Overview

Cisco UCS Manager User Documentation

Cisco UCS Manager offers you a new set of smaller, use-case based documentation described in the following table:

Guide	Description
Cisco UCS Manager Getting Started Guide	Discusses Cisco UCS architecture and Day 0 operations, including Cisco UCS Manager initial configuration and configuration best practices.
Cisco UCS Manager Administration Guide	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.
Cisco UCS Manager Infrastructure Management Guide	Discusses physical and virtual infrastructure components used and managed by Cisco UCS Manager.
Cisco UCS Manager Firmware Management Guide	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.

Guide	Description
Cisco UCS Manager Server Management Guide	Discusses the new licenses, registering Cisco UCS domain with Cisco UCS Central, power capping, server boot, server profiles, and server-related policies.
Cisco UCS Manager Storage Management Guide	Discusses all aspects of storage management, such as SAN and VSAN in Cisco UCS Manager.
Cisco UCS Manager Network Management Guide	Discusses all aspects of network management, such as LAN and VLAN connectivity in Cisco UCS Manager.
Cisco UCS Manager System Monitoring Guide	Discusses all aspects of system and health monitoring, including system statistics in Cisco UCS Manager.
Cisco UCS S3260 Server Integration with Cisco UCS Manager	Discusses all aspects of management of UCS S-Series servers that are managed through Cisco UCS Manager.

Infrastructure Management Guide Overview

This guide provides an overview of the physical and virtual infrastructure used in Cisco Unified Computing System (UCS) and managed through Cisco UCS Manager. It also provides detailed information about managing these infrastructure components. The following table summarizes the overall organization of the guide.

| Topic	Description
Overview	Conceptual overview of Cisco UCS architecture including Cisco Fabric Interconnects, I/O Module, Chassis, Servers, and Virtualization in Cisco UCS.
Equipment Policies	Equipment policies such as Chassis/FEX discovery policy, Chassis connectivity policy, and Rack Server discovery policy.
Chassis Management	Overview of the chassis supported and procedures to manage them.
I/O Module Management	Overview of I/O Modules and procedures to manage them.
Power Management in Cisco UCS	Overview of UCS Power Management policies, Global Power policies, and Power Capping.
Blade Server Management	Overview of Blade Servers and procedures to manage them.
Rack-Mount Server Management	Overview of Rack-Mount Servers and procedures to manage them.
S3X60 Server Node Management	Overview of S3X60 Server Node and procedures to manage them.

Topic	Description
Virtual Interface Management	Overview of Virtualization in Cisco UCS, Virtual Interfaces and procedures to manage them.
Server Troubleshooting	Common troubleshooting scenarios for Servers.

Cisco Unified Computing System Overview

Cisco UCS has a unique architecture that integrates compute, data network access, and storage network access into a common set of components under a single-pane-of-glass management interface.

Cisco UCS fuses access layer networking and servers. This high-performance, next-generation server system provides a data center with a high degree of workload agility and scalability. The hardware and software components support Cisco's unified fabric, which runs multiple types of data center traffic over a single converged network adapter.

Figure 1: Cisco Unified Computing System Architecture
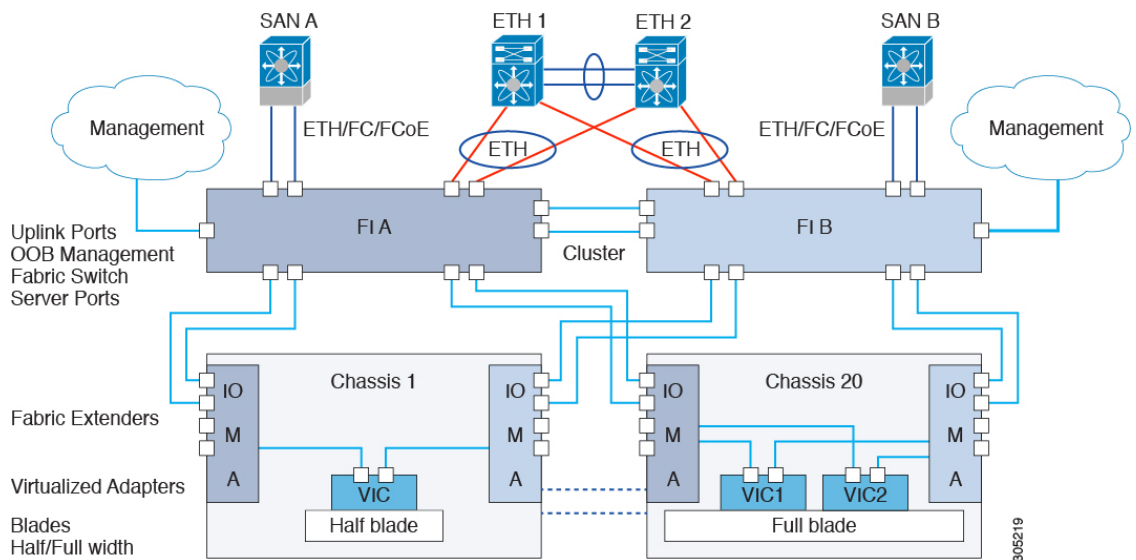
Architectural Simplification

The simplified architecture of Cisco UCS reduces the number of required devices and centralizes switching resources. By eliminating switching inside a chassis, network access-layer fragmentation is significantly reduced. Cisco UCS implements Cisco unified fabric within racks and groups of racks, supporting Ethernet and Fibre Channel protocols over 10 Gigabit Cisco Data Center Ethernet and Fibre Channel over Ethernet (FCoE) links. This radical simplification reduces the number of switches, cables, adapters, and management points by up to two-thirds. All devices in a Cisco UCS domain remain under a single management domain, which remains highly available through the use of redundant components.

High Availability

The management and data plane of Cisco UCS is designed for high availability and redundant access layer fabric interconnects. In addition, Cisco UCS supports existing high availability and disaster recovery solutions for the data center, such as data replication and application-level clustering technologies.

Scalability

A single Cisco UCS domain supports multiple chassis and their servers, all of which are administered through one Cisco UCS Manager. For more detailed information about the scalability, speak to your Cisco representative.

Flexibility

A Cisco UCS domain allows you to quickly align computing resources in the data center with rapidly changing business requirements. This built-in flexibility is determined by whether you choose to fully implement the stateless computing feature. Pools of servers and other system resources can be applied as necessary to respond to workload fluctuations, support new applications, scale existing software and business services, and accommodate both scheduled and unscheduled downtime. Server identity can be abstracted into a mobile service profile that can be moved from server to server with minimal downtime and no need for additional network configuration.

With this level of flexibility, you can quickly and easily scale server capacity without having to change the server identity or reconfigure the server, LAN, or SAN. During a maintenance window, you can quickly do the following:

- Deploy new servers to meet unexpected workload demand and rebalance resources and traffic.

- Shut down an application, such as a database management system, on one server and then boot it up again on another server with increased I/O capacity and memory resources.

Optimized for Server Virtualization

Cisco UCS has been optimized to implement VM-FEX technology. This technology provides improved support for server virtualization, including better policy-based configuration and security, conformance with a company's operational model, and accommodation for VMware's VMotion.

Cisco UCS Building Blocks and Connectivity

Figure 2: Cisco UCS Building Blocks and Connectivity

As shown in the figure above, the primary components included within Cisco UCS are as follows:

- **Cisco UCS Manager**—Cisco UCS Manager is the centralized management interface for Cisco UCS. For more information on Cisco UCS Manager, see *Introduction to Cisco UCS Manager* in *Cisco UCS Manager Getting Started Guide*

- **Cisco UCS Fabric Interconnects**—The Cisco UCS Fabric Interconnect is the core component of Cisco UCS deployments, providing both network connectivity and management capabilities for the Cisco UCS system. The Cisco UCS Fabric Interconnects run the Cisco UCS Manager control software and consist of the following components:

  - Cisco UCS 6400 Series Fabric Interconnects, Cisco UCS 6332 Series Fabric Interconnects, Cisco UCS 6200 Series Fabric Interconnects, and Cisco UCS Mini

  - Transceivers for network and storage connectivity

  - Expansion modules for the various Fabric Interconnects

  - Cisco UCS Manager software

For more information on Cisco UCS Fabric Interconnects, see Cisco UCS Fabric Infrastructure Portfolio, on page 6.

- **Cisco UCS I/O Modules and Cisco UCS Fabric Extender**—IO modules are also known as Cisco FEX or simply FEX modules. These modules serve as line cards to the FIs in the same way that Cisco Nexus Series switches can have remote line cards. IO modules also provide interface connections to blade servers. They multiplex data from blade servers and provide this data to FIs and do the same in the reverse direction. In production environments, IO modules are always used in pairs to provide redundancy and failover.

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Important The 40G backplane setting is not applicable for 22xx IOMs.

- **Cisco UCS Blade Server Chassis**—The Cisco UCS 5100 Series Blade Server Chassis is a crucial building block of Cisco UCS, delivering a scalable and flexible architecture for current and future data center needs, while helping reduce total cost of ownership.

- **Cisco UCS Blade and Rack Servers**—Cisco UCS Blade servers are at the heart of the UCS solution. They come in various system resource configurations in terms of CPU, memory, and hard disk capacity. The Cisco UCS rack-mount servers are standalone servers that can be installed and controlled individually. Cisco provides Fabric Extenders (FEXs) for the rack-mount servers. FEXs can be used to connect and manage rack-mount servers from FIs. Rack-mount servers can also be directly attached to the fabric interconnect.

  Small and Medium Businesses (SMBs) can choose from different blade configurations as per business needs.

- **Cisco UCS I/O Adapters**—Cisco UCS B-Series Blade Servers are designed to support up to two network adapters. This design can reduce the number of adapters, cables, and access-layer switches by as much as half because it eliminates the need for multiple parallel infrastructure for both LAN and SAN at the server, chassis, and rack levels.

Cisco UCS Fabric Infrastructure Portfolio

The Cisco UCS fabric interconnects are top-of-rack devices and provide unified access to the Cisco UCS domain. The Cisco UCS fabric interconnect hardware is now in its fourth generation. The following fabric interconnects are available in the Cisco UCS fabric interconnects product family:

- Cisco UCS 6400 Series Fabric Interconnects

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Note Cisco UCS Manager Release 4.1 introduces the Cisco UCS 64108 Fabric Interconnect to the Cisco UCS 6400 Series Fabric Interconnects.

- Cisco UCS 6300 Series Fabric Interconnects

- Cisco UCS 6200 Series Fabric Interconnects

- Cisco UCS 6324 Fabric Interconnects

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Note The Cisco UCS 6100 Series Fabric Interconnects and Cisco UCS 2104 I/O Modules have reached end of life.

Expansion Modules

The Cisco UCS 6200 Series supports expansion modules that can be used to increase the number of 10G, FCoE, and Fibre Channel ports.

- The Cisco UCS 6248 UP has 32 ports on the base system. It can be upgraded with one expansion module providing an additional 16 ports.

- The Cisco UCS 6296 UP has 48 ports on the base system. It can be upgraded with three expansion modules providing an additional 48 ports.

Cisco UCS 6400 Series Fabric Interconnects

Cisco UCS 6400 Series Fabric Interconnect Overview

A Cisco UCS 6400 Series Fabric Interconnect provides both network connectivity and management capabilities to the Cisco UCS system. The fabric interconnect provides Ethernet and Fibre Channel to the servers in the system, the servers connect to the fabric interconnect, and then to the LAN or SAN.

Each Cisco UCS 6400 Series Fabric Interconnect runs Cisco UCS Manager to fully manage all Cisco UCS elements. The fabric interconnect supports 10/25 Gigabit ports in the fabric with 40/100 Gigabit uplink ports. High availability can be achieved when a Cisco UCS 6400 Series Fabric Interconnect is connected to another Cisco UCS 6400 Series Fabric Interconnect through the L1 or L2 port on each device.

Cisco UCS 6400 Series Fabric Interconnect consists of:

- Cisco UCS 6454 Fabric Interconnects

- Cisco UCS 64108 Fabric Interconnects

Cisco UCS 64108 Fabric Interconnect

The Cisco UCS 64108 Fabric Interconnect is a 2 RU top-of-rack (TOR) switch that mounts in a standard 19-inch rack such as the Cisco R Series rack. This high-density FI is an ideal upgrade from the high-density Cisco UCS 6296 Fabric Interconnect.

The high-density Cisco UCS 64108 Fabric Interconnect has 96 10/25 Gb SFP28 ports and 12 40/100 Gb QSFP28 ports. Each 40/100 Gb port can break out into 4 x 10/25 Gb uplink ports. Ports 1 - 16 are unified ports that support 10/25 GbE or 8/16/32G Fibre Channel speeds. Ports 89-96 support 1Gbps Ethernet speeds.

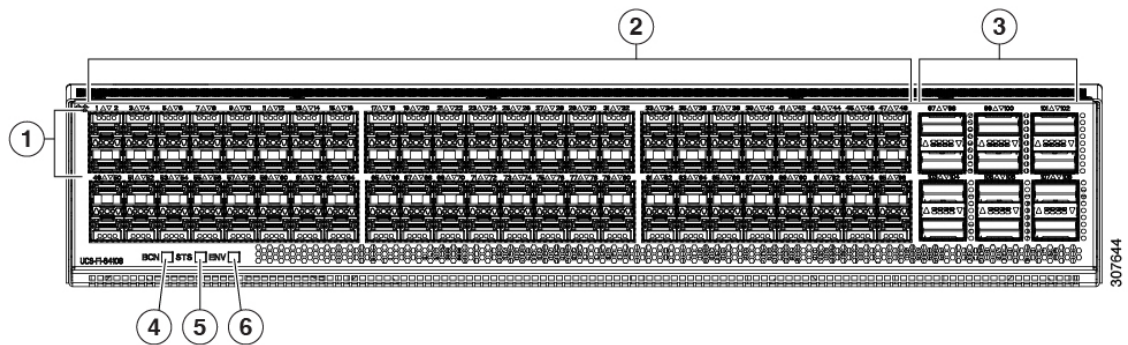The Cisco UCS 64108 Fabric Interconnect supports either:

- Eight FCoE port channels

- Or Four SAN port channels

- or Four SAN port channels and four FCoE port channels

The Cisco UCS 64108 Fabric Interconnect also has one network management port, one RS-232 serial console port for setting the initial configuration, and one USB port for saving or loading configurations. The FI also includes L1/L2 ports for connecting two fabric interconnects in a high-availability configuration.

The Cisco UCS 64108 Fabric Interconnect also contains a CPU board that consists of:

- Intel Xeon Processor, 6 core

- 64 GB of RAM

- 8 MB of NVRAM (4 x NVRAM chips)

- 128 GB SSD (bootflash)

Figure 3: Cisco UCS 64108 Fabric Interconnect Rear View

1	Ports 1-16 Unified ports: • 10/25 Gbps Ethernet or FCoE • 8/16/32 Gbps Fibre Channel	2	Ports 17-88 (10/25 Gbps Ethernet or FCoE)
3	Ports 89-96 • 10/25 Gbps Ethernet or FCoE • 1 Gbps Ethernet	4	Uplink Ports 97-108 (40/100 Gbps Ethernet or FCoE) Each of these ports can be 4 x 10/25 Gbps Ethernet or FCoE uplink ports when using a breakout cable.
5	System environment (fan fault) LED	6	System status LED
7	Beacon LED		

The Cisco UCS 64108 Fabric Interconnect has two power supplies (redundant as 1+1) and three fans (redundant as 2+1).

Figure 4: Cisco UCS 64108 Fabric Interconnect Front View
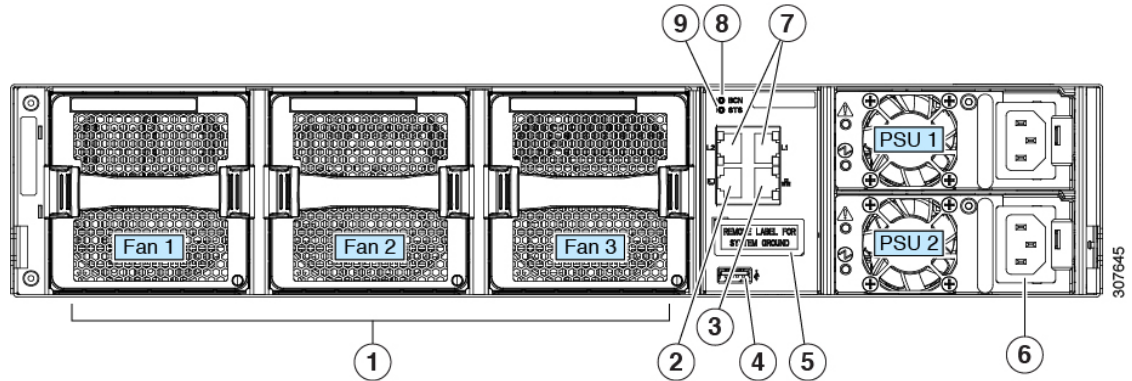
1	Cooling fans (hot swappable, 2+1 redundancy)	**2**	RS-232 serial console port (RJ-45 connector)
3	Network management port (RJ-45 connector)	4	USB port
5	Grounding pad for two-hole grounding lug (under protective label)	6	Power supplies Two identical AC or DC PSUs, hot-swappable, 1+1 redundancy
7	L1/L2 high-availability ports (RJ-45 connector)	8	Beacon LED
9	System status LED		

Cisco UCS 6454 Fabric Interconnect

The Cisco UCS 6454 Fabric Interconnect (FI) is a 1-RU top-of-rack switch that mounts in a standard 19-inch rack such as the Cisco R Series rack.

The Cisco UCS 6454 Fabric Interconnect has 48 10/25 Gb SFP28 ports (16 unified ports) and 6 40/100 Gb QSFP28 ports. Each 40/100 Gb port can break out into 4 x 10/25 Gb uplink ports. The sixteen unified ports support 10/25 GbE or 8/16/32G Fibre Channel speeds.

Note   The Cisco UCS 6454 Fabric Interconnect supported 8 unified ports (ports 1 - 8) with Cisco UCS Manager 4.0(1) and 4.0(2), but with release 4.0(4) and later it supports 16 unified ports (ports 1 - 16).

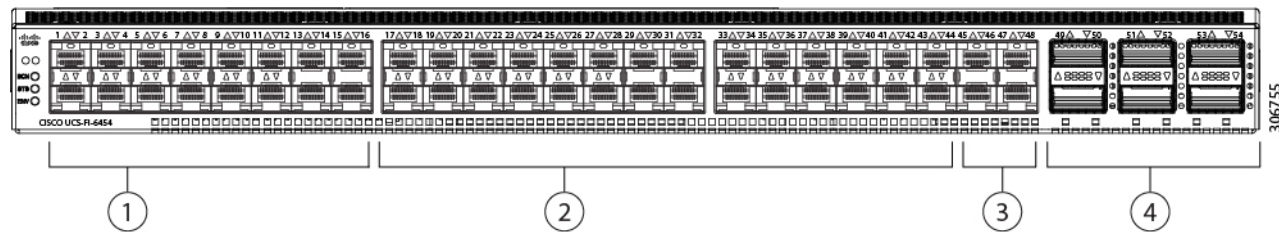The Cisco UCS 6454 Fabric Interconnect supports:

- Maximum of 8 FCoE port channels
- Or 4 SAN port channels
- Or a maximum of 8 SAN port channels and FCoE port channels (4 each)

The Cisco UCS 6454 Fabric Interconnect also has one network management port, one console port for setting the initial configuration, and one USB port for saving or loading configurations. The FI also includes L1/L2 ports for connecting two fabric interconnects for high availability.

The Cisco UCS 6454 Fabric Interconnect also contains a CPU board that consists of:

- Intel Xeon D-1528 v4 Processor, 1.6 GHz

- 64 GB of RAM

- 8 MB of NVRAM (4 x NVRAM chips)

- 128 GB SSD (bootflash)

Figure 5: Cisco UCS 6454 Fabric Interconnect Rear View

1	Ports 1-16 (Unified Ports 10/25 Gbps Ethernet or FCoE or 8/16/32 Gbps Fibre Channel)	2	Ports 17-44 (10/25 Gbps Ethernet or FCoE)
	Note When using Cisco UCS Manager releases earlier than 4.0(4), only ports 1-8 are Unified Ports.		**Note** When using Cisco UCS Manager releases earlier than 4.0(4), ports 9-44 are 10/25 Gbps Ethernet or FCoE.
3	Ports 45-48 (1/10/25 Gbps Ethernet or FCoE)	4	Uplink Ports 49-54 (40/100 Gbps Ethernet or FCoE)
			Each of these ports can be 4 x 10/25 Gbps Ethernet or FCoE uplink ports when using an appropriate breakout cable.

The Cisco UCS 6454 Fabric Interconnect chassis has two power supplies and four fans. Two of the fans provide front to rear airflow.

Figure 6: Cisco UCS 6454 Fabric Interconnect Front View
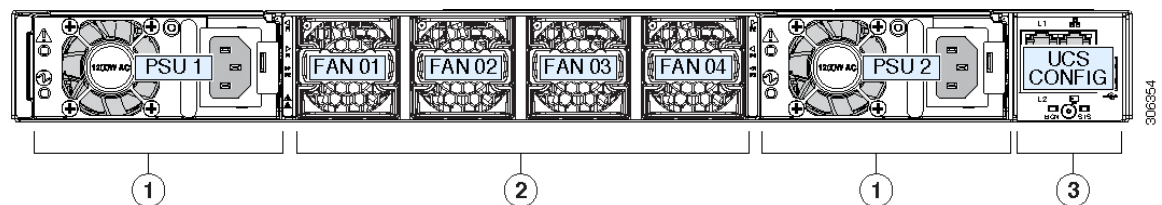
1	Power supply and power cord connector	**2**	Fans 1 through 4, numbered left to right, when facing the front of the chassis.

3	L1 port, L2 port, RJ45, console, USB port, and LEDs		

Ports on the Cisco UCS Fabric Interconnects

Ports on the Cisco UCS 6400 Series Fabric Interconnects can be configured to carry either Ethernet or Fibre Channel traffic. You can configure only ports 1-16 to carry Fibre Channel traffic. The ports cannot be used by a Cisco UCS domain until you configure them.

Note

- The Cisco UCS 6454 Fabric Interconnect supported 8 unified ports (ports 1 - 8) with Cisco UCS Manager 4.0(1) and 4.0(2), but with Release 4.0(4) and later releases, it supports 16 unified ports (ports 1 - 16).

  When you configure a port on a Fabric Interconnect, the administrative state is automatically set to enabled. If the port is connected to another device, this may cause traffic disruption. The port can be disabled and enabled after it has been configured.

The following table summarizes the second, third, fourth, and generation Fabric Interconnect support.

	Second Generation		**Third Generation**		**Fourth Generation**	
Item	Cisco UCS 6248 UP	Cisco UCS 6296 UP	Cisco UCS 6332	Cisco UCS 6332-16UP	Cisco UCS 6454	Cisco UCS 64108
Description	48-Port Fabric Interconnect	96-Port Fabric Interconnect	32-Port Fabric Interconnect	40-Port Fabric Interconnect	54-Port Fabric Interconnect	108-Port Fabric Interconnect
Form factor	1 RU	2 RU	1 RU	1 RU	1 RU	2 RU
Number of fixed 10 GB Interfaces	32	48	96 (40G to 4 x 10G breakout cables), QSA, Port 13 and 14 do not support 40G to 10G breakout	88 (40G to 4 x 10G breakout cables)	48 10G/25G interfaces	96 10G/25G interfaces

	Second Generation		**Third Generation**		**Fourth Generation**	
Number of Unified Ports	32	48	—	16	16 This FI supported 8 unified ports (ports 1 - 8) with Cisco UCS Manager 4.0(1) and 4.0(2), but with Release 4.0(4) and later it supports 16 unified ports (ports 1 - 16).	16 ports 1-16
Unified Port Speeds	1G/10G or 1G/2G/4G/8G-FC	1G/10G or 1G/2G/4G/8G - FC	—	1G/10G or 4G/8G/16G-FC	10G/25G or 8G/16G/32G-FC	10G/25G or 8G/16G/32G-FC
Number of 40-Gbps ports	—	—	32	24	6 40G/100G ports	12 40G/100G ports
Unified Port Range	Ports 1-32	Ports 1-48	None	Ports 1-16	Ports 1-16	Ports 1-16
Compatibility with the IOM	UCS 2204, UCS 2208	UCS 2204, UCS 2208	UCS 2204, UCS 2208, UCS 2304, UCS 2304V2	UCS 2204, UCS 2208, UCS 2304, UCS 2304V2	UCS 2204, UCS 2208, UCS 2408	UCS 2204, UCS 2208, UCS 2408
Compatibility with the FEX	Cisco Nexus 2232PP Cisco Nexus 2232TM-E	Cisco Nexus 2232PP Cisco Nexus 2232TM-E	Cisco Nexus 2232PP Cisco Nexus 2232TM-E Cisco Nexus 2348UPQ	Cisco Nexus 2232PP Cisco Nexus 2232TM-E Cisco Nexus 2348UPQ	Cisco Nexus 2232PP Cisco Nexus 2232TM-E Cisco Nexus 93180YC-FX3	Cisco Nexus 2232PP Cisco Nexus 2232TM-E Cisco Nexus 93180YC-FX3
Expansion Slots	1 (16 port)	3 (16 port)	None	None	None	None
Fan Modules	2	4	4	4	4	3
Power Supplies	2 (AC/DC available)	2 (AC/DC available)	2 (AC/DC)	2 (AC/DC)	2 (AC/DC)	2 (AC/DC)

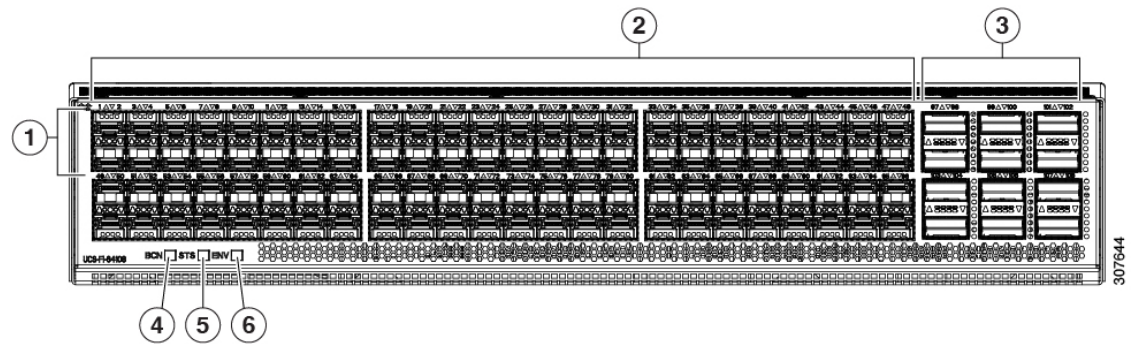# Port Breakout Functionality on Cisco UCS 64108 Fabric Interconnects

About Breakout Ports

Cisco UCS 64108 fabric interconnects support splitting a single 40/100G QSFP port into four 10/25G ports using a supported breakout cable. On the UCS 64108 fabric interconnect, by default, there are 12 ports in the 40/100G mode. These are ports 97 to 108. These 40/100G ports are numbered in a 2-tuple naming convention. For example, the second 40G port is numbered as 1/99. The process of changing the configuration from 40G to 10 G, or from 100G to 25G is called breakout, and the process of changing the configuration from [4X]10G to 40G or from [4X]25G to 100G is called unconfigure. These ports can be used as uplink port, appliance port, server port (using FEX), and FCoE storage port.

When you break out a 40G port into 10G ports or a 100G port into 25G ports, the resulting ports are numbered using a 3-tuple naming convention. For example, the breakout ports of the second 40-Gigabit Ethernet port are numbered as 1/99/1, 1/99/2, 1/99/3, 1/99/4.

The following image shows the rear view of the Cisco UCS 64108 fabric interconnect, and includes the ports that support breakout port functionality:

Figure 7: Cisco UCS 64108 Fabric Interconnect Rear View

1	Ports 1-16. Unified Ports can operate as 10/25 Gbps Ethernet or 8/16/32 Gbps Fibre Channel. FC ports are converted in groups of four. Unified ports: • 10/25 Gbps Ethernet or FCoE • 8/16/32 Gbps Fibre Channel	2	Ports 1-96. Each port can operate as either a 10 Gbps or 25 Gbps Ethernet or FCoE SFP28 port.
3	Uplink Ports 97-108. Each port can operate as either a 40 Gbps or 100 Gbps Ethernet or FCoE port. When using a breakout cable, each of these ports can operate as 4 x 10 Gbps or 4 x 25 Gbps Ethernet or FCoE ports. Ports 97 - 108 can be used to connect to Ethernet or FCoE uplink ports, and not to UCS server ports.	4	Ports 89-96 • 10/25 Gbps Ethernet or FCoE • 1 Gbps Ethernet

5	System environment (fan fault) LED	6	System status LED
7	Beacon LED		

Breakout Port Guidelines

The following are the guidelines for breakout functionality for Cisco UCS 64108 fabric interconnects:

- The breakout configurable ports are ports 97-108.

- You cannot configure the speed for each breakout port. Each breakout port is in auto mode.

- The fabric interconnect is rebooted after you configure the breakout mode for any of the supported fabric interconnect ports (1/97 to 1/108).

- Breakout ports are not supported as destinations for traffic monitoring.

- Ports 97-108 can be configured as uplink, appliance, server(using FEX), and FCoE storage ports.

## Port Breakout Functionality on Cisco UCS 6454 Fabric Interconnects

About Breakout Ports

Cisco UCS 6454 fabric interconnects support splitting a single 40/100G QSFP port into four 10/25G ports using a supported breakout cable. These ports can be used only as uplink ports connecting to a 10/25G switch. On the UCS 6454 fabric interconnect, by default, there are 6 ports in the 40/100G mode. These are ports 49 to 54. These 40/100G ports are numbered in a 2-tuple naming convention. For example, the second 40G port is numbered as 1/50. The process of changing the configuration from 40G to 10 G, or from 100G to 25G is called breakout, and the process of changing the configuration from [4X]10G to 40G or from [4X]25G to 100G is called unconfigure.

When you break out a 40G port into 10G ports or a 100G port into 25G ports, the resulting ports are numbered using a 3-tuple naming convention. For example, the breakout ports of the second 40-Gigabit Ethernet port are numbered as 1/50/1, 1/50/2, 1/50/3, 1/50/4.

The following image shows the rear view of the Cisco UCS 6454 fabric interconnect, and includes the ports that support breakout port functionality:

Figure 8: Cisco UCS 6454 Fabric Interconnect Rear View
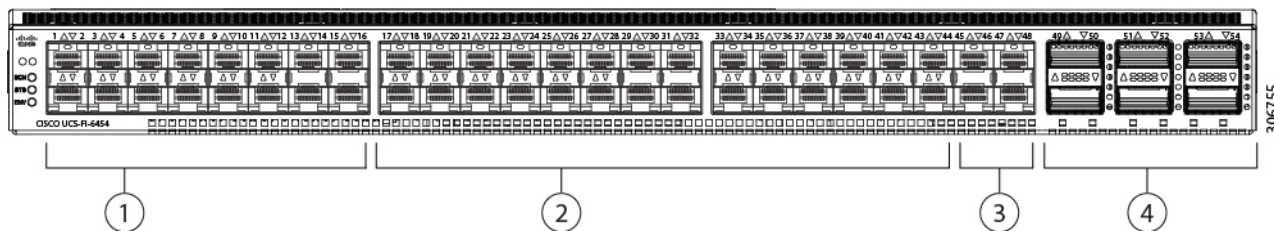
1	Ports 1-16 (Unified Ports 10/25 Gbps Ethernet or FCoE or 8/16/32 Gbps Fibre Channel)	2	Ports 17-44 (10/25 Gbps Ethernet or FCoE)
3	Ports 45-48 (1/10/25 Gbps Ethernet or FCoE)	4	Uplink Ports 49-54 (40/100 Gbps Ethernet or FCoE)

Breakout Port Guidelines

The following are the guidelines for breakout functionality for Cisco UCS 6454 fabric interconnects:

- The breakout configurable ports are ports 49-54.

- You cannot configure the speed for each breakout port. Each breakout port is in auto mode.

- The fabric interconnect is rebooted after you configure the breakout mode for any of the supported fabric interconnect ports (1/49 to 1/54).

- In Cisco UCS Manager Release 4.0(2), breakout ports are not supported as destinations for traffic monitoring.

- Ports 49-54 can only be configured as uplink ports. They cannot be configured as any of the following:

  - Server ports

  - FCoE storage ports

  - Appliance ports

Software Feature Configuration on Cisco UCS 6400 Series Fabric Interconnects

Cisco UCS Manager Release 4.0(1) and 4.0(2) introduced support for various software features on Cisco UCS 6454 Fabric Interconnects. Cisco UCS Manager Release 4.1 extends support for these features on Cisco UCS 64108 Fabric Interconnects. These software features are:

- Switching Modes—Support for Ethernet and FC switching modes on Cisco UCS 6400 Series Fabric Interconnects .

- MAC Security—Support for MAC security on Cisco UCS 6400 Series Fabric Interconnects.

- Breakout Uplink Ports—Support for splitting a single 40/100G QSFP port into four 10/25G ports using a supported breakout cable. These ports can be used only as Ethernet uplink or FCoE uplink ports connecting to a 10/25G switch. They cannot be configured as server ports, FCoE storage ports, appliance ports or monitoring ports.

- MTU Configuration—Cisco UCS 64108 Fabric Interconnects support MTU configuration for QOS drop class policy.

Cisco UCS 6400 Series Fabric Interconnects do not support the following software features:

- Chassis Discovery Policy in Non-Port Channel Mode—Cisco UCS 6400 Series Fabric Interconnects support only Port Channel mode.

- Chassis Connectivity Policy in Non-Port Channel Mode—Cisco UCS 6400 Series Fabric Interconnects support only Port Channel mode.

- Multicast Hardware Hash—Cisco UCS 6400 Series Fabric Interconnects do not support multicast hardware hash.

- Service Profiles with Dynamic vNICS—Cisco UCS 6400 Series Fabric Interconnects do not support Dynamic vNIC Connection Policies.

- Multicast Optimize—Cisco UCS 6400 Series Fabric Interconnects do not support Multicast Optimize for QoS.

- NetFlow—Cisco UCS 6400 Series Fabric Interconnects do not support NetFlow related configuration.

- Port profiles and DVS Related Configurations—Cisco UCS 6400 Series Fabric Interconnects do not support configurations related to port profiles and distributed virtual switches (DVS).

Configuration of the following software features has changed for Cisco UCS 6400 Series Fabric Interconnects:

- Unified Ports—Cisco UCS 6400 Series Fabric Interconnects support up to 16 unified ports, which can be configured as FC. These ports appear at the beginning of the module.

- VLAN Optimization—On Cisco UCS 6400 Series Fabric Interconnects, you can configure VLAN port count optimization through port VLAN (VP) grouping when the PV count exceeds 16000. The following table illustrates the PV Count with VLAN port count optimization enabled and disabled on Cisco UCS 6400 Series Fabric Interconnect, Cisco UCS 6300 Series Fabric Interconnects, and Cisco UCS 6200 Series Fabric Interconnects.

	6200 Series FI	6300 Series FI	6400 Series FI
PV Count with VLAN Port Count Optimization Disabled	32000	16000	16000
PV Count with VLAN Port Count Optimization Enabled	64000	64000	64000

When a Cisco UCS 6400 Series Fabric Interconnect is in Ethernet switching mode:

- The Fabric Interconnect does not support **VLAN Port Count Optimization Enabled**

- The Fabric Interconnect supports 16000 PVs, similar to EHM mode, when set to **VLAN Port Count Optimization Disabled**

- Limited Restriction on VLAN—Cisco UCS 6400 Series Fabric Interconnects reserve 128 additional VLANs for system purposes.

Cisco UCS 6300 Series Fabric Interconnects

Fabric Interconnect Features

A Cisco UCS 6300 Series Fabric Interconnect provides both network connectivity and management capabilities to a Cisco UCS system. The fabric interconnect provides Ethernet and Fibre Channel to the servers in the system, the servers connect to the fabric interconnect, and the fabric interconnect connects to the LAN or SAN.

Each Cisco UCS 6300 Series Fabric Interconnect runs Cisco UCS Manager to fully manage all Cisco UCS elements. The fabric interconnect supports full end-to-end 40-Gigabit capabilities in the fabric and enables 16-Gigabit Fibre Channel capabilities. High availability can be achieved when a Cisco UCS 6300 Series Fabric Interconnect is connected to another Cisco UCS 6300 Series Fabric Interconnect through the L1 or L2 port on each device.

The Cisco UCS 6300 Series Fabric Interconnect joins next-generation UCS products, including the following hardware:

- Cisco UCS 6332 Fabric Interconnect, an Ethernet or Fibre Channel over Ethernet (FCoE) chassis with 32 40-Gigabit QSFP+ ports

- Cisco UCS 6332-16UP Fabric Interconnect, an Ethernet, FCoE, and Fibre Channel chassis with 16 1- or 10-Gigabit SFP+ ports or 16 4-, 8-, or 16-Gigabit Fibre Channel ports, 24 40-Gigabit QSFP+ ports

- Cisco 2304 IOM or Cisco 2304V2, I/O modules with 8 40-Gigabit backplane ports and 4 40-Gigabit uplink ports

- Multiple VICs

Cisco UCS 6332 Fabric Interconnect

The Cisco UCS 6332 Fabric Interconnect is a 1-RU, top-of-rack switch with 32 40-Gigabit QSFP+ ports, one 100/1000 network management port, one RS-232 console port for setting the initial configuration, and two USB ports for saving or loading configurations. The switch also includes an L1 port and an L2 port for connecting two fabric interconnects to provide high availability. The switch mounts in a standard 19-inch rack, such as the Cisco R Series rack.

Cooling fans pull air front-to-rear. That is, air intake is on the fan side and air exhaust is on the port side.

Figure 9: Cisco UCS 6332 Fabric Interconnect Rear View

1	Port lane switch button, port lane LEDs, and L1 and L2 ports.	2	Ports 1–12 and ports 15–26 can operate as 40-Gbps QSFP+ ports, or as 4 x 10-Gbps SFP+ breakout ports.
			Ports 1 - 4 support Quad to SFP or SFP+ (QSA) adapters to provide 1-Gbps/10 Gbps operation.
			Ports 13 and 14 can operate as 40-Gbps QSFP+ ports. They cannot operate as 4 x 10-Gbps SFP+ breakout ports.
3	Ports 27–32 operate as 40-Gbps QSFP+ ports.		

Figure 10: Cisco UCS 6332 Fabric Interconnect Front View

1	Power supply and power cord connector	2	Fans1 through 4, numbered left to right, when facing the front of the chassis.
3	Management, console, and USB ports, and LEDs.		

Cisco UCS 6332-16UP Fabric Interconnect

The Cisco UCS 6332-16UP Fabric Interconnect is a 1-RU top-of-rack switch with 24 40-Gb QSFP+ ports, 16 10-Gb SFP ports, one 100/1000 network management port, one RS-232 console port for setting the initial configuration, and two USB ports for saving or loading configurations. The switch also includes an L1 port and an L2 port for connecting two fabric interconnects to provide high availability. The switch mounts in a standard 19-inch rack, such as the Cisco R Series rack.

Cooling fans pull air front-to-rear. That is, air intake is on the fan side and air exhaust is on the port side.

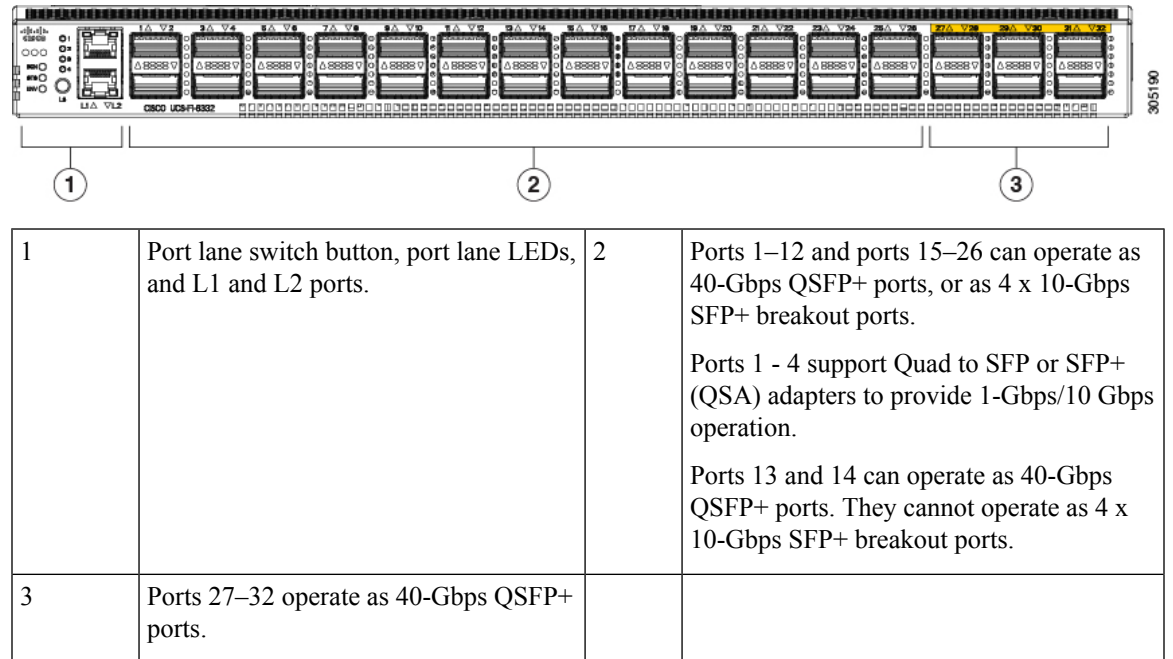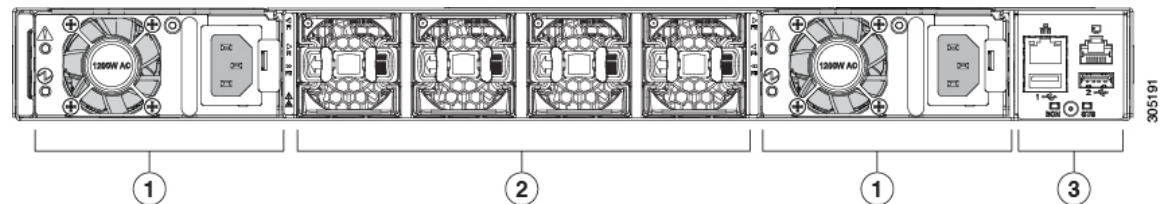*Figure 11: Cisco UCS 3223-16UP Fabric Interconnect Rear View*

1	Port lane switch button, port lane LEDs, and L1 and L2 ports.	2	Ports 1–16 are Unified Ports (UP) that operate either as 1- or 10-Gbps SFP+ fixed Ethernet ports; or as 4-, 8-, or 16-Gigabit Fibre Channel ports.
3	Ports 17–34 operate either as 40-Gbps QSFP+ ports, breakout mode for 4 x 10-Gigabit SFP+ breakout ports, or QSA for 10G.	4	Ports 35–40 operate as 40-Gbps QSFP+ ports.

Figure 12: Cisco UCS 6332-16UP Fabric Interconnect Front View

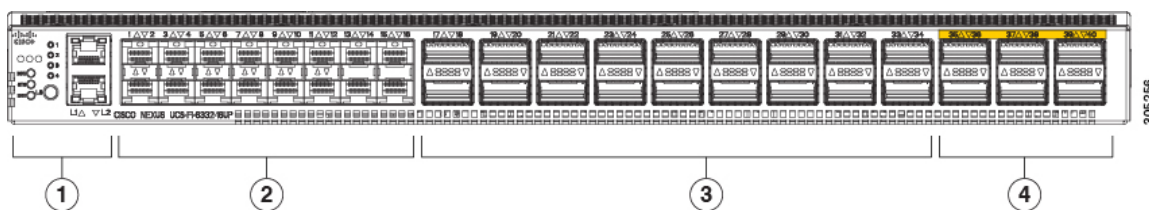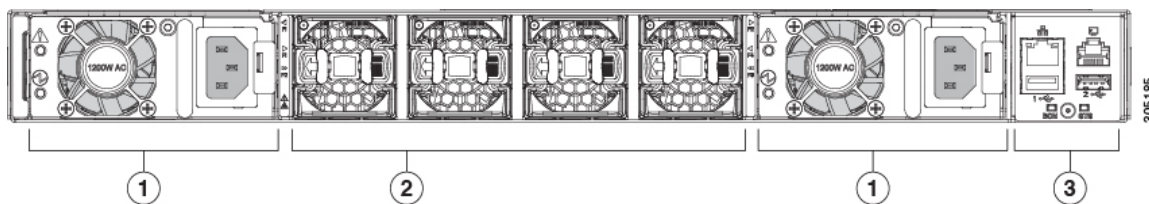| 1	Power supply and power cord connector	2	Fans1 through 4, numbered left to right, when facing the front of the chassis.
3	Management, console, and USB ports, and LEDs.		

Ports on the Cisco UCS 6300 Series Fabric Interconnects

Ports on the Cisco UCS 6300 Series Fabric Interconnects can be configured to carry either Ethernet or Fibre Channel traffic. These ports are not reserved. They cannot be used by a Cisco UCS domain until you configure them.

✎

| **Note** | When you configure a port on a fabric interconnect, the administrative state is automatically set to enabled. If the port is connected to another device, this may cause traffic disruption. You can disable the port after it has been configured. |

The following table summarizes the second and third generation ports for the Cisco UCS fabric interconnects.

	Cisco UCS Mini	**Second Generation**		**Third Generation**	
Item	Cisco UCS 6324	Cisco UCS 6248 UP	Cisco UCS 6296 UP	Cisco UCS 6332	Cisco UCS 6332-16UP
Description	Fabric Interconnect with 4 unified ports and 1 scalability port	48–Port Fabric Interconnect	96–Port Fabric Interconnect	32–Port Fabric Interconnect	40–Port Fabric Interconnect
Form factor	1 RU	1 RU	2 RU	1 RU	1 RU
Number of fixed 40 GB Interfaces	—	—	—	6(Ports 17–32)	6(Ports 35–40)
Number of 1GB/10GB Interfaces (depending on the SFP module installed)	All	All	All	Ports 5–26 using breakout cable	Ports 17–34 using breakout cable
Unified Ports (8 Gb/s, FC, FCoE)	4	All	All	None	Ports 1–16
Compatibility with all IOMs	All	All	All	All	All
Expansion Slots	None	1 (16 port)	3 (16 port)	None	None
Fan Modules	4	2	5	4	4
Power Supplies	—	2 (AC/DC available)	2 (AC/DC available)	2 (AC/DC available)	2 (AC/DC available)

> **Note** Cisco UCS 6300 Series Fabric Interconnects support breakout capability for ports. For more information on how the 40G ports can be converted into four 10G ports, see Port Breakout Functionality on Cisco UCS 6300 Series Fabric Interconnects, on page 21.

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
>
> • SPAN source ports

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

Port Breakout Functionality on Cisco UCS 6300 Series Fabric Interconnects
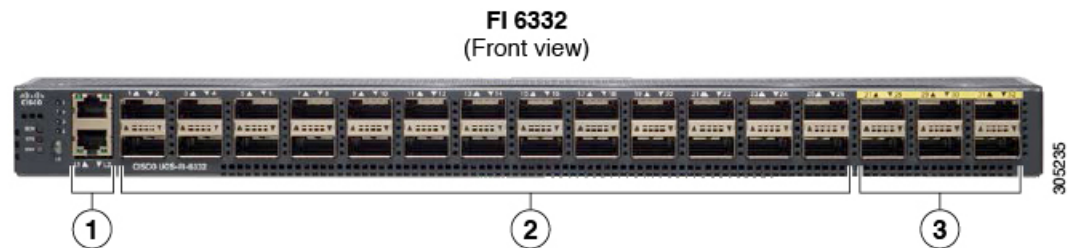
About Breakout Ports

Cisco UCS fabric interconnect 6300 series supports splitting a single QSFP port into four 10G ports using a supported breakout cable. By default, there are 32 ports in the 40G mode. These 40G ports are numbered in a 2-tuple naming convention. For example, the second 40G port is numbered as 1/2. The process of changing the configuration from 40G to 10G is called breakout and the process of changing the configuration from [4X]10G to 40G is called unconfigure.

When you break out a 40G port into 10G ports, the resulting ports are numbered using a 3-tuple naming convention. For example, the breakout ports of the second 40-Gigabit Ethernet port are numbered as 1/2/1, 1/2/2, 1/2/3, 1/2/4.

The following image shows the front view for the Cisco UCS 6332 series fabric interconnects, and includes the ports that may support breakout port functionality:

Figure 13: Cisco UCS 6332 Series Fabric Interconnects Front View

1	L1 and L2 high availability ports
2	28 X 40G QSFP ports (98 X 10G SFP ports)
	Note • QSA module is required on ports 13–14
	• A QSFP to 4XSFP breakout cable is required for 10G support.
3	6 X 40G QSFP ports

The following image shows the front view for the Cisco UCS 6332-16UP series fabric interconnects, and includes the ports that may support breakout port functionality:

Figure 14: Cisco UCS 6332-16UP Series Fabric Interconnects Front View
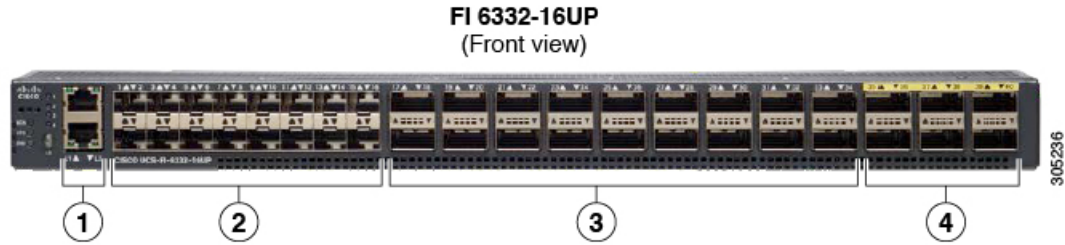
1	L1 and L2 high availability ports
2	16 X 1/10G SFP (16 X 4/8/16G FC ports)
3	18 X 40G QSFP(72 X 10G SFP+) **Note** • A QSFP to 4XSFP breakout cable is required for 10G support.
4	6 X 40G QSFP ports

The following image shows the rear view of the Cisco UCS 6300 series fabric interconnects.

Figure 15: Cisco UCS 6300 Series Fabric Interconnects Rear View
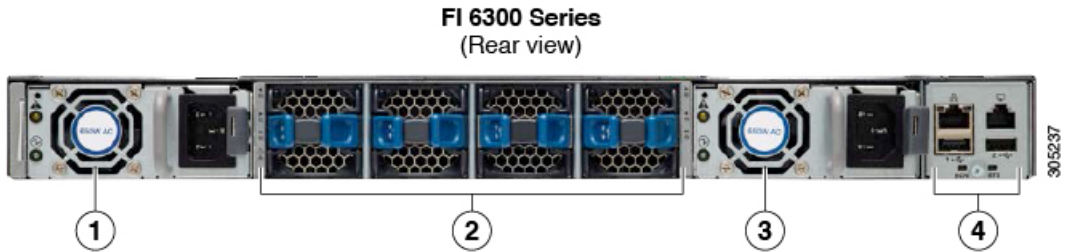
1	Power supply
2	Four fans
3	Power supply
4	Serial ports

Breakout Port Constraints

The following table summarizes the constraints for breakout functionality for Cisco UCS 6300 series fabric interconnects:

Cisco UCS 6300 Series Fabric Interconnect Series	Breakout Configurable Ports	Ports without breakout functionality support
Cisco UCS 6332	1–12, 15–26	13–14, 27–32 **Note** • Auto-negotiate behavior is not supported on ports 27–32.
Cisco UCS 6332-16UP	17–34	1–16, 35–40 **Note** • Auto-negotiate behavior is not supported on ports 35–40

☞

Important	Up to four breakout ports are allowed if QoS jumbo frames are used.

Cisco UCS Chassis

Cisco UCS Manager Release 3.1(1) and later releases provide support for Cisco UCS 5108 Blade Server Chassis

Chassis Management provides details on managing the chassis through Cisco UCS Manager.

Cisco UCS 5108 Blade Server Chassis

The Cisco UCS 5108 Blade Server Chassis, is six rack units (6RU) high, can mount in an industry-standard 19-inch rack, and uses standard front-to-back cooling. A chassis can accommodate up to eight half-width, or four full-width Cisco UCS B-Series Blade Servers form factors within the same chassis. By incorporating unified fabric and fabric-extender technology, the Cisco Unified Computing System enables the chassis to:

- Have fewer physical components
- Require no independent management
- Be more energy efficient than a traditional blade-server chassis

The Cisco UCS 5108 Blade Server Chassis is supported with all generations of fabric interconnects.

Cisco UCS Mini Infrastructure

The Cisco UCS Mini solution extends the Cisco UCS architecture into environments with requirements for smaller domains, including branch and remote offices, point-of-sale locations, and smaller IT environments. Cisco UCS Mini has three main infrastructure components:

- Cisco UCS 6324 fabric interconnect
- Cisco UCS blade server chassis
- Cisco UCS blade or rack mount servers

Figure 16: Cisco UCS Mini
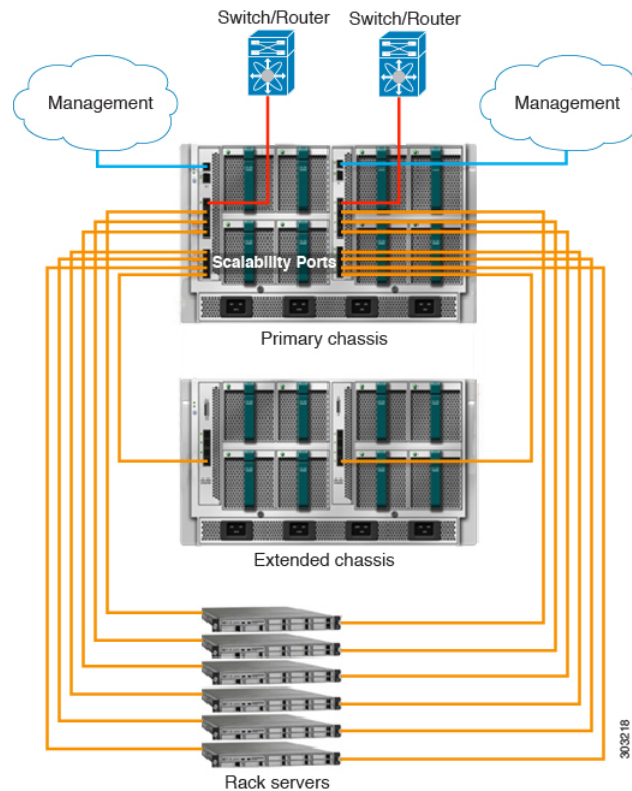
In the Cisco UCS Mini solution, the Cisco UCS 6324 fabric interconnect is collapsed into the IO Module form factor, and is inserted into the IOM slot of the blade server chassis. The Cisco UCS 6324 fabric interconnect has 24 10G ports available on it. Sixteen of these ports are server facing, two 10G ports are dedicated to each of the eight half width blade slots. The remaining eight ports are divided into groups of four 1/10G Enhanced Small Form-Factor Pluggable (SFP+) ports and one 40G Quad Small Form-factor Pluggable (QSFP) port, which is called the 'scalability port'.

Cisco UCS Manager Release 3.1(1) introduces support for a second UCS 5108 chassis to an existing single-chassis Cisco UCS 6324 fabric interconnect setup. This extended chassis enables you to configure an additional 8 servers. Unlike the primary chassis, the extended chassis supports IOMs. Currently, it supports UCS-IOM-2204XP and UCS-IOM-2208XP IOMs. The extended chassis can only be connected through the scalability port on the FI-IOM.

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Important   Currently, Cisco UCS Manager supports only one extended chassis for UCS Mini.

Cisco UCS Infrastructure Virtualization

Cisco UCS is a single integrated system with switches, cables, adapters, and servers that are all tied together and managed by unified management software. One capability that enables this unification is the ability to virtualize every component of the system at every level. Switch port, cables, adapter, and servers can all be virtualized. Because of the virtualization capabilities at every component of the system, you have the unique

capability to provide rapid provisioning of any service on any server on any blade through a system that is wired once. The following image illustrates these virtualization capabilities.

Figure 17: Virtualization Capabilities of Cisco UCS

Switch Port Virtualization

The physical interfaces provide physical connectivity for what are logical virtual interfaces on the fabric interconnects-virtual Fibre Channel interfaces (vFC) and virtual Ethernet interfaces (vEth). The logical connectivity to a server is provided through these virtual interfaces.

Cable Virtualization

The physical cables that connect to physical switch ports provide the infrastructure for logical and virtual cables. These virtual cables connect to virtual adapters on any given server in the system.

Adapter Virtualization

On the server, you have physical adapters, which provide physical infrastructure for virtual adapters. A virtual network interface card (vNIC) or virtual host bus adapter (vHBA) logically connects a host to a virtual interface on the fabric interconnect and allows the host to send and receive traffic through that interface. Each virtual interface in the fabric interconnect corresponds to a vNIC.

An adapter that is installed on the server appears to the server as multiple adapters through standard PCIe virtualization. When the server scans the PCIe bus, the virtual adapters that are provisioned appear to be physically plugged into the PCIe bus.

Server Virtualization

Server virtualization provides you with the ability of stateless servers. As part of the physical infrastructure, you have physical servers. However, the configuration of a server is derived from the service profile to which it is associated. All service profiles are centrally managed and stored in a database on the fabric interconnect.

A service profile defines all the settings of the server, for example, the number of adapters, virtual adapters, the identity of these adapters, the firmware of the adapters, and the firmware of the server. It contains all the settings of the server that you typically configure on a physical machine. Because the service profile is abstracted from the physical infrastructure, you can apply it to any physical server and the physical server will be configured according to the configuration defined in the service profile. *Cisco UCS Manager Server Management Guide* provides detailed information about managing service profiles.