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CONTENTS

PREFACE

Preface xi
Audience xi
Conventions xi
Related Cisco UCS Documentation xiii
Documentation Feedback xiii

CHAPTER 1

New and Changed Information 1
New and Changed Information for This Release 1

CHAPTER 2

Overview 3
Cisco UCS Manager User Documentation 3
Storage Options 4
Storage Design Considerations 6
Storage Configuration Sequence 6
Storage Protocols 7
The UCS Manager SAN Tab 7

CHAPTER 3

SAN Ports and Port Channels 9
Port Modes 9
Port Types 9
Server Ports 11
Configuring Server Ports 11
Reconfiguring a Port on a Fabric Interconnect 11
Enabling or Disabling a Port on a Fabric Interconnect 12
Unconfiguring a Port on a Fabric Interconnect 12
Appliance Ports  12
  Configuring an Appliance Port  13
  Modifying the Properties of an Appliance Port  14
FCoE and Fibre Channel Storage Ports  14
  Configuring an Ethernet Port as an FCoE Storage Port  14
  Configuring a Fibre Channel Storage Port  15
  Restoring an Uplink Fibre Channel Port  15
FC Links Rebalancing  16
Configuring FC Uplink Ports  16
FCoE Uplink Ports  17
  Configuring FCoE Uplink Ports  17
Unified Storage Ports  18
  Configuring an Appliance Port as a Unified Storage Port  18
  Unconfiguring a Unified Storage Port  19
Unified Uplink Ports  19
  Configuring Unified Uplink Ports  20
  Unconfiguring Unified Uplink Port  20
Policy-Based Port Error Handling  21
  Configuring Error-Based Action  21
Fibre Channel Port Channels  22
  Creating a Fibre Channel Port Channel  22
  Enabling a Fibre Channel Port Channel  23
  Disabling a Fibre Channel Port Channel  23
  Adding Ports to and Removing Ports from a Fibre Channel Port Channel  23
  Modifying the Properties of a Fibre Channel Port Channel  24
  Deleting a Fibre Channel Port Channel  25
FCoE Port Channels  25
  Creating an FCoE Port Channel  25
  Deleting an FCoE Port Channel  25
Unified Uplink Port Channel  26

CHAPTER 4  Fibre Channel Zoning  27
  Information About Fibre Channel Zoning  27
  Information About Zones  27
Contents

CHAPTER 5

Named VSANs 37

Named VSANs 37
Fibre Channel Uplink Trunking for Named VSANs 38
Guidelines and Recommendations for VSANs 38
Creating a Named VSAN 39
Creating a Storage VSAN 40
Deleting a Named VSAN 41
Changing the VLAN ID for the FCoE VLAN for a Storage VSAN 41
Enabling Fibre Channel Uplink Trunking 42
Disabling Fibre Channel Uplink Trunking 42

CHAPTER 6

SAN Pin Groups 43

SAN Pin Groups 43
Creating a SAN Pin Group 43
Deleting a SAN Pin Group 44

CHAPTER 7

FC Identity Assignment 45

Fibre Channel Identity 45
CHAPTER 8

WWN Pools

Creating a WWNN Pool
Adding a WWN Block to a WWNN Pool
Deleting a WWN Block from a WWNN Pool
Adding a WWNN Initiator to a WWNN Pool
Deleting a WWPN Initiator from a WWPN Pool
Deleting a WWNN Pool

WWPN Pools

Creating a WWPN Pool
Adding a WWN Block to a WWPN Pool
Deleting a WWN Block from a WWPN Pool
Adding a WWPN Initiator to a WWPN Pool
Deleting a WWPN Initiator from a WWPN Pool
Deleting a WWPN Pool

WWxN Pools

Creating a WWxN Pool
Adding a WWN Block to a WWxN Pool
Deleting a WWN Block from a WWxN Pool
Deleting a WWxN Pool

CHAPTER 9

Storage-Related Policies

About vHBA Templates
vHBA Template
Creating a vHBA Template
Binding a vHBA to a vHBA Template
Unbinding a vHBA from a vHBA Template
Deleting a vHBA Template

Fibre Channel Adapter Policies
Ethernet and Fibre Channel Adapter Policies
Creating a Fibre Channel Adapter Policy
Deleting a Fibre Channel Adapter Policy
About the Default vHBA Behavior Policy
# Contents

<table>
<thead>
<tr>
<th>Chapter 12</th>
<th>Configuring SD Card Support</th>
<th>121</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>FlexFlash Secure Digital Card Support</td>
<td>121</td>
</tr>
<tr>
<td></td>
<td>FlexFlash FX3S Support</td>
<td>123</td>
</tr>
<tr>
<td></td>
<td>Enabling FlexFlash SD Card Support</td>
<td>124</td>
</tr>
<tr>
<td></td>
<td>Disabling FlexFlash SD Card Support</td>
<td>124</td>
</tr>
<tr>
<td></td>
<td>Enabling Auto-Sync</td>
<td>125</td>
</tr>
<tr>
<td></td>
<td>Formatting the SD Cards</td>
<td>125</td>
</tr>
<tr>
<td></td>
<td>Resetting the FlexFlash Controller</td>
<td>125</td>
</tr>
<tr>
<td></td>
<td>FlexUtil Secure Digital Card Support</td>
<td>126</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chapter 13</th>
<th>Direct Attached Storage</th>
<th>127</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Direct Attached Storage</td>
<td>127</td>
</tr>
<tr>
<td></td>
<td>Fibre Channel Switching Mode</td>
<td>127</td>
</tr>
<tr>
<td></td>
<td>Configuring Fibre Channel Switching Mode</td>
<td>128</td>
</tr>
<tr>
<td></td>
<td>Creating a Storage VSAN</td>
<td>129</td>
</tr>
<tr>
<td></td>
<td>Creating a VSAN for Fibre Channel Zoning</td>
<td>130</td>
</tr>
<tr>
<td></td>
<td>Configuring a Fibre Channel Storage Port</td>
<td>132</td>
</tr>
<tr>
<td></td>
<td>Configuring Fibre Channel Zoning</td>
<td>133</td>
</tr>
<tr>
<td></td>
<td>Creating a Fibre Channel Storage Connection Policy</td>
<td>134</td>
</tr>
<tr>
<td></td>
<td>Creating a Service Profile with the Expert Wizard</td>
<td>135</td>
</tr>
<tr>
<td></td>
<td>Associating a Service Profile with a Server or Server Pool</td>
<td>136</td>
</tr>
</tbody>
</table>
CHAPTER 14

Storage Inventory  139
- Local Disk Locator LED Status  139
- Toggling the Local Disk Locator LED On and Off  139
- Custom LED Status with Advanced VMD on NVMe  140
- NVMe-optimized M5 Servers  143
- MSwitch Disaster Recovery  144
- NVMe PCIe SSD Inventory  144
- Viewing NVMe PCIe SSD Storage Inventory  144

CHAPTER 15

Cisco UCS S3260 System Storage Management  147
- Storage Server Features and Components Overview  147
- Cisco UCS S3260 Storage Management Operations  154
- Disk Sharing for High Availability  155
  - Disk Zoning Policies  155
  - Creating a Disk Zoning Policy  155
  - Creating Disk Slots and Assigning Ownership  158
  - Associating Disk Zoning Policies to Chassis Profile  158
  - Disk Migration  159
- Storage Enclosure Operations  160
  - Removing Chassis Level Storage Enclosures  160
Preface

• Audience, on page xi
• Conventions, on page xi
• Related Cisco UCS Documentation, on page xiii
• Documentation Feedback, on page xiii

Audience

This guide is intended primarily for data center administrators with responsibilities and expertise in one or more of the following:
• Server administration
• Storage administration
• Network administration
• Network security

Conventions

<table>
<thead>
<tr>
<th>Text Type</th>
<th>Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td>GUI elements</td>
<td>GUI elements such as tab titles, area names, and field labels appear in this font. Main titles such as window, dialog box, and wizard titles appear in this font.</td>
</tr>
<tr>
<td>TUI elements</td>
<td>In a Text-based User Interface, text the system displays appears in this font.</td>
</tr>
<tr>
<td>System output</td>
<td>Terminal sessions and information that the system displays appear in this font.</td>
</tr>
<tr>
<td>CLI commands</td>
<td>CLI command keywords appear in this font. Variables in a CLI command appear in this font.</td>
</tr>
<tr>
<td>[ ]</td>
<td>Elements in square brackets are optional.</td>
</tr>
</tbody>
</table>
### Text Type | Indication
--- | ---
\{x | y | z\} | Required alternative keywords are grouped in braces and separated by vertical bars.
\[x | y | z\] | Optional alternative keywords are grouped in brackets and separated by vertical bars.
string | A nonquoted set of characters. Do not use quotation marks around the string or the string will include the quotation marks.
< > | Nonprinting characters such as passwords are in angle brackets.
[ ] | Default responses to system prompts are in square brackets.
!, # | An exclamation point (!) or a pound sign (#) at the beginning of a line of code indicates a comment line.

---

**Note**
Means *reader take note*. Notes contain helpful suggestions or references to material not covered in the document.

**Tip**
Means *the following information will help you solve a problem*. The tips information might not be troubleshooting or even an action, but could be useful information, similar to a Timesaver.

**Timesaver**
Means *the described action saves time*. You can save time by performing the action described in the paragraph.

**Caution**
Means *reader be careful*. In this situation, you might perform an action that could result in equipment damage or loss of data.

**Warning**
IMPORTANT SAFETY INSTRUCTIONS
This warning symbol means danger. You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents. Use the statement number provided at the end of each warning to locate its translation in the translated safety warnings that accompanied this device.

SAVE THESE INSTRUCTIONS
Related Cisco UCS Documentation

Documentation Roadmaps

For a complete list of all B-Series documentation, see the Cisco UCS B-Series Servers Documentation Roadmap available at the following URL: https://www.cisco.com/c/en/us/td/docs/unified_computing/ucs/overview/guide/UCS_roadmap.html

For a complete list of all C-Series documentation, see the Cisco UCS C-Series Servers Documentation Roadmap available at the following URL: https://www.cisco.com/c/en/us/td/docs/unified_computing/ucs/overview/guide/ucs_rack_roadmap.html.

For information on supported firmware versions and supported UCS Manager versions for the rack servers that are integrated with the UCS Manager for management, refer to Release Bundle Contents for Cisco UCS Software.

Other Documentation Resources

Follow Cisco UCS Docs on Twitter to receive document update notifications.

Documentation Feedback

To provide technical feedback on this document, or to report an error or omission, please send your comments to ucs-docfeedback@external.cisco.com. We appreciate your feedback.
New and Changed Information

The following table provides an overview of the significant changes to this guide for this current release. The table does not provide an exhaustive list of all changes made to this guide or of all new features in this release.

Table 1: New Features and Changed Behavior in Cisco UCS Manager, Release 3.1(3)

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
<th>Where Documented</th>
</tr>
</thead>
<tbody>
<tr>
<td>Server SIOC Connectivity Functionality</td>
<td>Using this functionality, you can configure the data path through both the primary and auxiliary SIOCs when the chassis has single server and dual SIOCs set up.</td>
<td>Storage Server Features and Components Overview, on page 147</td>
</tr>
<tr>
<td>Cisco UCS C3260/C3X60 re-branding.</td>
<td>Beginning with Cisco UCS Manager Release 3.1(3), Cisco UCS C3260/C3X60 is renamed to Cisco UCS S3260. You may still see certain components in the system labeled as C3260/C3X60. For this release, the terms S3260 and C3260/C3X60 are used interchangeably. Both, S3260 and C3260/C3X60, refer to the same hardware component.</td>
<td>Storage Server Features and Components Overview, on page 147</td>
</tr>
</tbody>
</table>
Self-Encrypting Drives (SEDs) have a special hardware that encrypts incoming data and decrypts outgoing data in real-time. A media encryption key controls this encryption and decryption. SEDs need to be locked by providing a security key identifier and a security key. The security key is used to encrypt the media encryption key. You can configure security keys locally, or remotely using a KMIP server. In this release, Cisco UCS Manager supports SEDs on Cisco UCS C-Series and S-Series servers.

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
<th>Where Documented</th>
</tr>
</thead>
<tbody>
<tr>
<td>Security Policies for Self-Encrypting Drives, and KMIP Support</td>
<td>Self-Encrypting Drives (SEDs) have a special hardware that encrypts incoming data and decrypts outgoing data in real-time. A media encryption key controls this encryption and decryption. SEDs need to be locked by providing a security key identifier and a security key. The security key is used to encrypt the media encryption key. You can configure security keys locally, or remotely using a KMIP server. In this release, Cisco UCS Manager supports SEDs on Cisco UCS C-Series and S-Series servers.</td>
<td>Security Policies for Self-Encrypting Drives, on page 77</td>
</tr>
</tbody>
</table>

---

**Cisco UCS Manager integration with Cisco UCS C3260 System.**

Support for Cisco UCS C3260 storage server in a single (with an optional HDD or IO expander tray) or dual server deployment. Dynamic storage configuration is achieved by assigning ownership of drives to server nodes.

**User defined FC zones**

Support for creating and deleting user-defined FC zones and FC zone profiles.

Table 2: New Features and Changed Behavior in Cisco UCS Manager, Release 3.1(2)

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
<th>Where Documented</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco UCS Manager integration with Cisco UCS C3260 System.</td>
<td>Support for Cisco UCS C3260 storage server in a single (with an optional HDD or IO expander tray) or dual server deployment. Dynamic storage configuration is achieved by assigning ownership of drives to server nodes.</td>
<td>Creating a Disk Zoning Policy, on page 155</td>
</tr>
<tr>
<td>User defined FC zones</td>
<td>Support for creating and deleting user-defined FC zones and FC zone profiles.</td>
<td>Configuring Fibre Channel Zoning, on page 30</td>
</tr>
</tbody>
</table>
Overview

This guide describes how to configure the following storage management tasks:

- Ports and Port Channels
- Named VSANs
- SAN Pin Groups
- SAN Uplinks
- Pools
- FC Identity Assignment
- Storage-Related Policies
- Storage Profiles
- FlexFlash SD Card Support
- Direct Attached Storage
- Storage Inventory

Cisco UCS Manager User Documentation

Cisco UCS Manager offers you a new set of smaller, use-case based documentation described in the following table:
<table>
<thead>
<tr>
<th>Guide</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco UCS Manager Getting Started Guide</td>
<td>Discusses Cisco UCS architecture and Day 0 operations, including Cisco UCS Manager initial configuration and configuration best practices.</td>
</tr>
<tr>
<td>Cisco UCS Manager Administration Guide</td>
<td>Discusses password management, role-based access configuration, remote authentication, communication services, CIMC session management, organizations, backup and restore, scheduling options, BIOS tokens, and deferred deployments.</td>
</tr>
<tr>
<td>Cisco UCS Manager Infrastructure Management Guide</td>
<td>Discusses physical and virtual infrastructure components used and managed by Cisco UCS Manager.</td>
</tr>
<tr>
<td>Cisco UCS Manager Firmware Management Guide</td>
<td>Discusses downloading and managing firmware, upgrading through Auto Install, upgrading through service profiles, directly upgrading at endpoints using firmware auto sync, managing the capability catalog, deployment scenarios, and troubleshooting.</td>
</tr>
<tr>
<td>Cisco UCS Manager Server Management Guide</td>
<td>Discusses the new licenses, registering Cisco UCS domain with Cisco UCS Central, power capping, server boot, server profiles, and server-related policies.</td>
</tr>
<tr>
<td>Cisco UCS Manager Storage Management Guide</td>
<td>Discusses all aspects of storage management, such as SAN and VSAN in Cisco UCS Manager.</td>
</tr>
<tr>
<td>Cisco UCS Manager Network Management Guide</td>
<td>Discusses all aspects of network management, such as LAN and VLAN connectivity in Cisco UCS Manager.</td>
</tr>
<tr>
<td>Cisco UCS Manager System Monitoring Guide</td>
<td>Discusses all aspects of system and health monitoring, including system statistics in Cisco UCS Manager.</td>
</tr>
</tbody>
</table>

### Storage Options

The following are the UCS Manager storage options and the benefits of each.
• **Direct Attached Storage (DAS)**—This is the storage available inside a server and is directly connected to the system through the motherboard within a parallel SCSI implementation. DAS is commonly described as captive storage. Devices in a captive storage topology do not have direct access to the storage network and do not support efficient sharing of storage. To access data with DAS, a user must go through a front-end network. DAS devices provide little or no mobility to other servers and little scalability.

DAS devices limit file sharing and can be complex to implement and manage. For example, to support data backups, DAS devices require resources on the host and spare disk systems that other systems cannot use. The cost and performance of this storage depends upon the disks and RAID controller cards inside the servers. DAS is less expensive and is simple to configure; however, it lacks the scalability, performance, and advanced features provided by high-end storage.

• **Network Attached Storage (NAS)**—This storage is usually an appliance providing file system access. This storage could be as simple as an Network File System (NFS) or Common Internet File System (CIFS) share available to the servers. Typical NAS devices are cost-effective devices with not very high performance but have very high capacity with some redundancy for reliability. NAS is usually moderately expensive, simple to configure, and provides some advanced features; however, it also lacks scalability, performance, and advanced features provided by SAN.

• **Storage Area Network (SAN)**—A SAN is a specialized, high-speed network that attaches servers and storage devices. A SAN allows any-to-any connection across the network by using interconnect elements, such as switches and directors. It eliminates the traditional dedicated connection between a server and storage, and the concept that the server effectively owns and manages the storage devices. It also eliminates any restriction to the amount of data that a server can access, currently limited by the number of storage devices that are attached to the individual server. Instead, a SAN introduces the flexibility of networking to enable one server or many heterogeneous servers to share a common storage utility. A network might include many storage devices, including disk, tape, and optical storage. Additionally, the storage utility might be located far from the servers that it uses. This type of storage
provides maximum reliability, expandability, and performance. The cost of SAN is also very high compared to other storage options.

SAN is the most resilient, highly scalable, and high performance storage; however, it is also the most expensive and complex to manage.

**Storage Design Considerations**

UCS storage physical connectivity has a slightly different design consideration as compared to LAN physical connectivity. The following are some design considerations for SAN connectivity:

- Northbound storage physical connectivity does not support virtual port channels (vPCs) like LAN connectivity.
- Port channels or trunking is possible to combine multiple storage uplink ports that provide physical link redundancy.
- Redundancy of storage resources is handled by the storage itself and varies from vendor to vendor.
- Connect storage through northbound Cisco storage devices, such as Nexus or MDS Fabric Switches.
- It is possible to connect storage directly to UCS Fabric Interconnects, which is recommended for small implementations because of the fabric interconnect physical ports consumption and increased processing requirements.
- Software configuration including VSANs and zoning is required for providing access to storage resources.

**Storage Configuration Sequence**

Follow the suggested sequence to configure a storage network:

1. Configure and enable server ports, uplink ports, and FC ports.
2. Create a management IP address pool (typically on the same subnet as the UCS Manager Admin IP address).
4. For SAN boot, create a unique "Boot Policy" for each storage array boot target.
5. Create VNIC templates (for example, eth0-A, eth1-B) that both draw from the above MAC Pool, and are associated with Fabric-A and Fabric-B respectively.
6. Create VHBA templates (for example, fc0-A, fc1-B) that both draw from the above WWPN Pool, and are associated with Fabric-A and Fabric-B respectively.
7. Create service profile templates that draw from all earlier established pools, policies and templates, as appropriate.
8. Instantiate the service profile from the template and associate the service profile to a given blade, or set the service profile template to associate with a particular server pool.
Storage Protocols

Fiber Channel, iSCSI, and Fiber Channel over Ethernet are protocols for SAN connectivity.

- **iSCSI**—An industry standard protocol for attaching various I/O peripherals such as printers, scanners, tape drives, and storage devices. The most common SCSI devices are disks and tape libraries.

  SCSI is the core protocol to connect raw hard disk storage with the servers. To control remote storage with the SCSI protocol, different technologies are used as wrappers to encapsulate commands, such as FC and iSCSI.

  Fiber Channel protocol provides the infrastructure to encapsulate the SCSI traffic and provided connectivity between computers and storage. FC operates at speeds of 2, 4, 8, and 16 Gbps.

- **Fiber Channel (FC)** consists of the following:
  - Hard disk arrays that provide raw storage capacity.
  - Storage processors to manage hard disks and provide storage LUNs and masking for the servers.
  - Fiber Channel Switches (also known as Fabric) that provide connectivity between storage processors and server HBAs.
  - Fiber Channel Host Bus Adapters: They are installed in the computer and provide connectivity to the SAN.

  Fiber Channel identifies infrastructure components with World Wide Numbers (WWN). WWNs are 64-bit addresses which uniquely identify the FC devices. Like MAC addresses, it has bits assigned to vendors to identify their devices. Each end device (like an HBA port) is given a World Wide Port Number (WWPN) and each connectivity device (like a Fabric switch) is given a World Wide Node Number (WWNN).

  A Fiber Channel HBA used for connecting to a SAN is known as an initiator, and Fiber Channel SAN providing disks as LUNs is known as a target. The Fiber Channel protocol is different from Ethernet or TCP/IP protocols.

- **Fiber Channel over Ethernet (FCoE)** transport replaces the Fibre Channel cabling with 10 Gigabit Ethernet cables and provides lossless delivery over unified I/O. Ethernet is widely used in networking. With some advancement such as Data Center Ethernet (DCE) and Priority Flow Control (PFC) in Ethernet to make it more reliable for the datacenter, Fiber Channel is now also implemented on top of Ethernet. This implementation is known as FCoE.

The UCS Manager SAN Tab

From the SAN tab, you the UCS administrator can create, modify, and delete configuration elements related to SANs (FC, iSCSI) or direct attached FC/FCoE, NAS appliances, and communications.

The major nodes in this tab are the following:

- **SAN Cloud**—This node allows you to:
  - Configure SAN uplinks, including storage ports and port channels and SAN pin groups.
  - View the FC identity assignment
The UCS Manager SAN Tab

- Configure WWN Pools, including WWPN, WWxN, and WWxN, and iSCSI Qualified Name (IQN), pools.
- View the FSM details for a particular end point to determine if a task succeeded or failed and use the FSM to troubleshoot any failures.
- Monitor storage events and faults for health management.

- **Storage Cloud**—This node allows you to:
  - Configure storage FC links and storage FCoE interfaces (using SAN Storage Manager).
  - Configure VSAN settings.
  - Monitor SAN cloud events for health management.

- **Policies**—This node allows you to:
  - Configure threshold policies, classes, and properties and monitor events.
  - Configure threshold organization and sub-organization storage policies, including default VHBA, behavior, FC adaptor, LACP, SAN connectivity, SAN connector, and VHBA templates.

- **Pools**—This node allows you to configure pools defined in the system, including IQN, IQN suffix, WWNN, WWPN, and WWxN.

- **Traffic Monitoring Sessions**—This node allows you to configure port traffic monitoring sessions defined in the system.
SAN Ports and Port Channels

- Port Modes, on page 9
- Port Types, on page 9
- Server Ports, on page 11
- Reconfiguring a Port on a Fabric Interconnect, on page 11
- Enabling or Disabling a Port on a Fabric Interconnect, on page 12
- Unconfiguring a Port on a Fabric Interconnect, on page 12
- Appliance Ports, on page 12
- FCoE and Fibre Channel Storage Ports, on page 14
- FC Links Rebalancing, on page 16
- Configuring FC Uplink Ports, on page 16
- FCoE Uplink Ports, on page 17
- Unified Storage Ports, on page 18
- Unified Uplink Ports, on page 19
- Policy-Based Port Error Handling, on page 21
- Fibre Channel Port Channels, on page 22
- FCoE Port Channels, on page 25
- Unified Uplink Port Channel, on page 26

Port Modes

The port mode determines whether a unified port on the fabric interconnect is configured to carry Ethernet or Fibre Channel traffic. You configure the port mode in Cisco UCS Manager. However, the fabric interconnect does not automatically discover the port mode.

Changing the port mode deletes the existing port configuration and replaces it with a new logical port. Any objects associated with that port configuration, such as VLANs and VSANS, are also removed. There is no restriction on the number of times you can change the port mode for a unified port.

Port Types

The port type defines the type of traffic carried over a unified port connection.
By default, unified ports changed to Ethernet port mode are set to the Ethernet uplink port type. Unified ports changed to Fibre Channel port mode are set to the Fibre Channel uplink port type. You cannot unconfigure Fibre Channel ports.

Changing the port type does not require a reboot.

**Ethernet Port Mode**

When you set the port mode to Ethernet, you can configure the following port types:

- Server ports
- Ethernet uplink ports
- Ethernet port channel members
- FCoE ports
- Appliance ports
- Appliance port channel members
- SPAN destination ports
- SPAN source ports

**Note**

For SPAN source ports, configure one of the port types and then configure the port as SPAN source.

**Fibre Channel Port Mode**

When you set the port mode to Fibre Channel, you can configure the following port types:

- Fibre Channel uplink ports
- Fibre Channel port channel members
- Fibre Channel storage ports
- FCoE Uplink ports
- SPAN source ports

**Note**

For SPAN source ports, configure one of the port types and then configure the port as SPAN source.
Server Ports

Configuring Server Ports

All of the port types listed are configurable on both the fixed module and expansion module, including the server ports.

This task describes only one method of configuring ports. You can also configure ports from a right-click menu, or in the LAN Uplinks Manager.

Procedure

1. In the Navigation pane, click Equipment.
2. Expand Equipment > Fabric Interconnects > Fabric_Interconnect_Name > Fixed Module > Ethernet Ports.
3. Click a port under the Ethernet Ports node.
4. In the Work pane, click the General tab.
5. In the Actions area, click Reconfigure.
6. From the drop-down list, choose Configure as Server Port.

Reconfiguring a Port on a Fabric Interconnect

Procedure

1. In the Navigation pane, click Equipment.
2. Expand Equipment > Fabric Interconnects > Fabric_Interconnect_Name.
3. Expand the node for the ports that you want to reconfigure.
4. Click the port or ports that you want to reconfigure.
5. In the Work pane, click the General tab.
6. In the Actions area, click Reconfigure.
7. From the drop-down list, choose which way you want the port reconfigured.

Example: Reconfiguring an Uplink Ethernet Port as a Server Port

1. Expand the Ethernet Ports node and select the port you want to reconfigure.
2. Follow steps 5 and 6 above.
3. From the drop-down list choose Configure as Server Port.
Enabling or Disabling a Port on a Fabric Interconnect

After you enable or disable a port on a fabric interconnect, wait for at least 1 minute before you re-acknowledge the chassis. If you re-acknowledge the chassis too soon, the pinning of server traffic from the chassis might not get updated with the changes to the port that you enabled or disabled.

You can enable or disable a port only when it is configured. If the port is unconfigured, the enable and disable options are not active.

Procedure

Step 1  In the Navigation pane, click Equipment.
Step 2  Expand Equipment > Fabric Interconnects > Fabric_Interconnect_Name.
Step 3  Expand the node for the ports that you want to enable or disable.
Step 4  Under the Ethernet Ports node, select a port.
Step 5  In the Work pane, click the General tab.
Step 6  In the Actions area, click Enable Port or Disable Port.
Step 7  If a confirmation dialog box displays, click Yes.
Step 8  Click OK.

Unconfiguring a Port on a Fabric Interconnect

Procedure

Step 1  In the Navigation pane, click Equipment.
Step 2  Expand Equipment > Fabric Interconnects > Fabric_Interconnect_Name.
Step 3  Expand the node for the ports that you want to unconfigure.
Step 4  Under the Ethernet Ports node, select a port.
Step 5  In the Work pane, click the General tab.
Step 6  In the Actions area, click Unconfigure.
Step 7  If a confirmation dialog box displays, click Yes.
Step 8  Click OK.

Appliance Ports

Appliance ports are only used to connect fabric interconnects to directly attached NFS storage.
When you create a new appliance VLAN, its IEEE VLAN ID is not added to the LAN Cloud. Therefore, appliance ports that are configured with the new VLAN remain down, by default, due to a pinning failure. To bring up these appliance ports, you have to configure a VLAN in the LAN Cloud with the same IEEE VLAN ID.

Cisco UCS Manager supports up to four appliance ports per fabric interconnect.

**Configuring an Appliance Port**

You can configure Appliance ports on either the fixed module or an expansion module.

This task describes only one method of configuring appliance ports. You can also configure appliance ports from the **General** tab for the port.

**Note**

If you configure an appliance port when the uplink port is down, Cisco UCS Manager may display an error message stating that the appliance port has failed. This message is controlled by the **Action on Uplink Fail** option in the associated Network Control Policy.

**Procedure**

**Step 1**

In the **Navigation** pane, click **Equipment**.

**Step 2**

Expand **Equipment** > **Fabric Interconnects** > **Fabric_Interconnect_Name**.

**Step 3**

Expand the node for the ports that you want to configure.

**Step 4**

Under the **Ethernet Ports** node, select a port.

If you want to reconfigure a server port, uplink Ethernet port, or FCoE storage port, expand the appropriate node.

**Step 5**

In the **Work** pane, click the **General** tab.

**Step 6**

In the **Actions** area, click **Reconfigure**.

**Step 7**

From the drop-down list, click **Configure as Appliance Port**.

**Step 8**

If a confirmation dialog box displays, click **Yes**.

**Step 9**

In the **Configure as Appliance Port** dialog box, complete the required fields.

**Step 10**

In the **VLANs** area, do the following:

a) In the **Port Mode** field, click one of the following radio buttons to select the mode you want to use for the port channel:

   - **Trunk**—Cisco UCS Manager GUI displays the VLANs Table that lets you choose the VLANs you want to use.

   - **Access**—Cisco UCS Manager GUI displays the **Select VLAN** drop-down list that allows you to choose a VLAN to associate with this port or port channel.

With either mode, you can click the **Create VLAN** link to create a new VLAN.
If traffic for the appliance port needs to traverse the uplink ports, you must also define each VLAN used by this port in the LAN cloud. For example, you need the traffic to traverse the uplink ports if the storage is also used by other servers, or if you want to ensure that traffic fails over to the secondary fabric interconnect if the storage controller for the primary fabric interconnect fails.

b) If you clicked the Trunk radio button, complete the required fields in the VLANs table.

c) If you clicked the Access radio button, choose a VLAN from the Select VLAN drop-down list.

**Step 11** *(Optional)* If you want to add an endpoint, check the Ethernet Target Endpoint check box and specify the name and MAC address.

**Step 12** Click OK.

### Modifying the Properties of an Appliance Port

#### Procedure

1. In the Navigation pane, click Equipment.
2. Expand Equipment > Fabric Interconnects > Fabric_Interconnect_Name.
3. Expand the node for the appliance port that you want to modify.
4. Expand Ethernet Ports.
5. Click the appliance port for which you want to modify the properties.
6. In the Work pane, click the General tab.
7. In the Actions area, click Show Interface.
   
   You may need to expand the pane or use the scroll bars in the Properties dialog box to see all the fields.
8. In the Properties dialog box, modify the values as needed.
9. Click OK.

### FCoE and Fibre Channel Storage Ports

#### Configuring an Ethernet Port as an FCoE Storage Port

You can configure FCoE storage ports on either the fixed module or an expansion module. This task describes only one method of configuring FCoE storage ports. You can also configure FCoE storage ports from the General tab for the port.

**Before you begin**

The Fibre Channel switching mode must be set to Switching for these ports to be valid. The storage ports cannot function in end-host mode.
### Configuring a Fibre Channel Storage Port

This task describes only one method of configuring FC storage ports. You can also configure FC storage ports from the General tab for the port.

**Before you begin**

The Fibre Channel switching mode must be set to Switching for these ports to be valid. The storage ports cannot function in end-host mode.

**Procedure**

1. In the Navigation pane, click Equipment.
2. Expand Equipment > Fabric Interconnects > Fabric_Interconnect_Name.
3. Depending upon the location of the ports you want to configure, expand one of the following:
   - Fixed Module
   - Expansion Module
4. Click one or more of the ports under the Ethernet Ports node.
   
   If you want to reconfigure an uplink Ethernet port, server port, or appliance port, expand the appropriate node.
5. Right-click the selected port or ports and choose Configure as FCoE Storage Port.
6. If a confirmation dialog box displays, click Yes.
7. Click OK.

### Restoring an Uplink Fibre Channel Port

This task describes only one method of restoring an FC storage port to function as an uplink FC port. You can also reconfigure FC storage ports from the General tab for the port.
**Procedure**

**Step 1**  
In the Navigation pane, click **Equipment**.

**Step 2**  
Expand **Equipment** > **Fabric Interconnects** > **Fabric_Interconnect_Name**.

**Step 3**  
Expand the **Expansion Module** node.

**Step 4**  
Click one or more of the ports under the **FC Ports** node.

**Step 5**  
Right-click the selected port or ports and choose **Configure as Uplink Port**.

**Step 6**  
If a confirmation dialog box displays, click **Yes**.

**Step 7**  
Click **OK**.

---

**FC Links Rebalancing**

The FC uplinks balance automatically when FC Port Channels are utilized. To create FC Port Channels, refer to [Creating a Fibre Channel Port Channel, on page 22](#). For the FC uplinks that are not members of the Port Channels (Individual ISLs), load balancing is done according to the FC uplinks balancing algorithm. For a vHBA of a host or service profile to choose an available FC uplink, when FC uplink trunking is disabled, the uplink and vHBA must belong to the same VSAN.

For each vHBA, the algorithm searches for an FC uplink in the following order:

1. Least used FC uplink based on the number of vHBAs currently bound to the uplink.
2. If FC uplinks are equally balanced, then round robin is used.

This process continues for all the other vHBAs. The algorithm also considers other parameters such as pre-fip/fip adapters and number of flogis. You may not see the least-used component when there are less than six flogis.

After a port configuration or any other uplink state changes, if the traffic passing through the FC uplinks is no longer balanced, you can re-balance the traffic by resetting the vHBA(s) on each adapter and allow the load balancing algorithm to evaluate for the current state of the FC uplinks.

---

**Configuring FC Uplink Ports**

You can configure an FC Uplink port on either a fixed module or an expansion module.

This task describes only one method of configuring FC Uplink ports. You can also configure FC uplink ports from a right-click menu for the port.

**Procedure**

**Step 1**  
In the Navigation pane, click **Equipment**.

**Step 2**  
Expand **Equipment** > **Fabric Interconnects** > **Fabric_Interconnect_Name**.

**Step 3**  
Expand the node for the ports that you want to configure.
Step 4 Under the FC Ports node, select any Storage port.
Step 5 In the Work pane, click the General tab.
Step 6 From the Actions area, select Configure as Uplink Port.
Step 7 If a confirmation dialog box displays, click Yes.
Step 8 The Cisco UCS Manager GUI displays a success message.

In the Actions area, Configure as Uplink Port becomes grayed out and Configure as FC Storage Port becomes active.

---

**FCoE Uplink Ports**

FCoE uplink ports are physical Ethernet interfaces between the fabric interconnects and the upstream Ethernet switch, used for carrying FCoE traffic. With this support the same physical Ethernet port can carry both Ethernet traffic and Fibre Channel traffic.

FCoE uplink ports connect to upstream Ethernet switches using the FCoE protocol for Fibre Channel traffic. This allows both the Fibre Channel traffic and Ethernet traffic to flow on the same physical Ethernet link.

---

**Note**

FCoE uplinks and unified uplinks enable the multi-hop FCoE feature, by extending the unified fabric up to the distribution layer switch.

You can configure the same Ethernet port as any of the following:

- **FCoE uplink port**—As an FCoE uplink port for only Fibre Channel traffic.
- **Uplink port**—As an Ethernet port for only Ethernet traffic.
- **Unified uplink port**—As a unified uplink port to carry both Ethernet and Fibre Channel traffic.

---

**Configuring FCoE Uplink Ports**

You can configure an FCoE Uplink port on either a fixed module or an expansion module.

This task describes only one method of configuring FCoE Uplink ports. You can also configure FCoE uplink ports from a right-click menu or from the General tab for the port.

**Procedure**

---

Step 1 In the Navigation pane, click Equipment.
Step 2 Expand Equipment > Fabric Interconnects > Fabric_Interconnect_Name.
Step 3 Expand the node for the ports that you want to configure.
Step 4 Under the Ethernet Ports node, select any Unconfigured port.
Step 5 In the Work pane, click the General tab.
Step 6 In the Actions area, click Reconfigure.
Unified Storage Ports

Unified storage involves configuring the same physical port as both an Ethernet storage interface and an FCoE storage interface. You can configure any appliance port or FCoE storage port as a unified storage port, on either a fixed module or an expansion module. To configure a unified storage port, you must have the fabric interconnect in Fibre Channel switching mode.

In a unified storage port, you can enable or disable individual FCoE storage or appliance interfaces.

- In an unified storage port, if you do not specify a non-default VLAN for the appliance port, the FCoE-storage-native-vlan will be assigned as the native VLAN on the unified storage port. If the appliance port has a non-default native VLAN specified as native VLAN, this will be assigned as the native VLAN for the unified storage port.
- When you enable or disable the appliance interface, the corresponding physical port is enabled or disabled. So when you disable the appliance interface in unified storage, even if the FCoE storage is enabled, it goes down with the physical port.
- When you enable or disable the FCoE storage interface, the corresponding VFC is enabled or disabled. So when the FCoE storage interface is disabled in a unified storage port, the appliance interface will continue to function normally.

Configuring an Appliance Port as a Unified Storage Port

You can configure a unified storage port either from an appliance port or from an FCoE storage port. You can also configure the unified storage port from an unconfigured port. If you start from an unconfigured port, you will assign either an appliance configuration or an FCoE storage configuration to the port, and then will add another configuration to enable it as a unified storage port.

**Important**

Make sure the fabric interconnect is in Fibre Channel switching mode.

**Procedure**

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>In the Navigation pane, click Equipment.</td>
</tr>
<tr>
<td>2</td>
<td>Expand Equipment &gt; Fabric Interconnects &gt; Fabric_Interconnect_Name.</td>
</tr>
<tr>
<td>3</td>
<td>Depending on the location of the ports you want to configure, expand one of the following:</td>
</tr>
<tr>
<td></td>
<td>• Fixed Module</td>
</tr>
</tbody>
</table>
• Expansion Module

Step 4 Under the Ethernet Ports node, select any the port that is already configured as an appliance port. In the Work pane, under the General tab, in the Properties area, the Role will show as Appliance Storage.

Step 5 In the Actions area, click Reconfigure.

Step 6 From the pop-up menu, select Configure as FCoE Storage port.

Step 7 If a confirmation dialog box displays, click Yes.

Step 8 The Cisco UCS Manager GUI displays a success message. In the Properties area, the Role changes to Unified Storage.

---

Unconfiguring a Unified Storage Port

You can unconfigure and remove both configurations from the unified connect port. Or you can unconfigure either of them and retain the other on the port.

Procedure

Step 1 In the Navigation pane, click Equipment.

Step 2 Expand Equipment > Fabric Interconnects > Fabric_Interconnect_Name.

Step 3 Expand the node for the ports that you want to unconfigure.

Step 4 Under the Ethernet Ports node, select the port that you want to unconfigure.

Step 5 In the Work pane, click the General tab.

Step 6 In the Actions area, click Unconfigure. You will see the following options:

• Unconfigure FCoE Storage Port

• Unconfigure Appliance Port

• Unconfigure both

Step 7 Select one of the unconfigure options.

Step 8 If a confirmation dialog box displays, click Yes.

Step 9 The Cisco UCS Manager GUI displays a success message. In the Properties area, the Role changes to based on your unconfigure selection.

---

Unified Uplink Ports

When you configure an Ethernet uplink and an FCoE uplink on the same physical Ethernet port, it is called a unified uplink port. You can individually enable or disable either the FCoE or Ethernet interfaces independently.

• Enabling or disabling the FCoE uplink results in the corresponding VFC being enabled or disabled.
• Enabling or disabling an Ethernet uplink results in the corresponding physical port being enabled or disabled.

If you disable an Ethernet uplink, it disables the underlying physical port in a unified uplink. Therefore, even when the FCoE uplink is enabled, the FCoE uplink also goes down. But if you disable an FCoE uplink, only the VFC goes down. If the Ethernet uplink is enabled, it can still function properly in the unified uplink port.

Configuring Unified Uplink Ports

You can configure the unified uplink port from either of the following:

• From an existing FCoE uplink port or Ethernet uplink port
• From an unconfigured uplink port

You can configure the unified uplink port on either a fixed module or on an expansion module.

Procedure

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>In the Navigation pane, click Equipment.</td>
</tr>
<tr>
<td>2</td>
<td>Expand Equipment &gt; Fabric Interconnects &gt; Fabric_Interconnect_Name.</td>
</tr>
<tr>
<td>3</td>
<td>Expand the node for the ports that you want to configure.</td>
</tr>
<tr>
<td>4</td>
<td>Under the Ethernet Ports node, select a port.</td>
</tr>
<tr>
<td>5</td>
<td>In the Work pane, click the General tab.</td>
</tr>
<tr>
<td>6</td>
<td>In the Properties area, make sure the Role shows as Fcoe Uplink.</td>
</tr>
<tr>
<td>7</td>
<td>In the Actions area, click Reconfigure.</td>
</tr>
<tr>
<td>8</td>
<td>From the drop-down options, select Configure as Uplink Port.</td>
</tr>
<tr>
<td>9</td>
<td>If a confirmation dialog box displays, click Yes.</td>
</tr>
<tr>
<td>10</td>
<td>The Cisco UCS Manager GUI displays a success message.</td>
</tr>
</tbody>
</table>

In the Properties area, the Role changes to Unified Uplink.

Unconfiguring Unified Uplink Port

You can unconfigure and remove both configurations from the unified uplink port. Or you can unconfigure either the FCoE configuration or Ethernet port configuration and retain the other on the port.

Procedure

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>In the Navigation pane, click Equipment.</td>
</tr>
<tr>
<td>2</td>
<td>Expand Equipment &gt; Fabric Interconnects &gt; Fabric_Interconnect_Name.</td>
</tr>
<tr>
<td>3</td>
<td>Expand the node for the ports that you want to unconfigure.</td>
</tr>
<tr>
<td>4</td>
<td>Under the Ethernet Ports node, select the port you want to unconfigure.</td>
</tr>
<tr>
<td>5</td>
<td>In the Work pane, click the General tab.</td>
</tr>
</tbody>
</table>
In the **Actions** area, click **Unconfigure**. Select one of the following options:

- **Unconfigure FCoE Uplink Port**
- **Unconfigure Uplink Port**
- **Unconfigure both**

If a confirmation dialog box displays, click **Yes**.

The Cisco UCS Manager GUI displays a success message. In the **Properties** area, the **Role** changes based on your unconfigure selection.

Click **Save Changes**.

---

### Policy-Based Port Error Handling

If Cisco UCS Manager detects any errors on active network interface (NI) ports, and if the error-disable feature has been implemented, Cisco UCS Manager automatically disables the respective fabric interconnect port that is connected to the NI port that had errors. When a fabric interconnect port is error disabled, it is effectively shut down and no traffic is sent or received on that port.

The error-disable function serves two purposes:

- It lets you know which fabric interconnect port is error-disabled and that the connected NI Port has errors.
- It eliminates the possibility that this port can cause the failure of other ports other ports connected to the same Chassis/FEX. Such a failure can occur when the NI port has errors, which can ultimately cause serious network issues. The error-disable function helps prevent these situations.

### Configuring Error-Based Action

**Procedure**

1. In the **Navigation** pane, click **Admin**.
2. Expand **Admin > All > Stats Management > fabric > Internal LAN > thr-policy-default > etherNiErrStats**.
3. Select a delta property.
4. In the **Work** pane, click the **General** tab.
5. To implement an error-disable state on a fabric interconnect port, check the **Disable FI port when fault is raised** check box.
6. To enable auto recovery, in the **Enable Auto Recovery** field, select **Enable**.
7. To specify the time after which the port can automatically be re-enabled, in the **Time (in minutes)** field, type the desired value.
8. Click **Save Changes**.
Fibre Channel Port Channels

A Fibre Channel port channel allows you to group several physical Fibre Channel ports (link aggregation) to create one logical Fibre Channel link to provide fault-tolerance and high-speed connectivity. In Cisco UCS Manager, you create a port channel first and then add Fibre Channel ports to the port channel.

Note

Fibre Channel port channels are not compatible with non-Cisco technology.

You can create up to four Fibre Channel port channels in each Cisco UCS domain with Cisco UCS 6200, 6300 Series fabric interconnects. Each Fibre Channel port channel can include a maximum of 16 uplink Fibre Channel ports.

You can create up to two Fibre Channel port channels in each Cisco UCS domain with Cisco UCS 6324 fabric interconnects. Each Fibre Channel port channel can include a maximum of four uplink Fibre Channel ports.

Ensure that the Fibre Channel port channel on the upstream NPIV switch is configured with its channel mode as active. If both the member port(s) and peer port(s) do not have the same channel mode configured, the port channel will not come up. When the channel mode is configured as active, the member ports initiate port channel protocol negotiation with the peer port(s) regardless of the channel group mode of the peer port. If the peer port, while configured in a channel group, does not support the port channel protocol, or responds with a nonnegotiable status, it defaults to the On mode behavior. The active port channel mode allows automatic recovery without explicitly enabling and disabling the port channel member ports at either end.

This example shows how to configure channel mode as active:

```
switch(config)# int pol14
switch(config-if)# channel mode active
```

Creating a Fibre Channel Port Channel

**Procedure**

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td>In the Navigation pane, click SAN.</td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td>Expand SAN &gt; SAN Cloud.</td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
<td>Expand the node for the fabric where you want to create the port channel.</td>
</tr>
<tr>
<td><strong>Step 4</strong></td>
<td>Right-click the FC Port Channels node and choose Create Port Channel.</td>
</tr>
<tr>
<td><strong>Step 5</strong></td>
<td>In the Set Port Channel Name panel, specify the ID and name, then click Next.</td>
</tr>
<tr>
<td><strong>Step 6</strong></td>
<td>In the Add Ports panel, specify the port channel admin speed, and add ports to the port channel.</td>
</tr>
<tr>
<td><strong>Step 7</strong></td>
<td>Click Finish.</td>
</tr>
</tbody>
</table>
Enabling a Fibre Channel Port Channel

Procedure

- **Step 1**: In the **Navigation** pane, click **SAN**.
- **Step 2**: Expand **SAN > SAN Cloud > Fabric > FC Port Channels**.
- **Step 3**: Click the port channel you want to enable.
- **Step 4**: In the **Work** pane, click the **General** tab.
- **Step 5**: In the **Actions** area, click **Enable Port Channel**.
- **Step 6**: If a confirmation dialog box displays, click **Yes**.

Disabling a Fibre Channel Port Channel

Procedure

- **Step 1**: In the **Navigation** pane, click **SAN**.
- **Step 2**: Expand **SAN > SAN Cloud > Fabric > FC Port Channels**.
- **Step 3**: Click the port channel you want to disable.
- **Step 4**: In the **Work** pane, click the **General** tab.
- **Step 5**: In the **Actions** area, click **Disable Port Channel**.
- **Step 6**: If a confirmation dialog box displays, click **Yes**.

Adding Ports to and Removing Ports from a Fibre Channel Port Channel

Procedure

- **Step 1**: In the **Navigation** pane, click **SAN**.
- **Step 2**: Expand **SAN > SAN Cloud > Fabric > FC Port Channels**.
- **Step 3**: Click the port channel to which you want to add or remove ports.
- **Step 4**: In the **Work** pane, click the **General** tab.
- **Step 5**: In the **Actions** area, click **Add Ports**.
- **Step 6**: In the **Add Ports** dialog box, do one of the following:
  - To add ports, choose one or more ports in the **Ports** table, and then click the >> button to add the ports to the **Ports in the port channel** table.
  - To remove ports, choose one or more ports in the **Ports in the port channel** table, and then click the << button to remove the ports from the port channel and add them to the **Ports** table.
Step 7 Click OK.

## Modifying the Properties of a Fibre Channel Port Channel

### Note

If you are connecting two Fibre Channel port channels, the admin speed for both port channels must match for the link to operate. If the admin speed for one or both of the Fibre Channel port channels is set to auto, Cisco UCS adjusts the admin speed automatically.

### Procedure

**Step 1** In the Navigation pane, click SAN.

**Step 2** Expand SAN > SAN Cloud > Fabric > FC Port Channels.

**Step 3** Click the port channel that you want to modify.

**Step 4** In the Work pane, click the General tab.

**Step 5** In the Properties area, change the values in one or more of the following fields:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name field</td>
<td>The user-defined name given to the port channel. This name can be between 1 and 16 alphanumeric characters.</td>
</tr>
<tr>
<td>VSAN drop-down list</td>
<td>The VSAN associated with the port channel.</td>
</tr>
</tbody>
</table>
| Port Channel Admin Speed drop-down list | The admin speed of the port channel. This can be:  
  * 1 Gbps  
  * 2 Gbps  
  * 4 Gbps  
  * 8 Gbps  
  * auto |

**Step 6** Click Save Changes.
Deleting a Fibre Channel Port Channel

Procedure

Step 1  In the Navigation pane, click LAN.
Step 2  Expand SAN > SAN Cloud > Fabric > FC Port Channels.
Step 3  Right-click the port channel you want to delete and choose Delete.
Step 4  If a confirmation dialog box displays, click Yes.

FCoE Port Channels

An FCoE port channel allows you to group several physical FCoE ports to create one logical FCoE port channel. At a physical level, the FCoE port channel carries FCoE traffic over an Ethernet port channel. So an FCoE port channel with a set of members is essentially an Ethernet port channel with the same members. This Ethernet port channel is used as a physical transport for FCoE traffic.

For each FCoE port channel, Cisco UCS Manager creates a VFC internally and binds it to an Ethernet port channel. FCoE traffic received from the hosts is sent over the VFC the same way as the FCoE traffic is sent over Fibre Channel uplinks.

Creating an FCoE Port Channel

Procedure

Step 1  In the Navigation pane, click SAN.
Step 2  Expand SAN > SAN Cloud.
Step 3  Expand the node for the fabric where you want to create the port channel.
Step 4  Right-click the FCoE Port Channels node and choose Create FCoE Port Channel.
Step 5  In the Set Port Channel Name panel of the Create FCoE Port Channel wizard, specify the ID and name, then click Next.
Step 6  In the Add Ports panel of the Create FCoE Port Channel wizard, specify the ports that you want to add.
Step 7  Click Finish.

Deleting an FCoE Port Channel

Procedure

Step 1  In the Navigation pane, click SAN.
Unified Uplink Port Channel

When you create an Ethernet port channel and an FCoE port channel with the same ID, it is called a unified uplink port channel. When the unified port channel is created, a physical Ethernet port channel and a VFC are created on the fabric interconnect with the specified members. The physical Ethernet port channel is used to carry both Ethernet and FCoE traffic. The VFC binds FCoE traffic to the Ethernet port channel.

The following rules will apply to the member port sets of the unified uplink port channel:

- The Ethernet port channel and FCoE port channel on the same ID, must have the same set of member ports.

- When you add a member port channel to the Ethernet port channel, Cisco UCS Manager adds the same port channel to FCoE port channel as well. Similarly, adding a member to the FCoE port channel adds the member port to the Ethernet port channel.

- When you delete a member port from one of the port channels, Cisco UCS Manager automatically deletes the member port from the other port channel.

If you disable an Ethernet uplink port channel, it disables the underlying physical port channel in a unified uplink port channel. Therefore, even when the FCoE uplink is enabled, the FCoE uplink port channel also goes down. If you disable an FCoE uplink port channel, only the VFC goes down. If the Ethernet uplink port channel is enabled, it can still function properly in the unified uplink port channel.
Fibre Channel Zoning

Information About Fibre Channel Zoning

Fibre Channel zoning allows you to partition the Fibre Channel fabric into one or more zones. Each zone defines the set of Fibre Channel initiators and Fibre Channel targets that can communicate with each other in a VSAN. Zoning also enables you to set up access control between hosts and storage devices or user groups.

The access and data traffic control provided by zoning does the following:

- Enhances SAN network security
- Helps prevent data loss or corruption
- Reduces performance issues

Information About Zones

A zone consists of multiple zone members and has the following characteristics:

- Members in a zone can access each other; members in different zones cannot access each other.
- Zones can vary in size.
- Devices can belong to more than one zone.
- A physical fabric can have a maximum of 8,000 zones.
**Information About Zone Sets**

Each zone set consists of one or more zones. You can use zone sets to enforce access control within the Fibre Channel fabric. In addition, zone sets provide you with the following advantages:

- Only one zone set can be active at any time.
- All zones in a zone set can be activated or deactivated as a single entity across all switches in the fabric.
- Changes to a zone set are not applied until the zone set has been activated. If you make changes to the active zone set, you must reactivate that zone set to apply the changes.
- A zone can be a member of more than one zone set.
- A switch in a zone can have a maximum of 500 zone sets.

**Support for Fibre Channel Zoning in Cisco UCS Manager**

Cisco UCS Manager supports switch-based Fibre Channel zoning and Cisco UCS Manager-based Fibre Channel zoning. You cannot configure a combination of zoning types in the same Cisco UCS domain. You can configure a Cisco UCS domain with one of the following types of zoning:

- Cisco UCS Manager-based Fibre Channel zoning—This configuration combines direct attach storage with local zoning. Fibre Channel or FCoE storage is directly connected to the fabric interconnects and zoning is performed in Cisco UCS Manager, using Cisco UCS local zoning. Any existing Fibre Channel or FCoE uplink connections need to be disabled. Cisco UCS does not currently support active Fibre Channel or FCoE uplink connections coexisting with the utilization of the UCS Local Zoning feature.

- Switch-based Fibre Channel zoning—This configuration combines direct attach storage with uplink zoning. The Fibre Channel or FCoE storage is directly connected to the fabric interconnects and zoning is performed externally to the Cisco UCS domain through an MDS or Nexus 5000 switch. This configuration does not support local zoning in the Cisco UCS domain.

---

**Note**

Zoning is configured on a per-VSAN basis. You cannot enable zoning at the fabric level.

---

**Cisco UCS Manager-Based Fibre Channel Zoning**

With Cisco UCS Manager-based zoning, Cisco UCS Manager controls the Fibre Channel zoning configuration for the Cisco UCS domain, including creating and activating zones for all VSANs that you set up with this type of zoning. This type of zoning is also know as local zoning or direct attach storage with local zoning.

---

**Note**

You cannot implement Cisco UCS Manager-based zoning if the VSAN is also configured to communicate with a VSAN on an upstream switch and includes Fibre Channel or FCoE uplink ports.
Supported Fibre Channel Zoning Modes

Cisco UCS Manager-based zoning supports the following types of zoning:

- **Single initiator single target**—Cisco UCS Manager automatically creates one zone for each vHBA and storage port pair. Each zone has two members. We recommend that you configure this type of zoning unless you expect the number of zones to exceed the maximum supported.

- **Single initiator multiple targets**—Cisco UCS Manager automatically creates one zone for each vHBA. We recommend that you configure this type of zoning if you expect the number of zones to reach or exceed the maximum supported.

vHBA Initiator Groups

vHBA initiator groups determine the Fibre Channel zoning configuration for all vHBAs in a service profile. Cisco UCS Manager does not include any default vHBA initiator groups. You must create vHBA initiator groups in any service profile that is to be assigned to servers included in a zone.

The configuration in a vHBA initiator group determines the following:

- The vHBAs included in the initiator group, which are sometimes referred to as vHBA initiators.
- A Fibre Channel storage connection policy, which includes the associated VSAN and the Fibre Channel target ports on the storage array.
- The type of Fibre Channel zoning to be configured for the vHBAs included in the group.

Fibre Channel Storage Connection Policy

The Fibre Channel storage connection policy contains a collection of target storage ports on storage arrays that you use to configure Cisco UCS Manager-based Fibre Channel zoning. You can create this policy under an organization or an initiator group.

The storage arrays in these zones must be directly connected to the fabric interconnects. The target storage ports on these arrays that you include in the Fibre Channel storage connection policy can be either Fibre Channel storage ports or FCoE storage ports. You use the WWN of a port to add it to the policy and to identify the port for the Fibre Channel zone.

Note

Cisco UCS Manager does not create default Fibre Channel storage.

Fibre Channel Active Zone Set Configuration

In each VSAN that has been enabled for Fibre Channel zoning, Cisco UCS Manager automatically configures one zone set and multiple zones. The zone membership specifies the set of initiators and targets that are allowed to communicate with each other. Cisco UCS Manager automatically activates that zone set.

Cisco UCS Manager processes the user-configured vHBA initiator groups and their associated Fibre Channel storage connection policy to determine the desired connectivity between Fibre Channel initiators and targets. Cisco UCS Manager uses the following information to build pair-wise zone membership between initiators and targets:

- The port WWNs of the vHBA initiators derived from the vHBA initiator groups.
• The port WWNs of the storage array derived from the storage connection policy.

## Switch-Based Fibre Channel Zoning

With switch-based zoning, a Cisco UCS domain inherits the zoning configuration from the upstream switch. You cannot configure or view information about your zoning configuration in Cisco UCS Manager. You have to disable zoning on a VSAN in Cisco UCS Manager to use switch-based zoning for that VSAN.

## Guidelines and Recommendations for Cisco UCS Manager-Based Fibre Channel Zoning

When you plan your configuration for Fibre Channel zoning, consider the following guidelines and recommendations:

**Fibre Channel Switching Mode Must Be Switch Mode for Cisco UCS Manager Configurations**

If you want Cisco UCS Manager to handle Fibre Channel zoning, the fabric interconnects must be in Fibre Channel Switch mode. You cannot configure Fibre Channel zoning in End-Host mode.

**Symmetrical Configuration Is Recommended for High Availability**

If a Cisco UCS domain is configured for high availability with two fabric interconnects, we recommend that both fabric interconnects are configured with the same set of VSANs.

## Configuring Fibre Channel Zoning

This procedure provides a high level overview of the steps required to configure a Cisco UCS domain for Fibre Channel zoning that is controlled by Cisco UCS Manager. You must ensure that you complete all of the following steps.

### Procedure

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong> If you have not already done so, disconnect the fabric interconnects in the Cisco UCS domain from any external Fibre Channel switches, such as an MDS.</td>
<td></td>
</tr>
<tr>
<td><strong>Step 2</strong> If the Cisco UCS domain still includes zones that were managed by the external Fibre Channel switch, run the <code>clear-unmanaged-fc-zone-all</code> command on every affected VSAN to remove those zones.</td>
<td>This functionality is not currently available in the Cisco UCS Manager GUI. You must perform this step in the Cisco UCS Manager CLI.</td>
</tr>
<tr>
<td>Command or Action</td>
<td>Purpose</td>
</tr>
<tr>
<td>-------------------</td>
<td>---------</td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
<td>Configure the Fibre Channel switching mode for both fabric interconnects in Fibre Channel Switch mode. You cannot configure Fibre Channel zoning in End-Host mode. See Configuring Fibre Channel Switching Mode, on page 128.</td>
</tr>
<tr>
<td><strong>Step 4</strong></td>
<td>Configure the Fibre Channel and FCoE storage ports that you require to carry traffic for the Fibre Channel zones. See Configuring an Ethernet Port as an FCoE Storage Port, on page 14 and Configuring a Fibre Channel Storage Port, on page 15.</td>
</tr>
<tr>
<td><strong>Step 5</strong></td>
<td>Create one or more VSANs and enable Fibre Channel zoning on all VSANs that you require to carry traffic for the Fibre Channel zones. For a cluster configuration, we recommend that you create the VSANs that you intend to include in a Fibre Channel zone in the SAN Uplinks Manager and use the common/global configuration to ensure they are accessible to both fabric interconnects. See Creating a VSAN for Fibre Channel Zoning, on page 31.</td>
</tr>
<tr>
<td><strong>Step 6</strong></td>
<td>Create one or more Fibre Channel storage connection policies. You can perform this step when you configure Fibre Channel zoning in the service profiles, if you prefer. See Creating a VSAN for Fibre Channel Zoning, on page 31.</td>
</tr>
</tbody>
</table>
| **Step 7** | Configure zoning in service profiles or service profile templates for servers that need to communicate through Fibre Channel zones. Complete the following steps to complete this configuration:  
- Enable zoning in the VSAN or VSANs assigned to the vHBAs. See Creating a VSAN for Fibre Channel Zoning, on page 31  
- Configure one or more vHBA initiator groups. See Creating a Service Profile with the Expert Wizard, on page 135. |

## Creating a VSAN for Fibre Channel Zoning

**Note**

FCoE VLANs in the SAN cloud and VLANs in the LAN cloud must have different IDs. Using the same ID for an FCoE VLAN in a VSAN and a VLAN results in a critical fault and traffic disruption for all vNICs and uplink ports using that FCoE VLAN. Ethernet traffic is dropped on any VLAN with an ID that overlaps with an FCoE VLAN ID.

**Procedure**

1. **Step 1**  
   In the Navigation pane, click SAN.
2. **Step 2**  
   On the SAN tab, click the SAN node.
Creating a VSAN for Fibre Channel Zoning

**Step 3** In the **Work** pane, click the **SAN Uplinks Manager** link on the **SAN Uplinks** tab.

The SAN Uplinks Manager opens in a separate window.

**Step 4** In the SAN Uplinks Manager, click the **VSAN** tab.

You can create the VSAN on any of the subtabs. However, if you use the **All** subtab, you can view all of the configured VSANs in the table.

**Step 5** On the icon bar to the right of the table, click +.

If the + icon is disabled, click an entry in the table to enable it.

**Step 6** In the **Create VSAN** dialog box, complete the following fields:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name field</td>
<td>The name assigned to the network. This name can be between 1 and 32 alphanumeric characters. You cannot use spaces or any special characters other than - (hyphen), _ (underscore), : (colon), and . (period), and you cannot change this name after the object is saved.</td>
</tr>
<tr>
<td>FC Zoning field</td>
<td>Click the radio button to determine whether Cisco UCS Manager configures Fibre Channel zoning for the Cisco UCS domain. This can be one of the following:</td>
</tr>
<tr>
<td></td>
<td>• <strong>Disabled</strong>—The upstream switch handles Fibre Channel zoning, or Fibre Channel zoning is not implemented for the Cisco UCS domain. Cisco UCS Manager does not configure Fibre Channel zoning.</td>
</tr>
<tr>
<td></td>
<td>• <strong>Enabled</strong>—Cisco UCS Manager configures and controls Fibre Channel zoning for the Cisco UCS domain.</td>
</tr>
<tr>
<td>Note</td>
<td>If you enable Fibre Channel zoning through Cisco UCS Manager, do not configure the upstream switch with any VSANs that are being used for Fibre Channel zoning.</td>
</tr>
<tr>
<td>Type radio button</td>
<td>Click the radio button to determine how the VSAN should be configured. This can be one of the following:</td>
</tr>
<tr>
<td></td>
<td>• <strong>Common/Global</strong>—The VSAN maps to the same VSAN ID in all available fabrics.</td>
</tr>
<tr>
<td></td>
<td>• <strong>Fabric A</strong>—The VSAN maps to the a VSAN ID that exists only in fabric A.</td>
</tr>
<tr>
<td></td>
<td>• <strong>Fabric B</strong>—The VSAN maps to the a VSAN ID that exists only in fabric B.</td>
</tr>
<tr>
<td></td>
<td>• <strong>Both Fabrics Configured Differently</strong>—The VSAN maps to a different VSAN ID in each available fabric. If you choose this option, Cisco UCS Manager GUI displays a <strong>VSAN ID</strong> field and a <strong>FCoE VLAN</strong> field for each fabric.</td>
</tr>
</tbody>
</table>
### VSAN ID field

The unique identifier assigned to the network. The ID can be between 1 and 4078, or between 4080 and 4093. 4079 is a reserved VSAN ID. In addition, if you plan to use FC end-host mode, the range between 3840 to 4079 is also a reserved VSAN ID range.

### FCoE VLAN field

The unique identifier assigned to the VLAN used for Fibre Channel connections.

VLAN 4048 is user configurable. However, Cisco UCS Manager uses VLAN 4048 for the following default values. If you want to assign 4048 to a VLAN, you must reconfigure these values:

- After an upgrade to Cisco UCS, Release 2.0—The FCoE storage port native VLAN uses VLAN 4048 by default. If the default FCoE VSAN was set to use VLAN 1 before the upgrade, you must change it to a VLAN ID that is not used or reserved. For example, consider changing the default to 4049 if that VLAN ID is not in use.

- After a fresh install of Cisco UCS, Release 2.0—The FCoE VLAN for the default VSAN uses VLAN 4048 by default. The FCoE storage port native VLAN uses VLAN 4049.

For FIP-capable, converged network adapters, such as the Cisco UCS CNA M72KR-Q and the Cisco UCS CNA M72KR-E, the named VSAN must be configured with a named VLAN that is not the native VLAN for the FCoE VLAN ID. This configuration ensures that FCoE traffic can pass through these adapters.

---

**Creating a New Fibre Channel Zone Profile**

Perform the following procedure to create a new Fibre Channel Zone Profile.

**Before you begin**

Ensure that the VSAN is created for the Fiber Channel Zoning.

**Procedure**

1. **Step 1** In the Navigation pane, click SAN.
2. **Step 2** On the SAN tab, click Storage Cloud.
3. **Step 3** Right-click FC Zone Profiles and choose Create FC Zone Profile.
4. **Step 4** In the Create FC Zone Profile dialog box, complete the following fields:

   - **Name**
   - **Description**
   - **VSAN ID field**
   - **FCoE VLAN field**

   Click **OK**.
### Creating a New Fibre Channel Zone Profile

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Name field</strong></td>
<td>A name for the profile. This name can be between 1 and 32 alphanumeric characters. You cannot use spaces or any special characters other than - (hyphen), _ (underscore), : (colon), and . (period), and you cannot change this name after the object is saved.</td>
</tr>
<tr>
<td><strong>Description field</strong></td>
<td>This field is optional. Enter a brief description of the zone profile.</td>
</tr>
<tr>
<td><strong>FC Zoning radio button</strong></td>
<td>Select the desired state of the zone profile.</td>
</tr>
<tr>
<td><strong>FC User Zones</strong></td>
<td>Click the + icon on the right of the table to create FC User Zone. The <strong>Create FC User Zone</strong> window is displayed. Continue to next step for details to create FC user zone. <strong>Note</strong> If + icon is disabled, click an entry in the table to enable it.</td>
</tr>
</tbody>
</table>

### Step 5

Complete the following fields in the **Create FC User Zone** dialog box:

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Name field</strong></td>
<td>A name for the FC Zone. This name can be between 1 and 32 alphanumeric characters. You cannot use spaces or any special characters other than - (hyphen), _ (underscore), : (colon), and . (period), and you cannot change this name after the object is saved.</td>
</tr>
</tbody>
</table>
| **Path radio button** | Click the radio button to determine how the VSAN should be configured. Following options are available:  
  - **Path A**—The VSAN path to the VSAN ID that exists only in fabric A.  
  - **Path B**—The VSAN path to the VSAN ID that exists only in fabric B. **Note** Perform one of the following to select a VSAN:  
    - Select VSAN  
    - Create VSAN  
    - Create Storage VSAN |
### Deleting a Fibre Channel Zone Profile

Perform the following procedure to delete a Fibre Channel Zone Profile.

**Procedure**

1. In the **Navigation** pane, click **SAN**.
2. On the **SAN** tab, click **Storage Cloud**.
3. Click **FC Zone Profiles**.
4. In the **Work** pane, right-click the name of the zone profile you wish to delete.
5. Choose **Delete** and click **Yes** to confirm.

---

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Select VSAN drop-down list</strong></td>
<td>The unique identifier assigned to the VSANs that exists already in the network. The ID can be between 1 and 4078, or between 4080 and 4093. 4079 is a reserved VSAN ID. You cannot configure fibre channel zoning in end-host mode.</td>
</tr>
<tr>
<td><strong>Create VSAN link</strong></td>
<td>Click the + icon to create a new VSAN in a new window. This allows you to perform the same task as in <em>Creating a VSAN for Fibre Channel Zoning, on page 31</em>. After creating the VSAN, you can return here and continue creating channel zone profile.</td>
</tr>
<tr>
<td><strong>Create Storage VSAN link</strong></td>
<td>Click the + icon to create a new storage VSAN in a new window. This allows you to perform the same task as in <em>Creating a VSAN for Fibre Channel Zoning, on page 31</em>. After creating the VSAN, you can return here and continue creating channel zone profile.</td>
</tr>
<tr>
<td><strong>Member WWPNs</strong></td>
<td>Click the + icon on the right of the table to create World Wide Port Name (WWPN). The <strong>Create FC Zone Member</strong> window is displayed. Enter the WWPN for this zone.</td>
</tr>
</tbody>
</table>
Deleting a Fibre Channel User Zone

Perform the following procedure to delete a Fibre Channel User Zone.

Procedure

Step 1  In the Navigation pane, click SAN.
Step 2  On the SAN tab, click Storage Cloud.
Step 3  Click FC Zone Profiles.
Step 4  In the Work pane, select the zone profile.
Step 5  Navigate to FC User Zones.
Step 6  Right-click the name of the user zone you wish to delete.
Step 7  Choose Delete and click Yes to confirm.

The user zone is deleted from the system.

Fibre Channel Storage Connection Policies

Deleting a Fibre Channel Storage Connection Policy

Procedure

Step 1  In the Navigation pane, click SAN.
Step 2  Expand SAN > Policies > Organization_Name.
Step 3  Expand the Storage Connection Policies node.
Step 4  Right-click the policy you want to delete and select Delete.
Step 5  If a confirmation dialog box displays, click Yes.
Named VSANs

A named VSAN creates a connection to a specific external SAN. The VSAN isolates traffic to that external SAN, including broadcast traffic. The traffic on one named VSAN knows that the traffic on another named VSAN exists, but cannot read or access that traffic.

Like a named VLAN, the name that you assign to a VSAN ID adds a layer of abstraction that allows you to globally update all servers associated with service profiles that use the named VSAN. You do not need to reconfigure the servers individually to maintain communication with the external SAN. You can create more than one named VSAN with the same VSAN ID.

Named VSANs in Cluster Configurations

In a cluster configuration, a named VSAN can be configured to be accessible only to the Fibre Channel uplink ports on one fabric interconnect or to the Fibre Channel uplink ports on both fabric interconnects.

Named VSANs and the FCoE VLAN ID

You must configure each named VSAN with an FCoE VLAN ID. This property determines which VLAN is used for transporting the VSAN and its Fibre Channel packets.

For FIP-capable, converged network adapters, such as the Cisco UCS CNA M72KR-Q and the Cisco UCS CNA M72KR-E, the named VSAN must be configured with a named VLAN that is not the native VLAN for the FCoE VLAN ID. This configuration ensures that FCoE traffic can pass through these adapters.

In the following sample configuration, a service profile with a vNIC and vHBA mapped to fabric A is associated with a server that has FIP capable, converged network adapters:
• The vNIC is configured to use VLAN 10.
• VLAN 10 is also designated as the native VLAN for the vNIC.
• The vHBA is configured to use VSAN 2.
• Therefore, VSAN 2 cannot be configured with VLAN 10 as the FCoE VLAN ID. VSAN 2 can be mapped to any other VLAN configured on fabric A.

Fibre Channel Uplink Trunking for Named VSANs

You can configure Fibre Channel uplink trunking for the named VSANs on each fabric interconnect. If you enable trunking on a fabric interconnect, all named VSANs in a Cisco UCS domain are allowed on all Fibre Channel uplink ports on that fabric interconnect.

Guidelines and Recommendations for VSANs

The following guidelines and recommendations apply to all named VSANs, including storage VSANs.

VSAN 4079 is a Reserved VSAN ID

Do not configure a VSAN as 4079. This VSAN is reserved and cannot be used in either FC switch mode or FC end-host mode.

If you create a named VSAN with ID 4079, Cisco UCS Manager marks that VSAN with an error and raises a fault.

Reserved VSAN Range for Named VSANs in FC Switch Mode

If you plan to use FC switch mode in a Cisco UCS domain, do not configure VSANs with an ID in the range from 3040 to 4078.

VSANs in that range are not operational if the fabric interconnects are configured to operate in FC switch mode. Cisco UCS Manager marks that VSAN with an error and raises a fault.

Reserved VSAN Range for Named VSANs in FC End-Host Mode

If you plan to use FC end-host mode in a Cisco UCS domain, do not configure VSANs with an ID in the range from 3840 to 4079.

VSANs in that range are not operational if the following conditions exist in a Cisco UCS domain:
  • The fabric interconnects are configured to operate in FC end-host mode.
  • The Cisco UCS domain is configured with Fibre Channel trunking or SAN port channels.

If these configurations exist, Cisco UCS Manager does the following:
1. Renders all VSANs with an ID in the range from 3840 to 4079 non-operational.
2. Raises a fault against the non-operational VSANs.
3. Transfers all non-operational VSANs to the default VSAN.
4. Transfers all vHBAs associated with the non-operational VSANs to the default VSAN.

If you disable Fibre Channel trunking and delete any existing SAN port channels, Cisco UCS Manager returns all VSANs in the range from 3840 to 4078 to an operational state and restores any associated vHBAs back to those VSANs.

**Range Restrictions for Named VSAN IDs in FC Switch Mode**

If you plan to use FC switch mode in a Cisco UCS domain, do not configure VSANs in the range from 3040 to 4078.

When a fabric interconnect operating in FC switch mode is connected to MDS as the upstream switch, VSANs configured in Cisco UCS Manager in the range from 3040 to 4078 and assigned as port VSANs cannot be created in MDS. This configuration results in a possible port VSAN mismatch.

**Guidelines for FCoE VLAN IDs**

> **Note**
> FCoE VLANs in the SAN cloud and VLANs in the LAN cloud must have different IDs. Using the same ID for an FCoE VLAN in a VSAN and a VLAN results in a critical fault and traffic disruption for all vNICs and uplink ports using that FCoE VLAN. Ethernet traffic is dropped on any VLAN with an ID that overlaps with an FCoE VLAN ID.

VLAN 4048 is user configurable. However, Cisco UCS Manager uses VLAN 4048 for the following default values. If you want to assign 4048 to a VLAN, you must reconfigure these values:

- After an upgrade to Cisco UCS, Release 2.0—the FCoE storage port native VLAN uses VLAN 4048 by default. If the default FCoE VSAN was set to use VLAN 1 before the upgrade, you must change it to a VLAN ID that is not used or reserved. For example, consider changing the default to 4049 if that VLAN ID is not in use.

- After a fresh install of Cisco UCS, Release 2.0—the FCoE VLAN for the default VSAN uses VLAN 4048 by default. The FCoE storage port native VLAN uses VLAN 4049.

## Creating a Named VSAN

> **Note**
> FCoE VLANs in the SAN cloud and VLANs in the LAN cloud must have different IDs. Using the same ID for an FCoE VLAN in a VSAN and a VLAN results in a critical fault and traffic disruption for all vNICs and uplink ports using that FCoE VLAN. Ethernet traffic is dropped on any VLAN with an ID that overlaps with an FCoE VLAN ID.

### Procedure

**Step 1**
In the Navigation pane, click SAN.

**Step 2**
Expand SAN > SAN Cloud.
Creating a Storage VSAN

**Procedure**

1. In the Navigation pane, click SAN.
2. On the SAN tab, expand SAN > Storage Cloud.
3. In the Work pane, click the VSANs tab.
4. On the icon bar to the right of the table, click +.
   - If the + icon is disabled, click an entry in the table to enable it.
5. In the Create VSAN dialog box, complete the required fields.
6. Click OK.

Cisco UCS Manager GUI adds the VSAN to one of the following VSANs nodes:

- The Storage Cloud > VSANs node for a storage VSAN accessible to both fabric interconnects.
- The Storage Cloud > Fabric_Name > VSANs node for a VSAN accessible to only one fabric interconnect.

**Note**

FCoE VLANs in the SAN cloud and VLANs in the LAN cloud must have different IDs. Using the same ID for an FCoE VLAN in a VSAN and a VLAN results in a critical fault and traffic disruption for all vNICs and uplink ports using that FCoE VLAN. Ethernet traffic is dropped on any VLAN with an ID that overlaps with an FCoE VLAN ID.
**Deleting a Named VSAN**

If Cisco UCS Manager includes a named VSAN with the same VSAN ID as the one you delete, the VSAN is not removed from the fabric interconnect configuration until all named VSANs with that ID are deleted.

### Procedure

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>In the <strong>Navigation</strong> pane, click <strong>SAN</strong>.</td>
</tr>
<tr>
<td>Step 2</td>
<td>In the <strong>SAN</strong> tab, click the <strong>SAN</strong> node.</td>
</tr>
<tr>
<td>Step 3</td>
<td>In the <strong>Work</strong> pane, click the <strong>VSANs</strong> tab.</td>
</tr>
<tr>
<td>Step 4</td>
<td>Click one of the following subtabs, depending upon what type of VSAN you want to delete:</td>
</tr>
<tr>
<td></td>
<td><strong>Subtab</strong></td>
</tr>
<tr>
<td>All</td>
<td>Displays all VSANs in the Cisco UCS domain.</td>
</tr>
<tr>
<td>Dual Mode</td>
<td>Displays the VSANs that are accessible to both fabric interconnects.</td>
</tr>
<tr>
<td>Switch A</td>
<td>Displays the VSANs that are accessible to only fabric interconnect A.</td>
</tr>
<tr>
<td>Switch B</td>
<td>Displays the VSANs that are accessible to only fabric interconnect B.</td>
</tr>
</tbody>
</table>

| Step 5 | In the table, click the VSAN you want to delete. |
|        | You can use the **Shift** key or **Ctrl** key to select multiple entries. |
| Step 6 | Right-click the highlighted VSAN or VSANs and choose **Delete**. |
| Step 7 | If a confirmation dialog box displays, click **Yes**. |

**Caution**

Changing the VLAN ID of the FCoE VLAN for a storage VSAN causes a brief traffic outage. FCoE VLANs in the SAN cloud and VLANs in the LAN cloud must have different IDs. Using the same ID for an FCoE VLAN in a VSAN results in a critical fault and traffic disrupt for all NICs and uplink ports using that FCoE VLAN. Ethernet traffic drops on any VLAN with an ID that overlaps with an FCoE VLAN ID.

Changing the FCoE VLAN for the default VSAN or any configured VSAN under a global policy may result in storage disconnect or complete shut down.

### Procedure

| Step 1 | In the **Navigation** pane, click **SAN**. |
| Step 2 | On the **SAN** tab, expand **SAN > Storage Cloud > VSANs**. |
Step 3 Choose the VSAN for which you want to modify the FCoE VLAN ID.
Step 4 In the Work pane, click the General tab.
Step 5 In the FCoE VLAN field, enter the desired VLAN ID.
Step 6 Click Save Changes.

Enabling Fibre Channel Uplink Trunking

*Note* If the fabric interconnects are configured for Fibre Channel end-host mode, enabling Fibre Channel uplink trunking renders all VSANs with an ID in the range from 3840 to 4079 non-operational.

**Procedure**

Step 1 In the Navigation pane, click SAN.
Step 2 Expand SAN > SAN Cloud.
Step 3 Click the node for the fabric where you want to enable FC uplink trunking.
Step 4 In the Work pane, click the General tab.
Step 5 In the Actions area, click Enable FC Uplink Trunking.
Step 6 If a confirmation dialog box displays, click Yes.

Disabling Fibre Channel Uplink Trunking

**Procedure**

Step 1 In the Navigation pane, click SAN.
Step 2 Expand SAN > SAN Cloud.
Step 3 Click the node for the fabric where you want to disable Fibre Channel uplink trunking.
Step 4 In the Work pane, click the General tab.
Step 5 In the Actions area, click Disable FC Uplink Trunking.
Step 6 If a confirmation dialog box displays, click Yes.
SAN Pin Groups

Cisco UCS uses SAN pin groups to pin Fibre Channel traffic from a vHBA on a server to an uplink Fibre Channel port on the fabric interconnect. You can use this pinning to manage the distribution of traffic from the servers.

---

**Note**

In Fibre Channel switch mode, SAN pin groups are irrelevant. Any existing SAN pin groups will be ignored.

To configure pinning for a server, you must include the SAN pin group in a vHBA policy. The vHBA policy is then included in the service profile assigned to that server. All traffic from the vHBA will travel through the I/O module to the specified uplink Fibre Channel port.

You can assign the same pin group to multiple vHBA policies. As a result, you do not need to manually pin the traffic for each vHBA.

---

**Important**

Changing the target interface for an existing SAN pin group disrupts traffic for all vHBAs which use that pin group. The fabric interconnect performs a log in and log out for the Fibre Channel protocols to re-pin the traffic.

---

**Creating a SAN Pin Group**

In a system with two fabric interconnects, you can associate the pin group with only one fabric interconnect or with both fabric interconnects.

**Procedure**

1. In the Navigation pane, click SAN.
2. In the SAN tab, expand SAN > SAN Cloud.
Deleting a SAN Pin Group

What to do next
Include the pin group in a vHBA template.

Deleting a SAN Pin Group

Procedure

Step 1 In the Navigation pane, click SAN.
Step 2 In the SAN tab, expand SAN > SAN Cloud > SAN Pin Groups.
Step 3 Right-click the SAN pin group you want to delete and select Delete.
Step 4 If a confirmation dialog box displays, click Yes.
CHAPTER 7

FC Identity Assignment

- Fibre Channel Identity, on page 45

Fibre Channel Identity

A Fibre Channel node and port must have a globally unique World Wide Number (WWN). In Cisco UCS WWNs are created as identity pools. A Fibre Channel node (a whole server, storage array) must have a World Wide Node Name (WWNN) and a Fibre Channel port must have a World Wide Port Name (WWPN). Both WWNNs and WWPNs are physical entities; hence, they have a 64-bit address.

The WWNN pool is created as one large pool for the Cisco UCS domain. You can use the default pool in the Cisco UCS Manager SAN tab. However, it is recommended to create a custom WWNN pool for that UCS domain.

A communicating device is a node. A host bus adapter in a server constitutes a Fibre Channel node. For servers and hosts, WWNN is unique foe each host bus adapter (HBA). For a SAN switch, the WWNN is common for the chassis. For midrange storage, the WWNN is common for each controller unit. For enterprise storage, the WWNN is unique for the entire array.

Each server has a unique WWPN for each port of the HBA. For a SAN switch, the WWPN is available for each port in the chassis. For storage, each port has an individual.

The FC Identity Tab in Cisco UCS Manager displays the FC Identity of the devices in the Cisco UCS domain SAN cloud, including the:

- Selected device WWNN or WWPN identifier.
- Whether the identifier is assigned ti a vHBA.
- vHBA to which the identifier is assigned.
FC Identity Assignment
WWN Pools

A World Wide Name (WWN) pool is a collection of WWNs for use by the Fibre Channel vHBAs in a Cisco UCS domain. You create separate pools for the following:

- WW node names assigned to the vHBA
- WW port names assigned to the vHBA
- Both WW node names and WW port names

Important

A WWN pool can include only WWNNs or WWPNs in the ranges from 20:00:00:00:00:00:00:00 to 20:FF:00:FF:FF:FF:FF or from 50:00:00:00:00:00:00:00 to 5F:FF:00:FF:FF:FF:FF:FF. All other WWN ranges are reserved. When fibre channel traffic is sent through the Cisco UCS infrastructure, the source WWPN is converted to a MAC address. You cannot use WWPN pool which can translate to a source multicast MAC address. To ensure the uniqueness of the Cisco UCS WWNNs and WWPNs in the SAN fabric, Cisco recommends using the following WWN prefix for all blocks in a pool: 20:00:00:25:B5:XX:XX:XX

If you use WWN pools in service profiles, you do not have to manually configure the WWNs that will be used by the server associated with the service profile. In a system that implements multi-tenancy, you can use a WWN pool to control the WWNs used by each organization.

You assign WWNs to pools in blocks.

WWNN Pools

A WWNN pool is a WWN pool that contains only WW node names. If you include a pool of WWNNs in a service profile, the associated server is assigned a WWNN from that pool.
WWPN Pools

A WWPN pool is a WNN pool that contains only WW port names. If you include a pool of WWPNs in a service profile, the port on each vHBA of the associated server is assigned a WWPN from that pool.

WWxN Pools

A WWxN pool is a WNN pool that contains both WW node names and WW port names. You can specify how many ports per node are created with WWxN pools. The pool size must be a multiple of \( \text{ports-per-node} + 1 \). For example, if you specify 7 ports per node, the pool size must be a multiple of 8. If you specify 63 ports per node, the pool size must be a multiple of 64.

You can use a WWxN pool whenever you select a WWNN or WWPN pool. The WWxN pool must be created before it can be assigned.

- For WWNN pools, the WWxN pool is displayed as an option in the WWNN Assignment drop-down list.
- For WWPN pools, choose Derived in the WWPN Assignment drop-down list.

Creating a WWNN Pool

**Important**

A WWN pool can include only WWNNs or WWPNs in the ranges from 20:00:00:00:00:00:00:00 to 20:FF:00:FF:FF:FF:FF:FF or from 50:00:00:00:00:00:00:00 to 5F:FF:00:FF:FF:FF:FF:FF. All other WNN ranges are reserved. When fibre channel traffic is sent through the Cisco UCS infrastructure, the source WWPN is converted to a MAC address. You cannot use WWPN pool which can translate to a source multicast MAC address. To ensure the uniqueness of the Cisco UCS WWNNs and WWPNs in the SAN fabric, Cisco recommends using the following WNN prefix for all blocks in a pool: 20:00:00:25:B5:XX:XX:XX

**Procedure**

**Step 1**
In the Navigation pane, click SAN.

**Step 2**
In the SAN tab, expand SAN > Pools.

**Step 3**
Expand the node for the organization where you want to create the pool.

If the system does not include multitenancy, expand the root node.

**Step 4**
Right-click WWNN Pools and select Create WWNN Pool.

**Step 5**
In the Define Name and Description dialog box of the Create WWNN Pool wizard, complete the following fields:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name field</td>
<td>The name of the World Wide Node Name pool. This name can be between 1 and 32 alphanumeric characters. You cannot use spaces or any special characters other than - (hyphen), _ (underscore), : (colon), and . (period), and you cannot change this name after the object is saved.</td>
</tr>
</tbody>
</table>
Adding a WWN Block to a WWNN Pool

A WWN pool can include only WWNNs or WWPNs in the ranges from 20:00:00:00:00:00:00:00 to 20:FF:00:FF:FF:FF:FF:FF or from 50:00:00:00:00:00:00:00 to 5F:FF:00:FF:FF:FF:FF:FF. All other WWN ranges are reserved. When fibre channel traffic is sent through the Cisco UCS infrastructure, the source WWPN is converted to a MAC address. You cannot use WWPN pool which can translate to a source multicast MAC address. To ensure the uniqueness of the Cisco UCS WWNNs and WWPNs in the SAN fabric, Cisco recommends using the following WWN prefix for all blocks in a pool: 20:00:00:25:B5:XX:XX:XX
Procedure

Step 1 In the Navigation pane, click SAN.
Step 2 In the SAN tab, expand SAN > Pools > Organization_Name.
Step 3 Expand the WWNN Pools node.
Step 4 Right-click the WWNN pool to which you want to add a WWN block and select Create WWN Block.
Step 5 In the Create WWN Block dialog box, complete the following fields:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>From field</td>
<td>The first WWN in the block.</td>
</tr>
<tr>
<td>Size field</td>
<td>The number of WWNs in the block. For WWxN pools, the pool size must be a multiple of ( \text{ports-per-node} + 1 ). For example, if there are 7 ports per node, the pool size must be a multiple of 8. If there are 63 ports per node, the pool size must be a multiple of 64.</td>
</tr>
</tbody>
</table>

Step 6 Click OK.

Deleting a WWN Block from a WWNN Pool

If you delete an address block from a pool, Cisco UCS Manager does not reallocate any addresses in that block that were assigned to vNICs or vHBAs. All assigned addresses from a deleted block remain with the vNIC or vHBA to which they are assigned until one of the following occurs:

- The associated service profiles are deleted.
- The vNIC or vHBA to which the address is assigned is deleted.
- The vNIC or vHBA is assigned to a different pool.

Procedure

Step 1 In the Navigation pane, click SAN.
Step 2 In the SAN tab, expand SAN > Pools > Organization_Name > WWNN Pools > WWNN_Pool_Name.
Step 3 Right-click the WWN block that you want to delete and select Delete.
Step 4 If a confirmation dialog box displays, click Yes.
Adding a WWNN Initiator to a WWNN Pool

**Important**

A WWN pool can include only WWNNs or WWPNs in the ranges from 20:00:00:00:00:00:00:00 to 20:FF:00:FF:FF:FF:FF:FF or from 50:00:00:00:00:00:00:00 to 5F:FF:00:FF:FF:FF:FF:FF. All other WWN ranges are reserved. When fibre channel traffic is sent through the Cisco UCS infrastructure, the source WWPN is converted to a MAC address. You cannot use WWPN pool which can translate to a source multicast MAC address. To ensure the uniqueness of the Cisco UCS WWNNs and WWPNs in the SAN fabric, Cisco recommends using the following WNN prefix for all blocks in a pool: 20:00:00:25:B5:XX:XX:XX

**Procedure**

**Step 1**
In the Navigation pane, click SAN.

**Step 2**
In the SAN tab, expand SAN > Pools > Organization_Name.

**Step 3**
Expand the WWNN Pools node.

**Step 4**
Right-click the WWNN pool to which you want to add a WWNN initiator and select Create WWNN Initiator.

**Step 5**
In the Create WWNN Initiator dialog box, complete the following fields:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>World Wide Name field</td>
<td>The WWN.</td>
</tr>
<tr>
<td>Name field</td>
<td>The name of the WWNN initiator.</td>
</tr>
<tr>
<td></td>
<td>This name can be between 1 and 16 alphanumeric characters. You cannot use</td>
</tr>
<tr>
<td></td>
<td>spaces or any special characters other than - (hyphen), _ (underscore),</td>
</tr>
<tr>
<td></td>
<td>: (colon), and . (period), and you cannot change this name after the object</td>
</tr>
<tr>
<td></td>
<td>is saved.</td>
</tr>
<tr>
<td>Description field</td>
<td>A user-defined description of the WWNN initiator.</td>
</tr>
<tr>
<td></td>
<td>Enter up to 256 characters. You can use any characters or spaces except</td>
</tr>
<tr>
<td></td>
<td>` (accent mark), \ (backslash), ^ (carat), &quot; (double quote), = (equal sign),</td>
</tr>
<tr>
<td></td>
<td>&gt; (greater than), &lt; (less than), or ’ (single quote).</td>
</tr>
</tbody>
</table>

**Step 6**
Click OK.

Deleting a WWPN Initiator from a WWPN Pool

**Procedure**

**Step 1**
In the Navigation pane, click SAN.

**Step 2**
In the SAN tab, expand SAN > Pools > Organization_Name.

**Step 3**
Expand the WWPN Pools node.
Deleting a WWNN Pool

If you delete a pool, Cisco UCS Manager does not reallocate any addresses from that pool that were assigned to vNICs or vHBAs. All assigned addresses from a deleted pool remain with the vNIC or vHBA to which they are assigned until one of the following occurs:

- The associated service profiles are deleted.
- The vNIC or vHBA to which the address is assigned is deleted.
- The vNIC or vHBA is assigned to a different pool.

**Procedure**

Step 1 In the **Navigation** pane, click **SAN**.
Step 2 In the **SAN** tab, expand **SAN > Pools > Organization_Name**.
Step 3 Expand the **WWNN Pools** node.
Step 4 Right-click the WWNN pool you want to delete and select **Delete**.
Step 5 If a confirmation dialog box displays, click **Yes**.

WWPN Pools

Creating a WWPN Pool

**Important**

A WWPN pool can include only WWNNs or WWPNs in the ranges from 20:00:00:00:00:00:00:00 to 20:FF:00:FF:FF:FF:FF:FF or from 50:00:00:00:00:00:00:00 to 5F:FF:00:FF:FF:FF:FF:FF. All other WWN ranges are reserved. When fibre channel traffic is sent through the Cisco UCS infrastructure, the source WWPN is converted to a MAC address. You cannot use WWPN pool which can translate to a source multicast MAC address. To ensure the uniqueness of the Cisco UCS WWNNs and WWPNs in the SAN fabric, Cisco recommends using the following WWN prefix for all blocks in a pool: 20:00:00:25:B5:XX:XX:XX

**Procedure**

Step 1 In the **Navigation** pane, click **SAN**.

---

**Deleting a WWPN Pool**

Choose the WWPN pool from which you want to delete a WWPN initiator.

**Step 5** In the **Work** pane, click the **Initiators** tab.

**Step 6** Right-click the initiator that you want to delete and choose **Delete**.

**Step 7** If a confirmation dialog box displays, click **Yes**.
Step 2  In the SAN tab, expand SAN > Pools.

Step 3  Expand the node for the organization where you want to create the pool.
If the system does not include multitenancy, expand the root node.

Step 4  Right-click WWPN Pools and select Create WWPN Pool.

Step 5  In the Define Name and Description page of the Create WWPN Pool wizard, complete the following fields:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name field</td>
<td>The name of the World Wide Port Name pool. This name can be between 1 and 32 alphanumerics. You cannot use spaces or any special characters other than -(hyphen), _ (underscore), : (colon), and . (period), and you cannot change this name after the object is saved.</td>
</tr>
<tr>
<td>Description field</td>
<td>A description of the pool. Enter up to 256 characters. You can use any characters or spaces except ` (accent mark), \ (backslash), ^ (carat), &quot; (double quote), = (equal sign), &gt; (greater than), &lt; (less than), or ’ (single quote).</td>
</tr>
</tbody>
</table>
| Assignment Order field | This can be one of the following:  
- Default—Cisco UCS Manager selects a random identity from the pool.  
- Sequential—Cisco UCS Manager selects the lowest available identity from the pool. |

Step 6  Click Next.

Step 7  In the Add WWN Blocks page of the Create WWPN Pool wizard, click Add.

Step 8  In the Create WWN Block dialog box, complete the following fields:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>From field</td>
<td>The first WWN in the block.</td>
</tr>
<tr>
<td>Size field</td>
<td>The number of WWNs in the block. For WWxN pools, the pool size must be a multiple of ports-per-node + 1. For example, if there are 7 ports per node, the pool size must be a multiple of 8. If there are 63 ports per node, the pool size must be a multiple of 64.</td>
</tr>
</tbody>
</table>

Step 9  Click OK.

Step 10  Click Finish.

What to do next
Include the WWPN pool in a vHBA template.
Adding a WWN Block to a WWPN Pool

**Important**

A WWN pool can include only WWNNs or WWPNs in the ranges from 20:00:00:00:00:00:00:00 to 20:FF:00:FF:FF:FF:FF:FF or from 50:00:00:00:00:00:00:00 to 5F:FF:00:FF:FF:FF:FF:FF. All other WWN ranges are reserved. When fibre channel traffic is sent through the Cisco UCS infrastructure, the source WWPN is converted to a MAC address. You cannot use WWPN pool which can translate to a source multicast MAC address. To ensure the uniqueness of the Cisco UCS WWNNs and WWPNs in the SAN fabric, Cisco recommends using the following WWN prefix for all blocks in a pool: 20:00:00:25:B5:XX:XX:XX

**Procedure**

**Step 1**
In the **Navigation** pane, click **SAN**.

**Step 2**
In the **SAN** tab, expand **SAN > Pools > Organization_Name**.

**Step 3**
Expand the **WWPN Pools** node.

**Step 4**
Right-click the WWPN pool to which you want to add a WWN block and select **Create WWN Block**.

**Step 5**
In the **Create WWN Block** dialog box, complete the following fields:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>From field</td>
<td>The first WWN in the block.</td>
</tr>
<tr>
<td>Size field</td>
<td>The number of WWNs in the block.</td>
</tr>
<tr>
<td></td>
<td>For WWxN pools, the pool size must be a multiple of ports-per-node + 1.</td>
</tr>
<tr>
<td></td>
<td>For example, if there are 7 ports per node, the pool size must be a</td>
</tr>
<tr>
<td></td>
<td>multiple of 8. If there are 63 ports per node, the pool size must be a</td>
</tr>
<tr>
<td></td>
<td>multiple of 64.</td>
</tr>
</tbody>
</table>

**Step 6**
Click **OK**.

Deleting a WWN Block from a WWPN Pool

If you delete an address block from a pool, Cisco UCS Manager does not reallocate any addresses in that block that were assigned to vNICs or vHBAs. All assigned addresses from a deleted block remain with the vNIC or vHBA to which they are assigned until one of the following occurs:

- The associated service profiles are deleted.
- The vNIC or vHBA to which the address is assigned is deleted.
- The vNIC or vHBA is assigned to a different pool.

**Procedure**

**Step 1**
In the **Navigation** pane, click **SAN**.
Adding a WWPN Initiator to a WWPN Pool

**Important**
A WWN pool can include only WWNNs or WWPNs in the ranges from 20:00:00:00:00:00:00:00 to 20:FF:00:FF:FF:FF:FF:FF or from 50:00:00:00:00:00:00:00 to 5F:FF:00:FF:FF:FF:FF:FF. All other WWN ranges are reserved. When fibre channel traffic is sent through the Cisco UCS infrastructure, the source WWPN is converted to a MAC address. You cannot use WWPN pool which can translate to a source multicast MAC address. To ensure the uniqueness of the Cisco UCS WWNNs and WWPNs in the SAN fabric, Cisco recommends using the following WWN prefix for all blocks in a pool: 20:00:00:25:B5:XX:XX:XX

**Procedure**

**Step 1**
In the Navigation pane, click SAN.

**Step 2**
In the SAN tab, expand SAN > Pools > Organization_Name.

**Step 3**
Expand the WWPN Pools node.

**Step 4**
Right-click the WWPN pool to which you want to add a WWPN initiator and select Create WWPN Initiator.

**Step 5**
In the Create WWPN Initiator dialog box, complete the following fields:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>World Wide Name field</td>
<td>The WWN.</td>
</tr>
<tr>
<td>Name field</td>
<td>The name of the WWPN initiator. This name can be between 1 and 16 alphanumeric characters. You cannot use spaces or any special characters other than - (hyphen), _ (underscore), : (colon), and . (period), and you cannot change this name after the object is saved.</td>
</tr>
<tr>
<td>Description field</td>
<td>A user-defined description of the WWPN initiator. Enter up to 256 characters. You can use any characters or spaces except ` (accent mark), \ (backslash), ^ (carat), &quot; (double quote), = (equal sign), &gt; (greater than), &lt; (less than), or ' (single quote).</td>
</tr>
</tbody>
</table>

**Step 6**
If you want to add a SAN boot target, expand the Boot Target area and complete the following fields:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boot Target WWPN field</td>
<td>The WWPN that corresponds to the location of the boot image.</td>
</tr>
<tr>
<td>Boot Target LUN field</td>
<td>The LUN that corresponds to the location of the boot image.</td>
</tr>
</tbody>
</table>
Deleting a WWPN Initiator from a WWPN Pool

**Procedure**

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>In the Navigation pane, click SAN.</td>
</tr>
<tr>
<td>2</td>
<td>In the SAN tab, expand SAN &gt; Pools &gt; Organization_Name.</td>
</tr>
<tr>
<td>3</td>
<td>Expand the WWPN Pools node.</td>
</tr>
<tr>
<td>4</td>
<td>Choose the WWPN pool from which you want to delete a WWPN initiator.</td>
</tr>
<tr>
<td>5</td>
<td>In the Work pane, click the Initiators tab.</td>
</tr>
<tr>
<td>6</td>
<td>Right-click the initiator that you want to delete and choose Delete.</td>
</tr>
<tr>
<td>7</td>
<td>If a confirmation dialog box displays, click Yes.</td>
</tr>
</tbody>
</table>

Deleting a WWPN Pool

If you delete a pool, Cisco UCS Manager does not reallocate any addresses from that pool that were assigned to vNICs or vHBAs. All assigned addresses from a deleted pool remain with the vNIC or vHBA to which they are assigned until one of the following occurs:

- The associated service profiles are deleted.
- The vNIC or vHBA to which the address is assigned is deleted.
- The vNIC or vHBA is assigned to a different pool.

**Procedure**

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>In the Navigation pane, click SAN.</td>
</tr>
<tr>
<td>2</td>
<td>In the SAN tab, expand SAN &gt; Pools &gt; Organization_Name.</td>
</tr>
<tr>
<td>3</td>
<td>Expand the WWPN Pools node.</td>
</tr>
<tr>
<td>4</td>
<td>Right-click the WWPN pool you want to delete and select Delete.</td>
</tr>
<tr>
<td>5</td>
<td>If a confirmation dialog box displays, click Yes.</td>
</tr>
</tbody>
</table>
## WWxN Pools

### Creating a WWxN Pool

**Important**

A WWN pool can include only WWNNs or WWPNs in the ranges from 20:00:00:00:00:00:00:00 to 20:FF:00:FF:FF:FF:FF:FF or from 50:00:00:00:00:00:00:00 to 5F:FF:00:FF:FF:FF:FF:FF. All other WWN ranges are reserved. When fibre channel traffic is sent through the Cisco UCS infrastructure, the source WWPN is converted to a MAC address. You cannot use WWPN pool which can translate to a source multicast MAC address. To ensure the uniqueness of the Cisco UCS WWNNs and WWPNs in the SAN fabric, Cisco recommends using the following WNN prefix for all blocks in a pool: 20:00:00:25:B5:XX:XX:XX

---

**Procedure**

**Step 1**

In the **Navigation** pane, click **SAN**.

**Step 2**

In the **SAN** tab, expand **SAN > Pools**.

**Step 3**

Expand the node for the organization where you want to create the pool.

If the system does not include multitenancy, expand the **root** node.

**Step 4**

Right-click **WWxN Pools** and select **Create WWxN Pool**.

**Step 5**

In the **Define Name and Description** page of the **Create WWxN Pool** wizard, complete the following fields:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Name field</strong></td>
<td>The name of the World Wide Port Name pool.</td>
</tr>
<tr>
<td></td>
<td>This name can be between 1 and 32 alphanumeric characters. You cannot use</td>
</tr>
<tr>
<td></td>
<td>spaces or any special characters other than - (hyphen), _ (underscore),</td>
</tr>
<tr>
<td></td>
<td>: (colon), and . (period), and you cannot change this name after the object</td>
</tr>
<tr>
<td></td>
<td>is saved.</td>
</tr>
<tr>
<td><strong>Description field</strong></td>
<td>A description of the pool.</td>
</tr>
<tr>
<td></td>
<td>Enter up to 256 characters. You can use any characters or spaces except</td>
</tr>
<tr>
<td></td>
<td>` (accent mark), \ (backslash), ^ (carat), &quot; (double quote), = (equal sign),</td>
</tr>
<tr>
<td></td>
<td>&gt; (greater than), &lt; (less than), or ' (single quote).</td>
</tr>
<tr>
<td><strong>Max Ports per Node field</strong></td>
<td>The maximum number of ports that can be assigned to each node name in this pool.</td>
</tr>
<tr>
<td></td>
<td>You cannot change this value once the object has been saved.</td>
</tr>
</tbody>
</table>
### Adding a WWN Block to a WWxN Pool

**Important**

A WWN pool can include only WWNNs or WWPNs in the ranges from 20:00:00:00:00:00:00:00 to 20:FF:00:FF:FF:FF:FF:FF or from 50:00:00:00:00:00:00:00 to 5F:FF:00:FF:FF:FF:FF:FF. All other WWN ranges are reserved. When fibre channel traffic is sent through the Cisco UCS infrastructure, the source WWPN is converted to a MAC address. You cannot use WWPN pool which can translate to a source multicast MAC address. To ensure the uniqueness of the Cisco UCS WWNNs and WWPNs in the SAN fabric, Cisco recommends using the following WWN prefix for all blocks in a pool: 20:00:00:25:B5:XX:XX:XX

**Procedure**

1. In the Navigation pane, click SAN.
2. In the SAN tab, expand SAN > Pools > Organization_Name.
3. Expand the WWxN Pools node.

**What to do next**

Include the WWxN pool in a service profile and template.
Step 4 Right-click the WWxN pool to which you want to add a WWN block and select Create WWN Block.

Step 5 In the Create WWN Block dialog box, complete the following fields:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>From field</td>
<td>The first WWN in the block.</td>
</tr>
<tr>
<td>Size field</td>
<td>The number of WWNs in the block.</td>
</tr>
<tr>
<td>From field</td>
<td></td>
</tr>
<tr>
<td>Size field</td>
<td>For WWxN pools, the pool size must be a multiple of $ports-per-node + 1$. For example, if there are 7 ports per node, the pool size must be a multiple of 8. If there are 63 ports per node, the pool size must be a multiple of 64.</td>
</tr>
</tbody>
</table>

Step 6 Click OK.

Deleting a WWN Block from a WWxN Pool

If you delete an address block from a pool, Cisco UCS Manager does not reallocate any addresses in that block that were assigned to vNICs or vHBAs. All assigned addresses from a deleted block remain with the vNIC or vHBA to which they are assigned until one of the following occurs:

- The associated service profiles are deleted.
- The vNIC or vHBA to which the address is assigned is deleted.
- The vNIC or vHBA is assigned to a different pool.

Procedure

Step 1 In the Navigation pane, click SAN.
Step 2 In the SAN tab, expand SAN > Pools > Organization_Name > WWxN Pools > WWxN_Pool_Name .
Step 3 Right-click the WWN block that you want to delete and select Delete.
Step 4 If a confirmation dialog box displays, click Yes.

Deleting a WWxN Pool

If you delete a pool, Cisco UCS Manager does not reallocate any addresses from that pool that were assigned to vNICs or vHBAs. All assigned addresses from a deleted pool remain with the vNIC or vHBA to which they are assigned until one of the following occurs:

- The associated service profiles are deleted.
- The vNIC or vHBA to which the address is assigned is deleted.
- The vNIC or vHBA is assigned to a different pool.
Procedure

Step 1  In the Navigation pane, click SAN.
Step 2  In the SAN tab, expand SAN > Pools > Organization_Name.
Step 3  Expand the WWxN Pools node.
Step 4  Right-click the WWxN pool you want to delete and select Delete.
Step 5  If a confirmation dialog box displays, click Yes.
Storage-Related Policies

- About vHBA Templates, on page 61
- Fibre Channel Adapter Policies, on page 64
- About the Default vHBA Behavior Policy, on page 71
- SAN Connectivity Policies, on page 72

About vHBA Templates

vHBA Template

This template is a policy that defines how a vHBA on a server connects to the SAN. It is also referred to as a vHBA SAN connectivity template.

You must include this policy in a service profile for it to take effect.

Creating a vHBA Template

Before you begin

This policy requires that one or more of the following resources already exist in the system:
- Named VSAN
- WWNN pool or WWPN pool
- SAN pin group
- Statistics threshold policy

Procedure

Step 1 In the Navigation pane, click SAN.
Step 2 Expand SAN > Policies.
Step 3 Expand the node for the organization where you want to create the policy.
If the system does not include multitenancy, expand the root node.

**Step 4**  
Right-click the **vHBA Templates** node and choose **Create vHBA Template**.

**Step 5**  
In the **Create vHBA Template** dialog box, complete the following fields:

<table>
<thead>
<tr>
<th>Name Field</th>
<th>Description</th>
</tr>
</thead>
</table>
| **Name** field | The name of the virtual HBA template.  
This name can be between 1 and 16 alphanumeric characters. You cannot use spaces or any special characters other than - (hyphen), _ (underscore), : (colon), and . (period), and you cannot change this name after the object is saved. |
| **Description** field | A user-defined description of the template.  
Enter up to 256 characters. You can use any characters or spaces except ` (accent mark), \ (backslash), ^ (carat), " (double quote), = (equal sign), > (greater than), < (less than), or ' (single quote). |
| **Fabric ID** field | The name of the fabric interconnect that vHBAs created with this template are associated with. |
| **Select VSAN** drop-down list | The VSAN to associate with vHBAs created from this template. |
| **Create VSAN** link | Click this link if you want to create a VSAN. |
| **Template Type** field | This can be one of the following:  
- **Initial Template**—vHBAs created from this template are not updated if the template changes.  
- **Updating Template**—vHBAs created from this template are updated if the template changes. |
| **Max Data Field Size** field | The maximum size of the Fibre Channel frame payload bytes that the vHBA supports.  
Enter an integer between 256 and 2112. The default is 2048. |
| **WWPN Pool** drop-down list | The WWPN pool that a vHBA created from this template uses to derive its WWPN address. |
| **QoS Policy** drop-down list | The QoS policy that is associated with vHBAs created from this template. |
| **Pin Group** drop-down list | The SAN pin group that is associated with vHBAs created from this template. |
| **Stats Threshold Policy** drop-down list | The statistics collection policy that is associated with vHBAs created from this template. |

**Step 6**  
Click **OK**.
What to do next
Include the vHBA template in a service profile.

## Binding a vHBA to a vHBA Template

You can bind a vHBA associated with a service profile to a vHBA template. When you bind the vHBA to a vHBA template, Cisco UCS Manager configures the vHBA with the values defined in the vHBA template. If the existing vHBA configuration does not match the vHBA template, Cisco UCS Manager reconfigures the vHBA. You can only change the configuration of a bound vHBA through the associated vHBA template. You cannot bind a vHBA to a vHBA template if the service profile that includes the vHBA is already bound to a service profile template.

### Important
If the vHBA is reconfigured when you bind it to a template, Cisco UCS Manager reboots the server associated with the service profile.

### Procedure

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>In the <strong>Navigation</strong> pane, click <strong>Servers</strong>.</td>
</tr>
<tr>
<td>2</td>
<td>Expand <strong>Servers &gt; Service Profiles</strong>.</td>
</tr>
<tr>
<td>3</td>
<td>Expand the node for the organization that includes the service profile with the vHBA you want to bind. If the system does not include multi-tenancy, expand the <strong>root</strong> node.</td>
</tr>
<tr>
<td>4</td>
<td>Expand <strong>Service_Profile_Name &gt; vHBAs</strong>.</td>
</tr>
<tr>
<td>5</td>
<td>Click the vHBA you want to bind to a template.</td>
</tr>
<tr>
<td>6</td>
<td>In the <strong>Work</strong> pane, click the <strong>General</strong> tab.</td>
</tr>
<tr>
<td>7</td>
<td>In the <strong>Actions</strong> area, click <strong>Bind to a Template</strong>.</td>
</tr>
<tr>
<td>8</td>
<td>In the <strong>Bind to a vHBA Template</strong> dialog box, do the following:</td>
</tr>
<tr>
<td></td>
<td>a) From the <strong>vHBA Template</strong> drop-down list, choose the template to which you want to bind the vHBA.</td>
</tr>
<tr>
<td></td>
<td>b) Click <strong>OK</strong>.</td>
</tr>
<tr>
<td>9</td>
<td>In the warning dialog box, click <strong>Yes</strong> to acknowledge that Cisco UCS Manager may need to reboot the server if the binding causes the vHBA to be reconfigured.</td>
</tr>
</tbody>
</table>

## Unbinding a vHBA from a vHBA Template

### Procedure

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>In the <strong>Navigation</strong> pane, click <strong>Servers</strong>.</td>
</tr>
<tr>
<td>2</td>
<td>Expand <strong>Servers &gt; Service Profiles</strong>.</td>
</tr>
<tr>
<td>3</td>
<td>Expand the node for the organization that includes the service profile with the vHBA you want to unbind.</td>
</tr>
</tbody>
</table>
Deleting a vHBA Template

Procedure

Step 1 In the Navigation pane, click SAN.
Step 2 Expand SAN > Policies > Organization_Name.
Step 3 Expand the vHBA Templates node.
Step 4 Right-click the vHBA template that you want to delete and choose Delete.
Step 5 If a confirmation dialog box displays, click Yes.

Fibre Channel Adapter Policies

Ethernet and Fibre Channel Adapter Policies

These policies govern the host-side behavior of the adapter, including how the adapter handles traffic. For example, you can use these policies to change default settings for the following:

- Queues
- Interrupt handling
- Performance enhancement
- RSS hash
- Failover in a cluster configuration with two fabric interconnects

If the system does not include multi-tenancy, expand the root node.

Step 4 Expand Service_Profile_Name > vHBAs.
Step 5 Click the vHBA you want to unbind from a template.
Step 6 In the Work pane, click the General tab.
Step 7 In the Actions area, click Unbind from a Template.
Step 8 If a confirmation dialog box displays, click Yes.
For Fibre Channel adapter policies, the values displayed by Cisco UCS Manager may not match those displayed by applications such as QLogic SANsurfer. For example, the following values may result in an apparent mismatch between SANsurfer and Cisco UCS Manager:

- **Max LUNs Per Target**—SANsurfer has a maximum of 256 LUNs and does not display more than that number. Cisco UCS Manager supports a higher maximum number of LUNs.

- **Link Down Timeout**—In SANsurfer, you configure the timeout threshold for link down in seconds. In Cisco UCS Manager, you configure this value in milliseconds. Therefore, a value of 5500 ms in Cisco UCS Manager displays as 5s in SANsurfer.

- **Max Data Field Size**—SANsurfer has allowed values of 512, 1024, and 2048. Cisco UCS Manager allows you to set values of any size. Therefore, a value of 900 in Cisco UCS Manager displays as 512 in SANsurfer.

- **LUN Queue Depth**—The LUN queue depth setting is available for Windows system FC adapter policies. Queue depth is the number of commands that the HBA can send and receive in a single transmission per LUN. Windows Storport driver sets this to a default value of 20 for physical miniports and to 250 for virtual miniports. This setting adjusts the initial queue depth for all LUNs on the adapter. Valid range for this value is 1 - 254. The default LUN queue depth is 20. This feature only works with Cisco UCS Manager version 3.1(2) and higher.

- **IO TimeOut Retry**—When the target device does not respond to an IO request within the specified timeout, the FC adapter cancels the pending command then resends the same IO after the timer expires. The FC adapter valid range for this value is 1 - 59 seconds. The default IO retry timeout is 5 seconds. This feature only works with Cisco UCS Manager version 3.1(2) and higher.

---

**Operating System Specific Adapter Policies**

By default, Cisco UCS provides a set of Ethernet adapter policies and Fibre Channel adapter policies. These policies include the recommended settings for each supported server operating system. Operating systems are sensitive to the settings in these policies. Storage vendors typically require non-default adapter settings. You can find the details of these required settings on the support list provided by those vendors.

---

**Important**

We recommend that you use the values in these policies for the applicable operating system. Do not modify any of the values in the default policies unless directed to do so by Cisco Technical Support. However, if you are creating an Ethernet adapter policy for an OS (instead of using the default adapter policy), you must use the following formulas to calculate values that work for that OS.

**Interrupt Count in Linux Adapter Policies**

Drivers on Linux operating systems use differing formulas to calculate the Interrupt Count, depending on the eNIC driver version. The UCS 3.2 release increased the number of Tx and Rx queues for the eNIC driver from 8 to 256 each.

Use one of the following strategies, according to your driver version.

For Linux drivers before the UCS 3.2 firmware release, use the following formula to calculate the Interrupt Count.
Completion Queues = Transmit Queues + Receive Queues
Interrupt Count = (Completion Queues + 2) rounded up to nearest power of 2

For example, if Transmit Queues = 1 and Receive Queues = 8 then:
Completion Queues = 1 + 8 = 9
Interrupt Count = (9 + 2) rounded up to the nearest power of 2 = 16

On drivers for UCS firmware release 3.2 and higher, the Linux eNIC drivers use the following formula to calculate the Interrupt Count.
Interrupt Count = (#Tx or Rx Queues) + 2

For example:
Interrupt Count wq = 32, rq = 32, cq = 64 - then Interrupt Count = Max(32, 32) + 2 = 34
Interrupt Count wq = 64, rq = 8, cq = 72 – then Interrupt Count = Max(64, 8) + 2 = 66
Interrupt Count wq = 1, rq = 16, cq = 17 - then Interrupt count = Max(1, 16) + 2 = 18

Creating a Fibre Channel Adapter Policy

Tip
If the fields in an area do not display, click the Expand icon to the right of the heading.

Procedure

Step 1
In the Navigation pane, click Servers.

Step 2
Expand Servers > Policies.

Step 3
Expand the node for the organization where you want to create the policy.
If the system does not include multitenancy, expand the root node.

Step 4
Right-click Adapter Policies and choose Create Fibre Channel Adapter Policy.

Step 5
Enter a name and description for the policy in the following fields:

Table 3:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name field</td>
<td>The name of the policy. This name can be between 1 and 16 alphanumeric characters. You cannot use spaces or any special characters other than - (hyphen), _ (underscore), : (colon), and . (period), and you cannot change this name after the object is saved.</td>
</tr>
<tr>
<td>Description field</td>
<td>A description of the policy. Cisco recommends including information about where and when to use the policy. Enter up to 256 characters. You can use any characters or spaces except ' (accent mark), \ (backslash), ^ (carat), &quot; (double quote), = (equal sign), &gt; (greater than), &lt; (less than), or ’ (single quote).</td>
</tr>
</tbody>
</table>
**Step 6** *(Optional)* In the **Resources** area, adjust the following values:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Transmit Queues</strong></td>
<td>The number of transmit queue resources to allocate.</td>
</tr>
<tr>
<td><strong>Ring Size</strong></td>
<td>The number of descriptors in each transmit queue. This parameter applies</td>
</tr>
<tr>
<td></td>
<td>to Extended Link Services (ELS) and Common Transport (CT) fibre channel</td>
</tr>
<tr>
<td></td>
<td>frames for generic services. It does not affect adapter performance.</td>
</tr>
<tr>
<td></td>
<td>Enter an integer between 64 and 128. The default is 64.</td>
</tr>
<tr>
<td><strong>Receive Queues</strong></td>
<td>The number of receive queue resources to allocate.</td>
</tr>
<tr>
<td><strong>Ring Size</strong></td>
<td>The number of descriptors in each receive queue. This parameter applies</td>
</tr>
<tr>
<td></td>
<td>to Extended Link Services (ELS) and Common Transport (CT) fibre channel</td>
</tr>
<tr>
<td></td>
<td>frames for generic services. It does not affect adapter performance.</td>
</tr>
<tr>
<td></td>
<td>Enter an integer between 64 and 2048. The default is 64.</td>
</tr>
<tr>
<td><strong>I/O Queues</strong></td>
<td>The number of SCSI IO queue resources the system should allocate.</td>
</tr>
<tr>
<td><strong>Ring Size</strong></td>
<td>The number of descriptors in each SCSI I/O queue.</td>
</tr>
</tbody>
</table>

**Note**: The number of descriptors can affect the performance of the adapter, so we recommend that you do not change the default value.

**Step 7** *(Optional)* In the **Options** area, adjust the following values:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FCP Error Recovery</strong></td>
<td>Whether the system uses FCP Sequence Level Error Recovery (FC-TAPE) protocol for sequence level error recovery with tape devices. This enables or disables the Read Exchange Concise (REC) and Sequence Retransmission Request (SRR) functions on the VIC firmware. This can be one of the following:</td>
</tr>
<tr>
<td></td>
<td>• <strong>Disabled</strong>—This is the default.</td>
</tr>
<tr>
<td></td>
<td>• <strong>Enabled</strong>—You should select this option if your system is connected to one or more tape drive libraries.</td>
</tr>
<tr>
<td><strong>Note</strong></td>
<td>This parameter only applies to a server with a Virtual Interface Card (VIC) adapter.</td>
</tr>
<tr>
<td>Name</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Flogi Retries field</strong></td>
<td>The number of times that the system tries to log in to the fabric after the first failure. Enter any integer. To specify that the system continue to try indefinitely, enter <em>infinite</em> in this field. We recommend you consult your storage array documentation for the optimal value for this parameter.</td>
</tr>
<tr>
<td><strong>Note</strong></td>
<td>This parameter only applies to a server with a VIC adapter, or a converged network adapter.</td>
</tr>
<tr>
<td><strong>Flogi Timeout (ms) field</strong></td>
<td>The number of milliseconds that the system waits before it tries to log in again. Enter an integer between 1000 and 255000. The default is 4,000. We recommend you consult your storage array documentation for the optimal value for this parameter.</td>
</tr>
<tr>
<td><strong>Note</strong></td>
<td>This parameter only applies to a server with a VIC adapter or a converged network adapter. When a Flogi timeout value of 20 seconds or more is configured for a boot vHBA, it could lead to a SAN boot failure if the adapter does not receive an accept to the initial Flogi. For a boot-enabled vHBA, the recommended timeout values is 5 seconds or less.</td>
</tr>
<tr>
<td><strong>Plogi Retries field</strong></td>
<td>The number of times that the system tries to log into a port after the first failure. Enter an integer between 0 and 255. The default is 8. We recommend you consult your storage array documentation for the optimal value for this parameter.</td>
</tr>
<tr>
<td><strong>Note</strong></td>
<td>This parameter only applies to a server with a VIC adapter.</td>
</tr>
<tr>
<td><strong>Plogi Timeout (ms) field</strong></td>
<td>The number of milliseconds that the system waits before it tries to log in again. Enter an integer between 1000 and 255000. The default is 20,000. We recommend you consult your storage array documentation for the optimal value for this parameter. For an HBA that is going to be used to boot a Windows OS from SAN, the recommended value for this field is 4,000 ms.</td>
</tr>
<tr>
<td><strong>Note</strong></td>
<td>This parameter only applies to a server with a VIC adapter. When a Plogi timeout value of 20 seconds or more is configured for a boot vHBA, it could lead to a SAN boot failure if the adapter does not receive an accept to the initial Plogi. For a boot-enabled vHBA, the recommended timeout values is 5 seconds or less.</td>
</tr>
<tr>
<td>Name</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Port Down Timeout (ms) field</strong></td>
<td>The number of milliseconds a remote Fibre Channel port should be offline before informing the SCSI upper layer that the port is unavailable. This parameter is important for host multi-pathing drivers and it is one of the key indicators used for error processing. Enter an integer between 0 and 240000. The default is 30,000. For a server with a VIC adapter running ESX, the recommended value is 10,000. For a server with a port that is going to be used to boot a Windows OS from SAN, the recommended value for this field is 5000 milliseconds. We recommend you consult your storage array documentation for the optimal value for this parameter. <strong>Note</strong> This parameter only applies to a server with a VIC adapter.</td>
</tr>
<tr>
<td><strong>IO Retry Timeout (seconds)</strong></td>
<td>The number of seconds that the FC adapter waits before aborting the pending command and resending the same IO. This happens when the network device does not responding to an IO request within the specified time. Enter an integer between 0 and 59 seconds. The default IO retry timeout is 5 seconds.</td>
</tr>
<tr>
<td><strong>Port Down IO Retry field</strong></td>
<td>The number of times an IO request to a port is returned because the port is busy before the system decides the port is unavailable. Enter an integer between 0 and 255. The default is 8. We recommend you consult your storage array documentation for the optimal value for this parameter. <strong>Note</strong> This parameter only applies to a server with a VIC adapter running Windows.</td>
</tr>
<tr>
<td><strong>Link Down Timeout (ms) field</strong></td>
<td>The number of milliseconds the uplink port should be offline before it informs the system that the uplink port is down and fabric connectivity has been lost. Enter an integer between 0 and 240000. The default is 30,000. We recommend you consult your storage array documentation for the optimal value for this parameter. <strong>Note</strong> This parameter only applies to a server with a VIC adapter running Windows.</td>
</tr>
</tbody>
</table>
### IO Throttle Count field

The maximum number of data or control I/O operations that can be pending in the vHBA at one time. If this value is exceeded, the additional I/O operations wait in the queue until the number of pending I/O operations decreases and the additional operations can be processed.

**Note**  
This parameter is not the same as the LUN queue depth, which is controlled by Cisco UCS Manager based on the operating system installed on the server.

Enter an integer between 256 and 1024. The default is 256. We recommend you consult your storage array documentation for the optimal value for this parameter.

### Max LUNs Per Target field

The maximum number of LUNs that the Fibre Channel driver will export or show. The maximum number of LUNs is usually controlled by the operating system running on the server.

Enter an integer between 1 and 1024. The default value is 256. For servers running ESX or Linux, the recommended value is 1024.

We recommend you consult your operating system documentation for the optimal value for this parameter.

**Note**  
• This parameter only applies to a server with a VIC adapter or a network adapter.

### LUN Queue Depth field

The number of commands that the HBA can send and receive in a single transmission per LUN.

Enter an integer between 1 and 254. The default LUN queue depth is 20.

### Interrupt Mode radio button

The method used to send interrupts to the operating system from the driver. This can be one of the following:

- **MSI-X**—Message Signaled Interrupts (MSI) with the optional extension. We recommend that you select this option if the operating system on the server supports it.

- **MSI**—MSI only.

- **INTx**—PCI INTx interrupts.

**Note**  
This parameter only applies to a server with a VIC adapter or a network adapter running an operating system other than Windows. The Windows operating system ignores this parameter.

**Step 8**  
Click OK.

**Step 9**  
If a confirmation dialog box displays, click Yes.
Deleting a Fibre Channel Adapter Policy

Procedure

Step 1  In the Navigation pane, click SAN.
Step 2  Expand SAN > Policies > Organization_Name.
Step 3  Expand the Fibre Channel Policies node.
Step 4  Right-click the policy you want to delete and choose Delete.
Step 5  If a confirmation dialog box displays, click Yes.

About the Default vHBA Behavior Policy

Default vHBA Behavior Policy

Default vHBA behavior policy allow you to configure how vHBAs are created for a service profile. You can choose to create vHBAs manually, or you can allow them to be created automatically.

You can configure the default vHBA behavior policy to define how vHBAs are created. This can be one of the following:

• None—Cisco UCS Manager does not create default vHBAs for a service profile. All vHBAs must be explicitly created.

• HW Inherit—If a service profile requires vHBAs and none have been explicitly defined, Cisco UCS Manager creates the required vHBAs based on the adapter installed in the server associated with the service profile.

Note

If you do not specify a default behavior policy for vHBAs, none is used by default.

Configuring a Default vHBA Behavior Policy

Procedure

Step 1  In the Navigation pane, click SAN.
Step 2  Expand SAN > Policies.
Step 3  Expand the root node.

You can configure only the default vHBA behavior policy in the root organization. You cannot configure the default vHBA behavior policy in a sub-organization.

Step 4  Click Default vHBA Behavior.
Step 5  On the General Tab, in the Properties area, click one of the following radio buttons in the Action field:

- **None**—Cisco UCS Manager does not create default vHBAs for a service profile. All vHBAs must be explicitly created.

- **HW Inherit**—If a service profile requires vHBAs and none have been explicitly defined, Cisco UCS Manager creates the required vHBAs based on the adapter installed in the server associated with the service profile.

Step 6  Click Save Changes.

---

**SAN Connectivity Policies**

### About the LAN and SAN Connectivity Policies

Connectivity policies determine the connections and the network communication resources between the server and the LAN or SAN on the network. These policies use pools to assign MAC addresses, WWNs, and WWPNs to servers and to identify the vNICs and vHBAs that the servers use to communicate with the network.

---

**Note**  We do not recommend that you use static IDs in connectivity policies, because these policies are included in service profiles and service profile templates and can be used to configure multiple servers.

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### Privileges Required for LAN and SAN Connectivity Policies

Connectivity policies enable users without network or storage privileges to create and modify service profiles and service profile templates with network and storage connections. However, users must have the appropriate network and storage privileges to create connectivity policies.

#### Privileges Required to Create Connectivity Policies

Connectivity policies require the same privileges as other network and storage configurations. For example, you must have at least one of the following privileges to create connectivity policies:

- **admin**—Can create LAN and SAN connectivity policies
- **ls-server**—Can create LAN and SAN connectivity policies
- **ls-network**—Can create LAN connectivity policies
- **ls-storage**—Can create SAN connectivity policies

#### Privileges Required to Add Connectivity Policies to Service Profiles

After the connectivity policies have been created, a user with **ls-compute** privileges can include them in a service profile or service profile template. However, a user with only **ls-compute** privileges cannot create connectivity policies.
Interactions between Service Profiles and Connectivity Policies

You can configure the LAN and SAN connectivity for a service profile through either of the following methods:

- LAN and SAN connectivity policies that are referenced in the service profile
- Local vNICs and vHBAs that are created in the service profile
- Local vNICs and a SAN connectivity policy
- Local vHBAs and a LAN connectivity policy

Cisco UCS maintains mutual exclusivity between connectivity policies and local vNIC and vHBA configuration in the service profile. You cannot have a combination of connectivity policies and locally created vNICs or vHBAs. When you include a LAN connectivity policy in a service profile, all existing vNIC configuration is erased, and when you include a SAN connectivity policy, all existing vHBA configuration in that service profile is erased.

Creating a SAN Connectivity Policy

Procedure

Step 1  In the Navigation pane, click SAN.
Step 2  Expand SAN > Policies.
Step 3  Expand the node for the organization where you want to create the policy.
        If the system does not include multitenancy, expand the root node.
Step 4  Right-click SAN Connectivity Policies and choose Create SAN Connectivity Policy.
Step 5  In the Create SAN Connectivity Policy dialog box, enter a name and optional description.
Step 6  From the WWNN Assignment drop-down list in the World Wide Node Name area, choose one of the following:
        • Choose Select (pool default used by default) to use the default WWN pool.
        • Choose one of the options listed under Manual Using OUI and then enter the WWN in the World Wide Node Name field.
          You can specify a WWNN in the range from 20:00:00:00:00:00:00:00 to 20:FF:FF:FF:FF:FF:FF:FF or from 50:00:00:00:00:00:00:00 to 5F:FF:FF:FF:FF:FF:FF:FF. You can click the here link to verify that the WWNN you specified is available.
        • Choose a WWN pool name from the list to have a WWN assigned from the specified pool. Each pool name is followed by two numbers in parentheses that show the number of WWNs still available in the pool and the total number of WWNs in the pool.
Step 7  In the vHBAs table, click Add.
Step 8  In the Create vHBAs dialog box, enter the name and optional description.
Step 9  Choose the Fabric ID, Select VSAN, Pin Group, Persistent Binding, and Max Data Field Size.
        You can also create a VSAN or SAN pin group from this area.
Creating a vHBA for a SAN Connectivity Policy

Procedure

Step 1  In the Navigation pane, click SAN.
Step 2  On the SAN tab, expand SAN > Policies > Organization_Name > San Connectivity Policies.
Step 3  Choose the policy for which you want to create a vHBA.
Step 4  In the Work pane, click the General tab.
Step 5  In the table icon bar, click the + button.
Step 6  In the Create vHBAs dialog box, enter the name and optional description.
Step 7  Choose the Fabric ID, Select VSAN, Pin Group, Persistent Binding, and Max Data Field Size.
You can also create a VSAN or SAN pin group from this area.
Step 8  In the Operational Parameters area, choose the Stats Threshold Policy.
Step 9  In the Adapter Performance Profile area, choose the Adapter Policy and QoS Policy.
You can also create a fibre channel adapter policy or QoS policy from this area.
Step 10 Click Save Changes.

Deleting a vHBA from a SAN Connectivity Policy

Procedure

Step 1  In the Navigation pane, click SAN.
Step 2  Expand SAN > Policies > Organization_Name.
Step 3  Choose the policy from which you want to delete the vHBA.
Step 4  In the Work pane, click the General tab.
Step 5  In the vHBAs table, do the following:
   a) Click the vHBA that you want to delete.
b) On the icon bar, click Delete.

Step 6 If a confirmation dialog box displays, click Yes.

---

Creating an Initiator Group for a SAN Connectivity Policy

Procedure

Step 1 In the Navigation pane, click SAN.

Step 2 Expand SAN > Policies > Organization_Name.

Step 3 Choose the policy for which you want to create an initiator group.

Step 4 In the Work pane, click the vHBA Initiator Groups tab.

Step 5 In the table icon bar, click the + button.

Step 6 In the Create vHBA Initiator Group dialog box, complete the following fields:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name field</td>
<td>The name of the vHBA initiator group. This name can be between 1 and 16</td>
</tr>
<tr>
<td></td>
<td>alphanumeric characters. You cannot use spaces or any special characters</td>
</tr>
<tr>
<td></td>
<td>other than - (hyphen), _ (underscore), : (colon), and . (period), and you</td>
</tr>
<tr>
<td></td>
<td>cannot change this name after the object is saved.</td>
</tr>
<tr>
<td>Description field</td>
<td>A description of the group. Enter up to 256 characters. You can use any</td>
</tr>
<tr>
<td></td>
<td>characters or spaces except ‘ (accent mark), \ (backslash), ^ (carat), ”</td>
</tr>
<tr>
<td></td>
<td>(double quote), = (equal sign), &gt; (greater than), &lt; (less than), or ’</td>
</tr>
<tr>
<td></td>
<td>(single quote).</td>
</tr>
<tr>
<td>Select vHBA Initiators table</td>
<td>Check the check box in the Select column for each vHBA that you want to use.</td>
</tr>
<tr>
<td>Storage Connection Policy drop-down list</td>
<td>The storage connection policy associated with this vHBA initiator group. If you want to:</td>
</tr>
<tr>
<td></td>
<td>• Use an existing storage connection policy, then choose that policy from</td>
</tr>
<tr>
<td></td>
<td>the drop-down list. The Cisco UCS Manager GUI displays information about</td>
</tr>
<tr>
<td></td>
<td>the policy and its FC target endpoints in the Global Storage Connection</td>
</tr>
<tr>
<td></td>
<td>Policy area. Create a new storage connection policy that will be globally</td>
</tr>
<tr>
<td></td>
<td>available, then click the Create Storage Connection Policy link.</td>
</tr>
<tr>
<td></td>
<td>• Create a local storage connection policy that is available only to this</td>
</tr>
<tr>
<td></td>
<td>vHBA initiator group, then choose the Specific Storage Connection Policy</td>
</tr>
<tr>
<td></td>
<td>option. The Cisco UCS Manager GUI displays the Specific Storage Connection</td>
</tr>
<tr>
<td></td>
<td>Policy area that allows you to configure the local storage connection policy.</td>
</tr>
</tbody>
</table>

---

Cisco UCS Manager Storage Management Guide, Release 3.1
Click this link to create a new storage connection policy that will be available to all service profiles and service profile templates.

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create Storage Connection Policy link</td>
<td>Click this link to create a new storage connection policy that will be available to all service profiles and service profile templates.</td>
</tr>
</tbody>
</table>

Step 7 Click OK.

Deleting an Initiator Group from a SAN Connectivity Policy

Procedure

Step 1 In the Navigation pane, click SAN.
Step 2 Expand SAN > Policies > Organization_Name.
Step 3 Choose the policy from which you want to delete the initiator group.
Step 4 In the Work pane, click the vHBA Initiator Groups tab.
Step 5 In the table, do the following:
  a) Click the initiator group that you want to delete.
  b) On the icon bar, click Delete.
Step 6 If a confirmation dialog box displays, click Yes.

Deleting a SAN Connectivity Policy

If you delete a SAN connectivity policy that is included in a service profile, it also deletes all vHBAs from that service profile and disrupts SAN data traffic for the server associated with the service profile.

Procedure

Step 1 In the Navigation pane, click SAN.
Step 2 Expand SAN > Policies > Organization_Name.
Step 3 Expand the SAN Connectivity Policies node.
Step 4 Right-click the policy that you want to delete and choose Delete.
Step 5 If a confirmation dialog box displays, click Yes.
CHAPTER 10

SED Security Policies

- Security Policies for Self-Encrypting Drives, on page 77
- Security Flags of the Controller and Disk, on page 78
- Managing Local Security Policies, on page 78
- KMIP Client Certificate Policy, on page 80
- Managing Remote Security Policies, on page 82
- Enabling and Disabling Security on Disks, on page 84
- Disabling Security on a Controller, on page 84
- Unlocking a Locked Disk, on page 85
- Erasing a Secure Foreign Configuration Disk, on page 85

Security Policies for Self-Encrypting Drives

Self-Encrypting Drives (SEDs) have special hardware that encrypts incoming data and decrypts outgoing data in real-time. The data on the disk is always encrypted in the disk and stored in the encrypted form. The encrypted data is always decrypted on the way out of the disk. A media encryption key controls this encryption and decryption. This key is never stored in the processor or memory. Cisco UCS Manager supports SED security policies on Cisco UCS C-Series servers and S-Series servers.

SEDs must be locked by providing a security key. The security key, which is also known as Key-Encryption Key or an authentication passphrase, is used to encrypt the media encryption key. If the disk is not locked, no key is required to fetch the data.

Cisco UCS Manager enables you to configure security keys locally or remotely. When you configure the key locally, you must remember the key. If you forget the key, it cannot be retrieved, and the data is lost. You can configure the key remotely by using a key management server (also known as KMIP server). This method addresses the issues related to safe-keeping and retrieval of the keys in the local management.

The encryption and decryption for SEDs is done through the hardware. Thus, it does not affect the overall system performance. SEDs reduce the disk retirement and redeployment costs through instantaneous cryptographic erasure. Cryptographic erasure is done by changing the media encryption key. When the media encryption key of a disk is changed, the data on the disk cannot be decrypted, and is immediately rendered unusable. With Cisco UCS Manager Release 3.1(3), SEDs offer disk theft protection for C-Series and S-Series servers. For HX servers, SEDs offer node theft protection.
Security Flags of the Controller and Disk

Security flags indicate the current security status of the storage controller and disks.

The storage controller and disks have the following security flags:

- **Security Capable**—Indicates that the controller or disk is capable of supporting SED management.
- **Security Enable**—Indicates that the security-key is programmed on the controller or disk, and security is enabled on the device. This flag is set when you configure a security policy and associate it to a server, making the controller and disk secure. This flag is not set on an HX device.
- **Secured**—Indicates that the security-key is programmed on the controller or disk, and security is enabled on the HX device.

The following security flags are exclusive to storage disks:

- **Locked**—Indicates that the disk key does not match the key on the controller. This happens when you move disks across servers that are programmed with different keys. The data on a locked disk is inaccessible and the operating system cannot use the disk. To use this disk, you must either unlock the disk or secure erase the foreign configuration.
- **Foreign Secured**—Indicates that a secure disk is in foreign configuration. This happens when you unlock a locked disk with the right key, but the disk is in a foreign configuration state and the data on it is encrypted. To use this disk, you can either import the foreign configuration or clear the foreign config.

Managing Local Security Policies

Creating a Local Security Policy

**Before you begin**

You can create a local policy on a new or existing storage profile.

**Procedure**

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>In the Navigation pane, click <strong>Storage &gt; Storage Profiles</strong>.</td>
</tr>
<tr>
<td>Step 2</td>
<td>Choose the storage profile where you want to create the policy.</td>
</tr>
<tr>
<td>Step 3</td>
<td>Click the <strong>Security Policy</strong> tab and then click <strong>Create Security Policy</strong> or right-click the storage profile and select <strong>Create Security Policy</strong>.</td>
</tr>
</tbody>
</table>
| Step 4 | Click the **Local Policy** option.  
  a) Enter **Key**.  
    
    The key must consist of 32 alphanumeric characters.  
  b) Click **OK**. |
What to do next

The key thus created is associated to the storage profile for that server and is deployed under storage controller. To verify this, go to Server ID > Inventory > Storage > Controller and select a SAS storage controller. Go to the General tab and check whether the Security field shows as drive security enable.

Modifying a Local Security Policy

Procedure

Step 1  In the Navigation pane, click Storage > Storage Profiles.
Step 2  Choose the storage profile where you have created the policy.
Step 3  Click the Security Policy tab.
Step 4  (Optional) To modify the key for the local policy, in the Local Policy area:
   a) Enter a new security key for the database in the Key field.
   b) Enter the current security key for the database in the Deployed Key field.
Step 5  (Optional) To change the security policy from Local Policy to Remote Policy:
   a) Click the Remote Policy option.
   b) Enter the primary server details in the IP Address/Hostname field.
   c) (Optional) Enter the secondary server details in the IP Address/Hostname field.
   d) (Optional) Enter the current security key for the database in the Deployed Key field.
   e) (Optional) Enter the port number of the server in the Port field.
   f) Enter the contents of the KMIP certificate in the KMIP Server Public Certificate field.
   g) (Optional) Enter user credentials by clicking Add Login Details.
Step 6  Click Save Changes.

Inserting a Secured Disk into a Server with a Local Security Policy

When you insert a secured disk into a server, one of the following will occur:

- The security-key on the drive matches that of the server and it automatically gets unlocked.

- The security-key on the disk is different from the security-key on the server. The disk will appear as a locked disk. You can do one of the following on a locked disk:
  - Erase the secure foreign configuration to delete all data on the disk.
  - Unlock the disk by providing the correct key of the disk. After unlocking the disk, the disk will be in the Foreign Secured state. You must immediately import or clear the foreign configuration for these disks.

Note  If you unlock another set of disks before importing the foreign configuration for the current set of disks, the current set of disks become locked again and go in to the Locked state.
KMIP Client Certificate Policy

You can configure the key remotely by using a key management server, which is also known as KMIP server. You must create a KMIP client certificate policy before creating a remote policy. The hostname that is used for generating the certificate is the serial number of the KMIP server.

You can create a certificate policy from two separate scopes:

• Global scope—You can initially create a global certificate policy in this scope. Any modification of the certificate in this scope will not result in the regeneration of the certificate.

• Server scope—You can create or modify a certificate policy in this scope. This will result in a regeneration of the certificates. Such a certificate is specific to the server, and, for this server, overrides the global certificate.

After you create a KMIP client certificate policy, do one of the following:

• Copy the generated certificate to the KMIP Server.

• Use the generated Certificate Signing Request to get a CA-signed certificate. Copy this CA-signed certificate to the CIMC.

Creating a Global KMIP Client Certificate Policy

You can create a global KMIP client certificate policy.

The hostname that used to create the certificate when using this policy is the serial number of the server.

Procedure

<table>
<thead>
<tr>
<th>Step 1</th>
<th>In the Navigation pane, click Equipment.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 2</td>
<td>In the Work pane, click the Policies tab.</td>
</tr>
<tr>
<td>Step 3</td>
<td>Click the Security subtab.</td>
</tr>
<tr>
<td>Step 4</td>
<td>Click Create KMIP Client Cert Policy.</td>
</tr>
<tr>
<td>Step 5</td>
<td>In the Create KMIP Client Cert Policy dialog box that appears, enter the following information:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Country Code</strong></td>
<td>The country code corresponding to the country in which the company resides.</td>
</tr>
<tr>
<td></td>
<td>Enter two alphabetic characters in upper case.</td>
</tr>
<tr>
<td><strong>State</strong></td>
<td>The state or province in which the company requesting the certificate is headquartered.</td>
</tr>
<tr>
<td></td>
<td>Enter up to 32 characters.</td>
</tr>
</tbody>
</table>
Creating a KMIP Client Certificate Policy for a Server

You can create a KMIP client certificate policy for a server. This certificate is applicable only to the specific server, and overrides the global KMIP client certificate.

The hostname that used to create the certificate when using this policy is the serial number of the server.

**Procedure**

**Step 1** In the **Navigation** pane, click **Equipment**.
**Step 2** Expand **Equipment > Rack-Mounts > Servers > Server ID**.
**Step 3** In the **Work** pane, click the **Inventory** tab and then the **Storage** subtab.
**Step 4** Click the **Security** subtab.
**Step 5** Click **Create KMIP Client Cert Policy**.
**Step 6** In the **Create KMIP Client Cert Policy** dialog box that appears, enter the following information:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Country Code</td>
<td>The country code corresponding to the country in which the company resides. Enter two alphabetic characters in upper case.</td>
</tr>
<tr>
<td>State</td>
<td>The state or province in which the company requesting the certificate is headquartered. Enter up to 32 characters.</td>
</tr>
<tr>
<td>Name</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Locality</td>
<td>The city or town in which the company requesting the certificate is headquartered. Enter up to 32 characters.</td>
</tr>
<tr>
<td>Organization Name</td>
<td>The organization requesting the certificate.</td>
</tr>
<tr>
<td>Organization Unit Name</td>
<td>The organizational unit.</td>
</tr>
<tr>
<td>Email</td>
<td>The email address associated with the request.</td>
</tr>
<tr>
<td>Validity</td>
<td>The validity period of the certificate.</td>
</tr>
</tbody>
</table>

**Step 7**  
Click OK.

---

## Managing Remote Security Policies

### Creating a Remote Security Policy

You can create a remote policy on a new or existing storage profile.

**Before you begin**

Ensure that you have created a KMIP client certificate policy.

**Procedure**

**Step 1**  
In the Navigation pane, click Storage > Storage Profiles.

**Step 2**  
Choose the storage profile where you want to create the policy.

**Step 3**  
Click the Security Policy tab and then click Create Security Policy or right-click the storage profile and select Create Security Policy.

**Step 4**  
Click the Remote Policy option.

a) Enter the primary server details in the IP Address/Hostname field.

b) (Optional) Enter the secondary server details in the IP Address/Hostname field.

c) (Optional) Enter the port number of the server in the Port field.

d) Enter the contents of the KMIP certificate in the KMIP Server Public Certificate field.

e) (Optional) Enter user credentials by clicking Add Login Details.

f) Click OK.
A message that policy was created successfully is displayed.

What to do next
The key thus created is associated to the storage profile for that server and is deployed under storage controller. To verify this, go to Server ID > Inventory > Storage > Controller and select a SAS storage controller. Go to General tab and check whether the Security field shows as drive security enable.

Modifying a Remote Security Policy

Procedure

Step 1 In the Navigation pane, click Storage > Storage Profiles.
Step 2 Choose the storage profile where you have created the policy.
Step 3 Click the Security Policy tab.
Step 4 To modify the remote policy, in the Remote Policy area:
   a) Enter the primary server details in the IP Address/Hostname field.
   b) (Optional) Enter the secondary server details in the IP Address/Hostname field.
   c) (Optional) Enter the port number of the server in the Port field.
   d) Enter the contents of the KMIP certificate in the KMIP Server Public Certificate field.
      Save this certificate from the browser in base-64 format.
   e) (Optional) Enter user credentials by clicking Add Login Details.
Step 5 To change the security policy from Remote Policy to Local Policy:
   a) Click the Local Policy option.
   b) Enter a new security key for the controller in the Key field.
Step 6 Click Save Changes.

Modifying a Remote Security Key

Procedure

Step 1 In the Navigation pane, click Equipment.
Step 2 Expand Equipment > Rack-Mounts > Servers > Server ID.
Step 3 In the Work area, click the Inventory tab.
Step 4 Click the Storage subtab.
Step 5 In the Controllers tab, select a SAS controller.
Inserting a Secured Disk into a Server with a Remote Security Policy

When you insert a secured disk into a server with a remote security policy, the storage disk will appear as a locked disk. Do one of the following:

- Unlock the disk manually with the local key if the disk was previously locked using the local key.
- Unlock using the remote KMIP server.

When you move a secured disk from a server with a local security policy to a server with a remote security policy, the disk will come up as locked. Unlock the disk manually with the local key.

Enabling and Disabling Security on Disks

**Before you begin**

- To enable security on a disk, ensure that the disk is a JBOD.
- To secure erase a disk, the disk must be in an unconfigured good state.

**Procedure**

1. In the **Navigation** pane, click **Equipment**.
2. Expand **Equipment** > **Rack-Mounts** > **Servers** > **Server ID**.
3. In the **Work** area, click the **Inventory** tab.
4. Click the **Storage** subtab.
5. In the **Disks** tab, select a disk.
6. In the **Details** area, click **Enable Encryption**.
7. To disable a secure disk, click **Secure Erase**.

Disabling Security on a Controller

**Before you begin**

You can disable security only on SAS controllers. To disable security on controller, you must first disable security on all the secure disks and and delete all the secure virtual drives under the controller.
Unlocking a Locked Disk

When the key of an SED does not match the key on the controller, it shows the disk as Locked, Foreign Secure. You must unlock the disks either by providing the security-key for that disk, or by using the remote KMIP server. After unlocking the disk, import or clear the foreign configuration.

Procedure

Step 1 In the Navigation pane, click Equipment.
Step 2 Expand Equipment > Rack-Mounts > Servers > Server ID.
Step 3 In the Work area, click the Inventory tab.
Step 4 Click the Storage subtab.
Step 5 In the Controllers tab, select a SAS controller.
Step 6 In the General tab, click Disable Security.

Step 7 To unlock a disk that is secured with a local security policy:
   a) In the General tab, click Unlock Disk.
   b) In the Key text box, provide the key that was used to lock the disk.
   c) Click OK.

Step 7 To unlock a disk that is secured with a remote KMIP server, in the General tab, click Unlock For Remote.

After you unlock a locked disk, the security status of the disk will show as Foreign Secure.

What to do next
Import or clear foreign configuration.

Erasing a Secure Foreign Configuration Disk

You can erase a secure foreign configuration disk when you have a disk in locked state and you want to use the disk without accessing the existing data.
**Procedure**

<table>
<thead>
<tr>
<th>Step 1</th>
<th>In the Navigation pane, click Equipment.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 2</td>
<td>Expand Equipment &gt; Rack-Mounts &gt; Servers &gt; Server ID.</td>
</tr>
<tr>
<td>Step 3</td>
<td>In the Work area, click the Inventory tab.</td>
</tr>
<tr>
<td>Step 4</td>
<td>Click the Storage subtab.</td>
</tr>
<tr>
<td>Step 5</td>
<td>In the Disks tab, select a disk.</td>
</tr>
<tr>
<td>Step 6</td>
<td>In the General tab, click Secure Erase Foreign Configuration.</td>
</tr>
</tbody>
</table>
Storage Profiles

To allow flexibility in defining the number of storage disks, roles and usage of these disks, and other storage parameters, you can create and use storage profiles. A storage profile encapsulates the storage requirements for one or more service profiles. LUNs configured in a storage profile can be used as boot LUNs or data LUNs, and can be dedicated to a specific server. You can also specify a local LUN as a boot device. However, LUN resizing is not supported. The introduction of storage profiles allows you to do the following:

• Configure multiple virtual drives and select the physical drives that are used by a virtual drive. You can also configure the storage capacity of a virtual drive.

• Configure the number, type and role of disks in a disk group.

• Associate a storage profile with a service profile.

You can create a storage profile both at an org level and at a service-profile level. A service profile can have a dedicated storage profile as well as a storage profile at an org level.
Disk Groups and Disk Group Configuration Policies

Servers in a chassis can use storage that is centralized in that chassis. You can select and configure the disks to be used for storage. A logical collection of these physical disks is called a disk group. Disk groups allow you to organize local disks. The storage controller controls the creation and configuration of disk groups.

A disk group configuration policy defines how a disk group is created and configured. The policy specifies the RAID level to be used for the disk group. It also specifies either a manual or an automatic selection of disks for the disk group, and roles for disks. You can use a disk group policy to manage multiple disk groups. However, a single disk group can be managed only by one disk group policy.

A hot spare is an unused extra disk that can be used by a disk group in the case of failure of a disk in the disk group. Hot spares can be used only in disk groups that support a fault-tolerant RAID level. In addition, a disk can be allocated as a global hot spare, which means that it can be used by any disk group.

Virtual Drives

A disk group can be partitioned into virtual drives. Each virtual drive appears as an individual physical device to the Operating System.

All virtual drives in a disk group must be managed by using a single disk group policy.

Configuration States

Indicates the configuration states of a virtual drive. Virtual drives can have the following configuration states:

- Applying—Creation of the virtual drive is in progress.
- Applied—Creation of the virtual drive is complete, or virtual disk policy changes are configured and applied successfully.
- Failed to apply—Creation, deletion, or renaming of a virtual drive has failed due to errors in the underlying storage subsystem.
- Orphaned—The service profile that contained this virtual drive is deleted or the service profile is no longer associated with a storage profile.
- Not in use—The service profile that contained this virtual drive is in the disassociated state.

Deployment States

Indicates the actions that you are performing on virtual drives. Virtual drives can have the following deployment states:

- No action—No pending work items for the virtual drive.
- Creating—Creation of the virtual drive is in progress.
- Deleting—Deletion of the virtual drive is in progress.
- Modifying—Modification of the virtual drive is in progress.
- Apply-Failed—Creation or modification of the virtual drive has failed.
Operability States

Indicates the operating condition of a virtual drive. Virtual drives can have the following operability states:

- **Optimal**—The virtual drive operating condition is good. All configured drives are online.
- **Degraded**—The virtual drive operating condition is not optimal. One of the configured drives has failed or is offline.
- **Cache-degraded**—The virtual drive has been created with a write policy of write back mode, but the BBU has failed, or there is no BBU.

Note: This state does not occur if you select the always write back mode.

- **Partially degraded**—The operating condition in a RAID 6 virtual drive is not optimal. One of the configured drives has failed or is offline. RAID 6 can tolerate up to two drive failures.
- **Offline**—The virtual drive is not available to the RAID controller. This is essentially a failed state.
- **Unknown**—The state of the virtual drive is not known.

Presence States

Indicates the presence of virtual drive components. Virtual drives have the following presence states:

- **Equipped**—The virtual drive is available.
- **Mismatched**—A virtual drive deployed state is different from its configured state.
- **Missing**—Virtual drive is missing.

Configuring a Disk Group Policy

You can configure the disks in a disk group policy automatically or manually.

Procedure

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>In the Navigation pane, click Storage.</td>
</tr>
<tr>
<td>Step 2</td>
<td>Expand Storage &gt; Storage Provisioning &gt; Storage Policies</td>
</tr>
<tr>
<td>Step 3</td>
<td>Expand the node for the organization where you want to create the disk group policy.</td>
</tr>
<tr>
<td>Step 4</td>
<td>Right-click Disk Group Policies in the organization and select Create Disk Group Policy.</td>
</tr>
<tr>
<td>Step 5</td>
<td>In the Create Disk Group Policy dialog box, specify the following:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Name field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>The name of the policy</td>
</tr>
<tr>
<td></td>
<td>This name can be between 1 and 16 alphanumeric characters. You cannot use spaces or any special characters other than - (hyphen), _ (underscore), : (colon), and . (period), and you cannot change this name after the object has been saved.</td>
</tr>
</tbody>
</table>
A description of the policy. We recommend that you include information about where and when the policy should be used.

Enter up to 256 characters. You can use any characters or spaces except ` (accent mark), \ (backslash), ^ (carat), " (double quote), = (equal sign), > (greater than), < (less than), or ' (single quote).

This can be one of the following:

- RAID 0 Striped
- RAID 1 Mirrored
- RAID 5 Striped Parity
- RAID 6 Striped Dual Parity
- RAID 10 Mirrored and Striped

When you create a disk group with RAID 1 policy and configure four disks for it, a RAID 1E configuration is created internally by the storage controller.

**Step 6**

To automatically configure the disks in a disk group policy, select Disk Group Configuration (Automatic) and specify the following:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of drives</strong> field</td>
<td>Specifies the number of drives for the disk group. The range for drives is from 0 to 24 drives. <strong>Unspecified</strong> is the default number of drives. When you select the number of drives as <strong>Unspecified</strong>, the number of drives will be selected according to the disk selection process.</td>
</tr>
<tr>
<td><strong>Drive Type</strong> field</td>
<td>Drive type for the disk group. You can select:</td>
</tr>
<tr>
<td></td>
<td>- HDD</td>
</tr>
<tr>
<td></td>
<td>- SSD</td>
</tr>
<tr>
<td></td>
<td>- <strong>Unspecified</strong></td>
</tr>
<tr>
<td><strong>Unspecified</strong></td>
<td>is the default type of drive. When you select the drive type as <strong>Unspecified</strong>, the first available drive is selected. After this drive is selected, subsequent drives will be of a compatible type. For example, if the first was SSD, all subsequent drives would be SSD.</td>
</tr>
<tr>
<td><strong>Number of Hot Spares</strong> field</td>
<td>Number of dedicated hot spares for the disk group. The range for dedicated hot spares is from 0 to 24 hot spares. <strong>Unspecified</strong> is the default number of dedicated hot spares. When you select the number of dedicated hot spares as <strong>Unspecified</strong>, the hot spares will be selected according to the disk selection process.</td>
</tr>
</tbody>
</table>
### Step 7
To manually configure the disks in a disk group policy, select **Disk Group Configuration (Manual)** and do the following:

a) On the icon bar to the right of the table, click +

b) In the **Create Local Disk Configuration Reference** dialog box, complete the following fields:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slot field</td>
<td>Slot for which the local disk reference is configured.</td>
</tr>
</tbody>
</table>
| Role field         | Role of the local disk in the disk group. You can select:  
  - Normal  
  - Dedicated Hot Spare  
  - Global Hot Spare |
| Span ID field      | Span ID for the local disk. The values range from 0 to 8.  
  **Unspecified** is the default Span ID of the local disk. Use this only when spanning information is not required. |

### Step 8
In the **Virtual Drive Configuration** area, specify the following:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strip Size (KB) field</td>
<td>Stripe size for a virtual drive. This can only be <strong>Platform Default</strong>.</td>
</tr>
</tbody>
</table>
| Access Policy field   | Access policy for a virtual drive. This can be one of the following:  
  - Platform Default  
  - Read Write  
  - Read Only  
  - Blocked |
| Read Policy field     | Read policy for a virtual drive. This can be one of the following:  
  - Platform Default  
  - Read Ahead  
  - Normal |
| Write Cache Policy field | Write-cache-policy for a virtual drive. This can be one of the following: |
### RAID Levels

The RAID level of a disk group describes how the data is organized on the disk group for the purpose of ensuring availability, redundancy of data, and I/O performance.

The following are features provided by RAID:

- **Striping**—Segmenting data across multiple physical devices. This improves performance by increasing throughput due to simultaneous device access.

- **Mirroring**—Writing the same data to multiple devices to accomplish data redundancy.

- **Parity**—Storing of redundant data on an additional device for the purpose of error correction in the event of device failure. Parity does not provide full redundancy, but it allows for error recovery in some scenarios.
• Spanning—Allows multiple drives to function like a larger one. For example, four 20 GB drives can be combined to appear as a single 80 GB drive.

The supported RAID levels include the following:
• RAID 0 Striped—Data is striped across all disks in the array, providing fast throughput. There is no data redundancy, and all data is lost if any disk fails.
• RAID 1 Mirrored—Data is written to two disks, providing complete data redundancy if one disk fails. The maximum array size is equal to the available space on the smaller of the two drives.
• RAID 5 Striped Parity—Data is striped across all disks in the array. Part of the capacity of each disk stores parity information that can be used to reconstruct data if a disk fails. RAID 5 provides good data throughput for applications with high read request rates. RAID 5 distributes parity data blocks among the disks that are part of a RAID-5 group and requires a minimum of three disks.
• RAID 6 Striped Dual Parity—Data is striped across all disks in the array and two sets of parity data are used to provide protection against failure of up to two physical disks. In each row of data blocks, two sets of parity data are stored. Other than addition of a second parity block, RAID 6 is identical to RAID 5. A minimum of four disks are required for RAID 6.
• RAID 10 Mirrored and Striped—RAID 10 uses mirrored pairs of disks to provide complete data redundancy and high throughput rates through block-level striping. RAID 10 is mirroring without parity and block-level striping. A minimum of four disks are required for RAID 10.
• RAID 50 Striped Parity and Striped—Data is striped across multiple striped parity disk sets to provide high throughput and multiple disk failure tolerance.
• RAID 60 Striped Dual Parity and Striped—Data is striped across multiple striped dual parity disk sets to provide high throughput and greater disk failure tolerance.

**Automatic Disk Selection**

When you specify a disk group configuration, and do not specify the local disks in it, Cisco UCS Manager determines the disks to be used based on the criteria specified in the disk group configuration policy. Cisco UCS Manager can make this selection of disks in multiple ways.

When all qualifiers match for a set of disks, then disks are selected sequentially according to their slot number. Regular disks and dedicated hot spares are selected by using the lowest numbered slot.

The following is the disk selection process:

1. Iterate over all local LUNs that require the creation of a new virtual drive. Iteration is based on the following criteria, in order:
   1. Disk type
   2. Minimum disk size from highest to lowest
   3. Space required from highest to lowest
   4. Disk group qualifier name, in alphabetical order
5. Local LUN name, in alphabetical order

2. Select regular disks depending on the minimum number of disks and minimum disk size. Disks are selected sequentially starting from the lowest numbered disk slot that satisfies the search criteria.

---

**Note**

If you specify Any as the type of drive, the first available drive is selected. After this drive is selected, subsequent drives will be of a compatible type. For example, if the first drive was SATA, all subsequent drives would be SATA. Cisco UCS Manager Release 2.5 supports only SATA and SAS.

Cisco UCS Manager Release 2.5 does not support RAID migration.

3. Select dedicated hot spares by using the same method as normal disks. Disks are only selected if they are in an Unconfigured Good state.

4. If a provisioned LUN has the same disk group policy as a deployed virtual drive, then try to deploy the new virtual drive in the same disk group. Otherwise, try to find new disks for deployment.

---

**Supported LUN Modifications**

Some modifications that are made to the LUN configuration when LUNs are already deployed on an associated server are supported.

The following are the types of modifications that can be performed:

- Creation of a new virtual drive.
- Deletion of an existing virtual drive, which is in the orphaned state.
- Non-disruptive changes to an existing virtual drive. These changes can be made on an existing virtual drive without loss of data, and without performance degradation:
  - Policy changes. For example, changing the write cache policy.
  - Modification of boot parameters

The removal of a LUN will cause a warning to be displayed. Ensure that you take action to avoid loss of data.

---

**Unsupported LUN Modifications**

Some modifications to existing LUNs are not possible without destroying the original virtual drive and creating a new one. All data is lost in these types of modification, and these modifications are not supported.

Disruptive modifications to an existing virtual drive are not supported. The following are unsupported disruptive changes:

- Any supported RAID level change that can be handled through reconstruction. For example, RAID0 to RAID1.
- Increasing the size of a virtual drive through reconstruction.
- Addition and removal of disks through reconstruction.
• **Expand To Available** option is not supported for already deployed LUN.

Destructive modifications are also not supported. The following are unsupported destructive modifications:

• RAID-level changes that do not support reconstruction. For example, RAID5 to RAID1.

• Shrinking the size of a virtual drive.

• RAID-level changes that support reconstruction, but where there are other virtual drives present on the same drive group.

• Disk removal when there is not enough space left on the disk group to accommodate the virtual drive.

• Explicit change in the set of disks used by the virtual drive.

---

## Disk Insertion Handling

When the following sequence of events takes place:

1. The LUN is created in one of the following ways:
   1. You specify the slot specifically by using a local disk reference
   2. The system selects the slot based on criteria specified by you

2. The LUN is successfully deployed, which means that a virtual drive is created, which uses the slot.

3. You remove a disk from the slot, possibly because the disk failed.

4. You insert a new working disk into the same slot.

The following scenarios are possible:

- Non-Redundant Virtual Drives, on page 95
- Redundant Virtual Drives with No Hot Spare Drives, on page 96
- Redundant Virtual Drives with Hot Spare Drives, on page 96
- Replacing Hot Spare Drives, on page 96
- Inserting Physical Drives into Unused Slots, on page 96

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### Non-Redundant Virtual Drives

For non-redundant virtual drives (RAID 0), when a physical drive is removed, the state of the virtual drive is **Inoperable**. When a new working drive is inserted, the new physical drive goes to an **Unconfigured Good** state.

For non-redundant virtual drives, there is no way to recover the virtual drive. You must delete the virtual drive and re-create it.
Redundant Virtual Drives with No Hot Spare Drives

For redundant virtual drives (RAID 1, RAID 5, RAID 6, RAID 10, RAID 50, RAID 60) with no hot spare drives assigned, virtual drive mismatch, virtual drive member missing, and local disk missing faults appear until you insert a working physical drive into the same slot from which the old physical drive was removed.

If the physical drive size is greater than or equal to that of the old drive, the storage controller automatically uses the new drive for the virtual drive. The new drive goes into the Rebuilding state. After rebuild is complete, the virtual drive goes back into the Online state.

Redundant Virtual Drives with Hot Spare Drives

For redundant virtual drives (RAID 1, RAID 5, RAID 6, RAID 10, RAID 50, RAID 60) with hot spare drives assigned, when a drive fails, or when you remove a drive, the dedicated hot spare drive, if available, goes into the Rebuilding state with the virtual drive in the Degraded state. After rebuilding is complete, that drive goes to the Online state.

Cisco UCSM raises a disk missing and virtual drive mismatch fault because although the virtual drive is operational, it does not match the physical configuration that Cisco UCSM expects.

If you insert a new disk in the slot with the disk missing, automatic copy back starts from the earlier hot spare disk to the newly inserted disk. After copy back, the hot spare disk is restored. In this state all faults are cleared.

If automatic copy back does not start, and the newly inserted disk remains in the Unconfigured Good, JBOD, or Foreign Configuration state, remove the new disk from the slot, reinsert the earlier hot spare disk into the slot, and import foreign configuration. This initiates the rebuilding process and the drive state becomes Online. Now, insert the new disk in the hot spare slot and mark it as hot spare to match it exactly with the information available in Cisco UCSM.

Replacing Hot Spare Drives

If a hot spare drive is replaced, the new hot spare drive will go to the Unconfigured Good, Unconfigured Bad, JBOD, or Foreign Configuration state.

Cisco UCSM will raise a virtual drive mismatch or virtual drive member mismatch fault because the hot spare drive is in a state different from the state configured in Cisco UCSM.

You must manually clear the fault. To do this, you must perform the following actions:

1. Clear the state on the newly inserted drive to Unconfigured Good.
2. Configure the newly inserted drive as a hot spare drive to match what is expected by Cisco UCSM.

Inserting Physical Drives into Unused Slots

If you insert new physical drives into unused slots, neither the storage controller nor Cisco UCSM will make use of the new drive even if the drive is in the Unconfigured Good state and there are virtual drives that are missing good physical drives.

The drive will simply go into the Unconfigured Good state. To make use of the new drive, you will need to modify or create LUNs to reference the newly inserted drive.
Virtual Drive Naming

When you use Cisco UCS Manager to create a virtual drive, Cisco UCS Manager assigns a unique ID that can be used to reliably identify the virtual drive for further operations. Cisco UCS Manager also provides the flexibility to provide a name to the virtual drive at the time of service profile association. Any virtual drive without a service profile or a server reference is marked as an orphan virtual drive.

In addition to a unique ID, a name is assigned to the drive. Names can be assigned in two ways:

- When configuring a virtual drive, you can explicitly assign a name that can be referenced in storage profiles.
- If you have not preprovisioned a name for the virtual drive, Cisco UCS Manager generates a unique name for the virtual drive.

You can rename virtual drives that are not referenced by any service profile or server.

LUN Dereferencing

A LUN is dereferenced when it is no longer used by any service profile. This can occur as part of the following scenarios:

- The LUN is no longer referenced from the storage profile
- The storage profile is no longer referenced from the service profile
- The server is disassociated from the service profile
- The server is decommissioned

When the LUN is no longer referenced, but the server is still associated, re-association occurs.

When the service profile that contained the LUN is disassociated, the LUN state is changed to **Not in use**.

When the service profile that contained the LUN is deleted, the LUN state is changed to **Orphaned**.

Controller Constraints and Limitations

- For Cisco UCS C240, C220, C24, and C22 servers, each storage controller supports 24 virtual drives. For all other servers, each storage controller supports 16 virtual drives.

- In Cisco UCS Manager Release 2.2(4), blade servers do not support drives with a block size of 4K, but rack-mount servers support such drives. If a drive with a block size of 4K is inserted into a blade server, discovery fails and the following error message appears: *Unable to get Scsi Device Information from the system.*

- In Cisco UCS Manager Release 3.1(2) and later releases, RAID Controller that does not support Out of band inventory (OOB) in C240 M4 servers, display Operability as **NA** and Drive State as **Unknown**.
Storage Profiles

Creating a Storage Profile

You can create storage profile policies from the Storage tab in the Navigation pane. Additionally, you can also configure the default storage profile that is specific to a service profile from the Servers tab.

Caution

If you have a Cisco UCS blade or rack server with a default local disk configuration present in a Service Profile or Service Profile Template from an earlier release of UCS Manager and you upgrade to the 3.1 release and later releases, you can successfully create a Storage Profile with local LUNs in the same Service Profile or Service Profile Template if you change the Local Disk Configuration Default policy to Any Configuration instead of RAID level options in the local disk policy. The legacy LUN is thereafter part of the storage inventory.

Procedure

Step 1  In the Navigation pane, click Storage.
Step 2  Expand Storage > Storage Profiles
Step 3  Expand the node for the organization where you want to create the storage profile.
If the system does not include multitenancy, expand the root node.
Step 4  Right-click the organization and select Create Storage Profile.
Step 5  In the Create Storage Profile dialog box, specify the storage profile Name. You can provide an optional Description for this storage profile.
Step 6  (Optional) In the LUNs area, create Local LUNs and add them to this storage profile.
See Configuring Local LUNs, on page 99 for more information.
Step 7  In the LUNs area, create Controller Definitions and add them to this storage profile.
See Creating a Storage Profile PCH Controller Definition, on page 103 for more information.
Step 8  In the LUNs area, create Security Policy and add them to this storage profile.
See Creating a Local Security Policy, on page 78 and Creating a Remote Security Policy, on page 82 for more information.
Step 9  Click OK.
Creating a Specific Storage Profile

Procedure

**Step 1** Expand Servers > Service Profiles.

**Step 2** Expand the node for the organization that contains the service profile for which you want to create a specific storage profile.

If the system does not include multitenancy, expand the root node.

**Step 3** Choose the service profile for which you want to create a specific storage profile.

**Step 4** In the Work pane, click the Storage > LUN Configuration tab.

**Step 5** In the Actions area, click Modify Storage Profile.

**Step 6** In the Modify Storage Profile dialog box, click the Specific Storage Profile tab.

**Step 7** Click Create Specific Storage Profile.

**Step 8** (Optional) In the Specific Storage Profile area, complete the Description field to set the description of the storage profile.

Each service profile can have only one specific storage profile. Hence, the name of this storage profile is provided by default.

**Step 9** In the Storage Items area, Create Local LUNs and add them to this storage profile.

**Step 10** Click OK.

**Step 11** If a confirmation dialog box displays, click Yes.

Deleting a Storage Profile

Procedure

**Step 1** In the Navigation pane, click Storage.

**Step 2** Expand Storage > Storage Profiles

**Step 3** Expand the node for the organization that contains the storage profile that you want to delete.

**Step 4** Right-click the storage profile that you want to delete and select Delete.

**Step 5** Click Yes in the confirmation box that appears.

Local LUNs

Configuring Local LUNs

You can create local LUNs within a storage profile policy from the Storage tab in the Navigation pane. Additionally, you can also create local LUNs within the default storage profile that is specific to a service profile from the Servers tab.
Procedure

| Step 1 | In the Navigation pane, click Storage. |
| Step 2 | Expand Storage > Storage Profiles |
| Step 3 | Expand the node for the organization that contains the storage profile within which you want to create a local LUN. |
| Step 4 | In the Work pane, click the General tab. |
| Step 5 | In the Actions area, click Create Local LUN. |
| Step 6 | In the Create Local LUN dialog box, complete the following fields: |

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create Local LUN option</td>
<td>(Appears when you create a local LUN) Selected by default when you create a local LUN.</td>
</tr>
<tr>
<td>Prepare Claim Local LUN option</td>
<td>(Appears when you create a local LUN) Select when you want to claim an orphan LUN.</td>
</tr>
<tr>
<td>Name field</td>
<td>The name of the local LUN. This name can be between 1 and 10 alphanumeric characters. You cannot use spaces or any special characters other than - (hyphen), _ (underscore), : (colon), and . (period), and you cannot change this name after the object has been saved.</td>
</tr>
<tr>
<td>Size (GB) field</td>
<td>Size of this LUN in GB. The size can range from 1 to 10240 GB. <strong>Note</strong> You do not need to specify a LUN size while claiming an orphaned LUN.</td>
</tr>
<tr>
<td>Fractional Size (MB) field</td>
<td>The fractional size of this LUN in MB.</td>
</tr>
</tbody>
</table>
| Auto Deploy radio buttons | Whether the local LUN should be automatically deployed or not. This can be one of the following:  
  - **Auto Deploy**  
    — Automatically deploys the local LUN.  
  - **No Auto Deploy**  
    — Does no automatically deploy the local LUN. |
| Expand To Available checkbox | (Only available for rack and blade servers) Specifies that this LUN can be expanded to use the entire available disk group. For each service profile, only one LUN can use this option. **Expand To Available** option is not supported for already deployed LUN. |
| Select Disk Group Configuration drop-down list | Chose the disk group configuration to be applied to this local LUN from the drop-down list. |
Displaying Details of All Local LUNs Inherited By a Service Profile

Step 7  (Optional) Click Create Disk Group Policy to create a new disk group policy for this local LUN.
Step 8  Click OK.

Displaying Details of All Local LUNs Inherited By a Service Profile

Storage profiles can be defined under org and as a dedicated storage profile under service profile. Thus, a service profile inherits local LUNs from both possible storage profiles. It can have a maximum of 2 such local LUNs. You can display the details of all local LUNs inherited by a service profile by using the following command:

**Procedure**

Step 1  In the Navigation pane, click Servers.
Step 2  Expand Servers > Service Profiles.
Step 3  Expand the node for the organization that contains the service profile that you want to display.
Step 4  Choose the service profile whose inherited local LUNs you want to display.
Step 5  In the Work pane, click the Storage tab.
Step 6  Click the Storage Profiles subtab, and then click the Local LUNs tab.

Displays the following detailed information about all the local LUNs inherited by the specified service profile:

- **Name**—LUN name in the storage profile.
- **RAID Level**—Summary of the RAID level of the disk group used.
- **Size (MB)**—Size, in MB, of the LUN specified in the storage profile.
- **Config State**—State of LUN configuration. The states can be one of the following:
  - **Applying**—Admin state is online, the LUN is associated with a server, and the virtual drive is being created.
  - **Applied**—Admin state is online, the LUN is associated with a server, and the virtual drive is created.
  - **Apply Failed**—Admin state is online, the LUN is associated with a server, but the virtual drive creation failed.
  - **Not Applied**—The LUN is not associated with a server, or the LUN is associated with a service profile, but admin state is undeployed.
- **Deploy Name**—The virtual drive name after deployment.
- **LUN ID**—LUN ID.
- **Drive State**—State of the virtual drive. The states are:
  - **Unknown**
Optimal
Degraded
Inoperable
Partially Degraded

Deleting Local LUNs

Procedure

Step 1  In the Navigation pane, click Storage.
Step 2  Expand Storage > Storage Profiles
Step 3  Expand the node for the organization that contains the storage profile from which you want to delete a local LUN.
Step 4  Expand Local LUNs for the storage profile that you want and select the LUN that you want to delete.
Step 5  Right-click the LUN that you want to delete and select Delete. A confirmation dialog box appears.
Step 6  Click Yes.

PCH Controller Definitions

PCH SSD Controller Definition

Cisco UCS Manager Platform Controller Hub (PCH) Solid State Drive (SSD) Controller Definition provides a local storage configuration in storage profiles where you can configure all the disks in a single RAID or in a JBOD disk array.

The PCH Controller Definition configuration provides the following features:

• Ability to configure a single LUN RAID across two internal SSDs connected to the onboard PCH controller

• A way to configure the controller in two modes: AHCI (JBOD) and SWRAID (RAID).

• Ability to configure the PCH storage device in an Embedded Local LUN and Embedded Local Disk boot policy so precision control for boot order is achieved even with the presence of other bootable local storage devices in the server. Do not use the Local LUN or the Local JBOD options to boot from PCH disks

• Scrub policy support for the internal SSD drives. This is applicable only for the SWRAID mode. This does not apply for the AHCI and NORAID of PCH Controller modes. See the UCS Manager Server Management Guide.

• Firmware upgrade support for the internal SSD drives. Disk firmware upgrade is supported only when the PCH Controller is in SWRAID mode. It is not supported for AHCI mode.
You can configure PCH controller SSDs in a storage profile policy. You can enable or disable protect configuration which saves the LUN configuration even after a service profile disassociation. You choose a controller mode. The PCH controller configuration supports only these two RAID options: RAID0 and RAID1. Use No RAID configuration option for AHCI mode where all the disks connected to the controller configured as JBOD disks. The configuration deployment happens as part of the storage profile association to a service profile process.

Cisco UCS Manager supports PCH managed internal SSDs in the following M4 servers:

- UCSC-C240-M4L
- UCSC-C240-M4SX

For the PCH Controller Definition configuration in a Cisco UCS Manager boot policy two new devices exist to select: PCH LUN and PCH Disk. EmbeddedLocalLun represents the boot device in SWRAID mode and EmbeddedLocalDisk represent the boot devices in AHCI mode.

The system uses the same scrub policy is used to scrub supported SSDs. If the scrub is Yes, configured LUNs are destroyed as part of disassociation or re-discovery. If the scrub is No, configured LUNs are saved during disassociation and re-discovery.

Cisco UCS Manager supports firmware upgrade for the internal SSDs only when the PCH Controller is in SWRAID mode. It is not supported in AHCI mode.

Creating a Storage Profile PCH Controller Definition

The PCH Controller Definition provides a storage configuration in Storage Profiles where you can configure internal SSDs connected to a PCH controller. You create a name for the controller definition, specify whether you want the storage profile to retain the configuration even if the storage profile is disassociated from the service profile, and chose the RAID level to indicate the controller mode.

Procedure

**Step 1**  
In the Navigation pane, click Storage > Storage Profiles.

**Step 2**  
Choose the storage profile where you want to create the controller definition.

**Step 3**  
Click the Controller Definitions tab and then click Add at the bottom of the panel or right-click the storage profile and select Create Controller Definition.

**Step 4**  
In Create Controller Definition dialog box, configure the following information:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
</table>
| **Name field** | The name of the storage controller.  
**Note**  
Once you save a PCH Controller Definition, you cannot modify the name from the General Tab Properties area.  
Enter up to 16 characters. You can use any alphanumeric characters. Special characters and spaces are not supported. |
<table>
<thead>
<tr>
<th><strong>Name</strong></th>
<th><strong>Description</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Protect Configuration check box</td>
<td>If checked, the storage profile retains the configuration even if the storage profile is disassociated from the service profile. Note: If you disassociate the storage profile from a service profile with this option enabled, and then associate it with a new service profile that includes a local disk configuration policy with different properties, the server returns a configuration mismatch error and the association fails.</td>
</tr>
<tr>
<td>Name</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------</td>
<td>------------------------------------</td>
</tr>
<tr>
<td>RAID Level drop-down list</td>
<td></td>
</tr>
</tbody>
</table>
This can be one of the following disk policy modes:

- **No Local Storage**—(Supported for PCH SSD Controller Definition) For a diskless server or a SAN only configuration. If you select this option, you cannot associate any service profile which uses this policy with a server that has a local disk.

- **RAID 0 Striped**—(Supported for PCH SSD Controller Definition) Data is striped across all disks in the array, providing fast throughput. There is no data redundancy, and all data is lost if any disk fails.

- **RAID 1 Mirrored**—(Supported for PCH SSD Controller Definition) Data is written to two disks, providing complete data redundancy if one disk fails. The maximum array size is equal to the available space on the smaller of the two drives.

- **Any Configuration**—(Supported for PCH SSD Controller Definition) For a server configuration that carries forward the local disk configuration without any changes.

- **No RAID**—(Supported for PCH SSD Controller Definition) All the disks can be used individually without interdependency similar to JBOD disks. If you choose No RAID and you apply this policy to a server that already has an operating system with RAID storage configured, the system does not remove the disk contents. Therefore, there may be no visible differences on the server after you apply the No RAID mode. This can lead to a mismatch between the RAID configuration in the policy and the actual disk configuration shown in the Inventory > Storage tab for the server. To make sure that any previous RAID configuration information is removed from a disk, apply a scrub policy that removes all disk information after you apply the No RAID configuration mode.

- **RAID 5 Striped Parity**—(Not supported for PCH SSD Controller Definition) Data is striped across all disks in the array. Part of the capacity of each disk stores parity information that can be used to reconstruct data if a disk fails. RAID 5 provides good data throughput for applications with high read request rates.

- **RAID 6 Striped Dual Parity**—(Not supported for PCH SSD Controller Definition) Data is striped across all disks in the array and two parity disks are used to provide protection against the failure of up to two physical disks. In each row of data blocks, two sets of parity data are stored.

- **RAID 10 Mirrored and Striped**—(Not supported for PCH SSD Controller Definition) RAID 10 uses mirrored pairs of disks to provide complete data redundancy and high throughput rates.

- **RAID 50 Striped Parity and Striped**—(Not supported for PCH SSD Controller Definition) Data is striped across multiple striped parity disk sets to provide high throughput and multiple disk failure
<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAID 0 Striped</td>
<td>(Not supported for PCH SSD Controller Definition) Data is striped across multiple striped dual parity disk sets to provide high throughput and greater disk failure tolerance.</td>
</tr>
<tr>
<td>RAID 1 Mirrored</td>
<td>(Not supported for PCH SSD Controller Definition) Data is striped across multiple striped dual parity disk sets to provide high throughput and greater disk failure tolerance.</td>
</tr>
<tr>
<td>RAID 60 Striped Dual Parity and Striped</td>
<td>(Not supported for PCH SSD Controller Definition) Data is striped across multiple striped dual parity disk sets to provide high throughput and greater disk failure tolerance.</td>
</tr>
</tbody>
</table>

**Note** Some Cisco UCS servers require a license for certain RAID configuration options. When Cisco UCS Manager associates a service profile containing this local disk policy with a server, Cisco UCS Manager verifies that the selected RAID option is properly licensed. If there are issues, Cisco UCS Manager displays a configuration error during the service profile association.

For RAID license information for a specific Cisco UCS server, see the Hardware Installation Guide for that server.

---

**Step 5**

Click OK.

The new PCH Controller Definition appears in the navigation pane.

---

**What to do next**

For specific operating system software RAID driver installation procedures, see:

- Installing LSI MegaSR Drivers for Windows and Linux section in the *Cisco UCS C240 M4 Server Installation and Service Guide*

---

**Modifying a Service Profile PCH Controller Definition**

**Before you begin**

If you want to modify RAID level from **RAID 0 Striped** or **RAID 1 Mirrored** to NO RAID, then perform the following steps before starting the procedure:

1. Ensure that you have a scrub policy in the associated service profile. Refer Creating a Service Profile with the Expert Wizard in Cisco UCS Manager Server Management Guide.

2. Disassociate the server from the service profile. Refer Disassociating a Service Profile from a Server or Server Pool in Cisco UCS Manager Server Management Guide.

**Procedure**

**Step 1**

In the **Navigation** pane, click the **Storage** tab.

**Step 2**

Expand **Storage Profiles** to the specific storage profile name that you want.

**Step 3**

Expand **Controller Definitions** and click the specific controller definition that you want.
### Step 4

On the **General** tab, modify the following information:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Name</strong> field</td>
<td>The name of the storage controller.</td>
</tr>
<tr>
<td></td>
<td><strong>Note</strong> Once you save a PCH Controller Definition, you cannot modify the name from the General Tab Properties area.</td>
</tr>
<tr>
<td></td>
<td>Enter up to 16 characters. You can use any alphanumeric characters.</td>
</tr>
<tr>
<td></td>
<td>Special characters and spaces are not supported.</td>
</tr>
<tr>
<td><strong>Protect Configuration</strong> check box</td>
<td>If checked, the storage profile retains the configuration even if the storage profile is disassociated from the service profile.</td>
</tr>
<tr>
<td></td>
<td><strong>Note</strong> If you disassociate the storage profile from a service profile with this option enabled, and then associate it with a new service profile that includes a local disk configuration policy with different properties, the server returns a configuration mismatch error and the association fails.</td>
</tr>
<tr>
<td>Name</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------</td>
<td>------------------------------</td>
</tr>
<tr>
<td>RAID Level drop-down list</td>
<td></td>
</tr>
</tbody>
</table>
This can be one of the following disk policy modes:

- **No Local Storage**—(Supported for PCH SSD Controller Definition) For a diskless server or a SAN only configuration. If you select this option, you cannot associate any service profile which uses this policy with a server that has a local disk.

- **RAID 0 Striped**—(Supported for PCH SSD Controller Definition) Data is striped across all disks in the array, providing fast throughput. There is no data redundancy, and all data is lost if any disk fails.

- **RAID 1 Mirrored**—(Supported for PCH SSD Controller Definition) Data is written to two disks, providing complete data redundancy if one disk fails. The maximum array size is equal to the available space on the smaller of the two drives.

- **Any Configuration**—(Supported for PCH SSD Controller Definition) For a server configuration that carries forward the local disk configuration without any changes.

- **No RAID**—(Supported for PCH SSD Controller Definition) All the disks can be used individually without interdependency similar to JBOD disks. If you choose No RAID and you apply this policy to a server that already has an operating system with RAID storage configured, the system does not remove the disk contents. Therefore, there may be no visible differences on the server after you apply the No RAID mode. This can lead to a mismatch between the RAID configuration in the policy and the actual disk configuration shown in the Inventory > Storage tab for the server.

To make sure that any previous RAID configuration information is removed from a disk, apply a scrub policy that removes all disk information after you apply the No RAID configuration mode.

- **RAID 5 Striped Parity**—(Not supported for PCH SSD Controller Definition) Data is striped across all disks in the array. Part of the capacity of each disk stores parity information that can be used to reconstruct data if a disk fails. RAID 5 provides good data throughput for applications with high read request rates.

- **RAID 6 Striped Dual Parity**—(Not supported for PCH SSD Controller Definition) Data is striped across all disks in the array and two parity disks are used to provide protection against the failure of up to two physical disks. In each row of data blocks, two sets of parity data are stored.

- **RAID 10 Mirrored and Striped**—(Not supported for PCH SSD Controller Definition) RAID 10 uses mirrored pairs of disks to provide complete data redundancy and high throughput rates.

- **RAID 50 Striped Parity and Striped**—(Not supported for PCH SSD Controller Definition) Data is striped across multiple striped parity disk sets to provide high throughput and multiple disk failure
### Name | Description
--- | ---
 | tolerance.
 | • **RAID 60 Striped Dual Parity and Striped**—(Not supported for PCH SSD Controller Definition) Data is striped across multiple striped dual parity disk sets to provide high throughput and greater disk failure tolerance.

**Note** Some Cisco UCS servers require a license for certain RAID configuration options. When Cisco UCS Manager associates a service profile containing this local disk policy with a server, Cisco UCS Manager verifies that the selected RAID option is properly licensed. If there are issues, Cisco UCS Manager displays a configuration error during the service profile association.

For RAID license information for a specific Cisco UCS server, see the Hardware Installation Guide for that server.

---

**Step 5** Click OK. The system displays whether it saved the modified PCH Controller Definition successfully.

---

**What to do next**

If you had disassicated the server from the service profile to modify RAID level from **RAID 0 Striped** or **RAID 1 Mirrored** to **NO RAID**, then perform the following steps:

1. For any M4 server, re-acknowledge the server. Refer *Reacknowledging a Rack-Mount Server* in *Cisco UCS Manager Server Management Guide*.

2. Associate the service profile to the server. Refer *Associating a Service Profile with a Server or Server Pool* in *Cisco UCS Manager Server Management Guide*.

---

### Deleting a Storage Profile PCH Controller Definition

**Procedure**

1. In the **Navigation** pane, click the **Storage** tab.
2. Expand **Storage Profiles**.
3. Expand **PCH Controller Definitions**.
4. In the **Navigation** pane, click the specific **Controller Definition** that you want to delete.
5. In the **General** tab **Actions** area, click **Delete**.
6. Confirm whether you want to delete the definition.

The system displays whether it deleted the definition successfully. If not, see *PCH Controller Definition Configuration Troubleshooting*, on page 112.
Step 7  If successfully deleted, click OK.

PCH Controller Definition Configuration Troubleshooting

PCH Controller Definition Creation

Unsuccessful PCH Controller Definition configuration exists under the following situations:

- You try to configure a Controller definition for an unsupported server model
- You try to use the legacy local disk configuration policy and also configures the PCH storage in storage profile
- You try to configure same controller using storage profile controller definition and also by using storage profile Local LUN configuration interface
- If the Protect Configuration checkbox is ON and you configured the RAID Type differently than the deployed configuration in SWRAID mode.
- If the Protect Configuration checkbox is ON and the RAID Type does not match the present controller mode.

Warning

Any configuration change in the PCH storage configuration (like Controller mode change, RAID level change or controller qualifier change) for an already associated server triggers a PNUOS boot to happen causing a down time for the host OS.

Boot Policy

A configuration error occurs for any of the following cases:

- You select PCH Disk in boot policy but the primary or secondary target path slot number did not match with any of the inventoried internal SSD slot numbers.
- You select both PCH LUN and PCH Disk at the same time in the boot policy.

Firmware

For an incompatible software combination, there will not be any configuration error to at the time of association. However the storage configuration for the PCH SSD controller might fail or might not be deployed during association if you do not use the supported software combinations. Also, booting from the PCH SSD controller internal SSD might fail at the end of association for an incompatible software combination.

Replacing a Faulty M.2 Disk

Perform this procedure to replace a faulty M.2 disk:

Before you begin

Ensure that the SWRAID controller definition is configured and the replacement disk formatted empty drive.
Procedure

Step 1 Gracefully power down the server.
Step 2 Physically remove the faulty M.2 drive. Use the Serial Number and Disk Slot to identify the faulty disk.
Step 3 Insert the replacement M.2 drive.
Step 4 Power on the server.
Step 5 Wait for the disk to rebuild and then re-acknowledge the server.

Note SWRAID rebuild may take anywhere between 35 to 75 minutes depending on the disk size, disk speed, OS content, and other parameters.
AHCI is a NORaid configuration and hence rebuild is not applicable.

Associating a Storage Profile with an Existing Service Profile

You can associate a storage profile with an existing service profile or a new service profile. See Creating a Service Profile with the Expert Wizard, on page 135.

Procedure

Step 1 In the Navigation pane, click Servers.
Step 2 Expand Servers > Service Profiles.
Step 3 Expand the node for the organization that contains the service profile that you want to associate with a storage profile.
Step 4 Choose the service profile that you want to associate with a storage profile.
Step 5 In the Work pane, click the Storage tab.
Step 6 Click the LUN Configuration subtab.
Step 7 In the Actions area, click Modify Storage Profile. The Modify Storage Profile dialog box appears.
Step 8 Click the Storage Profile Policy tab.
Step 9 To associate an existing storage profile with this service profile, select the storage profile that you want to associate from the Storage Profile drop-down list, and click OK. The details of the storage profile appear in the Storage Items area.
Step 10 To create a new storage profile and associate it with this service profile, click Create Storage Profile, complete the required fields, and click OK. Creating a Storage Profile, on page 98 provides more information on creating a new storage profile.
Step 11 (Optional) To dissociate the service profile from a storage profile, select No Storage Profile from the Storage Profile drop-down list, and click OK.
Configuring Storage Profiles

Importing Foreign Configurations for a RAID Controller on a Blade Server

Procedure

Step 1 In the Navigation pane, click Equipment.
Step 2 Expand Equipment > Chassis > Chassis Number > Servers.
Step 3 Choose the server of the RAID controller for which you want to import foreign configurations.
Step 4 In the Work pane, click the Inventory tab and then the Storage subtab.
Step 5 Click the Controller subtab.
Step 6 In the Actions area, click Import Foreign Configuration.

Importing Foreign Configurations for a RAID Controller on a Rack Server

Configuring Local Disk Operations on a Blade Server

Procedure

Step 1 In the Navigation pane, click Equipment.
Step 2 Expand Equipment > Chassis > Chassis Number > Servers.
Step 3 Choose the server for which you want to configure local disk operations.
Step 4 In the Work pane, click the Inventory tab and then the Storage subtab.
Step 5 Click the Disks subtab.
Step 6 Right-click the disk that you want and select one of the following operations:

- Clear Foreign Configuration State—Clears any foreign configuration that exists in a local disk when it is introduced into a new configuration.
- Set Unconfigured Good—Specifies that the local disk can be configured.
- Set Prepare For Removal—Specifies that the local disk is marked for removal from the chassis.
- Set Undo Prepare For Removal—Specifies that the local disk is no longer marked for removal from the chassis.
- Mark as Dedicated Hot Spare—Specifies the local disk as a dedicated hot spare. You can select the virtual drive from the available drives.
- Remove Hot Spare—Specifies that the local disk is no longer a hot spare.
- Set JBOD to Unconfigured Good—Specifies that the new local disk can be configured after being marked as Unconfigured Good.
Configuring Local Disk Operations on a Rack Server

Procedure

Step 1 In the Navigation pane, click Equipment.
Step 2 Expand Equipment > Rack Mounts > Servers.
Step 3 Choose the server for which you want to configure local disk operations.
Step 4 In the Work pane, click the Inventory tab and then the Storage subtab.
Step 5 Click the Disks subtab.
Step 6 Right-click the disk that you want and select one of the following operations:
   - Clear Foreign Configuration State—Clears any foreign configuration that exists in a local disk when it is introduced into a new configuration.
   - Set Unconfigured Good—Specifies that the local disk can be configured.
   - Set Prepare For Removal—Specifies that the local disk is marked for removal.
   - Set Undo Prepare For Removal—Specifies that the local disk is no longer marked for removal.
   - Mark as Dedicated Hot Spare—Specifies the local disk as a dedicated hot spare. You can select the virtual drive from the available drives.
   - Remove Hot Spare—Specifies that the local disk is no longer a hot spare.
   - Set JBOD to Unconfigured Good—Specifies that the new local disk can be configured after being marked as Unconfigured Good.

Configuring Local Disk Operations

Procedure

Step 1 In the Navigation pane, click Equipment.
Step 2 Expand Equipment > Chassis > Chassis Number
Step 3 In the Work pane, click the Storage tab.
Step 4 Click the Disks subtab.
Step 5 Right-click the disk that you want and select one of the following operations:
   - Clear Foreign Configuration State—Clears any foreign configuration that exists in a local disk when it is introduced into a new configuration.
   - Set Unconfigured Good—Specifies that the local disk can be configured.
   - Set Prepare For Removal—Specifies that the local disk is marked for removal from the chassis.
   - Set Undo Prepare For Removal—Specifies that the local disk is no longer marked for removal from the chassis.
   - Mark as Dedicated Hot Spare—Specifies the local disk as a dedicated hot spare. You can select the virtual drive from the available drives.
   - Remove Hot Spare—Specifies that the local disk is no longer a hot spare.
• **Set JBOD to Unconfigured Good**—Specifies that the new local disk can be configured after being marked as Unconfigured Good.

### Deleting an Orphan Virtual Drive

#### Procedure

1. In the *Navigation* pane, click *Equipment*.
2. Expand *Equipment* > *Chassis* > *Chassis Number*.
3. In the *Work* pane, click the *Storage* tab.
4. Click the LUNs subtab.
5. Right-click the virtual drive that you want and select *Delete Orphaned LUN*.
   A confirmation dialog box appears.
6. Click *Yes*.

### Deleting an Orphan Virtual Drive on a Rack Server

#### Procedure

1. In the *Navigation* pane, click *Equipment*.
2. Expand *Equipment* > *Rack Mounts* > *Servers*.
3. Choose the server for which you want to delete an orphan virtual drive.
4. In the *Work* pane, click the *Inventory* tab and then the *Storage* subtab.
5. Click the LUNs subtab.
6. Right-click the virtual drive that you want and select *Delete Orphaned LUN*.
   A confirmation dialog box appears.
7. Click *Yes*.

### Renaming an Orphan Virtual Drive on a Blade Server

#### Procedure

1. In the *Navigation* pane, click *Equipment*.
2. Expand *Equipment* > *Chassis* > *Chassis Number* > *Servers*.
3. Choose the server for which you want to rename an orphan virtual drive.
4. In the *Work* pane, click the *Inventory* tab and then the *Storage* subtab.
5. Click the LUNs subtab.
Renaming an Orphan Virtual Drive on a Rack Server

**Procedure**

**Step 1** In the Navigation pane, click Equipment.
**Step 2** Expand Equipment > Rack Mounts > Servers.
**Step 3** Choose the server for which you want to rename an orphan virtual drive.
**Step 4** In the Work pane, click the Inventory tab and then the Storage subtab.
**Step 5** Click the LUNs subtab.
**Step 6** Right-click the virtual drive that you want and select Rename Referenced LUN.
**Step 7** In the Rename Referenced LUN dialog box that appears, enter the new LUN Name.
**Step 8** Click OK.

Boot Policy for Local Storage

You can specify the primary boot device for a storage controller as a local LUN or a JBOD disk. Each storage controller can have one primary boot device. However, in a storage profile, you can set only one device as the primary boot LUN.

**Note**
Cisco UCS S3260 M3 server nodes do not support Any as an option for the Local LUN Image Path while adding a local LUN to the boot policy through the Cisco UCS Manager GUI. In the Cisco UCS Manager CLI, Cisco UCS S3260 M3 server nodes do not support the local-any command option.

Configuring the Boot Policy for an Embedded Local LUN

**Note**
For a Cisco UCS S3260 M3 server node, before you migrate the boot policy from a local LUN or JBOD to an embedded local LUN or disk, you must delete the local storage configuration, wait for the association to complete and finally add the new local storage configuration. This will enable the boot operation from the PCH disks or LUNs.

**Procedure**

**Step 1** In the Navigation pane, click Servers.
Configuring the Boot Policy for an Embedded Local Disk

Procedure

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>In the Navigation pane, click Servers.</td>
</tr>
<tr>
<td>Step 2</td>
<td>Expand Servers &gt; Policies.</td>
</tr>
<tr>
<td>Step 3</td>
<td>Expand the node for the organization where you want to create the policy. If the system does not include multitenancy, expand the root node.</td>
</tr>
<tr>
<td>Step 4</td>
<td>Select the boot policy that you want to configure.</td>
</tr>
<tr>
<td>Step 5</td>
<td>In the Work pane, click the General tab.</td>
</tr>
<tr>
<td>Step 6</td>
<td>Click the down arrows to expand the Local Devices area.</td>
</tr>
<tr>
<td>Step 7</td>
<td>Click Add Embedded Local LUN to configure the boot order of the local LUN.</td>
</tr>
<tr>
<td>Step 8</td>
<td>To configure the local LUN as the primary boot device, select Primary.</td>
</tr>
<tr>
<td>Step 9</td>
<td>In the LUN Name field, enter the name of the LUN to be configured as the primary boot device.</td>
</tr>
<tr>
<td>Step 10</td>
<td>Click OK.</td>
</tr>
</tbody>
</table>

Configuring the Boot Policy for an Embedded Local Disk

BOD is supported only on the following servers:
- Cisco UCS B200 M3 blade server
- Cisco UCS B260 M4 blade server
- Cisco UCS B460 M4 blade server
- Cisco UCS B200 M4 blade server
- Cisco UCS C220 M4 rack-mount server
- Cisco UCS C240 M4 rack-mount server
- Cisco UCS C460 M4 rack-mount server
### Local LUN Operations in a Service Profile

#### Preprovisioning a LUN Name

Preprovisioning a LUN name can be done only when the admin state of the LUN is **Undeployed**. If this LUN name exists and the LUN is orphaned, its is claimed by the service profile. If this LUN does not exist, a new LUN is created with the specified name.

**Procedure**

<table>
<thead>
<tr>
<th>Step</th>
<th>Command or Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>In the <strong>Navigation</strong> pane, click <strong>Servers</strong>.</td>
</tr>
<tr>
<td>2</td>
<td>Expand <strong>Servers &gt; Service Profiles &gt; Service_Profile_Name</strong>.</td>
</tr>
<tr>
<td>3</td>
<td>In the <strong>Work</strong> pane, click the <strong>Storage</strong> tab.</td>
</tr>
<tr>
<td>4</td>
<td>Click the <strong>LUN Configuration</strong> tab.</td>
</tr>
<tr>
<td>5</td>
<td>In the <strong>Local LUNs</strong> subtab, right-click the LUN for which you want to preprovision a LUN name and select <strong>Pre-Provision LUN Name</strong>.</td>
</tr>
<tr>
<td>6</td>
<td>In the <strong>Set Pre-Provision LUN Name</strong> dialog box, enter the LUN name.</td>
</tr>
<tr>
<td>7</td>
<td>Click <strong>OK</strong>.</td>
</tr>
</tbody>
</table>

#### Claiming an Orphan LUN

Claiming an orphan LUN can be done only when the admin state of the LUN is **Undeployed**. You can explicitly change the admin state of the LUN to **Undeployed** for claiming an orphan LUN.

If the LUN name is empty, set a LUN name before claiming it.

**Procedure**

<table>
<thead>
<tr>
<th>Step</th>
<th>Command or Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>In the <strong>Navigation</strong> pane, click <strong>Servers</strong>.</td>
</tr>
<tr>
<td>2</td>
<td>Expand <strong>Servers &gt; Service Profiles &gt; Service_Profile_Name</strong>.</td>
</tr>
<tr>
<td>3</td>
<td>In the <strong>Work</strong> pane, click the <strong>Storage</strong> tab.</td>
</tr>
<tr>
<td>4</td>
<td>Click the <strong>LUN Configuration</strong> tab.</td>
</tr>
<tr>
<td>5</td>
<td>In the <strong>Local LUNs</strong> subtab, right-click the LUN that you want to claim and select <strong>Claim Orphan LUN</strong>.</td>
</tr>
<tr>
<td>6</td>
<td>In the <strong>Claim Orphan LUN</strong> dialog box that appears, select an orphaned LUN.</td>
</tr>
<tr>
<td>7</td>
<td>Right-click the LUN and select <strong>Set Admin State</strong>.</td>
</tr>
<tr>
<td>8</td>
<td>In the <strong>Set Admin State</strong> dialog box that appears, select <strong>Undeployed</strong> to undeploy a LUN and claim ownership.</td>
</tr>
<tr>
<td>9</td>
<td>Click <strong>OK</strong>.</td>
</tr>
</tbody>
</table>
Deploying and Undeploying a LUN

You can deploy or undeploy a LUN. If the admin state of a local LUN is Undeployed, the reference of that LUN is removed and the LUN is not deployed.

Procedure

Step 1 In the Navigation pane, click Servers.
Step 2 Expand Servers > Service Profiles > Service_Profile_Name.
Step 3 In the Work pane, click the Storage tab.
Step 4 Click the LUN Configuration tab.
Step 5 In the Local LUNs subtab, right-click the LUN that you want to deploy or undeploy and select Set Admin State.
Step 6 In the Set Admin State dialog box that appears, select Online to deploy a LUN or Undeployed to undeploy a LUN.
Step 7 Click OK.

Renaming a Service Profile Referenced LUN

Procedure

Step 1 In the Navigation pane, click Servers.
Step 2 Expand Servers > Service Profiles > Service_Profile_Name.
Step 3 In the Work pane, click the Storage tab.
Step 4 Click the LUN Configuration tab.
Step 5 In the Local LUNs subtab, right-click the LUN for which you want to rename the referenced LUN, and select Rename Referenced LUN.
Step 6 In the Rename Referenced LUN dialog box that appears, enter the new name of the referenced LUN.
Step 7 Click OK.
Configuring SD Card Support

- FlexFlash Secure Digital Card Support, on page 121
- FlexUtil Secure Digital Card Support, on page 126

FlexFlash Secure Digital Card Support

Overview
Cisco UCS B-Series, C-Series M3 and higher, and S-Series M4 servers support internal Secure Digital (SD) memory cards. The SD cards are hosted by the Cisco Flexible Flash storage controller, a PCI-based controller which has two slots for SD cards. The cards contain a single partition called HV. When FlexFlash is enabled, Cisco UCS Manager displays the HV partition as a USB drive to both the BIOS and the host operating system.

You can populate one or both the SD card slots that are provided. If two SD cards are populated, you can use them in a mirrored mode.

Note
Do not mix different capacity cards in the same server.

The SD cards can be used to store operating system boot images or other information. The following figure illustrates the SD card slots.
FlexFlash is disabled by default. You can enable FlexFlash in a local disk policy used in a service profile. When FlexFlash is enabled in a local disk policy, and the server is capable of supporting SD cards, the FlexFlash controller is enabled during service profile association. If a server is not capable of supporting SD cards or has an older CIMC version, a config failure message is displayed.

If you disable FlexFlash in a supported server, the Hypervisor or HV partition is immediately disconnected from the host. The FlexFlash controller will also be disabled as part of a related service profile disassociation.

The FlexFlash controller supports RAID-1 for dual SD cards. The FlexFlash scrub policy erases the HV partition in both cards, and brings the cards to a healthy RAID state.

You can configure new SD cards in a RAID pair and format them using one of the following methods:

- Format the SD cards. Formatting the SD Cards, on page 125 provides detailed information.

- For an associated server, create a FlexFlash scrub policy and disassociate the service profile from the server. For an unassociated server, create a FlexFlash scrub policy and reacknowledge the server after modifying the default scrub policy.

The Scrub Policy Settings section in the Cisco UCS Manager Server Management Guide provides more details about the usage of the scrub policy.

---

**Note**

Disable the scrub policy as soon as the pairing is complete.

To boot from the HV partition, the SD card must be present in the boot policy used in the service profile.

**FlexFlash Firmware Management**

The FlexFlash controller firmware is bundled as part of the CIMC image. When you upgrade the CIMC, if a newer firmware version is available for the FlexFlash controller, the controller can no longer be managed, and the FlexFlash inventory displays the Controller State as Waiting For User Action and the Controller Health as Old Firmware Running. To upgrade the FlexFlash controller firmware, you need to perform a board controller update. For more information, see the appropriate Cisco UCS B-Series Firmware Management...
Guide, available at the following URL:

Limitations for the Cisco Flexible Flash Storage Controller:

- The Cisco Flexible Flash storage controller only supports 16 GB, 32 GB, and 64 GB SD cards.

  **Note**  
  16 GB and 32 GB cards are supported only on the B200-M3 blade servers, and the 64 GB SD cards are supported only on the B200-M4 blade servers.

- We do not recommend using an SD card from a rack server in a blade server, or using an SD card from a blade server in a rack server. Switching SD cards between server types might result in data loss from the SD card.

- Some Cisco UCS C-Series rack-mount servers have SD cards with four partitions: HV, HUU, SCU, and Drivers. Only the HV partition is visible in Cisco UCS Manager. You can migrate a four-partition SD card to a single HV partition card with a FlexFlash scrub policy.

- The FlexFlash controller does not support RAID-1 sync (mirror rebuild). If the SD cards are in a degraded RAID state, or if any metadata errors are reported by the controller, you must run the FlexFlash scrub policy to pair the cards for RAID. For more information about the FlexFlash scrub policy, see Server-Related Policies. The following conditions might result in degraded RAID or metadata errors:
  - Inserting a new or used SD card in one slot, when the server already has an SD card populated in the second slot.
  - Inserting two SD cards from different servers.

- The server firmware version must be at 2.2(1a) or higher.

**FlexFlash FX3S Support**

Beginning with Release 2.2(3), Cisco UCS Manager allows additional FlexFlash support with the FX3S controller. The FX3S controller is present on the following servers:

- Cisco UCS B200 M4 blade server
- Cisco UCS C220 M4 rack server
- Cisco UCS C240 M4 rack server

FlexFlash operations with the FX3S control are similar to those with the Cisco Flexible Flash storage controller. FlexFlash is disabled by default, and is enabled using a local disk policy. You can also reset the controller, format the SD cards, and enable automatic synchronization of your paired SD cards.

The SD cards for the FX3S controller contain a single partition called Hypervisor.

**Limitations for the Cisco FX3S Controller:**

- The FX3S controller supports only 32 GB and 64 GB SD cards. 16 GB cards are not supported.
• We do not recommend using an SD card from a rack server in a blade server, or using an SD card from a blade server in a rack server. Switching SD cards between server types might result in data loss from the SD card.
• The server firmware version must be at 2.2(3a) or higher.

Enabling FlexFlash SD Card Support

Procedure

Step 1 In the Navigation pane, click Servers.
Step 2 Expand Servers > Policies.
Step 3 Expand the node for the organization where you want to create the policy.
   If the system does not include multitenancy, expand the root node.
Step 4 Expand Local Disk Config Policies and choose the local disk config policy for which you want to enable FlexFlash support.
Step 5 In the Work pane, click the General tab.
Step 6 In the FlexFlash State field, click the Enable radio button.
Step 7 In the FlexFlash Removable State field, select the removable state. Click the Yes option if you need to define the Flex Flash SD card as removable. Check your hypervisor requirements for the required removable state setting.
   • No Change (default) - Use this option if the hypervisor does not require a preset state for the SD card.
   • No - Use this option if the hypervisor requires a non-removable state for the SD card.
Step 8 Click Save Changes.

Disabling FlexFlash SD Card Support

This procedure describes how to disable the FlexFlash capability in a local disk policy.

Procedure

Step 1 In the Navigation pane, click on the Servers tab.
Step 2 Select Policies from the Filter dropdown list.
Step 3 Expand the Local Disk Config Policies tree.
Step 4 Highlight the policy for which you want to disable FlexFlash.
Step 5 Click the Events tab of the task pane, and select the Disable radio button next to FlexFlash State.
Step 6 If you need to replace the FlexFlash SD card, select the Yes radio button in the FlexFlash Removable State field. Make sure the SD cards are not in use before changing the FlexFlash Removable State.
Enabling Auto-Sync

Procedure

Step 1 In the Navigation pane, click Equipment.
Step 2 Expand Equipment > Chassis > Chassis Number > Servers.
Step 3 Click the server for which you want to enable auto-sync.
Step 4 In the Work pane, click the Inventory tab.
Step 5 Click the Storage subtab.
Step 6 In the Actions area, click Enable Auto-sync.
Step 7 In the Enable Auto-sync dialog box, choose the Admin Slot Number for the SD card that you want to use as the primary.
Step 8 Click OK.

Formatting the SD Cards

Procedure

Step 1 In the Navigation pane, click Equipment.
Step 2 Expand Equipment > Chassis > Chassis Number > Servers.
Step 3 Click the server for which you want to format the SD cards.
Step 4 In the Work pane, click the Inventory tab.
Step 5 Click the Storage subtab.
Step 6 In the Actions area, click Format SD Cards.
Step 7 Click Yes to format the SD cards.

Resetting the FlexFlash Controller

Procedure

Step 1 In the Navigation pane, click Equipment.
Step 2 Expand Equipment > Chassis > Chassis Number > Servers.
Step 3 Click the server for which you want to reset the FlexFlash controller.
Step 4  In the Work pane, click the Inventory tab.
Step 5  Click the Storage subtab.
Step 6  In the Actions area, click Reset FlexFlash Controller.
Step 7  Click Yes to reset the FlexFlash controller.

FlexUtil Secure Digital Card Support

The C-Series M5 Rack-Mount servers support a Micro-SD (FlexUtil) memory card for storage. UCS Manager however does not provide management support for Micro-SD card.
Direct Attached Storage

A typical Direct Attached Storage (DAS) system is made of a data storage device (for example enclosures holding a number of hard disk drives connected directly to a computer through a host bus adapter (HBA). Between those two points there is no network device (like a switch or router).

The main protocols used for DAS connections are ATA, SATA, eSATA, SCSI, SAS, USB, USB 3.0, IEEE 1394 and Fibre Channel.

Cisco UCS Manager allows you to have DAS with without the need for a SAN switch to push the zoning configuration.

The DAS configuration described assumes that the physical cables are already connected between the storage array ports and the Fabric Interconnects.

Fibre Channel Switching Mode

The Fibre Channel switching mode determines how the fabric interconnect behaves as a switching device between the servers and storage devices. The fabric interconnect operates in either of the following Fibre Channel switching modes:

End-Host Mode

End-host mode allows the fabric interconnect to act as an end host to the connected fibre channel networks, representing all servers (hosts) connected to it through virtual host bus adapters (vHBAs). This behavior is achieved by pinning (either dynamically pinned or hard pinned) vHBAs to Fibre Channel uplink ports, which
makes the Fibre Channel ports appear as server ports (N-ports) to the rest of the fabric. When in end-host mode, the fabric interconnect avoids loops by denying uplink ports from receiving traffic from one another. End-host mode is synonymous with N Port Virtualization (NPV) mode. This mode is the default Fibre Channel Switching mode.

---

**Note**

When you enable end-host mode, if a vHBA is hard pinned to an uplink Fibre Channel port and this uplink port goes down, the system cannot repin the vHBA, and the vHBA remains down.

**Switch Mode**

Switch mode is the traditional Fibre Channel switching mode. Switch mode allows the fabric interconnect to connect directly to a storage device. Enabling Fibre Channel switch mode is useful in Pod models where there is no SAN (for example, a single Cisco UCS domain that is connected directly to storage), or where a SAN exists (with an upstream MDS).

Switch mode is not the default Fibre Channel switching mode.

---

**Note**

In Fibre Channel switch mode, SAN pin groups are irrelevant. Any existing SAN pin groups are ignored.

---

**Configuring Fibre Channel Switching Mode**

**Important**

When you change the Fibre Channel switching mode, Cisco UCS Manager logs you out and restarts the fabric interconnect. For a cluster configuration, Cisco UCS Manager restarts both fabric interconnects simultaneously in Cisco UCS Manager Release 3.1(1) and earlier releases. In Cisco UCS Manager Release 3.1(2), when the Fibre Channel switching mode is changed, the UCS fabric interconnects reload sequentially. In Cisco UCS Manager Release 3.1(3), and later releases, the subordinate fabric interconnect reboots first as a result of the change in switching mode. The primary fabric interconnect reboots only after you acknowledge it in **Pending Activities**. The primary fabric interconnect can take several minutes to complete the change in Fibre Channel switching mode and become system ready.

---

**Note**

Reloading of fabric interconnects will cause a system-wide downtime for approximately 10-15 minutes.

---

**Procedure**

1. In the **Navigation** pane, click **Equipment**.
2. Expand **Equipment** > **Fabric Interconnects** > **Fabric_Interconnect_Name**.
3. In the **Work** pane, click the **General** tab.
4. In the **Actions** area of the **General** tab, click one of the following links:
Set Fibre Channel Switching Mode
Set Fibre Channel End-Host Mode

The link for the current mode is dimmed.

**Step 5**
In the dialog box, click **Yes**.
Cisco UCS Manager restarts the fabric interconnect, logs you out, and disconnects Cisco UCS Manager GUI.

---

**Creating a Storage VSAN**

---

**Note**
FCoE VLANs in the SAN cloud and VLANs in the LAN cloud must have different IDs. Using the same ID for an FCoE VLAN in a VSAN and a VLAN results in a critical fault and traffic disruption for all vNICs and uplink ports using that FCoE VLAN. Ethernet traffic is dropped on any VLAN with an ID that overlaps with an FCoE VLAN ID.

**Procedure**

**Step 1**
In the **Navigation** pane, click **SAN**.

**Step 2**
On the **SAN** tab, expand **SAN > Storage Cloud**.

**Step 3**
In the **Work** pane, click the **VSANs** tab.

**Step 4**
On the icon bar to the right of the table, click +.
If the + icon is disabled, click an entry in the table to enable it.

**Step 5**
In the **Create VSAN** dialog box, complete the required fields.

**Step 6**
Click **OK**.
Cisco UCS Manager GUI adds the VSAN to one of the following **VSANs** nodes:

- The **Storage Cloud > VSANs** node for a storage VSAN accessible to both fabric interconnects.
- The **Storage Cloud > Fabric_Name > VSANs** node for a VSAN accessible to only one fabric interconnect.
Creating a VSAN for Fibre Channel Zoning

Note

FCoE VLANs in the SAN cloud and VLANs in the LAN cloud must have different IDs. Using the same ID for an FCoE VLAN in a VSAN and a VLAN results in a critical fault and traffic disruption for all vNICs and uplink ports using that FCoE VLAN. Ethernet traffic is dropped on any VLAN with an ID that overlaps with an FCoE VLAN ID.

Procedure

Step 1
In the Navigation pane, click SAN.

Step 2
On the SAN tab, click the SAN node.

Step 3
In the Work pane, click the SAN Uplinks Manager link on the SAN Uplinks tab.

The SAN Uplinks Manager opens in a separate window.

Step 4
In the SAN Uplinks Manager, click the VSAN tab.

You can create the VSAN on any of the subtabs. However, if you use the All subtab, you can view all of the configured VSANs in the table.

Step 5
On the icon bar to the right of the table, click +.

If the + icon is disabled, click an entry in the table to enable it.

Step 6
In the Create VSAN dialog box, complete the following fields:

<table>
<thead>
<tr>
<th>Name field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name field</td>
<td>The name assigned to the network. This name can be between 1 and 32 alphanumeric characters. You cannot use spaces or any special characters other than - (hyphen), _ (underscore), : (colon), and . (period), and you cannot change this name after the object is saved.</td>
</tr>
</tbody>
</table>
**Name** | **Description**
---|---
**FC Zoning field** | Click the radio button to determine whether Cisco UCS Manager configures Fibre Channel zoning for the Cisco UCS domain. This can be one of the following:
  - **Disabled**—The upstream switch handles Fibre Channel zoning, or Fibre Channel zoning is not implemented for the Cisco UCS domain. Cisco UCS Manager does not configure Fibre Channel zoning.
  - **Enabled**—Cisco UCS Manager configures and controls Fibre Channel zoning for the Cisco UCS domain.
**Note** | If you enable Fibre Channel zoning through Cisco UCS Manager, do not configure the upstream switch with any VSANs that are being used for Fibre Channel zoning.

**Type radio button** | Click the radio button to determine how the VSAN should be configured. This can be one of the following:
  - **Common/Global**—The VSAN maps to the same VSAN ID in all available fabrics.
  - **Fabric A**—The VSAN maps to the a VSAN ID that exists only in fabric A.
  - **Fabric B**—The VSAN maps to the a VSAN ID that exists only in fabric B.
  - **Both Fabrics Configured Differently**—The VSAN maps to a different VSAN ID in each available fabric. If you choose this option, Cisco UCS Manager GUI displays a VSAN ID field and a FCoE VLAN field for each fabric.

**VSAN ID field** | The unique identifier assigned to the network.
The ID can be between 1 and 4078, or between 4080 and 4093. 4079 is a reserved VSAN ID. In addition, if you plan to use FC end-host mode, the range between 3840 to 4079 is also a reserved VSAN ID range.
### Configuring a Fibre Channel Storage Port

This task describes only one method of configuring FC storage ports. You can also configure FC storage ports from the General tab for the port.

**Before you begin**

The Fibre Channel switching mode must be set to Switching for these ports to be valid. The storage ports cannot function in end-host mode.

**Procedure**

1. **Step 1** In the Navigation pane, click Equipment.
2. **Step 2** Expand Equipment > Fabric Interconnects > Fabric_Interconnect_Name.
3. **Step 3** Expand the Expansion Module node.
4. **Step 4** Click one or more of the ports under the FC Ports node.
5. **Step 5** Right-click the selected port or ports and choose Configure as FC Storage Port.
6. **Step 6** If a confirmation dialog box displays, click Yes.
7. **Step 7** Click OK.

---

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
</table>
| **FCoE VLAN field** | The unique identifier assigned to the VLAN used for Fibre Channel connections. VLAN 4048 is user configurable. However, Cisco UCS Manager uses VLAN 4048 for the following default values. If you want to assign 4048 to a VLAN, you must reconfigure these values:  
  • After an upgrade to Cisco UCS, Release 2.0—The FCoE storage port native VLAN uses VLAN 4048 by default. If the default FCoE VSAN was set to use VLAN 1 before the upgrade, you must change it to a VLAN ID that is not used or reserved. For example, consider changing the default to 4049 if that VLAN ID is not in use.  
  • After a fresh install of Cisco UCS, Release 2.0—The FCoE VLAN for the default VSAN uses VLAN 4048 by default. The FCoE storage port native VLAN uses VLAN 4049.  
For FIP-capable, converged network adapters, such as the Cisco UCS CNA M72KR-Q and the Cisco UCS CNA M72KR-E, the named VSAN must be configured with a named VLAN that is not the native VLAN for the FCoE VLAN ID. This configuration ensures that FCoE traffic can pass through these adapters. |

---

Step 7 Click OK.
Configuring Fibre Channel Zoning

This procedure provides a high level overview of the steps required to configure a Cisco UCS domain for Fibre Channel zoning that is controlled by Cisco UCS Manager. You must ensure that you complete all of the following steps.

Procedure

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td>If you have not already done so, disconnect the fabric interconnects in the Cisco UCS domain from any external Fibre Channel switches, such as an MDS.</td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td>If the Cisco UCS domain still includes zones that were managed by the external Fibre Channel switch, run the <code>clear-unmanaged-fc-zone-all</code> command on every affected VSAN to remove those zones. This functionality is not currently available in the Cisco UCS Manager GUI. You must perform this step in the Cisco UCS Manager CLI.</td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
<td>Configure the Fibre Channel switching mode for both fabric interconnects in Fibre Channel Switch mode. You cannot configure Fibre Channel zoning in End-Host mode. See Configuring Fibre Channel Switching Mode, on page 128.</td>
</tr>
<tr>
<td><strong>Step 4</strong></td>
<td>Configure the Fibre Channel and FCoE storage ports that you require to carry traffic for the Fibre Channel zones. See Configuring an Ethernet Port as an FCoE Storage Port, on page 14 and Configuring a Fibre Channel Storage Port, on page 15.</td>
</tr>
<tr>
<td><strong>Step 5</strong></td>
<td>Create one or more VSANs and enable Fibre Channel zoning on all VSANs that you require to carry traffic for the Fibre Channel zones. For a cluster configuration, we recommend that you create the VSANs that you intend to include in a Fibre Channel zone in the SAN Uplinks Manager and use the common/global configuration to ensure they are accessible to both fabric interconnects. See Creating a VSAN for Fibre Channel Zoning, on page 31.</td>
</tr>
<tr>
<td><strong>Step 6</strong></td>
<td>Create one or more Fibre Channel storage connection policies. You can perform this step when you configure Fibre Channel zoning in the service profiles, if you prefer. See Creating a VSAN for Fibre Channel Zoning, on page 31.</td>
</tr>
<tr>
<td><strong>Step 7</strong></td>
<td>Configure zoning in service profiles or service profile templates for servers that need to communicate through Fibre Channel zones. Complete the following steps to complete this configuration:</td>
</tr>
<tr>
<td></td>
<td>• Enable zoning in the VSAN or VSANs assigned to the vHBAs. See Creating a VSAN for Fibre Channel Zoning, on page 31</td>
</tr>
</tbody>
</table>
Creating a Fibre Channel Storage Connection Policy

Procedure

<table>
<thead>
<tr>
<th>Step</th>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>In the Navigation pane, click SAN.</td>
<td>• Configure one or more vHBA initiator groups. See Creating a Service Profile with the Expert Wizard, on page 135.</td>
</tr>
<tr>
<td>Step 2</td>
<td>Expand SAN &gt; Policies.</td>
<td></td>
</tr>
<tr>
<td>Step 3</td>
<td>Expand the node for the organization where you want to create the policy.</td>
<td>If the system does not include multitenancy, expand the root node.</td>
</tr>
<tr>
<td>Step 4</td>
<td>Right-click the Storage Connection Policies node and choose Create Storage Connection Policy.</td>
<td></td>
</tr>
<tr>
<td>Step 5</td>
<td>In the Create Storage Connection Policy dialog box, complete the following fields:</td>
<td></td>
</tr>
<tr>
<td><strong>Name</strong></td>
<td><strong>Description</strong></td>
<td></td>
</tr>
<tr>
<td>Name field</td>
<td>The name of the policy. This name can be between 1 and 16 alphanumeric characters. You cannot use spaces or any special characters other than - (hyphen), _ (underscore), : (colon), and . (period), and you cannot change this name after the object is saved.</td>
<td></td>
</tr>
<tr>
<td>Description field</td>
<td>A description of the policy. Cisco recommends including information about where and when to use the policy. Enter up to 256 characters. You can use any characters or spaces except ` (accent mark), \ (backslash), ^ (carat), &quot; (double quote), = (equal sign), &gt; (greater than), &lt; (less than), or ' (single quote).</td>
<td></td>
</tr>
<tr>
<td>Step 6</td>
<td>In the Zoning Type field, click one of the following radio buttons:</td>
<td></td>
</tr>
<tr>
<td>• None</td>
<td>Cisco UCS Manager does not configure Fibre Channel zoning.</td>
<td></td>
</tr>
<tr>
<td>• Single Initiator Single Target</td>
<td>Cisco UCS Manager automatically creates one zone for each vHBA and storage port pair. Each zone has two members. We recommend that you configure this type of zoning unless you expect the number of zones to exceed the maximum supported.</td>
<td></td>
</tr>
<tr>
<td>• Single Initiator Multiple Targets</td>
<td>Cisco UCS Manager automatically creates one zone for each vHBA. We recommend that you configure this type of zoning if you expect the number of zones to reach or exceed the maximum supported.</td>
<td></td>
</tr>
<tr>
<td>Step 7</td>
<td>In the FC Target Endpoints table, click + on the icon bar to the right of the table.</td>
<td></td>
</tr>
</tbody>
</table>
If the + icon is disabled, click an entry in the table to enable it.

**Step 8**

In the **Create FC Target Endpoint** dialog box, complete the following fields and then click **OK**:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>WWPN field</strong></td>
<td>The WWPN (WWN) assigned to the physical target port on the Fibre Channel or FCoE storage array that the server uses to access the LUNs configured on the storage array.</td>
</tr>
<tr>
<td><strong>Description field</strong></td>
<td>A description of the target endpoint. We recommend that you include information about the port, LUNs, or storage array to which the target endpoint connects. Enter up to 256 characters. You can use any characters or spaces except ` (accent mark), \ (backslash), ^ (carat), &quot; (double quote), = (equal sign), &gt; (greater than), &lt; (less than), or ’ (single quote).</td>
</tr>
<tr>
<td><strong>Path field</strong></td>
<td>The fabric interconnect used for communications with the target endpoint.</td>
</tr>
<tr>
<td><strong>Select VSAN drop-down list</strong></td>
<td>The VSAN used for communications with the target endpoint.</td>
</tr>
<tr>
<td><strong>Create VSAN link</strong></td>
<td>Click this link if you want to create a VSAN.</td>
</tr>
</tbody>
</table>

Repeat this step until you have created all desired target endpoints for the policy.

**Step 9**

After you have created all desired target endpoints for the policy, click **OK**.

---

**Creating a Service Profile with the Expert Wizard**

**Procedure**

**Step 1**
In the **Navigation** pane, click **Servers**.

**Step 2**
Expand **Servers > Service Profiles**.

**Step 3**
Expand the node for the organization where you want to create the service profile.

If the system does not include multitenancy, expand the **root** node.

**Step 4**
Right-click the organization and select **Create Service Profile (expert)**.

**Step 5**
In the **Identify Service Profile** panel, specify the service profile **Name**, UUID assignment and click **Next**. You can provide an optional description for this service profile. If the UUID is not available, you can also create a UUID Suffix Pool from this panel.

**Note**
To create a service profile quickly, you can click **Finish** after specifying the name. Cisco UCS Manager creates a new service profile with the specified name and all system default values.

**Step 6**
(Optional) In the **Networking** panel, specify the required information for the **Dynamic vNIC Connection Policy** and **LAN Connectivity** sections, then click **Next**.
You can create a dynamic vNIC connection policy and LAN connectivity policy from this panel.

**Step 7**  
(Optional) In the **Storage** panel, specify the SAN configuration information such as, **Local Storage Policy**, **SAN Connectivity**, WWNN and VSAN, then click **Next**.

You can create a local disk configuration policy and SAN connectivity policy from this panel.

**Step 8**  
(Optional) In the **Zoning** panel, specify the required zoning information, then click **Next**.

You can create the vHBA initiator groups from this panel.

**Step 9**  
(Optional) In the **vNIC/vHBA Placement** panel, specify the placement method and PCI order, then click **Next**.

You can create a placement policy from this panel.

**Step 10**  
(Optional) In the **Server Boot Order** panel, specify the **Boot Policy** from the drop-down list, then click **Next**.

You can create a boot policy from this panel.

**Step 11**  
(Optional) In the **Maintenance Policy** panel, specify the maintenance policy, then click **Next**.

You can create a new maintenance policy and specify a maintenance schedule from this panel.

**Step 12**  
(Optional) In the **Server Assignment** panel, specify the **Server Assignment** from the drop-down list and the power state to apply on assignment, then click **Next**.

You can create a server pool or a host firmware package from this panel.

**Step 13**  
(Optional) In the **Operational Policies** panel, specify the system operational information such as, **BIOS Configuration**, **External IPMI Management Configuration**, **Management IP Address**, **Monitoring Configuration (Thresholds)**, **Power Control Policy Configuration**, and **Scrub Policy**, then click **Finish**.

**Note**  
To set up an Outband IPv4 address or an Inband IPv4 or IPv6 address, click the respective tabs and complete the required fields.

If you do not find the policies you need for each of these configurations, you can create them from this panel.

---

**Associating a Service Profile with a Server or Server Pool**

Follow this procedure if you did not associate the service profile with a blade server or server pool when you created it, or to change the blade server or server pool with which a service profile is associated.

**Procedure**

**Step 1**  
In the **Navigation** pane, click **Servers**.

**Step 2**  
Expand **Servers > Service Profiles**.

**Step 3**  
Expand the node for the organization that contains the service profile that you want to associate with a new server or server pool.

If the system does not include multitenancy, expand the **root** node.

**Step 4**  
Right-click the service profile you want to associate with a server and select **Associate Service Profile**.
**Step 5**  
In the **Associate Service Profile** dialog box, select one of the following options:

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
</table>
| **Server Pool** | Select a server pool from the drop-down list. Cisco UCS Manager assigns a server from this pool to the service profile.  
Continue with Step 7. |
| **Server**      | Navigate to the desired available server in the navigation tree and select the server which will be assigned to the service profile.  
Continue with Step 7. |
| **Custom Server** | Specifies the chassis and slot that contains the server that will be assigned to the service profile. If the server is not in the slot or is otherwise unavailable, the service profile will be associated with the server when it becomes available.  
Continue with Step 6. |

**Step 6**  
If you chose **Custom Server**, do the following:  
a) In the **Chassis Id** field, enter the number of the chassis where the selected server is located.  
b) In the **Server Id** field, enter the number of the slot where the selected server is located.

**Step 7**  
If you want to restrict the migration of the service profile after it is associated with a server, check the **Restrict Migration** check box.  
If you choose not to restrict migration, Cisco UCS Manager does not perform any compatibility checks on the new server before migrating the existing service profile. If the hardware of both servers are not similar, the association might fail.

**Step 8**  
Click **OK**.

---

**Verifying Fibre Channel Zoning Configuration**

Verify that the zone configuration and zoneset activation works properly.

**Procedure**

**Step 1**  
In the **Navigation** pane, click the **Servers** tab.

**Step 2**  
On the **Servers** tab, expand **Servers > Service Profiles**.

**Step 3**  
Navigate to and click the service profile you created previously.

**Step 4**  
Click the **FC Zones** tab in the right pane.

Verify that:
- The initiator and target WWPN are in the same zone.
- The zone Admin State is Applied
- The Oper State is Active
UCS Manager automatically creates the zone name. The zone naming convention is `ClusterName_FabricID_ZoneID_ServiceProfileName_InitiatorName`.

### Troubleshooting Fibre Channel Zoning Configuration

If you create a service profile, but cannot see the zones under the FC Zones tab, use this troubleshooting checklist:

- Is the zoning enabled on the intended VSAN?
- Is the service profile associated?
  
  Zones are created only when the service profile is associated with the server.
- Is the correct storage connection policy selected under vHBA initiator groups?
- Is the correct VHBA added to the correct vHBA initiator group?
- Is the correct VSAN selected for the vHBAs?
- Are the correct VSAN and fabric selected under the storage connection policy?
Local Disk Locator LED Status

The local disk locator LED is located on the slot where you insert the local disk. This LED identifies where a specific disk is inserted in a blade or rack server. The locator LED is useful for maintenance, when you need to remove a disk from among many disks in a server.

You can successfully turn on or off the local disk locator LED when:

- The server is powered on. UCS Manager generates an error if you attempt to turn the locator LED on or off when the server is powered off.
- The CIMC version is UCS Manager 3.1 or higher.
- The RAID controller supports the out-of-band (OOB) storage interface.

When Intel Volume Management Device (VMD) for NVMe is enabled, you can also configure blinking patterns for the LEDs on NVMe-managed devices to show drive status. VMD-enabled drives identified by a failure ID blink pattern can be hot-plugged without a system shutdown.

Toggling the Local Disk Locator LED On and Off

Before you begin

On and Off

- Ensure the server on which the disk is located is powered on. If the server is off, you are not able to turn on or off the local disk locator LED.
Procedure

Step 1  In the **Navigation** pane, click the **Equipment** tab.

Step 2  On the **Equipment** tab, expand **Equipment > Rack Mounts > Servers > Server Number**.
   a)  For Rack-mounted servers, go to **Rack Mounts>Servers>Server Number**.
   b)  For Blade servers, go to **Sensors>Storage>Server Number**.

Step 3  In the **Work** area, click the **Inventory > Storage > Disks** tabs. The Storage Controller inventory appears.

Step 4  Click a disk. The disk details appear.

Step 5  In the Actions area, click **Turn on Locator LED** or **Turn off Locator LED**. The **Locator LED** state appears in the **Properties** area.

Step 6  Click **Save Changes**.

---

**Custom LED Status with Advanced VMD on NVMe**

**Custom Blinking Patterns**

VMD allows you to customize LED blinking patterns on PCIe NVMe drives to better identify failing drives. The tables below provide some brief guidelines for customized blinking. As individualized patterns are programmable, these tables provide only representative guidelines.

*Table 4: LED Blinking Patterns: Windows*

<table>
<thead>
<tr>
<th>Status LED</th>
<th>Behavior</th>
<th>Options</th>
</tr>
</thead>
</table>
| "Activate LED"   | Identifies a specific device in an enclosure by blinking the status LED of that drive in a designated pattern. | 1-3600 seconds. Values outside this range default to 12 seconds.
|                  |                                                                         | Default = 12 seconds                                                     |
### Options Behavior Status LED

#### Drive Failure
- Indicates a drive that is in a degraded or failed state by lighting the status LED of that device in a defined failure pattern.
- The failure pattern is displayed until:
  1. It is physically removed.
  or
  the RAID volume, that contains the failed drive, is either deleted or physically removed.
  2. From the time when a non-failed drive that is part of a RAID volume is removed, or the failed drive is identified and removed. It remains in failure state until a new drive is inserted into the same slot or the platform is rebooted.
- Default = Option 1

#### RAID volume Initialization or Verify and Repair Process
- When a RAID volume is in Rebuild state, the status LEDs blink in the defined Rebuild pattern on either the specific drive being rebuilt or on the entire RAID volume that is being rebuilt.
- 1. Disabled (only on one drive)
  2. Enabled (on all drives)
- Default = Enabled

#### Managed unplug
- During a managed hot unplug, the status LED of the managed drive blinks in the defined Locate pattern until the drive is physically ejected.
- None. Enabled by default.

#### RAID volume is migrating
- During RAID volume migration, the status LEDs blink in the defined Rebuild pattern on all drives until the process is complete.
- 1. Disabled (No Status LED Blinking)
  2. Enabled (Blinks Status LEDs)
- Default = Enabled

#### Rebuild
- Only the migrating drive blinks.
- Default = Disabled

| Table 5: LED Blinking Patterns: Linux |

### Status LED | Behavior | Options |
--- | --- | --- |
Skip/exclude controller BLACKLIST | `ledmon` will exclude scanning controllers listed on the blacklist. When the whitelist is also set in the config file, the blacklist is ignored. | Exclude controllers on the blacklist. Default = Support all controllers |
<table>
<thead>
<tr>
<th>Status LED</th>
<th>Behavior</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAID volume is initializing, verifying, or verifying and fixing</td>
<td>Rebuild pattern on all drives in RAID volume (until initialization, verify, or verify and fix finishes).</td>
<td>1. True/Enabled (on all drives) 2. False/Disabled (no drives) Default = True/Enabled</td>
</tr>
<tr>
<td>RAIDX.volume is rebuilding</td>
<td>Rebuild pattern on a single drive to which RAID volume rebuilds</td>
<td>1. False/Disabled (on one drive) 2. True/Enabled (on all drives) Default = False/Disabled</td>
</tr>
<tr>
<td>Set <code>ledmon</code> scan interval</td>
<td>Defines the time interval between <code>ledmon</code> <code>sysfs</code> <code>scans</code>. The value is given in seconds.</td>
<td>10s (5s maximum) Default = 10s</td>
</tr>
<tr>
<td>RAID volume is migrating</td>
<td>Rebuild pattern on all drives in RAID volume (until migration finishes).</td>
<td>1. True/Enabled (on all drives) 2. False/Disabled (no drives) Default = True/Enabled</td>
</tr>
<tr>
<td>Set <code>ledmon</code> debug level</td>
<td>Corresponds with <code>-log-level</code> flag from <code>ledmon</code>.</td>
<td>Acceptable values are: quiet, error, warning, info, debug, all - 0 means ‘quiet’ and 5 means ‘all Default = 2</td>
</tr>
<tr>
<td>If the flag is set to <code>ledmon</code> true, will limit monitoring only to drives that are RAID members.</td>
<td>1. False / (all RAID member and PT) 2. True / (RAID member only) Default = False</td>
<td></td>
</tr>
<tr>
<td>Limited scans only to specific controllers</td>
<td><code>ledmon</code> limits changing the LED state to controllers listed on whitelist. Limit changing LED state in whitelist controller. Default = No limit.</td>
<td></td>
</tr>
</tbody>
</table>

**Table 6: LED Blinking Patterns: ESXi**

<table>
<thead>
<tr>
<th>Status LED</th>
<th>Behavior</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Identify&quot;</td>
<td>The ability to identify a specific device in an enclosure by blinking the status LED of that drive in the defined Locate pattern.</td>
<td>None. Default is Off.</td>
</tr>
<tr>
<td>&quot;Off&quot;</td>
<td>The ability to turn off the &quot;Identify&quot; LED once a specific device in an enclosure has been located.</td>
<td>None. Default is Off.</td>
</tr>
</tbody>
</table>
NVMe-optimized M5 Servers

Beginning with 3.2(3a), Cisco UCS Manager supports the following NVMe-optimized M5 servers:

- **UCSC-C220-M5SN**—The PCIe MSwitch is placed in the dedicated MRAID slot for UCS C220 M5 servers. This setup supports up to 10 NVMe drives. The first two drives are direct-attached through the riser. The remaining eight drives are connected and managed by the MSwitch. This setup does not support any SAS/SATA drive combinations.

- **UCSC-C240-M5SN**—The PCIe MSwitch is placed in the riser-2 at slot-4 for UCS C240 M5 servers. The servers support up to 24 drives. Slots 1-8 are the NVMe drives connected and managed by the MSwitch. The servers also support up to two NVMe drives in the rear and are direct-attached through the riser. This setup supports SAS/SATA combination with the SAS/SATA drives from slots 9-24. These drives are managed by the SAS controller placed in the dedicated MRAID PCIe slot.

- **UCS-C480-M5**—UCS C480 M5 servers support up to three front NVMe drive cages, each supporting up to eight NVMe drives. Each cage has an interposer card, which contains the MSwitch. Each server can support up to 24 NVMe drives (3 NVMe drive cages x 8 NVMe drives). The servers also support a rear PCIe Aux drive cage, which can contain up to eight NVMe drives managed by an MSwitch placed in PCIe slot-10.

This setup does not support:

- a combination of NVMe drive cages and HDD drive cages

- a combination of the Cisco 12G 9460-8i RAID controller and NVMe drive cages, irrespective of the rear Auxiliary drive cage

---

**Note**
The UCS C480 M5 PID remains same as in earlier release.

The following MSwitch cards are supported in NVMe optimized M5 servers:

- **UCS-C480-M5 HDD Ext NVMe Card (UCSC-C480-8NVME)**—Front NVMe drive cage with an attached interposer card containing the PCIe MSwitch. Each server supports up to three front NVMe drive cages and each cage supports up to 8 NVMe drives. Each server can support up to 24 NVMe drives (3 NVMe drive cages x 8 NVMe drives).

- **UCS-C480-M5 PCIe NVMe Switch Card (UCSC-NVME-SC)**—PCIe MSwitch card to support up to eight NVMe drives in the rear auxiliary drive cage inserted in PCIe slot 10.

---

**Note**
Cisco UCS-C480-M5 servers support a maximum of 32 NVMe drives (24 NVMe drives in the front + 8 NVMe drives in the rear auxiliary drive cage)

- **UCSC-C220-M5SN** and **UCSC-C240-M5SN** do not have separate MSwitch PIDs. MSwitch cards for these servers are part of the corresponding NVMe optimized server.
**MSwitch Disaster Recovery**

You can recover a corrupted MSwitch and roll back to a previous working firmware.

<table>
<thead>
<tr>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>If you have a setup with Cisco UCS C480 M5 Server, then MSwitch disaster recovery process can be performed only on one MSwitch at a time. If the disaster recovery process is already running for one MSwitch, then wait for it to complete. You can monitor the recovery status from FSM.</td>
</tr>
</tbody>
</table>

**Procedure**

- **Step 1** In the Navigation pane, click Equipment.
- **Step 2** Expand Rack-Mounts > Servers.
- **Step 3** Expand the server for which contains the MSwitch.
- **Step 4** In the Work pane, click Inventory > Storage > Controller.
- **Step 5** Select the MSwitch which you want to recover.
- **Step 6** Under the General tab, click Disaster Recovery.
  - **Note** Do not reset the server during the disaster recovery process.
- **Step 7** You can monitor the recovery status from FSM.

**NVMe PCIe SSD Inventory**

Cisco UCS Manager GUI discovers, identifies, and displays the inventory of Non-Volatile Memory Express (NVMe) Peripheral Component Interconnect Express (PCIe) SSD storage devices. You can view the health of the storage devices in the server. NVMe with PCIe SSD storage devices reduce latency, increased input/output operations per second (IOPS), and lower power consumption compared to SAS or SATA SSDs.

**Viewing NVMe PCIe SSD Storage Inventory**

**Procedure**

- **Step 1** In the Navigation pane, click the Equipment tab.
- **Step 2** On the Equipment tab, expand Equipment > Rack Mounts > Servers.
- **Step 3** Click the Inventory tab.
- **Step 4** Do one of the following:
  - a) Click the Storage tab.
    - You view the list of NVMe PCIe SSD storage devices named Storage Controller NVME ID number.
    - You view the name, size, serial number, operating status, state and other details.
b) Click the NVMe PCIe SSD storage device.
You see the following inventory details:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID</td>
<td>The NVMe PCIe SSD storage device configured on the server.</td>
</tr>
<tr>
<td>Model</td>
<td>The NVMe PCIe SSD storage device model.</td>
</tr>
<tr>
<td>Revision</td>
<td>The NVMe PCIe SSD storage device revision.</td>
</tr>
<tr>
<td>RAID Support</td>
<td>Whether the NVMe PCIe SSD storage device is RAID enabled.</td>
</tr>
<tr>
<td>OOB Interface Support</td>
<td>Whether the NVMe PCIe SSD storage device support out-of-band management.</td>
</tr>
<tr>
<td>PCIe Address</td>
<td>The NVMe PCIe SSD storage device on the virtual interface card (VIC).</td>
</tr>
<tr>
<td></td>
<td><strong>Note</strong> PCIe Address does not come upon hot insertion of the NVMe card. To view this info, re-acknowledge the server.</td>
</tr>
<tr>
<td>Number of Local Disks</td>
<td>The number of disks contained in the NVMe PCIe SSD storage device.</td>
</tr>
<tr>
<td>Rebuild Rate</td>
<td>Not applicable to NVMe PCIe SSD storage devices.</td>
</tr>
<tr>
<td>Vendor</td>
<td>The vendor that manufactured the NVMe PCIe SSD storage device.</td>
</tr>
<tr>
<td>PID</td>
<td>The NVMe PCIe SSD storage device product ID, also known as product name, model name, product number</td>
</tr>
<tr>
<td>Serial</td>
<td>The storage device serial number.</td>
</tr>
</tbody>
</table>
Storage Server Features and Components Overview

Storage Server Features

The following table summarizes the Cisco UCS S3260 system features:

Table 7: Cisco UCS S3260 System Features

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chassis</td>
<td>Four rack unit (4RU) chassis</td>
</tr>
</tbody>
</table>
| Processors               | • Cisco UCS S3260 M3 server nodes: Two Intel Xeon E5-2600 v2 Series processors inside each server node.  
                               • Cisco UCS S3260 M4 server nodes: Two Intel Xeon E5-2600 v4 Series processors inside each server node. |
| Memory                   | Up to 16 DIMMs inside each server node.                                     |
| Multi-bit error protection| This system supports multi-bit error protection.                           |
| Storage                  | The system has the following storage options:                             |
| Disk Management          | The system supports up to two storage controllers:                         |
|                          | • One dedicated mezzanine-style socket for a Cisco storage controller card inside each server node |
### Feature Description

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAID Backup</td>
<td>The supercap power module (SCPM) mounts to the RAID controller card.</td>
</tr>
<tr>
<td>PCIe I/O</td>
<td>The optional I/O expander provides two 8x Gen 3 PCIe expansion slots.</td>
</tr>
<tr>
<td>Network and Management I/O</td>
<td>The system can have one or two system I/O controllers (SIOCs). These provide rear-panel management and data connectivity.</td>
</tr>
<tr>
<td></td>
<td>• Two SFP+ 40 Gb ports each SIOC.</td>
</tr>
<tr>
<td></td>
<td>• One 10/100/1000 Ethernet dedicated management port on each SIOC.</td>
</tr>
<tr>
<td></td>
<td>The server nodes each have one rear-panel KVM connector that can be used with a KVM cable, which provides two USB, one VGA DB-15, and one serial DB-9 connector.</td>
</tr>
<tr>
<td>Power</td>
<td>Two or four power supplies, 1050 W each (hot-swappable and redundant as 2+2).</td>
</tr>
<tr>
<td>Cooling</td>
<td>Four internal fan modules that pull front-to-rear cooling, hot-swappable. Each fan module contains two fans.</td>
</tr>
<tr>
<td></td>
<td>In addition, there is one fan in each power supply.</td>
</tr>
</tbody>
</table>

### Front Panel Features

The following image shows the front panel features for the Cisco UCS S3260 system:

*Figure 3: Front Panel Features*

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Operations panel</td>
<td>6</td>
<td>Temperature status LED</td>
</tr>
<tr>
<td>2</td>
<td>System Power button/LED</td>
<td>7</td>
<td>Power supply status LED</td>
</tr>
</tbody>
</table>
Rear Panel Features

The following image shows the rear panel features for the Cisco UCS S3260 system:

Figure 4: Front Panel Features

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>System unit identification button/LED</td>
<td>8</td>
<td>Network link activity LED</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>System status LED</td>
<td>9</td>
<td>Pull-out asset tag (not visible under front bezel)</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Fan status LED</td>
<td>10</td>
<td>Internal-drive status LEDs</td>
<td></td>
</tr>
</tbody>
</table>

Disk Slots

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Server bay 1</td>
<td>8</td>
<td>Not used at this time</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• (Optional) I/O expander, as shown (with Cisco UCS S3260 M4 server node only)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• (Optional) server node</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• (Optional) drive expansion module</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Description</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>-------------------------------------------------------------------------------------------------------</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
</tbody>
</table>
| 2 | Server bay 2  
   - (Optional) server node  
     (Cisco UCS S3260 M4 shown)  
   - (Optional) drive expansion module                   | 9 | Not used at this time |
| 3 | System I/O controller (SIOC)  
   - SIOC 1 is required if you have a server node in server bay 1  
   - SIOC 2 is required if you have a server node in server bay 2 |
| 4 | Power supplies (four, redundant as 2+2)                                                                | 11 |   |
| 5 | 40-Gb SFP+ ports (two on each SIOC)                                                                   | 12 |   |
| 6 | Chassis Management Controller (CMS)  
     Debug Firmware Utility port (one each SIOC)                                                    | 13 |   |

**Cisco UCS S3260 M4 server node label (M4 SVRN)  
Note** This label identifies a Cisco UCS S3260 M4 server node. The Cisco UCS S3260 M3 server node does not have a label.

Routing and Switching Utility port (one each SIOC)

KVM console connector (one each server node).

Used with a KVM cable that provides two USB, one VGA, and one serial connector.

Server node unit identification button/LED.
### Storage Server Components

#### Server Nodes

The Cisco UCS S3260 system consists of one or two server nodes, each with two CPUs, DIMM memory of 128, 256, or 512 GB, and a RAID card up to 4 GB cache or a pass-through controller. The server nodes can be one of the following:

- Cisco UCS S3260 M3 Server Node
- Cisco UCS S3260 M4 Server Node—This node might include an optional I/O expander module that attaches to the top of the server node.

#### Disk Slots

The Cisco UCS S3260 chassis has 4 rows of 14 disk slots on the HDD motherboard and 4 additional disk slots on the HDD expansion tray. The following image shows the disk arrangement for the 56 top-accessible, hot swappable 3.5-inch 6 TB or 4 TB 7200 rpm NL-SAS HDD drives. A disk slot has two SAS ports and each is connected a SAS expander in the chassis.

**Figure 5: Cisco UCS S3260 Top View**

The following image shows the Cisco UCS S3260 chassis with the 4 additional disk slots on the HDD expansion tray.
If you have two server nodes with two SIOCs, you will have the following functionality:

1. The top server node works with the left SIOC (Server Slot1 with SIOC1).
2. The bottom server works with the right SIOC (Server Slot2 with SIOC2).

If you have one server node with two SIOCs, you can enable Server SIOC Connectivity functionality. Beginning with release 3.1(3), Cisco UCS S3260 system supports Server SIOC Connectivity functionality. Using this functionality, you can configure the data path through both the primary and auxiliary SIOCs when the chassis has single server and dual SIOCs set up.

**SAS Expanders**

The Cisco UCS S3260 system has two SAS expanders that run in redundant mode and connect the disks at the chassis level to storage controllers on the servers. The SAS expanders provide two paths between a storage controller, and hence enable high availability. They provide the following functionality:

- Manage the pool of hard drives.
- Disk zone configuration of the hard drives to storage controllers on the servers.

The following table describes how the ports in each SAS expander are connected to the disks based on the type of deployment.

<table>
<thead>
<tr>
<th>Port range</th>
<th>Connectivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-56</td>
<td>Top accessible disks</td>
</tr>
<tr>
<td>57-60</td>
<td>Disks in the HDD expansion tray.</td>
</tr>
</tbody>
</table>

**Note**

The number of SAS uplinks between storage controller and SAS expander can vary based on the type of controller equipped in the server.

**Storage Enclosures**

A Cisco UCS S3260 system has the following types of storage enclosures:
Chassis Level Storage Enclosures

- **HDD motherboard enclosure**—The 56 dual port disk slots in the chassis comprise the HDD motherboard enclosure.

- **HDD expansion tray**—The 4 additional dual disk slots in the Cisco UCS S3260 system comprise the HDD expansion tray.

**Note**
The HDD expansion tray is a field replaceable unit (FRU). The disks will remain unassigned upon insertion, and can be assigned to storage controllers. For detailed steps on how to perform disk zoning, see Disk Zoning Policies, on page 155

Server level Storage Enclosures

Server level storage enclosures are pre-assigned dedicated enclosures to the server. These can be one of the following:

- **Rear Boot SSD enclosure**—This enclosure contains two 2.5 inch disk slots on the rear panel of the Cisco UCS S3260 system. Each server has two dedicated disk slots. These disk slots support SATA SSDs.

- **Server board NVMe enclosure**—This enclosure contains one PCIe NVMe controller.

**Note**
In the Cisco UCS S3260 system, even though disks can be physically present on the two types of enclosures described above, from the host OS all the disks are viewed as part of one SCSI enclosure. They are connected to SAS expanders that are configured to run as single SES enclosure.

Storage Controllers

Mezzanine Storage Controllers

The following table lists the storage controller type, firmware type, modes, sharing and OOB support for the various storage controllers.

<table>
<thead>
<tr>
<th>Storage Controller Type</th>
<th>Firmware type</th>
<th>Modes</th>
<th>Sharing</th>
<th>OOB Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>UCSC-S3X60-R1GB</td>
<td>Mega RAID</td>
<td>HW RAID, JBOD</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>UCS-C3K-M4RAID</td>
<td>Mega RAID</td>
<td>HW RAID, JBOD</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>UCSC-S3X60-HBA</td>
<td>Initiator Target</td>
<td>Pass through</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>UCS-S3260-DHBA</td>
<td>Initiator Target</td>
<td>Pass through</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Other storage controllers

- **SW RAID Controller**—The servers in the Cisco UCS S3260 system support two dedicated internal SSDs embedded into the PCIe riser that is connected to the SW RAID Controller. This controller is supported on the Cisco C3000 M3 servers.
**NVMe Controller**—This controller is used by servers in the Cisco UCS S3260 system for inventory and firmware updates of NVMe disks.

For more details about the storage controllers supported in the various server nodes, see the related service note:

- Cisco UCS C3X60 M3 Server Node For Cisco UCS S3260 Storage Server Service Note
- Cisco UCS C3X60 M4 Server Node For Cisco UCS S3260 Storage Server Service Note

## Cisco UCS S3260 Storage Management Operations

The following table summarizes the various storage management operations that you can perform with the Cisco UCS Manager integrated Cisco UCS S3260 system.

<table>
<thead>
<tr>
<th>Operation</th>
<th>Description</th>
<th>See:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disk Sharing for High Availability</td>
<td>The SAS expanders in the Cisco UCS S3260 system can manage the pool of drives at the chassis level. To share disks for high availability, perform the following: 1. Creating disk zoning policies. 2. Creating disk slots and assigning ownership. 3. Associating disks to chassis profile.</td>
<td>&quot;Disk Zoning Policies&quot; section in this guide.</td>
</tr>
<tr>
<td>Storage Profiles, Disk Groups and Disk Group Configuration Policies</td>
<td>You can utilize Cisco UCS Manager's Storage Profile and Disk Group Policies for defining storage disks, disk allocation and management in the Cisco UCS S3260 system.</td>
<td>&quot;Storage Profiles&quot; section in the Cisco UCS Manager Storage Management Guide, Release 3.1(2).</td>
</tr>
<tr>
<td>Storage Enclosure Operations</td>
<td>You can swap the HDD expansion tray with a server, or remove the tray if it was previously inserted.</td>
<td>&quot;Removing Chassis Level Storage Enclosures&quot; section in this guide.</td>
</tr>
</tbody>
</table>
Disk Sharing for High Availability

Disk Zoning Policies

You can assign disk drives to the server nodes using disk zoning. Disk zoning can be performed on the controllers in the same server or on the controllers on different servers. Disk ownership can be one of the following:

- **Unassigned**
  
  Unassigned disks are those not visible to the server nodes.

- **Dedicated**
  
  If this option is selected, you will need to set the values for the **Server** and **Controller** for the disk slot.

  ![Note](note_icon)
  
  **Note** A disk is visible only to the assigned controller.

- **Shared**
  
  Shared disks are those assigned to more than one controller. They are specifically used when the servers are running in a cluster configuration, and each server has its storage controllers in HBA mode.

  ![Note](note_icon)
  
  **Note** Shared mode cannot be used under certain conditions when dual HBA controllers are used.

**Chassis Global Hot Spare**

If this option is selected, you will need to set the value for the **Slot Range** for the disk.

![Important](important_icon)

**Important**

Disk migration and claiming orphan LUNs: To migrate a disk zoned to a server (Server 1) to another server (Server 2), you must mark the virtual drive (LUN) as transport ready or perform a hide virtual drive operation. You can then change the disk zoning policy assigned for that disk. For more information on virtual drive management, see the **Disk Groups and Disk Configuration Policies** section of the Cisco UCS Manager Storage Management Guide.

Creating a Disk Zoning Policy

**Procedure**

1. **Step 1** In the Navigation pane, click **Chassis**.
2. **Step 2** Expand **Policies > root**.
3. **Step 3** Right-click **Disk Zoning Policies** and choose **Create Disk Zoning Policy**.
Step 4  In the **Create Disk Zoning Policy** dialog box, complete the following:

<table>
<thead>
<tr>
<th>Name field</th>
<th>Description</th>
</tr>
</thead>
</table>
| **Name** field | The name of the policy.  
This name can be between 1 and 16 alphanumeric characters. You cannot use spaces or any special characters other than - (hyphen), _ (underscore), : (colon), and . (period), and you cannot change this name after the object is saved. |

<table>
<thead>
<tr>
<th>Description field</th>
<th>Description</th>
</tr>
</thead>
</table>
| **Description** field | A description of the policy. Cisco recommends including information about where and when to use the policy.  
Enter up to 256 characters. You can use any characters or spaces except ` (accent mark), \ (backslash), ^ (carat), " (double quote), = (equalsign), > (greater than), < (less than), or ’ (single quote). |

<table>
<thead>
<tr>
<th>Preserve Config check box</th>
<th>Description</th>
</tr>
</thead>
</table>
| **Preserve Config** check box | If this check box is selected, it preserves all configuration related information for the disks such as slot number, ownership, server assigned, controller assigned, and controller type.  
**Note** By default the **Preserve Config** check box remains unchecked. |

In the **Disk Zoning Information** area, complete the following:

<table>
<thead>
<tr>
<th>Name</th>
<th>Field</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Name</strong> column</td>
<td>The name for the disk slot.</td>
</tr>
<tr>
<td><strong>Slot Number</strong> column</td>
<td>The slot number for the disk.</td>
</tr>
</tbody>
</table>
The slot ownership value. This can be one of the following:

- **Unassigned**—This option is selected by default. You can set the slot number in the **Slot Range** field.

- **Dedicated**—If this option is selected, you will need to set the values for the **Server**, **Controller**, and **Slot Range** for the disk slot.

- **Shared**—If this option is selected, you will need to set the values for the **Slot Range** and controller information such as server assigned, controller assigned, and controller type for the disk slot.

**Note**  
Shared mode cannot be used under certain conditions when dual HBA controllers are used. To view the conditions for **Shared** mode for Dual HBA controller, see Table 9: Limitations for Shared Mode for Dual HBA Controller, on page 157.

- **Chassis Global Hot Spare**—If this option is selected, you will need to set the value for the **Slot Range** for the disk.

<table>
<thead>
<tr>
<th>Name</th>
<th>Field</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ownership column</td>
<td>The slot ownership value. This can be one of the following:</td>
</tr>
<tr>
<td></td>
<td><strong>Unassigned</strong>—This option is selected by default. You can set the</td>
</tr>
<tr>
<td></td>
<td>slot number in the <strong>Slot Range</strong> field.</td>
</tr>
<tr>
<td></td>
<td><strong>Dedicated</strong>—If this option is selected, you will need to set the</td>
</tr>
<tr>
<td></td>
<td>values for the <strong>Server</strong>, <strong>Controller</strong>, and <strong>Slot Range</strong> for the</td>
</tr>
<tr>
<td></td>
<td>disk slot.</td>
</tr>
<tr>
<td></td>
<td><strong>Shared</strong>—If this option is selected, you will need to set the</td>
</tr>
<tr>
<td></td>
<td>values for the <strong>Slot Range</strong> and controller information such as</td>
</tr>
<tr>
<td></td>
<td>server assigned, controller assigned, and controller type for the</td>
</tr>
<tr>
<td></td>
<td>disk slot.</td>
</tr>
</tbody>
</table>
|                       | **Note**  
Shared mode cannot be used under certain conditions when dual HBA  |
|                       | controllers are used. To view the conditions for **Shared** mode for  |
|                       | Dual HBA controller, see Table 9: Limitations for Shared Mode for Dual |
|                       | HBA Controller, on page 157.                                        |
|                       | **Chassis Global Hot Spare**—If this option is selected, you will    |
|                       | need to set the value for the **Slot Range** for the disk.           |
|                       | **Assigned to Server** column                                       |
|                       | The ID of the server that the disk is assigned.                     |
|                       | **Assigned to Controller** column                                   |
|                       | The ID of the controller that the disk is assigned.                 |
|                       | **Controller Type** column                                           |
|                       | The type for the controller. If the disk is either dedicated or     |
|                       | shared, the controller type is always SAS.                         |

**Table 9: Limitations for Shared Mode for Dual HBA Controller**

<table>
<thead>
<tr>
<th>Server</th>
<th>HDD Tray</th>
<th>Controller</th>
<th>Shared mode Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco UCS S3260</td>
<td>No</td>
<td>Dual HBA</td>
<td>Not Supported</td>
</tr>
<tr>
<td>Cisco UCS S3260</td>
<td>HDD Tray</td>
<td>Dual HBA</td>
<td>Not Supported</td>
</tr>
<tr>
<td>Pre-Provisioned</td>
<td>HDD Tray</td>
<td>Dual HBA</td>
<td>Not Supported</td>
</tr>
</tbody>
</table>
Creating Disk Slots and Assigning Ownership

After you create a disk zoning policy, you must create the disk slots, and assign ownership.

Procedure

Step 1  In the Navigation pane, click **Chassis**.

Step 2  Expand **Policies > root > Disk Zoning Policies**, and select the disk zoning policy that you want to add disk slots.

Step 3  In the Work pane, under **Actions**, click **Add Slots to Policy**.

Step 4  In the **Add Slots to Policy** dialog box, complete the following:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ownership check box</td>
<td>The ownership for the disk slot. This can be one of the following:</td>
</tr>
<tr>
<td></td>
<td>• <strong>Unassigned</strong>—This option is selected by default. You can set the slot</td>
</tr>
<tr>
<td></td>
<td>number in the <strong>Slot Range</strong> field.</td>
</tr>
<tr>
<td></td>
<td>• <strong>Dedicated</strong>—If this option is selected, you will need to set the values</td>
</tr>
<tr>
<td></td>
<td>for the <strong>Server</strong>, <strong>Controller</strong>, and <strong>Slot Range</strong> for the disk slot.</td>
</tr>
<tr>
<td></td>
<td>• <strong>Shared</strong>—If this option is selected, you will need to set the values for</td>
</tr>
<tr>
<td></td>
<td>the <strong>Slot Range</strong> and controller information such as server assigned,</td>
</tr>
<tr>
<td></td>
<td>controller assigned, and controller type for the disk slot.</td>
</tr>
<tr>
<td></td>
<td><strong>Note</strong> Shared mode cannot be used under certain conditions when dual HBA</td>
</tr>
<tr>
<td></td>
<td>controllers are used. To view the conditions for <strong>Shared</strong> mode for Dual HBA</td>
</tr>
<tr>
<td></td>
<td>controller, see Table 9: Limitations for Shared Mode for Dual HBA Controller,</td>
</tr>
<tr>
<td></td>
<td>on page 157.</td>
</tr>
<tr>
<td></td>
<td>• <strong>Chassis Global Hot Spare</strong>—If this option is selected, you will need to</td>
</tr>
<tr>
<td></td>
<td>set the value for the <strong>Slot Range</strong> for the disk.</td>
</tr>
</tbody>
</table>

Step 5  Click **OK**.

Associating Disk Zoning Policies to Chassis Profile

Procedure

Step 1  In the **Navigation** pane, click **Chassis**.

Step 2  Expand **Chassis > Chassis Profiles**.

Step 3  Expand the node for the organization where you want to create the chassis profile.

If the system does not include multitenancy, expand the **root** node.
**Step 4** Right-click the organization and select **Create Chassis Profile**.

**Step 5** In the **Identify Chassis Profile** page, specify the name for the chassis profile, and click **Next**.

**Step 6** (Optional) In the **Maintenance Policy** page, specify the name for the maintenance policy, and click **Next**.

**Step 7** In the **Chassis Assignment** page, select **Select existing Chassis** under **Chassis Assignment**, and then select the chassis that you want to associate with this chassis profile. Click **Next**.

**Step 8** In the **Disk Zoning** page, specify the disk zoning policy that you want to associate with this chassis profile.

**Step 9** Click **Finish**.

---

**Disk Migration**

Before you can migrate a disk zoned from one server to another, you must mark the virtual drive (LUN) as transport ready or perform a hide virtual drive operation. This will ensure that all references from the service profile have been removed prior to disk migration. For more information on virtual drives, please refer to the "virtual drives" section in the *Cisco UCS Manager Storage Management Guide, Release 3.1*

**Procedure**

**Step 1** In the Navigation pane, click **Equipment > Chassis > Servers**.

**Step 2** Choose the Server where you want to perform disk migration.

**Step 3** In the Work pane, click the **Inventory** tab.

**Step 4** Click the **Storage** subtab.

**Step 5** Click the **LUNs** subtab.

**Step 6** Choose the storage controller where you want to prepare the virtual drives for migration to another server.

**Step 7** Choose the disk that you want to migrate.

**Step 8** In the **Actions** area, choose one of the following:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rename</td>
<td>Click on this link to rename your disk.</td>
</tr>
<tr>
<td>Delete</td>
<td>Click on this link to delete your disk.</td>
</tr>
<tr>
<td><strong>Set Transportation Ready</strong></td>
<td>Click on this link for the safe migration of the virtual drive from one server to another.</td>
</tr>
</tbody>
</table>

**Note** All virtual drives on a disk group must be marked as hidden before migrating or unassigning the disks from a server node.
### Storage Enclosure Operations

#### Removing Chassis Level Storage Enclosures

You can remove the storage enclosure corresponding to HDD expansion tray in Cisco UCS Manager after it is physically removed. You cannot remove server level or any other chassis level storage enclosures.

**Procedure**

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>In the Navigation pane, click Equipment.</td>
</tr>
<tr>
<td>Step 2</td>
<td>Expand Chassis &gt; Servers &gt; Storage Enclosures.</td>
</tr>
<tr>
<td>Step 3</td>
<td>Choose the storage enclosure that you want to remove.</td>
</tr>
<tr>
<td>Step 4</td>
<td>In the Actions area, click Remove Enclosure.</td>
</tr>
</tbody>
</table>

---

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ClearTransportation Ready</td>
<td>Click on this link to set the state of the virtual drive to no longer be transport ready.</td>
</tr>
<tr>
<td>Hide Virtual Drive</td>
<td>Click on this option for the safe migration of the virtual drive from one server to another.</td>
</tr>
<tr>
<td></td>
<td><strong>Note</strong> All virtual drives on a disk group must be marked as hidden before migrating or unassigning the disks from a server node.</td>
</tr>
<tr>
<td>Unhide Virtual Drive</td>
<td>Click on this link to unhide the virtual drive and enable IO operations.</td>
</tr>
</tbody>
</table>