BROADCOM®

MegaRAID® SAS Device Driver Installation

User Guide

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For a comprehensive list of changes to this document, see the Revision History.

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Chapter 1: Overview

This chapter provides an overview of the operating system (OS) drivers for the MegaRAID® SAS RAID controllers.

Subsequent chapters provide installation instructions for the OSs. Use the latest updates provided by the OS manufacturer, and review the `readme` file that accompanies the driver for any updated information. You can download the latest drivers for the various OSs from the Broadcom website at www.broadcom.com/support/download-search.

| NOTE | The MegaRAID RAID controllers do not all support the same OSs. Refer to the documentation for your MegaRAID controller for information about the OSs that the controller supports. You can search archived versions of this guide on the company website for information about OSs that are supported for earlier controllers. |

1.1   Driver Description

You can install the MegaRAID SAS Controller in any IBM AT-compatible computer that has a PCI Express (PCIe) local bus. The RAID controller can run under various OSs.

To use the controller with these OSs, you must install software drivers. Broadcom provides software drivers for the following OSs:

- Microsoft Windows
- Red Hat Linux
- SUSE Linux Enterprise Server (SLES)
- Ubuntu Linux
- FreeBSD
- VMware
- Solaris
- XenServer
- Debian
- CentOS
- Oracle Enterprise Linux (OEL)
- Fedora
- Oracle Virtual Machine (OVM)

1.1.1   Driver Functions

MegaRAID provides drivers for the MegaRAID controllers, which bring up to 12 Gb/s Serial Attached SCSI performance and 6.0 Gb/s SATA III performance to host adapter, workstation, and server designs. The controllers support internal and external storage devices, which let you use a system that supports enterprise-class SAS and desktop-class SATA III drives.

The SAS controllers integrate eight high-performance SAS/SATA III PHYs and a PCI Express bus master DMA core. Each of the eight PHYs is capable of up to 12Gb/s SAS link rates, and 6.0 Gb/s SATA III link rates.

The SAS RAID controllers support the SAS protocol as described in the *Serial Attached SCSI Standard, version 3.0*, and the Serial ATA III (SATA III) protocol defined by the *Serial ATA specification, version 3.0*. SATA III is an extension to SATA 2.0.

The drivers perform these functions:

- ■ The PCI Express protocol
- ■ Multiple RAID storage adapters (RSAs)
- ■ The ability to see newly configured logical drives in the configuration software utility without rebooting the system
- ■ The random deletion of logical drives that were created by using MegaRAID Storage Manager software (refer to the *MegaRAID SAS Software User Guide* for more information)
- ■ The use of the remaining array capacity by MegaRAID Storage Manager software

1.1.2   Driver Updates

Because Avago regularly updates device drivers, a feature might be added to your driver that is not included in the most recent documentation. If you have a question about a feature, consult the `readme` file that accompanies the driver, or contact your MegaRAID support representative. Be sure to use the latest service packs provided by the OS manufacturer.

You can download the latest drivers and software on the company website at www.broadcom.com/support/download-search.

1.2   Driver Names

The following table lists the device driver files, driver RPM and driver ISO support, and driver deb package for the MegaRAID controllers.

These files are available on the *Universal Driver Suite* CD that accompanied your MegaRAID controller. Avago updates the MegaRAID device drivers frequently. To make sure that you have the current version of these driver files, download the latest files from the company website at www.broadcom.com/support/download-search. Refer to the `readme` file that accompanies the driver for any updated information.

To make a driver diskette, extract the files from the *Universal Driver Suite* CD to a blank diskette, or download the driver files from the company website and extract them to an empty diskette. Label the diskette as the MegaRAID driver diskette for the given OS.

Table 1 MegaRAID Device Driver Files, Driver RPMs Support, Driver ISO Support, and Driver Deb Package Support

Operating System and Chapter	MegaRAID 12Gb/s Controller Support	Binary/ Source RPM Support	Device Driver File Names	Driver RPMs and Driver ISO Support
Chapter 2				
Windows 8, 8.1, 8.1 Update 1	Yes	megasas2.sys		
Windows 10 Client LTSB	Yes			
Windows Server 2012	Yes			
Windows Server 2012 R2	Yes			
Windows Server 2012 R2 Update 1	Yes			
Windows Server 2016	Yes			
Chapter 3				
■ Red Hat Enterprise Linux 6.x–6.6, 6.7, and 6.8 ■ Red Hat Enterprise Linux 7.x–7. 0, 7.1, and 7.2	Yes		N/A	KMOD RPMs and ISO support

Table 1 MegaRAID Device Driver Files, Driver RPMs Support, Driver ISO Support, and Driver Deb Package Support (Continued)

Operating System and Chapter	MegaRAID 12Gb/s Controller Support	Binary/ Source RPM Support	Device Driver File Names	Driver RPMs and Driver ISO Support
Chapter 4				
■ SUSE Linux Enterprise Server 11.x –11 SP2, 11 SP3, and 11 SP4. ■ SUSE Linux Enterprise Server 12.x –12 and 12 SP1	Yes		N/A	KMP RPMs and ISO support
Chapter 5				
■ Ubuntu 14.04 (LTS) ■ Ubuntu 16.04 (LTS) ■ Ubuntu 16.10	Yes	Ubuntu14.04, and16.04 haveonly librarysupport.	`Package.deb`	Deb package support
Chapter 6				
■ FreeBSD 10.2 ■ FreeBSD 10.3 ■ FreeBSD 11	Yes		`mrsas.ko` ■ 3Gb/s RAID controllers: `mfi.ko` ■ 6Gb/s RAID controllers: `mfi.ko` or `mrsas.ko`, depending on the controller ■ 12Gb/s RAID controllers: `mrsas.ko`	N/A
Chapter 7				
■ VMware ESXi 5.1x–5. 5 Update 1, 5.5 Update 2, and 5.5 Update 3 ■ VMware ESXi 6.x– 6.0 Update 1, and 6.0 Update 2 ■ VMware ESXi 6.5 **NOTE** Native driver support only.	Yes		■ ESXi 5.x: VMware installation bundle (VIB) file package `<offline-bundle>.`zip file package	N/A
Chapter 8				
■ XenServer 6.5 SP1 ■ XenServer 7.0	Yes		N/A	RPMs and ISO support
Chapter 9				
OEL 6.x based UEK Support: 32-bit OS ■ Update 7UEK (2.6.39-400.250.7)(el6uek). ■ Update 8UEK (2.6.39-400.278.2)(el6uek). 64-bit OS ■ Update 7UEK (3.8.13-68.3.4)(el6uek). ■ Update 8UEK (4.1.12-37.4.1)(el6uek).		Binary RPM is provided for Update 6UEK and Update 7UEK	N/A	KMOD RPMs and ISO support
OEL7.x based UEK Support: ■ Update 1UEK (3.8.13-55.1.6)(el7uek). ■ Update 2UEK (3.8.13-98.7.1)(el7uek). **NOTE** ISO (DUD) is not supported for all UEK kernels and is limited only to OEL 6.x and 7.x Red Hat kernel releases.		Binary RPM is provided for Gold UEK, Update 1UEK, and Update 2UEK.		

Table 1 MegaRAID Device Driver Files, Driver RPMs Support, Driver ISO Support, and Driver Deb Package Support (Continued)

Operating System and Chapter	MegaRAID 12Gb/s Controller Support	Binary/ Source RPM Support	Device Driver File Names	Driver RPMs and Driver ISO Support
Chapter 10				
Fedora 24	Yes		N/A	KMOD Source RPM only
Chapter 11				
■ CentOS 6.7, and CentOS 6.8 ■ Cent OS 7.1, and Cent OS 7.2	Yes		N/A	N/A

Chapter 2: Windows Driver Installation

This chapter describes the installation of the following Microsoft Windows OSs:

- Windows 8, 8.1, 8.1 Update 1
- Windows 10 client LTSB
- Windows Server 2012
- Windows Server 2012 R2
- Win Server 2012 R2 Update 1
- Windows Server 2016 GA LTSB
- Windows Server 2016 Nano Server

2.1 MegaRAID Primary Storage

In the MegaRAID primary storage configuration, the Windows OS is installed on virtual drives provided by the MegaRAID controller. The MegaRAID controllers (6Gb/s and 12Gb/s) include pre-boot configuration utilities (WebBIOS™ and Ctrl-R) that create the virtual drive before the installation of the Windows OS starts.

To install the Windows OS, prepare a USB flash drive, CD-ROM or diskette, as appropriate, with the MegaRAID driver.

The driver is distributed in a series of nested compressed files. Use an existing Windows device to extract the files for the driver-loading device (USB, CD-ROM, or diskette) by using the appropriate Windows driver. Only two driver choices exist across the supported Windows versions: one for 32-bit systems or one for 64-bit systems.

2.1.1 Storage Configuration

The procedures in this section describe how to create the virtual drive used for the Windows OS. You can add other virtual drives to the running OS after the Windows OS has been installed. The MegaRAID preboot BIOS utilities, such as WebBIOS (for 6Gb/s controllers) and Ctrl-R (for 12Gb/s controllers) that create the virtual disk for the Windows OS are accessible during the power-on self-test (POST) part of the bootup process.

Refer to the *MegaRAID SAS Software User Guide* or the *12Gb/s MegaRAID® SAS Software User Guide* for more information about the WebBIOS configuration utility and the Ctrl-R Utility, respectively.

2.1.1.1 Creating Storage Configuration Using WebBIOS

The following procedure describes the creation of a RAID 1 array. You can use other RAID levels, and the steps are the same except when selecting the RAID level. In a RAID 1 array, the RAID controller duplicates all data from one drive to a second drive. The RAID 1 array provides complete data redundancy, but at the cost of doubling the required data storage capacity. It is appropriate for small databases or any other environment that requires fault tolerance but small capacity.

1. When the host computer is booting, hold down the Ctrl key and press the H key when the following text appears on the window:

   ```
   Copyright© Avago Technologies
   Press <Ctrl><H> for WebBIOS
   ```

   The **Controller Selection** window appears.

2. If the system contains multiple SAS/SATA controllers, select a controller.

3. Click **Start**.

   The main **WebBIOS CU** window appears.

4. Click **Configuration Wizard**.

    The first **Configuration Wizard** window appears.

5. Click **New Configuration**.

    > **NOTE**   If you choose the first or second option, all of the existing data in the
    > configuration will be deleted. Make a backup copy of any data that
    > you want to keep before you choose an option.

6. Click **Next**.

    A dialog warns that you will lose data if you click **Clear Configuration** or **New Configuration**.

    The **WebBIOS Configuration Method** window appears.

7. Select **Manual Configuration**.

    Manual configuration lets you control all attributes of the new storage configuration as you create drive groups
    and virtual drives, and set their parameters.

8. Click **Next**.

    The **Disk Group Definition** window appears. You use this window to select drives to create drive groups.

9. Hold down the Ctrl key while you select two ready drives in the **Drives** panel on the left.

    You must select an even number of drives.

10. Click **Add To Array** to move the drives to a proposed drive group configuration in the **Disk Groups** panel.

    If you need to undo the changes, click **Reclaim**.

11. Choose whether to use power save mode.

12. Choose whether to use drive encryption.

    > **NOTE**   A RAID 1 virtual drive can contain up to 16 drive groups and up to
    > 32 drives in a single span. (Other factors, such as the type of controller,
    > can limit the number of drives.) You must use two drives in each
    > RAID 1 drive group in the span.

13. After you finish selecting drives for the drive group, click **Accept DG**.

14. Click **Next**.

    The **Virtual Drive Definition** window appears. You use this window to select the RAID level, strip size, read policy,
    and other attributes for the new virtual drives.

15. Change the virtual drive options from the defaults listed on the window as needed.

    Here are brief explanations of the virtual drive options:

    — **RAID Level**: The drop-down menu lists the possible RAID levels for the virtual drive. Select **RAID 1**.

    — **Strip Size**: The strip size specifies the length of the data segments that the RAID controller writes across
    multiple drives, not including parity drives. For example, consider a stripe that contains 64 KB of drive space
    and has 16 KB of data residing on each drive in the stripe. In this case, the stripe size is 64 KB and the strip size
    is 16 KB. You can set the strip size to 8, 16, 32, 64, 128, 256, 512, and 1024 KB. A larger strip size produces higher

read performance. If your computer regularly performs random read requests, choose a smaller strip size. The default is 64 KB.

— **Access Policy**: Select the type of data access that is allowed for this virtual drive.

RW: Permit read/write access. This setting is the default.

Read Only: Permit read-only access.

Blocked: Do not permit access.

— **Read Policy**: Specify the read policy for this virtual drive.

Normal: Disable the read-ahead capability. This setting is the default.

Ahead: Enable read-ahead capability, which permits the controller to read sequentially ahead of requested data and to store the additional data in cache memory, anticipating that the data will be needed soon. This setting speeds up read operations for sequential data, but little improvement exists when accessing random data.

— **Write Policy**: Specify the write policy for this virtual drive.

— **WBack**: In Write Back mode, the controller sends a data transfer completion signal to the host when the controller cache has received all of the data in a transaction. This setting is recommended in Standard mode.

WThru: In Write Through mode, the controller sends a data transfer completion signal to the host when the drive subsystem has received all of the data in a transaction. This setting is the default.

— **Write Back with BBU**: Select this mode if you want the controller to use Write Back mode, but the controller either has no battery backup unit (BBU) or the BBU is bad. If you do not choose this option, the controller firmware automatically switches to Write Through mode if it detects a bad or missing BBU In Write Through mode, the controller sends a data transfer completion signal to the host when the drive subsystem has received all of the data in a transaction. This setting is the default.

> **NOTE**   You can use Write Back mode with or without a battery. You should use either a battery to protect the controller cache or an uninterruptible power supply (UPS) to protect the entire system. If you do not use a battery or a UPS, and a power failure occurs, you risk losing the data in the controller cache. Although you can enable or disable the disk cache, you should disable it. If you enable the disk cache, the drive sends a data transfer completion signal to the controller when the drive cache has received all the data in a transaction. However, the data has not been actually transferred to the disk media, so you risk

losing the data in the disk cache if a power failure occurs. The data is unrecoverable.

— **IO Policy**: The IO policy applies to read operations on a specific virtual drive. It does not affect the read-ahead cache.

Direct: Read operations are not buffered in cache memory. Data is transferred to the cache and the host concurrently. If the same data block is read again, it comes from cache memory. This setting is the default.

Cached: Read operations are buffered in cache memory before they are sent to the host.

— **Drive Policy**: Specify the drive cache policy.

Enable: Enable the drive cache.

Disable: Disable the drive cache.

NoChange: Leave the current drive cache policy as is. This setting is the default.

— **Disable BGI**: Specify the background initialization status.

No: Leave background initialization enabled. A new configuration can be initialized in the background while you use WebBIOS to perform other configuration tasks. This setting is the default.

Yes: Select **Yes** if you do not want to allow background initialization for configurations on this controller.

— **Select Size**: Specify the size of the virtual drive or drives in MB, GB, or TB. Usually, this size is the full size for the RAID 1 array shown in the Configuration panel on the right. You can specify a smaller size if you want to create other virtual drives on the same drive group.

— **Update Size**: Click **Update Size** to update the Select Size Field value for the selected RAID levels.

16. Either click **Accept** to accept the changes to the virtual drive definition, or click **Reclaim** to return to the previous settings.

17. Click **Next** after you define the virtual drives.

The **Configuration Preview** window appears.

18. Check the information in the configuration preview.

19. If the virtual drive configuration is acceptable, click **Accept** to save the configuration. Otherwise, click **Back** to return to the previous screens and change the configuration.

20. If you accept the configuration, click **Yes** at the prompt to save the configuration and initialize the new virtual drive.

21. After the initialization is complete (the elapsed time depends on the RAID level and the disk size), click the **Home** button, and then click **Exit** in the left hand window frame.

22. Select **Exit Application**, and reboot the computer with the Windows OS in the DVD drive or the CD drive.

2.1.1.2   Creating Storage Configuration Using Ctrl-R

Perform the following steps to create a virtual drive.

1. When the host computer is booting, hold down the Ctrl key and press the R key when the following text appears on the window:

```
Copyright© Avago Technologies
Press <Ctrl><R> for Ctrl-R
```

The **Controller Selection** window appears.

2. In the **VD Mgmt** screen, navigate to the controller and press the F2 key.

3. Press Enter.

The **Create New VD** screen appears.

4. Select a RAID 1level for the drive group from the **RAID Level** field.

5. Select a power save mode for the drive group from the **Power save mode** field.

   The options available are **Auto**, **Max**, and **Controller defined**.

   This field is enabled only if power saving on configured drives is supported on the controller.

6. Enter a name for the virtual drive in the **Name** field.

   The name given to the virtual drive cannot exceed 15 characters.

7. Press **OK**.

   A dialog appears, asking you whether you want to initialize the virtual drive you just created.

8. To initialize the virtual drive, press **OK**.

   The **Create New VD** dialog appears again.

9. Press **Advanced**.

   The **Create Virtual Drive – Advanced** dialog appears. The following are the additional virtual drive properties that you can select while you create virtual drive. Change these parameters only if you have a specific reason for doing so. It is usually best to keep them at their default settings.

   — **Strip Size** – The strip size is the portion of the stripe that resides on a single virtual drive in the drive group. Strip sizes of 64 KB, 128 KB, 256 KB, 512 KB, or 1 MB are supported.

   — **Read Policy** – Specify one of the following options to specify the read policy for this virtual drive:

   • **Normal** – Read ahead capability lets the controller read sequentially ahead of requested data and to store the additional data in cache memory, thereby anticipating that the data will be needed soon. This process

speeds up reads for sequential data, but there is little improvement when the computer accesses random data.

- **Ahead** – Disables the read ahead capability.

— **Write Policy** – Select one of the following options to specify the write policy for this virtual drive:

- **Write Back** – In this mode, the controller sends a data transfer completion signal to the host when the controller cache receives all of the data in a transaction. If you select the Write Back policy and the battery is absent, the firmware disables the Write Back policy and defaults to the Write Through policy.

- **Write Through** – In this mode, the controller sends a data transfer completion signal to the host when the drive subsystem receives all the data in a transaction.

- **Always Write Back** – In this mode, the controller sends a data transfer completion signal to the host when the controller cache receives all the data in a transaction. If you select the Always Write Back policy and the battery is absent, the firmware is forced to use the Write Back policy.

— **I/O Policy** – The I/O policy applies to reads on a specific virtual drive. It does not affect the read ahead cache.

- **Cached** – In this mode, all reads are buffered in cache memory. **Cached I/O** provides faster processing.

- **Direct** – In this mode, reads are not buffered in cache memory. Data is transferred to the cache and the host concurrently. If the same data block is read again, it comes from cache memory. **Direct I/O** makes sure that the cache and the host contain the same data.

— **Disk cache policy** – Select a cache setting for this virtual drive:

- **Enable** – Enable the drive cache.

- **Disable** – Disable the drive cache.

- **Unchanged** – Updating the drive cache policy to **Unchanged** may enable /disable the drive cache based on the WCE (Write Cache Policy) bit of the save mode page of the drive.

— **Emulation** – Lets you to set the emulation type on a virtual drive to default or none. The force option forces the emulation to be set on a controller even when MFC settings do not support it. The possible options are **Default**, **Disabled**, or **Forced**.

— **Initialize** – Select to initialize the virtual drive. Initialization prepares the storage medium for use. Fast initialization will be performed on the virtual drive.

— **Configure Hot Spare** – Select to configure physical drives as hot spares for the newly created virtual drive.

This option is enabled only if there are additional drives and if they are eligible to be configured as hot spares. This option is not applicable for RAID 0. If you select this option after the Virtual drive is created, a dialog appears. The dialog asks you to choose the physical drives that you want to configure as hot spares.

— **Provide shared access**– Select this option if you want the virtual drive to be shared between the servers in a cluster. This option appears only if the controller supports High Availability DAS.

10. Select **Initialize**, and press **OK**.

The new virtual drive is created and initialized.

11. After the initialization is complete (the elapsed time depends on the RAID level and the disk size), press Esc twice (once to exit the dialog, and the second time to exit the utility).

A confirmation message box appears.

12. Press **OK** to exit the utility, and reboot the computer with the Windows OS in the DVD drive or the CD drive.

2.2 Primary OS Storage on the MegaRAID Controller

For the Windows Server 2012 OS, the MegaRAID driver is added after other installation steps.

Perform the following steps to set up the primary operating system storage on your MegaRAID controller:

1. The operating system loads and decompresses the core files from the boot DVD first.

2. After the **Install Windows Language selection** window, the **Install Now** window appears, followed by the OS selection, license agreement and installation type.

    On new installations, the Custom installation type is the only option.

3. On the next Windows installation window, a Load Driver link introduces the MegaRAID driver.

    For the Windows Server 2012 OS, you can add the driver from the CD, DVD, or USB flash drive.

4. Click **Browse**, and select the device and the folder with the previously extracted drivers.

5. In the next Windows installation window, select the driver to be installed, and click **Next**.

    If no driver appears, two common problems might have occurred.

    — The folder with the files was not selected.

    — The wrong driver (32-bit as compared to 64-bit) was selected.

6. After the driver is loaded, follow the rest of the standard Windows installation steps.

2.3 Drivers and Operating Systems

Starting with MegaRAID 6.12, we have one release order for MegaRAID Windows drivers. The release order structure of `win_megasas_drv_rel` driver is shown below:

■ `win_megaraid_drv_rel`: This binary zip file should be used for RAID mode.

When installing the MegaRAID Drivers on Windows platform, refer to the following table to locate the driver and its respective operating system.

Table 2 Drivers and Operating Systems

Driver	Windows Operating System	Architecture
Win8_x86	Windows 8 and Windows Server 2012	x86
Win8_x64	Windows 8 and Windows Server 2012	x64
Win8.1_x86	Windows 8.1 and Windows Server 2012 R2	x86
Win8.1_x64	Windows 8.1 and Windows Server 2012 R2	x64
Win10_x86	Windows 10 and Windows Server 2016	x86
Win10_x64	Windows 10 and Windows Server 2016	x64

2.4 Secondary Storage on the MegaRAID Controller with the Windows Server 2012 OS

As the MegaRAID controller is installed and the previously installed Windows OS starts, the Windows Server 2012 OS prompts with Found New Hardware.

Perform the following steps to set up secondary storage for the Windows 8 OS:

1. Select **Locate and Install**.

2. Select **Don't Search Online**.

3. Select **Show Me Other Options**.

4. Select **Browse My Computer**.

5. Click **Browse**.

6. In the **Browse for Folder** window, locate the previously extracted driver files from the local boot disk, CD, DVD, network, or USB device.

7. Click **OK**.

8. Click **Next**.

9. Click **Install**.

   The Hardware Wizard displays the following message: `The software for this device has been successfully installed.`

10. Reboot the system.

    The system does not require a reboot when the MegaRAID controller driver is loaded for the first time.

2.5 Using the Device Manager to Install MegaRAID on the Windows Server 2012 OS

If you do not install the MegaRAID driver at boot time, the MegaRAID driver is added or updated in the Windows environment using the Device Manager. Many methods exist to start the Device Manager, including one general method for all supported versions of the Windows OS.

Perform the following steps to add or update the MegaRAID driver in the Windows environment using the Device Manager:

1. Select **Start > Search > devmgmt.msc > enter key** (for all versions except the Windows 2003 OS).

   In the Device Manager, a MegaRAID controller with no driver appears under the heading Other devices as a RAID Controller or Unknown Device, depending on the system history.

2. Right-click and select either **RAID Controller** or **Unknown Device**, as appropriate.

3. If the device does not appear, double-click **Storage controllers** to expose any detected controllers that are supported by an existing driver.

4. If you locate the MegaRAID controller, right-click on the controller.

   The driver installation steps for the Windows 8 OS are the same no matter where the device was found.

5. Click **Update Driver Software**.

6. Click **Browse My Computer** to search for driver software.

7. Click the **Browse** button.

8. In the **Browse for Folder** window, locate the previously extracted driver files from the local boot disk, CD, DVD, network, or USB device.

9. Click **OK**.

10. Click **Next**.

11. Click **Install**.

    The Update Driver Software wizard shows the message: `The software for this device has been successfully installed.`

12. Reboot the system.

2.6 Installing a MegaRAID Driver on the Microsoft Windows Server 2016 OS

To install the MegaRAID driver on the Windows Server 2016 operating system, you have to download the Windows Server 2016 driver from the Broadcom Technologies website.

Consider the following points before you install the driver.

■ If you want to use the MegaRAID controller for primary storage, see Section 2.1.1.1, Creating Storage Configuration Using WebBIOS, on configuring a virtual disk for the OS in a pre-boot environment. The Windows installation program recognizes the MegaRAID controller, and it automatically installs a driver.

■ If you want to use the MegaRAID controller as secondary storage, install the OS with the MegaRAID controller installed. The OS automatically configures the controller with the in-box driver.

■ When the Microsoft OS is running on the machine with the MegaRAID controller, upgrade to the latest Avago™ MegaRAID driver.

2.6.1 Driver Upgrades

Perform the following steps to upgrade the Windows 8 driver.

1. Download the updated driver and put it on a USB, CD or DVD disc.

2. Boot the Microsoft Windows 8 OS, and then move the mouse to the upper- or lower-right corner of the screen to expose the desk icons for **Search**, **Share**, **Start**, **Devices**, and **Settings**, shown in the following figure.

Figure 1 Settings Option
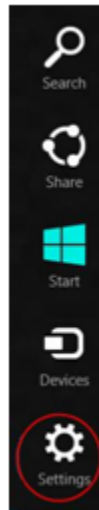
3. Click **Settings**.

4. On the Settings bar, click **Control Panel**, as shown in the following figure.

Figure 2 Settings Bar
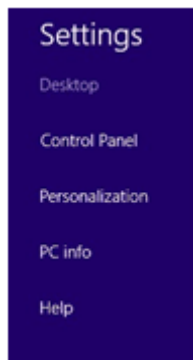
5. In the Control Panel, click **Hardware and Sound**.

The following figure appears.

Figure 3 Hardware and Sound
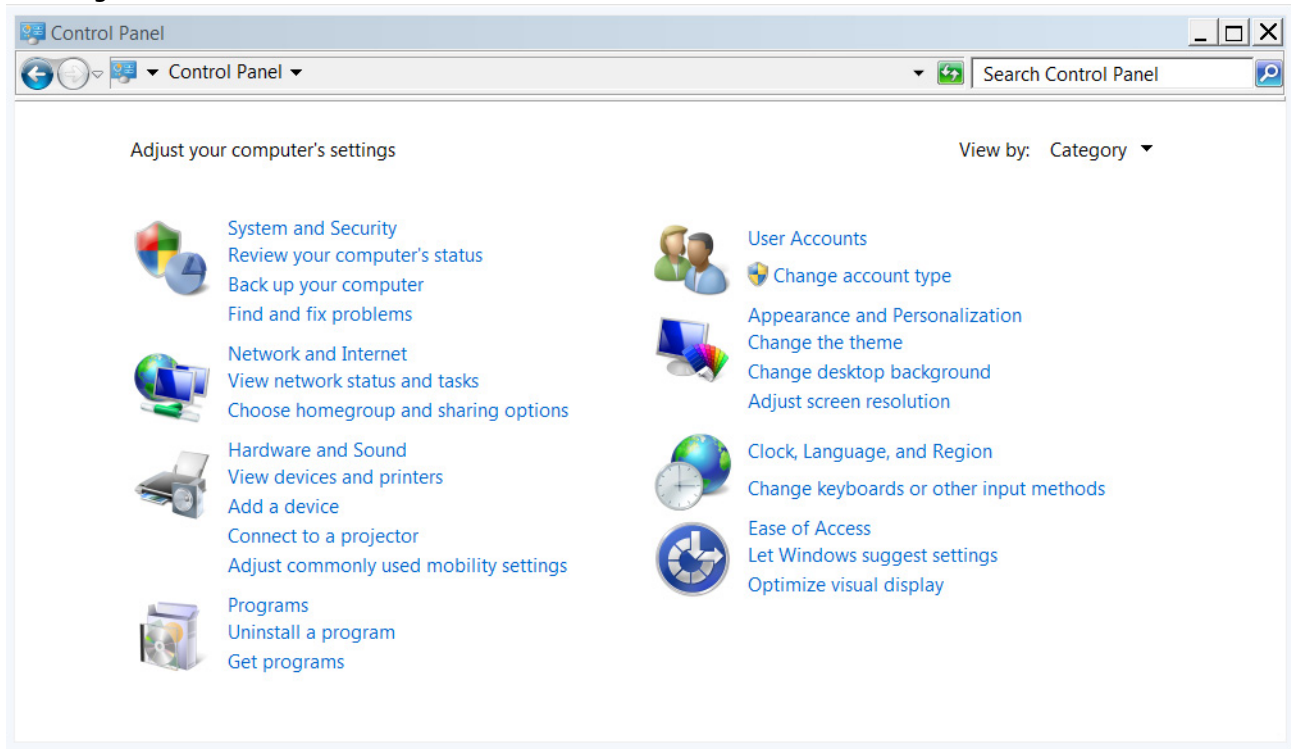
6. In the Hardware and Sound screen, click **Device Manager** under the Devices and Printers heading.
    The following figure appears.

Figure 4 Device Manager
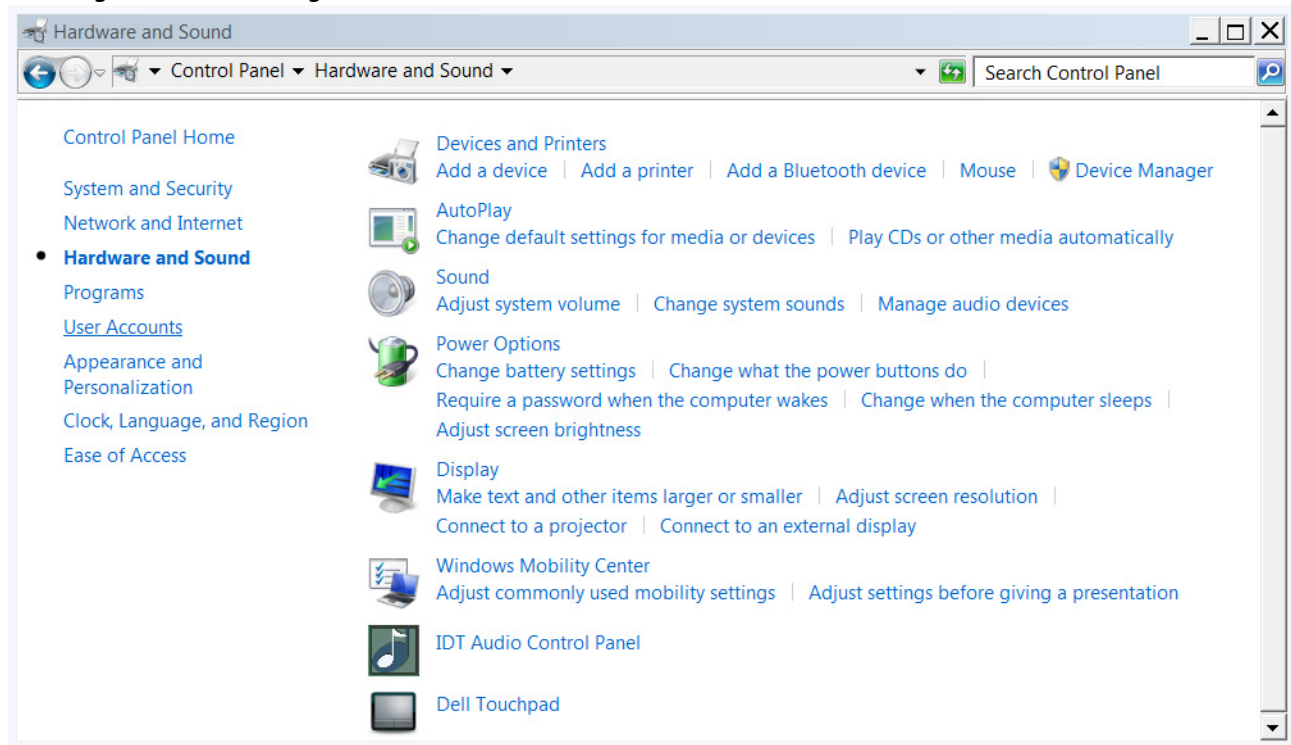
7. In the Device Manager, expand the sub-menu under Storage Controllers and right-click **Update Driver Software**, as shown in the following figure.

    You can find the version of the existing driver by right-clicking **Properties** and selecting the **Driver** tab.

Figure 5 Update Driver Software Option
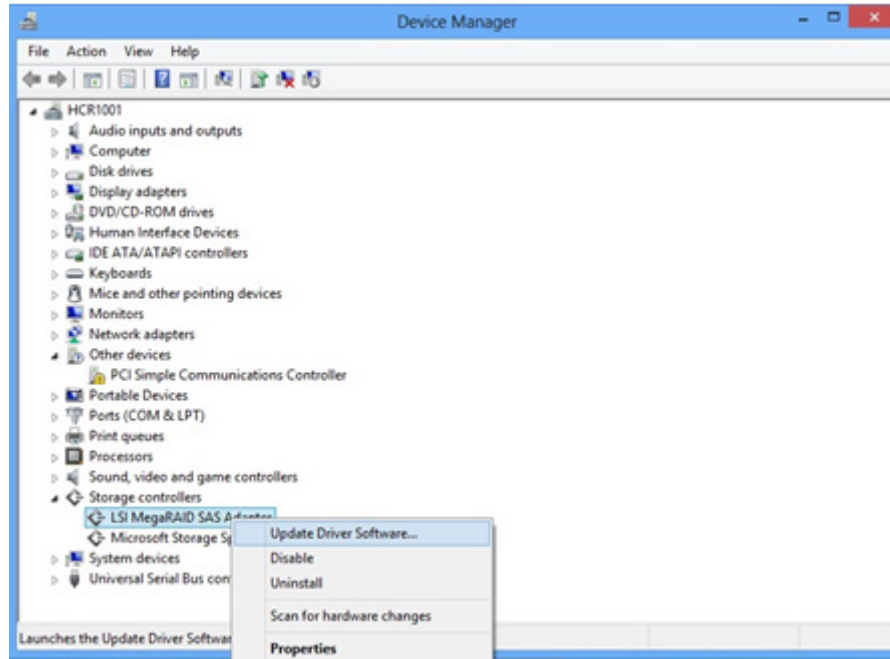
8. In the Update Driver Software wizard, select **Browse My Computer** to locate the updated driver on the USB, CD, or DVD.

9. When the driver is found, click **Install** to confirm, as shown on the following screen.

Figure 6 Install Button

10. The installation wizard presents progress screens and announces the completion of the installation.

11. After the driver is installed, reboot the system.

2.7 Installing a MegaRAID Driver on the Windows Server 2012 OS

The Microsoft Windows Server 2012 operating system package includes a MegaRAID driver in box.

The type of installation to use depends on how you plan to use your MegaRAID controller:

■ If you use the MegaRAID controller as primary storage, see Section 2.1.1.1, Creating Storage Configuration Using WebBIOS, on configuring a virtual disk for the OS in a pre-boot environment. The Windows installation program recognizes the MegaRAID controller, and it automatically installs a driver.

■ If you use the MegaRAID controller as secondary storage, Avago recommends that you install the OS without the MegaRAID controller, shut down the system, install the controller, and let the OS automatically configure the controller with the in-box driver.

■ After the Windows Server 2012 OS is running on the machine with the MegaRAID controller, an upgrade to the latest Avago MegaRAID driver is recommended. The following section describes how to upgrade the driver.

2.7.1 Upgrading the Driver for the Windows Server 2012 OS

Perform the following steps to upgrade the driver.

1. Download the updated driver from www.broadcom.com/support/download-search, and put it on a USB, CD, or DVD.

2. Boot the Microsoft Server 2012 OS.

3. Click the **Server Manager** button to start Server Manager, if it does not start automatically.

   The button to start Server Manager is the first item on the left of the start bar, as shown in the following figure.

Figure 7 Server Manager Button

The **Server Manager** page appears.

4. In Server Manager, open the Tools menu, and select **Computer Management**, as shown in the following figure.

Figure 8 Computer Management Option
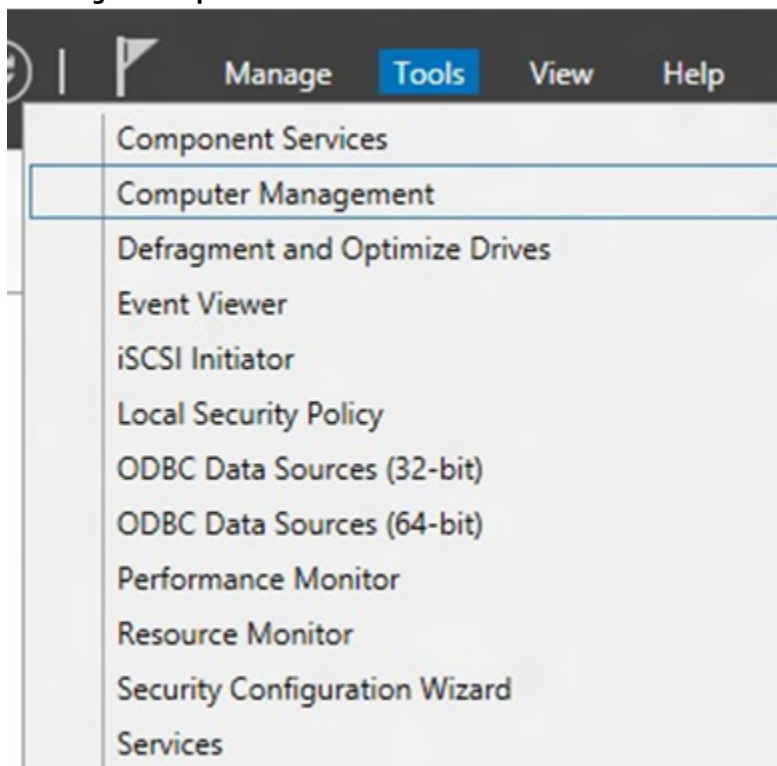
The **Computer Management** window appears.

5. In the left frame of the **Computer Management** window, select **Device Manager**.

Figure 9 Device Manager Option
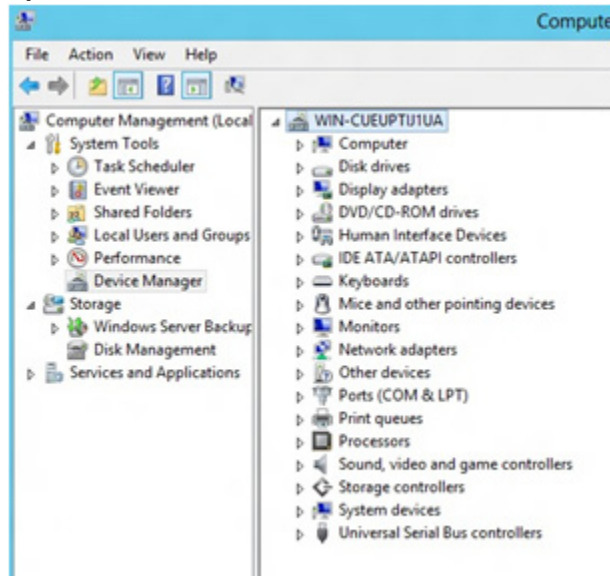
The **Device Manager** window appears.

6. In the **Device Manager** window, expand the submenu under **Storage Controllers**.

7. Right-click the **Avago MegaRAID Controller** option, and click **Update Driver Software**, as shown in the following figure.

Figure 10 Update Driver Software Option
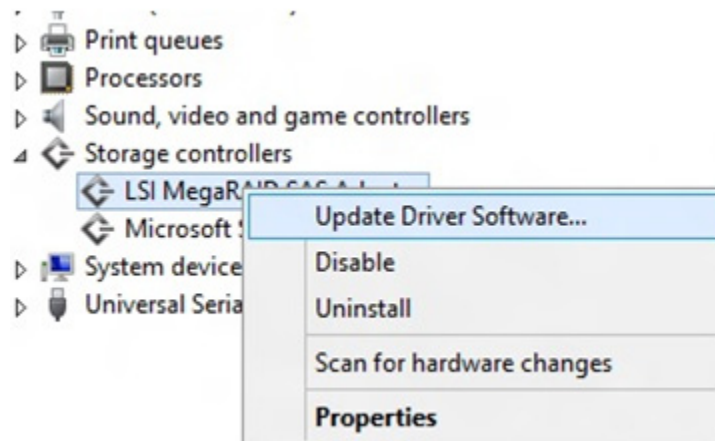
To find the version of the existing driver, right-click the **Avago MegaRAID Controller** option. Click **Properties**, and select the **Drivers** tab as shown in the following figure.

Figure 11 Driver Version
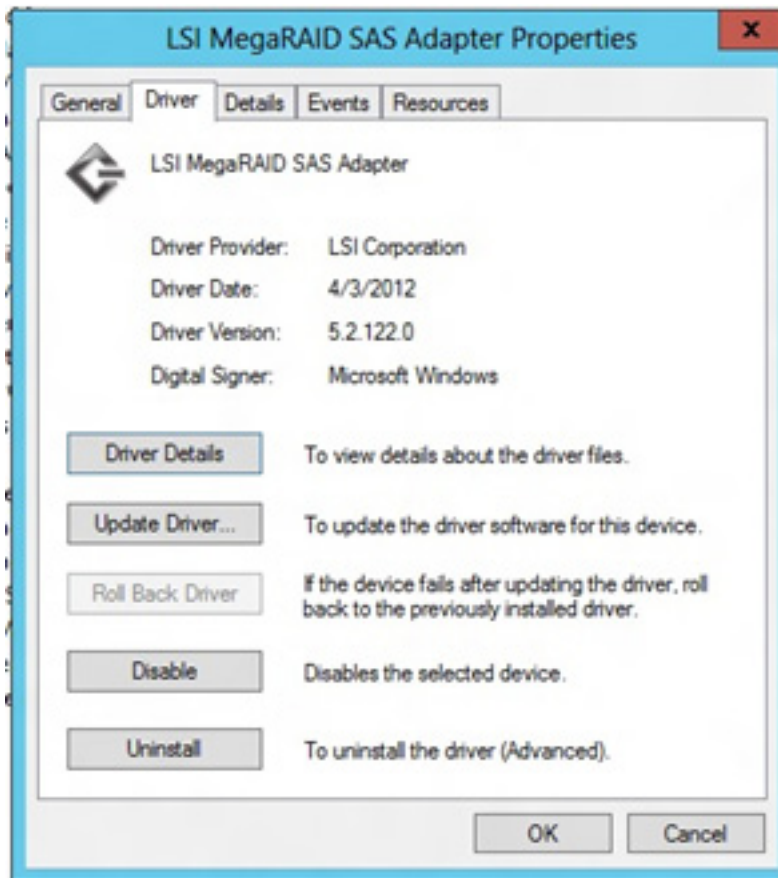
8.   In the Update Driver Software wizard, click the **Browse** button to locate the updated driver on the USB, CD, or DVD.

Figure 12 Update Driver Software Wizard
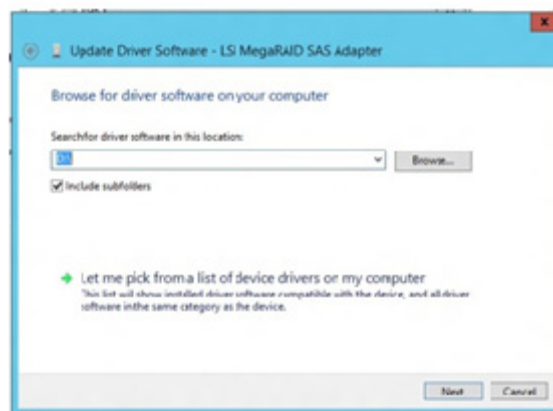
After you locate the updated driver, the **Windows Security** dialog appears.

9.   Click the **Install** button in the **Windows Security** dialog, as shown in the following figure.

Figure 13 Windows Security Dialog

The installation wizard presents progress screens and announces the completion of the installation.

Figure 14 Installation Complete Dialog
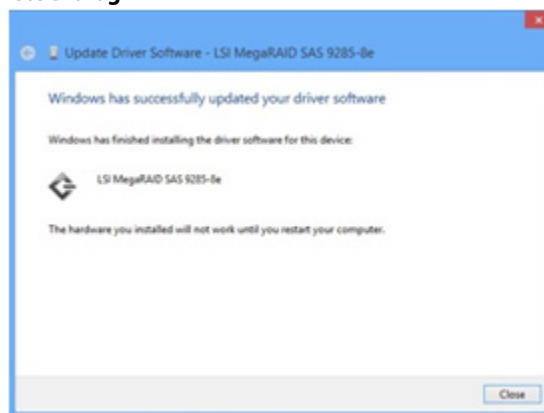
10. Reboot the system after the driver is installed.

2.8   Installing a Test Driver into a Windows 2016 Nano Server Image

Drivers cannot be installed dynamically (on-line) with Nano Server, you must add a test driver to the Nano Server image before deployment. You have two options to add a test driver to the image.

■   Add the driver when the Nano Server image is created.

■   Edit an existing image to add the test driver.

A good practice is to create a standard Nano Server image without adding any test drivers, then, when you test a new driver you can create a copy of the standard image file with a new name. Edit the new image to add the test driver. Editing the image to add a test driver is much faster compared to creating a new image.

> **NOTE**   When you edit a Nano Server image the Power Shell
> `Edit-NanoServerImage` function must be executed from the
> same directory from where the original image was created.

2.8.1   Adding a Test Driver When Creating a New Nano Server Image

You can use this procedure to create NanoServerVM.vhd file to run as a VM under Hyper-V. In this example, the test driver files are located at `c:\NanoServer_files\Test_Driver`.

> **NOTE**   You have to follow this procedure every time you create a Nano Server image.

1. Use a Virtual DVD utility to mount the ISO image as a local drive.

    a. You can just right-click on the ISO file and click Mount (`Virtual Clone Drive E:`).

2. Start the PowerShell as Administrator.

3. Navigate to your local NanoServer directory.

    `cd c:\NanoServer_files`

4. Run the following command to Import the PowerShell scripts needed for NanoServer generation.

    Import-Module `.\NanoServerImageGenerator.psm1 -Verbose`

5. Place the test driver files in a folder.

    `c:\NanoServer_files\Test_Driver`

6. Create the VHD file for NanoServer, using the following command syntax:

    ```
    New-NanoServerImage -MediaPath <path to mounted ISO> -BasePath <path to Base
    files copied from ISO> -TargetPath <path to created NanoServer VHD>
    -ComputerName <computer name> -DeploymentType <Host or Guest> -Edition
    <Standard or DataCenter> <other image creation options>
    ```

    — MediaPath is the root of the DVD media or ISO image containing Windows Server 2016.

    — BasePath will contain a copy of the Nano Server binaries, so you can use New-NanoServerImage - BasePath without having to specify -MediaPath in future runs.

    — TargetPath will contain the resulting `.wim` file containing the roles and features you selected. Make sure to specify the `.wim` extension.

    — ComputerName - Specifies the computer name for the Nano Server you have created.

    — DeploymentType - Specifies whether it is host deployment or a guest deployment.

    For this example we are setting the Guest role and the DriversPath pointing to the test driver:

    ```
    New-NanoServerImage -MediaPath e:\ -BasePath .\Base -TargetPath
    .\Nano1\NanoTestDrvrVM.vhd -ComputerName Nano1 -DeploymentType Guest
    -Edition Standard -DriversPath .\Test_Driver
    ```

7. Enter the Administrator password.

    After you enter the administrator password the new script performs the following operations:

    — Creates a Virtual Hard Disk from the NanoServer image

    — Mounts the Image

    — Adds the Packages

    — Adds the Test driver

    — Adds the Unattend.xml

    — Dismount the image

    A blue/green band at the top of the PowerShell window displays the status throughout the process.

> **NOTE**   This process takes between 20 - 30 minutes (the Virtual Machine has limited resources). Do not interrupt or close the PowerShell window

until the process has completed and the PowerShell prompt is displayed.

After the image creation process is complete, the newly created Nano Server image will contain the test driver which will be loaded on any devices supported via the INF file PnP entries.

2.8.2   Adding a Test Driver by Editing an Existing Nano Server Image

Perform the following steps within your Virtual Machine, this should be the same environment (with the same Base files) that was used to create the existing NanoServer image.

1. Start the PowerShell as Administrator.

2. Navigate to your local NanoServer directory.

   `cd c:\NanoServer_files`

3. Run the following command to Import the PowerShell scripts needed for NanoServer generation.

   Import-Module `.\NanoServerImageGenerator.psm1 -Verbose`

4. Place the test driver files in the folder.

   `c:\NanoServer_files\Test_Driver`

5. Edit the existing NanoServer image file, using the following command:

   ```
   Edit-NanoServerImage -BasePath .\Base -TargetPath .\Nano1\NanoServerVM.vhd
   -DriversPath .\Test_Driver
   ```

   The -BasePath must point to the same Base files that were used to originally create the image. For this example we are adding a test driver using the DriversPath option:

   The Edit script will mount the image, add the test driver, and then dismount the image. A blue/green band near the top of the PowerShell window will display status throughout the process.

NOTE	This process only takes between 2 and 3 minutes so it is much more efficient to use a standard image. Editing the image to add a test driver is much faster compared to creating a new image.

The image editing process will complete and the newly modified Nano Server image will contain the test driver which will be loaded on any devices supported via the INF file PnP entries.

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Chapter 3: Red Hat Linux Driver Installation
Installing the Driver in a New Red Hat Enterprise Linux 5.x, 6.x, or 7.x OS

Chapter 3: Red Hat Linux Driver Installation

This chapter describes how to install the device driver in new Red Hat Enterprise Linux systems, update the driver on existing operating systems, and uninstall the driver.

Refer to the release notes that accompanied the driver for information on an existing Red Hat Enterprise Linux system.

NOTE   An optimized, single unified binary is provided for RHEL, CentOS, and OEL operating systems.

3.1 Installing the Driver in a New Red Hat Enterprise Linux 5.*x*, 6.*x*, or 7.*x* OS

You can install the MegaRAID device driver in a new system from the Red Hat Enterprise Linux CD, DVD, or from a driver update disk.

NOTE   MegaRAID supports PPC 64-bit architecture for Red Hat Enterprise Linux 6, but the preboot application is not supported due to the PPC BIOS limitations.

NOTE   Do not install the operating system on the PPC virtual drive for the PPC 64-bit architecture.

3.1.1 Installing from a CD or a DVD

Perform the following steps to install the MegaRAID device driver in a new Red Hat Linux OS from the Red Hat Enterprise Linux installation media:

1. Refer to your system documentation, if needed, and boot the server with the installation CD or DVD.
2. Follow the installation procedure for the Red Hat OS.

   If you do not provide a driver disk at boot time, the driver is loaded automatically during the installation process.

3.1.2 Creating a Driver Update Disk with a USB Drive

You can transfer a driver disk image to a USB flash drive with the rawrite tool from DOS, or the `dd` utility in Linux. On a Linux machine, you can use the `dd` command to burn a driver ISO image on a USB drive.

Perform the following steps to create a driver update disk (DUD) with a USB drive.

1. Insert a USB flash drive into a Linux machine, making sure that the USB drive is not mounted.
2. Type the following command:

   `"$ dd if=<driver.iso> of=/dev/sdx"`

   Where `/dev/sdx` is the USB drive.

   NOTE   Make sure that you pick the correct DUD image from the Avago release bundle. The DUD image should match with the installed OS kernel version.

3. Press Enter.
4. Mount the USB flash drive to verify its contents.
5. Make sure the DUD image is in iso9660 format or MS-DOS format by typing the following command:

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Installing the Red Hat Enterprise Linux 5.x, 6.x, or 7.x Driver in an Existing Installation

```
$df -T
```

6. Press Enter.

    The file system type and other information about the mounted devices appear.

3.1.3   Installing from a Driver Update Diskette

Perform the following steps to create the driver update diskette by using the Linux driver image and to install the MegaRAID device driver in a new Red Hat Enterprise Linux OS:

1. Boot the server with the installation CD or DVD.

    Refer to your system documentation, if needed.

2. Enter the following boot option to load the driver disk during installation:

    ```
    linux dd
    ```

    > **NOTE**   If you do not get a command prompt to enter the `linux dd` boot option, press `Esc`. You may have to refer to your distribution-specific RPM package or installation method.

3. Press Enter to continue the installation.

4. When prompted, insert the driver diskette.

    The utility locates and loads the driver for your controller.

5. Press Alt+Ctrl+F4 to verify that the driver is loaded.

6. Press Alt+Ctrl+F1 to return to the installation.

7. Follow the Red Hat installation procedure to complete the installation.

3.2   Installing the Red Hat Enterprise Linux 5.*x*, 6.*x*, or 7.*x* Driver in an Existing Installation

You can install the device driver in an existing Red Hat Enterprise Linux system from the Red Hat Enterprise Linux installation CD.

Perform the following steps to add the Red Hat Enterprise Linux 5, 6, or 7 driver to an existing installation:

1. Turn on the power to the system.

    The system initializes the hardware. The system then detects the controller and invokes Kudzu, the Red Hat Enterprise Linux hardware configuration utility.

2. Enter the `-ivh driver.rpm` command.

    The following RAID controller is added to your system: `LSI MegaSAS`

3. Select the **Configure the device** option.

4. Highlight the Configure tab, and press Enter.

    The system configures the controller and installs the appropriate driver in the kernel.

    The system boots and displays the devices connected or configured on the controller.

3.3 Installing or Updating the Red Hat Linux System Driver

3.3.1 Installing or Updating the Driver by Using the Generic RPMs

Perform the following steps to install or update to the latest version of the Red Hat Linux system driver by using the generic RPMs:

1. Boot the system.
2. Go to Console (your terminal GUI).
3. Perform the following steps to install the <kmod> RPM. In this example, the driver version is 06.602.03.00.
   a. Uninstall the earlier version, if needed.
   b. Extract the packaging from the Linux system by typing the following command and pressing Enter:

   ```
   # tar -zxvf megaraid_sas_components.gz
   ```

   c. For RHEL5 (Update 8), architecture = x86_64, type the following commands and press Enter:

   ```
   # cd rhel5_oel5_centos5/rpms-1# rpm -ivh
   kmod-megaraid_sas-06.602.03.00-1-el5.8.x86_64.rpm
   ```

   d. For RHEL6 (Update 2), architecture = x86_64, type the following commands and press Enter:

   ```
   # cd rhel6_oel6_centos6/rpms-1# rpm -ivh
   kmod-megaraid_sas-06.602.03.00_el6.2-1.x86_64.rpm
   ```

NOTE	You need to select the correct RPM from the available bundled RPMs. Otherwise, you will see an RPM installed but it will be for a different kernel version.

4. Reboot the system to load the driver.

3.3.2 Installing or Updating the Driver by Using the DKMS RPMs

Perform the following steps to install or update to the latest version of the Red Hat Linux system driver by using the DKMS RPMs. In this example, the driver version is 06.602.03.00-1.

NOTE	This DKMS packaging is provided only for RHEL5(x86 and x86_64) pre-compiled binaries.

1. Extract the packaging from the Linux system by typing the following commands and pressing Enter:

   ```
   # tar -zxvf megaraid_sas-release.tar.gz
   # cd dkms-1
   # tar -zxvf megaraid_sas-06.602.03.00-1.dkms.tar.gz
   ```

2. Install the DKMS framework by typing the following commands and pressing Enter:

   ```
   # rpm -ivh dkms-2.0.2.21.1-1.noarch.rpminstall DKMS rpm
   # rpm -ivh megaraid_sas-06.602.03.00-1dkms.noarch.rpm
   ```

3. Reboot to load the driver with the newer version by typing the following command and pressing Enter:

   ```
   # reboot
   ```

3.4 Uninstalling the Red Hat System Driver

NOTE	When you uninstall the existing version of the driver, the driver rolls back to previous version of the driver.

Perform the following steps to uninstall the <kmod> RPM. In this example, the driver version is 06.602.03.00.

1. Type the following command and press Enter:

   ```
   # rpm -qa | grep megaraid_sas
   ```

2. Find the string that contains the text megaraid_sas, and copy the string.
3. Type the following commands and press Enter:

   ```
   # rpm -e megaraid_sas-06.602.03.00-1-rhel5

   # reboot
   ```

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Chapter 4: SUSE Linux Enterprise Server (SLES) Driver Installation
Installing the Driver in a New SUSE Linux Enterprise Server System

Chapter 4: SUSE Linux Enterprise Server (SLES) Driver Installation

This chapter describes how to install the device driver in new SUSE Linux Enterprise Server (SLES) operating systems (OSs), update the driver on existing systems, and uninstall the driver.

4.1 Installing the Driver in a New SUSE Linux Enterprise Server System

You can install the MegaRAID device driver in a new system from the SUSE SLES Linux CD or DVD, or from a driver update diskette.

NOTE	If you use Service Pack (SP) 1 or SP 2, you need to load the driver. If you use SP 3 RC 2, the MegaSAS driver is already on the SUSE SLES Linux CD.
NOTE	MegaRAID supports PPC 64-bit architecture for the SUSE Linux Enterprise Server System, but the preboot application is not supported due to the PPC BIOS limitations.
NOTE	Do not install the operating system on the PPC virtual drive for the PPC 64-bit architecture.

4.1.1 Installing the Driver from a CD or a DVD

Perform the following steps to install the driver in a new SUSE Linux Enterprise Server system from the SUSE Linux Enterprise Server installation CD or DVD:

1. Boot the server with the SUSE Linux Enterprise Server SP CD or DVD.

   The system BIOS must support booting from a CD-ROM. BIOS settings might require changes to allow CD-ROM booting. Refer to your system documentation.
2. Follow the installation procedure for the SUSE OS.

   If you do not provide a driver disk at boot time, the driver is loaded automatically during the installation process.

4.1.2 Creating a Driver Update Disk with a USB Drive

You can transfer a driver disk image to a USB flash drive with the rawrite tool from DOS, or the `dd` utility in Linux. On a Linux machine, you can use the `dd` command to burn a driver ISO image on a USB drive.

Perform the following steps to create a driver update disk (DUD) with a USB drive.

1. Insert a USB flash drive into a Linux machine, making sure that the USB drive is not mounted.
2. Type the following command:

   ```
   "$ dd if=<driver.iso> of=/dev/sdx"
   ```

   Where `/dev/sdx` is the USB drive.

NOTE	Make sure that you pick the correct DUD image from the Avago release bundle. The DUD image should match with the installed OS kernel version.

3. Press Enter.

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Chapter 4: SUSE Linux Enterprise Server (SLES) Driver Installation
Installing or Updating the SUSE Linux Enterprise Server Driver

4. Mount the USB flash drive to verify its contents.

5. Make sure the DUD image is in iso9660 format or MS-DOS format by typing the following command:

    ```
    $df -T
    ```

6. Press Enter.

    The file system type and other information about the mounted devices appear.

4.1.3   Installing from a Driver Update Diskette

To install the MegaSAS device driver in a new SUSE Linux Enterprise Server, create the driver update diskette by using the Linux driver image.

Perform the following steps to install the driver:

1. Refer to your system documentation, if needed, and boot the server with the installation CD or DVD.

2. At the installation message, perform one of the following actions:
    — Press F5 for SUSE Linux Enterprise Server 10.
    — Press F6 for SUSE Linux Enterprise Server 11.
    — Press F6 for SUSE Linux Enterprise Server 12.

3. Continue the installation procedure and, when prompted, insert the driver diskette.

    The utility locates and loads the driver for your controller.

4. Press Alt+Ctrl+F4 to verify that the driver is loaded.

5. Press Alt+Ctrl+F1 to return to the installation.

6. Follow the SUSE installation procedure to complete the installation.

4.2   Installing or Updating the SUSE Linux Enterprise Server Driver

4.2.1   Installing the Driver by Using the Generic RPMs

Perform the following steps to install or upgrade to the latest version of the SLES 10, 11, or 12 driver by using the generic RPMs:

1. Boot the system.

2. Go to Console (your terminal GUI).

3. Perform the following steps to install the <kmod> RPM. In this example, the driver version is 06.602.03.00.

    a. Uninstall the earlier version, if needed.

    b. Extract the packaging from the Linux system by typing the following command and pressing Enter:

        ```
        # tar -zxvf megaraid_sas_components.gz
        ```

    c. For SLES10 (Service Pack 4) architecture = x86_64 flavor = default, type the following commands and press Enter:

        ```
        # cd sles10/rpms-1

        # rpm -ivh
        lsi-megaraid_sas-kmp-default-06.602.03.00_sles10sp4-1.x86_64.rpm
        ```

    d. For SLES11 (Service Pack 2), architecture = x86_64 flavor = default, type the following commands and press Enter:

```
# cd sles11/rpms-1

# rpm -ivh
lsi-megaraid_sas-kmp-default-06.602.03.00_sles11sp2-1.x86_64.rpm
```

> **NOTE** You must select the correct RPM from the available bundled RPMs. Otherwise, you will see an RPM installed, but it will be for a different kernel version.

    e.   For SLES12, architecture = x86_64 flavor = default, type the following commands and press Enter:

```
# cd sles12/rpms-1

# rpm -ivh lsi-megaraid_sas-kmp-default-06.602.03.00_sles12-1.x86_64.rpm
```

4.   Reboot the system to load the driver.

4.2.2   Installing or Updating the Driver by Using the DKMS RPMs

Perform the following steps to install or update to the latest version of the SLES system driver by using the DKMS RPMs. In this example, the driver version is 06.602.03.00-1.

> **NOTE** This DKMS packaging is provided only for SLES10(x86_64) and SLES11(x86_64) pre-compiled binaries.

1.   Extract the packaging from the Linux system by typing the following commands and pressing Enter:

```
# tar -zxvf megaraid_sas-release.tar.gz
# cd dkms-1
# tar -zxvf megaraid_sas-06.602.03.00-1.dkms.tar.gz
```

2.   Install the DKMS framework by typing the following commands and pressing Enter:

```
# rpm -ivh dkms-2.0.2.21.1-1.noarch.rpminstall DKMS rpm
# rpm -ivh megaraid_sas-06.602.03.00-1dkms.noarch.rpm
```

3.   Reboot to load the driver with the newer version by typing the following command and pressing Enter:

```
# reboot
```

4.3   Uninstalling the SUSE Linux Enterprise Server Driver

> **NOTE** When you uninstall the existing version of the driver, the driver rolls back to previous version of the driver.

Perform the following steps to uninstall the <kmod> RPM. In this example, the driver version is 06.602.03.00.

1.   Type the following command and press Enter:

```
# rpm -qa | grep megaraid_sas
```

2.   Find the string that contains the text megaraid_sas, and copy the string.

The driver name/version associated with megaraid_sas is copied, so that it is easier for you to uninstall the exact version of the driver.

3.   Type the following commands and press Enter:

    `# rpm -e` and paste the text string that you have copied.

```
# reboot
```

Chapter 5: Ubuntu Driver Installation

This chapter describes how to install and uninstall the device driver on Ubuntu.

Refer to the release notes that accompanied the driver for information on an existing Ubuntu Linux system.

> **NOTE**   Other supported Ubuntu OS versions follow the same driver installation process described in the following section.

> **NOTE**   The Ubuntu OS does not support driver update diskettes.

5.1   Installing the Driver in a New Ubuntu Linux LTS OS

You can install the device driver in a new Ubuntu Linux LTS system from the `.deb` package, which contains the executables, configuration files, libraries, and documentation in a Debian archive file.

Ubuntu uses the Debian file format for OS components, and Avago provides the MegaRAID driver in this file format.

Perform the procedure in this section if the Ubuntu Linux OS boots from a device that is not managed by a MegaRAID controller, but in which the MegaRAID controller is or will be present on the system and used for managing secondary storage.

Assuming that you already have the `.deb` package, perform the following steps to install the driver.

1. If you are running the OS as root, perform the following steps; otherwise, go to step 2.
   a. Make sure that you are running the OS as root. To do so, if you are logged in as a standard user, type the following command and press Enter:

      ```
      sudo su
      ```

      You are prompted for the password.
   b. Provide the password and press Enter.
   c. In the directory where the package is located, type the following command and press Enter:

      ```
      dpkg -i Package.deb
      ```

   This action installs the driver on the Ubuntu OS.
2. Perform the following steps if you are not running the OS as root:
   a. In the directory where the package is located, type the following command and press Enter:

      ```
      sudo dpkg -i Package.deb
      ```

      You are prompted for the password.
   b. Provide the password and press Enter.

   This action installs the driver on the Ubuntu OS.

5.2   Removing the Driver in a New Ubuntu Linux LTS OS

To remove the device driver in an Ubuntu Linux system, perform the following procedure if the Ubuntu Linux OS boots from a device that is not managed by a MegaRAID controller, but in which the MegaRAID controller is or will be present on the system and used for managing secondary storage.

1. If you are running the OS as root, perform the following steps; otherwise, go to step 2:

    a. Make sure that you are running the OS as root. To do so, if you are logged in as a standard user, type the following command and press Enter:

    ```
    sudo su
    ```

    You are prompted for the password.

    b. Provide the password and press Enter.

    c. In the directory where the MegaRAID SAS driver package is located, type the following command and press Enter:

    ```
    $dpkg -r megaraid-sas
    ```

    This action removes the driver from the Ubuntu OS.

2. Perform the following steps if you are not running the OS as root:

    a. In the directory where the MegaRAID SAS driver package is located, type the following command and press Enter:

    ```
    sudo $dpkg -r megaraid-sas
    ```

    You are prompted for the password.

    b. Provide the password and press Enter.

    This action removes the driver from the Ubuntu OS.

Chapter 6: FreeBSD Driver Installation

This chapter describes how to install the device driver and update the existing device driver on FreeBSD Operating Systems.

6.1   Avago MegaRAID Drivers and Softwares for the FreeBSD OS

- For information on FreeBSD OS administration, refer to
  http://www.freebsd.org/doc/en_US.ISO8859-1/books/handbook and
  http://www.freebsd.org/doc/en_US.ISO8859-1/books/handbook/disks-adding.html
- For information on FreeBSD Man Pages, refer to http://www.freebsd.org/cgi/man.cgi

Installing the Drivers on FreeBSD OS

This section describes how to install the driver for your MegaRAID controller on FreeBSD OS:

- If the virtual drives you have created are your boot devices, install the driver for the controller as you install the FreeBSD OS.
- If the operating system is already installed on a unit connected to another controller or to the motherboard, start the FreeBSD OS, and then install the driver.

> **NOTE**   If your FreeBSD system does not have the mpt driver issue, install your MegaRAID controller in the system before you install the Avago driver. Refer to the installation guide that came with your controller for instructions. You can download the installation guide at: https://www.freebsd.org/cgi/man.cgi?query=mrsas&sektion=4.

The following topics are detailed in this chapter:

- Section 6.1, Avago MegaRAID Drivers and Softwares for the FreeBSD OS
- Section 6.2, Obtaining Avago FreeBSD Drivers.
- Section 6.3, Creating a FreeBSD OS Driver Diskette.
- Section 6.4, Installing the FreeBSD OS on Storage Managed by a MegaRAID Controller (Primary Storage).
- Section 6.5, Installing the Kernel Driver on a FreeBSD OS that Boots from a Device Not Managed by a MegaRAID Controller (Secondary Storage).

6.2   Obtaining Avago FreeBSD Drivers

Avago drivers can be compiled from source files into the kernel as built-in drivers or they can be modules that are loaded manually or by the operating system.

You can obtain the MegaRAID controller driver for the FreeBSD OS from one of these two sources:

- Avago software CD-ROM, which includes the following items:
  Compiled and tested kernel driver modules for the FreeBSD OSs are located at:
  ```
  components/<OS_Version>/<Architecture>
  ```
- Driver source files for the FreeBSD OSs are located at the following path:
  ```
  components/src/mrsas.tgz
  ```
- Avago website

You can download the latest compiled and tested driver modules, and the driver source files for the FreeBSD OS from the company website at www.broadcom.com/support/download-search.

6.3 Creating a FreeBSD OS Driver Diskette

You need a diskette to install the FreeBSD OS on a virtual drive or a drive that is managed by the MegaRAID controller. The virtual drive or drive then becomes the boot unit for which your version of the FreeBSD OS does not have an up-to-date built-in driver.

Follow these steps to create a driver diskette.

1. Insert a blank diskette and the Avago software CD into an installed FreeBSD OS.
2. Navigate to the following folder path, depending on your current FreeBSD OS version and the system architecture:

   `components/<OS_Version>/<Architecture>/boot/kernel/mrsas.ko`
3. Copy the appropriate driver to the diskette.

   This driver is the driver from the folder `i386` if you are installing the 32-bit FreeBSD OS, and the `amd64` folder if you are installing the 64-bit FreeBSD OS.

   You need the driver source from the file `components/src/driver_name.tgz` to update the kernel with a new driver.

6.4 Installing the FreeBSD OS on Storage Managed by a MegaRAID Controller (Primary Storage)

This section describes how to load the FreeBSD OS kernel driver module to enable boot device support and then how to compile the current drivers into the kernel from source files.

Use the procedure in the next section if your boot unit is going to be managed by the MegaRAID controller.

6.4.1 Installing the FreeBSD OS on Storage Managed by a MegaRAID Controller

Use the following procedure if your boot unit will be managed by the MegaRAID controller.

For the FreeBSD OS versions 9.x or 10.x, the FreeBSD system contains the `mfi(4)` driver as an inbox solution in the kernel. A new FreeBSD kernel ISO must to be created to exclude the `mfi(4)` driver before you load the `mrsas(4)` driver module. With the newly created FreeBSD kernel ISO, you can complete the installation and boot your FreeBSD system through a MegaRAID virtual drive using the Avago's FreeBSD driver solution.

To exclude the `mfi(4)` driver if the FreeBSD OS has this issue, see Section 6.4.2, Creating a Custom ISO Image to Exclude the mfi (4).

After you create a custom FreeBSD Installation disk with the new FreeBSD kernel custom ISO image and you have the `mrsas` driver diskette ready, perform the following steps to install the FreeBSD OS. The procedure describes how to load the FreeBSD kernel driver module to enable boot device support and how to compile the current drivers into the kernel from source files.

As a prerequisite, you need an OS Installation CD for the FreeBSD 9.x or FreeBSD 10.x OSs (i386 or amd64). Use the CD that you created using the instructions in Section 6.4.2, Creating a Custom ISO Image to Exclude the mfi (4).

NOTE	This procedure is specific to versions of the FreeBSD OSs for which a compiled module is available. For other versions of a FreeBSD OS for which a compiled module is not supplied by Avago, you must compile

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your own module from source files. Section 6.6.2, Compiling and Loading the Driver as a Module by Using kldload (Dynamically Loadable Module).

Perform the following steps to install the FreeBSD OS on storage managed by a MegaRAID controller:

1. Disconnect all SCSI, ATA, and SAS devices in the system, except for the CD/DVD drive, and the hard drives that are connected to the MegaRAID controller.

2. Create the RAID virtual drives on the MegaRAID controller using WebBIOS or Preboot CLI.

3. Insert the FreeBSD Installation disk into the CD/DVD drive, and boot from it.

4. At the FreeBSD boot menu, select **Escape to loader prompt** (option 2 in the FreeBSD 9.x OS, and option 3 in the FreeBSD 10.x OS).

5. Insert the diskette containing the `mrsas.ko` module for the specific version of the FreeBSD OS into the diskette drive.

   If you use a USB flash drive, you might need to insert the drive before booting so the drive can be seen in the next step. If so, make sure to boot from the CD/DVD drive and not from the USB drive.

6. Perform the following steps at the loader prompt:

   a. To load a new driver from a diskette drive, type the following commands and press Enter.

   ```
   load disk0:mrsas.ko
   ```

NOTE	If you have multiple units or devices for the OS installation, and the unit or device that you want to use for the installation is not disk0; change `disk0` to the appropriate number, such as `disk1` or `disk5`. The `lsdev` command lists all of the devices from which you can load the driver. If you use a USB flash drive, you might need to insert the flash drive before booting so that it can be accessed in this step.

7. To continue the installation procedure, type the following command, and press Enter.

   ```
   OK boot
   ```

8. Install the FreeBSD OS, including the kernel source.

   It is very important to include the kernel source files.

9. Remove both the FreeBSD installation disk from the CD/DVD drive, and the diskette from the diskette drive (or the USB flash drive, if used), and reboot.

10. On bootup, repeat step 4 through step 7.

11. Upon boot, continue with the instructions in Section 6.6.1, Updating the Kernel with the New Driver Source, for a statically linked module.

6.4.2 Creating a Custom ISO Image to Exclude the mfi (4)

You must use this procedure if you are installing the FreeBSD OS on Storage Managed by a MegaRAID Controller (Primary Storage), which is described in Section 6.4, Installing the FreeBSD OS on Storage Managed by a MegaRAID Controller (Primary Storage). You must use this procedure if you need to exclude the mfi driver from the kernel from the kernel because it may conflict with `mrsas(4)`.

This procedure is leveraged from the following locations:

- A FreeBSD article, *FreeBSD Release Engineering, Section 3 Release Building*, by Murray Stokely - http://www.freebsd.org/doc/en_US.ISO8859-1/articles/releng/index.html.
- *FreeBSD Handbook, Chapter 9 Configuring the FreeBSD Kernel, Section 9.5 Building and Installing a Custom Kernel* - http://www.freebsd.org/doc/en_US.ISO8859-1/books/handbook/kernelconfig-building.html

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Because different versions of the FreeBSD OS have different make files, drivers, build procedures, and so on, the easiest way to create a custom ISO image for a specific version of the FreeBSD OS is to install the version of the FreeBSD OS that is needed for the ISO image. The procedure outlined in this section works for all supported versions of the FreeBSD OS (currently, versions 9.2.0, 9.3.0, 10.0.0 and 10.1.0). Some steps are different for FreeBSD version 9.2 or later, and are noted.

Perform the following steps to create the custom ISO image.

1. Install the required version of the FreeBSD OS on an available disk that is not attached to a MegaRAID controller.

    During installation, you must install all of the system source code. You might need a network connection to download the source code that is used to build the ISO image. The CD or the DVD that is used to install the OS might already contain the source code, depending on the type of installation that is on the CD or the DVD. Otherwise, you can use the `sysinstall` utility to download the source. The installed OS is used only to build the custom ISO, and then it is no longer required.

2. Boot to the disk with the new FreeBSD OS, and then change to the `/usr/src/sys/<arch>/conf` directory, where `<arch>` is either i386 or amd64, depending on what type of architecture the ISO image is for.

    You must edit the generic kernel configuration file in this folder so that the mfi and mpt drivers are not installed when the new custom ISO is built. The mfi and mpt lines can be removed or commented out by adding # before `device`, as shown in the following examples:

    ```
    #device    mfi    # LSI MegaRAID SAS
    ```

    > **NOTE**   The preferred method to use when you edit the generic configuration file is to copy it to another file, and then create a kernel using this new kernel configuration file. However, using that method here would require a more complex procedure and is unnecessary.

3. Issue the following commands to build the tools and the other items that are required to build the ISO image. This command can take several hours to complete.

    ```
    # cd /usr/src
    # make buildworld TARGET=<arch>
    ```

    where `<arch>` is the architecture for the ISO image to be created.

4. Issue the following commands to build the ISO image.

    The `make` command can take several hours to complete.

    ```
    # cd /usr/src
    # make buildkernel TARGET=<arch>
    NOPORTS=1 \
    NODOC=1
    ```

    Where `<arch>` is the architecture for the desired ISO image. Ports and Docs are not included in this example because it is faster and less complex to leave these values out of the build. If Ports and Docs were included, the build process might fail because more packages might be needed. Visit the FreeBSD website at http://www.freebsd.org for complete documentation about the `make release` command.

    > **NOTE**   The creation of the ISO image is the last step in the make process. If ISO image creation fails then run the `make` command again, but use the `rerelease` command instead of the `release` command. Using the `rerelease` command makes sure that the `make` process starts up

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from where it failed, and not from the start of the `make` process, which could save several hours.

5. After you successfully complete the `make` process, all of the new ISO images are located in the `/usr/obj/usr/src/release` release directory.

6.5 Installing the Kernel Driver on a FreeBSD OS that Boots from a Device Not Managed by a MegaRAID Controller (Secondary Storage)

Perform the procedures in this section if the FreeBSD OS boots from a device that is *not* managed by a MegaRAID controller, but in which the MegaRAID controller is or will be present on the system and used for managing secondary storage.

When you use the virtual drive managed by the MegaRAID controller for secondary storage, you do not need to use a driver diskette for driver installation.

Install the FreeBSD OS on the drive attached to the motherboard *before* you install the MegaRAID controller. This step reduces the possibility of installing the FreeBSD OS to the wrong drive or unit.

Get the latest driver source files for your version of FreeBSD, see Section 6.2, Obtaining Avago FreeBSD Drivers.

The following procedures document two types of OS installation:

- Installation on a system does not include an Avago controller before the OS installation.
- Installation on a system includes an Avago controller before the OS installation.

6.5.1 Installing the FreeBSD OS on a System that Does Not Include an Avago Controller before the OS Installation

Perform the following steps:

1. Install the FreeBSD OS, including the kernel source, on a motherboard attached drive.

    It is critical to include kernel source files.

2. After the OS installation, reboot.

3. Follow the instructions for driver installation in Section 6.6.1, Updating the Kernel with the New Driver Source, for a statically linked module, or in Section 6.6.2, Compiling and Loading the Driver as a Module by Using kldload (Dynamically Loadable Module).

4. After the FreeBSD OS is installed and the driver is updated, power down the system and install the MegaRAID controller.

    For assistance, refer to the installation guide that came with the controller.

6.5.2 Installing the FreeBSD OS on a System that Includes an Avago Controller before the OS Installation

Perform the following steps:

1. Start the installation process.

2. Proceed with the installation on a drive attached to the motherboard.

    Make sure you install the full the FreeBSD OS source.

3. After the OS installation, follow the instructions for driver installation in Section 6.6.1, Updating the Kernel with the New Driver Source for a statically linked module or in Section 6.6.2, Compiling and Loading the Driver as a Module by Using kldload (Dynamically Loadable Module).

6.6 Updating Drivers in the FreeBSD System

You can update drivers either from source files or with driver modules. By using source files, you can compile drivers into the kernel, or you can create modules for versions of the FreeBSD OS for which Avago does not supply modules.

This section includes these topics:

- Updating the kernel with the new driver source
- Compiling and loading the driver as a module using `kldload` (dynamically loadable module)
- Updating the MegaRAID kernel driver module in the FreeBSD OS

6.6.1 Updating the Kernel with the New Driver Source

Use this procedure to update your kernel from driver source files for both a dynamically loadable module and a statically linked module. To obtain the source files, see Section 6.2, Obtaining Avago FreeBSD Drivers.

Perform the following steps to update your kernel with the driver source files:

1. Make sure that the kernel source has been installed on the system.

   The kernel sources are in the `/usr/src/sys` directory.

2. Go to the `/usr/src/sys/dev/` directory and perform the following steps.

   a. Check to see whether a directory with the driver name `mrsas` already exists. If a directory already exists, move it to a different folder.

      - To move the `mrsas (4)` driver, type the following command and press Enter:

        ```
        # mv /usr/src/sys/dev/mrsas /root/mrsas.backup
        ```

3. Proceed to the `/usr/src/sys/modules/` directory and repeat step 2.

4. Unpack the compressed `mrsas` driver source file and move the `sys/dev/mrsas` directory to the `/usr/src/sys/dev/mrsas` directory.

   a. Enter the `# cp -r <uncompressed_directory>/sys/dev/mrsas /usr/src/sys/dev/` command.

   b. Enter the `# cp -r <uncompressed_directory>/sys/modules/mrsas /usr/src/sys/modules/` command to copy the `sys/modules/mrsas` directory to the `/usr/src/sys/modules/` directory.

5. Go to `/usr/src/sys/i386/conf` if you are running a 32-bit version of the FreeBSD OS, or `/usr/src/sys/amd64/conf` if you are running a 64-bit version of the FreeBSD OS, and perform the following steps:

   a. Copy the GENERIC configuration file to another file name. For example:

      ```
      # cp GENERIC MYKERNEL
      ```

   b. Open your current configuration file (`GENERIC`, `MYKERNEL`, `SMP`, or `PAE`, or custom configuration), with vi or another editor. For example:

      - *For a dynamically loadable module*, comment out the following lines by typing # at the start of the line:

      For the mrsas driver, comment out the following line by typing # at the start of the line, if it exists:

        ```
        #device    mfi    # LSI MegaRAID SAS
        #device    mrsas    # LSI MegaRAID SAS2
        ```

      - *For a statically linked module*, make sure the following lines are *not* commented out:

      For the mrsas driver, make sure the following line is *not* commented out:

        ```
        device    mrsas    # LSI MegaRAID SAS2
        ```

●   If you do not have a MegaRAID 92*XX* or earlier controller installed in your system, make sure to comment out the following line:

```
#device    mfi    # LSI MegaRAID SAS
```

c.   Save your changes.

> **NOTE**   Each line is an entry in this file. Make sure a newly added entry is on a new line.

d.   In the `/usr/src/sys/conf/` file, perform the following steps for the mfi driver or the MegaRAID SAS driver, depending on which driver you use.

For the mrsas driver, make sure that the following entries are present:

```
dev/mrsas/mrsas.c         optional mrsas
dev/mrsas/mrsas_cam.c     optional mrsas
dev/mrsas/mrsas_ioctl.c   optional mrsas
dev/mrsas/mrsas_fp.c      optional mrsas
dev/mrsas/mrsas_linux.c   optional mrsas
```

> **NOTE**   Make sure if a new `*.c` file is added, then entry for that should be added in the same manner as above. Each line is an entry in this file. Make sure a newly added entry is on a new line.

e.   Save your changes.

f.   To compile the kernel, go to the `/usr/src` directory, type the following commands if your current configuration is MYKERNEL, and press Enter.

```
# cd /usr/src
# make buildkernel KERNCONF=MYKERNEL
```

g.   To install the new kernel, type the following commands if your current configuration is MYKERNEL, and press Enter.

```
# make installkernel KERNCONF=MYKERNEL
```

The new kernel is copied to the `/boot/kernel` directory. The old kernel is moved to the `/boot/kernel.old` directory.

6.   Reboot your system to use the new kernel.

When the system reboots, the new kernel driver module loads automatically.

6.6.2   Compiling and Loading the Driver as a Module by Using kldload (Dynamically Loadable Module)

To use a driver module in case Avago does not supply a driver module for your version of the FreeBSD OS, use the procedures in this section. If you want to install only an Avago-supplied module, see Section 6.6.3, Updating the MegaRAID Kernel Driver Module in the FreeBSD OS.

> **NOTE**   You can use `kldload` to load the driver as a module only if your boot drive is attached to the mother board and is not managed by the MegaRAID controller.

Perform the following steps to compile the driver as a module:

1.   Boot to the FreeBSD OS.

2. Obtain driver source files; see Section 6.2, Obtaining Avago FreeBSD Drivers.

3. Make sure your kernel is prepared for the dynamically loadable module described in Section 6.6.1, Updating the Kernel with the New Driver Source.

4. To build the driver module, type the following command, depending on which driver you use, and press Enter.

```
# cd /usr/src/sys/modules/mrsas
# make clean
# make
```

These steps create the driver `mrsas.ko` module in the `/usr/src/sys/modules/mrsas` directory.

5. To load the kernel driver module, type the following commands and press Enter.

```
# cd /usr/src/sys/modules/mrsas
# kldload -v ./mrsas.ko
```

6. To load the driver automatically during bootup, but still be linked dynamically, perform the following steps, depending on which driver you use.

   a. To copy the MegaRAID SAS driver into the boot folder, type the following command, and press Enter.

   ```
   # cp /usr/src/sys/modules/mrsas/mrsas.ko /boot/kernel/mrsas.ko
   ```

   NOTE　　　　　Back up the old module in case you want to revert back to it.

   b. Enter the following line in the `/boot/loader.conf` file.

   ```
   mrsas_load="YES"
   ```

6.6.3　　Updating the MegaRAID Kernel Driver Module in the FreeBSD OS

This section describes how to update the MegaRAID driver with a kernel driver module in the FreeBSD OS.

NOTE　　　　　Make a backup of your original driver before updating the MegaRAID driver in case you need to revert back to it. However, you cannot revert back to the original driver if you are booting from that unit.

Perform the following steps to update the MegaRAID driver with a kernel driver module under the FreeBSD OS.

1. Download and extract the driver.

   See Section 6.2, Obtaining Avago FreeBSD Drivers, for instructions.

2. Back up any critical data before you update the MegaRAID driver.

3. Change the directory to the location with the extracted driver.

4. To copy the driver into the `/boot/kernel` directory, type the following command, and press Enter.

```
# cp mrsas.ko /boot/kernel.
```

Make sure that the module version (32-bit or 64-bit) matches the FreeBSD version. If the versions do not match, a kernel panic might occur.

5. To load the driver, type the following command, and press Enter.

```
# kldload -v /boot/kernel/mrsas.ko
```

If storage is present, the system log records its presence (usually in `/var/log/messages`).

6. To have the driver load automatically every time the system reboots, add the following line to the `/boot/loader.conf` file, and press Enter.

```
mrsas_load="YES".
```

Chapter 7: VMware Driver Installation

This chapter describes how to install and update the VMware device drivers on VMware vSphere 5.*x*, and ESXi 6.*x* OSs.

7.1 Installing Asynchronous Drivers on the VMware ESXi 5.*x* and 6.*x* OS

An existing ESXi host can install drivers from a specific VIB file or from an `<offline-bundle>.zip` file.

7.1.1 Using esxcli and the Asynchronous Driver VIB File in an Existing ESXi Installation

An existing ESXi host can install asynchronous drivers from an asynchronous driver VIB file. The VIB file is copied to the ESXi host by using the datastore browser, and then installed using the `esxcli` utility in the ESXi Shell.

> **NOTE** This procedure requires remote ESXi network connectivity using vSphere client.

Perform the following steps to install the asynchronous drivers:

1. Extract the contents of the asynchronous driver zip file.
2. Identify the `<offline-bundle>.zip` file.
3. Extract the contents of the `<offline-bundle>.zip` file.
4. Identify the `async-driver.vib` file.
5. Log in to the ESXi host using vSphere client with administrator privileges, such as root.
6. Using the Datastore Browser, upload the `async-driver.vib` file to an ESXi host's datastore.
7. Enter the host into Maintenance mode.

> **NOTE** You can enter host into maintenance mode through the vSphere Client, or by adding the `--maintenancemode` option to the `esxcli` command.

8. Log in as root to the ESXi console through SSH or iLO/DRAC.
9. To install drivers from the VIB file (this action requires an absolute path), type the following command, and press Enter.

   ```
   esxcli software vib install -v /path/async-driver.vib
   ```

   For example:

   ```
   esxcli software vib install -v /vmfs/volumes/datastore/async-driver.vib
   ```

10. Reboot the ESXi host.
11. Exit Maintenance mode.

> **NOTE** You can update an ESX host remotely by using the `esxcli` utility, which is part of the vSphere CLI. For more details on using this utility, refer to the vSphere Command-Line Interface Documentation page.

7.1.2 Using esxcli and an Offline Bundle Async Driver Zip File in an Existing ESXi Installation

In this procedure, you copy the offline bundle zip file to the ESXi host by using the Datastore Browser and install it by using the `esxcli` utility in the ESXi shell.

NOTE	This procedure requires remote ESXi network connectivity using vSphere client.

Perform the following steps to install the async drivers:

1. Extract the contents of the async driver zip file.
2. Identify the `<offline-bundle>.zip` file.
3. Log in to the ESXi host using vSphere client with administrator privileges, such as root.
4. Using the Datastore Browser, upload the `<offline-bundle>.zip` file to an ESXi host's datastore.
5. Enter the host into Maintenance mode.

NOTE	You can enter host into Maintenance mode through the vSphere Client or by adding the `--maintenancemode` option to the `esxcli` command.

6. Log in as root to the ESXi console through SSH or iLO/DRAC.
7. To install drivers using the offline bundle (this action requires an absolute path), type the following command, and press Enter.

```
esxcli software vib install –d /path/<offline-bundle>.zip
```

For example:

```
esxcli software vib install –d /vmfs/volumes/datastore/<offline-bundle>.zip
```

8. Reboot the ESXi host.
9. Exit Maintenance mode.

7.1.3 Installing an Upgrade

The upgrade process is similar to a new installation, except for the `esxcli` command.

- To upgrade, type the following command, and press Enter.

```
esxcli software vib update –v {VIBFILE}
```

NOTE	Before you run the `esxcli` command, enter the ESXi host into Maintenance mode. You can enter the host into Maintenance mode through the vSphere Client, or by adding the `–maintenancemode` option to the `esxcli` command.

7.1.4 Installation Using the VMware Update Manager

The VMware Update Manager (VUM) is a plug-in for the Virtual Center Server (vCenter Server). You can use the VUM utility to install a VIB by importing the associated offline bundle package (a zip file that contains the VIB and metadata). You can then create an add-on baseline and re-mediate the host or hosts with this baseline.

Refer to the vCenter Server documentation for more information about the VUM.

Chapter 8: Citrix XenServer Driver Installation

This chapter describes how to install the device driver and update the existing device driver on Citrix XenServer.

NOTE   The XenServer OS driver support is for 32-bit and 64-bit systems.

8.1   Creating a Driver Update Disk with a USB Drive

You can transfer a driver disk image to a USB flash drive with the rawrite tool from DOS, or the `dd` utility in Linux. On a Linux machine, you can use the `dd` command to burn a driver ISO image on a USB drive.

Perform the following steps to create a driver update disk (DUD) with a USB drive.

1. Insert a USB flash drive into a Linux machine, making sure that the USB drive is not mounted.
2. Type the following command:

   ```
   "$ dd if=<driver.iso> of=/dev/sdx"
   ```

   Where `/dev/sdx` is the USB drive.

   NOTE   Make sure that you pick the correct DUD image from the Avago
   release bundle. The DUD image should match with the installed OS
   kernel version.

3. Press Enter.
4. Mount the USB flash drive to verify its contents.
5. Make sure the DUD image is in iso9660 format or MS-DOS format by typing the following command:

   ```
   $df –T
   ```

6. Press Enter.

   The file system type and other information about the mounted devices appear.

8.2   Installing the XenServer 6.*x* OS on Storage Managed by a MegaRAID Controller (Primary Storage)

This section describes how to set up the XenServer 6 OS on your host system. The Citrix Server CD-ROM consists of XenServer and Client. You can use the XenServer CD-ROM to install the Client on a Windows-based system.

Avago distributes the Avago XenServer 6.2 and 6.5 drivers in an ISO image. You can update the drivers during the installation or you can update them when new drivers become available.

NOTE   For primary storage, before you install the Avago driver, you must
have your MegaRAID controller already installed in the system. Refer
to the installation guide that came with your controller for the
installation instructions. You can download the installation guide at
www.broadcom.com/support/download-search.

Perform the following steps to install the XenServer 6.2 or 6.5 OS driver at boot time on storage managed by a MegaRAID controller. This procedure contains additional actions for the XenServer 5.6 FP1OS in step 20.

1. Download the ISO image to install the Citrix Xenserver OS.

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2. Using the ISO image, perform the following steps to make a USB flash drive as a driver update disk (DUD).

   a. Copy the ISO image.

   b. Using the Linux command, type the following command in text mode:

   ```
   dd if=image of=target
   ```

   For example,

   ```
   dd if=megaraid_sas-08.255.02.00-2.6.27.42-0.1.1.xs5.6.0.44.111158.iso of =/dev/sdb
   ```

   Where `/dev/sdb=` pen drive location.

3. Boot the computer from the main installation CD.

4. For the DUD installation, select F9 from the initial boot screen.

5. Accept the End User License Agreement (EULA), then proceed.

   The installer reads from the boot disk, and then loads several screens showing the MegaRAID SAS driver.

6. After you return to the initial boot screen, remove the pen drive, then proceed as normal.

   After the initial boot messages, the installer does some hardware detection and initialization, then a screen appears that prompts you to select which keyboard key map you want to use for the installation.

7. Select the desired key map and choose **OK** to proceed.

8. Select the option to install or upgrade the XenServer OS, and choose **OK** to proceed.

   The next screen displays a message stating that the setup program will install XenServer on the computer, and warning that the installation will overwrite data on any hard drives that you select to use for the installation.

9. Click **OK**.

   The XenServer End User License Agreement (EULA) appears.

10. Click **Accept EULA**.

    If you have multiple local hard disks, you are prompted to choose the primary disk for the installation.

11. Select the desired disk and click **OK** to proceed.

    After you select the primary disk, you are prompted to choose whether you want any of the other drives to be formatted for use by the XenServer OS for VM storage.

12. Click **OK** to proceed.

    The next screen prompts you to specify the source of the installation packages.

13. If you are installing from CD, select **Local media (CD-ROM)**.

    The next screen prompts you to choose whether to verify the integrity of the installation media.

14. Click **Skip verification** to bypass verification of the installation media.

    Verifying installation can take some time.

15. Click **OK** to proceed.

    You are prompted to set a root password.

16. For network configuration, use the default setting and continue to press **OK**.

    You are prompted to select the general geographical area for the time zone.

17. Choose the time zone from the displayed list of geographical areas, then click **OK** to proceed.

    You are prompted to choose a method for setting the system time. The options are **Using NTP** or **Manual time**.

18. Select **Using NTP**.

    You are prompted for the IP address and the gateway.

19. Use the default setting, and click **OK** to continue.

    From this point forward, the installation begins to copy files to hard drive, and a progress bar appears.

20. For *Xenserver 5.6 FP1 installations only*, perform the following steps:

Towards the end of the installation process, the installer prompts you for any additional packages. The **megaraid_sas** driver RPM listed is listed as a selection.

a. Before you select the **megaraid_sas** driver RPM, insert the pen drive into the USB slot, and then select **Accept** and continue as normal.

b. After the installation completes, select **Reboot**.

The system now runs under the Citrix XenServer OS.

8.3 Installing or Updating the XenServer 6.2 or 6.5 OS Driver

Perform the following steps to install or update to the latest version of the MegaRAID SAS driver:

1. Boot the system.
2. Go to the Console (your terminal GUI).
3. Install the Dynamic Kernel Module Support (DKMS) driver RPM.

    Uninstall the earlier version first, if needed.
4. Install the MegaRAID SAS driver RPM.

    Uninstall the earlier version first, if needed.
5. Reboot the system to load the driver.

Chapter 9: Oracle Enterprise Linux Driver Installation

To install the device driver in new Oracle Enterprise Linux (OEL) 6.*x* and 7.*x* systems, or to update the driver on existing operating systems, see Chapter 3Red Hat Linux Driver Installation, and follow the instructions to install a new OEL system.

NOTE   An optimized, single unified binary is provided for RHEL, CentOS, and OEL operating systems.

Chapter 10: Fedora Driver Installation

To install or update the device driver on Fedora Operating Systems, see Chapter 3 Red Hat Linux Driver Installation.

| NOTE | The Fedora OS does not support a driver update disk. |

Chapter 11: CentOS Driver Installation

To install, update, and uninstall the device driver on CentOS Operating Systems, see Chapter 3 Red Hat Linux Driver Installation.

NOTE	An optimized, single unified binary is provided for RHEL, CentOS, and OEL operating systems.

Appendix A: 240 VD Driver Support and Known Limitations

This appendix describes which drivers are supported and known limitations for the MegaRAID 6Gb/s SAS RAID controller and the MegaRAID 12Gb/s SAS RAID controller.

A.1   Operating System Driver Support

The following table describes the operating system (OS) driver support matrix for the MegaRAID 6Gb/s SAS RAID controller and the MegaRAID 12Gb/s SAS RAID controller.

Table 3 Operating System Support Matrix

OS Driver	Less than or Equal to 64 VD Support	240 VD Support
Windows	Yes	Yes
Linux	Yes	Yes
VMware (Native/Legacy)	Yes	Yes
Solaris	Yes	Yes
FreeBSD	Yes	Yes

A.2   Known Driver Limitations

No known limitations.

> **NOTE**   For the 240 VD feature to work, both the driver and the firmware must support the 240 VD feature. Otherwise, the driver exposes only the first 64 VDs.

A.3   Dual Queue Depth Driver Limitation

Drivers which support Dual Queue Depth (dual QD) enable dual QD by default. If you have a configuration where the virtual drives are more in number (for example, if 25 percent of the IO load is on the virtual drives), you should use the driver module parameter/system registry to disable dual QD.

Revision History

The following document changes were made.

Version and Date	Description of Changes
Version 2.8, December 21, 2016	■ Updated Table 1, MegaRAID Device Driver Files, Driver RPMs Support, Driver ISO Support, and Driver Deb Package Support. ■ Updated Section 2, Windows Driver Installation. ■ Updated Table 2, Drivers and Operating Systems. ■ Removed references to SDS mode from Section 2.3, Drivers and Operating Systems. ■ Added a section Section 2.8, Installing a Test Driver into a Windows 2016 Nano Server Image.
Version 2.7, October 6, 2016	■ Updated Table 1, MegaRAID Device Driver Files, Driver RPMs Support, Driver ISO Support, and Driver Deb Package Support. ■ Updated Section 2.3, Drivers and Operating Systems.
Version 2.6, March 11, 2016	Updated Table 1, MegaRAID Device Driver Files, Driver RPMs Support, Driver ISO Support, and Driver Deb Package Support.
Version 2.5, January 29, 2016	Updated Table 1, MegaRAID Device Driver Files, Driver RPMs Support, Driver ISO Support, and Driver Deb Package Support.
Version 2.4, December 31, 2015	■ Updated the supported operating system versions. ■ Created Dual Queue Depth Driver Limitation topic which details the dual QD limitation on supported drivers.
Version 2.3, September 8, 2015	■ Updated the supported operating system versions. ■ Created Drivers and Operating Systems for locating drivers and their respective operating systems while installing MegaRAID drivers on the Windows platform.
Version 2.2, June 2015	Made some minor corrections in the OS support table and rereleased the document.
Version 2.1, June 2015	■ Updated Section 1.1.1, Driver Functions. ■ Updated the supported operating system versions in Table 1, MegaRAID Device Driver Files, Driver RPMs Support, Driver ISO Support, and Driver Deb Package Support. ■ Added the new supported operating systems and removed the deprecated operating systems throughout the document. ■ Added Section 2.1.1.2, Creating Storage Configuration Using Ctrl-R.
Version 2.0, March 2015	■ Added Section 8.6, Installing the Driver Package during OS Installation (Solaris 11.1 OS, x86 Only). ■ Added the 240 VD Driver Support and Known Limitations appendix. ■ Changed LSI references to Avago. ■ Minor rewrites for clarity and consistency.
80-00163-01 Rev. Q, November 2014	Updated the supported operating system versions.
80-00163-01 Rev. P, August 2014	■ Updated template of the document. ■ Updated the supported operating system versions.
80-00163-01 Rev. O, June 2014	Updated the supported operating system versions.
80-00163-01 Rev. N, March 2014	■ Added the FreeBSD, Debian, and CentOS operating systems. ■ Updated the operating system versions.
80-00163-01 Rev. M, February 2014	Updated the supported operating system versions.
80-00163-01 Rev. L, August 2013	Updated the supported operating system versions.
80-00163-01 Rev. K, May 2013	■ Updated the supported operating system versions.
80-00163-01 Rev. J, April 2013	■ Updated Table 1 in Chapter 1, the Solaris, Ubuntu, Solaris, XenServer, and OVM OS chapters, and the version number for various operating systems. ■ Added the Oracle Enterprise Linux chapter.

Version and Date	Description of Changes
80-00163-01 Rev. I, February 2013	Updated the FreeBSD chapter and added the Oracle Enterprise Linux information.
80-00163-01 Rev. H, December 2012	Added the Debian 6.0 OS, OVM 3.0.3 OS, Fedora OS, and CentOS OS.
80-00163-01 Rev. G, September 2012	■ Added the Microsoft Windows 8 operating system, Windows Server 2012 OS, Ubuntu Linux OS, and XenServer OS. ■ Updated the FreeBSD operating system.
80-00163-01 Rev. F, June 2012	Updated the operating system versions and the installation procedures.
80-00163-01 Rev. E, January 2011	Updated the user guide with the current versions of the operating systems.
80-00163-01 Rev. D, June 2009	Updated the procedure for installing the FreeBSD operating system.
80-00163-01 Rev. C, April 2009	Updated the Solaris 10 operating system information and driver file names.
80-00163-01 Rev. B, November 2008	Added installation instructions for the FreeBSD and Solaris 10 operating systems.
80-00163-01 Rev. A, August 2007	■ Updated the installation procedures for the Windows, Red Hat Linux, and SUSE Linux operating systems to include the latest versions. ■ Added a chapter for the SCO operating system.
DB15-000358-00, February 2006	Initial release of the document.