
<code>get -o driver</code>	Display properties of the RAID controller driver.

## 6.18.2 set -o driver

**Note:** CLI does not support the `set o -driver` command in Linux.

The syntax for the `set -o driver` command (including all required and optional parameters) is as follows:

```
set -o driver [--performance|--powersaving] [-h]
```

Table 6-45 describes the required and optional parameters for the `set -o driver` command.

**Table 6-45 Command Parameters: set -o driver**

Syntax	Description
<b>Required Parameter</b>	
None	n/a
<b>Optional Parameters</b>	
[ <code>--performance</code>   <code>--powersaving</code> ]	Use one of the following options to select the operating mode for the driver: <ul style="list-style-type: none"> <li><code>--performance</code> (for best performance)</li> <li><code>--powersaving</code> (for lowest power consumption)</li> </ul> <b>Note:</b> If this parameter is not included in the command line, CLI uses <code>--performance</code> .
[-h]	Use to display help text on <code>set -o driver</code> command.
<b>Example</b>	
<code>set -o driver --performance</code>	Set driver for best performance.

## 6.19 Updating BIOS, Firmware, and Flash Configuration

Table 6-46 lists the commands used for updating BIOS, firmware, and flash configuration.

**Table 6-46 Updating BIOS, Firmware, and Flash Configuration**

Command	IOC	IOP	ROC	Description
<code>flash</code>	✓	✓	✓	Update or backup flash image.
<code>flashrw</code>	✓	✓	✓	Read flash contents (in bytes), or write a pattern byte to flash offset, or compare flash contents with the pattern (for testing purposes).

### 6.19.1 flash

Use `flash` to update or backup the flash image.

The syntax for the `flash` command (including all required and optional parameters) is as follows:

```
flash -a <update|backup|erase> -f <file> -i <adapter id> -t
<bios|firmware|config|bin> -p <pd> [-h].
```

Table 6-47 describes the required and optional parameters for the `flash` command.

**Table 6-47 Command Parameters: flash**

Syntax	Description
<b>Required Parameters</b>	
<code>-a &lt;update backup erase&gt;</code>	Use one of the following options to select the action: <ul style="list-style-type: none"> <li><code>update</code> (update flash image)</li> <li><code>backup</code> (backup flash image)</li> <li><code>erase</code> (erase flash configuration page)</li> </ul>
<code>-f &lt;file&gt;</code>	Use to specify full path name of file to be updated or backed-up.
<code>-i &lt;adapter id&gt;</code>	Use to specify controller/adapter ID.
<code>-t &lt;bios firmware config bin&gt;</code>	Use one of the following options to select image type. <ul style="list-style-type: none"> <li><code>bios</code> (BIOS image)</li> <li><code>firmware</code> (firmware image)</li> <li><code>config</code> (controller configuration page file)</li> <li><code>bin</code> (firmware binary file)</li> </ul>
<b>Optional Parameter</b>	
<code>[-h]</code>	Use to display help text for the <code>flash</code> command.
<b>Example</b>	
<code>flash -a update -f c:\bios.bin -i 0 -t bios</code>	Update BIOS image for controller 0 using image file <code>c:\bios.bin</code>

## 6.19.2 flashrw

Use `flashrw` to perform the following operations:

- Read flash contents (in bytes).
- Write the pattern byte to flash offset.
- Compare flash contents with the pattern (for testing purposes).

The syntax for the `flashrw` command (including all required and optional parameters) is as follows:

```
flashrw -a <read|write|compare> [-s <flash address offset>] [-c <byte count>] [-p <pattern>] [-h]
```

Table 6-48 describes the required and optional parameters for the `flashrw` command.

**Table 6-48 Command Parameters: flashrw**

Syntax	Description
<b>Required Parameter</b>	
<code>-a &lt;read write compare&gt;</code>	<p>Use one of the following options to select the action:</p> <ul style="list-style-type: none"> <li>• <code>read</code> Read flash data (in bytes) starting from the offset address.</li> <li>• <code>write</code> Write specified pattern to the bytes starting from the offset address.</li> <li>• <code>compare</code> Compare flash data with pattern starting from the offset address.</li> </ul> <p><b>Note:</b> The default flash offset of 0 bytes is used if it is not explicitly specified using the parameter <code>[-s &lt;flash address offset&gt;]</code>.</p>
<b>Optional Parameters</b>	
<code>[-s &lt;flash address offset&gt;]</code>	<p>Use to specify the flash address offset (in bytes).</p> <p><b>Note:</b> If this parameter is not included in the command line, CLI uses the default flash offset of 0 bytes.</p>
<code>[-c &lt;byte count&gt;]</code>	<p>Use to specify the byte count.</p> <p><b>Note:</b> If this parameter is not included in the command line, CLI uses the default byte count of 1 byte.</p> <p><b>Note:</b> The maximum byte count is equal to the size of the flash memory (in bytes).</p>
<code>[-p &lt;pattern&gt;]</code>	Use to specify the hex pattern for write and compare actions.
<code>[-h]</code>	Use to display help text for the <code>flashrw</code> command.
<b>Examples</b>	
<code>flashrw -a write -s 10 -c 2 -p 0x00</code>	Write 0x00 to flash offset 10 and offset 11.
<code>flashrw -a read</code>	Read and display all flash data.

## 6.20 Saving CLI Output

Table 6-49 lists the command used for saving CLI output to a file.

Table 6-49 Saving CLI Output

Command	IOC	IOP	ROC	Description
<code>-output</code>	✓	✓	✓	Output CLI text to a file.

### 6.20.1 -output

Use `-output` command parameter to save CLI output to a file.

The syntax for using `-output` command parameter is as follows:

```
command -output <filename>
```

For example, `info -o pd -output temp.txt` redirects the CLI output for the command `info -o pd` to the `temp.txt` file, without displaying any information in the CLI.

## 6.21 Exiting CLI

Table 6-32 lists the command used for exiting the CLI.

Table 6-50 Exiting CLI

Command	IOC	IOP	ROC	Description
<code>exit</code>	✓	✓	✓	Exit CLI.

### 6.21.1 `exit`

Type `exit` to exit the CLI.



# A MBU FOR 88SE91XX IO PROCESSOR (IOP)

This appendix contains the following sections:

- Overview
- Launching the BIOS
- Navigating the BIOS
- Creating Virtual Disk
- Erasing RAID Configuration Data
- Rebuilding Virtual Disk
- Deleting Virtual Disk

## A.1 Overview

This section discusses the following:

- Supported Controllers
- Supported RAID Functionality

### A.1.1 Supported Controllers

The Marvell BIOS utility (MBU) supports 88SE91xx controllers with on-board CPU.

**Note:** Controllers in the 88SE91xx family may contain an on-board CPU depending on OEM selections. The on-board CPU enables RAID functionality and requires firmware programming. Contact the OEM vendor for specific information on the capabilities of the 88SE91xx controller.

### A.1.2 Supported RAID Functionality

Table 1-1 lists the RAID functionality supported by the BIOS.

**Table 1-1 Supported RAID Functionality**

Feature	Description
RAID Levels	RAID 0 and RAID 1
Number of Virtual Disks (VDs) per controller	1 or 2 (depends on OEM selection)
Number of HDDs per VD	2
Stripe Sizes	32K and 64K
Rebuild	Manual rebuild for RAID 1

**Note:** Visit the Marvell Extranet or contact your FAE/sales representative to check for newer versions of BIOS with enhanced functionality.

## A.2 Launching the BIOS

**Note:** The BIOS is only applicable to 88SE91xx controllers with on-board CPU.

Table 1-2 lists the keyboard controls for launching the BIOS during the controller's Power-On Self Test (POST).

**Table 1-2 Launching the BIOS**



Key	Function
 + 	<p>Launch the Marvell BIOS Utility</p> <p>Press the key combination during the controller's POST.</p> <p><b>Note:</b> After pressing Ctrl+M, you may have to wait a few seconds before the BIOS appears.</p>

Figure 1-1 shows the messages displayed during the POST of an 88SE91xx controller with on-board CPU.

**Figure 1-1 BIOS Post Messages**

```

Marvell 88SE91xx Adapter - BIOS Version 1.0.0.1008
PCI-E X1 Bandwidth Usage: 5.0Gbps   Configure SATA as: AHCI Mode

Virtual Disk
    No Virtual Disk!
Physical Disk
[ID] [Disk Name]                [Size]      [Speed]
  0   SATA ST3750330MS          715GB      3.0G
  8   SATA ST3750330MS          715GB      3.0G
 16   ATAPI SONY DVD-ROM DDU1615 Not Available UDMA2

Press <Ctrl>+<M> to enter BIOS Setup or <Space> to continue_
  
```

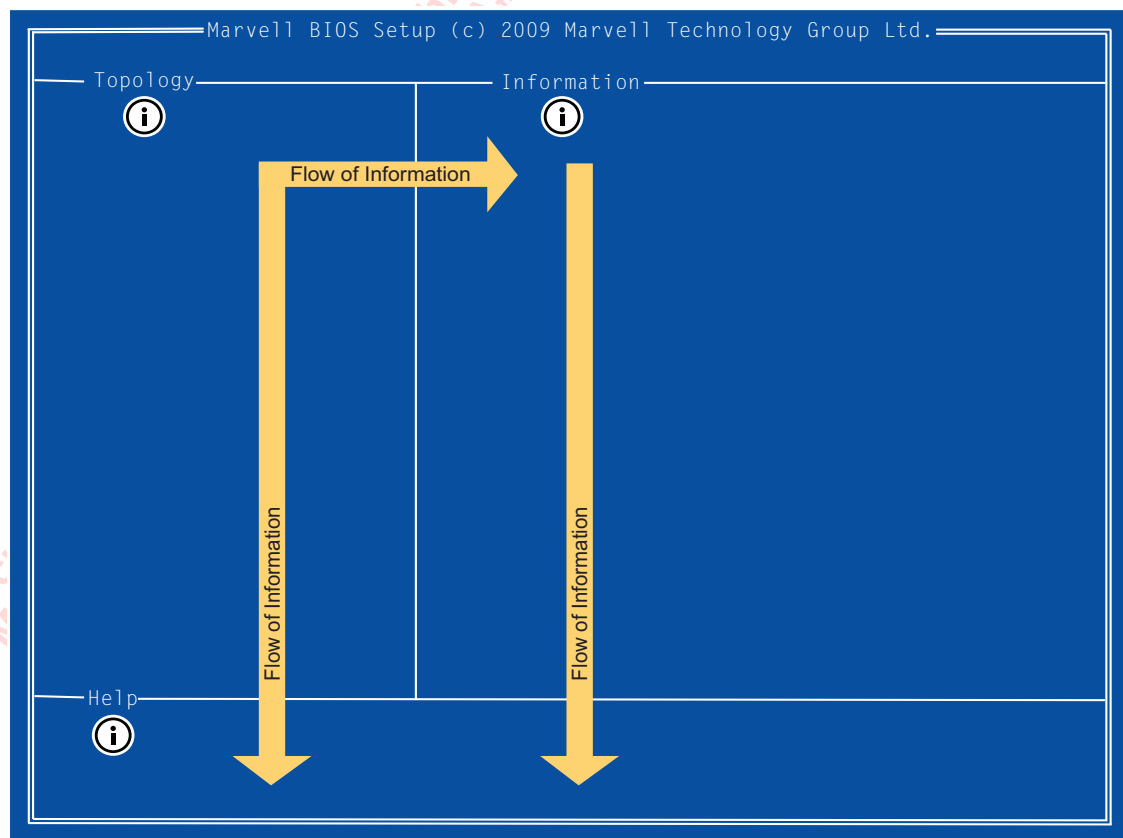
**Note:** The 88SE91xx controller has two SATA ports and one PATA port. Figure 1-1 shows a setup where a 88SE91xx controller's SATA ports are connected to two SATA drives and the PATA port to a ATAPI DVD-ROM drive.

## A.3 Navigating the BIOS

As shown in Figure 1-2, the BIOS user interface (UI) is divided into three main panes:

- **Topology**
- **Information**
- **Help**

Figure 1-2 BIOS User Interface



**Note:** The symbol 'i' is a visual element used in this document to emphasize specific areas of the BIOS UI as relevant to the topic under discussion. The symbol is *not* part of the Marvell BIOS UI.

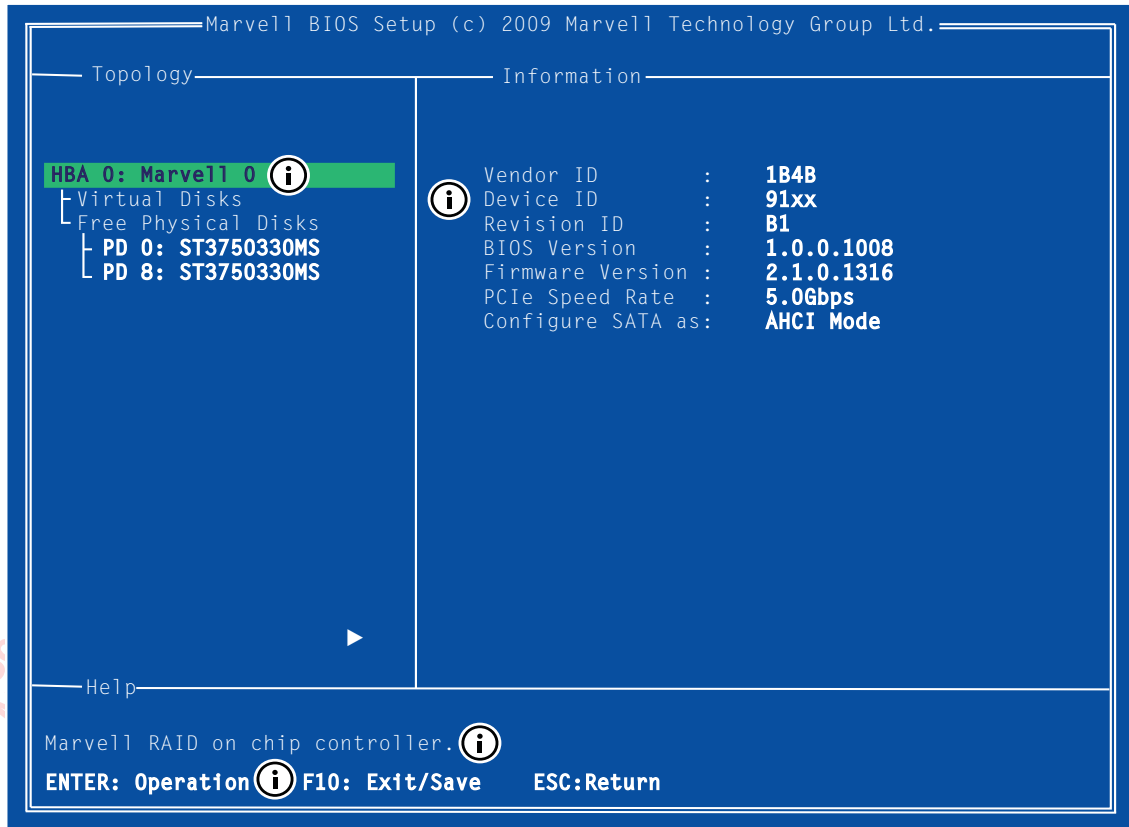
The arrow lines in Figure 1-2 show the flow of information in the user interface. Selections made in a pane determine the contents shown in other panes in the following ways:

- Content in the **Information** pane is populated based on selections in the **Topology** pane.
- Content in the **Help** pane is populated based on selections in both the **Topology** and **Information** panes.

### A.3.1 Topology

As shown in Figure 1-3, the **Topology** pane uses a tree view to list and show the relationships between the various physical/virtual devices attached to the system. The devices on this list include the HBA, physical disks, and virtual disks.

Figure 1-3 BIOS UI Example Selection



### A.3.2 Information

The **Information** pane is populated based on the selection in the **Topology** pane. Figure 1-3 shows information relevant to the selection **HBA 0: Marvell 0**.

### A.3.3 Help









The **Help** pane is populated based on selections in both the **Topology** and **Information** panes. The **Help** pane in Figure 1-3 shows a brief description and lists keyboard controls for performing actions relevant to the selection (which in Figure 1-3 is **HBA 0: Marvell 0**).

**Note:** The **Help** pane is used by the BIOS to display important information relevant to the selection. The pane may contain short descriptions on selections, messages on selecting list items, default values for settings, among others.

### A.3.4 Keyboard Controls

Table 1-3 lists the controls for navigating and using the BIOS UI.

**Table 1-3 Navigation Keys**

Key	Function
	Scrolls menu/list items.
	
	Selects an item and shows a pop-up menu with options.
	Toggles between Enable/Disable states and Select/Unselect states (as applicable).
	Go backwards.
 	Confirm (Y) or Deny (N) settings.
	Save and Exit the BIOS.

## A.4 Creating Virtual Disk

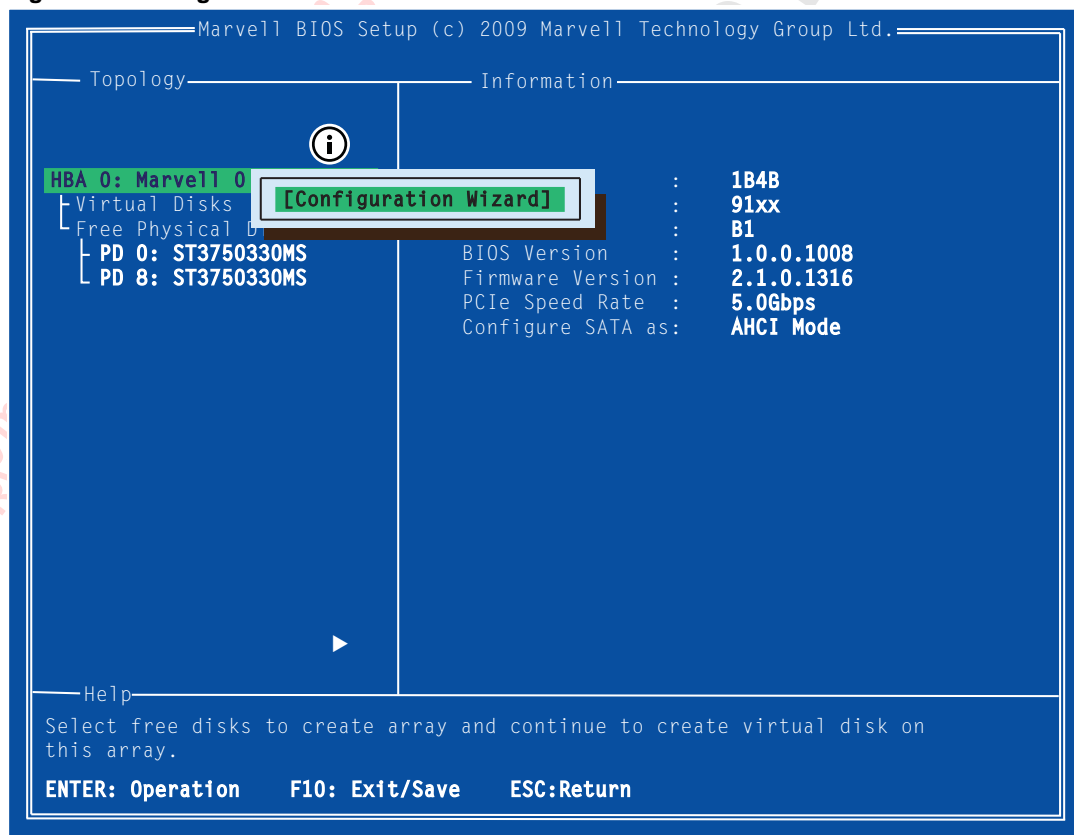
This section describes the procedure for creating a virtual disk using the BIOS Configuration Wizard.

To create a virtual disk

1. In the **Topology** pane, scroll to **HBA 0: Marvell 0** and press **Enter** to select. A menu pops-up, as shown in Figure 1-4.

Select **Configuration Wizard** and press **Enter** to begin creating the virtual disk.

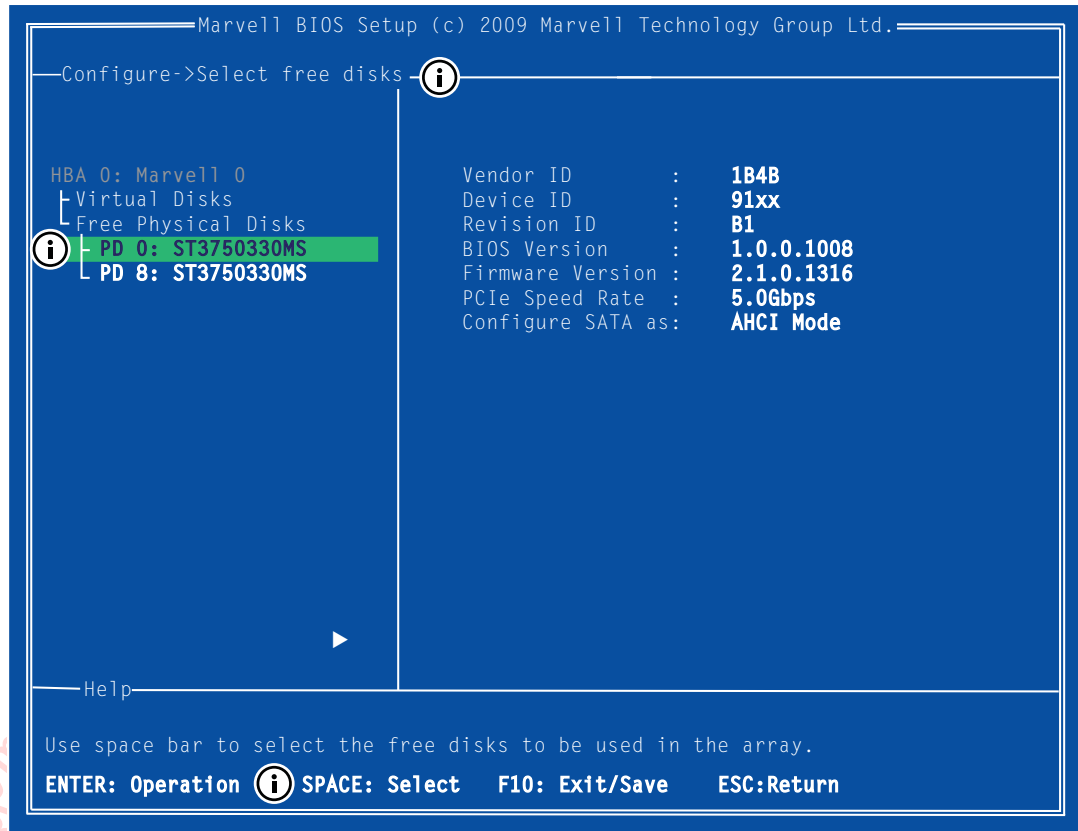
Figure 1-4 Configuration Wizard



2. Press **Space** to select/unselect a disk, as shown in Figure 1-5. Use the arrow keys to scroll the list of free disks.



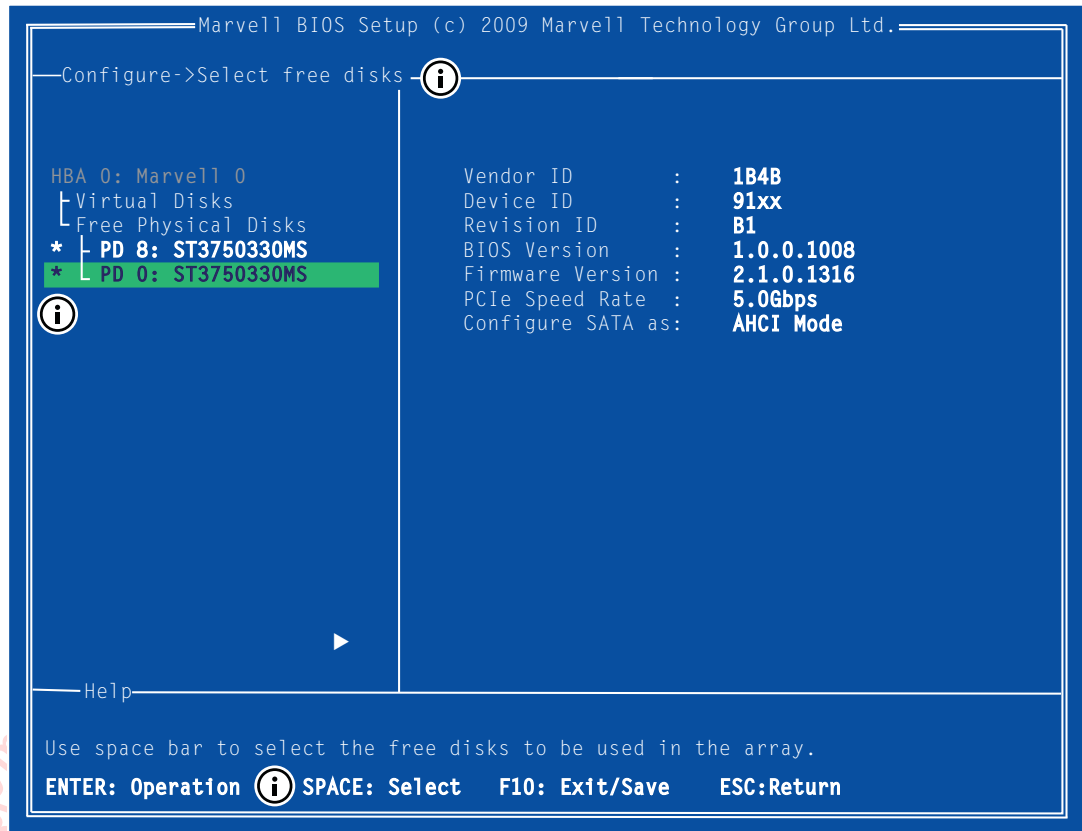
Figure 1-5 Select Free Disks



**Note:** The 88SE91xx controller supports the creation of RAID 0 and RAID 1 virtual disks comprising of exactly two SATA physical disks. PATA physical disks cannot be used to create RAID virtual disks.

- After selecting the required disks, press **Enter** to continue, as shown in Figure 1-6.

Figure 1-6 Confirm Disk Selection

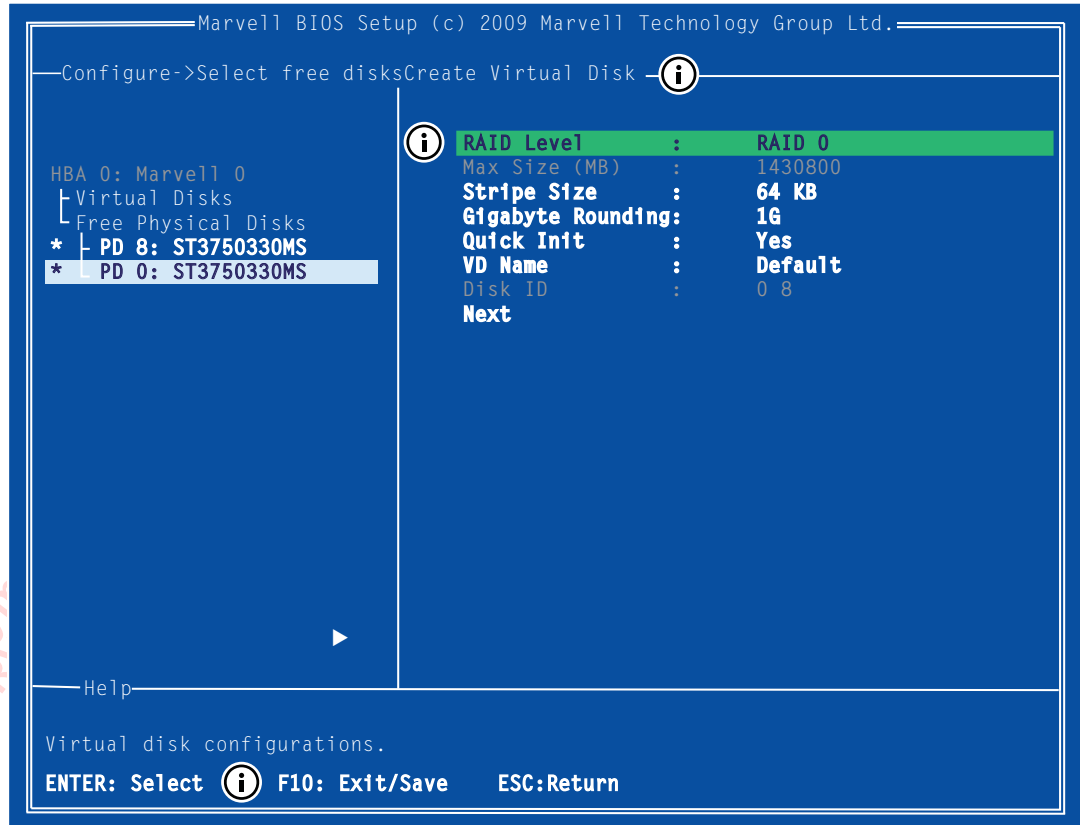


**Note:** When a disk is selected, an asterisk (\*) appears to the left of the disk label, as shown in Figure 1-6.

4. **Create Virtual Disk** by configuring its settings in the **Information** pane, as shown in Figure 1-7.

The controls for making selections are listed in the **Help** pane when an available setting is highlighted.

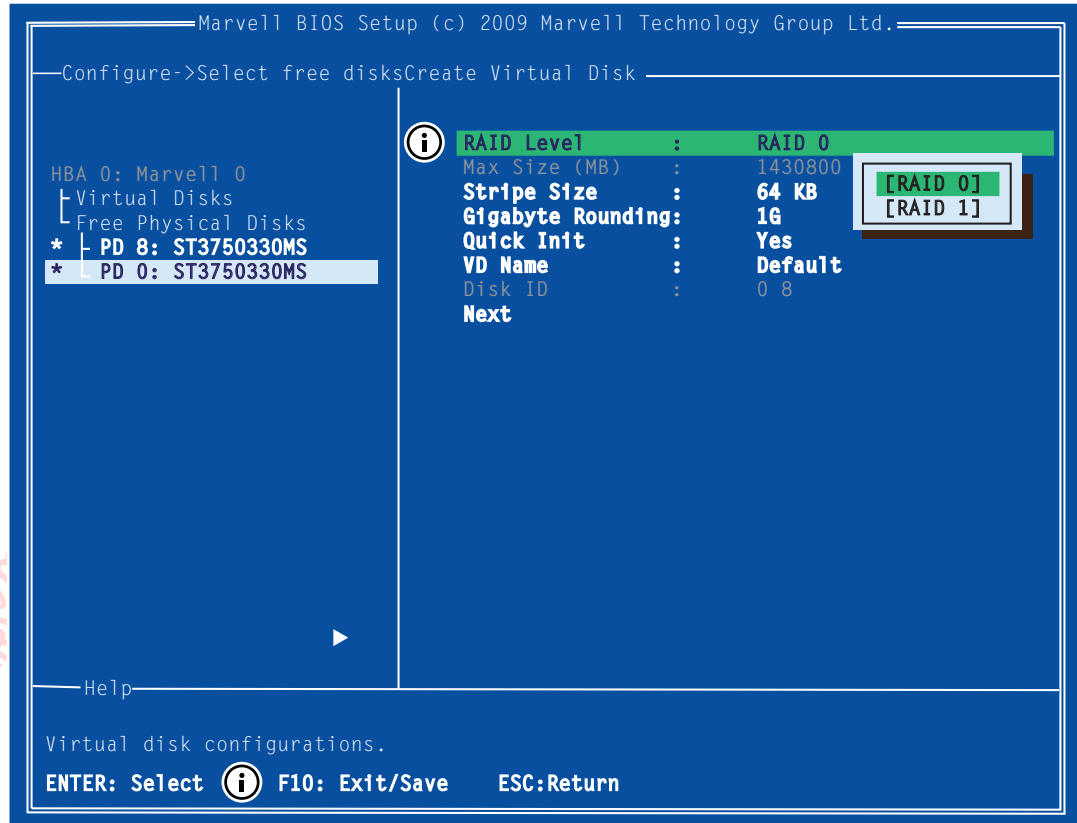
**Figure 1-7 Configure Virtual Disk**



**Note:** Max Size (MB) and Disk ID are properties of the virtual disk that cannot be edited. Max Size (MB) is the size of the RAID virtual disk as determined by the selected RAID Level. Disk ID lists the IDs of the physical disks comprising the virtual disk.

5. **RAID Level**, as shown in Figure 1-7, is highlighted when the **Create Virtual Disk** screen is presented. Press **Enter** to select a **RAID Level**. A menu pops-up, as shown in Figure 1-8, and lists available RAID levels.
6. Scroll the list, as shown in Figure 1-8, and press **Enter** to select a **RAID Level** (RAID 0, RAID 1).

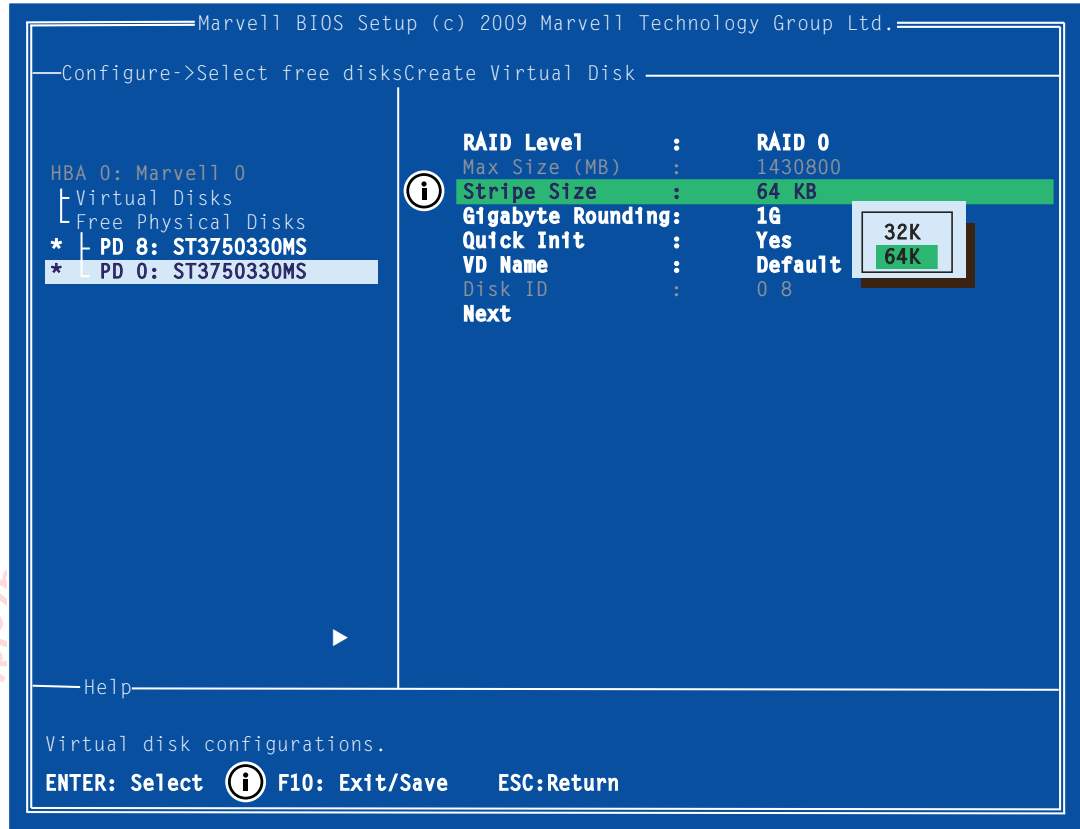
Figure 1-8 RAID Level



**Note:** The default RAID Level is RAID 0. For information on RAID levels, see Appendix B, [Selecting a RAID Level](#).

7. Scroll to **Stripe Size** and press **Enter** to select.  
A menu pops-up, as shown in Figure 1-9, and lists available stripe sizes for the selected RAID level.
8. Scroll the list, as shown in Figure 1-9, and press **Enter** to select **Stripe Size** (32K, 64K).

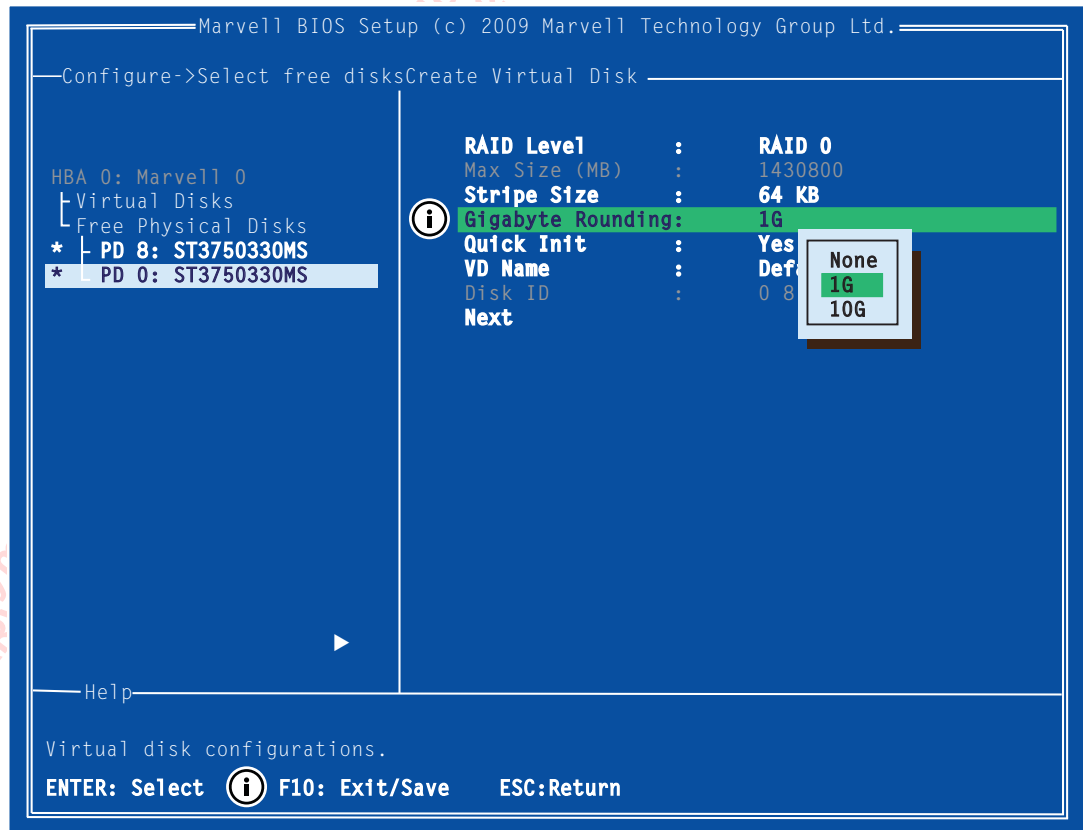
Figure 1-9 Stripe Size



**Note:** The default Stripe Size is 64 KB. For information on Stripe Size, see Appendix D, [Glossary](#).

9. Scroll to **Gigabyte Rounding** and press **Enter** to select.  
A menu pops-up, as shown in Figure 1-10, and lists available stripe sizes for the selected RAID level.
10. Scroll the list, as shown in Figure 1-10, and press **Enter** to select **Gigabyte Rounding** (None, 1G, 10G).

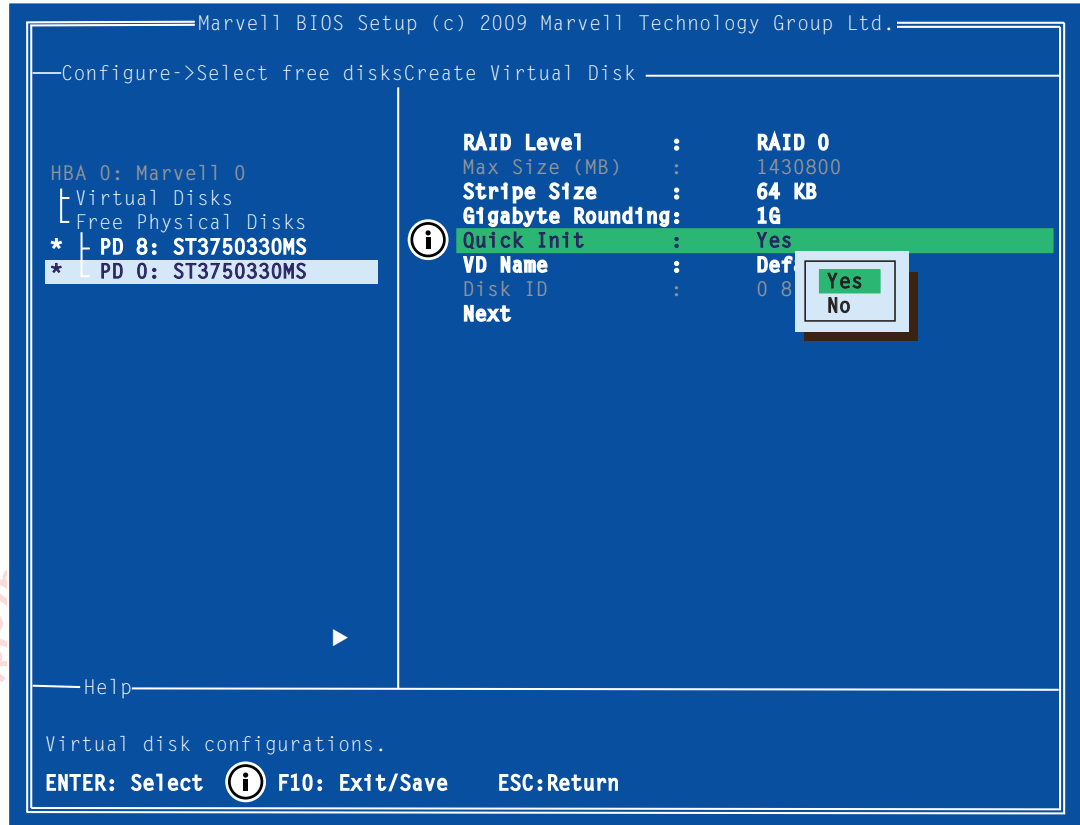
**Figure 1-10 Gigabyte Rounding**



**Note:** The default setting for Gigabyte Rounding is 1G. For information on Gigabyte Rounding, see Appendix D, [Glossary](#).

11. Scroll to **Quick Init** and press **Enter** to enable or disable quick initialization of the virtual disk.  
A menu pops-up, as shown in Figure 1-11, and lists available options for quick initialization of the virtual disk.
12. Scroll the list, as shown in Figure 1-11, and press **Enter** to select **Quick Init** (Yes, No).

Figure 1-11 Quick Init

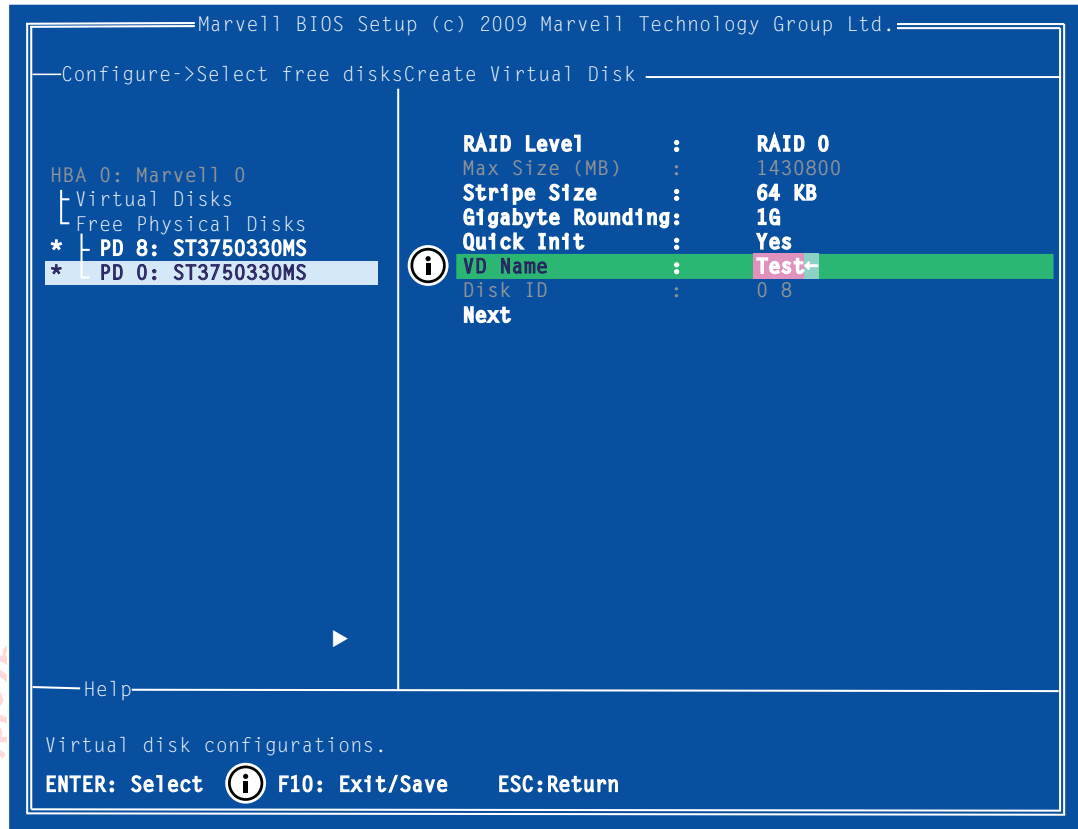


**Note:** The default setting for Quick Init is Yes.



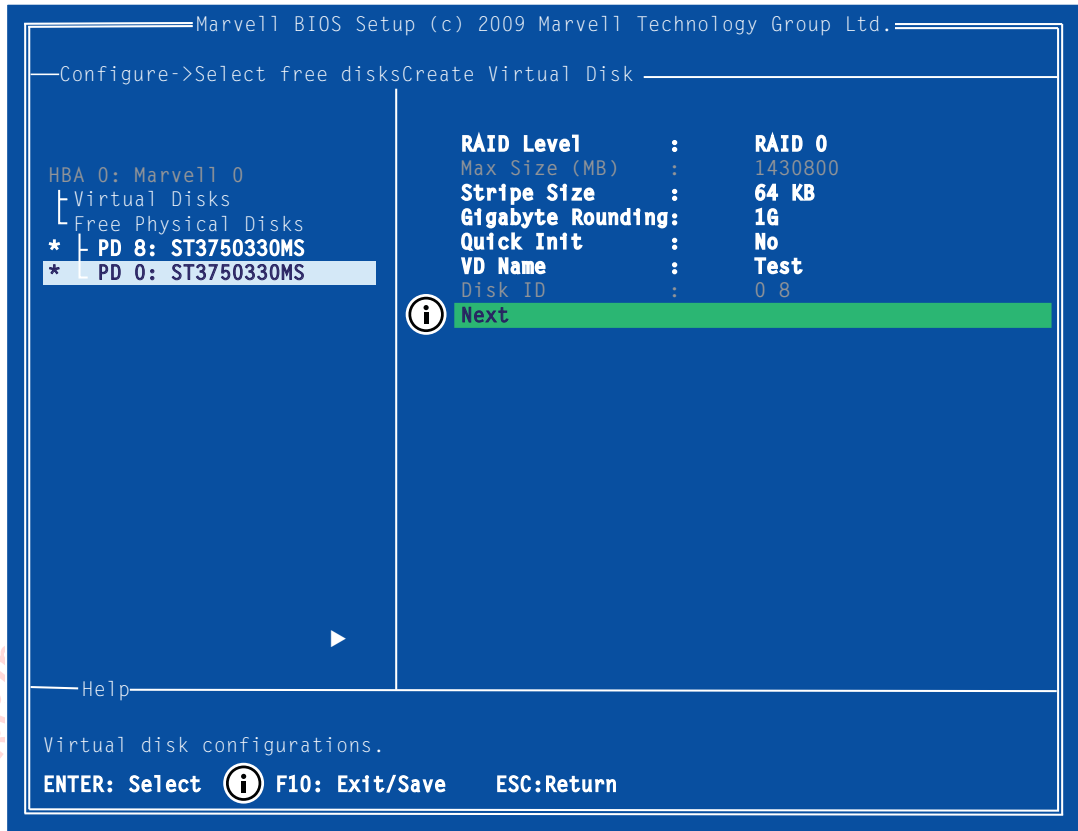
13. Scroll to **VD Name** and the **Default** name is cleared for a new name, as shown in Figure 1-12.  
**Type** a new name and press **Enter** to confirm the selection.

Figure 1-12 VD Name



14. After configuring the virtual disk, scroll to **Next**, as shown in Figure 1-13.  
Press **Enter** to create the virtual disk.

Figure 1-13 Create Virtual Disk



15. Press **Y** to select **Yes**, as shown in Figure 1-14, to confirm the creation of the virtual disk.  
The virtual disk is now listed in the **Topology** pane, as shown in Figure 1-15.

**Figure 1-14 Create Virtual Disk Confirmation**

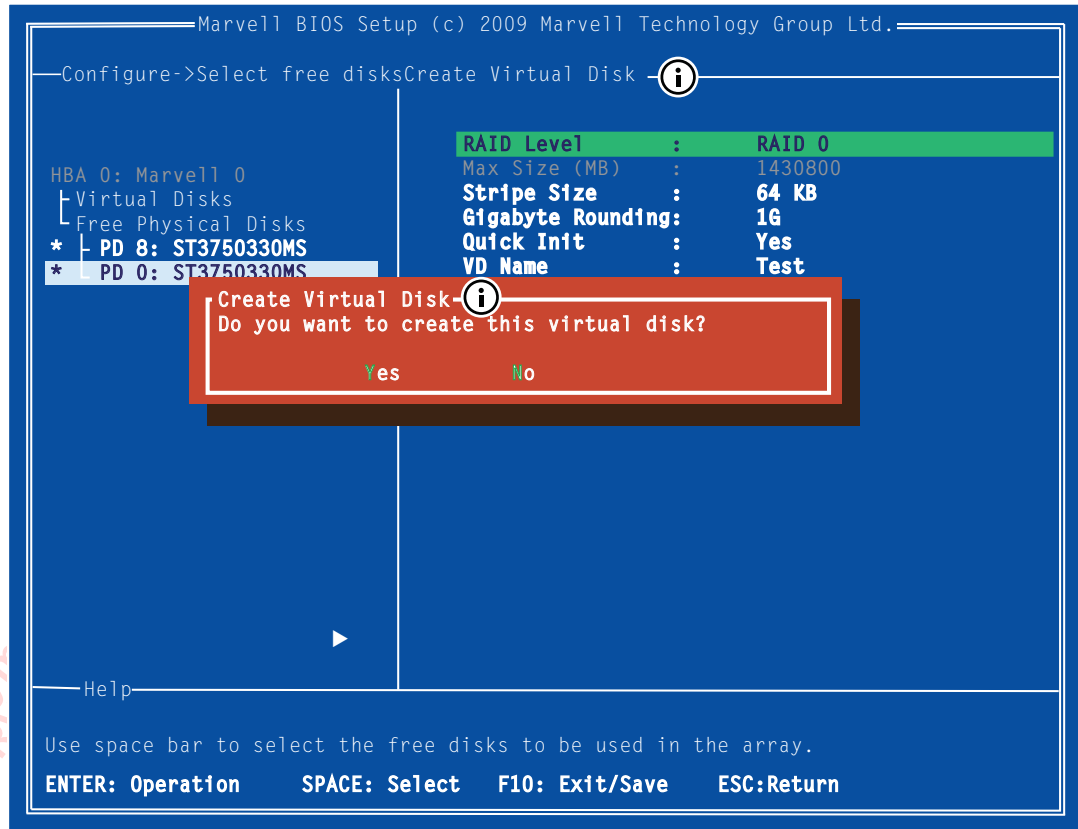
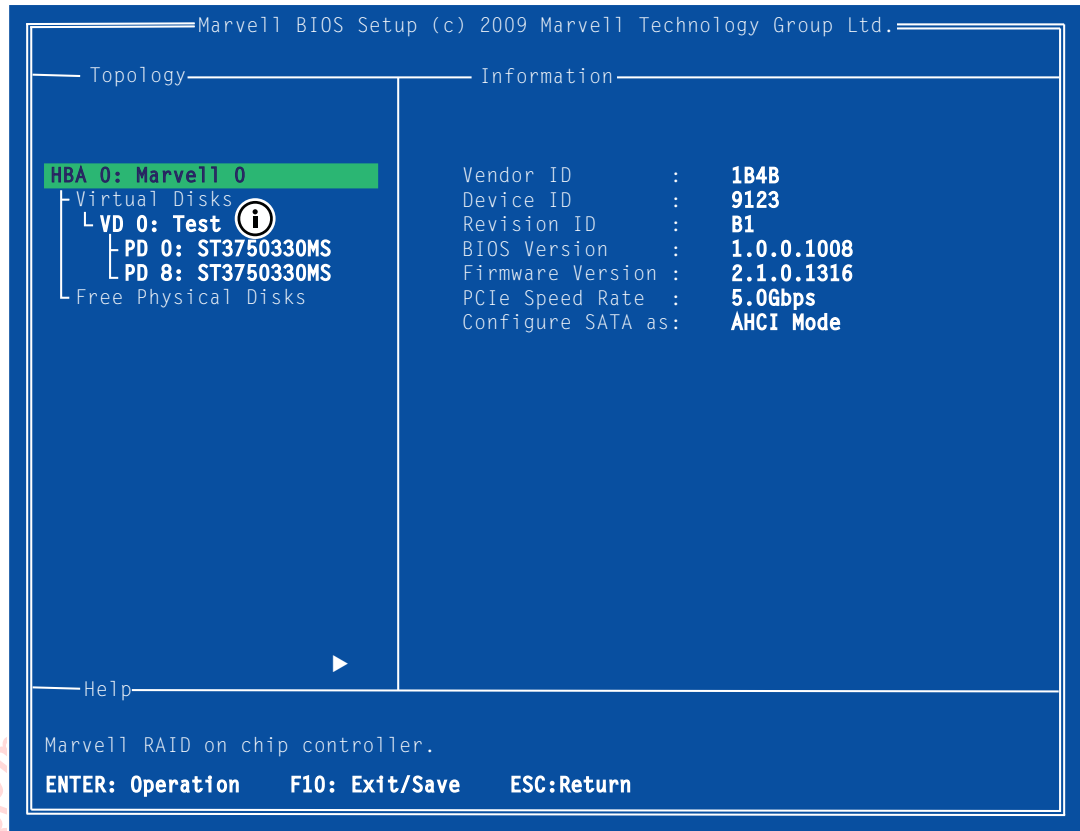


Figure 1-15 Virtual Disk in Topology Pane



## A.5 Erasing RAID Configuration Data

This topic describes the procedure to erase RAID configuration data (if any) on a foreign physical disk.

**Note:** The RAID controller stores RAID configuration data on all physical disks that are part of a virtual disk. RAID configuration data must be erased on the physical disk before it can be used with another virtual disk.

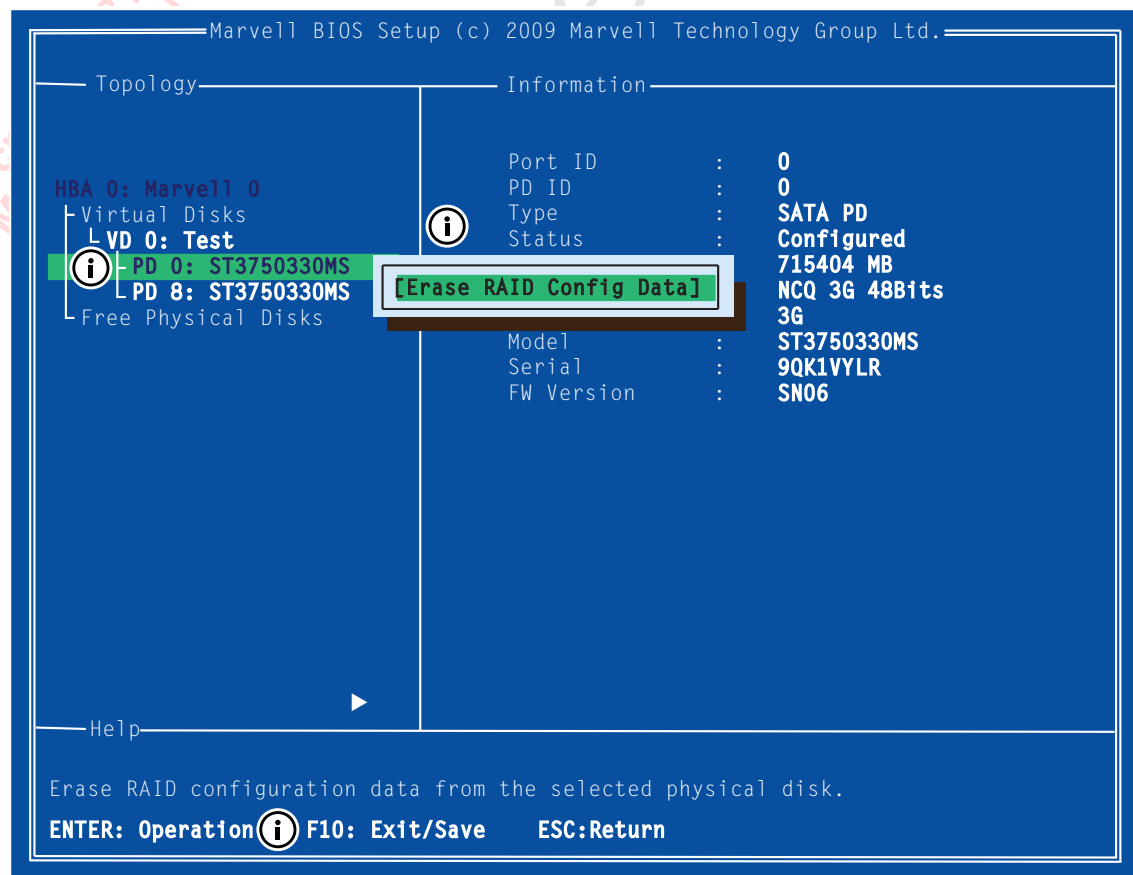
**To erase RAID configuration data**

**WARNING** If the physical disk was originally part of another virtual disk, using **Erase RAID Configuration Data** may damage that virtual disk.



1. In the **Topology** pane, select **Physical Disk (VD 0: Default > PD 0: ST3750330MS** in Figure 1-16) and press **Enter**. A menu pops-up, as shown Figure 1-16.
2. Select **Erase RAID Config Data** to erase the RAID configuration data, as shown in Figure 1-16.
3. Select **Yes** when prompted to confirm the operation.

**Figure 1-16 Erase RAID Configuration Data**



## A.6 Rebuilding Virtual Disk

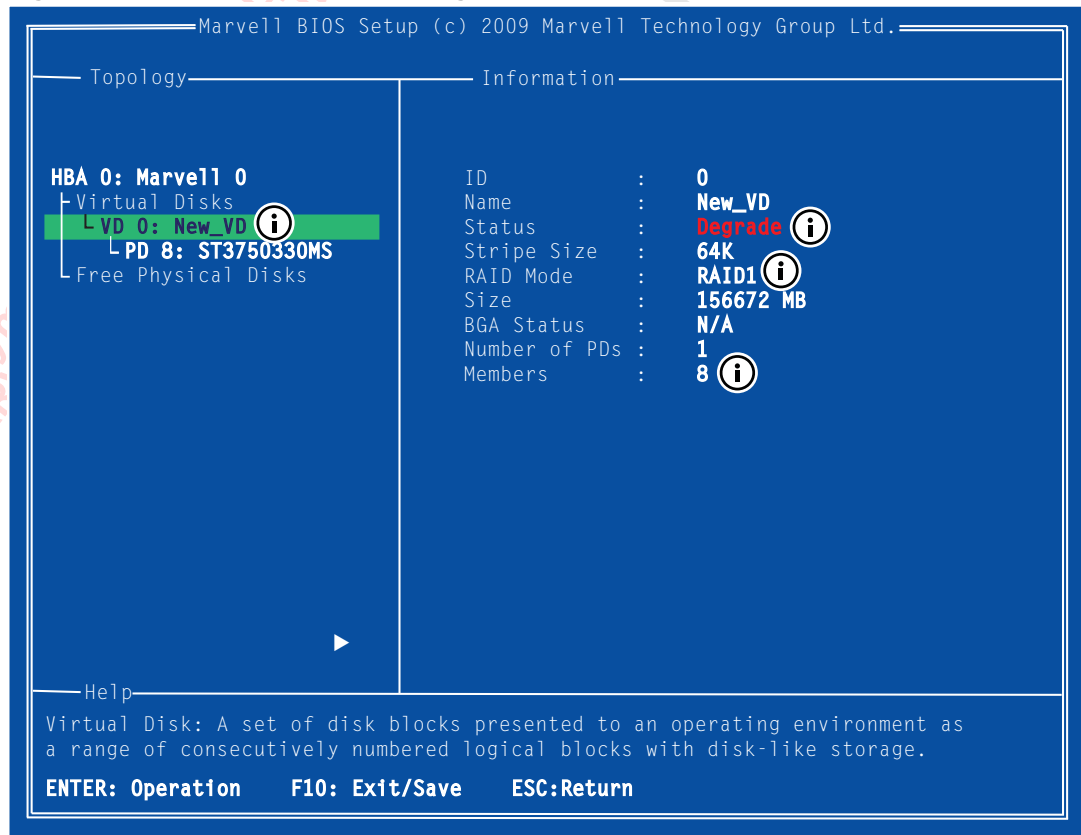
This topic describes the procedure to manually rebuild a degraded virtual disk. This is applicable to the RAID 1 virtual disk created with the 88SE91xx controller.

**Note:** The 88SE91xx BIOS supports manual rebuilding of RAID 1 virtual disks. The rebuild process is both initiated and completed in the BIOS. The Marvell RAID Utility (MRU), which runs in an OS environment, cannot be used to either initiate, resume, or complete the rebuild process. Spare physical disks are not supported.

### To manually rebuild a RAID 1 virtual disk

1. When a virtual disk is degraded, the **Status** of a virtual disk is changed from **Functional** to **Degrade**, as shown in Figure 1-17.

Figure 1-17 Virtual Disk Properties: Degrade VD

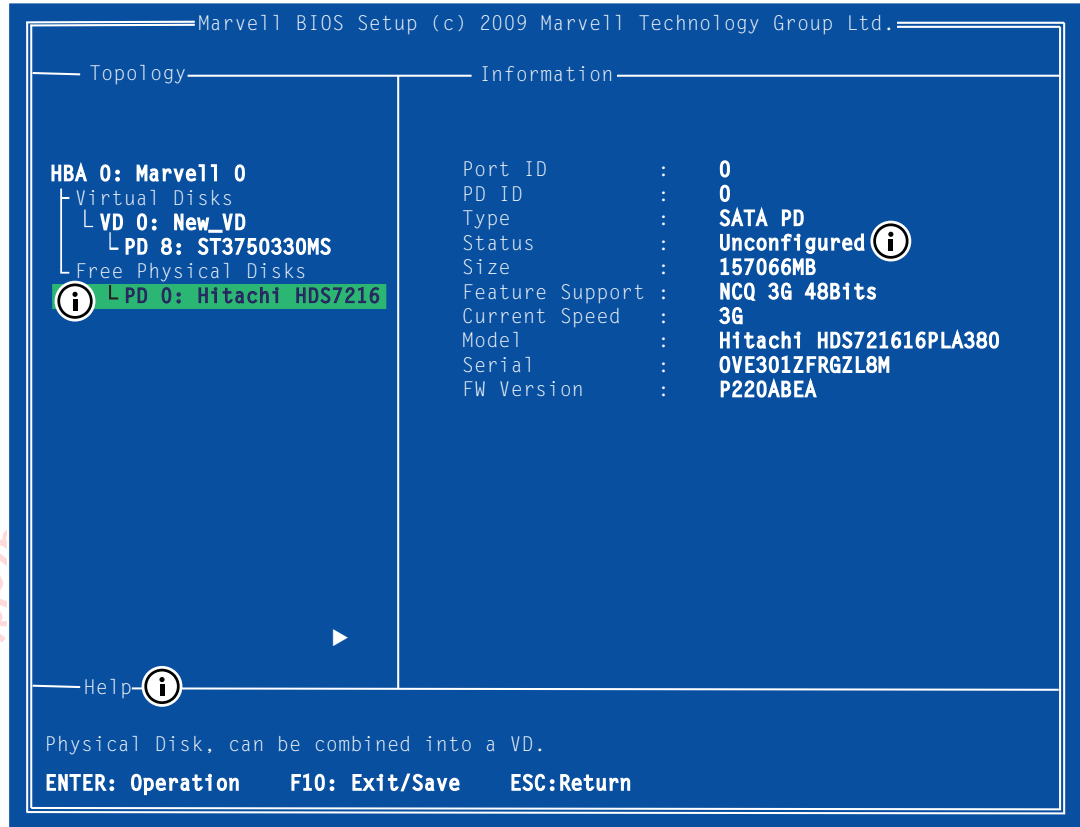


2. Replace the faulty physical disk with an identical physical disk.

**Note:** If an identical disk is unavailable, use a replacement physical disk of larger size or one with a slightly smaller size as determined the Gigabyte Rounding setting for the virtual disk.

The 88SE91xx detects the new physical disk and lists the device under Free Physical Disks in the Topology pane, as shown in Figure 1-18.

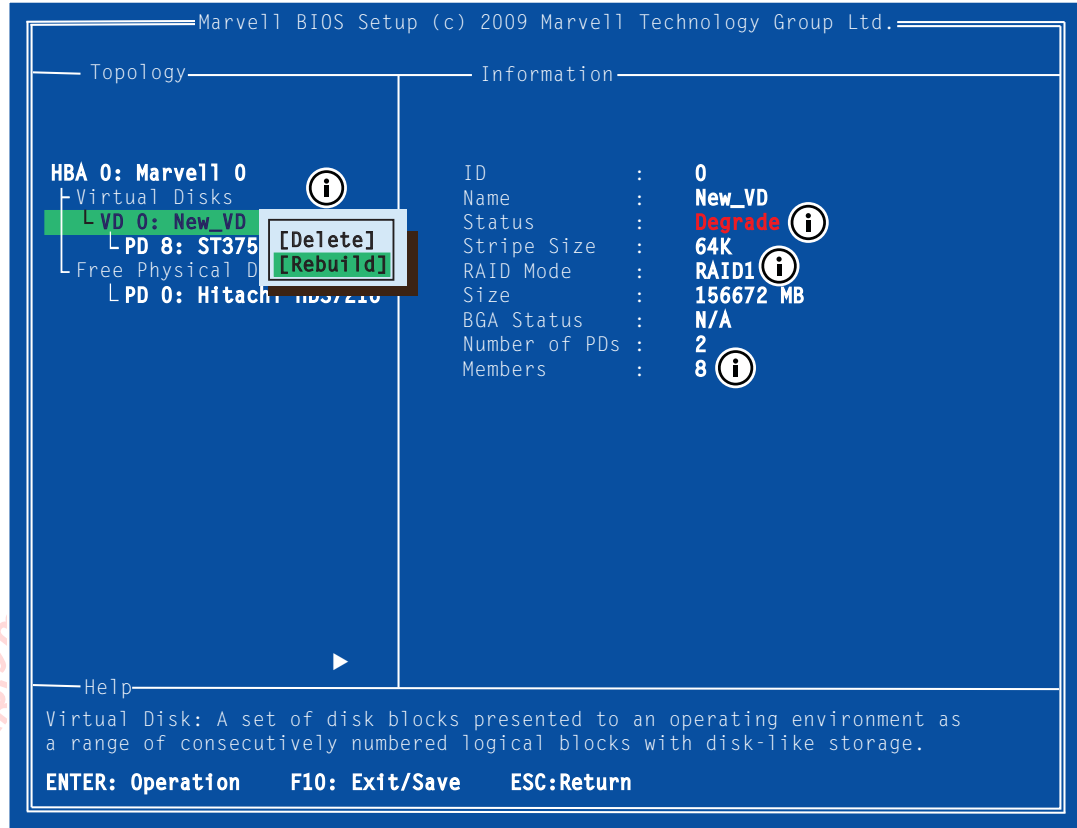
**Figure 1-18 Replacement Physical Disk**





3. In the **Topology** pane, scroll to **Virtual Disks (VD 0: New\_VD** in Figure 1-19), and press **Enter** to select. A menu pops-up, as shown in Figure 1-19.  
Scroll to **Rebuild** and press **Enter** to configure the rebuild process.

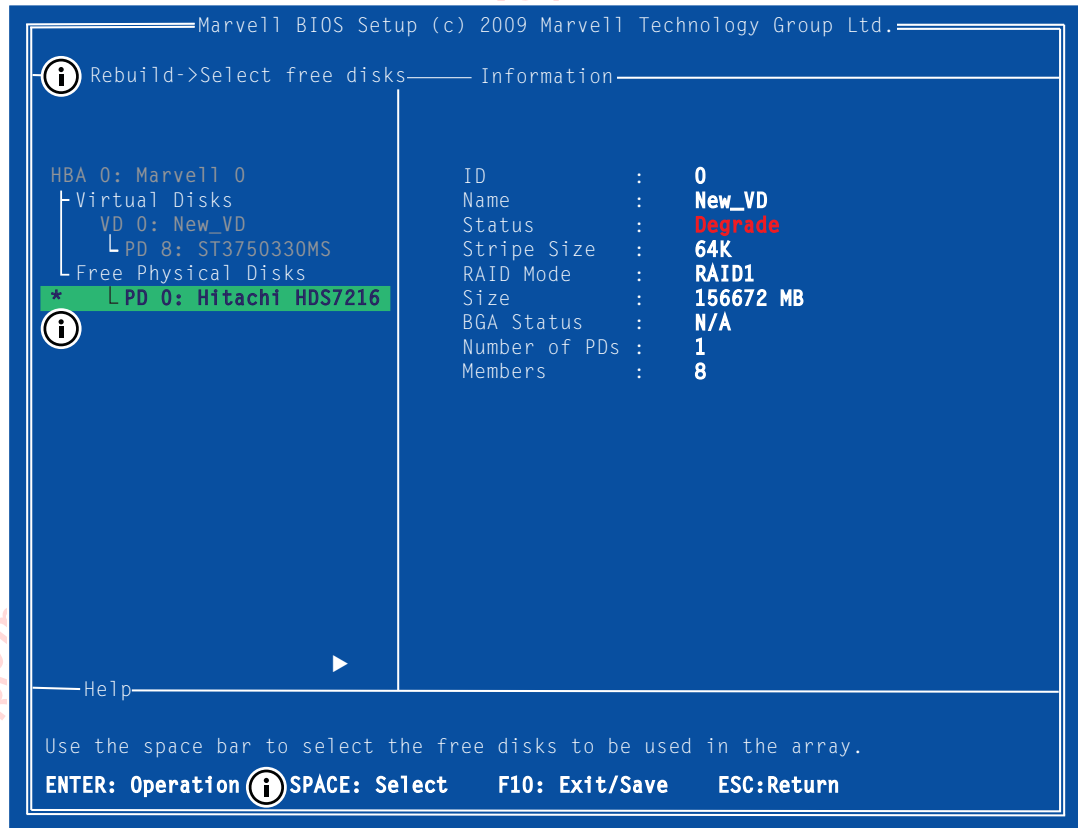
Figure 1-19 Rebuild Virtual Disk



4. Scroll through the list of free disks, as shown in Figure 1-20, and press **Space** to select or unselect a replacement physical disk.

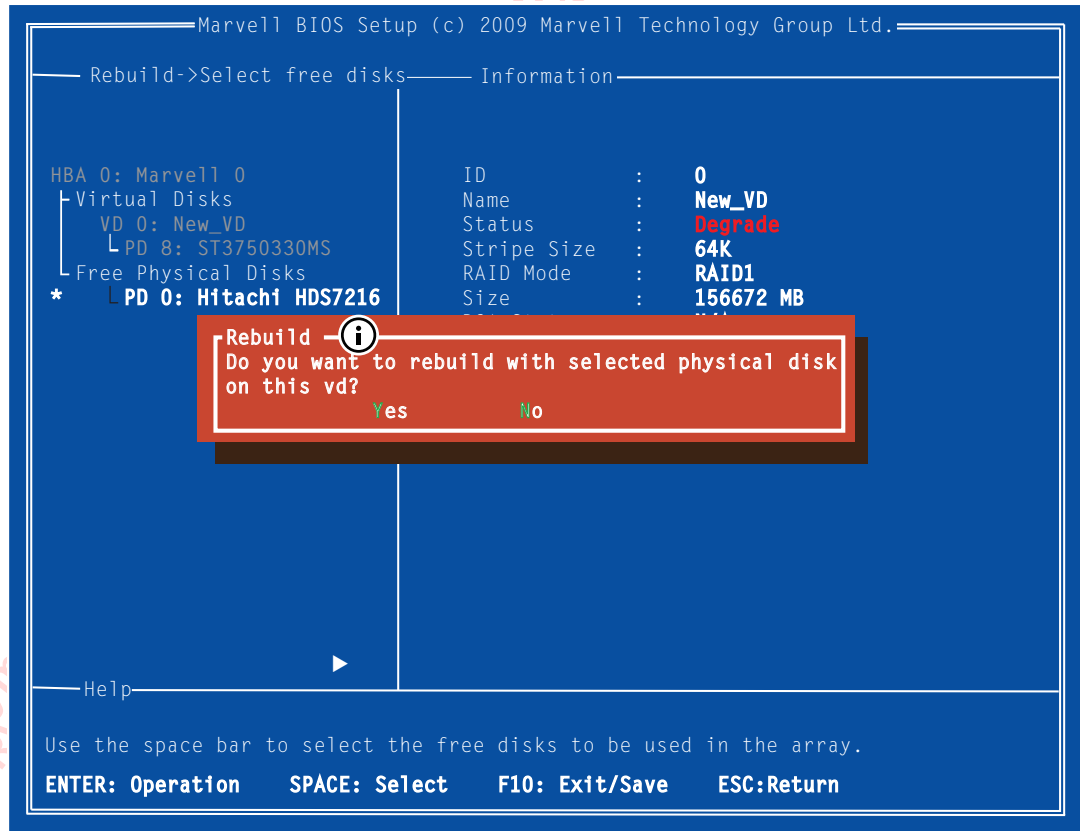
Press **Enter** to continue.

**Figure 1-20 Select Replacement Disk**



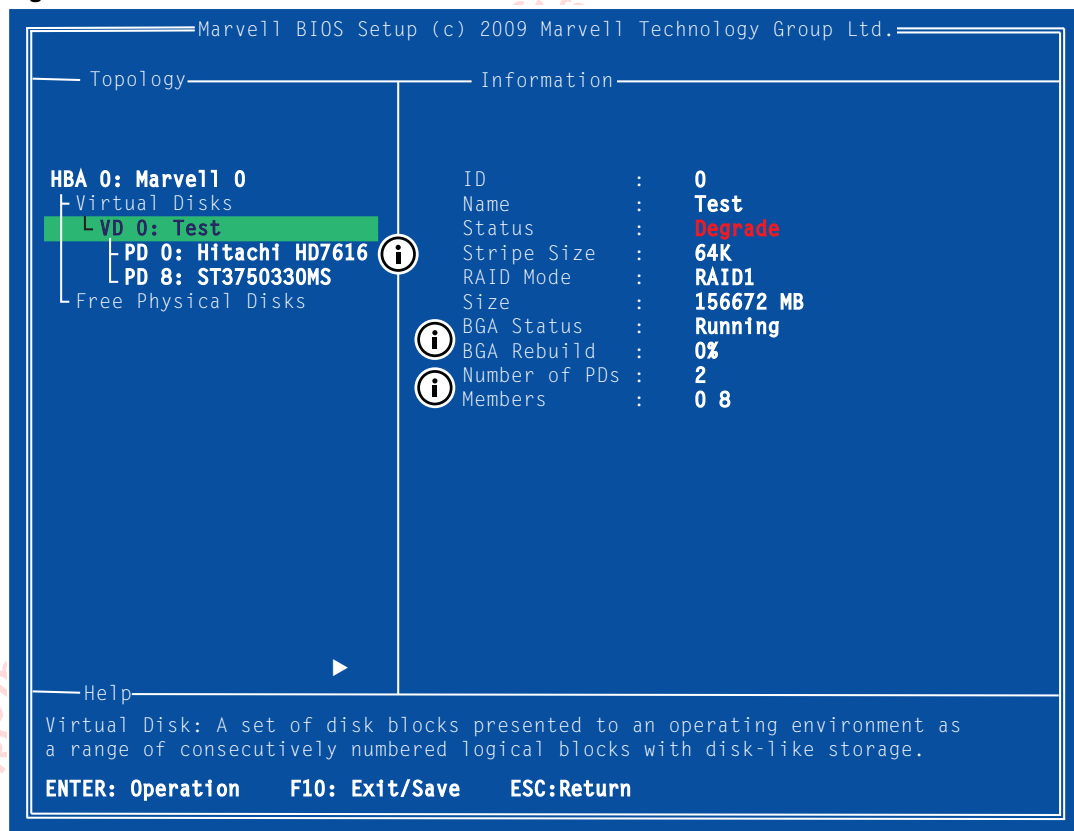
- Press **Y** to select **Yes**, as shown in Figure 1-21, when prompted to confirm the rebuild process.

Figure 1-21 Confirm Rebuild Virtual Disk



- The status of the Rebuild process is reflected in the properties of the virtual disk, as shown in Figure 1-22.

Figure 1-22 Rebuild Status



#### To pause the rebuild process

- In the **Topology** pane, scroll to the partially rebuilt **Virtual Disk**.
- Press **Enter** to view available operations on **Virtual Disk**.
- Scroll to **Pause** and press **Enter** to pause the rebuild process.

**Note:** Incomplete rebuild procedures are paused upon exiting the BIOS. The rebuild procedure(s) can be resumed manually upon re-entering the BIOS.

#### To resume the rebuild process

- In the **Topology** pane, scroll to the partially rebuilt **Virtual Disk**.
- Press **Enter** to view available operations on **Virtual Disk**.
- Scroll to **Resume** and press **Enter** to resume the rebuild process.

**Note:** The rebuild process is both initiated and completed in the BIOS. The Marvell RAID Utility (MRU), which runs in an OS environment, cannot be used to either initiate, pause, resume, or complete the rebuild process.

## A.7 Deleting Virtual Disk

This topic describes the procedure to delete a virtual disk.

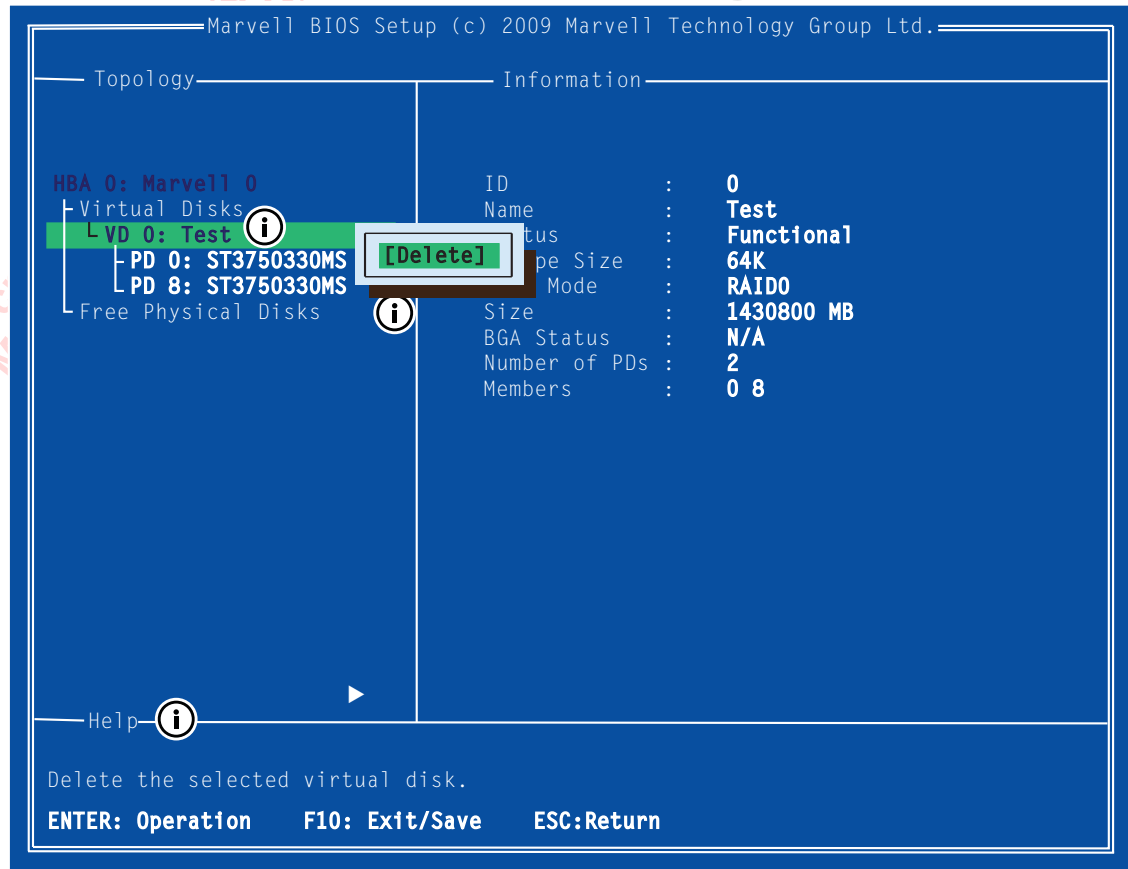
### To delete a virtual disk

**WARNING** Using **Delete** permanently erases all data on the virtual disk.



1. In the **Topology** pane, select **Virtual Disk (VD 0: Default** in Figure 1-23) and press **Enter**. A menu pops-up, as shown Figure 1-23.
2. Select **Delete** to delete the virtual disk, as shown in Figure 1-23.
3. Press **Y** to select **Yes** when prompted **Do you want to delete this virtual disk?**
4. Press **Y** to select **Yes** when prompted **Do you want to delete MBR from this virtual disk?**

Figure 1-23 Delete Virtual Disk



# B

## SELECTING A RAID LEVEL

This chapter contains the following sections:

- RAID Overview
- Comparing RAID Levels
- RAID 0 (Striping)
- RAID 1 (Disk Mirroring)
- RAID 1E (Data Mirroring and Striping)
- RAID 5 (Striping with Single Parity)
- RAID 6 (Striping with Dual Parity)
- RAID 10 (Disk Mirroring and Striping)
- RAID 50 (Striping RAID 5 Arrays)
- RAID 60 (Striping RAID 6 Arrays)

## B.1 RAID Overview

RAID is an acronym for Redundant Array of Independent Disks. The RAID storage systems are created by combining multiple (two or more) physical disks and storing data using techniques specified by different RAID levels. Each RAID level offers a unique set of characteristics suitable for certain applications. See Section B.2, [Comparing RAID Levels](#) for a comparison of RAID levels across a number of parameters.



## B.2 Comparing RAID Levels

Table 2-1 compares RAID levels across a number of parameters. These ratings are intended to help you identify RAID levels with characteristics suitable for your application.

**Note:** A specific quantitative comparison is not possible because RAID performance is dependent on a number of variables that are unique to the equipment setup, such as the number of physical disks, performance characteristics of those disks, spindle synchronization, performance characteristics of the RAID controller, among others.

**Table 2-1 Comparing RAID Levels**

RAID Level	0	1	1E	5	6	10	50	60
Read Performance	★★★★	★★★☆☆	★★★☆☆	★★★☆☆	★★★☆☆	★★★☆☆	★★★☆☆	★★★☆☆
Write Performance	★★★★	★★★☆☆	★★★☆☆	★★★☆☆	★★★☆☆	★★★☆☆	★★★☆☆	★★★☆☆
Fault Tolerance	✗	★★★★	★★★☆☆	★★★☆☆	★★★★	★★★☆☆	★★★★	★★★★
Efficient use of disk capacity	★★★★	★★★☆☆	★★★☆☆	★★★★	★★★☆☆	★★★☆☆	★★★★	★★★☆☆
Automatic rebuild	✗	✓	✓	✓	✓	✓	✓	✓
Minimum number of drives	2	Exactly 2	3 (only odd number of drives)	3	4	4	6	8

### Legend

- ★★★★ Best
- ★★★☆☆ Best-
- ★★★☆☆ Good
- ★★★☆☆ Good-
- ★★★☆☆ Poor

## B.3 RAID 0 (Striping)

RAID 0 stripes data evenly across multiple (two or more) physical disks. It does not store parity or mirror data for fault tolerance.

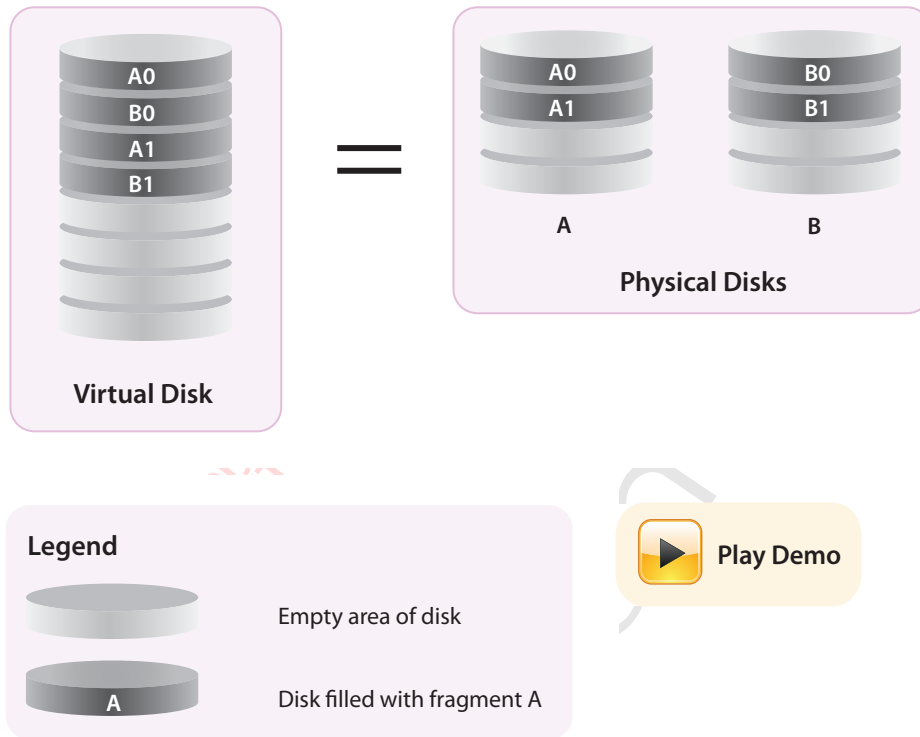
Table 2-2 describes RAID 0 across a number of parameters.

Table 2-2 RAID 0

Parameter	Rating	Description
Read Performance	☆☆☆	RAID 0 offers the best read/write performance because data striped across multiple physical disks can be both read and written simultaneously. With the minimum two physical disks, RAID 0 can perform two operations (read or write) simultaneously. The number of simultaneous operations increases with the number of disks in the RAID 0 set.
Write Performance	☆☆☆	
Fault Tolerance	✗	RAID 0 does not contain parity or mirror data for fault tolerance. Data is not recoverable if any one of the physical disks fails.
Efficient use of disk capacity	☆☆☆	RAID 0 does not offer fault tolerance. The storage space on the virtual disk/array is used fully and efficiently to store data. <b>Note:</b> When creating a RAID 0 with physical disks of different sizes, the storage space added to the virtual disk/array by each physical disk is limited to the size of the smallest physical disk. For example, a RAID 0 virtual disk/array comprising of 150 GB and 100 GB physical disks creates a 200 GB virtual disk/array (twice the size of the smallest physical disk 100 GB).
Automatic rebuild	✗	Not Applicable. RAID 0 does not offer fault tolerance.
Minimum number of drives		2
Suitable Applications		RAID 0 is ideally suited for applications requiring best read/write performance and where fault tolerance is not required.

Figure 2-1 describes RAID 0.

**Figure 2-1 RAID 0**



**Note:** Click **Play Demo** to launch an Adobe Flash® demonstration RAID 0. To view the demonstration, Adobe Reader® 9 (or higher) is required. If Play Demo is disabled, or if an error message, or blank window appears upon clicking Play Demo, then upgrade to the latest version of Adobe Reader® at <http://get.adobe.com/reader/>.

## B.4 RAID 1 (Disk Mirroring)

RAID 1 uses exactly two physical disks and creates a copy (or mirror) of the primary physical disk on the secondary physical disk, as shown in Figure 2-2.

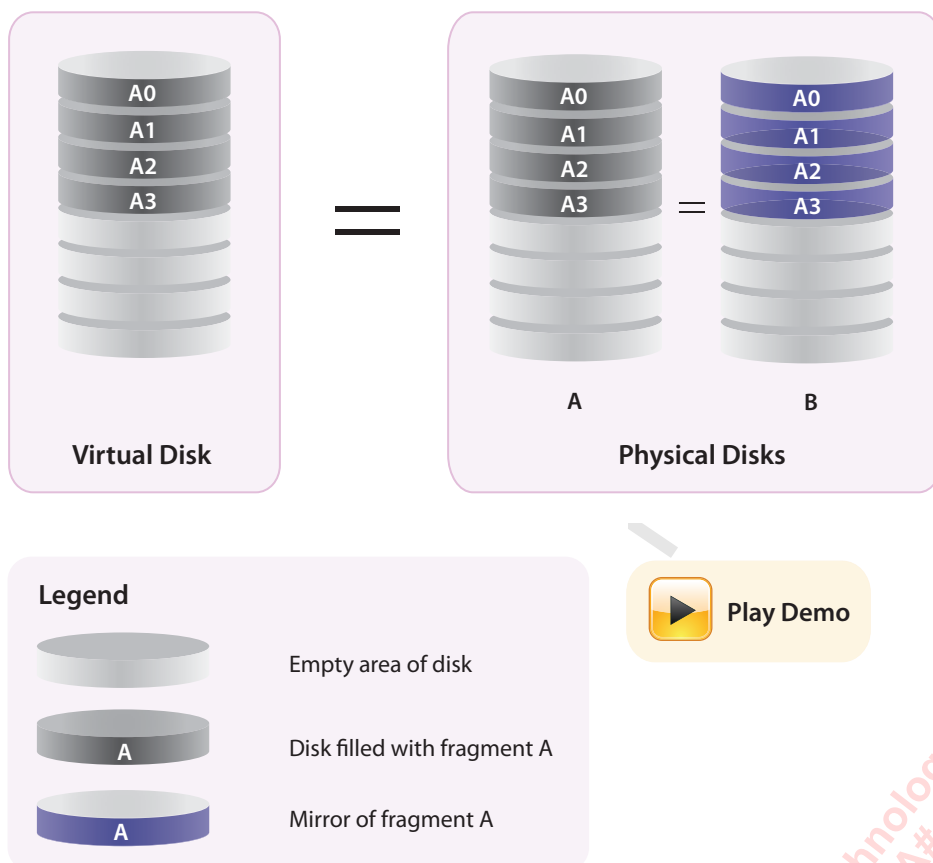
Table 2-3 describes RAID 1 across a number of parameters.

Table 2-3 RAID 1

Parameter	Rating	Description
Read Performance	☆☆☆	RAID 1 can perform two read operations simultaneously. Since data is identical on both physical disks, a read command can be sent to the secondary disk when the primary disk is busy with another read operation.
Write Performance	☆☆☆	Write performance is comparatively lower than read performance because data (original and mirror) must be written on two physical disks simultaneously.
Fault Tolerance	☆☆☆	RAID 1 virtual disks/arrays can tolerate the failure of one physical disk. <b>Note:</b> Although RAID 1 can tolerate the failure of only one physical disk, it receives high fault tolerance rating because one physical disk in a RAID 1 virtual disk/array (which always comprises of only two physical disks) is equivalent to 50% of the disks. As such, from a purely statistical viewpoint, RAID 1 can tolerate the failure of up to 50% of the physical disks. No other RAID level offers this percentage level of fault tolerance, which explains the high rating for RAID 1. Use this rating after considering the aforementioned limitations of RAID 1 with regard to your application.
Efficient use of disk capacity	☆☆☆	Data on the primary disk is mirrored on the secondary disk. Only 50% of the combined physical disk space is available for use.
Automatic rebuild	✓	Available.
Minimum number of drives		RAID 1 uses exactly two physical disks.
Suitable Applications		RAID 1 is ideally suited for applications requiring high read performance and fault tolerance.

Figure 2-2 describes RAID 1.

Figure 2-2 RAID 1



**Note:** Click **Play Demo** to launch an Adobe Flash® demonstration RAID 1. To view the demonstration, Adobe Reader® 9 (or higher) is required. If Play Demo is disabled, or if an error message, or blank window appears upon clicking Play Demo, then upgrade to the latest version of Adobe Reader® at <http://get.adobe.com/reader/>.

## B.5 RAID 1E (Data Mirroring and Striping)

RAID 1E uses a combination of data mirroring and striping (RAID 0) techniques. A minimum of three physical disks are required to create a RAID 1E virtual disk/array, as shown in Figure 2-3. RAID 1E is similar to RAID 10, except that RAID 1E operates on an odd number of disks.

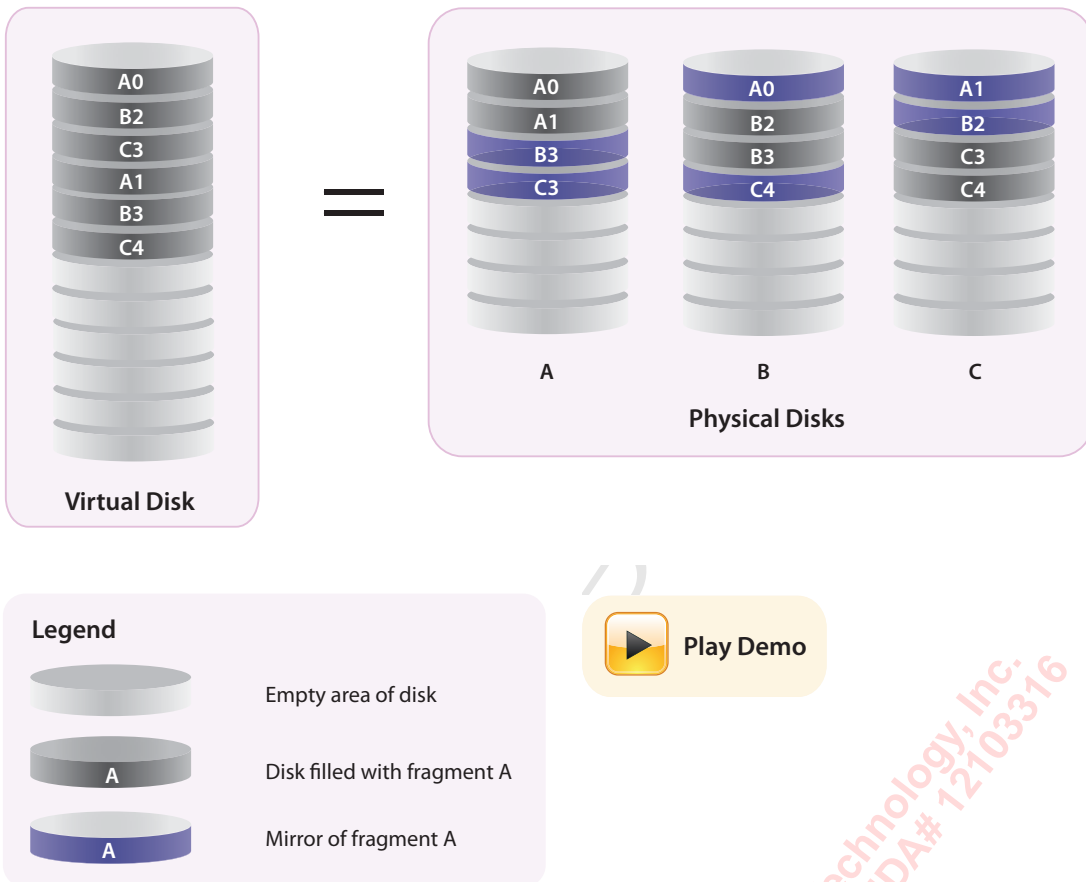
Table 2-4 describes RAID 1E across a number of parameters.

**Table 2-4 RAID 1E**

Parameter	Rating	Description
Read Performance	☆☆☆	RAID 1E provides read performance comparable to RAID 0 (striping).
Write Performance	☆☆☆☆	RAID 1E provides write performance comparable to RAID 1 (disk mirroring). Write performance is comparatively lower than read performance because data (original and mirror) is written on two physical disks simultaneously.
Fault Tolerance	☆☆☆☆	<p>In a RAID 1E, mirrored data is distributed such that the array can tolerate the failure of one physical disk.</p> <p>When the minimum three physical disks are used in a RAID 1E virtual disk/array, approximately 33% (one physical disk) of the combined disk capacity is used for storing mirror data. In other words, RAID 1E can be rebuilt if 33% of the disks fail. As the number of disks increases, the reliability of the RAID 1E virtual disk/array decreases (lesser than 33%).</p> <p><b>Note:</b> The reliability (as measured by Mean Time Between Failure or Mean Time To Failure) for physical disks is equal to average reliability of each disk divided by the number of disks. Assuming that each physical disk is almost perfectly reliable, the reliability is roughly inversely proportional to the number of disks. In other words, as the number of physical disks increases, the reliability of the RAID 1E virtual disk/array decreases.</p>
Efficient use of disk capacity	☆☆☆☆	Like RAID 1, RAID 1E uses the mirroring technique for fault tolerance, using 50% of the combined disk capacity for mirroring data. For example, three 100 GB physical disks (a total of 300 GB) create a 150 GB virtual disk/array because the remaining 150 GB is used to store mirror data.
Automatic rebuild	✓	Available.
Minimum number of drives	3	<p><b>Note:</b> RAID 1E operates <b>only</b> on an odd number of disks.</p>

Figure 2-3 describes RAID 1E.

Figure 2-3 RAID 1E



**Note:** Click **Play Demo** to launch an Adobe Flash® demonstration RAID 1E. To view the demonstration, Adobe Reader® 9 (or higher) is required. If Play Demo is disabled, or if an error message, or blank window appears upon clicking Play Demo, then upgrade to the latest version of Adobe Reader® at <http://get.adobe.com/reader/>.



## B.6 RAID 5 (Striping with Single Parity)

RAID 5 uses the striping technique in combination with single parity to provide high fault tolerance. At least three physical disks are required to create a RAID 5 virtual disk/array, as shown in Figure 2-4. Data and parity information are striped across all physical disks, with RAID parity information requiring the equivalent of one physical disk, regardless of the number of physical disks.

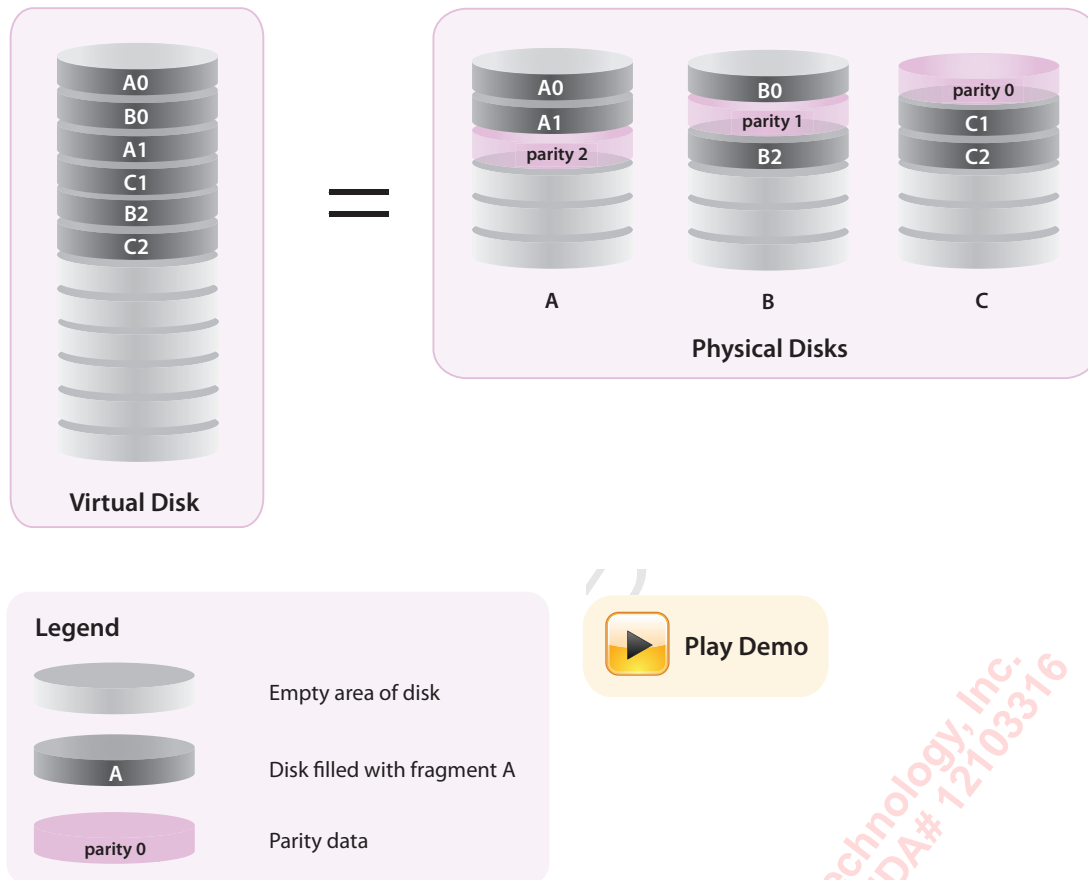
Table 2-5 describes RAID 5 across a number of parameters.

**Table 2-5 RAID 5**

Parameter	Rating	Description
Read Performance	☆☆☆	Read performance is good (due to striping) but write performance is comparatively lower because of the need to calculate and write single parity information.
Write Performance	☆☆☆☆	
Fault Tolerance	☆☆☆☆	The combination of striping and parity provides good fault tolerance with a more efficient use of physical disk space than RAID 1 (disk mirroring). A RAID 5 virtual disk/array can tolerate the failure of one physical disk.
Efficient use of disk capacity	☆☆☆☆	When the minimum three physical disks are used in a RAID 5, approximately 33% of the combined disk capacity is used for redundancy (term used to describe storing of parity or mirror data). The capacity efficiency increases as the number of physical disks increases (because only one physical disk is used for redundancy irrespective of the number of physical disks).
Automatic rebuild	✓	Available.
Minimum number of drives	3	

Figure 2-4 describes RAID 5.

Figure 2-4 RAID 5



**Note:** Click **Play Demo** to launch an Adobe Flash® demonstration RAID 5. To view the demonstration, Adobe Reader® 9 (or higher) is required. If Play Demo is disabled, or if an error message, or blank window appears upon clicking Play Demo, then upgrade to the latest version of Adobe Reader® at <http://get.adobe.com/reader/>.

## B.7 RAID 6 (Striping with Dual Parity)

RAID 6 uses the striping technique in combination with dual parity to provide high fault tolerance. At least four physical disks are required to create a RAID 6 virtual disk/array, as shown in Figure 2-5. Data and parity information are striped across all physical disks, with RAID parity information requiring the equivalent of two physical disks, regardless of the number of physical disks.

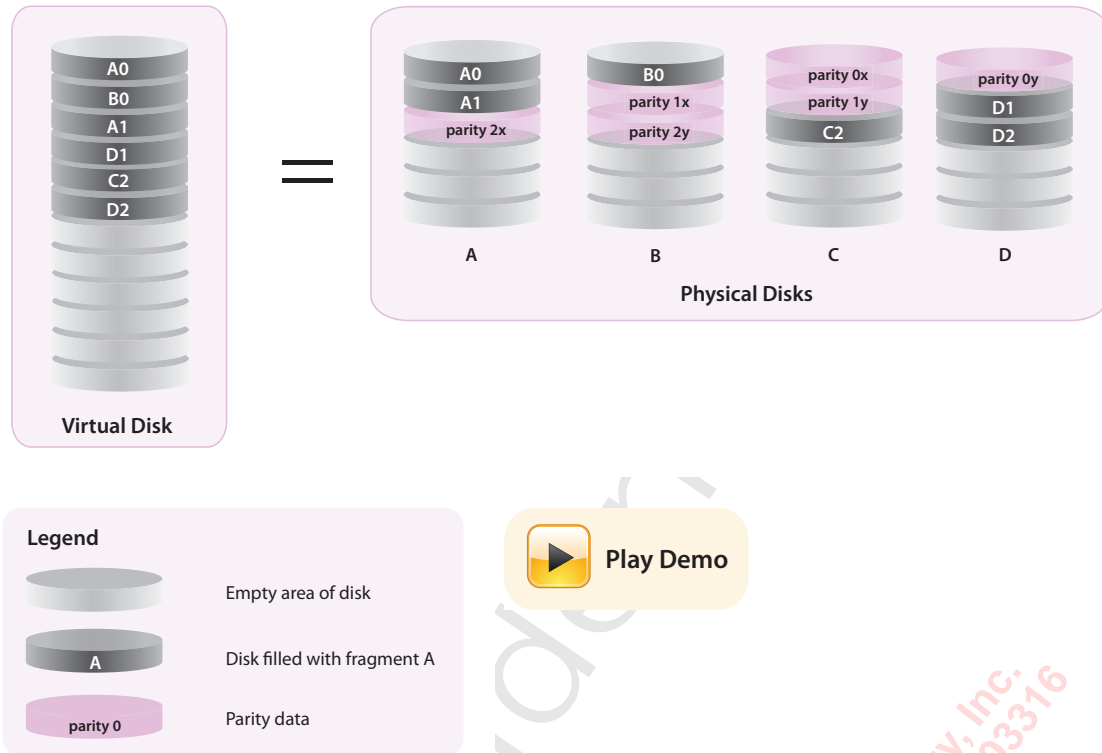
Table 2-6 describes RAID 6 across a number of parameters.

**Table 2-6 RAID 6**

Parameter	Rating	Description
Read Performance	☆☆☆	Read performance is good (due to striping) but write performance is comparatively lower because of the need to calculate and write parity information twice.
Write Performance	☆☆☆	
Fault Tolerance	☆☆☆☆	The combination of striping and parity provides high fault tolerance. For virtual disks/arrays comprising of more than four physical disks, RAID 6 provides a more efficient use of physical disk space than RAID 1 (mirroring). RAID 6 is similar to RAID 5, but dual parity provides the advantage of recovering data when up to two physical disks fail.
Efficient use of disk capacity	☆☆☆	When the minimum four physical disks are used in a RAID 6 virtual disk/array, 50% of the combined disk capacity (two physical disks) is used for redundancy. The capacity efficiency increases as the number of physical disks increases (because only two physical disks are used for redundancy irrespective of the number of physical disks).
Automatic rebuild	✓	Available
Minimum number of drives	4	

Figure 2-5 describes RAID 6.

Figure 2-5 RAID 6



**Note:** Click **Play Demo** to launch an Adobe Flash® demonstration RAID 6. To view the demonstration, Adobe Reader® 9 (or higher) is required. If Play Demo is disabled, or if an error message, or blank window appears upon clicking Play Demo, then upgrade to the latest version of Adobe Reader® at <http://get.adobe.com/reader/>.

## B.8 RAID 10 (Disk Mirroring and Striping)

RAID 10 incorporates the technique of striping (RAID 0) across multiple disk mirrors (RAID 1). At least four physical disks are required to create a RAID 10 virtual disk/array, as shown in Figure 2-6.

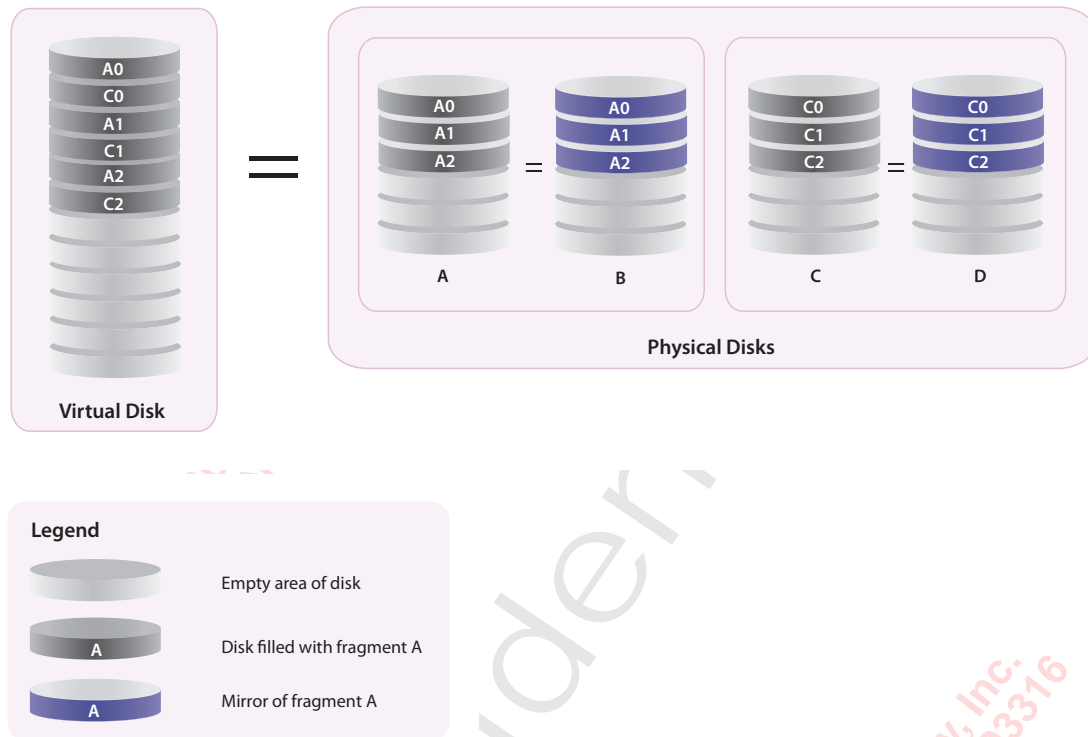
Table 2-7 describes RAID 10 across a number of parameters.

**Table 2-7 RAID 10**

Parameter	Rating	Description
Read Performance	☆☆☆	RAID 10 provides read performance comparable to RAID 0 (striping).
Write Performance	☆☆☆	RAID 10 provides write performance comparable to RAID 1 (disk mirroring). Write performance is comparatively lower than read performance because data (original and mirror) is written on two physical disks simultaneously.
Fault Tolerance	☆☆☆	RAID 10 virtual disks/arrays can tolerate the failure of one physical disk in each RAID 1 set. The failed disk must be replaced to ensure continued fault tolerance. Otherwise, the single working physical disk in the partially degraded RAID 1 set becomes the single point of failure for the entire RAID 10 virtual disk/array.
Efficient use of disk capacity	☆☆☆	Like RAID 1, RAID 10 uses the mirroring technique for redundancy, thereby using 50% of the combined disk capacity for mirroring data. For example, four 100 GB physical disks (a total of 400 GB) create a 200 GB virtual disk/array because the remaining 200 GB is used to store mirror data.  <b>Note:</b> When creating a RAID 10 virtual disk/array with physical disks of different sizes, the storage space added to the array by each physical disk is limited to the size of the smallest physical disk. This is true for any RAID virtual disk/array using the disk mirroring technique. For example, a RAID 10 virtual disk/array comprising of 150 GB, 200 GB, 100 GB, and 80 GB physical disks is sized at 320 GB (four times the size of the smallest physical disk 80 GB).
Automatic rebuild	✓	Available.
Minimum number of drives	4	

Figure 2-6 describes RAID 10.

Figure 2-6 RAID 10



**Note:** An Adobe Flash® demonstration of RAID 10 is not provided. RAID 10 incorporates the technique of striping (RAID 0) across multiple disk mirrors (RAID 1) arrays. View demonstrations for RAID 0 and RAID 1 for an understanding of how RAID 10 arrays are built.

## B.9 RAID 50 (Striping RAID 5 Arrays)

RAID 50 incorporates the technique of striping (RAID 0) across multiple RAID 5 arrays. RAID 5 uses the striping technique in combination with single parity to provide high fault tolerance. At least six physical disks are required to create a RAID 50 array, as shown in Figure 2-7.

Table 2-8 describes RAID 50 across a number of parameters.

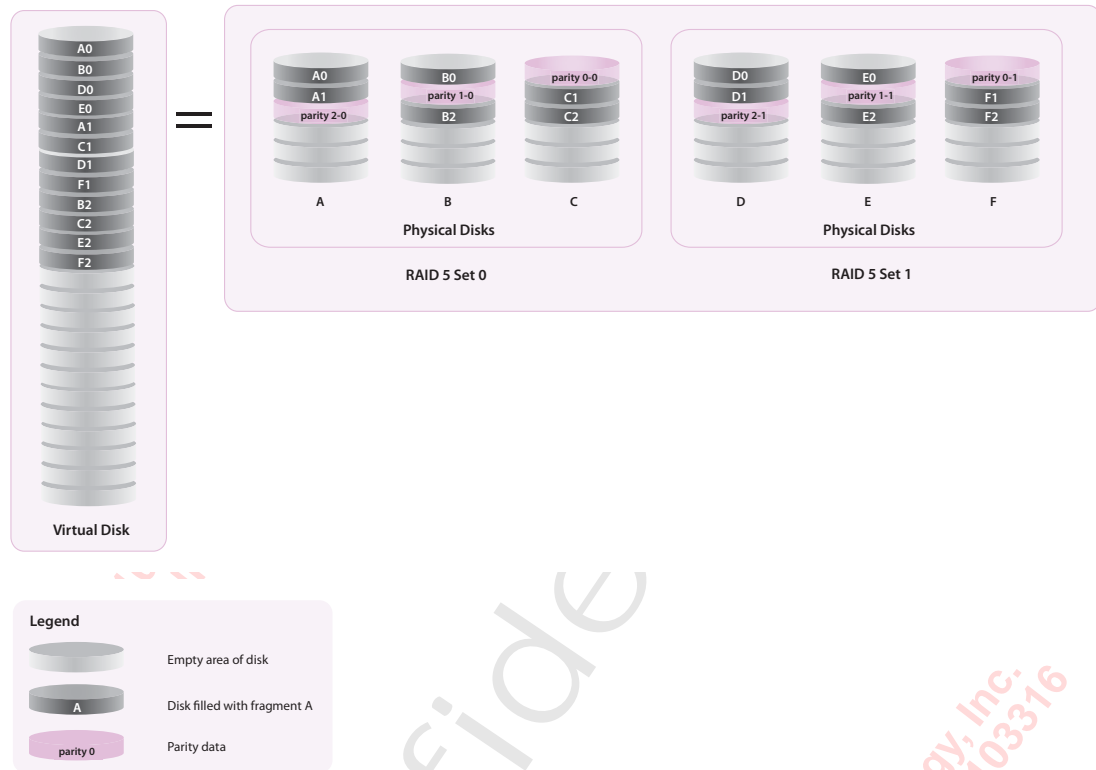
**Table 2-8 RAID 50**

Parameter	Rating	Description
Read Performance	☆☆☆	Read/write performance is similar to RAID 5. Read performance is good (due to striping) but write performance is comparatively lower because of the need to calculate and write single parity information.
Write Performance	☆☆☆☆	
Fault Tolerance	☆☆☆☆	RAID 50 arrays can tolerate the failure of one physical disk <i>in each</i> RAID 5 set. The failed physical disk must be replaced to ensure continued fault tolerance. Otherwise, the two or more working physical disks in the partially degraded RAID 5 set become multiple points of failure for the entire array.
Efficient use of disk capacity	☆☆☆☆	When the minimum six physical disks are used in a RAID 50 array, approximately 33% of the combined disk capacity (one physical disk per RAID 5 set) is used for redundancy. The capacity efficiency increases as the number of physical disks increases (because <i>only</i> one physical disk is used per RAID 5 set for redundancy irrespective of the number of physical disks in the RAID 5 set).
Automatic rebuild	✓	Available
Minimum number of drives		6



Figure 2-7 describes RAID 50.

Figure 2-7 RAID 50



**Note:** An Adobe Flash® demonstration of RAID 50 is not provided. RAID 50 incorporates the technique of striping (RAID 0) across multiple RAID 5 arrays. View demonstrations for RAID 0 and RAID 5 for an understanding of how RAID 50 arrays are built.

## B.10 RAID 60 (Striping RAID 6 Arrays)

RAID 60 incorporates the technique of striping (RAID 0) across multiple RAID 6 arrays. RAID 6 uses the striping technique in combination with dual parity to provide high fault tolerance. At least eight physical disks are required to create a RAID 60 array, as shown in Figure 2-8.

Table 2-9 describes RAID 60 across a number of parameters.

**Table 2-9 RAID 60**

Parameter	Rating	Description
Read Performance	☆☆☆	Read/write performance is similar to RAID 6. Read performance is good (due to striping) but write performance is comparatively lower because of the need to calculate and write parity information twice.
Write Performance	☆☆☆	
Fault Tolerance	☆☆☆	RAID 60 arrays can tolerate the failure of two physical disks <i>in each</i> RAID 6 set. The failed disks must be replaced to ensure continued fault tolerance. Otherwise, the two or more working physical disks in the partially degraded RAID 6 set become multiple points of failure for the entire array.
Efficient use of disk capacity	☆☆☆	When the minimum eight physical disks are used in a RAID 60 array, 50% of the combined disk capacity (two physical disks per RAID 6 set) is used for redundancy. The capacity efficiency increases as the number of physical disks increases (because <i>only</i> two physical disks are used per RAID 6 set for redundancy irrespective of the number of physical disks in the RAID 6 set).
Automatic rebuild	✓	Available
Minimum number of drives	8	

Figure 2-8 describes RAID 60.

Figure 2-8 RAID 60



**Note:** An Adobe Flash® demonstration of RAID 60 is not provided. RAID 60 incorporates the technique of striping (RAID 0) across multiple RAID 6 arrays. View demonstrations for RAID 0 and RAID 6 for an understanding of how RAID 60 arrays are built.



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# C

## ICONS USED IN MRU

This appendix describes the icons used in MRU for the following physical/virtual devices:

- Arrays
- Events
- Physical Disks
- Virtual Disks
- Other Devices

8cmymtbz810-gd8biy0x \* Lycom Technology, Inc.  
MARVELL CONFIDENTIAL, UNDER NDA# 12103316



Confidential

8cmymtbz810-gd8biy0x \* Lycom Technology, Inc.  
MARVELL CONFIDENTIAL, UNDER NDA# 12103316

## C.1 Arrays

Table 3-1 lists the icons used to indicate the status of arrays.





**Table 3-1 Icons for Arrays**

Symbol	Description	Notes
	Online Array	The array is operating normally.
	Degraded Array	The array is degraded and has no fault tolerance. In this state, data is not recoverable if even one physical disk fails. Rebuild the array by replacing the failed physical disk(s).

## C.2 Events

Table 3-2 lists the icons used for adapter events.

**Table 3-2 Icons for Events**









Symbol	Description	Notes
	Normal Event	Example: Physical disk 1 is assigned as spare.
	Unknown Event	Any event that was not recognized by MRU. See Windows Events Viewer for more information on the event.
	Warning Event	Example: Virtual Disk 1 is deleted.
	Critical Event	Example: Virtual Disk 1 is degraded.



## C.3 Physical Disks

Table 3-3 lists the icons used to indicate the status of physical disks.









**Table 3-3 Icons for Physical Disks**

Symbol	Description	Notes
	Unconfigured Physical Disk	The physical disk is available for use in a virtual disk (or array).
	Configured Physical Disk	The physical disk is part of a virtual disk.
	Foreign Physical Disk	The foreign physical disk is part of a virtual disk created with another RAID controller. The foreign physical disk cannot be used on the RAID controller unless the RAID configuration metadata is erased on the disk.
	Offline Physical Disk	The physical disk is part of a virtual disk and has an error. Check the event log for details and replace the physical disk if necessary. <b>Note:</b> An offline physical disk can render a virtual disk offline or degrade it.
	Unconfigured Spare Drive	The spare drive is available for rebuilding virtual disks and arrays.
	Configured Spare Drive	The spare drive was used to rebuild a virtual disk and is now part of the same.
	SAS/SATA Tape Device	n/a
	CD/DVD Device	n/a

## C.4 Virtual Disks

Table 3-4 lists the icons used to indicate the status of virtual disks.





**Table 3-4 Icons for Virtual Disks**

Symbol	Description	Notes
	Online Virtual Disk	The virtual disk is operating normally.
	Online Virtual Disk with Background Activity	The virtual disk is operating normally and performing a background activity.
	Offline Virtual Disk	This virtual disk is not operating because one or more member physical disks are not connected. Data can neither be written nor read from the virtual disk.
	Foreign Virtual Disk	The RAID configuration metadata on the physical disk indicates that it is part of a virtual disk that was created with another RAID controller.
	Partially Optimal Virtual Disk	One or more physical disks in the virtual disk have failed and reduced the fault tolerance of the virtual disk. The virtual disk is still operating normally.
	Partially Optimal Virtual Disk with Background Activity	The partially optimal virtual disk is performing a background activity.
	Degraded Virtual Disk	The virtual disk is degraded and has no fault tolerance. In this state, data is not recoverable if even one physical disk fails. Rebuild the virtual disk by replacing the failed physical disk(s).
	Degraded Virtual Disk with Background Activity	The degraded virtual disk is rebuilding.

## C.5 Other Devices

Table 3-5 lists the icons used in MRU.

**Table 3-5 Miscellaneous Icons**

Symbol	Description
	Adapter
	Battery Backup Unit (BBU)
	Enclosure
	Port Multiplier

# D

## GLOSSARY

This glossary describes abbreviations, acronyms, and terms used in MRU.

### A

#### Adapter

Adapter refers to any board that hosts the RAID controller ASIC.

**Note:** MRU executes commands on the RAID controller, which is hosted on either an HBA (Host Bus Adapter), evaluation board, or OEM motherboard.

See *Controller*.

#### AES

Acronym for Advanced Encryption Standard.

**Note:** This feature requires hardware and software support.

#### AES Link

Refers to AES encryption being applied to data at the link level (transmission from one network location to another).

**Note:** This feature requires hardware and software support.

#### Array

An Array is a combination of two or more physical disks that are presented to the operating system as a single storage device comprising of one (or more) virtual disk(s).

See *Virtual Disk*.

#### ASIC

Acronym for Application Specific Integrated Circuit.

#### Auto-Rebuild

Auto-Rebuild is disabled by default. When enabled, degraded virtual disks (and arrays) are automatically rebuilt if a spare drive of suitable size is available.

**Note:** The size of the spare drive must be equal to or greater than that being replaced. The Gigabyte Rounding for the virtual disk may provides some flexibility in size.

See *Spare Drive*, *Gigabyte Rounding*, and *Rebuild*.

## B

### Background Initialization

Refers to Full Initialization running as a background activity.  
See *Full Initialization*.

### BBU

Abbreviation for Battery Backup Unit.

### BGA

Abbreviation for Background Activity.

## C

### Consistency Check

Consistency Check checks and reports the integrity of parity/mirror data on the virtual disk.

#### Notes:

- Consistency Check is recommended as a regular maintenance procedure for virtual disks.
- Aside from regular maintenance runs, also run Consistency Check when a virtual disk is not performing as expected.
- Perform Full Initialization on the virtual disk before running Consistency Check.

### Consistency Fix

Consistency Fix checks, reports, and fixes parity/mirror data on virtual disks.

**Note:** Perform Full Initialization on the virtual disk before running Consistency Fix.

### Controller

Refers to the RAID controller ASIC that MRU executes commands on.

**Note:** Although MRU and CLI use the terms Adapter and Controller interchangeably, MRU is executing commands on the RAID controller ASIC.

See *Adapter*.

### Copy Back

Copy Back replaces a functioning physical disk on an operating array by copying all the contents of the functioning physical disk to a replacement physical disk, without degrading the array. This is useful when the functioning disk shows signs of impending failure.

**Note:** Copy Back is only available for RAID-On-Chip (ROC) controllers.

## D

### **Dedicated Spare Drive**

A dedicated spare drive is a spare that is assigned for exclusive use by a specific array.

**Note:** Dedicated Spare Drive is only available for RAID-On-Chip (ROC) controllers.

See *Global Spare Drive, Spare*.

### **Degraded Virtual Disk/Array**

A fault-tolerant virtual disk/array becomes degraded when one or more member physical disks fail. In this state, the fault tolerance of the virtual disk/array is compromised to the extent determined by the RAID level and number of failed member physical disks. Rebuild the disk to ensure continued fault tolerance.

See *Rebuild*.

## E

### **Erase Foreign Configuration**

Erase Foreign Configuration erases the RAID configuration metadata on a foreign virtual disk. This is useful when using a foreign physical disk in a new virtual disk.

**Note:** If the foreign physical disk was originally part of another virtual disk, erasing RAID configuration data might damage that virtual disk, depending on the virtual disk's fault tolerance capabilities.

## F

- Fast Initialization** In this mode, MRU erases the Master Boot Record (MBR) in all physical disks constituting the virtual disk. This is a destructive process that erases all data on the virtual disk.
- Note:** Fast Initialization is available only when creating a virtual disk, except for RAID-On-Chip Controllers (ROCs).
- Fault Tolerance** Refers to the ability of a virtual disk/array to remain operational even when one or more member physical disks fail. The extent of fault tolerance is determined by the RAID level of the virtual disk/array.
- See *Redundancy*.
- Foreground Initialization** Foreground Initialization writes 0 to the entire virtual disk. As with Fast Initialization, all data on the virtual disk is destroyed.
- Full Initialization** In this mode, mirror (or parity) data is updated to ensure consistency of data on the physical disks constituting the virtual disk. This non-destructive method of initialization is performed in the background while the operating system continues to access the virtual disk.
- Note:** Full Initialization is recommended as a regular maintenance procedure for virtual disks.

## G

- Gigabyte Rounding** Gigabyte Rounding is applicable to RAID levels using the disk mirroring concept (RAID 1 and RAID 10). It defines the flexibility in size for spare drives used to rebuild degraded virtual disks (and arrays).
- Available options for Gigabyte Rounding are None, 1G, and 10G.
- Note:** For example, 120.5 GB and 115.7 GB physical disks can create a 115.7 GB RAID 1 virtual disk. If Gigabyte Rounding is set to 1G, then the controller floors the size of the physical disks to the nearest lower GB size. The 120.5 GB and 115.7 GB disks are treated as 120 GB and 115 GB physical disks, resulting in a 115 GB RAID 1 virtual disk. If the 115.7 GB physical disk fails, the virtual disk can be rebuilt with a spare drive sized between 115 and 115.7 GB, providing flexibility in size up to 0.7 GB.



**Global Spare Drive**

A global spare drive is a spare that is available for use by all virtual disks (and arrays).

See *Dedicated Spare Drive*, *Spare*.

## H

**Hot Spare**

Controllers supporting this feature allow MRU to *automatically* replace a failed or offline physical disk with a spare drive connected to the controller. The automatic replacement is performed while the virtual disk (or array) is still operating.

See *Auto-Rebuild*.

**Hot Swap**

Controllers supporting this feature allow users to *manually* hot-swap (replace) a failed or offline physical disk with a spare drive at the same location while the virtual disk (or array) is still operating.

## I

**Import**

Controllers supporting this feature allow you to import a virtual disk created with another RAID controller.

**Initialization**

See *Fast Initialization* and *Full Initialization*.

**Initialization Rate**

The controller assigns priority to Background Initialization based on the Initialization Rate. Default is 50% (Medium).

**Note:** When background activities are in progress, the controller is still available to the OS for normal operations. However, the response time may be lower depending on the background activity control rate.

**IO Controller (IOC)**

IO Controllers (IOCs) such as the Marvell 88SE63xx/88SE64xx SAS controllers can create and manage RAID 0, 1, 5, and 10 virtual disks.

**Note:** Marvell RAID controllers support different sets of RAID levels depending on the hardware model and OEM software package. Some software packages, depending on OEM selections, support limited RAID levels by design. Check with the OEM vendor for information specific to your controller.

**IO Processor (IOP)** An IOP is similar to an IOC, except that it contains an on-board CPU that enables hardware RAID functionality. The Marvell 88SE91xx 6 Gbps SATA RAID IOP can create and manage RAID 0 and RAID 1 virtual disks.

**Note:** Marvell RAID controllers support different sets of RAID levels depending on the hardware model and OEM software package. Some software packages, depending on OEM selections, support limited RAID levels by design. Check with the OEM vendor for information specific to your controller.

## K

**Key-phrase** Refers to the alpha-numeric string used to generate the AES key for data encryption.

**Note:** MRU uses an algorithm to combine the key-phrase with internal 128/256-bit AES keys to generate the AES key used for encryption.

## L

### Locate

Locate turns the LED on a physical disk ON or OFF. This is useful when identifying a physical disk in an enclosure or backplane.

**Note:** The enclosure or backplane must support the Locate feature.

## M

### Media Patrol

Media Patrol checks and fixes media errors on physical disks.

For a configured physical disk, Media Patrol checks and fixes media errors immediately. For spare drives, Media Patrol logs all media errors and fixes them when the spare drive is used to rebuild a virtual disk/array.

**Media Patrol Rate** The controller assigns priority to Media Patrol based on the Media Patrol Rate. Default is 100% (High).

**Note:** When background activities are in progress, the controller is still available to the OS for normal operations. However, the response time may be lower depending on the background activity control rate.

<b>Metadata</b>	Metadata, stored by MRU on physical disks, contains RAID configuration data about the virtual disk and/or array.
<b>Migrate</b>	Migrate allows you to increase the disk capacity and change the RAID level of an operating RAID array
<b>Module Consolidate</b>	Enable Module Consolidate to consolidate all requests sent from the OS. Enabling this feature can improve sequential read/write performance. Default is On (Enable).

## N

<b>No Initialization</b>	No initialization is performed on the virtual disk.
<b>No Read Ahead</b>	Read Ahead Cache is disabled. See <i>Read Ahead</i> .

## O

<b>Online Capacity Expansion</b>	Refers to disk capacity expansion of an operating RAID array. <b>Note:</b> The RAID level does not change. See <i>Migrate</i> .
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## P

<b>PD</b>	Abbreviation for Physical Disk.
<b>Poll S.M.A.R.T. Status</b>	Enable Poll S.M.A.R.T. Status to periodically check S.M.A.R.T. status of physical disks. Default is Off (Disable).  If MRU's request for S.M.A.R.T status fails or if the physical disk is no longer in S.M.A.R.T status, MRU logs the event in Event Logs.

# R

## RAID

RAID is an acronym for Redundant Array of Independent Disks. For more information, see Appendix B, [Selecting a RAID Level](#).

## RAID-On-Chip Controller (ROC)

RAID-On-Chip (ROC) controllers such as the Marvell 88RC8180 can create and manage RAID 0, 1, 1E, 5, 10, 50, and 60 arrays. ROCs contain an on-board CPU which enables hardware RAID functionality.

**Note:** Marvell RAID controllers support different sets of RAID levels depending on the hardware model and OEM software package. Some software packages, depending on OEM selections, support limited RAID levels by design. Check with the OEM vendor for information specific to your controller.

## Read Ahead

In this read cache mode, the controller's read performance is configured for sequential access of data. It reads extra blocks from the physical disk to cache memory, in anticipation of the next read command from the application.

**Note:** For applications requiring random access of data, enabling Read Ahead might degrade read performance due to the overhead of advance read operations.

## Rebuild

Rebuild is the process of reconstructing data on a degraded virtual disk/array. Data is reconstructed on the replacement physical disk(s) using parity or mirror data on the virtual disk.

**Note:** Virtual disks/arrays can be rebuilt only as long as they are fault tolerant. All data is lost on the virtual disk/array if the number of failed member physical disks is greater than its fault tolerance capabilities.

## Rebuild Rate

The controller assigns priority to Rebuild based on the Rebuild Rate. Default is 50% (Medium).

**Note:** When background activities are in progress, the controller is still available to the OS for normal operations. However, the response time may be lower depending on the background activity control rate.

## Redundancy

Refers to the concept of duplicating data either through mirroring or storing parity information, in order to enable rebuilding of virtual disks/arrays in the event of the failure of one or more member physical disks.

See *Fault Tolerance*.

**Relearn** The Relearn procedure stabilizes/optimizes BBU performance. During Relearn, the BBU is discharged completely and then re-charged to full capacity. If MRU detects that BBU capacity/voltage is low and/or unstable, it automatically initiates the Relearn procedure. Relearn may also be scheduled as a maintenance task for the BBU to ensure stable/optimal performance.

## S

**Set Free** Set Free releases an offline physical disk from a virtual disk.  
For information on offline physical disks, see Appendix C, [Icons used in MRU](#).

**Spare** Refers to physical disk assigned as spare drive for use in rebuilding virtual disks/arrays.  
See *Dedicated Spare Drive*, *Global Spare Drive*, *Hot Spare*, and *Hot Swap*.

**Stripe Size** Stripe Size specifies the size of single data block on the virtual disk.  
Available stripe sizes are 16K, 32K, 64K (default), 128K, 256K, 512K, and 1024K. For RAID 5 and 50, the stripe size is limited to 64K.  
Support for different stripe sizes varies with controllers.

**Note:** The larger the stripe size, the longer it takes for the controller to read from and write to data blocks on the physical disks. For best read/write performance, a larger stripe size is recommended for applications requiring large data transfers such as audio, video, and graphics. A smaller stripe size enhances read/write performance for applications with content much smaller in size, such as e-mails, and documents.

**Synchronization Rate** The controller assigns priority to Consistency Check and Consistency Fix based on the Synchronization Rate. Default is 50% (Medium).

**Note:** When background activities are in progress, the controller is still available to the OS for normal operations. However, the response time may be lower depending on the background activity control rate.

## V

**VD** Abbreviation for Virtual Disk.

**Virtual Disk** A virtual disk is a combination of two or more physical disks that are presented to the operating system as a single storage device.

See *Array*.

## W

**Write-Back,  
Performance**

In this write cache mode, the controller is configured for best write performance. Write data is stored temporarily in DDR cache memory and flushed to the hard disk at the appropriate time. In the event of power failure, there is a risk of losing data integrity if the transfer of data from the DDR cache to hard disk is not completed.

**Note:** A BBU (Battery Backup Unit) is recommended when using Write-Back cache mode. When a BBU is available and optimally charged, MRU automatically turns on Write-Back (Performance) cache.

**Write-Through,  
Reliable**

This is the default write cache mode in MRU. In this mode, all write operations are performed on the hard disk before a completion status is returned to the operating system.

# E TROUBLESHOOTING

Table 5-1 lists potential issues you might encounter when using MRU and possible solutions for the same.

**Table 5-1 Troubleshooting**

Category	Issue	Possible Solutions
Adapter Detection	MRU does not detect the adapter	<ul style="list-style-type: none"> <li>Verify that the drivers for the RAID controller are installed, as described in 1.2, <a href="#">Installing the Marvell RAID Utility (MRU)</a>.</li> <li>Re-install MRU.</li> <li>Install the latest version of MRU.</li> </ul>
	Adapter is detected but serial number is not available	
Adapter Events	No events are displayed in MRU or CLI	<ul style="list-style-type: none"> <li>In Windows, use Windows Event Viewer to view adapter events.</li> <li>Verify that the drivers for the RAID controller are installed, as described in 1.2, <a href="#">Installing the Marvell RAID Utility (MRU)</a>.</li> <li>Re-install MRU.</li> <li>Install the latest version of MRU.</li> </ul>
Auto-Rebuild	Auto-Rebuild is enabled but the virtual disk does not rebuild automatically	<ul style="list-style-type: none"> <li>If your degraded virtual disk/array does not auto-rebuild even when a global spare drive is available, verify hat the spare drive is suitable for the virtual disk.</li> </ul>
Other	Other	<ul style="list-style-type: none"> <li>Contact us at <a href="mailto:docfeedback@marvell.com">docfeedback@marvell.com</a>. A quick response is guaranteed.</li> </ul>





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