M A R V E L L ®

Marvell Storage Utility

User Manual for 88SE91xx

Doc No. MV-S800768-00 Rev. -
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CONTENTS

1 GETTING STARTED

This chapter contains the following sections:

- Overview
- Installing the Marvell Storage Utility (MSU)

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1.1 Overview

The Marvell Storage Utility (MSU) is a browser-based management utility for Marvell 88SE91xx controllers. Using storage devices connected to the controller, it can create and manage RAID and HyperDuo virtual disks and arrays.

This section discusses the following:

- Software Components
- System Requirements
- Supported Browsers
- Supported Operating Systems
- Supported RAID Levels
- HyperDuo Modes

WARNING **Be sure to back up all data before connecting your disk drives to the Marvell controller. Connection may destroy data on the drives.**

1.1.1 Software Components

The MSU installation package includes the following components:

- **Marvell Storage Utility (MSU)**

    The MSU is a browser-based utility that can create and manage RAID and HyperDuo virtual disks. 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 the MSU.

Note: The 88SE91xx BIOS, a built-in component of 88SE91xx controllers, can also be used to create and manage RAID or HyperDuo virtual disks. For more information, see Appendix A, BIOS Utility.

1.1.2 System Requirements

The MSU has the following system requirements:

- Local/remote Marvell 88SE91xx 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

The MSU supports the following browsers:

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

1.1.4   Supported Operating Systems

The MSU currently supports the following operating systems:

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

1.1.5   Supported RAID Levels

The MSU supports the following RAID levels:

- RAID 0 (Striping)
- RAID 1 (Disk Mirroring)

1.1.6   HyperDuo Modes

The MSU supports the following HyperDuo modes:

- Safe Mode
- Capacity Mode

1.2   Installing the Marvell Storage Utility (MSU)

This section discusses the following:

- Installing the 88SE91xx Controller
- Connecting Physical Disks
- Installing the MSU in Windows

1.2.1   Installing the 88SE91xx Controller

Before installing the MSU, install the 88SE91xx controller in the system. Refer to the controller HBA (Host Bus Adapter) or evaluation board documentation for hardware and software installation instructions.

Note: RAID and/or HyperDuo functionality may not be supported on your 88SE91xx controller. Refer to the controller HBA or evaluation board documentation for more information.

1.2.2   Connecting Physical Disks

After installing the controller, connect physical disks to the 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.

    Note: If you are using HyperDuo, you can skip this step.

2. Connect the required number of physical disks to available ports on the controller, either directly or through a backplane/enclosure. Refer to the controller HBA or evaluation board documentation for installation instructions.

3. Power-up the physical disks.

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

1.2.3   Installing the MSU in Windows

This section discusses the following:

- Verifying 88SE91xx Controller Drivers Installation
- Installing the MSU in Windows

1.2.3.1   Verifying 88SE91xx Controller Drivers Installation

Before installing the MSU, verify that the drivers for the 88SE91xx 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 88SE91xx controller is listed under one of the following categories:

   ■ **SCSI and RAID controllers** (for Windows XP and Windows Server 2003)

   ■ **IDE ATA/ATAPI controllers** (for Windows Vista, Windows Server 2008, and Windows 7).

   Figure 1-1 Device Manager (Windows 7)
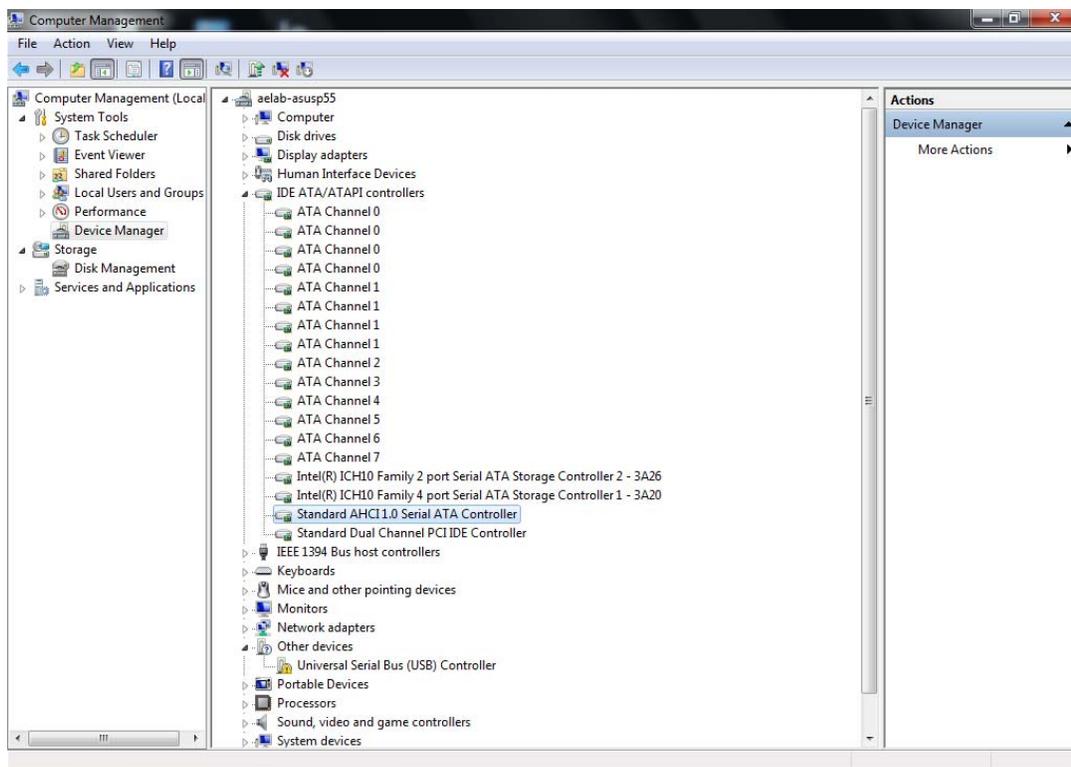
Note: 88SE91xx controllers use generic Windows AHCI SATA drivers on Windows Vista, Windows Server 2008, and Windows 7. No additional driver installation is required.

1.2.3.2   Installing the MSU in Windows

This section describes the procedure for installing the MSU in Windows.

To install the MSU in Windows

1. Verify that the drivers for the 88SE91xx controller are installed, as described in section 1.2.3.1, Verifying 88SE91xx Controller Drivers Installation.

2. Run **MSUSetup.exe**. The **MSU Setup Wizard** appears, as shown in Figure 1-2.

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

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

Figure 1-2 MSU Setup Wizard

Figure 1-3 License Agreement
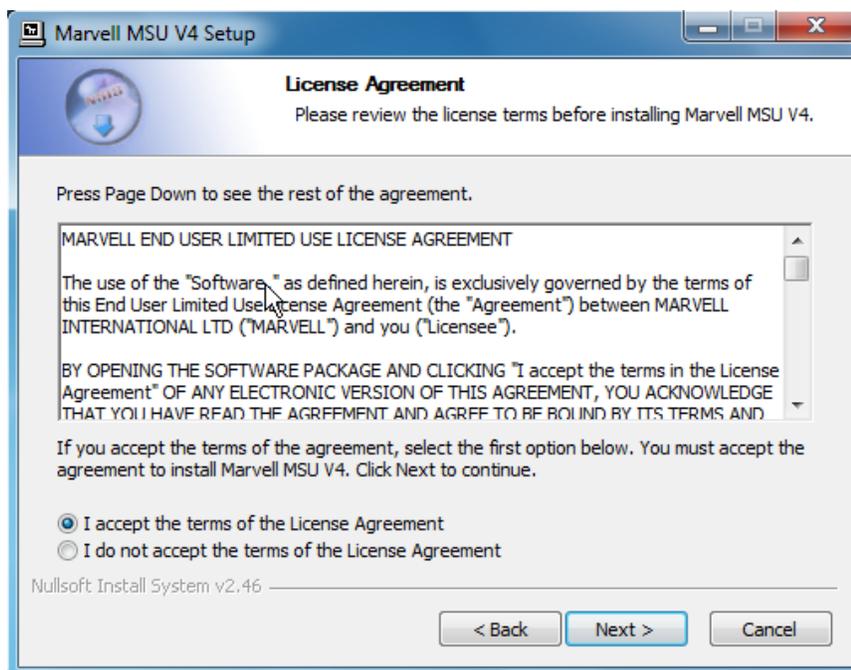
4. Read the **License Agreement** and select **I accept the terms of the License Agreement**, as shown in Figure 1-3.

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.

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.

   Figure 1-4 Choose Components
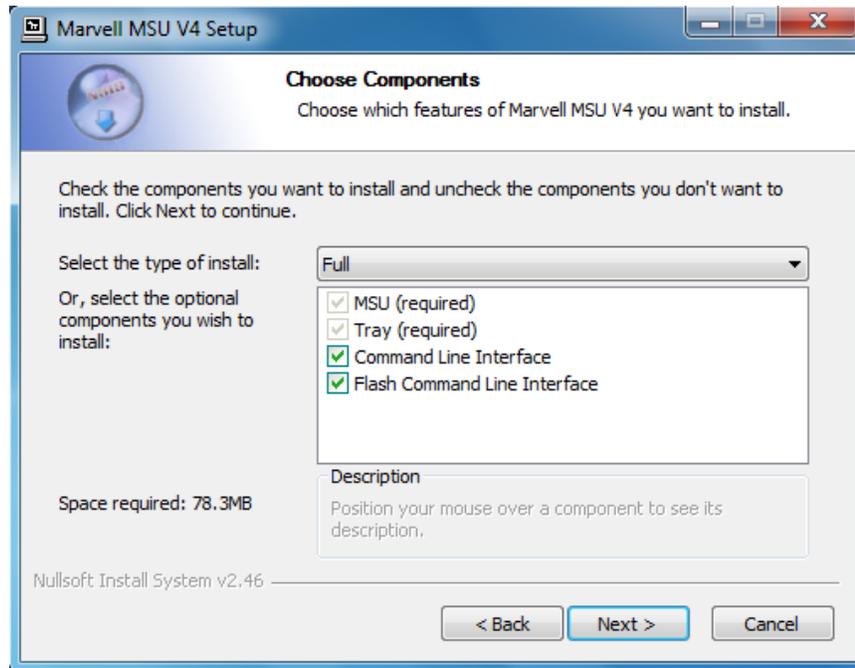
   Note: Installation of the Command Line Interface utility and Flash Command Line Interface utility is optional and disabled by default. Check these components if you wish to install them.

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

8. Select **Install**, as shown in Figure 1-5, to begin installation.

   The installation wizard displays progress, as shown in Figure 1-6.

Figure 1-5 Choose Install Location
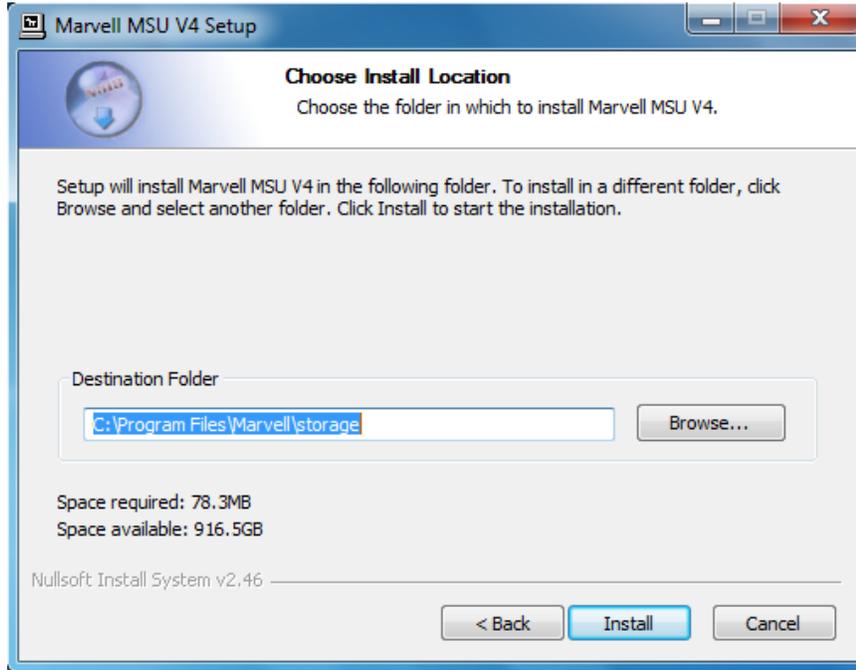
Figure 1-6 Installation Progress
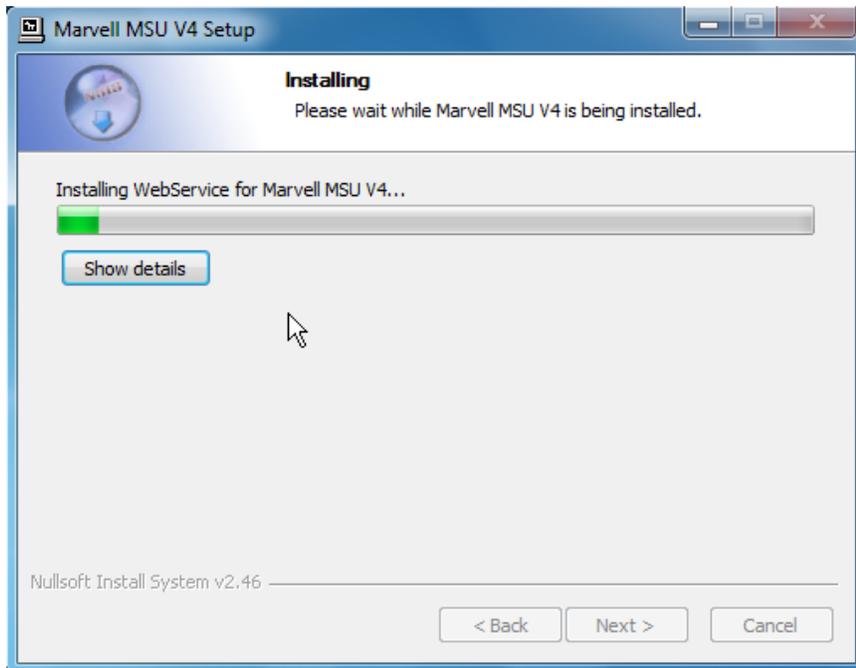
9. After installing the Apache2 HTTP Server (which is a built-in component of the installation package), the installation triggers a **Windows Security Alert** on some versions of Windows, as shown in Figure 1-7.

   Select **Unblock** or **Allow Access** to continue.

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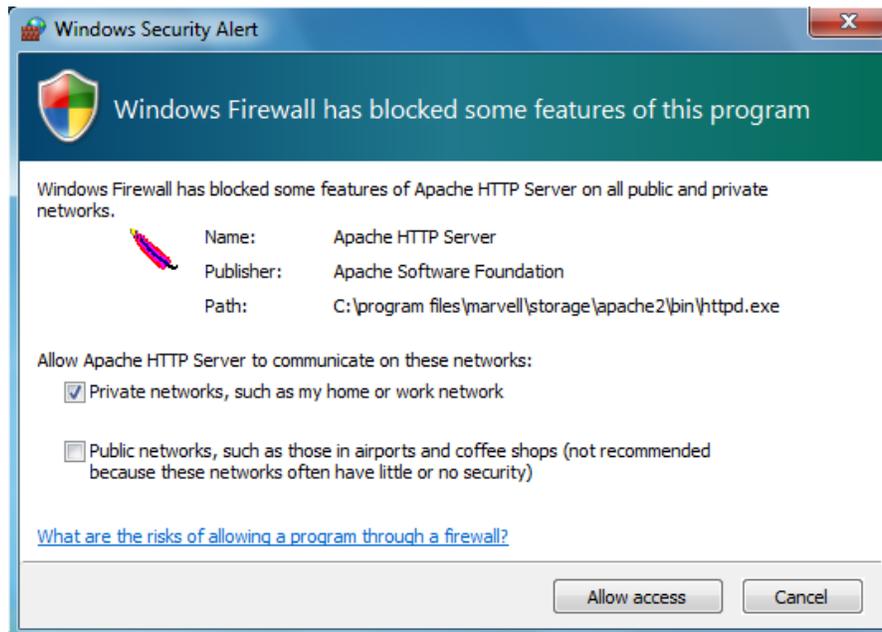
   Note: Figure 1-7 shows the Security Alert that appears in Windows 7. The alert is similar for other WIndows operating systems.

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. The MSU is now installed.

Figure 1-8 Installation Complete

2 MARVELL STORAGE UTILITY (MSU)

This chapter contains the following sections:

- **Overview**
- **Enabling Scripting**
- **Opening the MSU**
- **Tray Application for Windows**
- **Login**
- **User Interface**
- **Logout**

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2.1   Overview

The Marvell Storage Utility (MSU) is a browser-based management utility for Marvell 88SE91xx controllers. It can create and manage RAID and HyperDuo virtual disks using storage devices connected to the 88SE91xx controller. This chapter provides an introduction to the MSU and an overview of its user interface. The chapters that follow describe the following uses of the MSU in detail:

- RAID Virtual Disks (see Chapter 3, RAID)
- HyperDuo Virtual Disks (see Chapter 4, HyperDuo)

2.2   Enabling Scripting

Before opening the MSU, 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
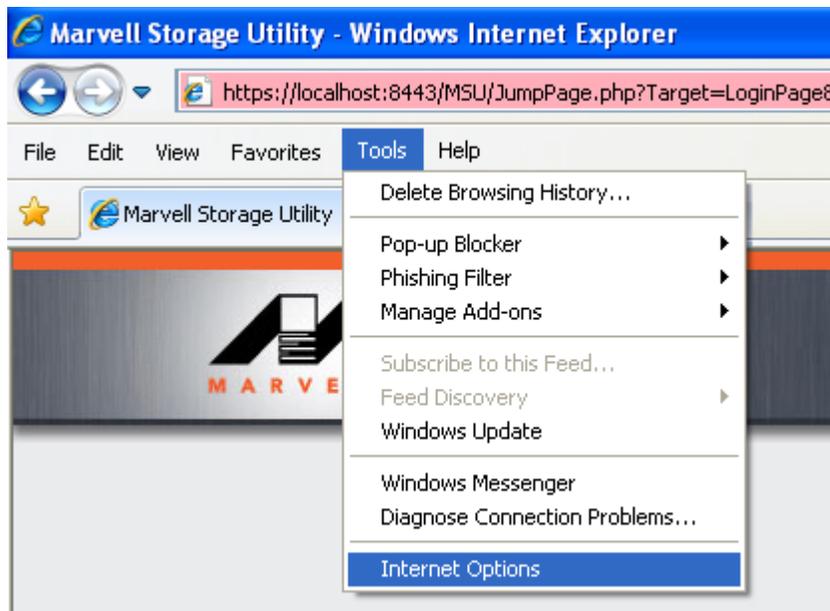
Figure 2-2 Internet Options
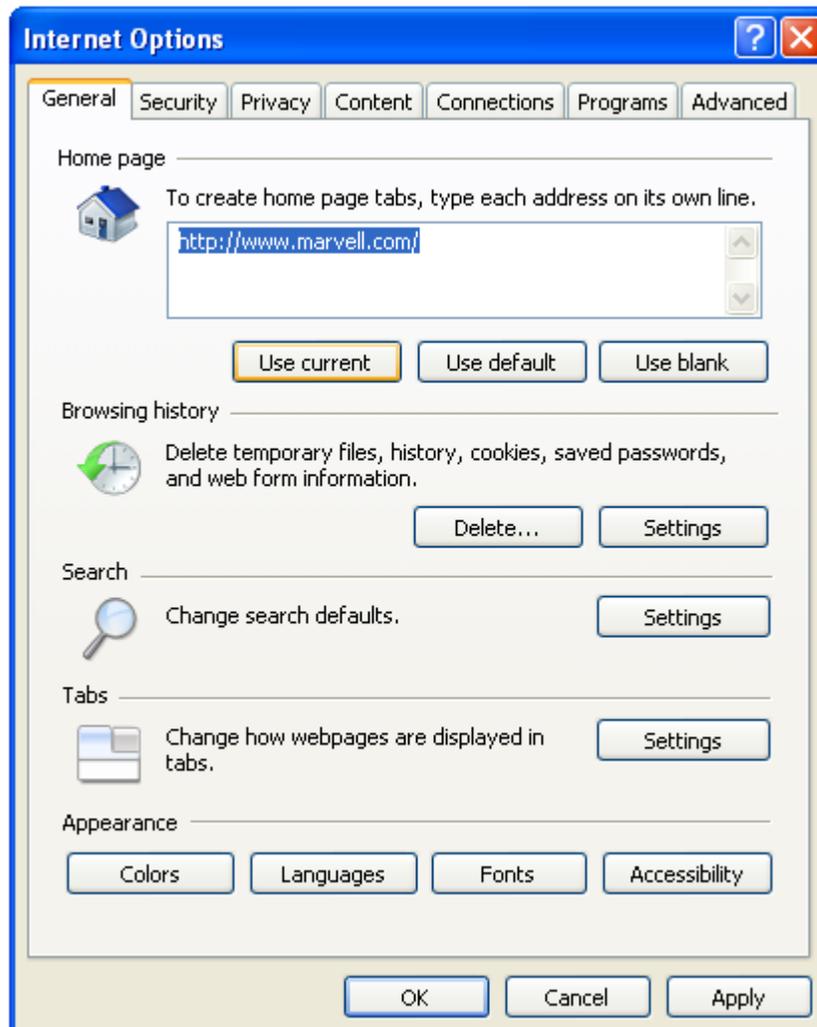
2. Select the **Security** tab, as shown in Figure 2-3.

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
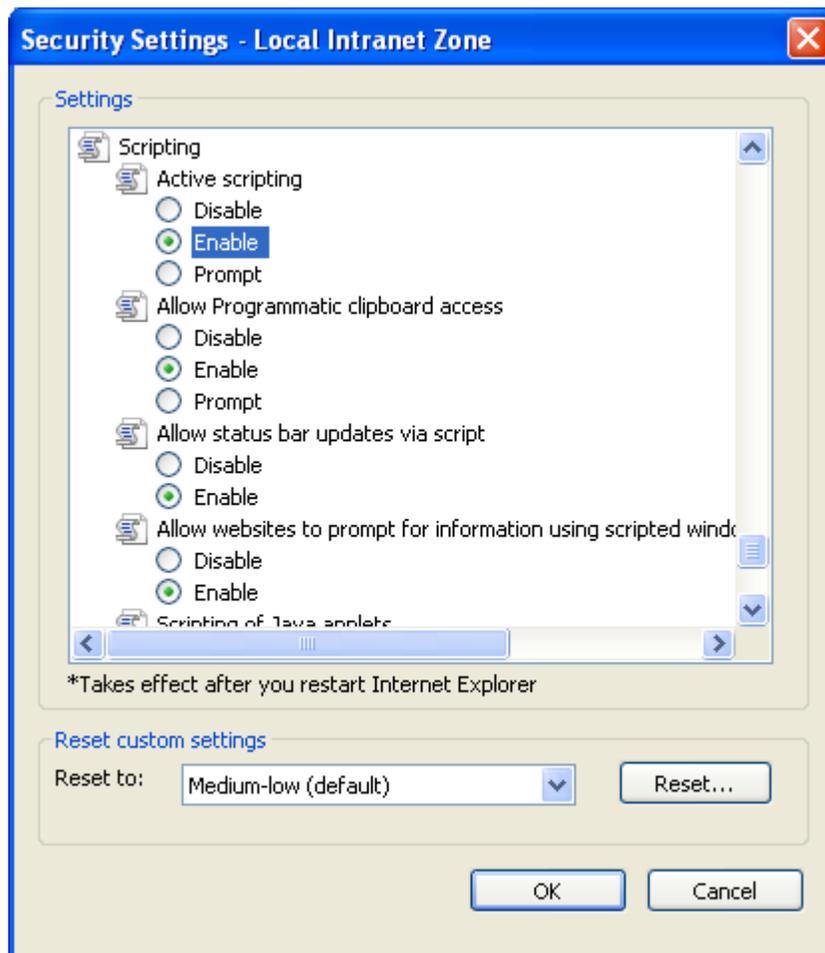
5. In the list of settings, browse to **Scripting** > **Active scripting**.

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 the MSU 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 **General** tab selected, as shown in Figure 2-6.

Figure 2-5 Firefox Tools Menu
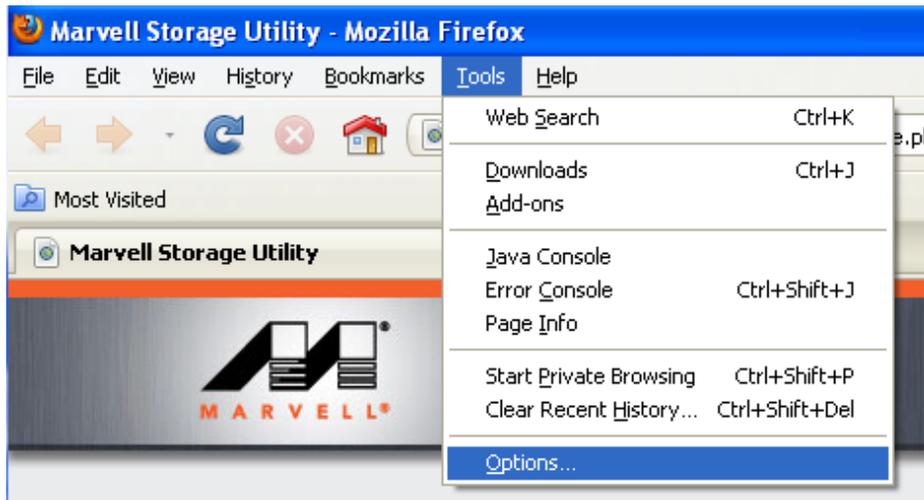
Figure 2-6 Firefox Options Dialog
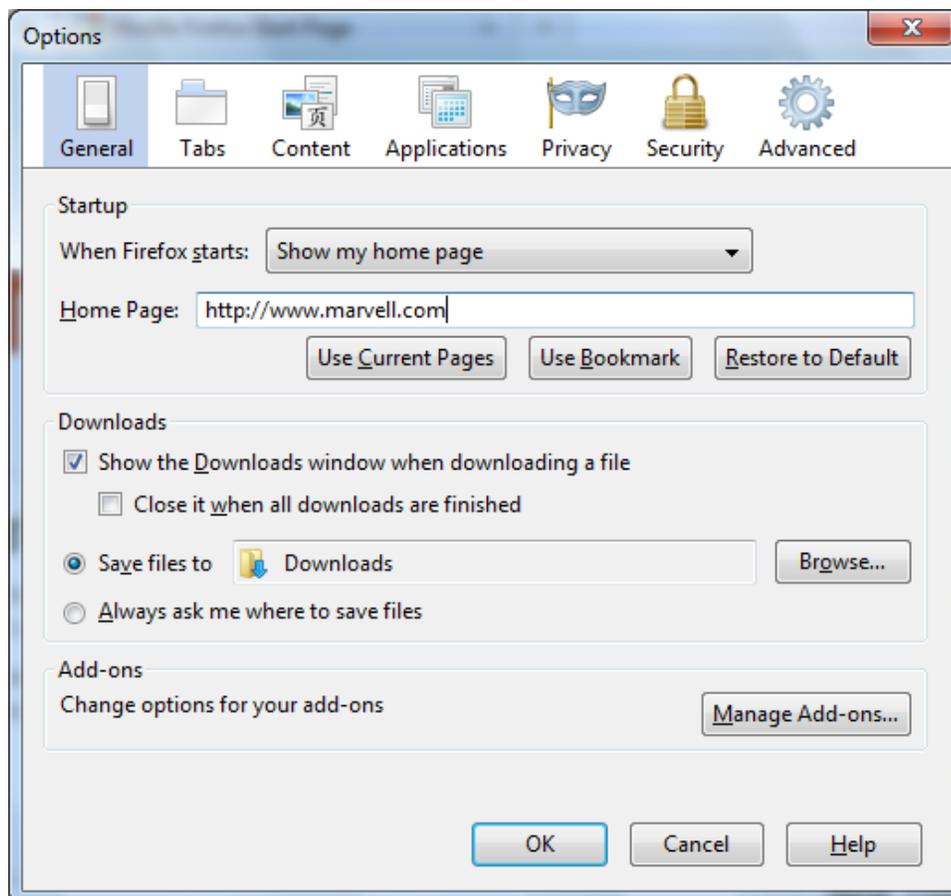
2. Select the **Content** tab, as shown in Figure 2-6.

3. As shown in Figure 2-7, **Enable Javascript** should be selected by default. Enable Javascript if it is disabled.

Figure 2-7 Content
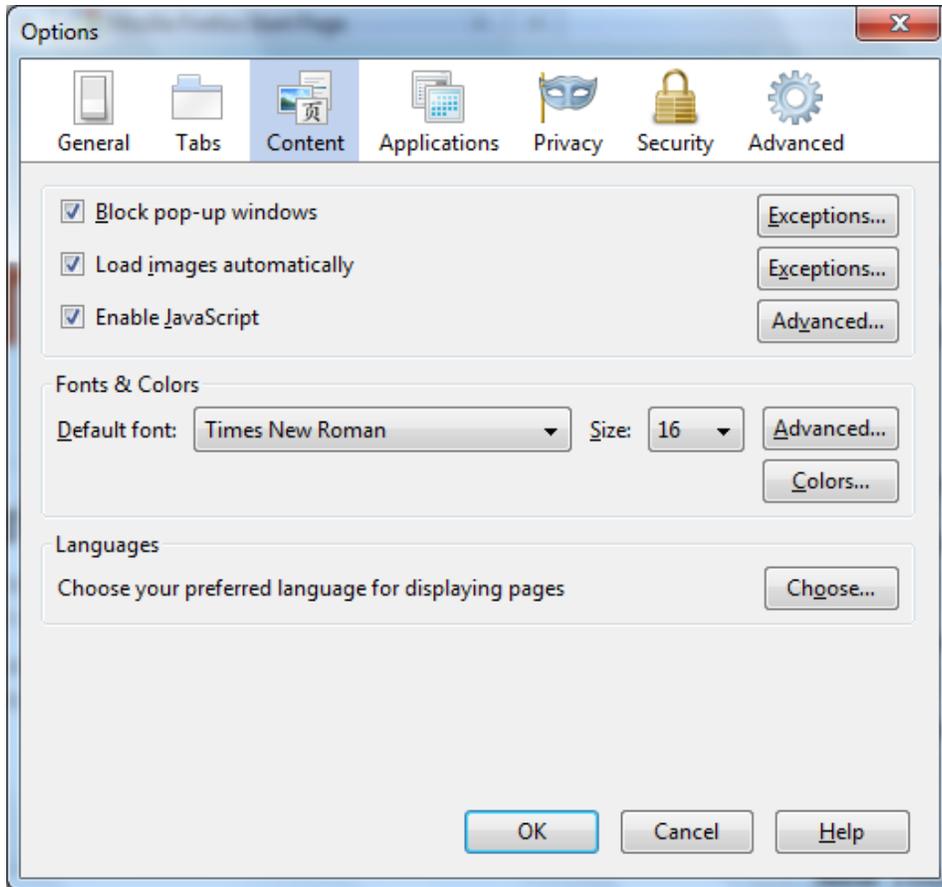
4. Select **OK** to confirm the selection.

   This closes the **Options** dialog.

2.3   Opening the MSU

This section discusses the following:

- Opening the MSU in Windows
- Tray Application for Windows

2.3.1   Opening the MSU in Windows

This section describes the procedure to open the MSU in Windows.

To open the MSU in Windows

1. Verify that Active Scripting or JavaScript is enabled in the default browser, as described in 2.2, Enabling Scripting.

2. Open the MSU.

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

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

        Figure 2-8 MSU Desktop Shortcut

        OR

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

        OR

    - Double-click the MSU Tray Application icon.

        OR

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

3. Upon opening, the **Login** page appears, as described in 2.5, Login.

To control a local 88SE91xx controller

4. By default, the MSU uses the following URL to select the default local 88SE91xx controller (if any) installed on the local system.

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

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

To control a remote RAID controller

5. Type the following URL the browser address bar.

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

    Note: Replace `ip_address` with the IP address of the remote RAID controller. Alternatively, you can use the System Name instead of the IP address in most internal network environments.

2.4   Tray Application for Windows

When the MSU opens in Windows, the Tray Application appears in the System Tray, as shown in Figure 2-9.

Figure 2-9 Tray Application

The Tray Application provides right-click menu options for controlling the MSU, as shown in Figure 2-10. The menu has options for performing the following tasks:

- ■   Accelerate Status
- ■   Open the MSU
- ■   Enable/Disable Alarm
- ■   Enable/Disable Pop-up Event Messages
- ■   View Version Information
- ■   Exit the Tray Application

Figure 2-10 Tray Application: Right-click Menu
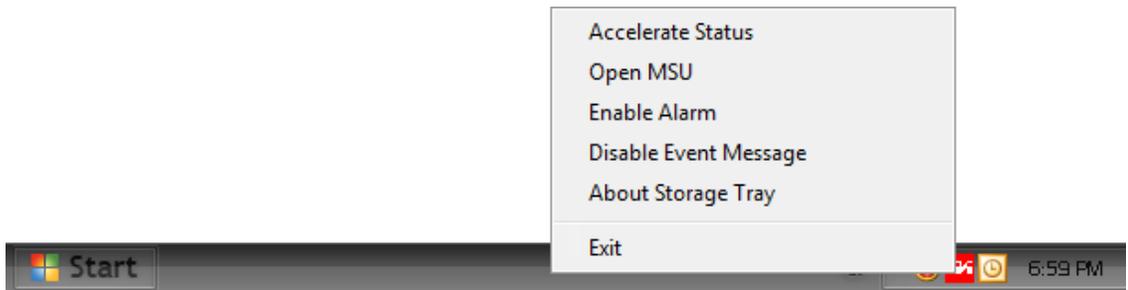
2.4.1   Accelerate Status

Select **Accelerate Status** to see a pop-up window that displays the status of a scheduled acceleration task, as shown in Figure 2-11.

Figure 2-11 Tray Application: Accelerate Status
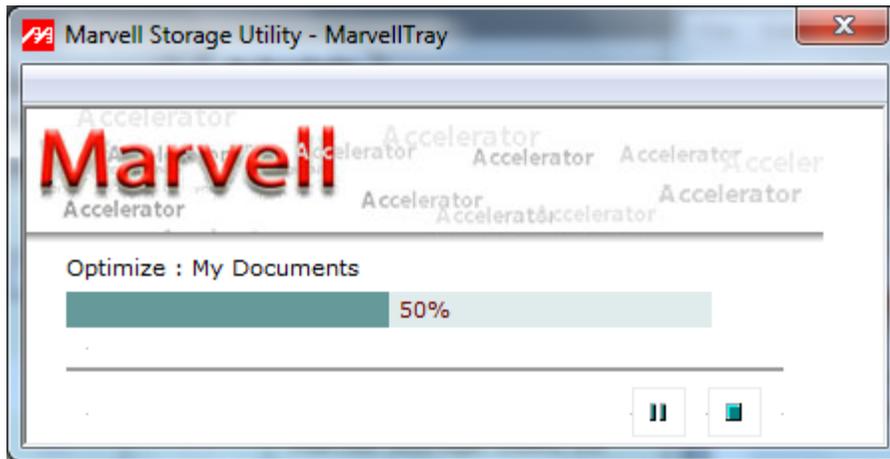
2.4.2   Open the MSU

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

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

2.4.3   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 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`.

2.4.4   Enable/Disable Pop-up Event Messages

Event messages are pop-up messages that appear above the System Tray, as shown in Figure 2-12. Event messages are enabled by default.

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

Figure 2-12 Tray Application: Pop-up Event Message

2.4.5 View Version Information

Select **About Storage Tray** to view version information for the MSU Tray Application.

2.4.6 Exit the Tray Application

Select **Exit** to exit the MSU 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 the MSU in some versions of Windows, Internet Explorer may detect a problem with the security certificate for the MSU web page, as shown in Figure 2-13. Select **Continue to this website (not recommended)**, as shown in Figure 2-13, to continue opening the MSU.

Figure 2-13 Internet Explorer: Website Security Certificate Warning
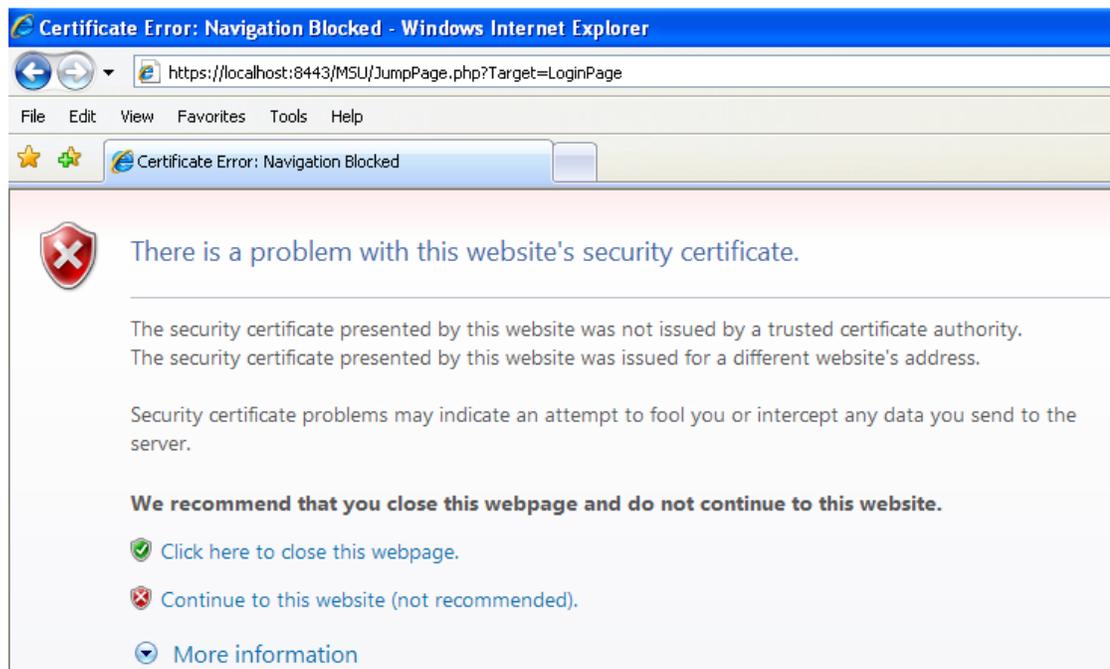
2.5.2 Login Page

Opening the MSU will take you to a login page, as seen in Figure 2-14. Use your Windows username and password to log into the MSU. If you have a username but no password, leave the password field blank.

Note: If you are on a network, preface your username with the network domain name and a backslash.

Figure 2-14 MSU Login

2.6 User Interface

The MSU user interface, as shown in Figure 2-15, contains the following three panes:

■ Marvell Storage Management

■ Properties

■ Event Logs

Figure 2-15 MSU User Interface
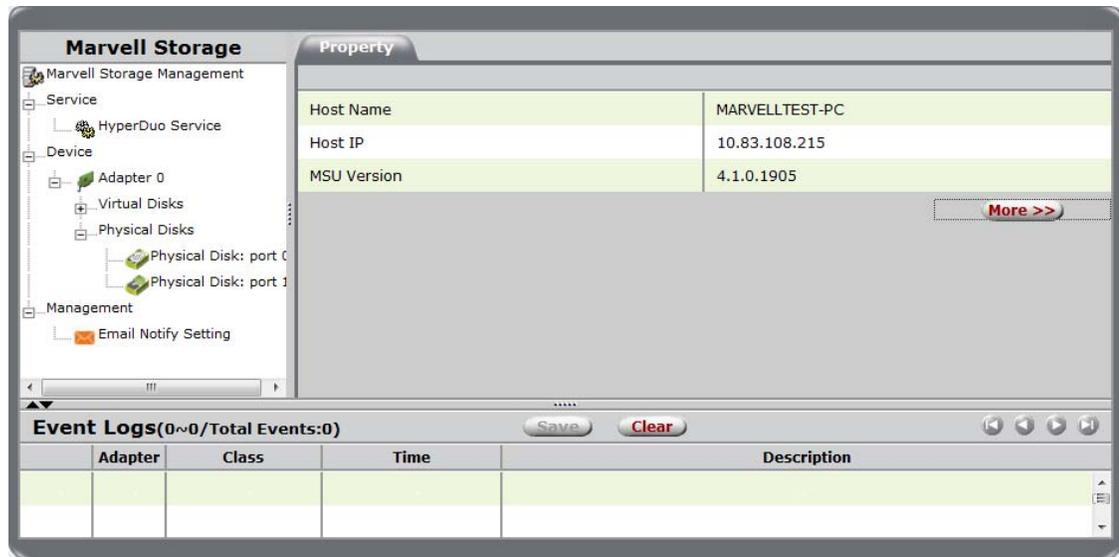
2.6.1 Marvell Storage Management

As shown in Figure 2-16, the Marvell Storage Management pane uses a *tree* view to list and show the relationships between the various physical/virtual devices attached to the system. Depending on the usage of the controller, this list includes the following devices and services:

■ Adapter

■ Physical Disk

■ Virtual Disk

■ HyperDuo Service

■ Email Notify Setting

Figure 2-16 Marvell Storage Management Pane
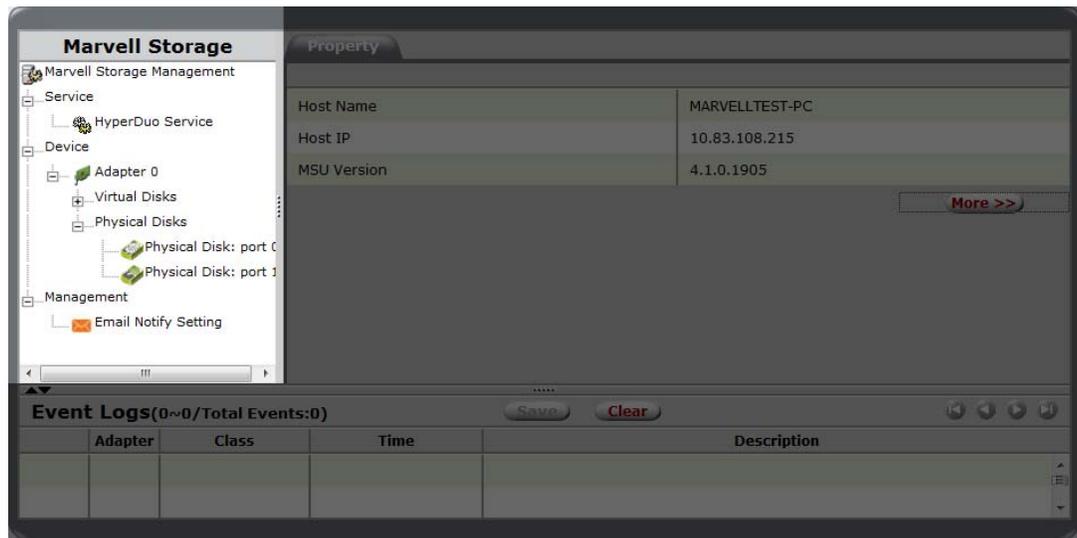
2.6.2   Properties

As shown in Figure 2-17, 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.

- **Operation**

  Roll-over the Operation tab to view a menu of operations that can be performed on the device selected in the System pane.

- **Programs**

  This tab allows you to configure the virtual disk.

- **Schedule**

  This tab allows you to schedule regular maintenance tasks.

Figure 2-17 Properties Pane
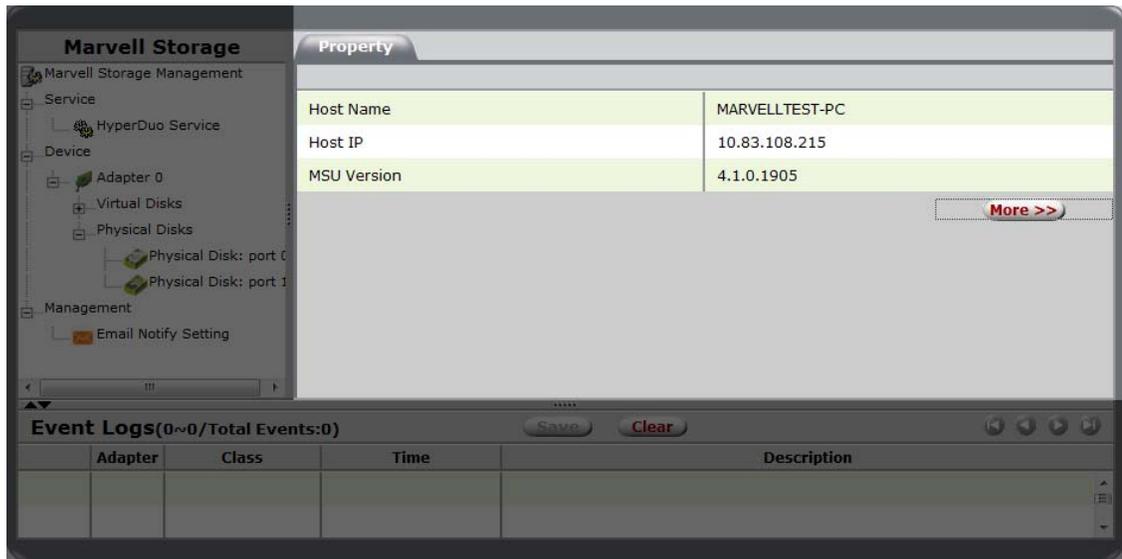
2.6.3   Event Logs

As shown in Figure 2-18, 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 the MSU.

Figure 2-18 Event Logs Pane
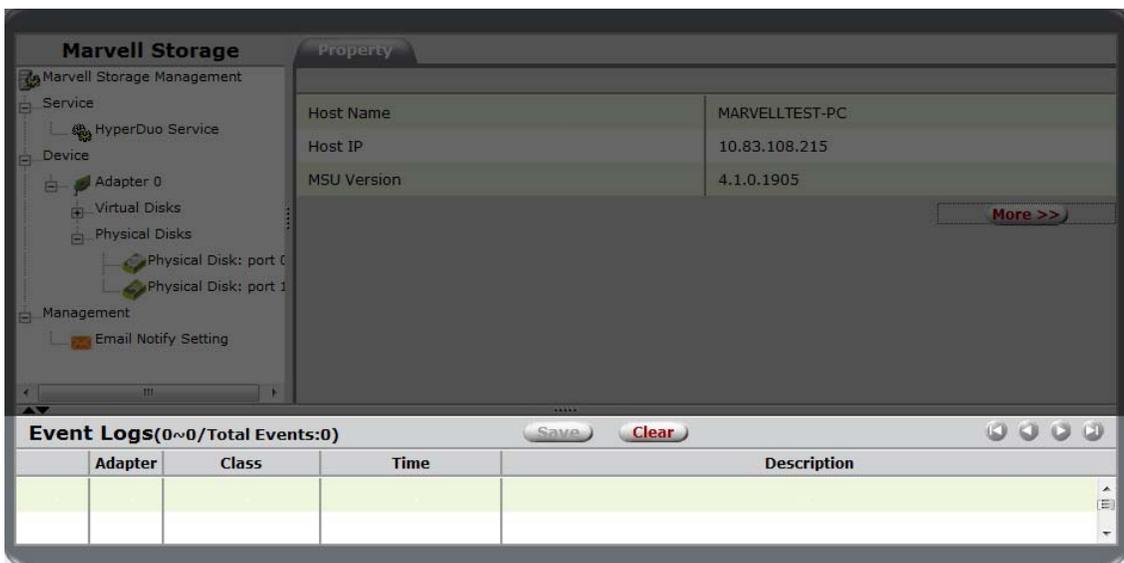
2.7   Logout

Select **Logout**, as shown in Figure 2-19, to logout of the MSU.

Figure 2-19 MSU Logout

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

3 RAID

This chapter contains the following sections:

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

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3.1　Overview

This chapter describes RAID functionality in the MSU for Marvell 88SE91xx controllers.

Note: RAID is supported by some, but not all, Marvell 88SE91xx controllers. To find out if your controller supports RAID, refer to the controller or HBA documentation. RAID options only appear in the MSU for controllers that have RAID support.

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 RAID virtual disk that is optimized for either best read/write performance or best fault tolerance (reliability).

Note: This section is particularly useful if you are new to RAID technology and are not sure about which RAID level to use.

To quickly create virtual disk optimized for performance/reliability

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

Figure 3-1 Quick Create Wizard
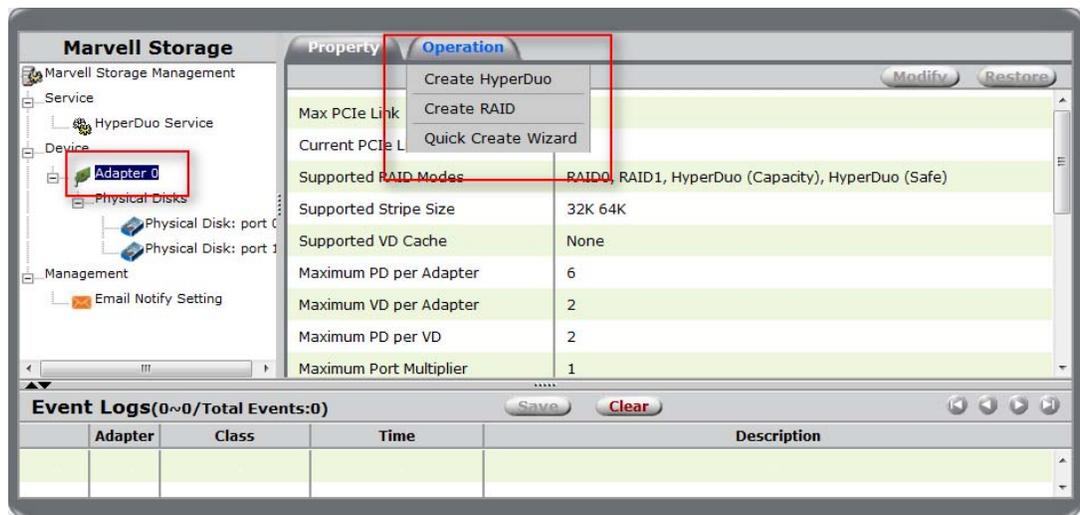
Figure 3-2 Create Options
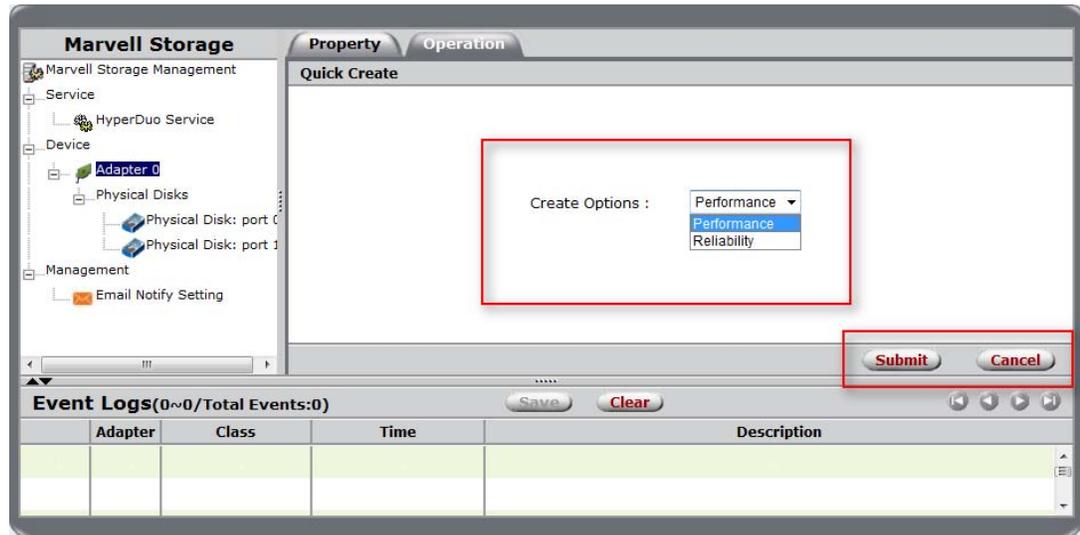
3. Select one of the following options:

- **Performance** creates a virtual disk that is optimized for best read and write performance.
- **Reliability** creates a virtual disk that is optimized for best fault tolerance.

Based on the performance/reliability selection and the capabilities of the RAID controller, the MSU creates a suitable virtual disk using some or all available physical disks.

4. After creating the virtual disk, the MSU displays the **Property** tab for the new **Virtual Disk**, as shown in Figure 3-3.

Figure 3-3 VD Created
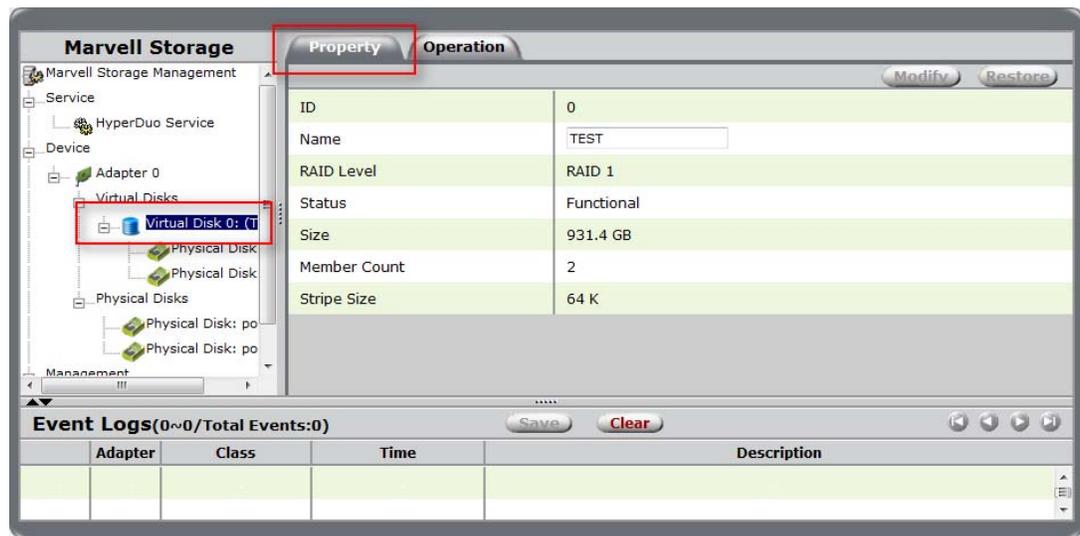
3.2.2 Customizing Virtual Disk for your Application

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

WARNING Creating a RAID virtual disk destroys all data on the physical disks included in the virtual disk. Make sure to back up all data before continuing.

To create a custom virtual disk most suitable for your application

1. Select **Adapter**.

2. Roll-over the **Operation** tab, and select **Create RAID**, as shown in Figure 3-4.

   The **Create New VD** screen appears, as shown in Figure 3-5.

   Figure 3-4 Create RAID
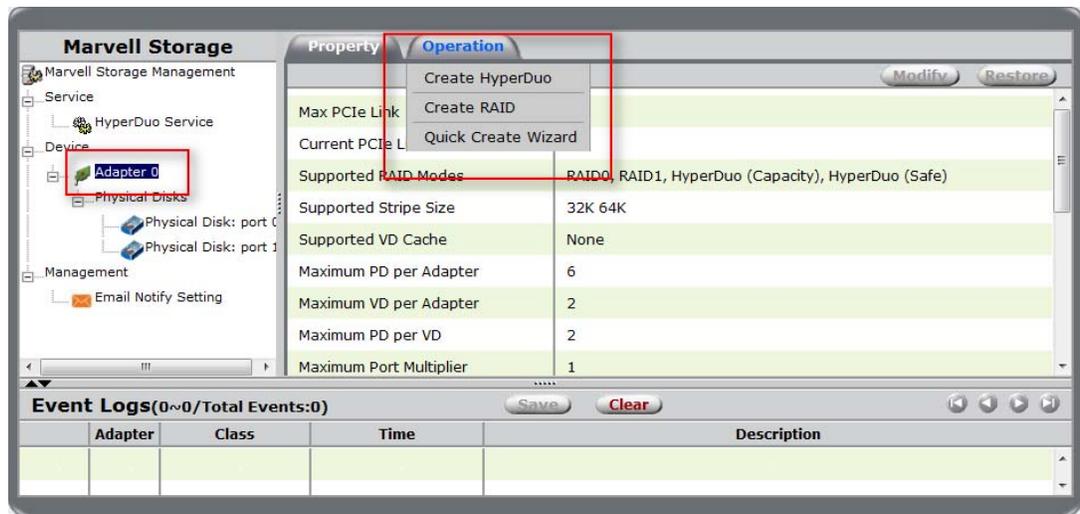
3. Click the **Select RAID Level** dropdown to select the RAID level most suitable for your application, as shown in Figure 3-5.

   Note: For information on RAID levels, see Appendix B, Selecting a RAID Level.

Figure 3-5 Select RAID Level
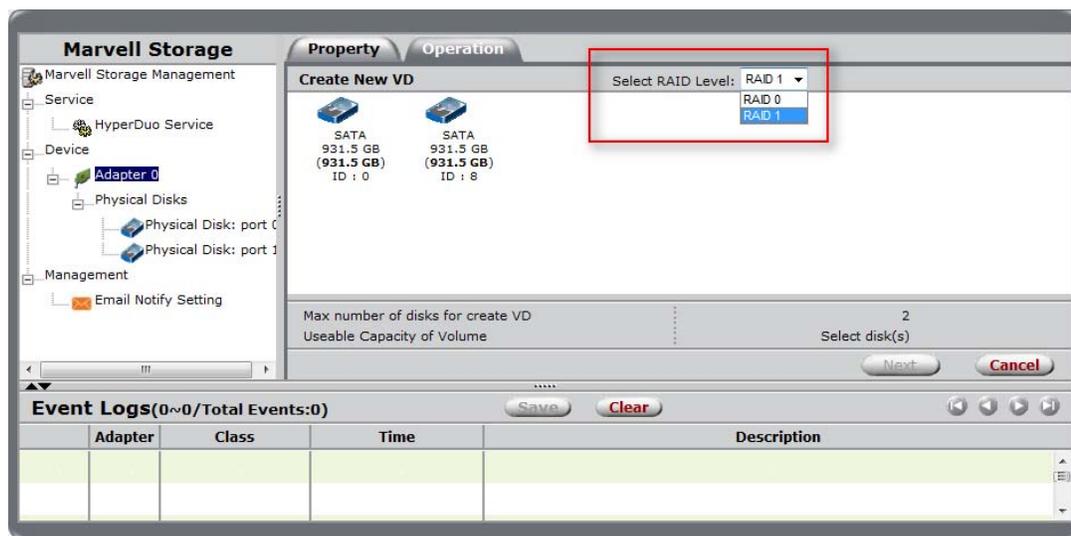
Figure 3-6 Select Physical Disks
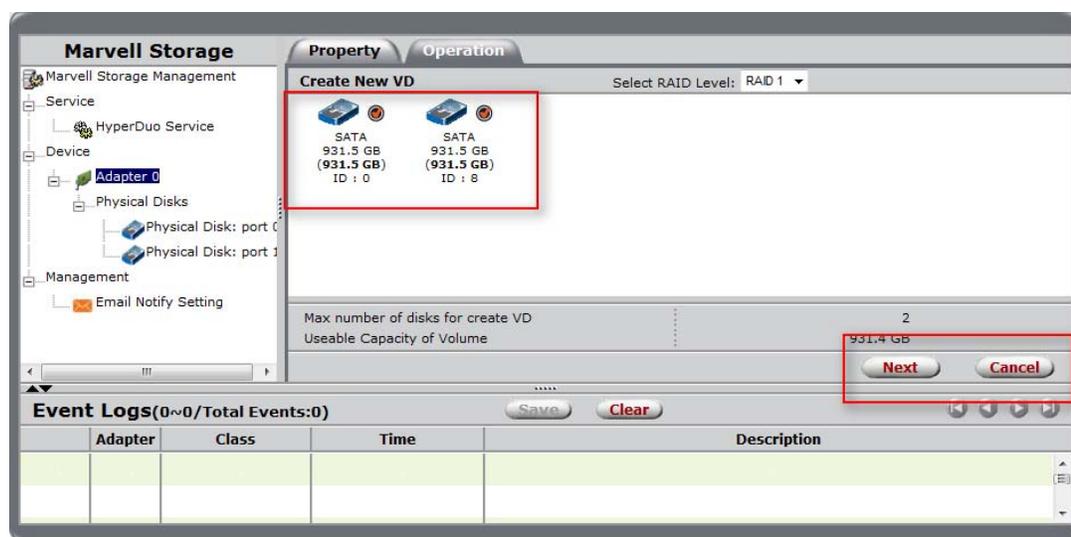
4. After selecting the physical disks, select **Next** as shown in Figure 3-6.

The **Create New VD** screen now presents options to configure the virtual disk, as shown in Figure 3-7.

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

Figure 3-7 Create New VD
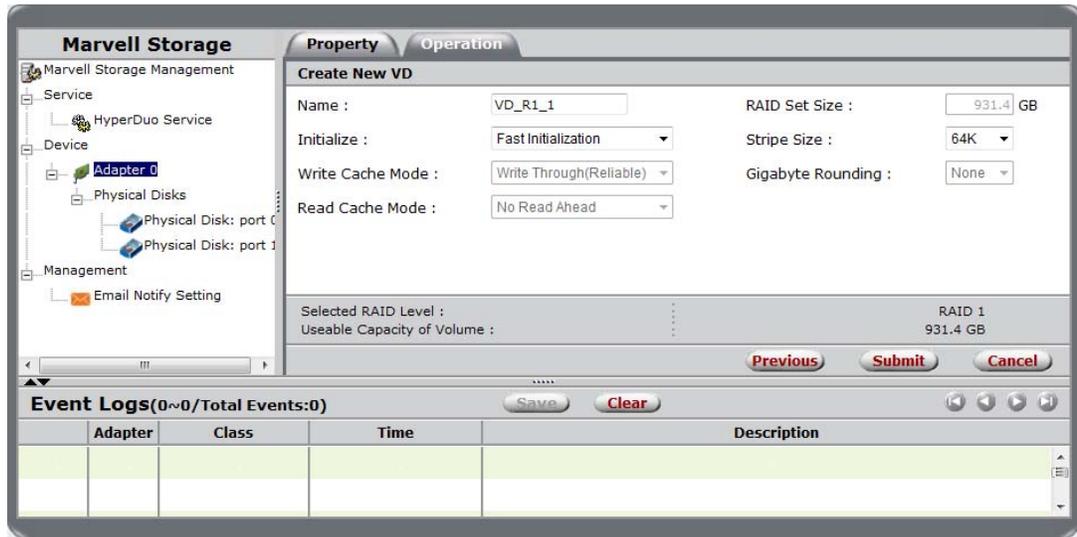
5. The MSU assigns a default name to the virtual disk. To rename the virtual disk, click the **Name** field and type a new name.

6. Select the **Initialization** method for the virtual disk, as shown in Figure 3-8.

Figure 3-8 Initialization
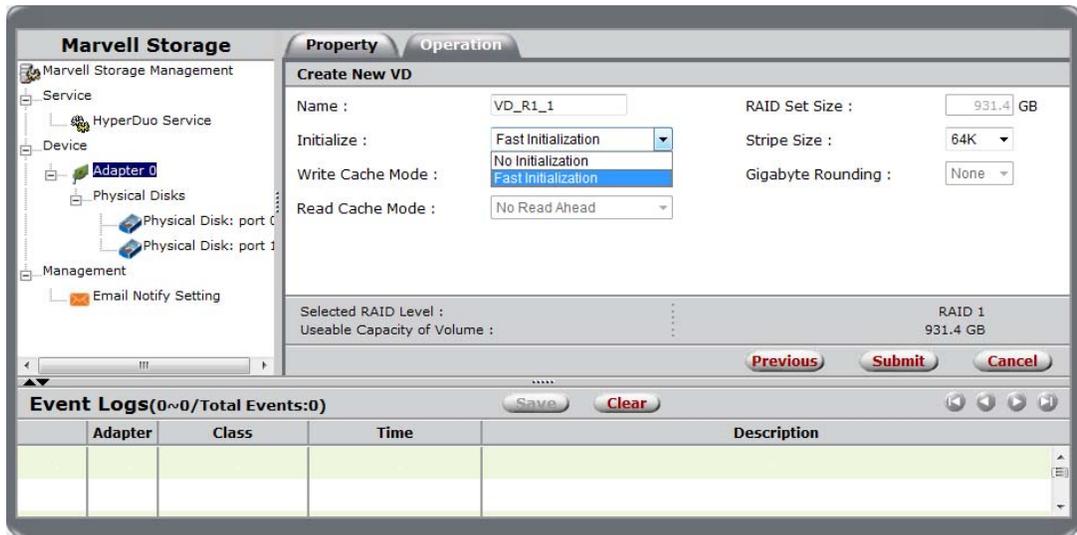
7. Select **Stripe Size** for the virtual disk, as shown in Figure 3-9.

Note: Available stripe sizes vary by controller.

Creating Virtual Disk   **3-7**

Figure 3-9 Stripe Size
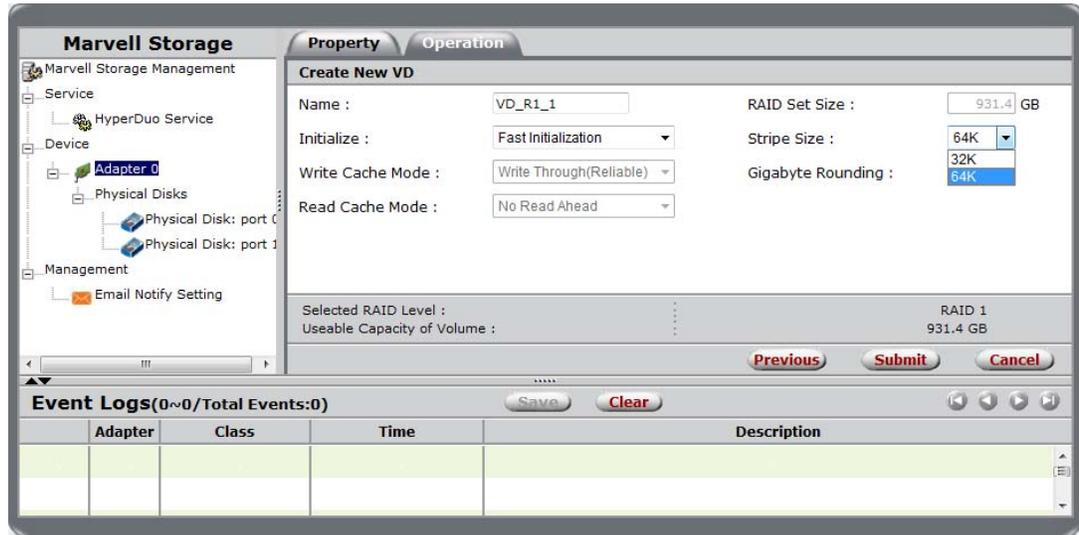
8. Select **Submit** to create the virtual disk.

The MSU creates the virtual disk and displays the **Property** tab for the new virtual disk, as shown in Figure 3-10.

Figure 3-10 VD Created
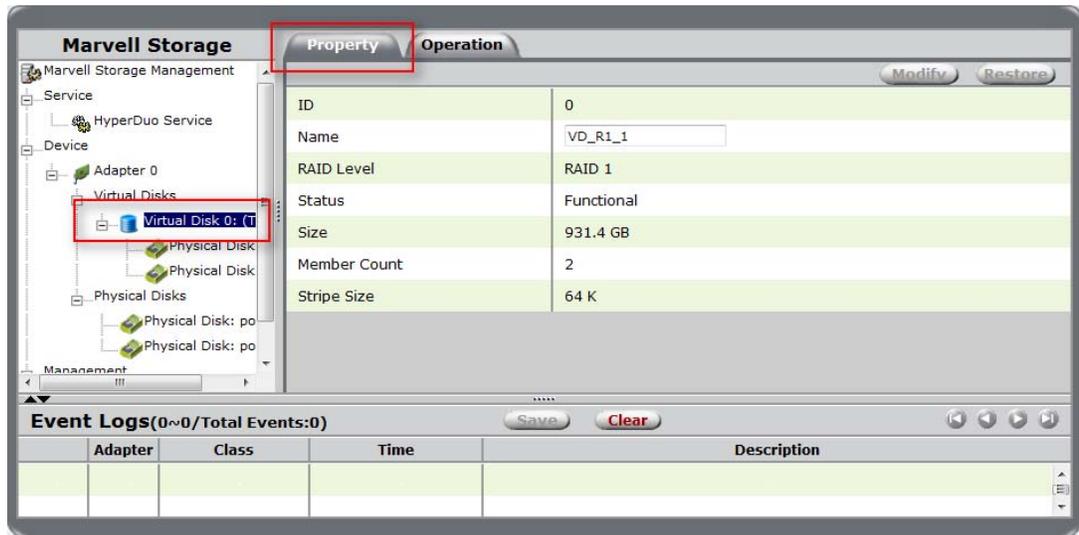
3.3   Managing Virtual Disk

This section discusses the following:

- Viewing Properties of Virtual Disk
- Renaming Virtual Disk

3.3.1   Viewing Properties of Virtual Disk

To view the properties of a virtual disk, select the Virtual Disk in the list of system devices, as shown in Figure 3-11. Upon selection, the MSU displays the **Property** tab for the virtual disk.

Figure 3-11 Properties of Virtual Disk
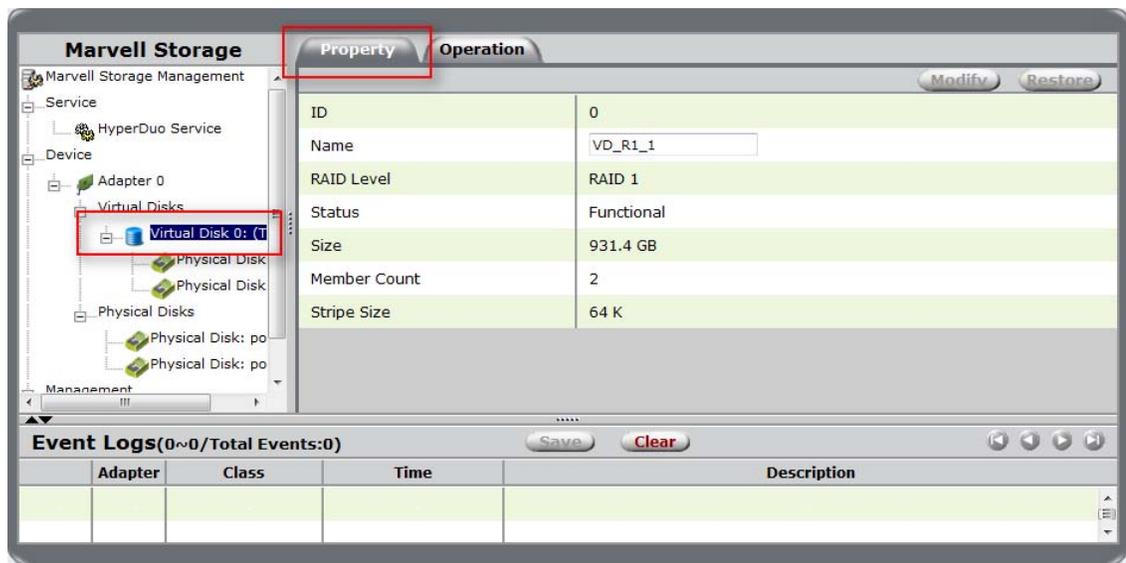
3.3.2 Renaming Virtual Disk

The virtual disk can be renamed by selecting the **Name** field in the **Property** tab for the **Virtual Disk,** as shown in Figure 3-12. Type a new name in the field, and select **Modify** to confirm changes.

Figure 3-12 Renaming Virtual Disk
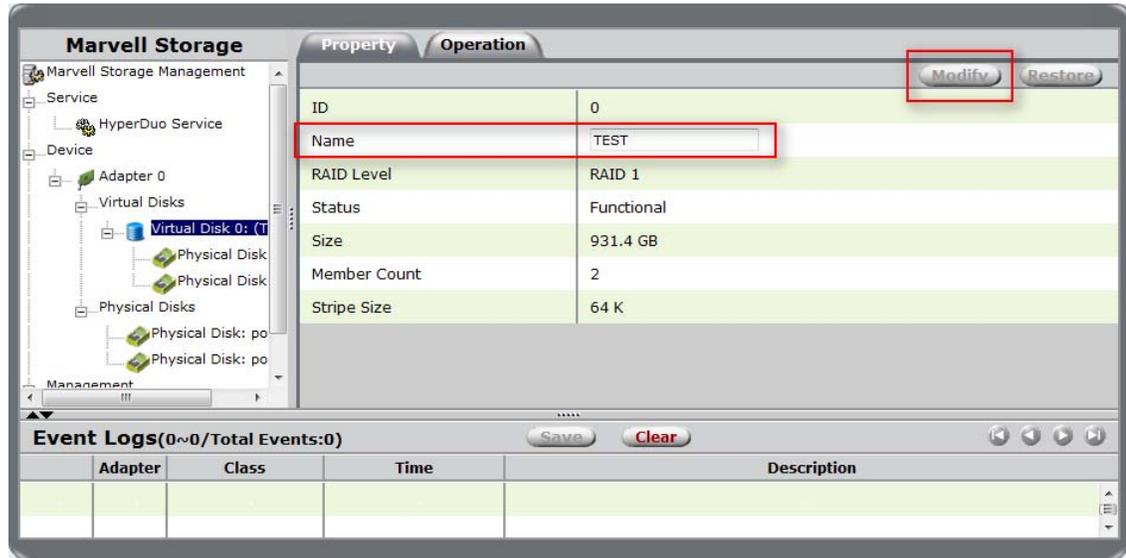
Note: Modify is grayed-out until the settings change.

3.4 Managing Physical Disks

This section discusses the following:

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

3.4.1 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 3-13. Upon selection, the MSU displays the **Property** tab for the physical disk.

Figure 3-13 Properties of Physical Disk
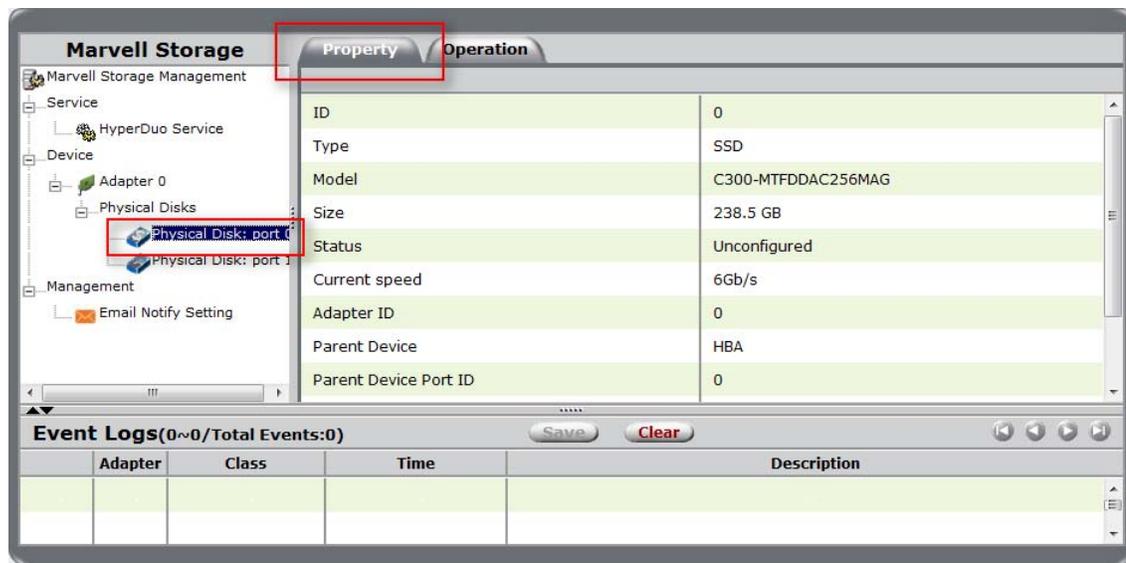
Note: The properties of a physical disk cannot be edited.

3.4.2 Erasing RAID Configuration Data on Foreign Physical Disk

This section describes the procedure for erasing 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 from the physical disk before it can be used with another virtual disk.

WARNING When erasing a foreign configuration from a physical disk, all data on that disk is erased. If the physical disk was originally part of another virtual disk, erasing RAID configuration data may damage that virtual disk.

To erase RAID configuration data

1. Select the foreign **Physical Disk** in the list of system devices, as shown in Figure 3-14.

2. Roll over the **Operation** tab and select **Erase Foreign Configuration**, as shown in Figure 3-14.

Figure 3-14 Erasing RAID Configuration Data on Physical Disk

Managing Physical Disks
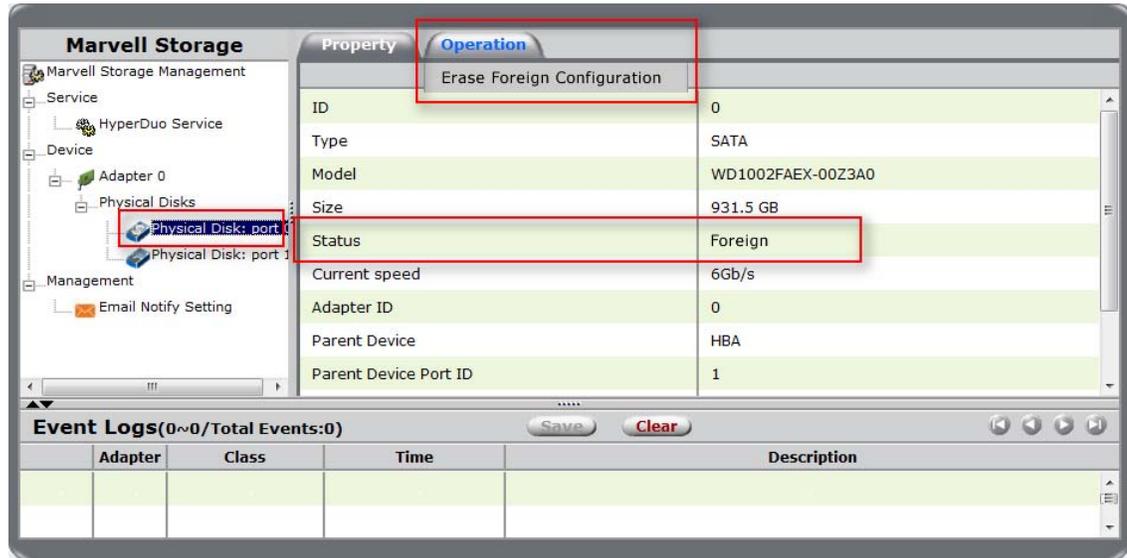
3.5 Monitoring Virtual Disk

This section discusses the following:

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

3.5.1 Receiving Email Event Notifications

This section describes the procedure to configure the MSU to send event notifications to a user's email account.

Note: This requires a working SMTP email server.

To configure email event notifications

1. Select **Email Notify Setting**, as shown in Figure 3-15.

2. Configure the email server settings and select **Test setting**, as shown in Figure 3-15.

   The MSU sends a test email to the configured email address. If the test email is received, the settings are working correctly.

3. Select **Submit** to save settings.

   The MSU confirms changes with the message **Setting updated successfully!**

   Figure 3-15 Email Notify Setting
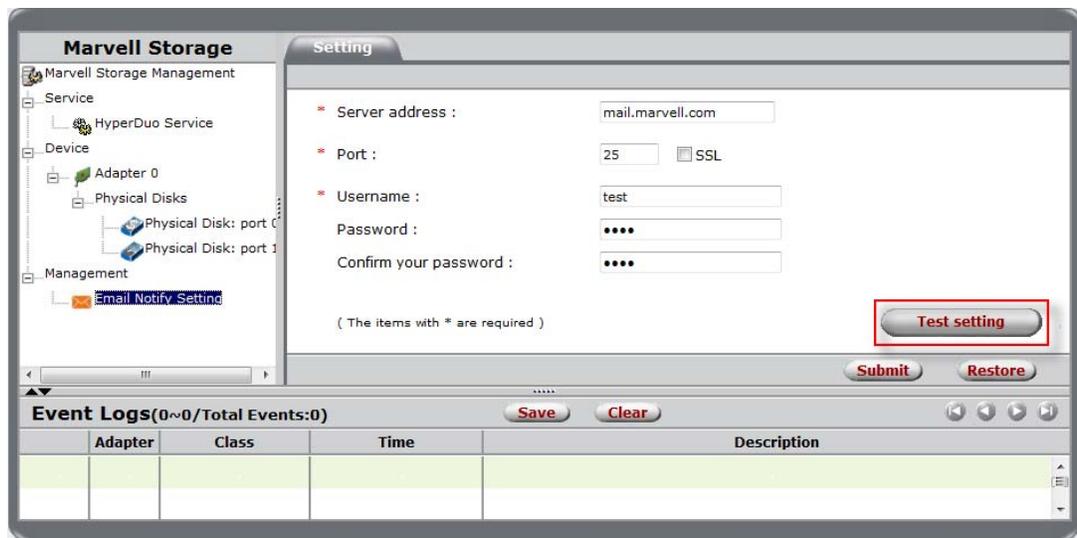
3.5.2 Viewing Events using Windows Event Viewer

Note: This section applies to Windows operating systems only.

Because adapter events are triggered by the Windows driver, events in the MSU can also be viewed in the Windows Event Viewer.

To view events in the Windows Event Viewer

1. From the **Start** menu, right-click **My Computer** (in XP or 2003) or **Computer** (in Vista, 2008, or 7) and select **Manage**.

   The **Computer Management** utility appears, as shown in Figure 3-16.

2. Browse to **System Tools > Event Viewer > System** (in XP or 2003) or **System Tools > Event Viewer > Windows Logs > System** (in Vista, 2008, or 7) to view all system events including those of the MSU, as shown in Figure 3-16.

   Figure 3-16 Event Viewer (Windows 7)
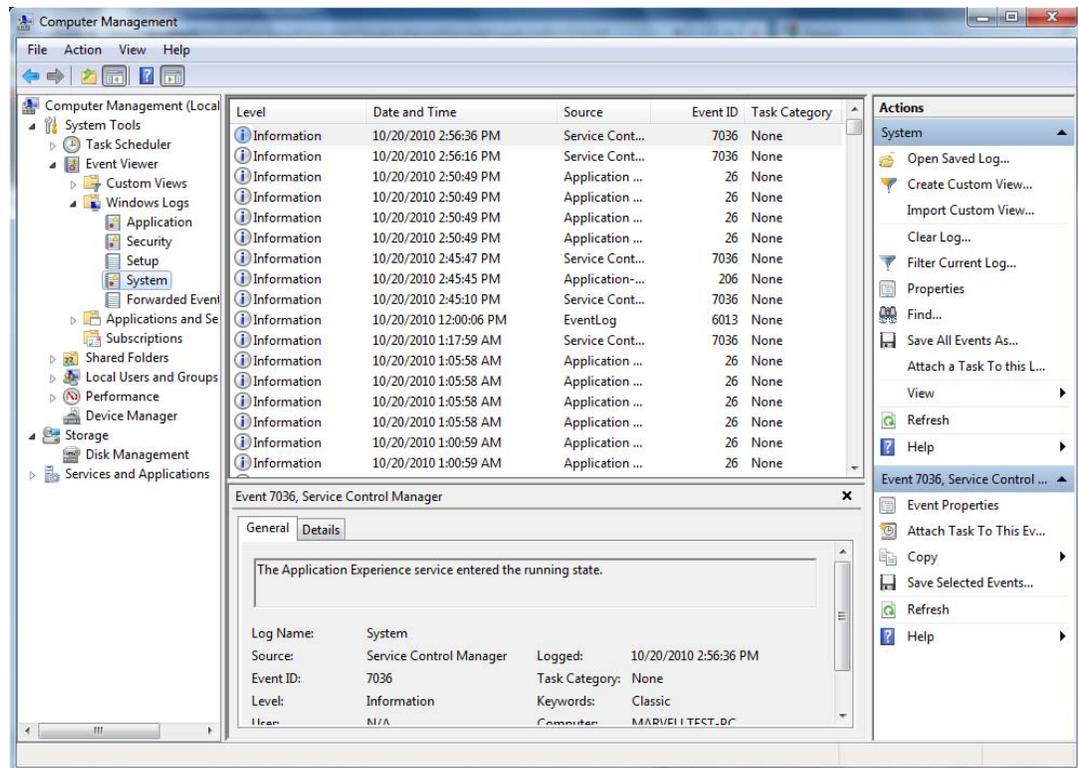
3.5.3 Enabling Alarm for Critical Events

The MSU 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 or disabled using the Tray Application, as shown in Figure 3-17.

Figure 3-17 Enabling Alarm using Tray Application
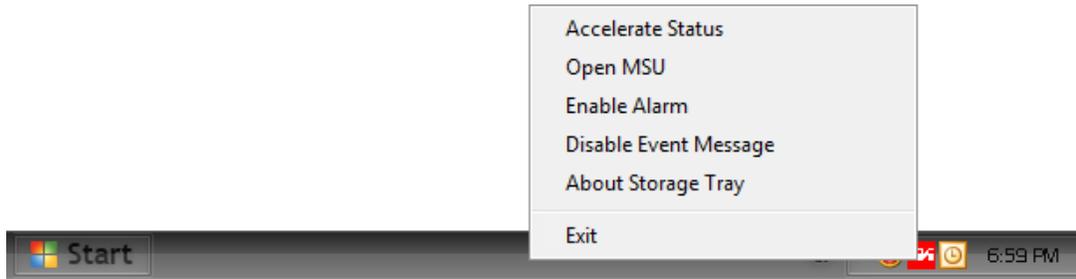
3.6   Rebuilding Degraded Virtual Disk

At this time, the MSU cannot initiate, pause, resume, stop, or complete rebuilding of virtual disks. To rebuild virtual disks created with 88SE91xx, use the BIOS as described in Appendix A, BIOS Utility.

3.7 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**, as shown in Figure 3-18.

    Figure 3-18 Delete VD
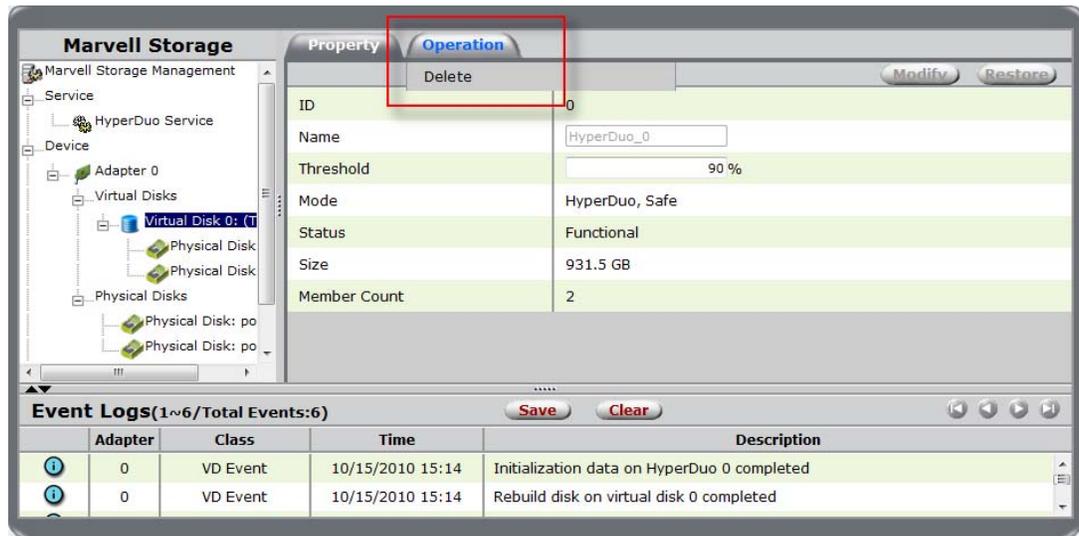
3. The MSU displays the warning **All data on this virtual disk will be erased once it is deleted!**

    Select **OK** to acknowledge the warning.

4. The MSU 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. The MSU 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.

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4 **HYPERDUO**

This chapter contains the following sections:

- Overview
- Creating HyperDuo Virtual Disk
- Managing HyperDuo Virtual Disk
- Monitoring HyperDuo Virtual Disk
- Rebuilding Degraded Virtual Disk
- Deleting HyperDuo Virtual Disk

Doc No. MV-S800768-00 Rev. -

4.1   Overview

This chapter describes HyperDuo functionality in the MSU for Marvell 88SE91xx SATA controllers.

Note: HyperDuo is supported by some, but not all, Marvell 88SE91xx controllers. To find out if your controller supports HyperDuo, refer to the controller or HBA documentation.

4.2 Creating HyperDuo Virtual Disk

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

Note: A HyperDuo virtual disk must contain one HDD and one SSD.

To quickly create virtual disk optimized for performance/reliability

1. Select **Adapter**.

2. Roll-over the **Operation** tab and select **Create HyperDuo**, as shown in Figure 4-1.

   The **Create HyperDuo** screen appears, as shown in Figure 4-2.

   Figure 4-1 Create HyperDuo
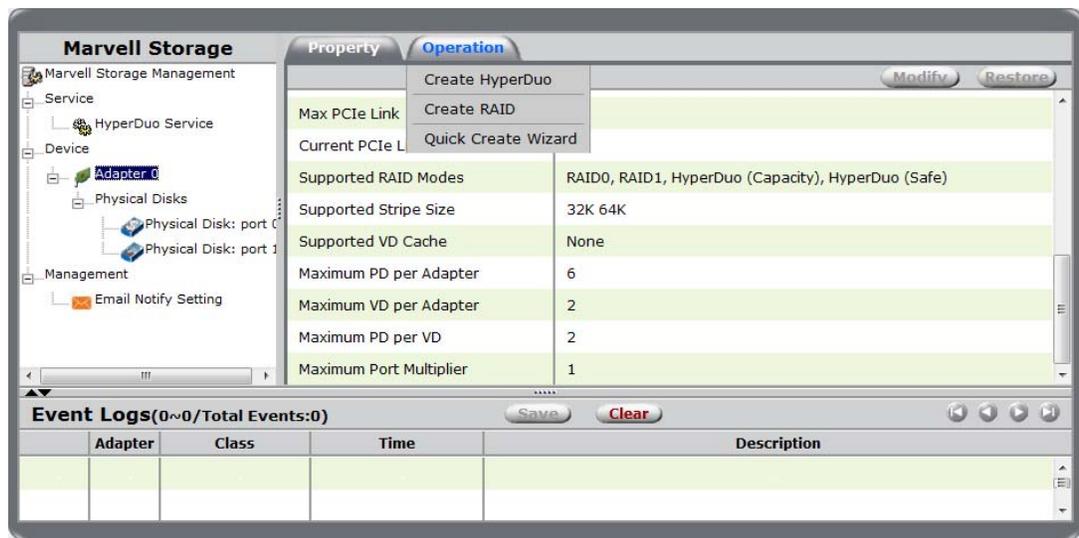
3. Select one of the following options, as shown in Figure 4-2:

   - **Safe** mode creates a virtual disk that is optimized for best fault tolerance. It is safe to use with hard drives that contain existing data. Virtual disks created in safe mode can also be partially rebuilt if the SSD fails, but not if the HDD fails.

   - **Capacity** mode creates a virtual disk that is optimized for maximum utilization of the SSD. Virtual disks created in capacity mode have better read and write performance than those created in safe mode. However, they cannot be rebuilt.

   WARNING Capacity mode is a data-destructive process. Please back up all data before using capacity mode.

4. Select **Sync SSD Data** to copy the data currently on your HDD to the SSD.

   Note: Sync SSD Data is only available in Safe mode.

5. Enter a number between 10-100 in the **Threshold(%)** field.

   The **Threshold(%)** number defines the percentage of your SSD the MSU uses to optimize performance. The default is 90.

Figure 4-2 Create HyperDuo Screen
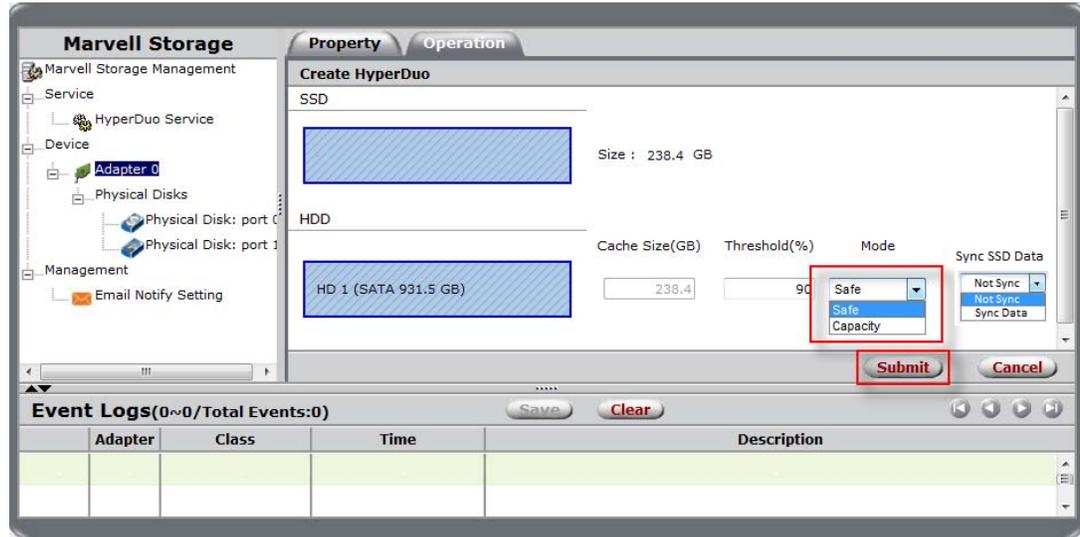
6. Press **Submit**.

   The MSU displays the **Property** tab for the HyperDuo virtual disk and begins initialization, as shown in Figure 4-3. This can take up to 30 minutes to complete. System performance may slow during this period.

Figure 4-3 Initialization
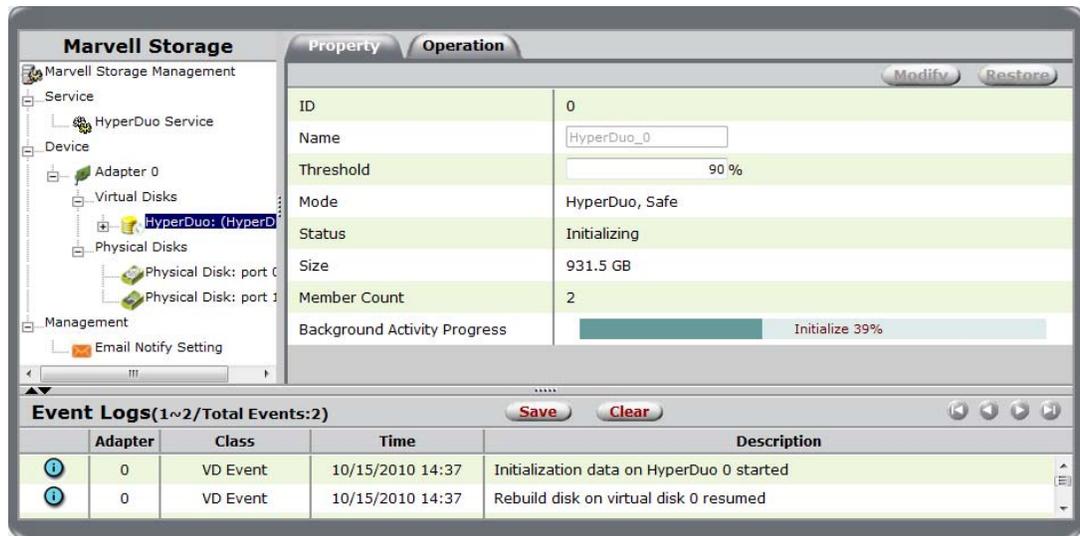
4.3 Managing HyperDuo Virtual Disk

This section describes procedures for customizing your HyperDuo virtual disk.

To add folders for HyperDuo optimization

1. Select **HyperDuo Service**.

2. Select **Advanced**.

   The **Customize Wizard** window appears, as shown in Figure 4-4.

3. Navigate to the folders you want to add.

   - Click a folder name to go to its subfolder.

   - Click the green button with the white arrow to return to a parent folder.

4. Check folders to select them, as shown in Figure 4-4.

5. Click **Next** to add selected folders.

6. Review the folders. Select the red X beside a folder or file to remove it.

7. Select **Submit** to save settings.

Figure 4-4 Customize Wizard
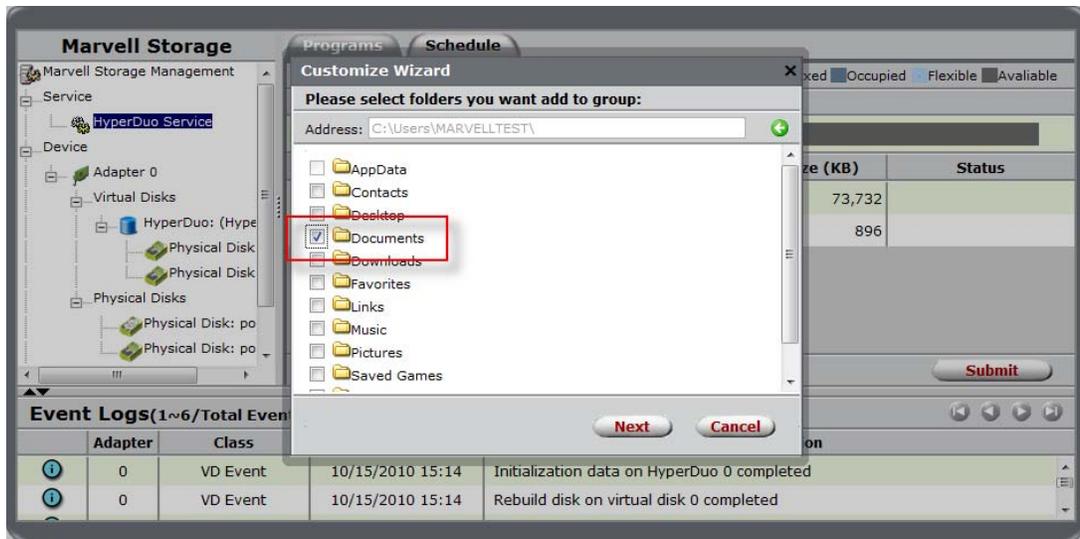
To change method of optimization

1. Select **HyperDuo Service**.

2. Check folders or programs, as shown in Figure 4-5.

   - Check **Auto** to have the MSU manage the optimization of a folder or program automatically.

   - Check **Cache** to manually select a folder or program for optimization.

   - Check neither to specify that a folder or program should never be optimized.

3. Select **Submit** to commit changes, as shown in Figure 4-5.

---

4. Select **OK** in the pop-up that follows.

The MSU begins optimization, as shown in Figure 4-6.

Figure 4-5 Check Methods of Optimization
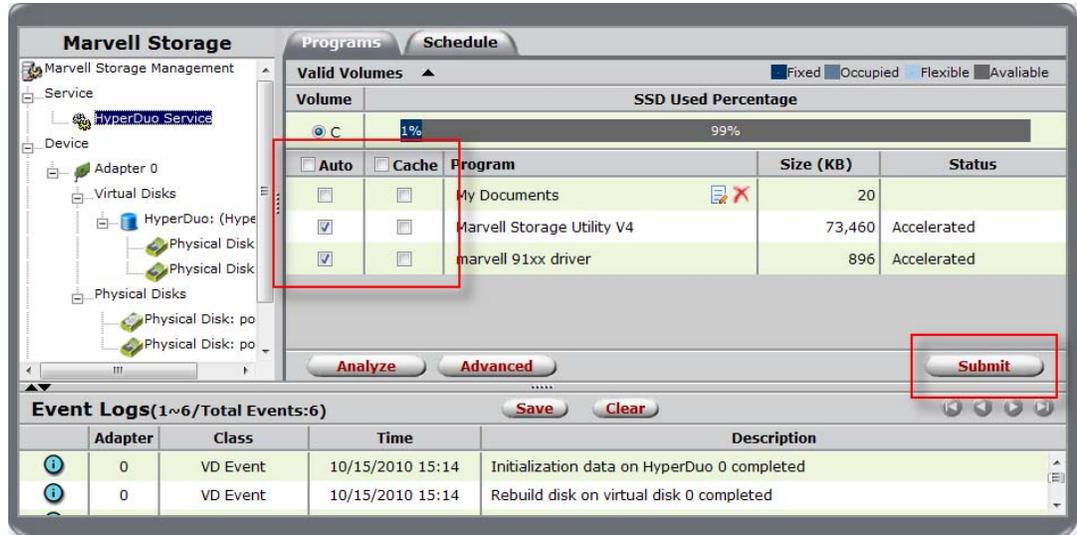
Figure 4-6 Optimization in Progress
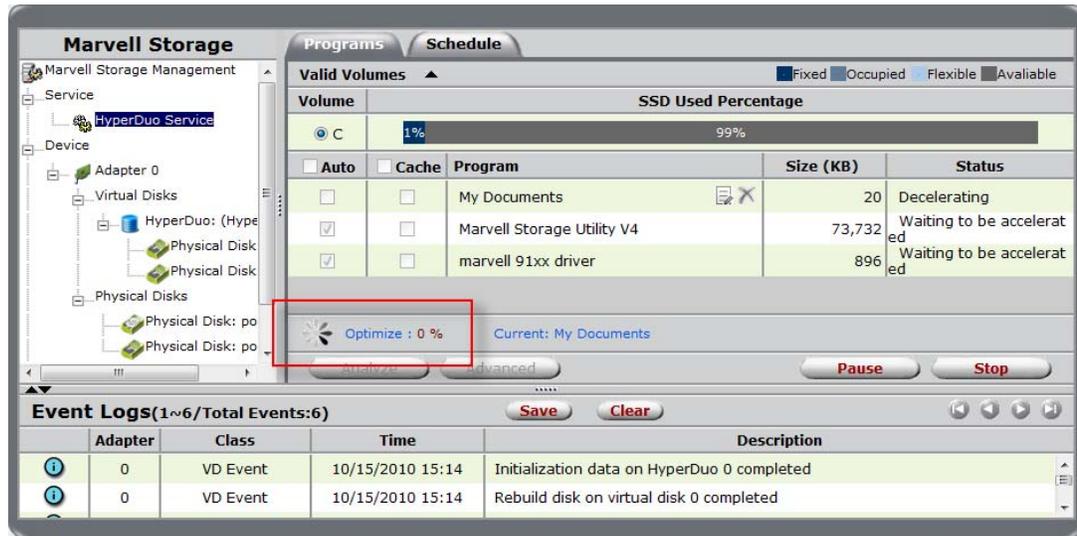
4.4 Monitoring HyperDuo Virtual Disk

This section discusses the following:

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

### 4.4.1 Receiving Email Event Notifications

This section describes the procedure to configure the MSU to send event notifications to a user's email account.

Note: This requires a working SMTP email server.

To configure email event notifications

1. Select **Email Notify Setting**, as shown in Figure 4-7.
2. Configure the email server settings and select **Test setting**, as shown in Figure 4-7.

   The MSU sends a test email to the configured email address. If the test email is received, the settings are working correctly.
3. Select **Submit** to save settings.

   The MSU confirms changes with the message **Setting updated successfully!**

Figure 4-7 Email Notify Setting
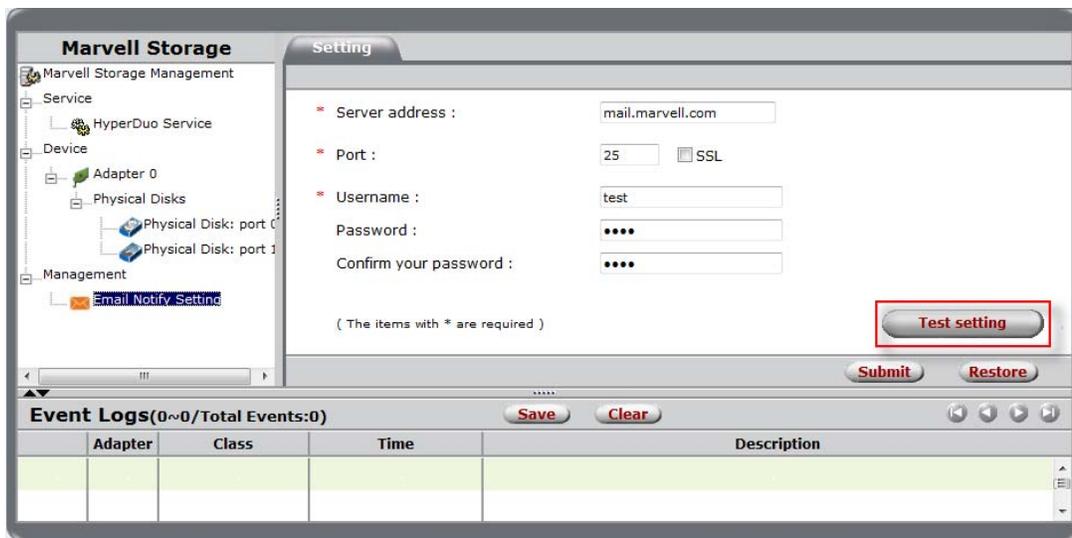
4.4.2 Viewing Events using Windows Event Viewer

Note: This section applies to Windows operating systems only.

Because adapter events are triggered by the Windows driver, events in the MSU can also be viewed in the Windows Event Viewer.

To view events in the Windows Event Viewer

1. From the **Start** menu, right-click **My Computer** (in XP or 2003) or **Computer** (in Vista, 2008, or 7) and select **Manage**.

    The **Computer Management** utility appears, as shown in Figure 4-8.

2. Browse to **System Tools > Event Viewer > System** (in XP or 2003) or **System Tools > Event Viewer > Windows Logs > System** (in Vista, 2008, or 7) to view all system events including those of the MSU, as shown in Figure 4-8.

    Figure 4-8 Event Viewer (Windows 7)
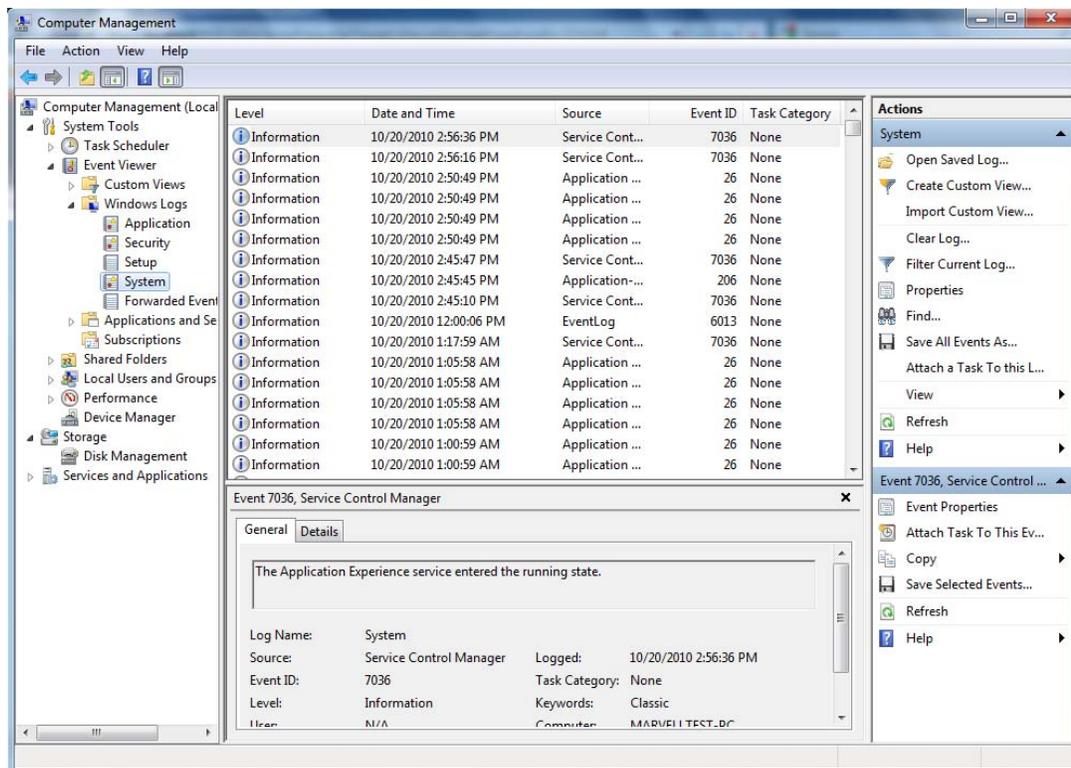

4.4.3   Enabling Alarm for Critical Events

The MSU 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 or disabled using the Tray Application, as shown in Figure 4-9.

Figure 4-9 Enabling Alarm using Tray Application
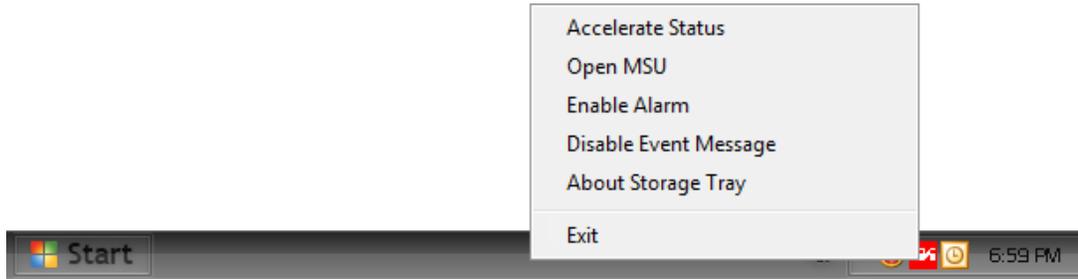
4.5 Rebuilding Degraded Virtual Disk

At this time, the MSU cannot initiate, pause, resume, stop, or complete rebuilding of virtual disks. To partially rebuild HyperDuo virtual disks created with 88SE91xx, use the controller BIOS as described in Appendix A, BIOS Utility.

A HyperDuo virtual disk can be partially rebuilt only if the following conditions are true:

- The virtual disk was created in Safe mode. Capacity mode does not support the rebuilding of virtual disks.
- The SSD was the only physical disk that failed. If the HDD failed, or if both drives failed, the virtual disk cannot be rebuilt.

4.6 Deleting HyperDuo Virtual Disk

This section describes the procedure for deleting a HyperDuo 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 **HyperDuo** from the **Virtual Disks** menu under **Adapter**. The **Property** tab for the HyperDuo virtual disk appears.

2. Roll over the **Operation** tab and select **Delete**, as shown in Figure 4-10.

Figure 4-10 Delete
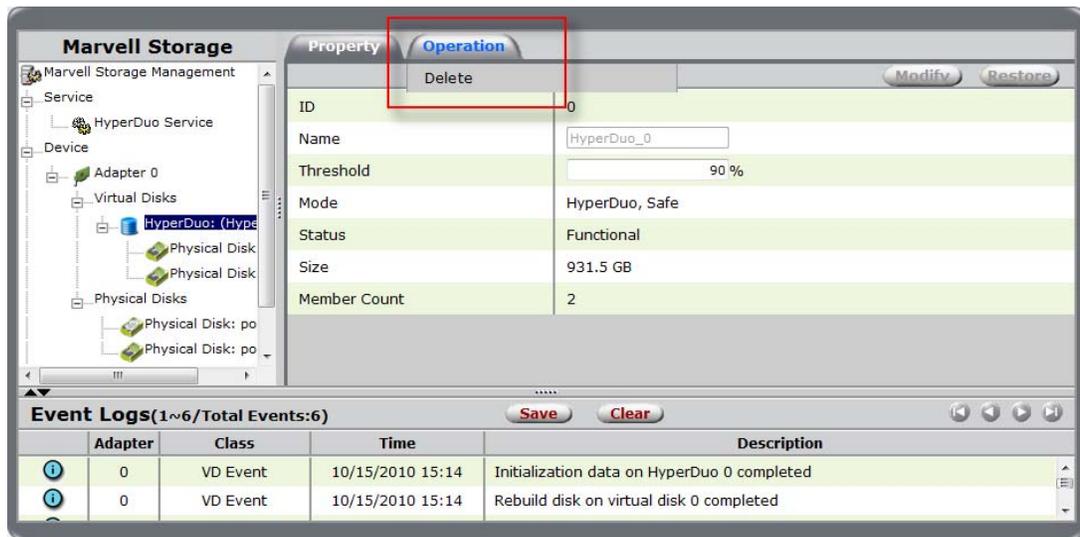
3. The MSU requests confirmation of deletion with a pop-up message: **Are you sure you want to delete this HyperDuo?**

   Select **OK** to confirm deletion.

4. The MSU 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 it.

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A BIOS UTILITY

This appendix contains the following sections:

- Overview
- Launching 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 Functionality

A.1.1 Supported Controllers

The BIOS utility supports 88SE91xx controllers with on-board CPU.

A.1.2 Supported Functionality

Table A-1 lists the functionality supported by the BIOS.

Table A-1 Supported Functionality

Feature	Description
RAID Levels	RAID 0 and RAID 1
HyperDuo Modes	Safe Mode and Capacity Mode
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 and Safe Mode

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

Table A-2 lists the keyboard controls for launching the BIOS during the controller's Power-On Self Test (POST).

Table A-2 Launching the BIOS

Key	Function
Ctrl + **M**	Launch the Marvell BIOS Utility Press the key combination during the controller's POST. *Note: You may have to wait a few seconds for the Marvell BIOS to appear.*

Figure A-1 shows the messages displayed during the POST of an 88SE91xx controller with on-board CPU.

Figure A-1 BIOS Post Message

```
Marvell 88SE91xx Adapter - BIOS Version 1.0.0.1029
PCI-E X1 5.0Gbps
Mode: CPU AHCI

Physical Disk
 [ID]  [Disk Name]                      [Size]      [Speed]      [Status]
  0     HDD WDC WD1002FAEX              1TB         3Gb/s        Unconfigured
  1     HDD WDC WD1002FAEX              1TB         3Gb/s        Unconfigured

















 Press <Ctrl>+<M> to enter BIOS Setup or <Space> to continue_
```

A.2.1   Keyboard Controls

Table A-3 lists the controls for navigating and using the BIOS UI.

Table A-3 Navigation Keys

Key	Function
↑ ↓	Scrolls menu/list items.
Enter	Selects an item and shows a pop-up menu with options.
Space	Toggles between Enable/Disable states and Select/Unselect states (as applicable).
Esc	Go backwards.
Y N	Confirm (Y) or Deny (N) settings.
F10	Save and Exit the BIOS.

A.3 Creating Virtual Disk

The Marvell BIOS utility allows you to create virtual disks using the **Configuration Wizard**. This section discusses the following:

- Creating RAID Virtual Disk
- Creating HyperDuo Virtual Disk

A.3.1 Creating RAID Virtual Disk

To create RAID 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 A-2.

   Select **Configuration Wizard** and press **Enter** to begin creating the virtual disk.

   Figure A-2 Configuration Wizard
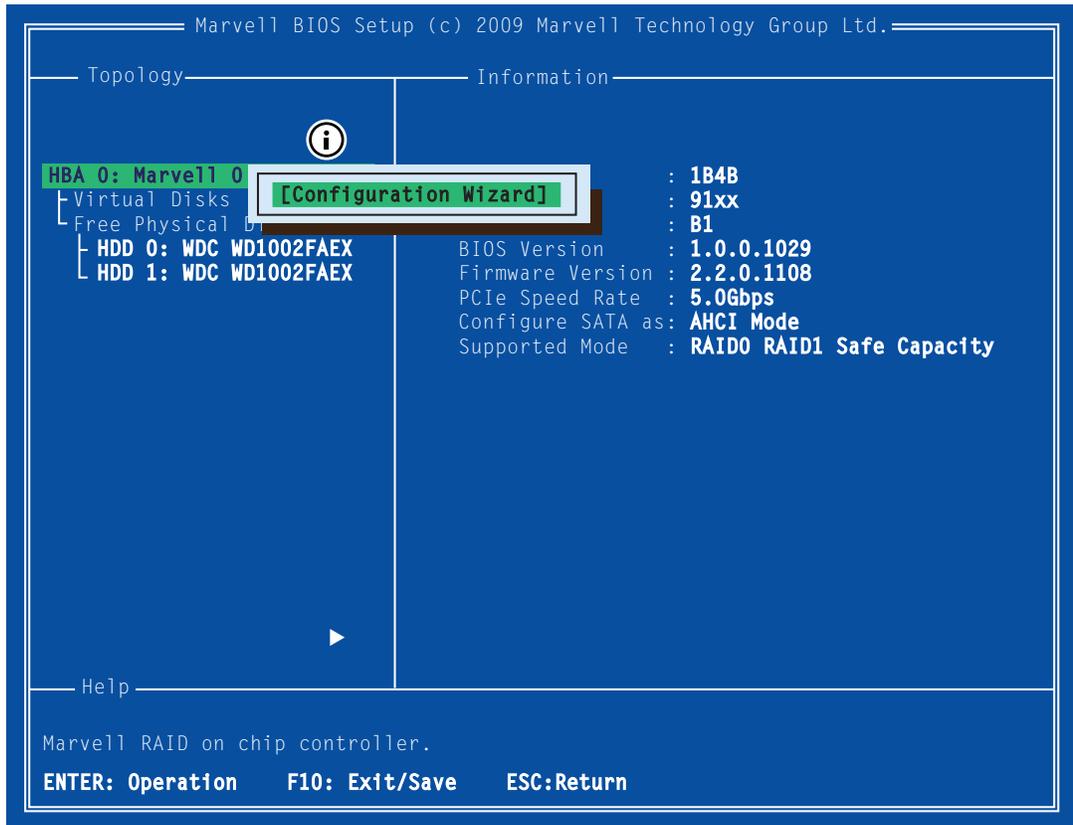
2. Use the arrow keys to scroll through the list of free physical disks, as shown in Figure A-3. Press **Space** to select/unselect a disk.

Note: When a disk is selected, an asterisk (*) appears to the left of the disk label, as shown in Figure A-3.

Figure A-3 Select Free Disks
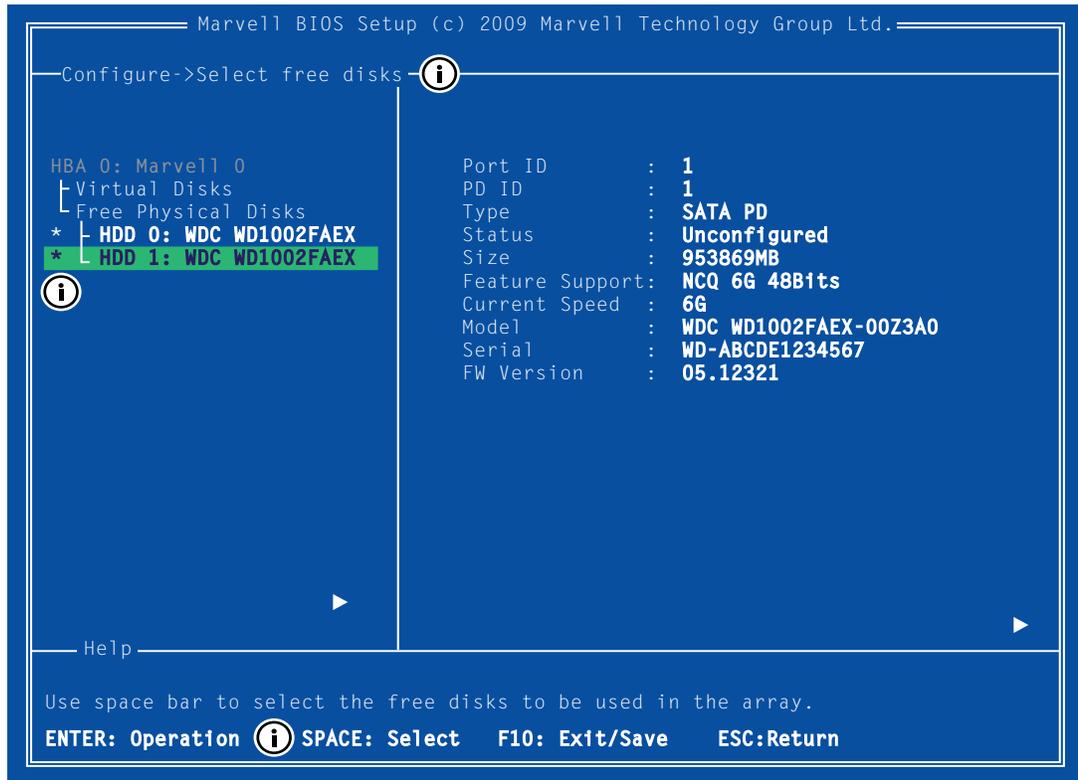
Note: The 88SE91xx controller supports the creation of virtual disks comprising of exactly two SATA physical disks. PATA physical disks cannot be used to create virtual disks.

3. After selecting the required disks, press **Enter** to continue.

4. The **Create Virtual Disk** configuration options appear in the **Information** pane, as shown in Figure A-4. Available keystrokes are listed in the **Help** pane when a setting is highlighted.

Figure A-4 Create Virtual Disk
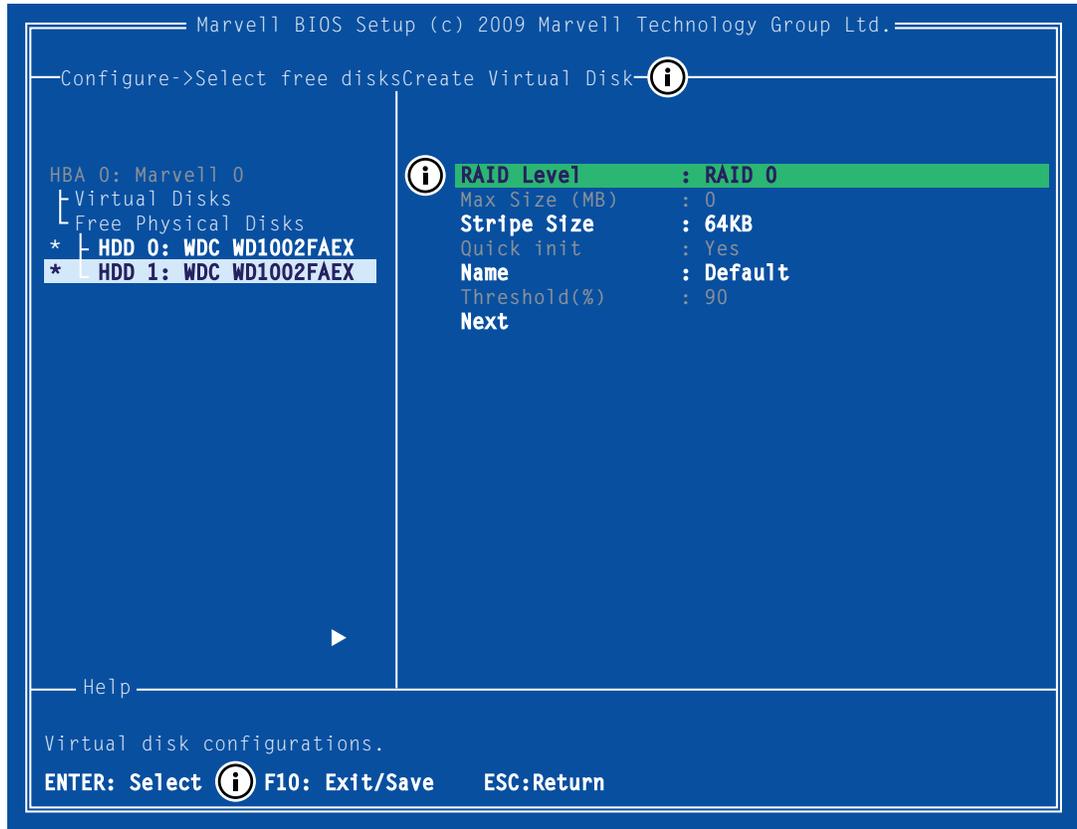
Note: Max Size (MB), Quick init, and Threshold(%) options are unavailable in the current version of BIOS.

5. Highlight **RAID Level** and press **Enter**.

A menu pops up, as shown in Figure A-5, and lists available RAID levels. Select your preferred RAID Level and press **Enter**.

Figure A-5 RAID Level


```
══ Marvell BIOS Setup (c) 2009 Marvell Technology Group Ltd.══

─Configure->Select free disksCreate Virtual Disk─

HBA 0: Marvell 0            ⓘ  RAID Level        : RAID 0
├ Virtual Disks                Max Size (MB)     : 0
└ Free Physical Disks          Stripe Size       : 64KB          [RAID 0]
*  ├ HDD 0: WDC WD1002FAEX     Quick init        : Yes           [RAID 1]
*  └ HDD 1: WDC WD1002FAEX     Name              : Default
                               Threshold(%)      : 90
                               Next

                    ►

─Help─

Virtual disk configurations.
ENTER: Select  ⓘ  F10: Exit/Save     ESC:Return
```

Note: The default RAID Level is RAID 0.

6. Highlight **Stripe Size** and press **Enter** to select.

A menu pops-up, as shown in Figure A-6, and lists available stripe sizes for the selected RAID level. Select your preferred stripe size and press **Enter**.

Figure A-6 Stripe Size

```
═══════ Marvell BIOS Setup (c) 2009 Marvell Technology Group Ltd.═══════

 ─Configure->Select free disksCreate Virtual Disk─────────

  HBA 0: Marvell 0              RAID Level      : RAID 1
   ├Virtual Disks               Max Size (MB)   : 953869MB
   └Free Physical Disks     ⓘ   Stripe Size     : 64KB
  *  ├ HDD 0: WDC WD1002FAEX     Quick init      : Yes
  *  └ HDD 1: WDC WD1002FAEX     Name            : Default       ┌──────┐
                                 Threshold(%)    : 90            │ 32K  │
                                 Next                            │ 64K  │
                                                                 └──────┘


                      ▶

  ─Help────────────────────────────────────────────────────

  Virtual disk configurations.
  ENTER: Select  ⓘ  F10: Exit/Save     ESC:Return
```

Note: The default Stripe Size is 64 KB.

7. Highlight **Name.** The **Default** name is cleared for a new name, as shown in Figure A-7. Type a new name and press **Enter** to confirm the selection.

Figure A-7 Name

```
╔═════════ Marvell BIOS Setup (c) 2009 Marvell Technology Group Ltd.═════════╗
║                                                                            ║
║   ┌Configure->Select free disksCreate Virtual Disk───────────────────────┐║
║   │                                                                       │║
║   │                                                                       │║
║   │  HBA 0: Marvell 0          RAID Level       : RAID 1                  │║
║   │  ├Virtual Disks            Max Size (MB)     : 0                       │║
║   │  └Free Physical Disks      Stripe Size      : 64KB                    │║
║   │  * ├ HDD 0: WDC WD1002FAEX  Quick init       : Yes                     │║
║   │  *  └ HDD 1: WDC WD1002FAEX (i) Name          :←                       │║
║   │                            Threshold(%)      : 90                      │║
║   │                            Next                                        │║
║   │                                                                       │║
║   │                                                                       │║
║   │                                                                       │║
║   │                                                                       │║
║   │                                                                       │║
║   │                                                                       │║
║   │                      ▶                                                 │║
║   │                                                                       │║
║   └─ Help ────────────────────────────────────────────────────────────────│║
║                                                                            ║
║   Virtual disk configurations.                                             ║
║   ENTER: Select  (i) F10: Exit/Save    ESC:Return                          ║
╚════════════════════════════════════════════════════════════════════════════╝
```
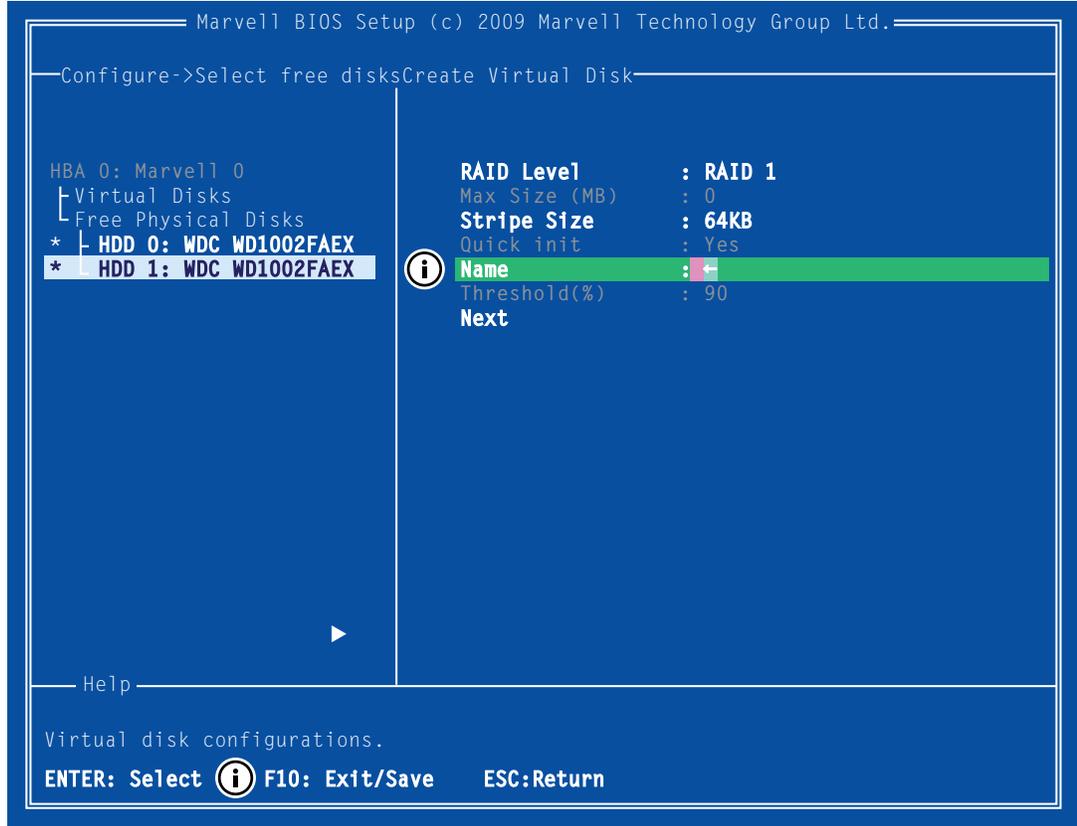
8. After configuring the virtual disk, highlight **Next**.

    Press **Enter** to create the virtual disk.

9. Press **Y** to confirm the creation of the virtual disk, as shown in Figure A-8.

    The virtual disk is now listed in the **Topology** pane.

Figure A-8 Create Virtual Disk
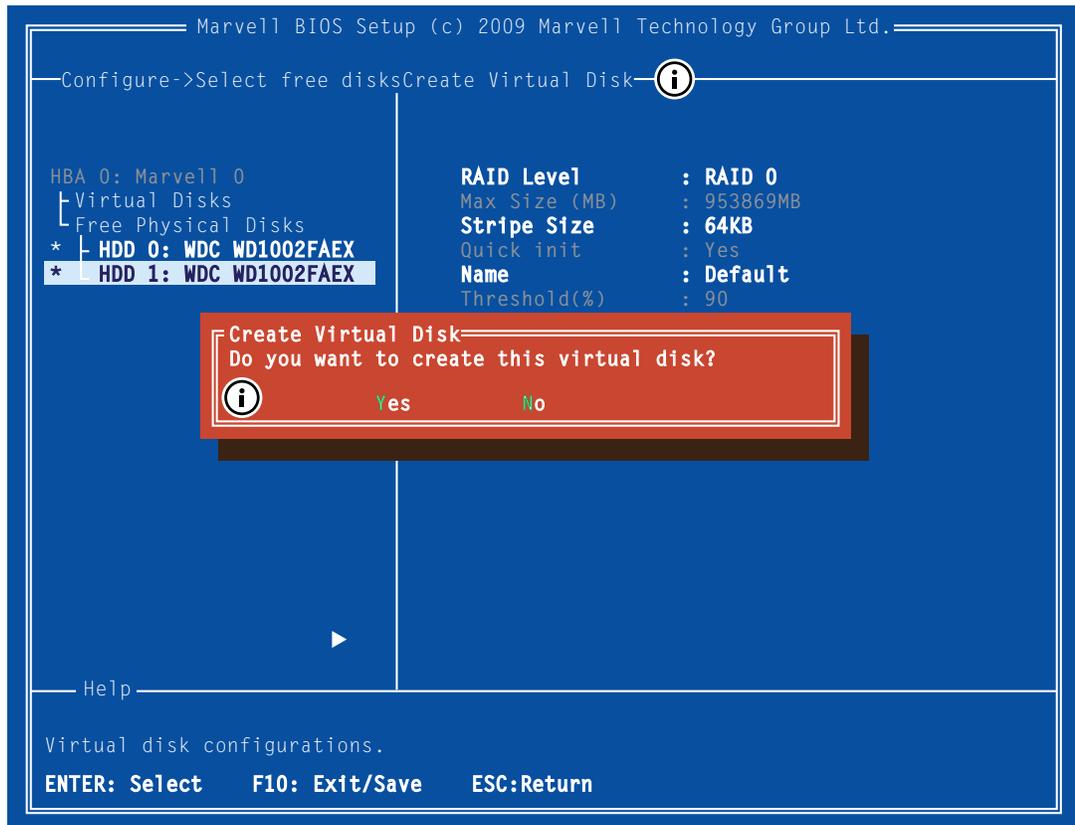
A.3.2   Creating HyperDuo Virtual Disk

To create HyperDuo 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 A-9.

    Select **Configuration Wizard** and press **Enter** to begin creating the virtual disk.

    Figure A-9 Configuration Wizard
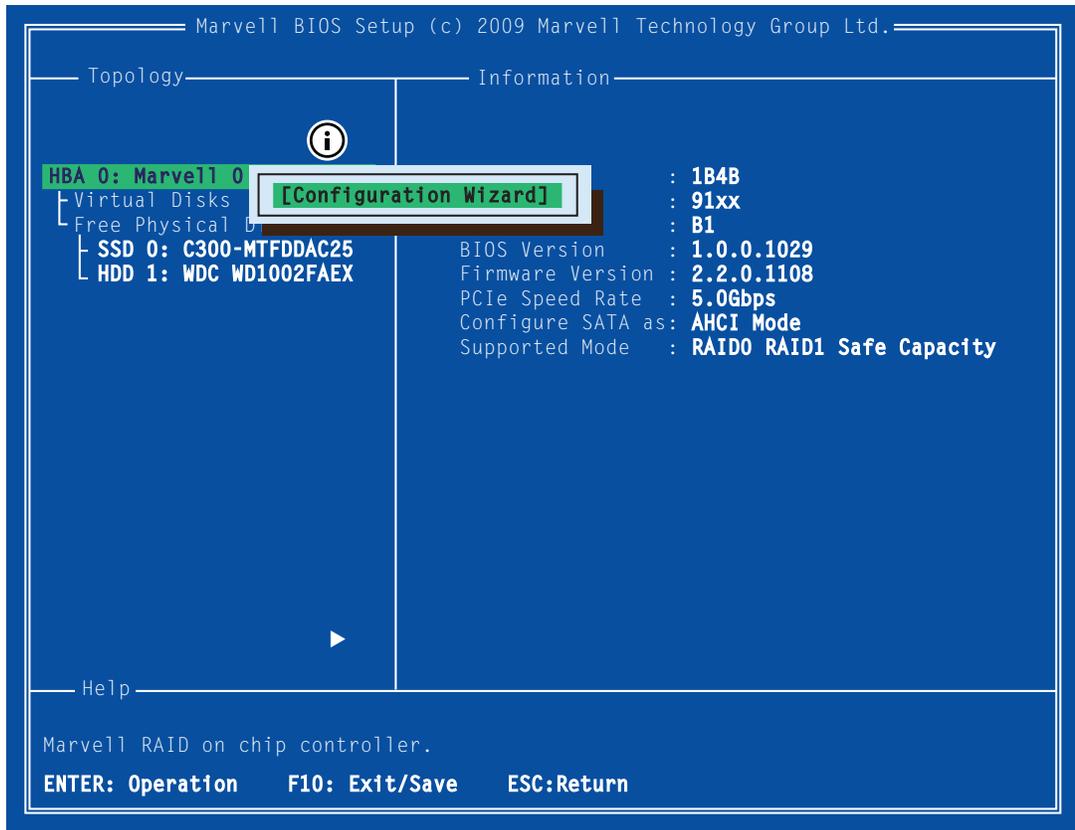
2. Use the arrow keys to scroll through the list of free physical disks, as shown in Figure A-10. Press **Space** to select/unselect a disk.

Note: When a disk is selected, an asterisk (*) appears to the left of the disk label, as shown in Figure A-10.

Figure A-10 Select Free Disks

```
═══ Marvell BIOS Setup (c) 2009 Marvell Technology Group Ltd. ═══

 ─Configure->Select free disks─ (i) ─────────────────────────────


  HBA 0: Marvell 0                  Port ID          :  1
  ├Virtual Disks                    PD ID            :  1
  └Free Physical Disks              Type             :  SATA PD
  *  ├ SSD 0: C300-MTFDDAC25        Status           :  Unconfigured
  *  └ HDD 1: WDC WD1002FAEX        Size             :  953869MB
  (i)                               Feature Support:   NCQ 6G 48Bits
                                    Current Speed    :  6G
                                    Model            :  WDC WD1002FAEX-00Z3A0
                                    Serial           :  WD-ABCDE1234567
                                    FW Version       :  05.12321




                        ▶                                            ▶

 ─Help─

  Use space bar to select the free disks to be used in the array.
  ENTER: Operation (i) SPACE: Select    F10: Exit/Save    ESC:Return
```

Note: The 88SE91xx controller supports the creation of virtual disks comprised of exactly two SATA physical disks. PATA physical disks cannot be used to create virtual disks.

3. After selecting the required disks, press **Enter** to continue.

4. The **Create Virtual Disk** configuration options appear in the **Information** pane, as shown in Figure A-11. Available keystrokes are listed in the **Help** pane when a setting is highlighted.

Figure A-11 Create Virtual Disk

```
══ Marvell BIOS Setup (c) 2009 Marvell Technology Group Ltd.══

─Configure->Select free disksCreate Virtual Disk─ⓘ─────────────


  HBA 0: Marvell 0                  ⓘ HyperDuo         : Safe
  ├Virtual Disks                       Max Size (MB)    : 953869
  └Free Physical Disks                 Stripe Size      : 64KB
  * ├ SSD 0: C300-MTFDDAC25            Keep original data: Yes
  *   HDD 1: WDC WD1002FAEX            Name             : Default
                                       Threshold(%)     : 90
                                       Next










              ▶

  ── Help ──

  Virtual disk configurations.

  ENTER: Select  ⓘ F10: Exit/Save    ESC:Return
```

Note: Max Size (MB), Stripe Size, and Name options are unavailable in the current version of BIOS.

5. Highlight **HyperDuo** and press **Enter**.

A menu pops up, as shown in Figure A-12, and lists available HyperDuo modes and RAID levels. Select your preferred mode and press **Enter**.

Figure A-12 HyperDuo Mode
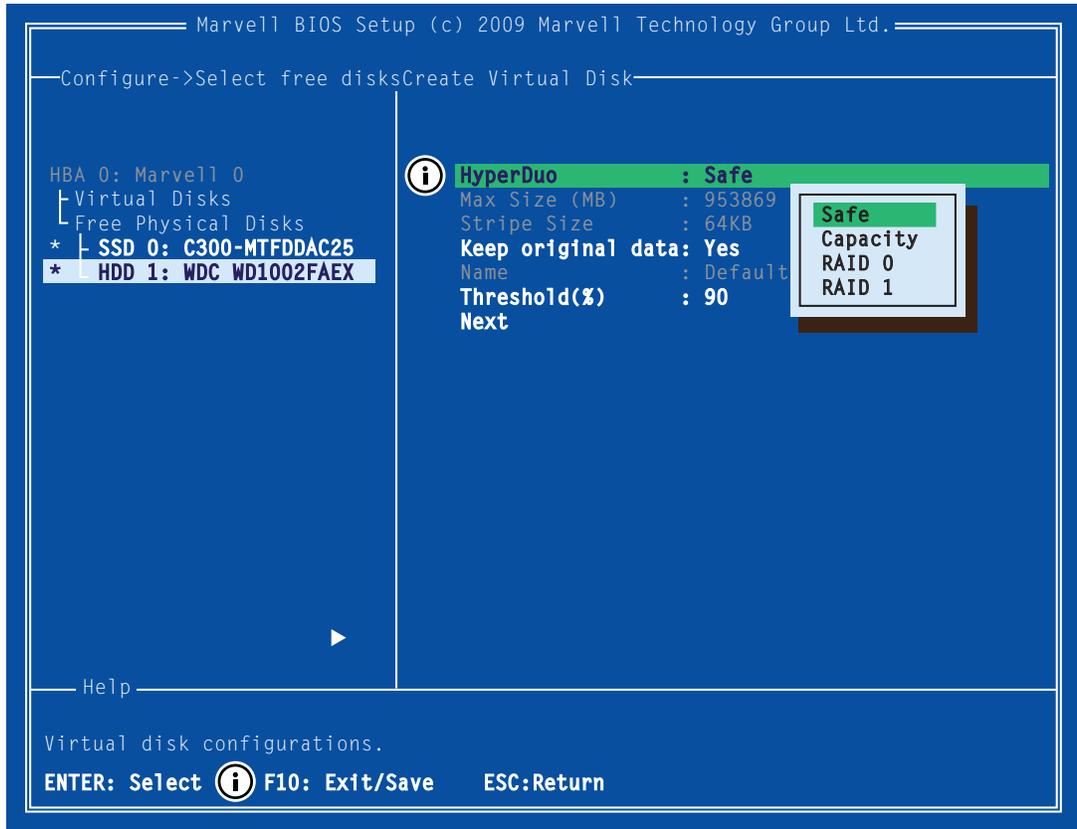
Note: The default HyperDuo mode is Safe mode.

6. Highlight **Keep original data** and press **Enter** to select.

A menu pops-up, as shown in Figure A-13. Select **Yes** or **No** and press **Enter**.

Figure A-13 Keep Original Data

```
╔═══════════ Marvell BIOS Setup (c) 2009 Marvell Technology Group Ltd.═══════════╗
║                                                                                ║
║  ┌Configure->Select free disksCreate Virtual Disk──────────────────────────┐   ║
║  │                                                                          │   ║
║  │                                                                          │   ║
║  │  HBA 0: Marvell 0                    HyperDuo        : Safe               │   ║
║  │  ├Virtual Disks                      Max Size (MB)   : 953869             │   ║
║  │  └Free Physical Disks                Stripe Size     : 64KB               │   ║
║  │  *  ├ SSD 0: C300-MTFDDAC25         Keep original data: Yes              │   ║
║  │  *  └ HDD 1: WDC WD1002FAEX          Name            : Default  ┌──────┐  │   ║
║  │                                      Threshold(%)    : 90       │ Yes  │  │   ║
║  │                                      Next                       │ No   │  │   ║
║  │                                                                 └──────┘  │   ║
║  │                                                                          │   ║
║  │                                                                          │   ║
║  │                              ▶                                           │   ║
║  │                                                                          │   ║
║  │  ─ Help ─────────────────────────────────────────────────────────────   │   ║
║  └──────────────────────────────────────────────────────────────────────────┘   ║
║  Virtual disk configurations.                                                  ║
║  ENTER: Select (i) F10: Exit/Save    ESC:Return                                ║
╚════════════════════════════════════════════════════════════════════════════════╝
```

Note: This option is disabled when you choose Capacity mode, as it is inherently data-destructive.

7. After configuring the virtual disk, highlight **Next**. Press **Enter** to create the virtual disk.

8. Press **Y** to confirm the creation of the virtual disk, as shown in Figure A-14.

   The virtual disk is now listed in the **Topology** pane.

Figure A-14 Create Virtual Disk
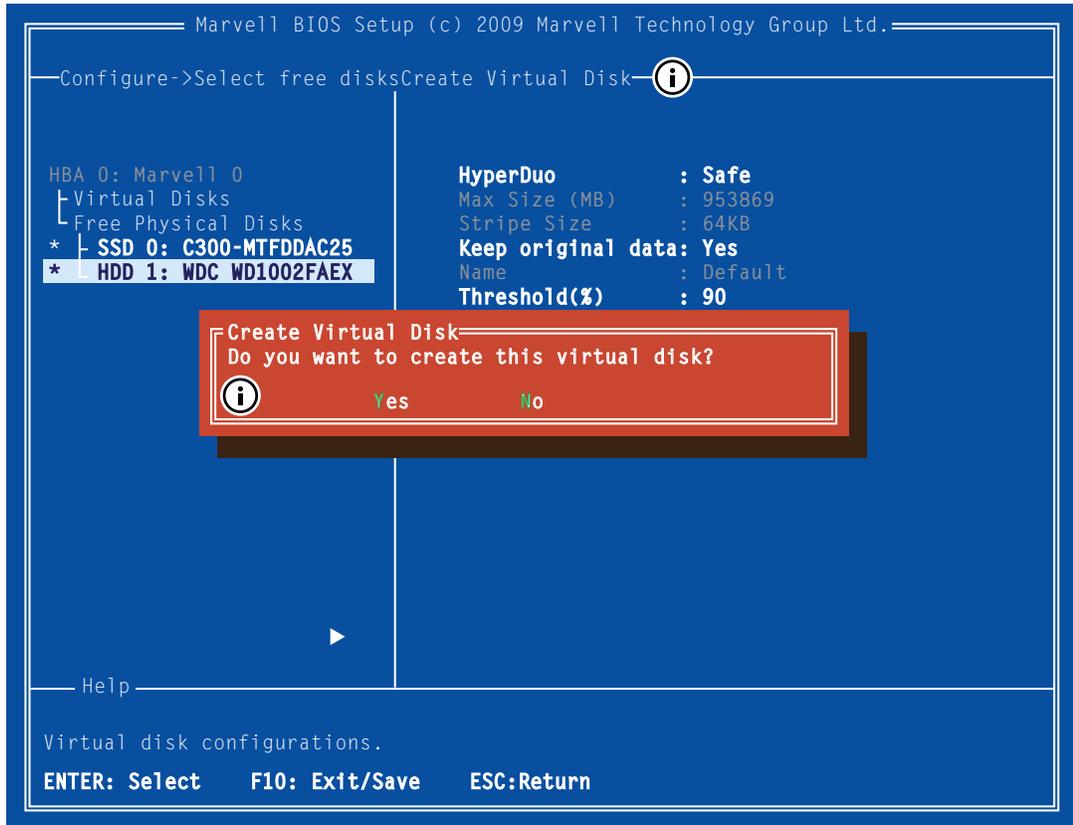
A.4   Erasing RAID Configuration Data

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 (Test** > **HDD 0: WDC WD1002FAEX** in Figure A-15) and press **Enter**. A menu pops-up, as shown Figure A-15.

2. Select **Erase RAID Config Data** to erase the RAID configuration data, as shown in Figure A-15.

3. Select **Yes** to confirm the operation.

Figure A-15 Erase RAID Configuration Data

Erasing RAID Configuration Data
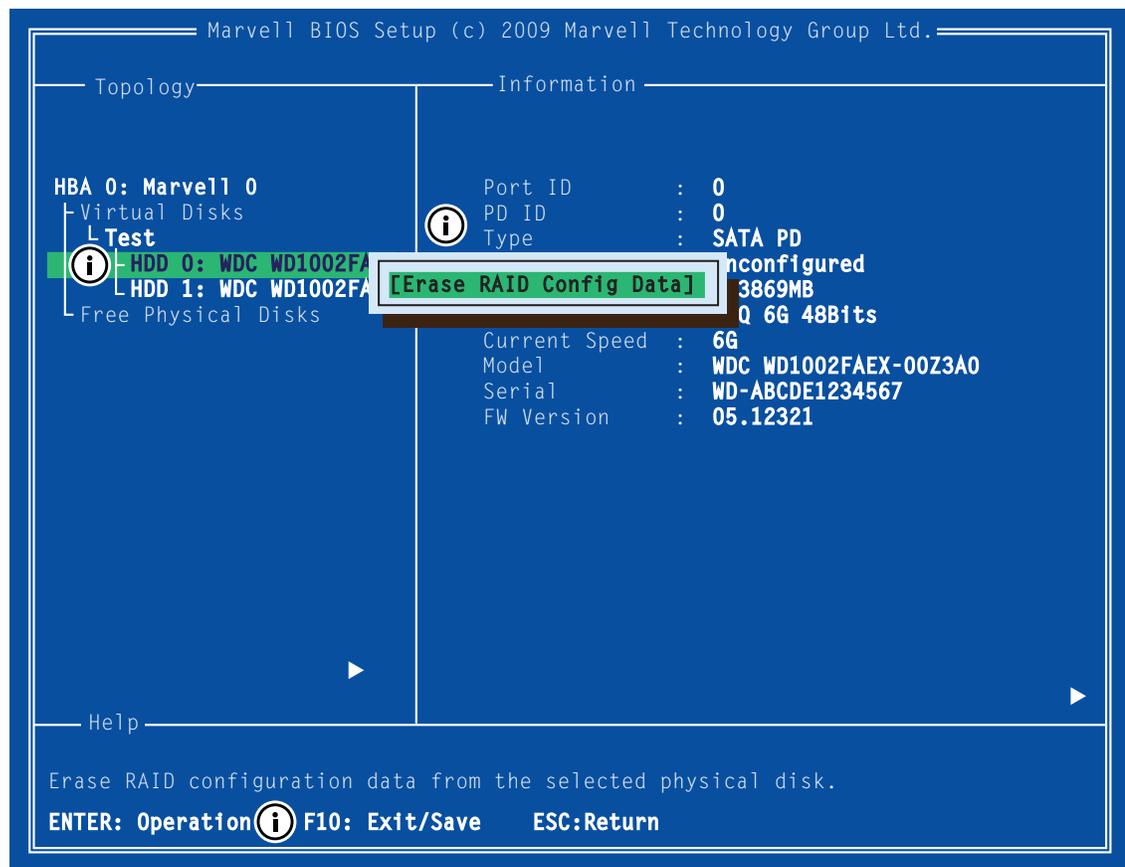
A.5 Rebuilding Virtual Disk

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. HyperDuo virtual disks created in Safe Mode may also be partially rebuilt if the SSD fails.

Note: Only the 88SE91xx BIOS supports manual rebuilding of virtual disks. The Marvell Storage Utility (MSU), 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 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 A-16.

Figure A-16 Virtual Disk Properties: Degrade VD

```
══════════ Marvell BIOS Setup (c) 2009 Marvell Technology Group Ltd.══════════

    ┌Topology─────────────────────────┬─Information─────────────────────

     HBA 0: Marvell 0                    ID          :   0
     ├Virtual Disks                      Name        :   Test
     │ └Test         (i)                 Status      :   Degrade (i)
     │   └HDD 1: WDC WD1002FAEX          Stripe Size :   64K
     └Free Physical Disks               RAID Mode   :   RAID1 (i)
                                         Size        :   953869MB
                                         BGA Status  :   N/A
                                         Number of PDs :  1
                                         Members     :   8 (i)








                     ▶

    └Help──────────────────────────────────────────────────────────────
     Virtual Disk: A set of disk blocks presented to an operating environment as
     a range of consecutively numbered logical blocks with disk-like storage.

     ENTER: Operation    F10: Exit/Save    ESC:Return
```

2. Replace the faulty physical disk with an identical physical disk.

The 88SE91xx detects the new physical disk and lists the device under Free Physical Disks in the Topology pane, as shown in Figure A-17.

Figure A-17 Replacement Physical Disk
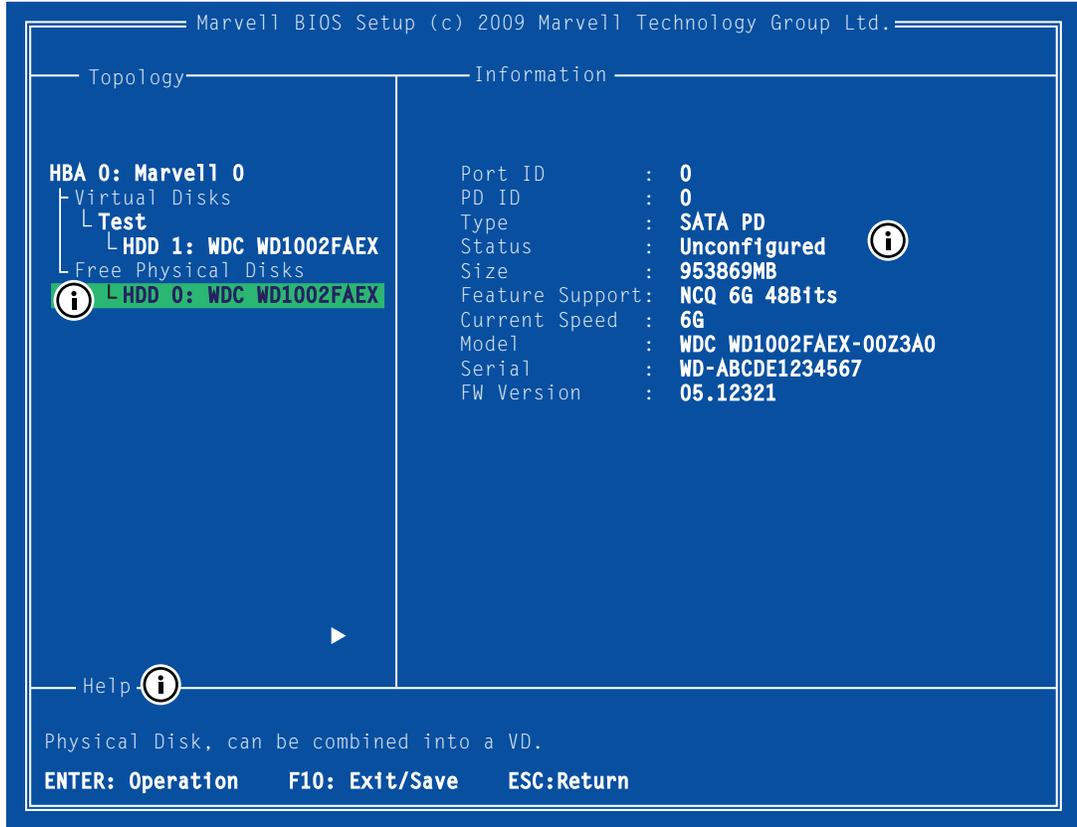
3. In the **Topology** pane, scroll to **Virtual Disks** (**Test** in Figure A-18), and press **Enter**. A menu pops-up, as shown in Figure A-18.

Scroll to **Rebuild** and press **Enter** to configure the rebuild process.

Figure A-18 Rebuild Virtual Disk
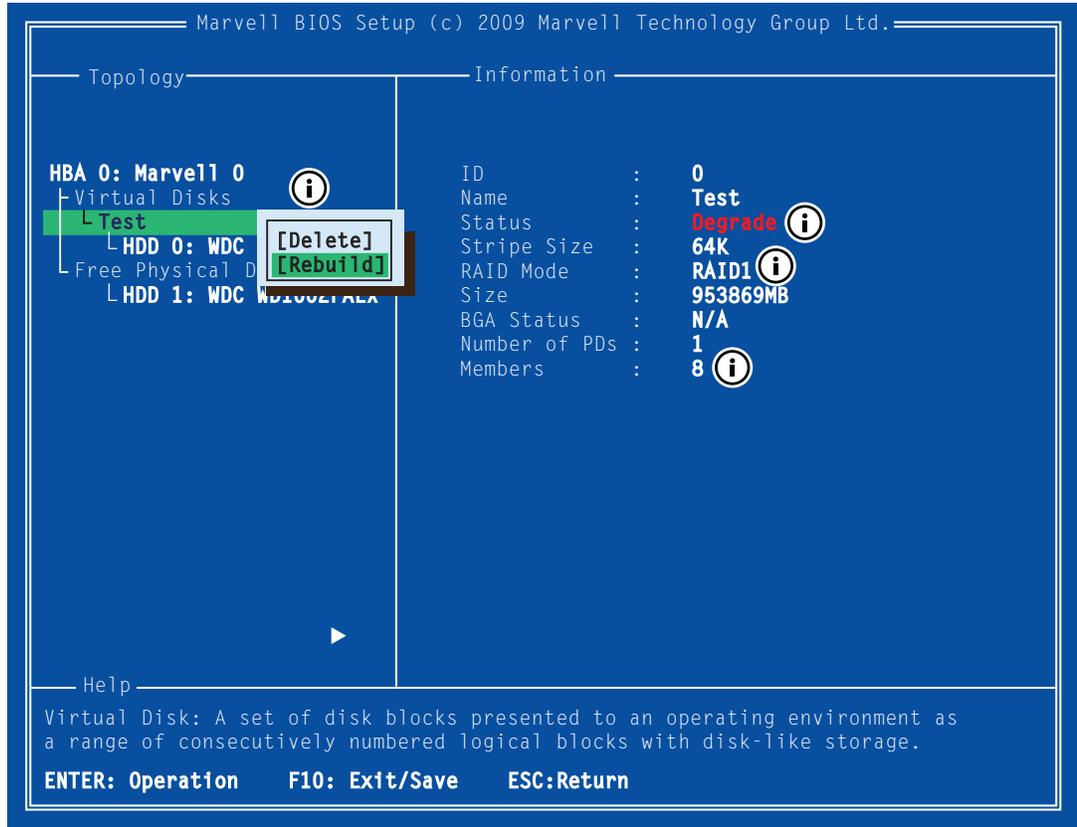
4. Scroll through the list of free disks, as shown in Figure A-19, and press **Space** to select or unselect a replacement physical disk.

Press **Enter** to continue.

Figure A-19 Select Replacement Disk

```
┌──────── Marvell BIOS Setup (c) 2009 Marvell Technology Group Ltd.════┐
│ ┌─Rebuild->Select free disks──── Information ──────────────────────┐
│ (i)                                                                  │
│                                                                      │
│   HBA 0: Marvell 0              ID           :   0                   │
│   ├Virtual Disks                Name         :   Test                │
│   │ └Test                       Status       :   Degrade             │
│   │   └HDD 1: WDC WD1002FAEX    Stripe Size  :   64K                 │
│   └Free Physical Disks          RAID Mode    :   RAID1               │
│      └HDD 0: WDC WD1002FAEX     Size         :   953869MB            │
│                                 BGA Status   :   N/A                 │
│                                 Number of PDs:   1                   │
│                                 Members      :   8                   │
│                                                                      │
│                       ▶                                              │
│   ┌─Help ─────────────────────────────────────────────────────────┐
│   Use the space bar to select the free disks to be used in the array.│
│   ENTER: Operation (i) SPACE: Select   F10: Exit/Save   ESC:Return  │
└──────────────────────────────────────────────────────────────────────┘
```

5. Press **Y** when prompted to confirm the rebuild process, as shown in Figure A-20, .

Figure A-20 Confirm Rebuild Virtual Disk

```
═══════ Marvell BIOS Setup (c) 2009 Marvell Technology Group Ltd.═══════

── Rebuild->Select free disks────── Information ──────────────


 HBA 0: Marvell 0                   ID          :   0
 ├Virtual Disks                     Name        :   Test
 │ └Test                            Status      :   Degrade
 │   └HDD 1: WDC WD1002FAEX         Stripe Size :   64K
 └Free Physical Disks              RAID Mode   :   RAID1
  *  └HDD 0: WDC WD1002FAEX         Size        :   953869MB
           ┌Rebuild ──(i)────────────────────────────────────┐
           │ Do you want to rebuild with selected physical disk│
           │ on this vd?                                       │
           │          Yes            No                        │
           └───────────────────────────────────────────────────┘




                   ►


── Help ──────────────────────────────────────────────

 Use the space bar to select the free disks to be used in the array.

 ENTER: Operation    SPACE: Select    F10: Exit/Save    ESC:Return
```

6. The status of the Rebuild process is reflected in the properties of the virtual disk, as shown in Figure A-21.

Figure A-21 Rebuild Status

```
═══════════════ Marvell BIOS Setup (c) 2009 Marvell Technology Group Ltd.═══════════════

  ┌─Topology──────────────────────────┐  ┌─Information──────────────────────────
  │                                   │  │
  │                                   │  │
  │  HBA 0: Marvell 0                 │  │  ID          :  0
  │  ├Virtual Disks                   │  │  Name        :  Test
  │   └ VD 0: Test                    │  │  Status      :  Degrade
  │   (i)├─HDD 0: WDC WD1002FAEX      │  │  Stripe Size :  64K
  │      └─HDD 1: WDC WD1002FAEX      │  │  RAID Mode   :  RAID1
  │  └Free Physical Disks             │  │  Size        :  953869MB
  │                                   │  (i)  BGA Status  :  Running
  │                                   │  │  BGA Rebuild :  5%
  │                                   │  (i)  Number of PDs :  2
  │                                   │  │  Members     :  0 8
  │                                   │  │
  │                                   │  │
  │                                   │  │
  │                                   │  │
  │                                   │  │
  │                  ▶                │  │
  │                                   │  │
  └─Help──────────────────────────────┴──┴──────────────────────────────────────
  Virtual Disk: A set of disk blocks presented to an operating environment as
  a range of consecutively numbered logical blocks with disk-like storage.

  ENTER: Operation    F10: Exit/Save    ESC:Return
```

A.6   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 (Test** in Figure A-22) and press **Enter**. A menu pops-up, as shown Figure A-22.

2. Select **Delete** to delete the virtual disk, as shown in Figure A-22.

    The prompt **Do you want to delete this virtual disk?** appears.

3. Press **Y** to confirm.

    The prompt **Do you want to delete MBR from this virtual disk?** appears.

4. Press **Y** to confirm.

Figure A-22 Delete Virtual Disk
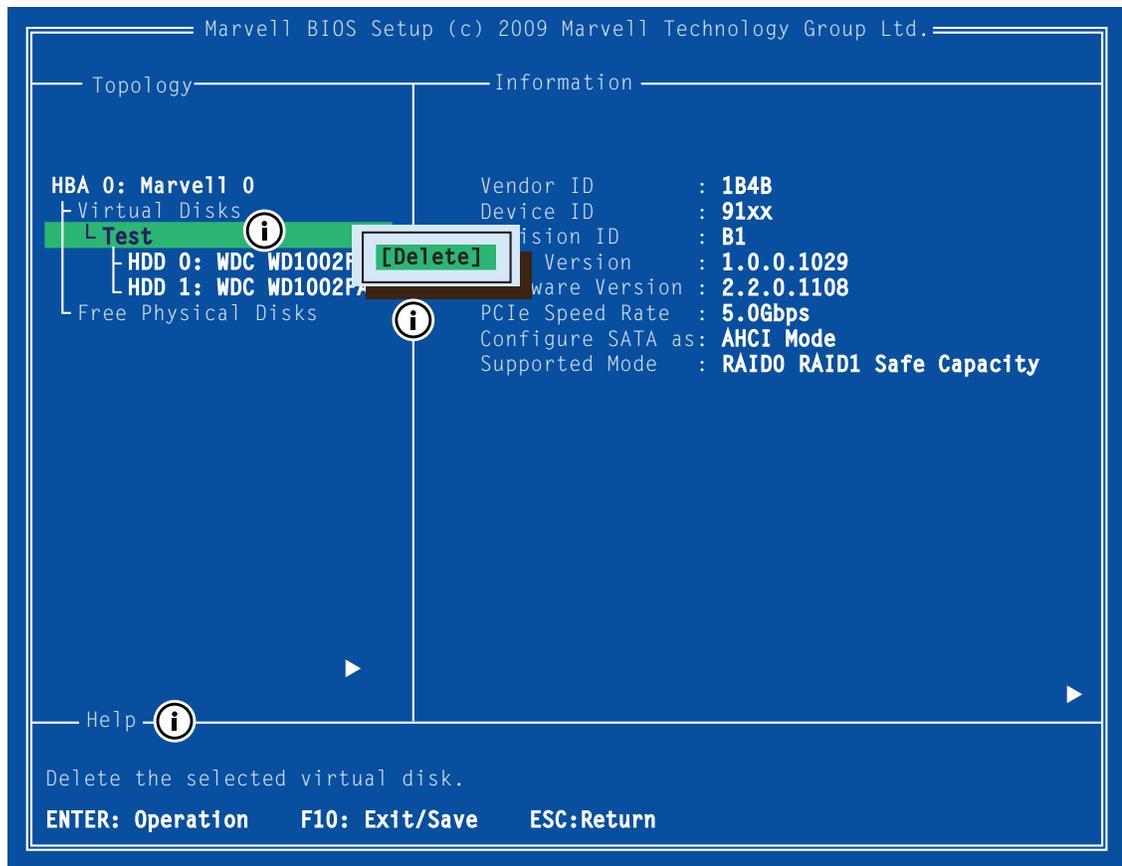
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B   SELECTING A RAID LEVEL

This chapter contains the following sections:

- RAID Overview
- Comparing RAID Levels
- RAID 0 (Striping)
- RAID 1 (Disk Mirroring)

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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 B-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 B-1 Comparing RAID Levels

RAID Level	0	1
Read Performance	★★★	★★☆
Write Performance	★★★	★☆☆
Fault Tolerance	✖	★★★
Efficient use of disk capacity	★★★	★☆☆
Automatic rebuild	✖	✔
Minimum number of drives	2	Exactly 2

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 B-2 describes RAID 0 across a number of parameters.

Table B-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.
		Note: 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 B-1 describes RAID 0.

Figure B-1 RAID 0

Legend

	Empty area of disk
A	Disk filled with fragment A

Doc No. MV-S800768-00 Rev. -
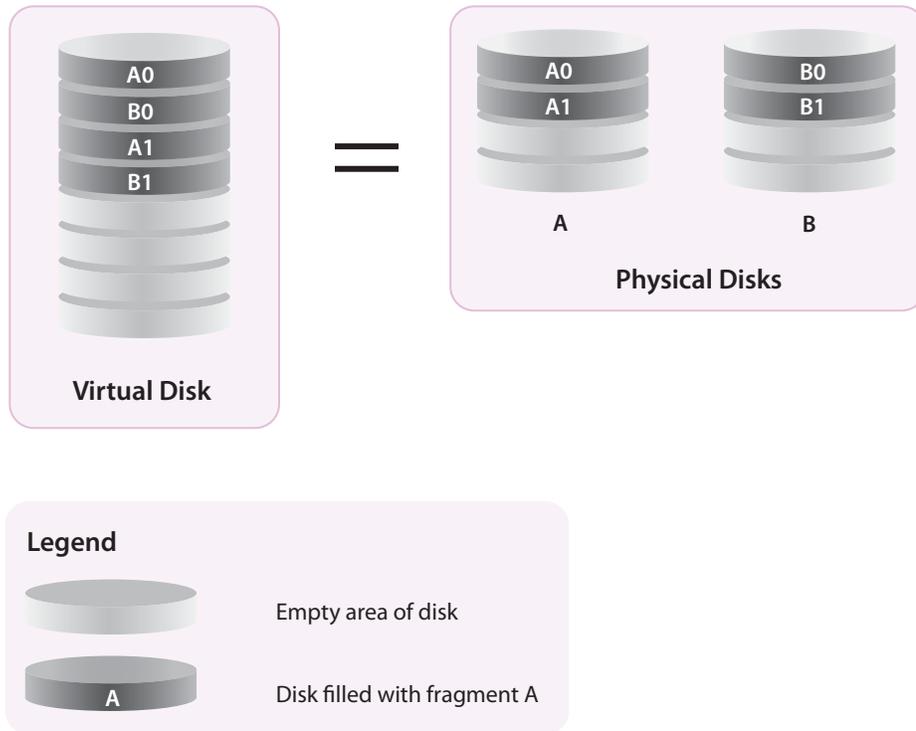
B.4   RAID 1 (Disk Mirroring)

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 B-2.

Table B-3 describes RAID 1 across a number of parameters.

Table B-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.
		Note: *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 B-2 describes RAID 1.

Figure B-2 RAID 1

Virtual Disk   **Physical Disks**

Legend

Empty area of disk

Disk filled with fragment A

Mirror of fragment A
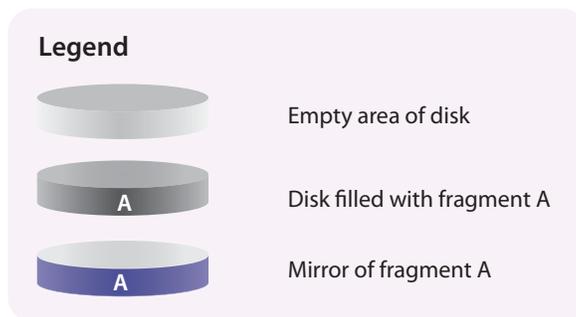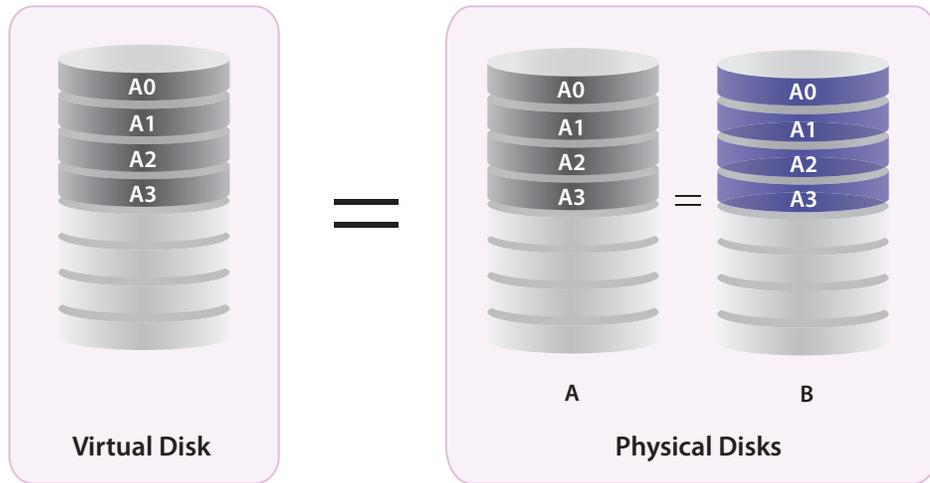
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C   ICONS USED IN THE MSU

This appendix describes the icons used in the MSU for the following physical/virtual devices:

- Events
- Physical Disks
- Virtual Disks

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C.1   Events

Table C-1 lists the icons used for adapter events.

Table C-1 Icons for Events

Symbol	Description	Notes
(info icon)	Normal Event	Example: Physical disk 1 is assigned as spare.
(question icon)	Unknown Event	Any event that was not recognized by the MSU. See Windows Events Viewer for more information on the event.
(warning icon)	Warning Event	Example: Virtual Disk 1 is deleted.
(critical icon)	Critical Event	Example: Virtual Disk 1 is degraded.

C.2 Physical Disks

Table C-2 lists the icons used to indicate the status of physical disks.

Table C-2 Icons for Physical Disks

Symbol	Description	Notes
	Unconfigured Physical Disk	The physical disk is available for use in a virtual disk.
	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. ***Note:** 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	The MSU indicates connected SAS/SATA tape devices. However, SAS/SATA tape devices are not available for use in a virtual disk.
	CD/DVD Device	The MSU indicates connected CD/DVD devices. However, CD/DVD devices are not available for use in a virtual disk.

C.3 Virtual Disks

Table C-3 lists the icons used to indicate the status of virtual disks.

Table C-3 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.

D GLOSSARY

This glossary describes abbreviations, acronyms, and terms used in this manual.

A

Adapter Adapter refers to any board that hosts the Controller.

> *Note: Commands are executed on the controller, which is hosted on either an HBA (Host Bus Adapter), evaluation board, or OEM motherboard.*

Related terms: Controller

Auto-Rebuild When enabled, degraded virtual disks are automatically rebuilt if a global spare drive of suitable size is available.

Related terms: Rebuild, Spare, Global Spare Drive, Hot Spare, Hot Swap.

B

BGA Abbreviation for Background Activity.

BIOS POST BIOS Power-On Self Test.

This is a pre-boot diagnostic test procedure that checks if the required hardware is present and functioning correctly. The system typically continues to boot even if errors are encountered (unless they are fatal errors).

C

CLI Command Line Interface

Consistency Check

Consistency Check checks and reports the integrity of parity/mirror data on the virtual disk.

Notes:
- Not applicable to RAID 0 (Striping) virtual disk or JBOD.
- Consistency Check can be performed only on fully-initialized virtual disks.
- Consistency errors are recorded in the Event Logs.
- 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.

Related terms: Consistency Fix, Synchronization Rate.

Consistency Fix

Consistency Fix checks, reports, and fixes parity/mirror data on virtual disks.

Note: Consistency Fix can be performed only on fully-initialized virtual disks.

Related terms: Consistency Check, Synchronization Rate.

Controller

Refers to the RAID controller on which commands are executed.

Note: Although the terms Adapter and Controller are used interchangeably, commands are executed on the RAID controller which is hosted on the Adapter.

Related terms: Adapter

D

Disk Data Format (DDF)

The DDF/metadata contains controller attributes, RAID configuration data, Read Check Table, watermark for background activities, and temporary data swap space for some processes.

64 MB of disk space on every RAID configured physical disk is reserved for storing DDF/metadata.The remaining space is reported as the usable capacity of the physical disk.

Drive Size Coercion

Drive Size Coercion is designed for fault tolerance virtual disks, such as RAID 1 (Disk Mirroring). When using physical disks of varying sizes, the controller limits (or coerces) the usable size of each physical disk to size of the smallest physical disk. This is useful when it is not possible to use physical disks of the same size.

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.
	Related terms: Global Spare Drive, Hot Spare, Hot Swap, 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 degraded virtual disk/array is compromised to the extent determined by the RAID level and number of failed member physical disks. Rebuild the virtual disk/array to ensure continued and maximum fault tolerance.
	Related terms: Rebuild

E

ESD	Electrostatic Discharge
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.
Event Logs	Refers to the Event Logs pane in the Marvell RAID Utility.

F

Fast Initialization	In this mode, the MSU 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 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.
	Related terms: Redundancy

Foreground Initialization
Foreground Initialization writes 0 to the entire virtual disk. As with Fast Initialization, all data on the virtual disk is destroyed.

Related terms: Fast Initialization.

G

Global Spare Drive
A global spare drive is a spare that is available for use by all virtual disks.

Related terms: Dedicated Spare Drive, Hot Spare, Hot Swap, Spare.

H

HBA
Host Bus Adapter

HDD
Hard Disk Drive.

Also referred to as Physical Disk.

Hot Spare
This feature allows for the automatic replacement of a failed or offline physical disk with a spare drive connected to the controller. The automatic replacement is performed while the virtual disk is still operating.

Related terms: Auto-Rebuild, Global Spare Drive, Hot Swap, Spare.

Hot Swap
This feature allows 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.

Related terms: Global Spare Drive, Hot Spare, Spare.

Hot Plug
When using Windows, physical disks can be plugged in and out with requiring a complete system power-down. The physical disk should be unplugged using the Safely Remove Hardware icon in the System Tray.

HyperDuo   This feature allows users to create a virtual disk using a SSD and a HDD. This would not be possible with a standard RAID controller.

I

Import   Controllers supporting this feature allow you to import a virtual disk created with another RAID controller.

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.

Related terms: Quick Initialization.

INT13h   INT13h, or Interrupt 0x13, is an interrupt vector in x386-based systems that allows the system to boot from a controller. Enable INT13h when a physical device or virtual disk attached to the controller is a bootable device.

IOP   Abbreviation for IO Processor.

IO Processors (IOPs) contain 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.

K

Key-phrase   Refers to the alpha-numeric string used to generate the AES key for data encryption.

Note: The MSU uses an algorithm to combine the key-phrase with internal 128/256-bit AES keys to generate the AES key used for encryption.

L

LBA   Logical Block Addressing

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

MBR Master Boot Record

Metadata Metadata, stored by the MSU on physical disks, contains RAID configuration data about the virtual disk and/or array.

Migrate Migrate allows you to increase the disk capacity and change the RAID level of an operating RAID array.

Module Consolidate 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

No Initialization No initialization is performed on the virtual disk.

Related terms: Quick Initialization, Initialization Rate.

No Read Ahead In this read cache mode, data is not pre-fetched in anticipation of the next read operation. This is suitable for applications that access data randomly.

Related terms: Read Ahead

P

PCB Printed Circuit Board

PCIe PCI Express

PD	Physical Disk

PD Table	Physical Disk Table.

PD Table is the mapping of PD ID and WWN for each physical disk. It is stored in the SPI Flash. PD ID is assigned to each physical disk, starting with 0 and subsequently in increments of one. So the first physical disk is assigned an ID of 0, the next 1, and so on. This ID is persistent throughout the life of the HBA. Clearing or erasing PD table clears information on the PD IDs for all physical disks ever connected to the HBA. After clearing, the PD ID assignment would restart from 0.

Poll S.M.A.R.T. Status	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 the MSU'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, the MSU logs the event in Event Logs.

Q

Quick Initialization	In this mode, the Master Boot Record (MBR) in erased on all physical disks constituting the virtual disk. This is a destructive process that permanently erases all data on the virtual disk.

Related terms: Initialization Rate.

R

Read Check Table	Used to record the sectors with invalid data, including events such as losing write-back cache or unavailability of fault-tolerance data during background activities (which prevents the controller from reading the wrong data).

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.

Related terms: No Read Ahead

Rebuild	Rebuild is the process of reconstructing data on a degraded virtual disk. Data is reconstructed on the replacement physical disk(s) using parity or mirror data on the virtual disk.
	Note: Virtual disks 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
	Related terms: Auto-Rebuild, Fault Tolerance, Rebuild Rate.
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.
	Related terms: Rebuild, Auto-Rebuild.
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.
	Related terms: Fault Tolerance
ROC	Abbreviation for RAID-On-Chip Controller.
	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.

S

SAS	Serial Attached SCSI (Small Computer System Interface)
SATA	Serial ATA (Advanced Technology Attachment)
Serial Console	Enable Serial Console to transmit the BIOS display video through the system's serial port. Another serial port can then receive this signal and display the same in a terminal.

Set Free   Set Free releases an offline physical disk from a virtual disk.

S.M.A.R.T. Monitoring   When enabled, the controller periodically checks the S.M.A.R.T. status of physical disks. Any departure from S.M.A.R.T. status is reported in the Event Logs.

SSD   Solid State Drive

Spare   Refers to physical disk assigned as spare drive for use in rebuilding virtual disks.

Related terms: Global Spare Drive, Hot Spare, Hot Swap.

Staggered Spin-Up   In order to avoid excessive power-draw at power-up, physical disks can be powered-up sequentially (instead of powering-up simultaneously).

Depending on power supply, the speed of the computer, and other system configuration variations, you may want to spin up fewer or more physical disks at the same time. This can be configured in the BIOS. The total time for spinning-up all physical disks completely is limited to a maximum of 10 seconds. For example, in a setup consisting of eight physical disks, HDDs can be spun-up in groups of 4, 2, 1, and 1 with a delay of 2 seconds between the spin-up groups.

Stripe Size   Stripe Size specifies the size of single data block on the virtual disk.

Available stripe sizes are 16 KB, 32 KB, 64 KB (default), and 128 KB.

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.

Related terms: Consistency Check, Consistency Fix.

V

VD	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.

W

Wipe Out   Performs Quick Initialization of the physical or virtual disk.

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, the controller automatically turns on Write-Back (Performance) cache.

Related terms: Write-Through (Reliability)

Write-Through (Reliability)   This is the default write cache mode. In this mode, all write operations are performed on the hard disk before a completion status is returned to the operating system.

Related terms: Write-Back (Performance)

E   TROUBLESHOOTING

Table E-1 lists potential issues you might encounter when using the MSU and possible solutions for the same.

Table E-1 Troubleshooting

Category	Issue	Possible Solutions
Adapter Detection	The MSU does not detect the adapter Adapter is detected but serial number is not available	• Verify that the drivers for the Marvell controller are installed, as described in 1.2, Installing the Marvell Storage Utility (MSU). • Reseat HBA. • Seat HBA in a different PCIe slot. • Re-install the MSU. • Install the latest version of the MSU.
Adapter Events	No events are displayed in the MSU	• In Windows, use Windows Event Viewer to view adapter events. • Verify that the drivers for the Marvell controller are installed, as described in 1.2, Installing the Marvell Storage Utility (MSU). • Re-install the MSU. • Install the latest version of the MSU.

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F MARVELL END USER LIMITED USE LICENSE AGREEMENT

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