



12Gb/s MegaRAID[®] Tri-Mode Device Driver Installation

User Guide

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For a comprehensive list of changes to this document, see the [Revision History](#).

Corporate Headquarters

San Jose, CA

Website

www.broadcom.com

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Chapter 1: Overview

This chapter provides an overview of the operating system (OS) drivers for the MegaRAID® 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 <https://www.broadcom.com/support/download-search>.

NOTE

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

1.1 Driver Description

You can install the MegaRAID controllers in any computer that has a PCI Express (PCIe) local bus. The MegaRAID controllers can run under various operating systems.

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

- Microsoft Windows
- Linux (Red Hat and SUSE Linux Enterprise Server)
- VMware
- Citrix XenServer
- Ubuntu
- CentOS
- FreeBSD

1.1.1 Driver Functions

The MegaRAID controllers provide drivers that bring up to 12Gb/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 or NVMe 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 6.0Gb/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:

- They use the PCI Express protocol
- They provide multiple RAID storage adapters (RSAs)
- They provide the ability to see newly configured logical drives in the configuration software utility without rebooting the system

1.1.2 Driver Updates

Because Broadcom 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 operating system manufacturer.

You can download the latest drivers and software on the Broadcom website at <https://www.broadcom.com/support/download-search>.

1.2 Supported Operating Systems

The following table lists the supported operating systems, device driver files, driver RPMs, driver ISO, and driver deb packages for the MegaRAID controllers.

The device driver files are available on the *Universal Driver Suite* CD that accompanied your MegaRAID controller. Broadcom updates the device drivers frequently. Also, ensure that you have the current version of these driver files, download the latest drivers from the Broadcom website at <https://www.broadcom.com/support/download-search>. Refer to the `readme` file that accompanies the driver package for any updated information.

To make a driver diskette, prepare a USB flash drive, CD-ROM or diskette, as appropriate, extract the files from the *Universal Driver Suite* CD to a blank diskette, or download the driver files from the Broadcom website and extract them to an empty diskette. Label the diskette as the MegaRAID driver diskette for your respective operating system.

Table 1 Supported Operating Systems

Operating System	Version/Flavors	Installation Instructions
Microsoft Windows	<p>Microsoft Windows Client versions:</p> <ul style="list-style-type: none"> ■ Windows Client 10 LTSB ■ Windows Client 10 RS1 ■ Windows Client 10 RS2 ■ Windows 8.1 ■ Windows 8. <p>Microsoft Windows Server versions:</p> <ul style="list-style-type: none"> ■ Windows Server 2016 RS1 ■ Windows Server 2012 R2 Update 1 ■ Windows Server 2012 R2 ■ Windows Server 2012 	Microsoft Windows Driver Installation
Red Hat Linux	<ul style="list-style-type: none"> ■ Red Hat Enterprise Linux 7.4 ■ Red Hat Enterprise Linux 7.3 ■ Red Hat Enterprise Linux 7.2 ■ Red Hat Enterprise Linux 6.9 ■ Red Hat Enterprise Linux 6.8 ■ Red Hat Enterprise Linux 6.7 	Red Hat Linux Driver Installation
SUSE Linux Enterprise Server	<ul style="list-style-type: none"> ■ SUSE Linux Enterprise Server 12 SP3 ■ SUSE Linux Enterprise Server 12 SP2 ■ SUSE Linux Enterprise Server 12 SP1 ■ SUSE Linux Enterprise Server 11 SP4 ■ SUSE Linux Enterprise Server 11 SP3 ■ SUSE Linux Enterprise Server 11 SP2 	SUSE Linux Enterprise Server Driver Installation

Table 1 Supported Operating Systems (Continued)

Operating System	Version/Flavors	Installation Instructions
VMware	<ul style="list-style-type: none"> ■ VMware ESXi 6.5 Update 1 ■ VMware ESXi 6.5 ■ VMware ESXi 6.0 Update 3 ■ VMware ESXi 6.0 Update 2 ■ VMware ESXi 6.0 Update 1 	VMware Driver Installation
Citrix XenServer	<ul style="list-style-type: none"> ■ Citrix XenServer 7.2 ■ Citrix XenServer 7.1 ■ Citrix XenServer 6.5 ■ Citrix XenServer 6.2 	Citrix XenServer Driver Installation
Ubuntu	<ul style="list-style-type: none"> ■ Ubuntu 16.04 LTS ■ Ubuntu 14.04 LTS 	Ubuntu Driver Installation
CentOS	<ul style="list-style-type: none"> ■ CentOS-7.4 ■ CentOS-7.3 ■ CentOS-7.2 ■ CentOS-6.9 ■ CentOS-6.8 ■ CentOS-6.7 	CentOS Driver Installation
FreeBSD	<ul style="list-style-type: none"> ■ FreeBSD 11 ■ FreeBSD 10.3 ■ FreeBSD 10.2 	FreeBSD Driver Installation
Oracle Linux	<ul style="list-style-type: none"> ■ Oracle Linux 7.4 ■ Oracle Linux 7.3 ■ Oracle Linux 7.2 ■ Oracle Linux 6.9 ■ Oracle Linux 6.8 ■ Oracle Linux 6.7 	Red Hat Linux Driver Installation

Chapter 2: Microsoft Windows Driver Installation

This chapter describes how to install the device driver and update the existing device driver on Microsoft Windows operating systems.

2.1 MegaRAID Primary Storage

In the MegaRAID primary storage configuration, the Windows operating system is installed on virtual drives provided by the MegaRAID controller. The MegaRAID controllers include preboot configuration utilities, such as HII, that create the virtual drive before the installation of the Windows OS starts.

To install the Windows operating system, prepare a USB flash drive, CD-ROM, DVD, 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, DVD, or diskette) by using the appropriate Windows driver. Only two driver choices exist across the supported Windows versions: one for 32-bit systems and 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 utilities, such as HII, create a virtual disk for the Windows OS and are accessible during the power-on self-test (POST) part of the boot-up process.

Refer to the *12Gb/s MegaRAID Tri-Mode Software User Guide* for more information.

2.2 Primary Operating System Storage on the MegaRAID Controller

NOTE For the Windows Server 2012 Operating System, the MegaRAID driver is added after the other installation steps.

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

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

- After the **Install Windows Language selection** window, the **Install Now** window appears, followed by the operating system selection, license agreement, and installation type.
On new installations, the **Custom** installation type is the only option.
- On the next Windows installation window, a Load Driver link introduces the MegaRAID driver.
For the Windows Server 2012 Operating System, you can add a driver from the CD, DVD, diskette, or USB flash drive.
 1. Click **Browse**, and select the device and the folder with the previously extracted drivers.
 2. In the next Windows installation window, select the driver to be installed.

3. 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.

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

2.3 Drivers and Operating Systems

On MegaRAID for Windows drivers, the release order structure of `win_megasas_drv_rel` driver is shown below as an example:

`win_megaraid_drv_rel`, this binary zip file should be used for RAID mode.

When installing the MegaRAID drivers on the Windows Operating System, see [Table 2, Drivers and Operating Systems](#) 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

WDCFG is a utility for configuring driver runtime parameters that are automatically installed as part of driver installation. However, WDCFG is dependent on the Visual C++ runtime package from Microsoft. If the Visual C++ Runtime package is not installed on the local machine where WDCFG is running, the `wdcfg.exe - System Error` message is displayed. If this error appears, you must download and install the latest Microsoft Visual C++ runtime package from <https://www.microsoft.com/en-us/download/details.aspx?id=48145>.

2.4 Secondary Storage on the MegaRAID Controller with the Windows Server 2012 Operating System

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

Perform the following steps to set up secondary storage for the Windows Server 2012 Operating System:

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 diskette, 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 Operating System

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 Operating System.

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**
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 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 the MegaRAID Driver on the Microsoft Windows Server 2016 OS

To install the MegaRAID driver on the Windows Server 2016 operating system, you must download the Windows Server 2016 driver from the Broadcom website at <https://www.broadcom.com/support/download-search>.

Consider the following points before you install the driver.

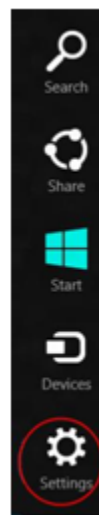
- If you want to use the MegaRAID controller as secondary storage, install the OS with the MegaRAID controller installed. The OS automatically configures the controller with the in-box driver.
- When the Microsoft OS is running on the machine with the MegaRAID controller, upgrade to the latest Broadcom MegaRAID driver.

2.6.1 Driver Upgrades

Perform the following steps to upgrade the Windows driver.

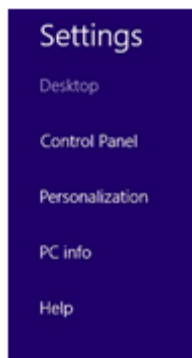
1. Download the updated driver and put it on a USB drive, CD, or DVD disc.
2. Boot the Microsoft Windows Server 2016 Operating System, and then move the mouse to the upper-right or lower-right corner of the screen to expose the desk icons for **Search**, **Share**, **Start**, **Devices**, and **Settings** as shown in the following figure.

Figure 1 Settings Option



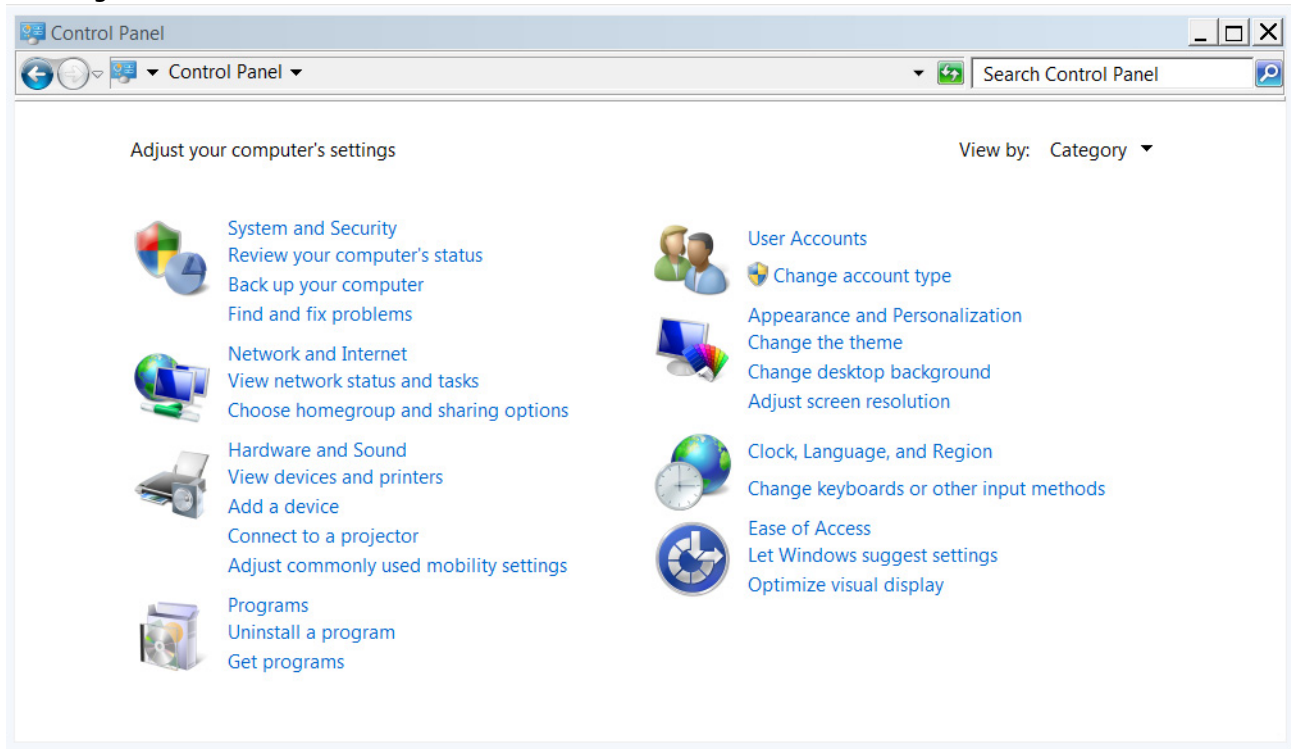
3. Click **Settings**.

Figure 2 Settings Bar



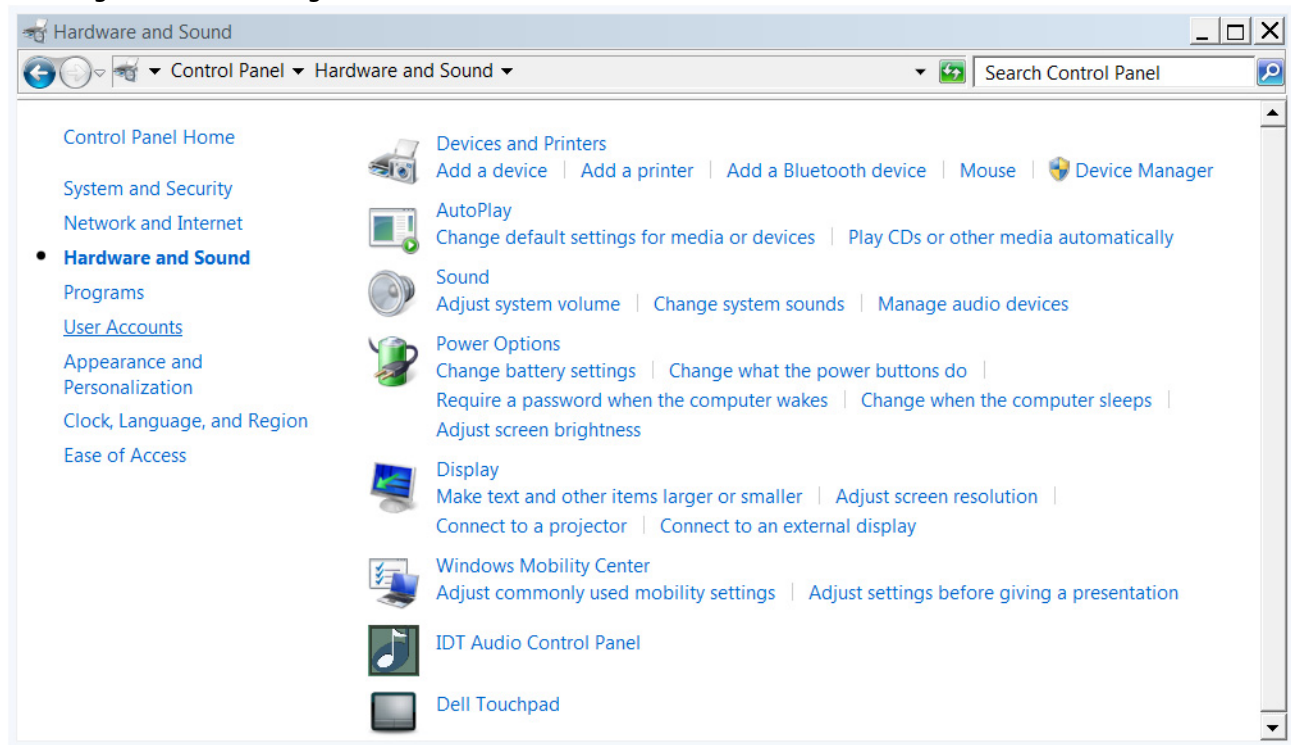
4. On the **Settings** bar, click **Control Panel**.
 5. In the **Control Panel**, click **Hardware and Sound**.
- The following figure appears.

Figure 3 Hardware and Sound



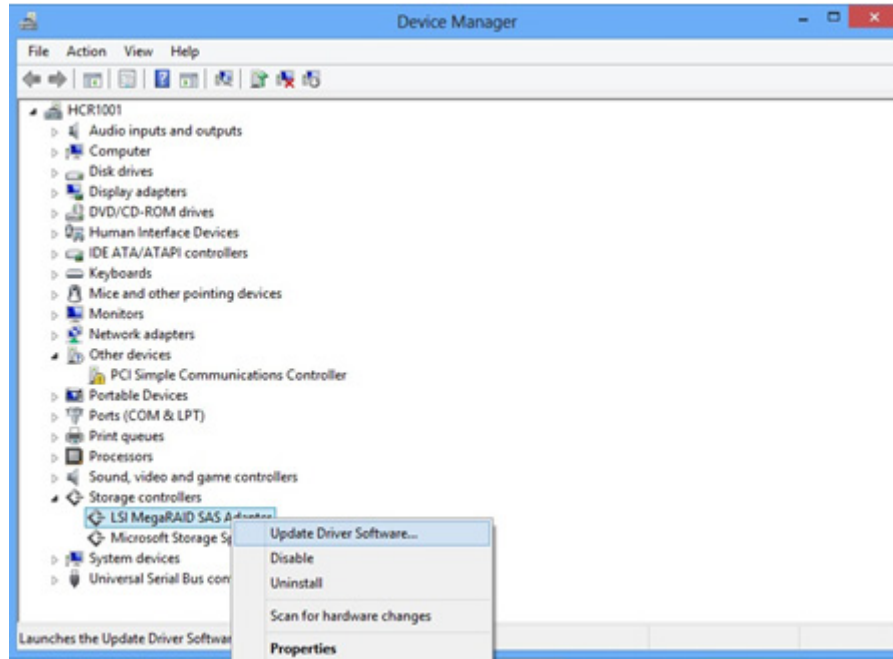
6. In the **Hardware and Sound** screen, click **Device Manager** under the **Devices and Printers** heading. The following figure appears.

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

Figure 6 Windows Security Dialog



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

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

2.7 Installing the MegaRAID Driver on the Windows Server 2012 OS

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

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

- If you use the MegaRAID controller as secondary storage, you should 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, you should upgrade to the latest Broadcom MegaRAID driver. 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 <https://www.broadcom.com/support/download-search>, and put it on a USB, diskette, CD, or DVD.
2. Boot the Windows 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.

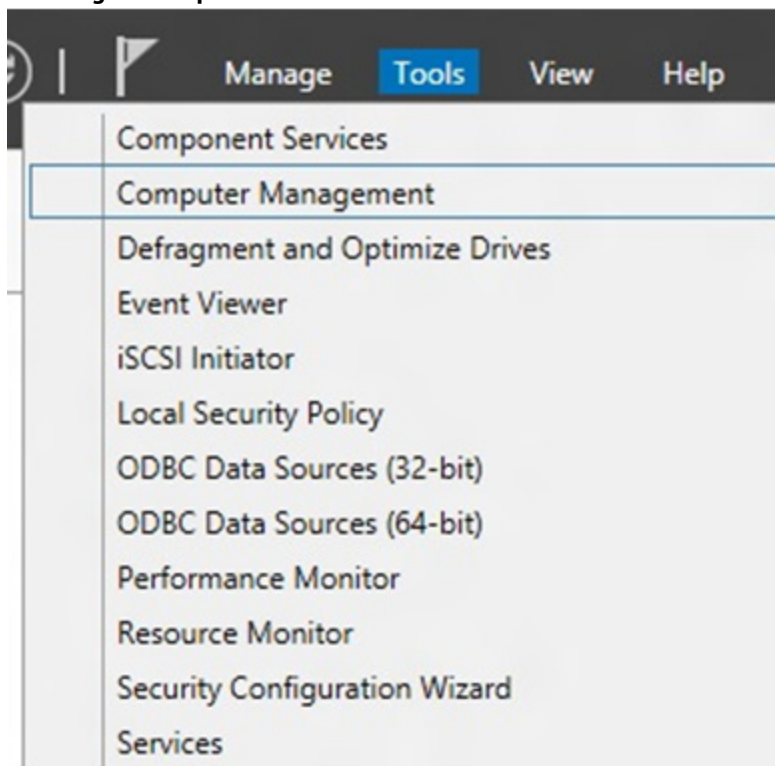
Figure 7 Server Manager Button



The **Server Manager** page appears.

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

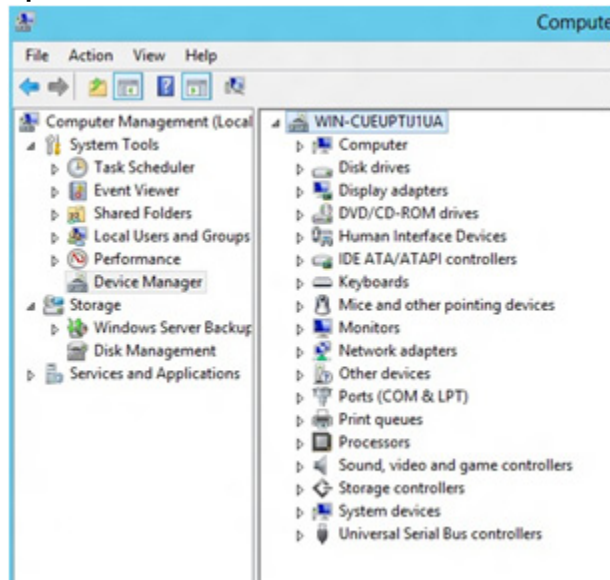
Figure 8 Computer Management Option



The **Computer Management** window appears.

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

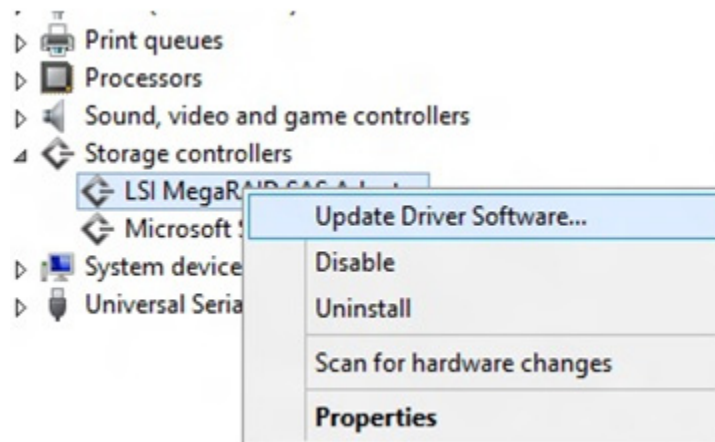
Figure 9 Device Manager Option



The **Device Manager** window appears.

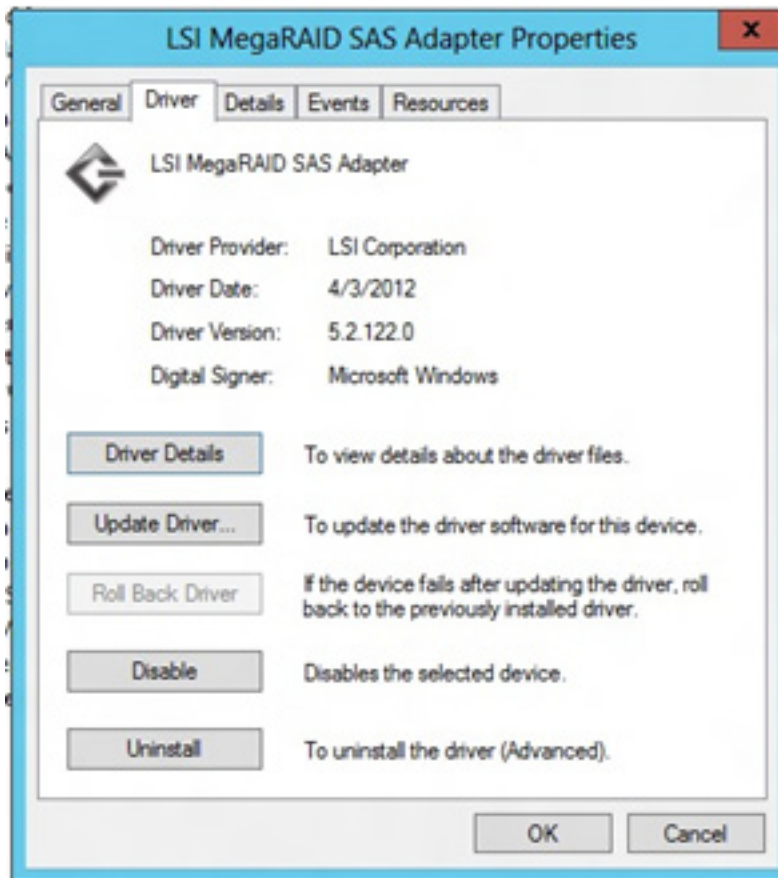
6. In the **Device Manager**, expand the submenu under **Storage controllers**.
7. Right-click the **LSI MegaRAID Controller** option, and click **Update Driver Software**, as shown in the following figure.

Figure 10 Update Driver Software Option



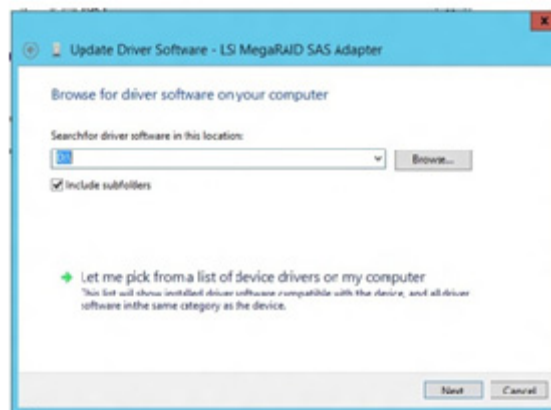
To find the version of the existing driver, right-click the **LSI MegaRAID Controller** option. Click **Properties**, and select the **Drivers** tab as shown in the following figure.

Figure 11 Driver Version



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

Figure 12 Update Driver Software Wizard



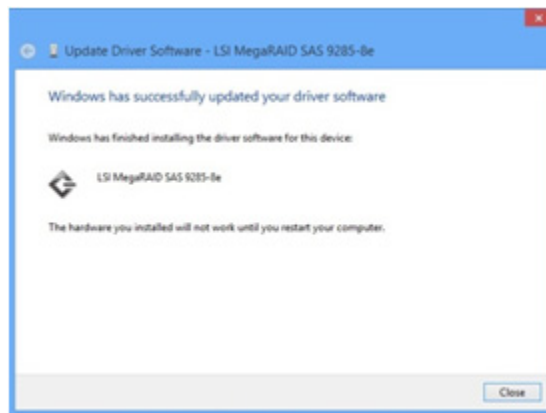
- After you locate the updated driver, the **Windows Security** dialog appears.
9. Click the **Install** button in the **Windows Security** dialog, as shown in the following figure.

Figure 13 Windows Security Dialog



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

Figure 14 Installation Complete Screen



10. Reboot the system after the driver is installed.

Chapter 3: Red Hat Linux Driver Installation

This chapter describes how to install the device driver, update the existing device driver, and uninstall the device driver on Red Hat Enterprise Linux (RHEL).

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

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

3.1 Installing the Driver on a New Red Hat Enterprise Linux 6.x or 7.x OS

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

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 RHEL OS from the RHEL installation media:

1. Refer to your system documentation, if needed, and boot the server with the installation CD, diskette, 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 Broadcom 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 ISO 9660 format or MS-DOS format by typing the `$df -T` command:

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 update disk during installation:

```
linux dd
```

NOTE If you do not get a command prompt to enter the `linux dd` boot option, press **Esc**. You might need 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 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 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 RHEL 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

You can either install or update the driver by using generic RPM Package Manager (RPM) or Dynamic Kernel Module Support (DKMS) RPMs.

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 07.701.16.00-1.
 - a. Uninstall the earlier version, if needed.
 - b. Extract the packaging from the Linux system by typing one of the following commands and pressing **Enter**:

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

- c. For RHEL5 architecture = x86_64, type the following commands and press **Enter**:

```
# cd rhel5_oe15_centos5/rpms-1# rpm -ivh  
kmod-megaraid_sas-06.602.03.00-1-el5.8.x86_64.rpm
```

- d. For RHEL6 architecture = x86_64, type the following commands and press **Enter**:

```
# cd rhel6_oe16_centos6/rpms-1# rpm -ivh  
kmod-megaraid_sas-06.602.03.00-el6.2-1.x86_64.rpm
```

NOTE You must 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.rpm install 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
```

Chapter 4: SUSE Linux Enterprise Server Driver Installation

This chapter describes how to install the device driver, update the existing device driver, and uninstall the device driver on SLES environments.

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 must 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 Service Pack 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 SLES Operating System.
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 Broadcom release bundle. The DUD image should match with the installed OS kernel version.

3. Press **Enter**.

4. Mount the USB drive to verify its contents.
5. Make sure the DUD image is in ISO 9660 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 SLES, 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 SLES 10.
 - Press **F6** for SLES 11.
 - Press **F6** for SLES 12.
3. Continue the installation procedure and, when prompted, insert the driver update 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_6, 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.rpm install 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 and 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: VMware Driver Installation

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

5.1 Installing Asynchronous Drivers on the VMware 6.x OS

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

5.1.1 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 the 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. Place the host into Maintenance mode.

NOTE You can place the 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.

5.1.2 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. Place the host into Maintenance mode.

NOTE You can place the 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.

5.1.3 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**.

- If you are upgrading using a `.vib` file:

```
esxcli software vib update -v /filepath/FILENAME.VIB
```

- If you are upgrading using a `.zip` file:

```
esxcli software vib update -d /filepath/FILENAME.ZIP
```

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.

5.1.4 Installing the Device Driver through 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 remediate the host or hosts with this baseline.

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

Chapter 6: 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 Operating System driver supports 32-bit and 64-bit systems.

6.1 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 Broadcom 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 ISO 9660 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.

6.2 Installing the XenServer 6 Operating System on Storage Managed by a MegaRAID Controller (Primary Storage)

This section describes how to set up the XenServer 6 Operating System 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.

Broadcom distributes the XenServer 6 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 Broadcom 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 Operating System driver at boot time on storage managed by a MegaRAID controller.

1. Download the ISO image to install the Citrix XenServer Operating System.
2. Using the ISO image, perform the following steps to make a USB flash drive as the 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* is the USB drive location.

3. Boot the computer from the main installation CD.
4. For the DUD installation, press **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 USB drive, and then proceed as normal.

After the initial boot messages, the installer does some hardware detection and initialization. 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 click **OK** to proceed.
8. Select the option to install or upgrade the XenServer Operating System, and click **OK** to proceed.

The next screen displays a message stating that the setup program will install XenServer on the computer, and a 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 Operating System 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 a 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 the installation media 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 click **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, and 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 the 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 USB drive into the USB slot, and then select **Accept** and continue.
- b. After the installation completes, select **Reboot**.

The system now runs under the Citrix XenServer Operating System.

6.3 Installing or Updating the XenServer 6.5 or 7 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 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 7: 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.

7.1 Installing the Driver in a New Ubuntu Linux LTS Operating System

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 operating system components, and Broadcom provides the MegaRAID driver in this file format.

Perform the procedure in this section if the Ubuntu Linux operating system 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 operating system as root, perform the following steps; otherwise, go to Step 2.
 - a. Make sure that you are running the operating system 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 Operating System.

2. Perform the following steps if you are not running the Operating System 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 Operating System.

7.2 Removing the Driver in a New Ubuntu Linux LTS Operating System

To remove the device driver in an Ubuntu Linux system, perform the following procedure if the Ubuntu Linux Operating System 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 operating system as root, perform the following steps; otherwise, go to Step 2.
 - a. Make sure that you are running the operating system 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 Operating System.

2. Perform the following steps if you are not running the operating system 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 Operating System.

Chapter 8: CentOS Driver Installation

To install, update, and uninstall the device driver on CentOS operating systems, see [Section 3, Red Hat Linux Driver Installation](#)

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

Chapter 9: FreeBSD Driver Installation

This chapter describes how to install the device driver and update the existing device driver on FreeBSD operating systems.

9.1 MegaRAID Drivers and Softwares for the FreeBSD OS

- For information on FreeBSD OS administration, see 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, see <http://www.freebsd.org/cgi/man.cgi>

Installing the Drivers on the 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 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>.

9.2 Obtaining FreeBSD Drivers

MegaRAID 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 three sources:

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

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

9.3 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 software CD into 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 `components/src/driver_name.tgz` file to update the kernel with a new driver.

9.4 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.

9.4.1 Installing the FreeBSD Operating System 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 Operating System versions 10.x or 11.x, the FreeBSD system contains the `mfi(4)` driver as an in-box solution in the kernel. A new FreeBSD kernel ISO must 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 Broadcom's FreeBSD driver solution.

To exclude the `mfi(4)` driver if the FreeBSD Operating System has this issue, see [Section 9.4.2, 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 Operating System. The procedure describes how to load the FreeBSD kernel driver module.

As a prerequisite, you need an operating system Installation CD for the FreeBSD 10.x or FreeBSD 11.x operating systems (i386 or amd64). Use the CD that you created using the instructions in [Section 9.4.2, Creating a Custom ISO Image to Exclude the mfi\(4\)](#).

NOTE

This procedure is specific to versions of the FreeBSD Operating Systems for which a compiled module is available. For other versions of a FreeBSD Operating System for which a compiled module is not supplied by Broadcom, you must compile your own module from source files. See [Section 9.6.2, Compiling and Loading the Driver as a Module by Using kldload \(Dynamically Loadable Module\)](#).

Perform the following steps to install the FreeBSD Operating System 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 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 3 in the FreeBSD 10.x or 11.x Operating Systems).
5. Insert the diskette containing the `mrsas.ko` module for the specific version of the FreeBSD Operating System 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. At the loader prompt,
 - a. To load a new driver from a diskette drive, type the following command and press **Enter**.

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

NOTE

If you have multiple units or devices for the operating system 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 Operating System, including the kernel source.
It is 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 from the USB port, if used), and reboot.
10. After reboot, repeat Step 4 through Step 7.
11. Upon boot, continue with the instructions in [Section 9.6.1, Updating the Kernel with the New Driver Source](#), for a statically linked module.

9.4.2 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 9.4, 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 obtained 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 8.5 Building and Installing a Custom Kernel – http://www.freebsd.org/doc/en_US.ISO8859-1/books/handbook/kernelconfig-building.html.

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 10.x and 11.x). Some steps may vary depending on the FreeBSD versions.

Perform the following steps to create the custom ISO image.

1. Install the required version of the FreeBSD OS on an available diskette 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 the type of architecture for which the ISO image is to be created.

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.

NOTE 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.

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

```
# cd /usr/src
# make buildkernel TARGET=<arch>
NOPTS=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, 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 from where it failed, and not from the start of the `make` process, which could save several hours.

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

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

Perform the procedures in this section if the FreeBSD Operating System 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 Operating System on the drive attached to the motherboard *before* you install the MegaRAID controller. This step reduces the possibility of installing the FreeBSD Operating System to the wrong drive or unit.

Get the latest driver source files for your version of FreeBSD; see [Section 9.2, Obtaining FreeBSD Drivers](#).

The following procedures document two types of operating system installation:

- Installation on a system does not include a Broadcom controller before the operating system installation.
- Installation on a system includes a Broadcom controller before the operating system installation.

9.5.1 Installing the FreeBSD Operating System on a System That Does Not Include Broadcom Controller before the Operating System Installation

Perform the following steps:

1. Install the FreeBSD Operating System, including the kernel source, on a drive attached to the motherboard. It is critical to include kernel source files.
2. After the operating system installation, reboot the system.
3. Follow the instructions for driver installation in [Section 9.6.1, Updating the Kernel with the New Driver Source](#), for a statically linked module, or in [Section 9.6.2, Compiling and Loading the Driver as a Module by Using kldload \(Dynamically Loadable Module\)](#).
4. After the FreeBSD Operating System 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.

9.5.2 Installing the FreeBSD OS on a System That Includes a Broadcom 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 9.6.1, Updating the Kernel with the New Driver Source](#) for a statically linked module or in [Section 9.6.2, Compiling and Loading the Driver as a Module by Using kldload \(Dynamically Loadable Module\)](#).

9.6 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 Broadcom does not supply modules.

9.6.1 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 9.2, Obtaining FreeBSD Drivers](#).

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

1. Make sure that the kernel source is installed on the system.
The kernel source is in the `/usr/src/sys` directory.
2. Go to the `/usr/src/sys/dev/` directory.
3. 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
```
4. Proceed to the `/usr/src/sys/modules/` directory, and repeat Step 3.
5. 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.
6. Go to `/usr/src/sys/i386/conf` if you are running a 32-bit version of the FreeBSD OS, or go to `/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 92XX 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 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, the entry for that should be added in the same manner as shown previously. 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.

7. Reboot your system to use the new kernel.

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

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

To use a driver module in case Broadcom does not supply a driver module for your version of the FreeBSD Operating System, use the procedures in this section. If you want to install only the Broadcom-supplied module, see [Section 9.6.3, Updating the MegaRAID Kernel Driver Module in the FreeBSD Operating System](#).

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

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

1. Boot to the FreeBSD Operating System.
2. Obtain driver source files; see [Section 9.2, Obtaining FreeBSD Drivers](#).

3. Make sure your kernel is prepared for the dynamically loadable module as described in [Section 9.6.1, Updating the Kernel with the New Driver Source](#).
4. To build the driver module, type the following commands, 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.
 - 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.

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

```
mrsas_load="YES"
```

9.6.3 Updating the MegaRAID Kernel Driver Module in the FreeBSD Operating System

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

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 Operating System.

1. Download and extract the driver.
See [Section 9.2, Obtaining 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 automatically load every time the system reboots, add the following line to the `/boot/loader.conf` file, and press **Enter**.

```
mrsas_load="YES"
```

Chapter 10: Fedora Driver Installation

To install or update the device driver on Fedora operating systems, see [Section 3, Red Hat Linux Driver Installation](#).

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

Appendix A: 64 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 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 Virtual Drive Support
Windows	Yes
Linux	Yes
VMware (Native/Legacy)	Yes

A.2 Known Driver Limitations

No known limitations.

Revision History

Version 1.4, February 16, 2018

The following document change was made.

- Updated [Section 1.2, Supported Operating Systems](#).

Version 1.3, November 30, 2017

The following document change was made.

- Updated [Section 1.2, Supported Operating Systems](#).

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- Updated [Section 1.2, Supported Operating Systems](#).

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- Updated [Section 1.2, Supported Operating Systems](#).

Preliminary, Version 1.0, October 28, 2016

Initial document release.

