RAID Controller Considerations

This appendix contains the following sections:

Also see these procedures for replacing RAID-related hardware:

- Replacing a Cisco Modular RAID Controller Card, page 3-40
- Replacing a Modular RAID Controller Transportable Memory Module (TMM), page 3-42
- Replacing the Supercap Power Module (RAID Backup Battery), page 3-44
- Replacing a SATA Interposer Board, page 3-38
- Replacing a Software RAID 5 Key Module, page 3-46

Supported RAID Controllers and Required Cables

This server supports the RAID controllers and cable requirements shown in Table C-1.

Caution In a SFF 8-drive server, do not use the embedded software RAID controller and a hardware RAID controller card to control the front-facing drives at the same time. This combination is not supported and could result in data loss. You can use the embedded software RAID controller to control internal SAS SSD boot drives (SFF 24-drive and LFF 12-drive server versions only) while you use a hardware RAID controller card to control the front-facing drives.

Note See Support Matrix For Cisco UCS C240 M4 Server RAID Controllers, page C-5 for information about controller support by server version and drive type.

Table C-1 Cisco UCS C240 M4 RAID Options

Controller	Style	Supported Server Version/ Maximum Front-Facing Drives Controlled	SCPM	RAID Levels	Required Cables
Embedded RAID (PCH SATA)	On board	• SFF 8-drives/no expander: 8 internal SATA drives	No	0, 1, 5[1], 10	• SFF 8-drives/no expander: Cable and required SATA interposer board bundled as `UCSC-IP-PCH-C240M4=`
Cisco UCS 12G SAS Modular RAID Controller This controller can be ordered with modular flash-based write cache (FBWC) options: 1 GB, 2 GB, or 4 GB. Note: See also Cisco 12G SAS Modular RAID Controller Considerations, page C-3.	PCIe	• SFF 8-drives/no expander: 8 internal drives • SFF 16-drives/expander: 16 internal drives • SFF 24-drives/expander: 24 internal drives • LFF 12-drives/expander: 12 internal drives	Yes[2]	Variable by cache size: • No cache: 0, 1, 10 • 1GB, 2GB, or 4GB cache: 0, 1, 5, 6, 10, 50, 60	• SFF 8-drives/no expander: (`UCS-240CBLMR8=`) • SFF 16 drives/expander: (`UCS-240CBLMR16=`) • SFF 24 drives/expander: (`UCS-240CBLMR24=`) • LFF 12 drives/expander: (`UCS-240CBLMR12=`)

Table C-1 Cisco UCS C240 M4 RAID Options (continued)

Controller	Style	Supported Server Version/ Maximum Front-Facing Drives Controlled	SCPM	RAID Levels	Required Cables
Cisco UCS 12G SAS Modular HBA	PCIe	• SFF 8-drives/no expander: 8 internal drives • SFF 16-drives/expander: 16 internal drives • SFF 24-drives/expander: 24 internal drives • LFF 12-drives/expander: 12 internal drives	No	Non-RAID	• SFF 8-drives/no expander: (`UCS-240CBLMR8=`) • SFF 16 drives/expander: (`UCS-240CBLMR16=`) • SFF 24 drives/expander: (`UCS-240CBLMR24=`) • LFF 12 drives/expander: (`UCS-240CBLMR12=`)
Cisco UCS SAS 9300-8e HBA Note: See also Cisco UCS SAS 9300-8e HBA Considerations, page C-5.	PCIe	• All server versions 8 external SAS+SATA ports, controlling up to 1024 non-RAID external drives	No	Non-RAID	• External storage cables are not sold by Cisco. NOTE: This HBA does not support optical cables for connection to external storage (copper only).

1. Embedded RAID 5 support requires an optional RAID 5 key module.
2. SCPM = SuperCap power module (RAID backup unit). See RAID Backup Units, page C-7.

RAID Card Firmware Compatibility

If the PCIe card that you are installing is a RAID controller card, firmware on the RAID controller must be verified for compatibility with the current Cisco IMC and BIOS versions that are installed on the server. If not compatible, upgrade or downgrade the RAID controller firmware accordingly using the Host Upgrade Utility (HUU) for your firmware release to bring it to a compatible level.

See the HUU guide for your Cisco IMC release for instructions on downloading and using the utility to bring server components to compatible levels: HUU Guides

Cisco 12G SAS Modular RAID Controller Considerations

Stripe-Size Limitation When No Flash-Backed Write Cache is Present

This controller can be ordered with several modular flash-backed write cache (FBWC) options: 512 MB, 1 GB, 2 GB, or 4 GB.

- If the controller has a FBWC and you are using a RAID configuration that uses striping (RAID 0, 10, 50, or 60), then the full list of stripe sizes is available (8, 16, 32, 64, 128, 256, 512, or 1024 KB).
- If the controller does not have a FBWC, then the only stripe size available is 64 KB.

Write-Cache Policy for Cisco 12G SAS Modular RAID Controller

For this server and other Cisco Generation M4 servers, the default write-cache policy for the Cisco Modular RAID controller is *Write Through* (irrespective of the presence of a charged Supercap power module or "good BBU"). This utilizes the optimal performance characteristics of the controller.

If you have Cisco IMC 2.0(5) or later firmware installed to the M4 server, the write policy can be set to *Write Back*, if preferred.

You can set the write policy using the following methods:

- For standalone servers, use the Cisco IMC interface to set Virtual Drive Properties > Write Policy. See the "Managing Storage Adapters" section in your Cisco IMC Configuration Guide.
  Cisco IMC GUI and CLI Configuration Guides
- For Cisco UCS-integrated servers, use the Cisco UCS Manager interface to set the write-cache policy as part of virtual drive configuration in your storage profile.
  Cisco UCS Manager Configuration Guides
- Use the LSI Option ROM Configuration Utility.

Support Matrix For Cisco UCS C240 M4 Server RAID Controllers

Table C-2 lists the support for the available controllers by server version.

Table C-2 Support Matrix For C240 M4 RAID Controllers

C240 M4 Version	Boot SSD (Internal) Supported?	Embedded Software RAID Control Boot SSD (Internal)?	AHCI Mode Control Boot SSD (Internal)?	Hardware Controller Card Control Boot SSD (Internal)?	Embedded Software RAID Control Front-Facing drives?	AHCI mode Control Front-Facing drives?	Cisco 12G Modular RAID Controller Card Control Front-Facing Drives?	SAS 9300-8i HBA Controller Card Control Front-Facing Drives?
SFF 8 HDD	No	N/A	N/A	N/A	Yes	No	Yes	N/A
LFF 12 HDD	Yes	Yes	Yes	No	No	No	Yes	Yes
SFF 16 HDD	No	N/A	N/A	N/A	No	No	Yes	N/A
SFF 24 HDD	Yes	Yes	Yes	No	No	No	Yes	Yes

Cisco UCS SAS 9300-8e HBA Considerations

This section contains the following topics:

Optical Cables Not Supported for 9300-8e HBA

The 9300-8e HBA does not support optical cables for connection to external storage (copper only).

Mixing Rules

Mixing the Cisco UCS 9300-8e HBA in the same server as the Cisco UCS 12G SAS Modular HBA requires the following firmware levels:

- Cisco IMC/BIOS 2.0(8) or later
- Cisco UCS Manager 2.2(6) or later (for integrated servers only)

Cisco UCS 9300-8e Bad Drive and Predictive Failure Behavior

The bad drive and predictive failure behavior for the Cisco UCS SAS 9300-e HBA cards is different than that for LSI MegaRAID cards. The list below compares behavior for these HBA cards and LSI MegaRAID cards.

- Bad/invalid/0MB drive handling:

  - MegaRAID: The bad drive is marked BAD in the GUI/CLI interfaces and the fault LED on the drive is solid amber.
  - HBA: The bad drive is not shown in the GUI/CLI and there is no LED indication.
- Drive predictive failure:
  - MegaRAID: If the drive is part of a RAID volume with a spare, the software performs an auto-copy backup and then marks the drive failed/BAD with the fault LED on the drive solid amber.
  - HBA: There is no error handling and there is no LED indication. The operating system must handle the fault.

Setting the Preferred Boot Device for Cisco UCS 9300-8e

Currently, the boot device order for these HBAs does not map to a physical slot as seen in the Boot Option dialog of the server BIOS Setup Utility. This makes it difficult to differentiate between multiple devices.

Use the following procedure to select the preferred boot device in the LSI BIOS CU SAS Topology screen. When you select the preferred boot device in the BIOS CU SAS Topology screen, it is displayed at the top of the list in the server BIOS Setup Utility Boot Option dialog, making it easy to identify.

Step 1 In the LSI SAS BIOS CU, navigate to the SAS Topology screen.

Step 2 Press **Alt+B** to select or deselect a device as the preferred boot device. On this screen, you can identify the device by slot number.

Step 3 Press **Alt+A** to select or deselect a device as the alternate boot device. On this screen, you can identify the device by slot number. The alternate boot device is used if the preferred boot device is not detected.

Step 4 Return to the BIOS CU SAS Topology screen.

The Device Info column shows which devices you selected with the designators `Boot` and `Alt`.

Step 5 In the server BIOS Setup Utility, open the Boot Option dialog.

The preferred device that you selected in the LSI BIOS CU is listed at the top of the list.

Step 6 Select the device at the top of the list as your boot option.

Mixing Drive Types in RAID Groups

Table C-3 lists the technical capabilities for mixing hard disk drive (HDD) and solid state drive (SSD) types in a RAID group. However, see the recommendations that follow for the best performance.

Table C-3 Drive Type Mixing in RAID Groups

Mix of Drive Types in RAID Group	Allowed?
SAS HDD + SATA HDD	Yes
SAS SSD + SATA SSD	Yes
HDD + SSD	No

Mixing Drive Types in RAID Groups

For the best performance, follow these guidelines:

- Use either all SAS or all SATA drives in a RAID group.
- Use the same capacity for each drive in the RAID group.
- Never mix HDDs and SSDs in the same RAID group.

RAID Backup Units

This server supports installation of one SuperCap power module (SCPM). The units mount to clips on the removable air baffle (see Figure 3-22).

The SCPM provides approximately three years of backup for the disk write-back cache DRAM in the case of a sudden power loss by offloading the cache to the NAND flash.

For SCPM replacement instructions, see Replacing the Supercap Power Module (RAID Backup Battery), page 3-44.

RAID Controller Cabling

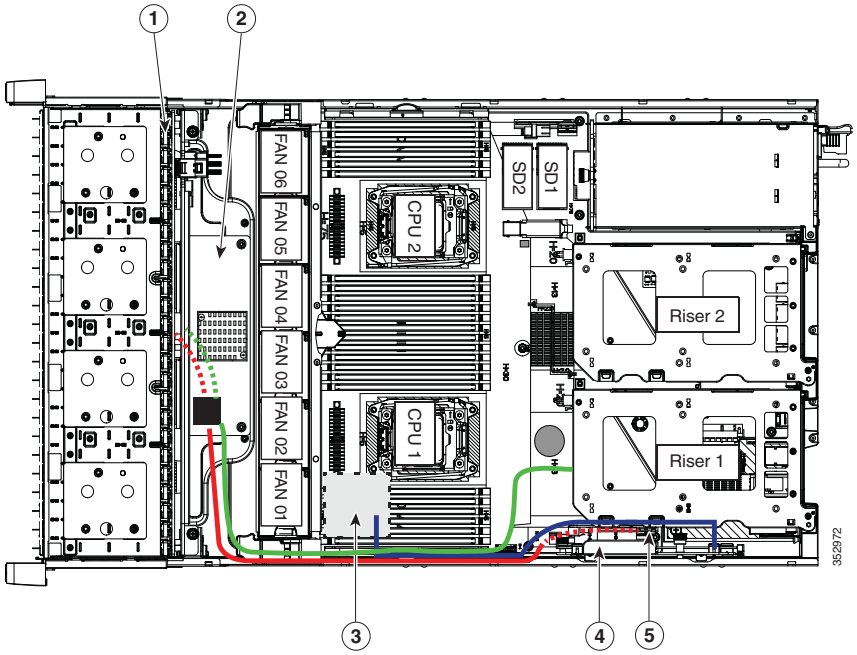
This section includes the following topics:

Cable Routing

The RAID controller connectors in this server are shown in Figure C-1.

- The red line shows the recommended cable routing path from the Cisco modular RAID controller card or the embedded SATA RAID interposer board to the drive backplane or expander. Cable clips on the chassis wall secure the cables.
- The blue line shows the recommended cable routing path from the Cisco modular RAID controller to the SCPM on the removable air baffle. The SCPM cable should pass through the opening on the rear of the air baffle to avoid interfering with the top cover.
- The green line shows the recommended cable routing path from an HBA in slot 1 to the drive backplane or expander.

Figure C-1 RAID Controller Connectors and Cable Paths



1	Drive backplane The SFF 16-drive and LFF 12-drive options have an expander integrated into the backplane.	**4**	Cisco modular RAID controller PCIe slot (dedicated slot on motherboard)
2	Expander The SFF 24-drive version (shown) has an expander separate from the backplane.	**5**	Embedded SATA RAID interposer board socket on motherboard
3	SCPM mounting location on removable air baffle (air baffle not shown)		

Cisco UCS C240 M4 Server RAID Controller Cabling Instructions

This section contains cabling instructions for controlling front-facing drives in the four server versions and their supported cables:

- SFF 8-Drive Direct-Connect Backplane, No Expander, page C-9
- SFF 16-Drive Backplane with Integrated Expander, page C-9
- SFF 24-Drive Backplane with Expander Cabling, page C-10
- LFF 12-Drive Backplane with Expander, page C-10

SFF 8-Drive Direct-Connect Backplane, No Expander

The SFF 8-drive option does not use a SAS expander, so connections from the controller are made directly to the backplane. The cable connections required for each type of controller are as follows:

Embedded RAID

This option can control up to eight front-facing SATA drives (in two groups of four drives).

The required `UCSC-IP-PCH-C240M4=` kit includes the SATA interposer board and one Y-cable (mini-SAS HD to mini-SAS 36-pin x2).

Make the following connections:

1. Connect the PORT A cable connector to the PORT A connector on the interposer board.
2. Connect the PORT B cable connector to the PORT B connector on the interposer board.
3. Connect the single mini-SAS HD cable connector to the single connector on the backplane.

Cisco UCS 12G Modular RAID Controller

This option can control up to eight drives.

The required `UCS-240CBLMR8=` cable kit has one cable with a mini-SAS HD connector on each end.

Make the following connections:

1. Connect one end of the cable to the modular RAID controller card.
2. Connect the other end of the cable to the single mini-SAS HD connector on the backplane.

SFF 16-Drive Backplane with Integrated Expander

The SFF 16-drive option has a SAS expander integrated with the backplane.

Cisco UCS 12G Modular RAID Controller

This option can control up to 16 drives.

The required `UCS-C240CBLMR16=` cable kit has one cable with a mini-SAS HD connector on each end.

Make the following connections:

1. Connect one end of the cable to the modular RAID controller card.
2. Connect the other end of the cable to the single mini-SAS HD connector on the backplane.

SFF 24-Drive Backplane with Expander Cabling

The SFF 24-drive option has a backplane and SAS expander.

Note No cabling is required for the embedded SATA RAID controller to control the internal SSD boot drives.

Cisco UCS 12G Modular RAID Controller

This option can control up to 24 drives.

The required `UCS-240CBLMR24=` cable kit has one cable with a mini-SAS HD connector on each end.

Make the following connections:

1. Connect one end of the cable to the modular RAID controller card.
2. Connect the other end of the cable to the single mini-SAS HD connector on the expander.

Cisco UCS SAS 9300-8i HBA

This option can control up to 24 drives (non-RAID).

The required `240CBLHBA24=` cable kit has one cable with a mini-SAS HD connector on each end.

Make the following connections:

1. Connect one end of the cable to the modular RAID controller card.
2. Connect the other end of the cable to the single mini-SAS HD connector on the expander.

LFF 12-Drive Backplane with Expander

The LFF 12-drive option has a SAS expander integrated with the backplane.

Note No cabling is required for the embedded SATA RAID controller to control the internal SSD boot drives.

Cisco UCS 12G Modular RAID Controller

This option can control up to 12 drives.

The required `UCS-240CBLMR12=` cable kit has one Y-cable with a mini-SAS HD double connector on one end and two mini-SAS HD single connectors on the other end.

1. Connect the mini-SAS double connector to the modular RAID controller card.
2. Connect single connector PORT A to the PORT A connector on the backplane.
3. Connect single connector PORT B to the PORT B connector on the backplane.

Cisco UCS SAS 9300-8i HBA

This option can control up to 12 drives (non-RAID).

The required `240CBLHBA12=` cable kit has one Y-cable with a mini-SAS HD double connector on one end and two mini-SAS HD single connectors on the other end.

Make the following connections:

1. Connect the mini-SAS double connector to the modular RAID controller card.

2. Connect single connector PORT A to the PORT A connector on the backplane.
3. Connect single connector PORT B to the PORT B connector on the backplane.

Embedded SATA RAID Controller

Note The VMware ESX/ESXi operating system is not supported with the embedded SATA MegaRAID controller in SW RAID mode. You can use VMWare in AHCI mode.

Note The Microsoft Windows Server 2016 Hyper-V hypervisor is supported for use with the embedded MegaRAID controller in SW RAID mode, but all other hyperviors are not supported. All Hypervisors are supported in AHCI mode.

This server includes an embedded MegaRAID controller hub that can control up to eight SATA-only front-facing drives (SFF 8-drive server only). It can also control up to two internal boot SSDs (SFF 24-drive and LFF 12-drive servers only).

This section contains the following topics:

Embedded SATA RAID Controller Requirements For Front-Facing Drive Control

The embedded SATA RAID controller hub requires the following items:

- For front-facing drive control—The SFF, 8-drive version of the server.

  The embedded RAID option is available for front-facing drive control only with the SFF 8-drive, direct-connect backplane.
- A SATA interposer board and Y-cable (bundled as `UCSC-IP-PCH-C240M4=`).

  This interposer board plugs into the motherboard and provides cable connectors.
- (Optional) A SATA RAID 5 key module.

  This optional module can be installed to a motherboard header to add SATA RAID 5 support for front-facing drives.
- The embedded SATA RAID controller must be enabled in the server BIOS.
- (Optional) LSI MegaSR drivers for Windows or Linux.

Note The embedded SATA RAID controller can also manage internal SSD boot drives in a RAID 1 array. For that case, the requirement is either the LFF 12-drive or the SFF 24-drive version of the server. Only the LFF 12-drive and the SFF 24-drive versions of the server support internal boot SSDs. No cabling is required for managing the internal SSD boot drives.

Embedded SATA RAID: Two SATA Controllers

The embedded RAID Patsburgh controller hub (PCH) is split into two controllers: SATA and sSATA (secondary SATA). These two controllers are seen as separate RAID controllers in the Cisco IMC interface and are configurable separately.

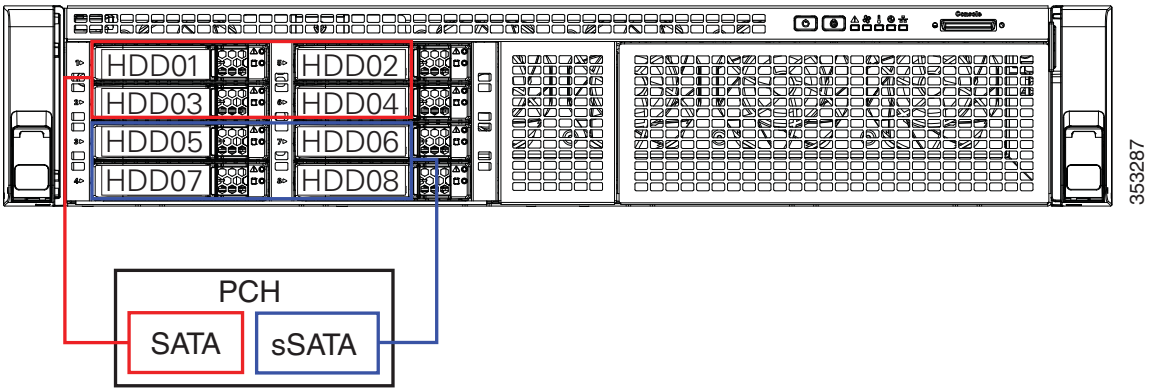
- The first SATA controller controls front-facing drives 1–4; it can also control the two internal SATA SSD boot drives (see Table C-4).
- The secondary sSATA controller controls front-facing drives 5–8 (see Table C-4).

Table C-4 SATA and sSATA Listing of Drives in LSI SW RAID Utilities

SATA	sSATA
0—Front HDD 01	0—Front HDD 05
1—Front HDD 02	1—Front HDD 06
2—Front HDD 03	2—Front HDD 07
3—Front HDD 04	3—Front HDD 08
4—SSD internal boot drive	
5—SSD internal boot drive	

- When configuring RAID groups, you cannot create a group that spans more than four drives.
  - The first SATA controller can control a RAID group of up to four drives, comprised of only front drives 1–4 (see Figure C-2).
  - The first SATA controller can also control a RAID 1 group of the two internal SATA boot drives.
  - The secondary sSATA controller can control a RAID group of up to four drives, comprised of only front drives 5–8 (see Figure C-2).

Figure C-2 Embedded RAID Controller Drive Groups



- See Enabling the Embedded RAID Controller in the BIOS, page C-15 for instructions on enabling the two SATA controllers.
- Each controller is listed separately in the BIOS. You can select the boot order of the controllers in the BIOS (use the **Boot Options** tab in the BIOS Setup Utility).

Note To set the boot order for virtual drives, use the LSI Embedded RAID Configuration Utility (legacy or UEFI version). See Launching the LSI Embedded MegaRAID Configuration Utilities, page C-16.

Embedded SATA RAID Controller Considerations

Note the following considerations for controlling front-facing drives (SFF 8-drive server version only):

- The default setting for this embedded controller hub is SATA RAID 0, 1, and 10 support for up to eight front-facing SATA drives.
- You can upgrade to SATA RAID 0, 1, 5, and 10 support for up to eight front-facing SATA drives (in two groups of four drives) by installing a RAID 5 key module on the motherboard. See Installing a Software RAID 5 Key Module for Embedded RAID 5 Support, page C-14.
- When you order the server with this embedded controller, the controller is enabled in the BIOS. Instructions for enabling the controller are included for the case in which a server is reset to defaults (Disabled). See Enabling the Embedded RAID Controller in the BIOS, page C-15.
- You cannot downgrade from using a HW RAID controller card to using the software RAID embedded controller for front-facing drive control.

Caution Data migration from software RAID (embedded RAID) to HW RAID (a controller card) is *not* supported and could result in data loss. Migrations from software RAID to HW RAID are supported only *before* there is data on the drives, or the case in which there are no drives in the server.

- The required drivers for this controller are already installed and ready to use with the LSI software RAID Configuration Utility (legacy version or UEFI via the server BIOS). However, if you will use this controller with Windows or Linux, you must download and install additional drivers for those operating systems. See Installing LSI MegaSR Drivers For Windows and Linux, page C-17.

Installing a SATA Interposer Board For Front-Facing Drive Control

The Embedded RAID controller requires a SATA interposer board for front-facing drive control. The RAID cables included connect from this board to the eight-drive, direct-connect backplane.

To install a SATA interposer board, see Replacing a SATA Interposer Board, page 3-38.

Installing a Software RAID 5 Key Module for Embedded RAID 5 Support

The software RAID 5 key module contains a chip on a small circuit board. This module attaches to a two-pin motherboard header. This chip upgrades support to add embedded SATA RAID 5 support for front-facing drive control.

To install a RAID 5 key module, see Replacing a Software RAID 5 Key Module, page 3-46.

Enabling the Embedded RAID Controller in the BIOS

Note The default setting in the BIOS for the embedded controller is disabled.

When you enable this controller, both the primary (SATA) and secondary (sSATA) controllers are enabled.

Enabling SATA Mode and Selecting Option ROM Mode

Step 1 Set the SATA mode for managing the two boot drives:

a. Boot the server and press **F2** when prompted to enter the BIOS Setup utility.

b. Choose the **Advanced** tab, and then choose **LOM and PCIe Slots Configuration**.

c. Select **PCH SATA Mode** and then choose one of the options from the dialog:

- AHCI—Advanced host controller interface. You can manage the internal SSD boot drives by using your operating system's storage management feature.
- Disabled—The embedded RAID controller is disabled.
- LSI SW RAID—In supported server versions, you can manage the internal SSD boot drives or the front-facing drives by using the server's embedded SATA RAID controller. For support by server version, see Support Matrix For Cisco UCS C240 M4 Server RAID Controllers, page C-5.

Note Before you change from LSI SW RAID mode to AHCI mode, delete all the RAID volumes configured in the connected physical drives.

d. If you selected LSI SW RAID mode and you want to set the option ROM mode, continue with the next step. If not, skip to Step 3.

Note There is no option ROM mode in AHCI SATA mode.

Step 2 Optional: Set the SATA option ROM mode for the two boot drives (only with LSI SW RAID SATA mode):

a. Choose the **Advanced** tab, and then choose **LOM and PCIe Slots Configuration**.

b. Select **PCH SATA OPROM Mode** and then choose one of the options from the dialog:

- Enabled—You can boot from these boot drives. You can use the UEFI management interface or the free-standing legacy management utility.
- Disabled—You cannot boot from these boot drives.
- UEFI Only—Select this to enable booting but manage RAID only by using the UEFI version of the LSI utility that is built into the server BIOS. See Launching the LSI Embedded MegaRAID Configuration Utilities, page C-16.
- Legacy Only—Select this enable booting but manage RAID only by using the free-standing version of the LSI utility. See Launching the LSI Embedded MegaRAID Configuration Utilities, page C-16.

Step 3 Press **F10** to save your changes and exit the utility.

Disabling the Embedded RAID Controller in the BIOS

Step 1 Boot the server and press **F2** when prompted to enter the BIOS Setup Utility.

Step 2 Select the **Advanced** tab, and then select **LOM and PCIe Slots Configuration**.

Step 3 Set PCH SATA Mode to **Disabled**.

Step 4 Press **F10** to save your changes and exit the utility.

Launching the LSI Embedded MegaRAID Configuration Utilities

You can use one of the two LSI utilities:

- Launch the legacy free-standing utility by pressing **Ctrl+M** when you see the prompt during system boot.
- Launch the UEFI version of the LSI utility that is built into the server BIOS as follows:

1. Press **F2** when you see the prompt during system boot to open the BIOS Setup Utility.
2. Select the **Advanced** tab.
3. Open the UEFI utility for the primary (SATA) or the secondary controller (sSATA) by selecting one of the following:
   - LSI SW RAID Configuration Utility (SATA)
   - LSI SW RAID Configuration Utility (sSATA)

Note The secondary SATA (sSATA) UEFI utility is activated only in a SFF 8-drive version of the server where it can be used to control front-facing drives 5–8. It is not used when controlling the internal boot drives in a SFF 24-drive or LFF 12-drive version of the server.

Note These UEFI options are activated only if you have already set the PCH SATA OPROM Mode to Enabled or UEFI Only. See Enabling SATA Mode and Selecting Option ROM Mode, page C-15.

For information about using the Embedded MegaRAID software to configure your disk arrays, see the LSI Embedded MegaRAID Software User Guide.

Installing LSI MegaSR Drivers For Windows and Linux

Note The required drivers for this controller are already installed and ready to use with the LSI software RAID Configuration Utility. However, if you will use this controller with Windows or Linux, you must download and install additional drivers for those operating systems.

This section explains how to install the LSI MegaSR drivers for the following supported operating systems:

- Microsoft Windows Server
- Red Hat Enterprise Linux (RHEL)
- SUSE Linux Enterprise Server (SLES)

For the specific supported OS versions, see the Hardware and Software Interoperability Matrix for your server release.

This section contains the following topics:

Downloading the LSI MegaSR Drivers

The MegaSR drivers are included in the C-Series driver ISO for your server and OS. Download the drivers from Cisco.com.

Step 1 Find the drivers ISO file download for your server online and download it to a temporary location on your workstation:

a. See the following URL: **http://www.cisco.com/cisco/software/navigator.html**

b. Type the name of your server in the **Select a Product** search field and then press **Enter**.

c. Click **Unified Computing System (UCS) Drivers**.

d. Click the release number that you are downloading.

e. Click the Download icon to download the drivers ISO file.

Step 2 Continue through the subsequent screens to accept the license agreement and then browse to a location where you want to save the drivers' ISO file.

Microsoft Windows Driver Installation

This section describes how to install the LSI MegaSR driver in a Windows installation.

This section contains the following topics:

Windows Server 2008R2 Driver Installation

The Windows operating system automatically adds the driver to the registry and copies the driver to the appropriate directory.

Step 1 Create a RAID drive group using the LSI Software RAID Configuration Utility before you install this driver for Windows. Launch this utility by pressing **Ctrl-M** when `LSI SWRAID` is shown during the BIOS POST.

Step 2 Download the Cisco UCS C-Series drivers' ISO, as described in Downloading the LSI MegaSR Drivers, page C-17.

Step 3 Prepare the drivers on a USB thumb drive:

a. Burn the ISO image to a disk.

b. Browse the contents of the drivers folders to the location of the embedded MegaRAID drivers:

/<OS>/Storage/Intel/C600/

c. Expand the Zip file, which contains the folder with the MegaSR driver files.

d. Copy the expanded folder to a USB thumb drive.

Step 4 Start the Windows driver installation using one of the following methods:

- To install from local media, connect an external USB DVD drive to the server and then insert the first Windows installation disk into the drive. Skip to Step 6.
- To install from remote ISO, log in to the server's Cisco IMC interface and continue with the next step.

Step 5 Launch a Virtual KVM console window and click the **Virtual Media** tab.

a. Click **Add Image** and browse to select your remote Windows installation ISO file.

b. Check the check box in the Mapped column for the media that you just added, and then wait for mapping to complete.

Step 6 Power cycle the server.

Step 7 Press **F6** when you see the F6 prompt during bootup. The Boot Menu window opens.

Step 8 On the Boot Manager window, choose the physical disk or virtual DVD and press **Enter**. The Windows installation begins when the image is booted.

Step 9 Press **Enter** when you see the prompt, "Press any key to boot from CD."

Step 10 Observe the Windows installation process and respond to prompts in the wizard as required for your preferences and company standards.

Step 11 When Windows prompts you with "Where do you want to install Windows," install the drivers for embedded MegaRAID:

a. Click **Load Driver**. You are prompted by a Load Driver dialog box to select the driver to be installed.

b. Connect the USB thumb drive that you prepared in Step 3 to the target server.

c. On the Windows Load Driver dialog that you opened in Step a, click **Browse**.

d. Use the dialog box to browse to the location of the drivers folder on the USB thumb drive, and then click **OK**.

   Windows loads the drivers from the folder and when finished, the driver is listed under the prompt, "Select the driver to be installed."

e. Click **Next** to install the drivers.

Updating the Windows Driver

Step 1 Click **Start**, point to **Settings**, and then click **Control Panel**.

Step 2 Double-click **System**, click the **Hardware** tab, and then click **Device Manager**. Device Manager starts.

Step 3 In Device Manager, double-click **SCSI and RAID Controllers**, right-click the device for which you are installing the driver, and then click **Properties**.

Step 4 On the Driver tab, click **Update Driver** to open the Update Device Driver wizard, and then follow the wizard instructions to update the driver.

Linux Driver Installation

This section explains the steps to install the embedded MegaRAID device driver in a Red Hat Enterprise Linux installation or a SUSE Linux Enterprise Server installation.

This section contains the following topics:

Obtaining the Driver Image File

See Downloading the LSI MegaSR Drivers, page C-17 for instructions on obtaining the drivers. The Linux driver is offered in the form of dud-[*driver version*].img, which is the boot image for the embedded MegaRAID stack.

Note The LSI MegaSR drivers that Cisco provides for Red Hat Linux and SUSE Linux are for the original GA versions of those distributions. The drivers do not support updates to those OS kernels.

Preparing Physical Installation Disks For Linux

This section describes how to prepare physical Linux installation disks from the driver image files, using either the Windows operating system or the Linux operating system.

Note This procedure requires a USB thumb drive.

Note Alternatively, you can mount the dud.img or dd.iso file as a virtual disk rather than a physical disk, as described in the installation procedures.

Note For RHEL 7.1 and later, there is no dud.img file--the driver is contained in an dd.iso file.

Preparing Physical Installation Disks with the Windows Operating System

Under Windows, you can use the RaWrite floppy image-writer utility to create disk images from image files.

Step 1 Download the Cisco UCS C-Series drivers ISO, as described in Downloading the LSI MegaSR Drivers, page C-17 and save it to your Windows system that has a diskette drive.

Step 2 Extract the dud.img or .iso file:

a. Burn the ISO image to a disc.

b. Browse the contents of the drivers folders to the location of the embedded MegaRAID drivers:

/<OS>/Storage/Intel/C600/

c. Expand the Zip file, which contains the folder with the driver files.

Step 3 Copy the driver update disk image dud-[driver version].img or .iso file and your file raw write.exe to a directory.

Note RaWrite is not included in the driver package.

Step 4 If necessary, use this command to change the filename of the driver update disk to a name with fewer than eight characters: **copy dud-[***driver version***].img dud.img**

Step 5 Open the DOS Command Prompt and navigate to the directory where raw write.exe is located.

Step 6 Enter the following command to create the installation diskette: **raw write**

Step 7 Press **Enter**.

You are prompted to enter the name of the boot image file.

Step 8 Enter: **dud.img**

Step 9 Press **Enter**.

You are prompted for the target disk.

Step 10 Insert a floppy disk into the server and enter: **A:**

Step 11 Press **Enter**.

Step 12 Press **Enter** again to start copying the file to the diskette.

Step 13 After the command prompt returns and the floppy disk drive LED goes out, remove the disk.

Step 14 Label the diskette with the image name.

Preparing Installation Disks with a Linux Operating System

Under Red Hat Linux and SUSE Linux, you can use a driver disk utility to create disk images from image files.

Note This procedure requires a USB thumb drive.

Note For RHEL 7.1 and later, there is no dud.img file--the driver is contained in a dd.iso file.

Step 1 Download the Cisco UCS C-Series drivers ISO image, as described in Downloading the LSI MegaSR Drivers, page C-17 and save it to your Linux system.

Step 2 Extract the dud.img or .iso file:

a. Burn the ISO image to a disc.

b. Browse the contents of the drivers folders to the location of the embedded MegaRAID drivers:

/<OS>/Storage/Intel/C600/

c. Expand the Zip file, which contains the folder with the driver files.

Step 3 Copy the driver update disk image dud-[driver version].img or .iso file to your Linux system.

Step 4 Insert a blank USB thumb drive into a port on your Linux system.

Step 5 Create a directory and mount the dud-[driver version].img or dd.iso file to that directory:

mkdir <*destination_folder*>

mount -oloop <*driver_image*> <*destination_folder*>

Step 6 Copy the contents in the directory to your USB thumb drive.

Installing the Red Hat Linux Driver

Note This server supports Red Hat Linux 6.5 and later.

For the specific supported OS versions, see the Hardware and Software Interoperability Matrix for your server release.

This section describes the fresh installation of the Red Hat Enterprise Linux device driver on systems with the embedded MegaRAID stack.

Step 1 **Before starting driver installation:** Create a RAID drive group using the LSI Software RAID Configuration utility before you install this driver for the OS. Launch this utility by pressing **Ctrl-M** when `LSI SWRAID` is shown during the BIOS POST.

Note For RHEL 6.x the driver is contained in a dud.img file. In RHEL 7.x, the driver is contained in a dd.iso file.

Step 2 Prepare the dud.img or dd.iso file using one of the following methods:

- To install from local media: Use one of the procedures in Preparing Physical Installation Disks For Linux, page C-20.
  Then return to Step 4 of this procedure.
- To install from a virtual disk: Download and save the Cisco UCS C-Series drivers ISO image, as described in Downloading the LSI MegaSR Drivers, page C-17.
  Then continue with the next step.

Step 3 Extract the dud.img or dd.iso file:

a. Burn the Cisco UCS C-Series Drivers' ISO image to a disc.

b. Browse the contents of the drivers folders to the location of the embedded MegaRAID drivers:

/<OS>/Storage/Intel/C600/

c. Copy the dud-<*driver version*>.img or dd.iso file to a temporary location on your workstation.

d. If you are using RHEL 7.x, rename the saved dd.iso to dd.img.

Note If you are using RHEL 7.x, renaming the dd.iso file to dd.img simplifies this procedure and saves time. The Cisco UCS virtual drive mapper can map only one .iso at a time, and only as a virtual CD/DVD. Renaming the file to dd.img allows you to mount the RHEL installation ISO as a virtual CD/DVD *and* the renamed dd.img as a virtual floppy disk or removable disk at the same time. This avoids the steps of unmounting and remounting the RHEL ISO when the dd.iso driver file is prompted for.

Step 4 Start the Linux driver installation using one of the following methods:

- To install from local media, connect an external USB DVD drive to the server and then insert the first RHEL installation disk into the drive.
  Then continue with Step 6.
- To install from virtual disk, log in to the server's Cisco IMC interface. Then continue with the next step.

Step 5 Launch a Virtual KVM console window and click the **Virtual Media** tab.

a. Click **Add Image** and browse to select your remote RHEL installation ISO image.

Note An .iso file can be mapped only as a virtual CD/DVD.

b. Click **Add Image** again and browse to select your RHEL 6.x dud.img or the RHEL 7.x dd.img file that you renamed in Step 3.

Note Map the .img file as a virtual floppy disk or removable disk.

c. Check the check boxes in the Mapped column for the media that you just added, then wait for mapping to complete.

Step 6 Power cycle the target server.

Step 7 Press **F6** when you see the F6 prompt during bootup. The Boot Menu window opens.

Note Do not press Enter in the next step to start the installation. Instead, press **e** to edit installation parameters.

Step 8 On the Boot Menu, use the arrow keys to select **Install Red Hat Enterprise Linux** and then press **e** to edit installation parameters.

Step 9 Append one of the following blacklist commands to the end of the line that begins with **linuxefi**:

- For RHEL 6.*x* (32- and 64-bit), enter:
  linux dd blacklist=isci blacklist=ahci nodmraid noprobe=<ata*drive number*>

Note The **noprobe** values depend on the number of drives. For example, to install RHEL 6.5 on a RAID 5 configuration with three drives, enter
Linux dd blacklist=isci blacklist=ahci nodmraid noprobe=ata1 noprobe=ata2

- For RHEL 7.x (32- and 64-bit), enter:
  linux dd modprobe.blacklist=ahci nodmraid

Step 10 **Optional**: To see full, verbose installation status steps during installation, delete the **Quiet** parameter from the line.

Step 11 On the Boot Manager window, press **Ctrl+x** to start the interactive installation.

Step 12 Below **Driver disk device selection**, select the option to install your driver .iso file. (Type **r** to refresh the list if it is not populated.)

Note The installer recognizes the driver file as an .iso file, even though you renamed it to dd.img for mapping.

Type the number of the driver device ISO in the list. Do *not* select the RHEL ISO image. In the following example, type **6** to select device sdb:

```
5) sr0 iso9660 RHEL-7.6\x20Server.x
6) sdb iso9660 CDROM
# to select, 'r' - refresh, or 'c' -continue: 6
```

The installer reads the driver ISO and lists the drivers.

Step 13 Under **Select drivers to install**, type the number of the line that lists the megasr driver. For example, type **1** and press **Enter**:

```
1) [ ] /media/DD-1/rpms/x86_61/kmod-megasr-18.01.2010.1107_e17.6-1.x86_61.rpm
# to toggle selection, or 'c' -continue: 1
```

Your selection is displayed with an x in brackets.

```
1) [X] /media/DD-1/rpms/x86_61/kmod-megasr-18.01.2010.1107_e17.6-1.x86_61.rpm
```

Step 14 Type **c** to continue.

Step 15 Follow the Red Hat Linux installation wizard to complete the installation.

Step 16 When the wizard's Installation Destination screen is displayed, ensure that **LSI MegaSR** is listed as the selection. If it is not listed, the driver did not load successfully. In that case, select **Rescan Disc**.

Step 17 After installation completes, reboot the system.

Installing the SUSE Linux Enterprise Server Driver

For the specific supported OS versions, see the Hardware and Software Interoperability Matrix for your server release.

This section describes the installation of the SUSE Linux Enterprise Server (SLES) driver on a system with the embedded MegaRAID stack.

Step 1 **Before starting driver installation:** Create a RAID drive group using the LSI SWRAID Configuration utility before you install this driver for the OS. Launch this utility by pressing **Ctrl+M** when `LSI SWRAID` is shown during the BIOS POST.

Step 2 Prepare the dud.img file using one of the following methods:

- To install from a physical disk, use one of the procedures in Preparing Physical Installation Disks For Linux, page C-20.
  Then return to Step 4 of this procedure.
- To install from a virtual disk, download and save the Cisco UCS C-Series drivers ISO, as described in Downloading the LSI MegaSR Drivers, page C-17.
  Then continue with the next step.

Step 3 Extract the dud.img file that contains the driver:

a. Burn the Cisco UCS C-Series drivers ISO image to a disc.

b. Browse the contents of the drivers folders to the location of the embedded MegaRAID drivers:

/<OS>/Storage/Intel/C600/

c. Copy the dud-<*driver version*>.img file to a temporary location on your workstation.

Step 4 Start the Linux driver installation using one of the following methods:

- To install from local media, connect an external USB DVD drive to the server and then insert the first SLES install disc into the drive. Skip to Step 6.
- To install from remote ISO, log in to the server's Cisco IMC interface and continue with the next step.

Step 5 Launch a Virtual KVM console window and click the **Virtual Media** tab.

a. Click **Add Image** and browse to select your remote SLES installation ISO file.

Note An .iso file can be mapped only as a virtual CD/DVD.

b. Click **Add Image** again and browse to select your dud.img file.

Note Map the .img file as a virtual floppy disk or removable disk.

c. Check the check box in the Mapped column for the media that you just added, and then wait for mapping to complete.

Step 6 Power cycle the server.

Step 7 Press **F6** when you see the F6 prompt during bootup. The Boot Menu window opens.

Step 8 On the Boot Manager window, select the physical or virtual SLES installation ISO and press **Enter**.

The SLES installation begins when the image is booted.

Step 9 When the first SLES screen appears, choose **Installation**.

Step 10 Enter one of the following in the Boot Options field:

- For SLES 11 and SLES 11 SP1 (32- and 64-bit), enter: **brokenmodules=ahci**
- For SLES 11 SP2 (32-and 64-bit), enter: **brokenmodules=ahci brokenmodules=isci**
- For SLES 12, press **e** to edit installation parameters. Then append the following parameter to the end of the line that begins with **linuxefi**: **brokenmodules=ahci**

Step 11 **Optional**: To see detailed status information during the installation, add the following parameter to the line that begins with **linuxefi**: **splash=verbose**

Step 12 Do one of the following actions:

- For SLES 11, press **F6** for the driver and choose **Yes**.
- For SLES 12, press **Ctrl+x** to start the installation.

The installation proceeds.

Step 13 Do one of the following actions:

- For SLES 11: If you prepared the dud.img file on a physical disk, insert the USB thumb drive to the target server and then insert the disk in the A:/ drive and press **Enter**.
- For SLES 11: If you mapped the dud.img file as a virtual disk in Step 5, choose the location of the virtual disk. Press **Enter** to choose Installation.
- For SLES 12: The installer finds the LSI driver automatically in the `dud-<driver version>.img` file that you provided. With verbose status messages, you see the driver being installed when `LSI MegaRAID SW RAID Module` is listed

Step 14 Follow the SLES installation wizard to complete the installation. Verify installation of the driver when you reach the **Suggested Partitioning** screen:

a. On the **Suggested Partitioning** screen, select **Expert Partitioner**.

b. Navigate to **Linux > Hard disks** and verify that there is a device listed for the `LSI - LSI MegaSR driver`. The device might be listed as a type other than sda. For example:

```
dev/sdd: LSI - LSI MegaSR
```

If no device is listed, the driver did not install properly. In that case, repeat the steps above.

Step 15 When installation is complete, reboot the target server.

Restoring RAID Configuration After Replacing a RAID Controller

When you replace a RAID controller, the RAID configuration that is stored in the controller is lost. Use the following procedure to restore your RAID configuration to your new RAID controller.

Step 1 Replace your RAID controller. See Replacing a PCIe Card, page 3-53.

Step 2 If this was a full chassis swap, replace all drives into the drive bays, in the same order that they were installed in the old chassis.

Step 3 Reboot the server and watch for the prompt to press F.

Note For newer RAID controllers, you are not prompted to press F. Instead, the RAID configuration is imported automatically. In this case, skip to Step 6.

Step 4 Press **F** when you see the following on-screen prompt:

```
Foreign configuration(s) found on adapter.
Press any key to continue or 'C' load the configuration utility,
or 'F' to import foreign configuration(s) and continue.
```

Step 5 Press any key (other than C) to continue when you see the following on-screen prompt:

```
All of the disks from your previous configuration are gone. If this is
an unexpected message, then please power of your system and check your cables
to ensure all disks are present.
Press any key to continue, or 'C' to load the configuration utility.
```

Step 6 Watch the subsequent screens for confirmation that your RAID configuration was imported correctly.

- If you see the following message, your configuration was successfully imported. The LSI virtual drive is also listed among the storage devices.

  N `Virtual Drive(s) found on host adapter.`

- If you see the following message, your configuration was not imported. This situation can happen if you do not press F quickly enough when prompted. In this case, reboot the server and try the import operation again when you are prompted to press F.

  `0 Virtual Drive(s) found on host adapter.`

For More Information

The LSI utilities have help documentation for more information about using the utilities.

For basic information about RAID and for using the utilities for the RAID controller cards that are supported in Cisco servers, see the Cisco UCS Servers RAID Guide.

Full Avago Technologies/LSI documentation is also available:

- For hardware SAS MegaRAID—Avago Technologies/LSI 12 Gb/s MegaRAID SAS Software User's Guide, Rev. F
- For embedded software MegaRAID—LSI Embedded MegaRAID Software User Guide