Cisco Nexus 5000 Series Switches (Cisco Nexus 5548, Cisco Nexus 5596 Switches)

Latest Additions to the Cisco Nexus 5000 Series Switches

Cisco Nexus 5000 Series Switches Product Overview

Today's data centers are increasingly filled with dense rack-mount and blade servers that host powerful multicore processors. The rapid increase in in-rack computing density and the increasing use of virtualization software combine to accelerate the demand for 10 Gigabit Ethernet and consolidated I/O: applications for which the Cisco Nexus® 5000 Series Switches are an excellent match. With low latency, front-to-back cooling, and rear-facing data ports, the Cisco Nexus 5000 Series is designed for a broad range of physical, virtual, storage access, and high-performance computing environments, thus giving customers the flexibility to meet and scale their data center requirements in a gradual manner and at a pace that aligns with their business objectives.

The switch series, using cut-through architecture, supports line-rate 10 Gigabit Ethernet on all ports while maintaining consistently low latency independent of packet size and services enabled. It supports a set of network technologies known collectively as Data Center Bridging (DCB) that increases the reliability, efficiency, and scalability of Ethernet networks. These features allow the switches to support multiple traffic classes over a lossless Ethernet fabric, thus enabling consolidation of LAN, SAN, and cluster environments. Its ability to connect Fibre Channel over Ethernet (FCoE) to native Fibre Channel protects existing storage system investments while dramatically simplifying in-rack cabling.

In addition to supporting standard 10 Gigabit Ethernet network interface cards (NICs) on servers, the Cisco Nexus 5000 Series integrates with multifunction adapters called converged network adapters (CNAs) that combine the functions of Ethernet NICs and Fibre Channel host bus adapters (HBAs), making the transition to a single, unified network fabric transparent and consistent with existing practices, management software, and OS drivers. The switch series is compatible with integrated transceivers and Twinax cabling solutions that deliver cost-effective connectivity for 10 Gigabit Ethernet to servers at the rack level, eliminating the need for expensive optical transceivers.

The Cisco Nexus 5000 Series is designed for data center environments with cut-through technology that enables consistent low-latency Ethernet solutions, with front-to-back cooling, and with data ports in the rear, bringing switching into close proximity with servers and making cable runs short and simple. The switch series is highly serviceable, with redundant, hot-pluggable power supplies and fan modules. It uses data center-class Cisco® NX-OS Software for high reliability and ease of management.

Cisco Nexus 5500 Platform Overview

In a constantly changing business environment, companies are calling upon their IT departments to help them reduce costs, improve productivity, and introduce new ways to interact with their customer base.

The Cisco Nexus 5500 platform extends the industry-leading versatility of the Cisco Nexus 5000 Series Switches of purpose-built 10 Gigabit Ethernet data center-class switches and provides innovative advances toward higher density, lower latency, and multilayer services. The Cisco Nexus 5500 platform is well suited for enterprise-class data center server access-layer deployments across a diverse set of physical, virtual, storage-access, and high-performance computing (HPC) data center environments.

Cisco Nexus 5548P Switch

The Cisco Nexus 5548P Switch (Figure 1) is the first of the Cisco Nexus 5500 platform switches. It is a one-rack-unit (1RU) 10 Gigabit Ethernet and FCoE switch offering up to 960-Gbps throughput and up to 48 ports. The switch has 32 1/10-Gbps fixed Enhanced Small Form-Factor Pluggable (SFP+) Ethernet and FCoE ports and one expansion slot.

Figure 1. Cisco Nexus 5548P Switch

Expansion Module Options for the Cisco Nexus 5548P

The Cisco Nexus 5500 platform is equipped with expansion modules that can be used to increase the number of 10 Gigabit Ethernet and FCoE ports or to connect to Fibre Channel SANs with 8/4/2/1-Gbps Fibre Channel switch ports, or both.

The Cisco Nexus 5548P supports the addition of one expansion module from the following three offerings (Figure 2):

- Ethernet module that provides sixteen 1 and 10 Gigabit Ethernet and FCoE ports using the SFP+ interface
- Fibre Channel plus Ethernet module that provides eight 1 and 10 Gigabit Ethernet and FCoE ports using the SFP+ interface, and eight ports of 8/4/2/1-Gbps native Fibre Channel connectivity using the SFP+/SFP interface
- A unified port module that provides up to sixteen 1 and 10 Gigabit Ethernet and FCoE ports using the SFP+ interface or up to 16 ports of 8/4/2/1-Gbps native Fibre Channel connectivity using the SFP+/SFP interface. The use of 1 and 10 Gigabit Ethernet or 8/4/2/1-Gbps Fibre Channel on a port is mutually exclusive but selectable for any of the 16 physical ports per module.

Figure 2. From Left to Right: 16-Port 1 and 10 Gigabit Ethernet and FCoE Module, 8-Port Fibre Channel plus 8-Port 1 and 10 Gigabit Ethernet and FCoE Module, and Unified Port Module

In addition to these expansion modules, the Cisco Nexus 5548P supports a Layer 3 daughter card that can be ordered with the system or as a spare (field upgradable). This daughter card provides up to 160 Gbps of Layer 3 forwarding capability (240 million packets per second [mpps]) that can be shared by all 48 ports in the chassis. As shown in Figure 3, the Layer 3 daughter card does not take up one of the expansion slots on the rear of the chassis, but instead is installed by replacing the I/O module that is located on the front of the chassis.

Figure 3. Layer 3 Daughter Card on the Cisco Nexus 5548UP Switch

Cisco Nexus 5548UP Switch

The Cisco Nexus 5548UP is a 1RU 10 Gigabit Ethernet, Fibre Channel, and FCoE switch offering up to 960 Gbps of throughput and up to 48 ports. The switch has 32 unified ports and one expansion slot.

Expansion Module Options for the Cisco Nexus 5548UP

The Cisco Nexus 5500 platform is equipped with expansion modules that can be used to increase the number of 10 Gigabit Ethernet and FCoE ports or to connect to Fibre Channel SANs with 8/4/2/1-Gbps Fibre Channel switch ports, or both.

The Cisco Nexus 5548UP supports one expansion module from the following offerings (Figure 4):

- Ethernet module that provides sixteen 1 and 10 Gigabit Ethernet and FCoE ports using the SFP+ interface
- Fibre Channel plus Ethernet module that provides eight 1 and 10 Gigabit Ethernet and FCoE ports using the SFP+ interface, and eight ports of 8/4/2/1-Gbps native Fibre Channel connectivity using the SFP+/SFP interface
- A unified port module that provides up to sixteen 1 and 10 Gigabit Ethernet and FCoE ports using the SFP+ interface or up to 16 ports of 8/4/2/1-Gbps native Fibre Channel connectivity using the SFP+/SFP interface. The use of 1 and 10 Gigabit Ethernet or 8/4/2/1-Gbps Fibre Channel on a port is mutually exclusive but selectable for any of the 16 physical ports per module.

Figure 4. From Left to Right: 16-Port 1 and 10 Gigabit Ethernet and FCoE Module, 8-Port Fibre Channel plus 8-Port 1 and 10 Gigabit Ethernet and FCoE Module, and Unified Port Module

In addition to these expansion modules, the Cisco Nexus 5548UP supports a Layer 3 daughter card that can be ordered with the system or as a spare (field upgradable). This daughter card provides up to 160 Gbps of Layer 3 forwarding capability (240 mpps) that can be shared by all 48 ports in the chassis. Note that the Layer 3 daughter card does not take up one of the expansion slots on the rear of the chassis, but instead is installed by replacing the I/O module that is located on the front of the chassis.

Cisco Nexus 5596UP Switch

The Cisco Nexus 5596UP Switch (Figure 5) is a 2RU 10 Gigabit Ethernet, Fibre Channel, and FCoE switch offering up to 1920 Gbps of throughput and up to 96 ports. The switch has 48 unified ports and three expansion slots.

Figure 5. Cisco Nexus 5596UP Switch Configured with Three 16-Port Expansion Modules

Expansion Module Options for the Cisco Nexus 5596UP Switch

The Cisco Nexus 5500 platform is equipped with expansion modules that can be used to increase the number of 10 Gigabit Ethernet and FCoE ports or to connect to Fibre Channel SANs with 8/4/2/1-Gbps Fibre Channel switch ports, or both.

The Cisco Nexus 5596UP supports three expansion modules from the following offerings (Figure 6):

- Ethernet module that provides sixteen 1 and 10 Gigabit Ethernet and FCoE ports using the SFP+ interface
- Fibre Channel plus Ethernet module that provides eight 1 and 10 Gigabit Ethernet and FCoE ports using the SFP+ interface, and eight ports of 8/4/2/1-Gbps native Fibre Channel connectivity using the SFP+/SFP interface
- A unified port module that provides up to sixteen 1 and 10 Gigabit Ethernet and FCoE ports using the SFP+ interface or up to sixteen ports of 8/4/2/1-Gbps native Fibre Channel connectivity using the SFP+ and SFP interface. The use of 1 and 10 Gigabit Ethernet or 8/4/2/1-Gbps Fibre Channel on a port is mutually exclusive but selectable for any of the 16 physical ports per module.
- A Layer 3 module provides up to 160 Gbps of Layer 3 forwarding capability (240 mpps) that can be shared by all the I/O ports in the chassis

Figure 6. From Left to Right: 16-Port 1 and 10 Gigabit Ethernet and FCoE Module, 8-Port Fibre Channel plus 8-Port 1 and 10 Gigabit Ethernet and FCoE Module, Unified Port Module, and Layer 3 Module

Cisco Nexus 2000 Series Fabric Extenders

The Cisco Nexus 2000 Series Fabric Extenders comprise a category of data center products that provide a universal server-access platform that scales across a multitude of 1 Gigabit Ethernet, 10 Gigabit Ethernet, unified fabric, rack, and blade server environments. The Cisco Nexus 2000 Series Fabric Extenders are designed to simplify data center architecture and operations by meeting the business and application needs of a data center. Working in conjunction with Cisco Nexus switches, the Cisco Nexus 2000 Series Fabric Extenders offer a cost-effective and efficient way to support today's Gigabit Ethernet environments while allowing easy migration to 10 Gigabit Ethernet, virtual machine-aware Cisco unified fabric technologies.

The Cisco Nexus 2000 Series design is aligned with the design of servers. It offers front-to-back cooling, compatibility with data center hot-aisle and cold-aisle designs, placement of all switch ports at the rear of the unit in close proximity to server ports, and accessibility of all user-serviceable components from the front panel. The Cisco Nexus 2000 Series is built for nonstop operation, with redundant hot-swappable power supplies and a hot-swappable fan tray with redundant fans. Its compact 1RU form factor takes up relatively little space, making it easy to incorporate into rack designs (Figure 7).

Figure 7. Cisco Nexus 2000 Series Fabric Extenders: Cisco Nexus 2148T (Bottom Left), Cisco Nexus 2248TP GE (Top Right) and Cisco Nexus 2232PP 10GE (Bottom Right)

The Cisco Nexus 2000 Series provides two types of ports: ports for end-host attachment (host interfaces) and uplink ports (fabric interfaces). Fabric Interfaces are differentiated with a yellow color for connectivity to the upstream parent Cisco Nexus switch.

Table 1 lists the Cisco Nexus 2000 Series Fabric Extenders. Fabric extenders can be mixed and matched to a parent switch to provide connectivity options.

Table 1. Cisco Nexus 2000 Series Specifications

Description	Specification
Cisco Nexus 2148T	48 1000BASE-T host interfaces and 4 10 Gigabit Ethernet fabric interfaces (SFP+)
Cisco Nexus 2224TP	24 100/1000BASE-T host interfaces and 2 10 Gigabit Ethernet fabric interfaces (SFP+)
Cisco Nexus 2248TP	48 100/1000BASE-T host interfaces and 4 10 Gigabit Ethernet fabric interfaces (SFP+)
Cisco Nexus 2232PP	32 1 and 10 Gigabit Ethernet and FCoE host interfaces (SFP+) and 8 10 Gigabit Ethernet and FCoE fabric interfaces (SFP+)

The Cisco Nexus 2224TP and 2248TP provide port density options for highly scalable 100-Mbps and 1 Gigabit Ethernet connectivity. The Cisco Nexus 2232PP provides ease of migration from 1 Gigabit Ethernet to 10 Gigabit Ethernet while supporting highly scalable 10 Gigabit environments.

The Cisco Nexus 2232PP 10GE Fabric Extender is an excellent platform for migration from 1 Gigabit Ethernet to 10 Gigabit Ethernet and unified fabric environments. It supports FCoE and DCB, which increases the reliability, efficiency, and scalability of Ethernet networks. These features allow the switches to support multiple traffic classes over a lossless Ethernet fabric, thus enabling consolidation of LAN, SAN, and cluster environments.

Cisco Nexus 2000 Series and Cisco Nexus 5500 Platform Deployment Scenarios

The fabric extenders can be used in the following deployment scenarios:

- Rack servers with 1 or 10 Gigabit Ethernet NICs; the fabric extender can be physically located at the top of the rack, and the Cisco Nexus 5500 platform switch can reside in the middle or at the end of the row
- Mixed 1 and 10 Gigabit Ethernet environments in which rack servers are running at both speeds in the same rack or in separate racks
- 10 Gigabit Ethernet and FCoE deployments; servers with CNAs for unified fabric environments with the Cisco Nexus 2232PP
- Server racks with integrated lights-out (iLO) management; 100 Megabit Ethernet or 1 Gigabit Ethernet management and iLO interfaces
- 1 and 10 Gigabit Ethernet blade servers with pass-through blades
- Virtualized access

The Cisco Nexus 2000 Series can be used in conjunction with the Cisco Nexus 5500 platform in two main design scenarios:

- Cisco Nexus 2000 Series Fabric Extenders single-connected to one upstream Cisco Nexus 5500 platform switch: In this deployment scenario, access-layer redundancy is achieved through redundant server connections to two upstream Cisco Nexus 5500 platform switches using Cisco virtual PortChannel (vPC) technology or server NIC teaming to two Cisco Nexus 2000 Series Fabric Extenders.
- Cisco Nexus 2000 Series Fabric Extenders dual-connected to two upstream Cisco Nexus 5500 platform switches (using vPC): In this deployment scenario, access-layer redundancy is achieved through a combination of Cisco Nexus 2000 Series Fabric Extenders dual-connected to an upstream parent switch and server NIC teaming.

Efficient Transceiver and Cabling Options

The Cisco Nexus 5500 platform supports a wide variety of 1 and 10 Gigabit Ethernet connectivity options using Cisco 10GBASE SFP+ modules.

In addition, the Cisco Nexus 5500 platform supports 1 Gigabit Ethernet connectivity options using 1GBASE SFP modules, 8/4/2 -Gbps Fibre Channel SFP+ and 4/2/1-Gbps Fibre Channel SFP interfaces are supported with expansion module options.

Table 2 lists the supported transceiver options.

Table 2. Cisco Nexus 5500 Platform Transceiver Support Matrix

Cisco SFP	Description
FET-10G	10-Gbps SFP+ module for Cisco Nexus 2000 Series to Cisco Nexus 5000 Series connectivity
Cisco SFP-10G-SR	10GBASE-SR SFP+ module (multimode fiber [MMF])
Cisco SFP-10G-LR	10GBASE-LR SFP+ module (single-mode fiber [SMF])
Cisco SFP-H10GB-CU1M	10GBASE-CU SFP+ cable 1m (Twinax cable)
Cisco SFP-H10GB-CU3M	10GBASE-CU SFP+ cable 3m (Twinax cable)
Cisco SFP-H10GB-CU5M	10GBASE-CU SFP+ cable 5m (Twinax cable)
Cisco SFP-H10GB-ACU7M	10GBASE-CU SFP+ cable 7m (active Twinax cable)
Cisco SFP-H10GB-ACU10M	10GBASE-CU SFP+ cable 10m (active Twinax cable)
Cisco GLC-T	1000BASE-T SFP
Cisco GLC-SX-MM	Gigabit Ethernet SFP, LC connector SX transceiver (MMF)
Cisco GLC-LH-SM	Gigabit Ethernet SFP, LC connector LX/LH transceiver (SMF)
Cisco SFP-GE-T	1000BASE-T SFP, extended temperature range
Cisco SFP-GE-S	Gigabit Ethernet SFP, LC connector SX transceiver (MMF), extended temperature range and digital optical monitoring (DOM)
Cisco SFP-GE-L	Gigabit Ethernet SFP, LC connector LX/LH transceiver (SMF), extended temperature range and DOM
Cisco DS-SFP-FC4G-SW	4-Gbps Fibre Channel SW SFP, LC (for Fibre Channel expansion module ports)
Cisco DS-SFP-FC4G-LW	4-Gbps Fibre Channel LW SFP, LC (for Fibre Channel expansion module ports)
Cisco DS-SFP-FC8G-SW	8-Gbps Fibre Channel SW SFP+, LC (for Fibre Channel expansion module ports)
Cisco DS-SFP-FC8G-LW	8-Gbps Fibre Channel LW SFP+, LC (for Fibre Channel expansion module ports)

The high bandwidth of 10 Gigabit Ethernet poses challenges to transmissions that are met by the transceiver and cabling options supported by the Cisco Nexus 5500 platform.

The platform supports an innovative Twinax copper cabling solution that connects to standard SFP+ connectors for in-rack use, and optical cabling for longer cable runs (Table 3).

- For in-rack or adjacent-rack cabling, the Cisco Nexus 5500 platform supports SFP+ direct-attach 10 Gigabit Ethernet copper, an innovative solution that integrates transceivers with Twinax cables into an energy-efficient, low-cost, and low-latency solution. SFP+ direct-attach 10 Gigabit Twinax copper cables use only 0.1 watt (W) of power per transceiver and introduce only approximately 0.25 microsecond of latency per link.
- For longer cable runs, the Cisco Nexus 5500 platform supports multimode, short-reach optical SFP+ transceivers. These optical transceivers use approximately 1W per transceiver and have a latency of less than 0.1 microsecond.

Table 3. The Cisco Nexus 5500 Platform Supports SFP+ Direct-Attach 10 Gigabit Copper for In-Rack Cabling, and Optical Solutions for Longer Connections

Connector (Media)	Cable	Distance	Power (Each Side)	Transceiver Latency (Link)	Standard
SFP+ CU copper	Twinax	5m	Approximately 0.1W	Approximately 0.1 microsecond	SFF 8431
SFP+ ACU copper	Active Twinax	7m 10m	Approximately 0.5W	Approximately 6.8 nanoseconds	SFF 8461
SFP+ SR MMF and SR	MM OM2 MM OM3	82m 300m	1W	Approximately 0 microseconds	IEEE 802.3ae

Features and Benefits

The comprehensive feature sets of the Cisco Nexus 5500 platform make it well suited for top-of-rack, middle-of-row, or end-of-row data center access-layer applications. The platform switches protect investments in data center racks with standards-based 10 Gigabit Ethernet and FCoE features and virtual machine awareness features that allow IT departments to consolidate networks based on their own requirements and timing. The combination of higher port density, lossless Ethernet, wire-speed performance, and very low latency makes the switch platform well suited for meeting the growing demand for 10 Gigabit Ethernet that can support a common Ethernet-based fabric in enterprise and service provider data centers, protecting enterprises' investments. The switch platform provides sufficient port density to support single and multiple racks fully populated with blade and rack-mount servers.

- Built for today's data centers, the switches are designed just like the servers they support. Ports and power connections are at the rear, close to server ports, helping keep cable lengths as short and efficient as possible, delivering benefits traditionally offered on blade servers to rack servers as well. Hot-swappable power and fan modules can be accessed from the front panel, where status lights offer an at-a-glance view of switch operation. Front-to-back cooling is consistent with server designs, supporting efficient data center hot- and cold-aisle designs. Serviceability is enhanced with all customer-replaceable units accessible from the front panel. The use of SFP+ ports offers increased flexibility, enabling use of a range of interconnect solutions, including copper Twinax cable for short runs and fiber for long runs.
- DCB enables Ethernet fabrics to support lossless transmission to increase network scalability, support I/O consolidation, ease management of multiple traffic flows, and optimize performance. Although SAN consolidation requires only the lossless fabric provided by the Ethernet Pause mechanism, the Cisco Nexus 5500 platform provides additional features that create an even more easily managed, high-performance, unified network fabric. DCB features are summarized in Table 4 and supported by the Cisco Nexus 5500 platform.

Table 4. DCB Features and Benefits

Feature	Business Benefit
Priority Flow Control (PFC)	• Simplifies management of multiple traffic flows over a single network link • Creates lossless behavior for Ethernet by allowing class-of-service (CoS)-based flow control
Enhanced Transmission Selection (ETS)	Enables consistent management of quality of service (QoS) at the network level by providing consistent scheduling of different traffic types (IP, storage, etc.)
Data Center Bridging Exchange (DCBX) Protocol	Simplifies network deployment and reduces configuration errors by providing autonegotiation of DCB features between the NIC and the switch and between switches

- FCoE is a standards-based upper-layer protocol that maps the Fibre Channel Protocol (FCP) and services onto Layer 2 Ethernet. It is a straightforward encapsulation of Fibre Channel within Ethernet that preserves existing Fibre Channel network management models and tools, helping protect investments in software and staff training.

- Cisco unified fabric consolidates all data center I/O onto Layer 2 Ethernet. Unified fabric reduces capital and operating costs by reducing the number of server adapters, cables, and upstream switches needed. All I/O (LAN, SAN, and cluster) typically is consolidated onto two Ethernet links. DCB and FCoE enable the incorporation of Fibre Channel frames into a unified fabric, facilitating wire-once strategies in which all servers become capable of SAN connection. A standard and uniform approach to I/O enhances server and storage consolidation strategies. The Cisco Nexus 5500 platform also connects to existing native Fibre Channel networks, protecting current investments in storage networks. Additionally, the Cisco Nexus 5500 platform attaches to directly connected FCoE and Fibre Channel storage devices and supports multi-tiered unified network fabric connect directly over FCoE.
- Unified ports allow any capable port to take on the character of 1 and 10 Gigabit Ethernet, SAN and LAN shared on 10 Gigabit Ethernet, or 8/4/2/1-Gbps Fibre Channel. Unified ports give the user flexibility in choosing SAN and LAN port options consistent with the virtualized data center and offer a migration path to FCoE for those users not yet ready to make the move from native Fibre Channel.
- Energy efficiency achieved through the use of the Cisco Nexus 5500 platform helps data centers operate within their space, power, and cooling parameters while reducing their carbon footprints. Every network link at the rack level requires adapters, switches, and transceivers, all of which consume power. I/O consolidation reduces energy consumption by eliminating the need for separate Fibre Channel adapters, cables, and switches. In many cases, server cluster networks also can be consolidated onto 10 Gigabit Ethernet networks, especially given the low latency of the Cisco Nexus 5500 platform. The switch hardware is also designed for energy efficiency. Variable-speed fans consume only the amount of power necessary to cool the chassis at that specific point in time. The switch power supplies are sized to support worst-case scenarios, in which inefficient SFP+ transceivers increase power draw; however, when low-power cabling solutions are deployed, the switch platform's power supplies maintain 90 percent efficiency at only 25 percent utilization, making efficient use of power in best-case scenarios.
- Consistent management for Cisco products is provided through the consistency of both the Cisco NX-OS Software and Cisco MDS 9000 Software management models and tools. The switch platform's network features can be managed using the Cisco command-line interface (CLI), and the Fibre Channel and FCoE features can be managed through the Cisco Fabric Manager suite. Cisco Data Center Network Manager (DCNM) also supports the Cisco Nexus 5500 platform. The capability to manage Ethernet and FCoE features independently with existing Cisco tools preserves existing management models, best practices, and investments in staff training. In addition, Simple Network Management Protocol (SNMP) MIBs, XML, and the Cisco CLI are made available to customers for switch management through third-party and custom-developed tools. The switch platform uses Cisco NX-OS for superior operating efficiency, pervasive security, and continuous operation even through software upgrades.
- Software manageability and serviceability features include Smart Call Home and automated parameter exchange (through DCBX). Security is enhanced through role-based access control (RBAC); support for authentication, authorization, and accounting (AAA), remote TACACS+, and RADIUS servers; and Secure Shell (SSH) access.

Applications

The Cisco Nexus 5500 platform supports a number of application scenarios, making the switches a versatile data center option:

- As access-layer switches, they can be used purely as 1 and 10 Gigabit Ethernet switches, consolidating 10 Gigabit Ethernet connections into a smaller number of server connections trunked to the aggregation layer.

- In conjunction with the Cisco Nexus 2248TP GE Ethernet Fabric Extender, the Cisco Nexus 5500 platform can be used as a high-density 1 Gigabit Ethernet switching system, consolidating more than 900 Gigabit Ethernet connections in a single management plane.
- In conjunction with the Cisco Nexus 2232PP 10GE Fabric Extender, the Cisco Nexus 5500 platform can be used as a high-density 10 Gigabit Ethernet switching system, consolidating more than 600 10 Gigabit Ethernet connections in a single management plane.
- As a rack-level I/O consolidation platform, the switches carry Ethernet traffic from servers to the aggregation layer, and carry Fibre Channel traffic to existing Fibre Channel SANs.
- As a crucial element in data center I/O consolidation, the switches enable I/O consolidation at the access layer and provide interoperability between the Cisco Nexus 5500 platform and other standards-based products.

The capability of the Cisco Nexus 5500 platform to function in all these capacities helps protect investment in the data center with a deployment model in which additional features can be enabled as they are needed.

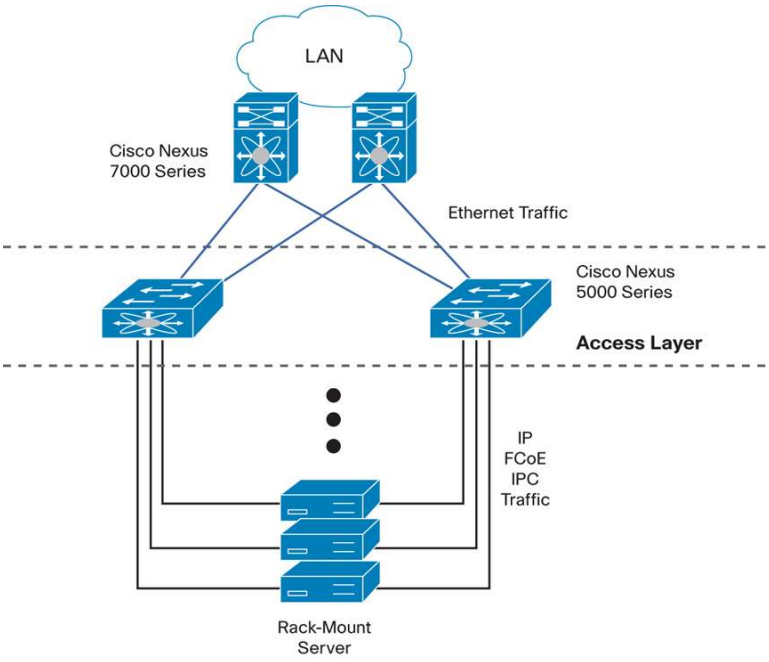
1 and 10 Gigabit Ethernet Access-Layer Switch

The Cisco Nexus 5500 platform is designed with the density, performance, front-to-back cooling, and rear data-port configuration that make it well suited for aggregating a large number of 10 Gigabit Ethernet links either from servers or from other access-layer switches. The switch port density allows each switch to support a single rack or neighboring racks using the SFP+ direct-attach 10 Gigabit copper cabling option. The Cisco Nexus 5500 platform can also be purchased with only the Ethernet capabilities enabled, allowing IT departments to deploy them in parallel with existing Fibre Channel SANs.

Figure 8 shows an active-active pair of Cisco Nexus 5500 platform switches cross-connected to redundant Ethernet NICs in servers. Instead of using multiple 1 Gigabit Ethernet connections to servers for LAN, virtual machine mobility applications, and Small Computer System Interface over IP (iSCSI) SAN support, customers can combine their traffic over a consolidated, lossless, low-latency 10 Gigabit Ethernet fabric.

The Cisco Nexus 5500 platform can be deployed as a top-of-tack, access-layer switch in parallel with existing Fibre Channel SANs.

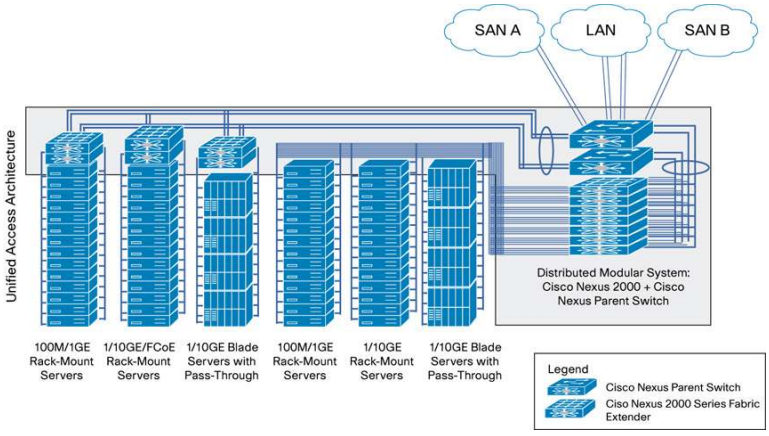
Figure 8. Active-Active Pair of Cisco Nexus 5000 Series Switches Connected to Redundant Servers



Unified Access Architecture

One deployment scenario involves equipping each data center rack with two Cisco Nexus 2248 GE Fabric Extenders or with two Cisco Nexus 2232 10GE Fabric Extenders, connected to two upstream Cisco Nexus 5500 platform switches (Figure 9). Up to 48 servers can connect to each 1 Gigabit Ethernet fabric extender, and up to 32 servers can connect to each 10 Gigabit Ethernet fabric extender. Assuming that these servers are dual-homed, a pair of Cisco Nexus 5500 platform switches can connect up to 1152 1 Gigabit Ethernet servers (24 N2248) or up to 768 10 Gigabit Ethernet servers (24 N2232).

Figure 9. Sample Unified Access Deployment Scenario Supporting Up to 1152 1 Gigabit Ethernet Servers or Up to 768 10 Gigabit Ethernet Servers with a Single Pair of Access-Layer Switches and a Single Point of Management

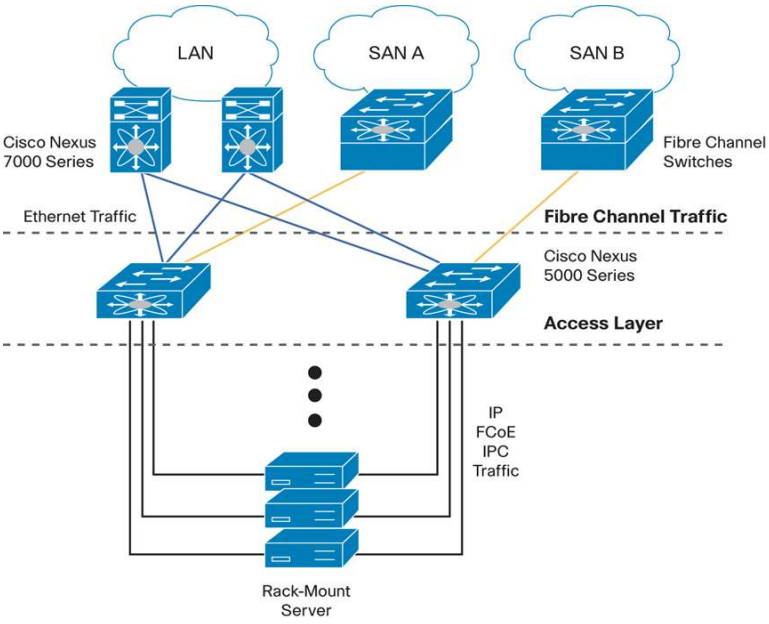


Unified Fabric with FCoE: I/O Consolidation

The Cisco Nexus 5500 platform consolidates multiple networks - LAN, SAN, and server cluster - on a single unified fabric, saving the capital and operating expenses associated with deployment of multiple parallel networks, switching infrastructure, and cabling. The Cisco Nexus 5500 platform is compatible with third-party I/O CNAs that present separate Ethernet NICs and Fibre Channel HBAs to the server operating system. This approach allows existing drivers and Fibre Channel management software to work transparently with FCoE. Upstream, expansion modules

support direct connections from the Cisco Nexus 5500 platform to existing native Fibre Channel SANs using dedicated native Fibre Channel ports (Figure 10). Cisco Nexus 5500 platform can also be connected to upstream FCoE-capable switches through industry-standard VE-port Inter-Switch Links (ISLs).

Figure 10. A Pair of Cisco Nexus 5000 Series Switches in an Active-Active Configuration with Native Fibre Channel Connections to Two Storage Networks



Investment Protection with FCoE Unified Fabric

The Cisco Nexus 5500 platform supports consolidated I/O using FCoE on downlinks to servers. FCoE is Fibre Channel and, as such, has familiar methods of configuration, operation, and management. On the uplinks to the network, customers can choose among FCoE direct attachment to storage systems, native Fibre Channel direct attachment to storage systems, FCoE connection to FCoE-capable switches, and native Fibre Channel connection to existing SANs. Fibre Channel and FCoE can exist simultaneously in the Fibre Channel network, allowing customers to continue to use their existing administration and management tools. Cisco Fabric Manager SAN management software manages Fibre Channel and FCoE flows over both FCoE- and Fibre Channel-capable ports.

Product Architecture

The Cisco Nexus 5500 platform is built around two custom components: a unified crossbar fabric and a unified port controller application-specific integrated circuit (ASIC). Each Cisco Nexus 5500 platform switch contains a single unified crossbar fabric ASIC and multiple unified port controllers to support fixed ports and expansion modules within the switch.

The unified port controller provides an interface between the unified crossbar fabric ASIC and the network media adapter and makes forwarding decisions for Ethernet, Fibre Channel, and FCoE frames. The ASIC supports the overall cut-through design of the switch by transmitting packets to the unified crossbar fabric before the entire payload has been received. The unified crossbar fabric ASIC is a single-stage, nonblocking crossbar fabric capable of meshing all ports at wire speed. The unified crossbar fabric offers superior performance by implementing QoS-aware scheduling for unicast and multicast traffic. Moreover, the tight integration of the unified crossbar fabric with the unified port controllers helps ensure low-latency, lossless fabric for ingress interfaces requesting access to egress interfaces.

Cisco NX-OS Software Overview

Cisco NX-OS is a data center–class operating system built with modularity, resiliency, and serviceability at its foundation. Based on the industry-proven Cisco MDS 9000 SAN-OS Software, Cisco NX-OS helps ensure continuous availability and sets the standard for mission-critical data center environments. The self-healing and highly modular design of Cisco NX-OS makes zero-impact operations a reality and enables exceptional operational flexibility.

Focused on the requirements of the data center, Cisco NX-OS provides a robust and comprehensive feature set that fulfills the Ethernet and storage networking requirements of present and future data centers. With an XML interface and a CLI like that of Cisco IOS® Software, Cisco NX-OS provides state-of-the-art implementations of relevant networking standards as well as a variety of true data center–class Cisco innovations.

Cisco NX-OS Software Features and Benefits

- Software compatibility: Cisco NX-OS Software Release 5.0 interoperates with Cisco products running any variant of the Cisco IOS Software operating system. Cisco NX-OS 5.0 also interoperates with any networking OS that conforms to the networking standards listed as supported in this data sheet.
- Common software throughout the data center: Cisco NX-OS simplifies the data center operating environment and provides a unified OS designed to run all areas of the data center network, including the LAN, SAN, and Layer 4 to 7 network services.
- Modular software design: Cisco NX-OS is designed to support distributed multithreaded processing on symmetric multiprocessors (SMPs), multicore CPUs, and distributed line-card processors. Computationally intensive tasks, such as hardware table programming, can be offloaded to dedicated processors distributed across the line cards. Cisco NX-OS modular processes are instantiated on demand, each in a separate protected memory space. Thus, processes are started and system resources allocated only when a feature is enabled. The modular processes are governed by a real-time preemptive scheduler that helps ensure the timely processing of critical functions.
- Quick development of enhancements and problem fixes: The modularity of Cisco NX-OS allows new features, enhancements, and problem fixes to be integrated into the software quickly. Thus, modular fixes can be developed, tested, and delivered in a short time span.
- Troubleshooting and diagnostics: Cisco NX-OS is built with unique serviceability functions to enable network operators to take early action based on network trends and events, enhancing network planning and improving network operations center (NOC) and vendor response times. Smart Call Home and Cisco Generic Online Diagnostics (GOLD) are some of the features that enhance the serviceability of Cisco NX-OS.
    - Smart Call Home: The Smart Call Home feature continuously monitors hardware and software components to provide email-based notification of critical system events. A versatile range of message formats is available for optimal compatibility with pager services, standard email, and XML-based automated parsing applications. This feature offers alert grouping capabilities and customizable destination profiles. It can be used, for example, to directly page a network support engineer, send an email message to a NOC, and employ Cisco Auto-Notify services to directly generate a case with the Cisco Technical Assistance Center (TAC). This feature is a step toward autonomous system operation, enabling networking devices to inform IT when a problem occurs and helping ensure that the problem is acted on quickly, reducing time to resolution and increasing system uptime.
    - Cisco GOLD: Cisco GOLD is a suite of diagnostic facilities to verify that hardware and internal data paths are operating as designed. Boot-time diagnostics, continuous monitoring, and on-demand and scheduled tests are part of the Cisco GOLD feature set. This industry-leading diagnostics subsystem allows rapid fault isolation and continuous system monitoring, critical in today's continuously operating environments.

- Programmatic XML interface: Based on the NETCONF industry standard, the Cisco NX-OS XML interface provides a consistent API for devices, enabling rapid development and creation of tools to enhance the network.
- SNMP: Cisco NX-OS complies with SNMPv1, v2, and v3. An extensive collection of MIBs is supported.
- RBAC: With RBAC, Cisco NX-OS enables administrators to limit access to switch operations by assigning roles to users. Administrators can customize access and restrict it to the users who require it.

Specifications

Table 5 lists the specifications for the Cisco Nexus 5500 platform.

Table 5. Product Specifications

Performance
• Cisco Nexus 5548P and 5548UP: Layer 2 hardware forwarding at 960 Gbps or 714.24 mpps; Layer 3 performance of up to 160 Gbps or 240 mpps • Cisco Nexus 5596UP: Layer 2 hardware forwarding at 1920 Gbps or 1428 mpps; Layer 3 performance of up to 160 Gbps or 240 mpps • MAC address table entries: 32,000 • Low-latency cut-through design that provides predictable, consistent traffic latency regardless of packet size, traffic pattern, or enabled features on 10 Gigabit Ethernet interfaces • Line-rate traffic throughput on all ports
Interfaces
• Cisco Nexus 5548P: 32 fixed 1 and 10 Gigabit Ethernet and FCoE ports; additional interfaces through one expansion module • Cisco Nexus 5548UP: 32 fixed ports configurable as 1 and 10 Gigabit Ethernet and FCoE or 8/4/2/1-Gbps native Fibre Channel; additional interfaces through one expansion module • Cisco Nexus 5596UP: 48 fixed ports configurable as 1 and 10 Gigabit Ethernet and FCoE or 8/4/2/1-Gbps native Fibre Channel; additional interfaces through up to three expansion modules • Expansion modules • 16-port 1 and 10 Gigabit Ethernet and FCoE module • 8-port 8/4/2/1-Gbps Fibre Channel plus 8-port 1 and 10 Gigabit Ethernet and FCoE module • Unified port module consisting of 16 ports configurable as 8/4/2/1-Gbps Fibre Channel or 1 and 10 Gigabit Ethernet and FCoE • Layer 3 module (Cisco Nexus 5596UP only; one per system) • Layer 3 daughter card (Cisco Nexus 5548P and 5548UP only; one per system) • Extension through the Cisco Nexus 2000 Series
Layer 2 Features
• Layer 2 switch ports and VLAN trunks • IEEE 802.1Q VLAN encapsulation • Support for up to 4096 VLANs • Rapid Per-VLAN Spanning Tree Plus (PVRST+) (IEEE 802.1w compatible) • Multiple Spanning Tree Protocol (MSTP) (IEEE 802.1s): 64 instances • Spanning Tree PortFast • Spanning Tree root guard • Spanning Tree Bridge Assurance • Cisco EtherChannel technology (up to 16 ports per EtherChannel) • Cisco vPC technology • vPC configuration synchronization • Link Aggregation Control Protocol (LACP): IEEE 802.3ad • Advanced PortChannel hashing based on Layer 2, 3, and 4 information • Jumbo frames on all ports (up to 9216 bytes) • Pause frames (IEEE 802.3x) • Storm control (unicast, multicast, and broadcast) • Private VLANs • Private VLAN over trunks (Isolated and Promiscuous) • Private VLANs over vPC and EtherChannels
Layer 3 Features
• Layer 3 interfaces: Routed ports on Cisco Nexus 5500 platform interfaces, switch virtual interface (SVI), PortChannels, subinterfaces, and PortChannel subinterfaces for a total of 4096 entries • Support for up to 8000 prefixes and up to 8000 host entries • Support for up to 2000 multicast routes

- Support for 1000 VRF entries
- Support for up to 4096 VLANs
- 16-way equal-cost multipathing (ECMP)
- 2000 ingress and 1000 egress access control list (ACL) entries
- Routing protocols: Static, Routing Information Protocol Version2 (RIPv2), Enhanced Interior Gateway Routing Protocol (EIGRP), Open Shortest Path First Version 2 (OSPFv2), and Border Gateway Protocol (BGP)
- Hot-Standby Router Protocol (HSRP) and Virtual Router Redundancy Protocol (VRRP)
- ACL: Routed ACL with Layer 3 and 4 options to match ingress and egress ACL
- Multicast: Protocol Independent Multicast Version 2 (PIMv2) sparse mode, Source Specific Multicast (SSM), Multicast Source Discovery Protocol (MSDP), and Internet Group Management Protocol Versions 2, and 3 (IGMP v2, and v3)
- Virtual Route Forwarding (VRF): VRF-lite (IP VPN); VRF-aware unicast; and BGP-, OSPF-, RIP-, and VRF-aware multicast
- Unicast Reverse Path Forwarding (uRFP) with ACL; strict and loose modes
- Jumbo frame support (up to 9216 bytes)

QoS

- Layer 2 IEEE 802.1p (CoS)
- 8 hardware queues per port
- Per-port QoS configuration
- CoS trust
- Port-based CoS assignment
- Modular QoS CLI (MQC) compliance
- ACL-based QoS classification (Layers 2, 3, and 4)
- MQC CoS marking
- Per-port virtual output queuing
- CoS-based egress queuing
- Egress strict-priority queuing
- Egress port-based scheduling: Weighted Round-Robin (WRR)

Security

- Ingress ACLs (standard and extended) on Ethernet and virtual Ethernet ports
- Standard and extended Layer 2 ACLs: MAC addresses, protocol type, etc.
- Standard and extended Layer 3 to 4 ACLs: IPv4 and v6, Internet Control Message Protocol (ICMP), TCP, User Datagram Protocol (UDP), etc.
- VLAN-based ACLs (VACLs)
- Port-based ACLs (PACLs)
- Named ACLs
- ACL logging and statistics
- Optimized ACL distribution
- ACLs on virtual terminals (VTYs)
- Dynamic Host Configuration Protocol (DHCP) snooping with Option 82
- Dynamic Address Resolution Protocol (ARP) Inspection
- IP source guard
- DHCP relay

High-Availability Features

- In-Service Software Upgrade (ISSU) for Layer 2
- Hot-swappable field-replaceable power supplies, fan modules, and expansion modules
- 1:1 power redundancy
- N:1 fan module redundancy

Management

- Switch management using 10/100/1000-Mbps management or console ports
- CLI-based console to provide detailed out-of-band management
- In-band switch management
- Locator and beacon LEDs on Cisco Nexus 2000 Series
- Port-based locator and beacon LEDs
- Configuration synchronization
- Module preprovisioning
- Configuration rollback
- Secure Shell Version 2 (SSHv2)
- Telnet
- AAA
- AAA with RBAC
- RADIUS

- TACACS+
- Syslog
- Embedded packet analyzer
- SNMPv1, v2, and v3
- Enhanced SNMP MIB support
- XML (NETCONF) support
- Remote monitoring (RMON)
- Advanced Encryption Standard (AES) for management traffic
- Unified username and passwords across CLI and SNMP
- Microsoft Challenge Handshake Authentication Protocol (MS-CHAP)
- Digital certificates for management between switch and RADIUS server
- Cisco Discovery Protocol Versions 1 and 2
- RBAC
- Switched Port Analyzer (SPAN) on physical, PortChannel, VLAN, and Fibre Channel interfaces
- Ingress and egress packet counters per interface
- Network Time Protocol (NTP)
- Cisco GOLD
- Comprehensive bootup diagnostic tests
- Call Home
- Smart Call Home
- Cisco Fabric Manager
- Cisco DCNM
- CiscoWorks LAN Management Solution (LMS)

Data Center Bridging

- CEE- and IEEE-compliant PFC (per-priority Pause frame support)
- PFC link distance support: 3000m
- CEE-compliant DCBX Protocol
- CEE- and IEEE-compliant Enhanced Transmission Selection

Fibre Channel and FCoE Features (Requires Storage Services License)

- T11 standards-compliant FCoE (FC-BB-5)
- T11 FCoE Initialization Protocol (FIP) (FC-BB-5)
- Any 10 Gigabit Ethernet port configurable as FCoE
- SAN administration separate from LAN administration
- FCP
- Fibre Channel forwarding (FCF)
- Fibre Channel standard port types: E, F, and NP
- Fibre Channel enhanced port types: VE, TE, and VF
- F-port trunking
- F-port channeling
- Direct attachment of FCoE and Fibre Channel targets
- Up to 64 buffer credits per native Fibre Channel port
- Up to 32 VSANs per switch
- Fibre Channel (SAN) PortChannel
- Native Interop Mode 2
- Native Interop Mode 3
- VSAN trunking
- Fabric Device Management Interface (FDMI)
- Fibre Channel ID (FCID) persistence
- Distributed device alias services
- In-order delivery
- Port tracking
- Cisco N-Port Virtualization (NPV) technology
- N-port identifier virtualization (NPIV)
- Fabric services: Name server, registered state change notification (RSCN), login services, and name-server zoning
- Per-VSAN fabric services
- Cisco Fabric Services
- Diffie-Hellman Challenge Handshake Authentication Protocol (DH-CHAP) and Fibre Channel Security Protocol (FC-SP)
- Distributed device alias services
- Host-to-switch and switch-to-switch FC-SP authentication

- Fabric Shortest Path First (FSPF)
- Fabric binding for Fibre Channel
- Standard zoning
- Port security
- Domain and port
- Enhanced zoning
- SAN PortChannels
- Cisco Fabric Analyzer
- Fibre Channel traceroute
- Fibre Channel ping
- Fibre Channel debugging
- Cisco Fabric Manager support
- Storage Management Initiative Specification (SMI-S)

SNMP MIBs

Generic MIBs

- SNMPv2-SMI
- CISCO-SMI
- SNMPv2-TM
- SNMPv2-TC
- IANA-ADDRESS-FAMILY-NUMBERS-MIB
- IANAifType-MIB
- IANAiprouteprotocol-MIB
- HCNUM-TC
- CISCO-TC
- SNMPv2-MIB
- SNMP-COMMUNITY-MIB
- SNMP-FRAMEWORK-MIB
- SNMP-NOTIFICATION-MIB
- SNMP-TARGET-MIB
- SNMP-USER-BASED-SM-MIB
- SNMP-VIEW-BASED-ACM-MIB
- CISCO-SNMP-VACM-EXT-MIB

Layer 3 MIBs

- UDP-MIB
- TCP-MIB
- OSPF-MIB
- BGP4-MIB
- CISCO-HSRP-MIB

Fibre Channel MIBs

- CISCO-ST-TC
- CISCO-FC-FE-MIB
- CISCO-FCSP-MIB
- CISCO-PORT-TRACK-MIB
- CISCO-PSM-MIB
- CISCO-FC-SPAN-MIB
- CISCO-PORT-CHANNEL-MIB
- CISCO-RSCN-MIB
- CISCO-NS-MIB
- CISCO-FCS-MIB
- CISCO-DM-MIB
- FIBRE-CHANNEL-FE-MIB
- CISCO-FC-ROUTE-MIB
- CISCO-FSPF-MIB
- CISCO-ZS-MIB
- CISCO-ZS-EXT-MIB
- CISCO-VSAN-MIB
- CISCO-CFS-MIB
- CISCO-FCPING-MIB
- CISCO-FCTRACEROUTE-MIB

- CISCO-FDMI-MIB
- CISCO-FC-DEVICE-ALIAS-MIB
- CISCO-WWNMGR-MIB
- FCMGMT-MIB
- CISCO-VEDM-MIB
- CISCO-FCOE-MIB

Ethernet MIBs

- CISCO-VLAN-MEMBERSHIP-MIB

Configuration MIBs

- ENTITY-MIB
- IF-MIB
- CISCO-ENTITY-EXT-MIB
- CISCO-ENTITY-FRU-CONTROL-MIB
- CISCO-ENTITY-SENSOR-MIB
- CISCO-FLASH-MIB
- CISCO-SYSTEM-MIB
- CISCO-SYSTEM-EXT-MIB
- CISCO-IP-IF-MIB
- CISCO-IF-EXTENSION-MIB
- CISCO-SERVER-INTERFACE-MIB
- CISCO-NTP-MIB
- CISCO-IMAGE-MIB
- CISCO-IMAGE-CHECK-MIB
- CISCO-IMAGE-UPGRADE-MIB
- CISCO-CONFIG-COPY-MIB
- CISCO-ENTITY-VENDORTYPE-OID-MIB
- CISCO-BRIDGE-MIB

Monitoring MIBs

- DIFFSERV-DSCP-TC
- NOTIFICATION-LOG-MIB
- DIFFSERV-MIB
- CISCO-CALLHOME-MIB
- CISCO-SYSLOG-EXT-MIB
- CISCO-PROCESS-MIB
- RMON-MIB
- CISCO-RMON-CONFIG-MIB
- CISCO-HC-ALARM-MIB

Security MIBs

- CISCO-AAA-SERVER-MIB
- CISCO-AAA-SERVER-EXT-MIB
- CISCO-COMMON-ROLES-MIB
- CISCO-COMMON-MGMT-MIB
- CISCO-RADIUS-MIB
- CISCO-SECURE-SHELL-MIB
- TCP/IP MIBs
- INET-ADDRESS-MIB
- TCP-MIB
- CISCO-TCP-MIB
- UDP-MIB
- IP-MIB
- CISCO-IP-PROTOCOL-FILTER-MIB
- CISCO-DNS-CLIENT-MIB

Miscellaneous MIBs

- START-MIB
- CISCO-LICENSE-MGR-MIB
- CISCO-FEATURE-CONTROL-MIB
- CISCO-CDP-MIB
- CISCO-RF-MIB
- CISCO-ETHERNET-FABRIC-EXTENDER-MIB
- CISCO-BRIDGE-MIB

Standards

Industry Standards

- IEEE 802.1D: Spanning Tree Protocol
- IEEE 802.1p: CoS prioritization
- IEEE 802.1Q: VLAN tagging
- IEEE 802.1Qaz: Enhanced transmission selection
- IEEE 802.1Qbb: Per-priority Pause
- IEEE 802.1s: Multiple VLAN instances of Spanning Tree Protocol
- IEEE 802.1w: Rapid reconfiguration of Spanning Tree Protocol
- IEEE 802.3: Ethernet
- IEEE 802.3ad: LACP with fast timers
- IEEE 802.3ae: 10 Gigabit Ethernet
- SFF 8431 SFP+ CX1 support
- RMON

Fibre Channel Standards

- FC-PH, Revision 4.3 (ANSI/INCITS 230-1994)
- FC-PH, Amendment 1 (ANSI/INCITS 230-1994/AM1 1996)
- FC-PH, Amendment 2 (ANSI/INCITS 230-1994/AM2-1999)
- FC-PH-2, Revision 7.4 (ANSI/INCITS 297-1997)
- FC-PH-3, Revision 9.4 (ANSI/INCITS 303-1998)
- FC-PI, Revision 13 (ANSI/INCITS 352-2002)
- FC-PI-2, Revision 10 (ANSI/INCITS 404-2006)
- FC-PI-4, Revision 7.0
- FC-FS, Revision 1.9 (ANSI/INCITS 373-2003)
- FC-FS-2, Revision 0.91
- FC-LS, Revision 1.2
- FC-SW-2, Revision 5.3 (ANSI/INCITS 355-2001)
- FC-SW-3, Revision 6.6 (ANSI/INCITS 384-2004)
- FC-GS-3, Revision 7.01 (ANSI/INCITS 348-2001)
- FC-GS-4, Revision 7.91 (ANSI/INCITS 387-2004)
- FC-BB-5, Revision 2.0 for FCoE
- FCP, Revision 12 (ANSI/INCITS 269-1996)
- FCP-2, Revision 8 (ANSI/INCITS 350-2003)
- FCP-3, Revision 4 (ANSI/INCITS 416-2006)
- FC-MI, Revision 1.92 (INCITS TR-30-2002, except for FL-ports and Class 2)
- FC-MI-2, Revision 2.6 (INCITS TR-39-2005, except for FL-ports and Class 2)
- FC-SP, Revision 1.6
- FC-DA, Revision 3.1 (INCITS TR-36-2004, except for FL-ports, SB-ports and Class 2)
- Class of Service: Class 3, Class F
- Fibre Channel standard port types: E and F
- Fibre Channel enhanced port types: SD and TE

Physical Specifications

SFP+ Optics

Cisco Nexus 5500 platform supports 10 Gigabit Ethernet SFP+ copper Twinax cables for short distances and SFP+ optics (10GBASE-SR, 10GBASE-LR, and Cisco Nexus 2000 Series Fabric Extender Transceiver [FET-10G]) for longer distances. SFP+ has several advantages compared to other 10 Gigabit Ethernet connectivity options:

- Small 10 Gigabit Ethernet form factor
- Optical interoperability with XENPAK, X2, and XFP interface types
- Low power consumption
- Hot-swappable device

- Cisco Nexus 5500 platform products support 8-Gbps Fibre Channel-compatible SFP+ for native Fibre Channel connectivity options; 8-Gbps Fibre Channel-compatible short-reach and 10-km long-reach SFP transceiver modules operate at 8/4/2 Gbps and are supported in the 8-Gbps-capable native Fibre Channel ports on expansion modules and unified ports

SFP Optics

The Cisco Nexus 5500 platform supports Gigabit Ethernet SFP for Gigabit Ethernet connectivity options, available in both standard and extended temperature ranges with Digital Optical Monitoring (DOM) support. The following SFP transceiver modules are supported by hardware in all ports of the Cisco Nexus 5500 platform:

- Cisco 1000BASE-T SFP
- Cisco 1000BASE-SX SFP
- Cisco 1000BASE-LX/LR SFP
- Cisco 4/2/1G Fibre Channel SFP

Power Supply

Table 6 lists the power supply properties of the Cisco Nexus 5500 platform.

Table 6. Power Supply Properties

AC Power Supply Properties	Cisco Nexus 5548P and 5548UP	Cisco Nexus 5596UP
Typical operating power	390W	660W
Maximum power (Layer 2)	600W (without Layer 3 daughter card)	882W (without Layer 3 expansion module)
Maximum power (Layer 3)	730W (with Layer 3 daughter-card)	972W (with 3x Layer 3 expansion module)
Input voltage	100 to 240 VAC	100 to 240 VAC
Frequency	50 to 60 Hz	50 to 60 Hz
Efficiency	95 to 98% (50 to 100% load)	95 to 98% (50 to 100% load)
RoHS compliance	Yes	Yes
Hot swappable	Yes	Yes
Heat dissipation	1998 BTU/hr (600W)	3010 BTU/hr (882W)

Environment

Table 7 lists the environment properties of the Cisco Nexus 5500 platform.

Table 7. Environment Properties

Property	Cisco Nexus 5548P and 5548UP	Cisco Nexus 5596UP
Physical (height x width x depth)	1.72 x 17.3 x 29.5 in. (4.4 x 43.9 x 74.9 cm)	3.47 x 17.3 x 29.5 in. (8.8 x 43.9 x 74.9 cm)
Operating temperature	32 to 104℉ (0 to 40℃)	32 to 104℉ (0 to 40℃)
Nonoperating (storage) temperature	(40 to 158℉ ((40 to 70℃)	(40 to 158℉ ((40 to 70° C)
Humidity	5 to 95% (noncondensing)	5 to 95% (noncondensing)
Altitude	0 to 10,000 ft (0 to 3000m)	0 to 10,000 ft (0 to 3000m)

Weight

Table 8 lists the weight of the Cisco Nexus 5500 platform switches.

Table 8. Weight

Component	Weight
Cisco Nexus 5548P or 5548UP with 2 750W power supplies, 1 expansion module, and 2 fan modules	35 lb (15.88 kg)
Cisco Nexus 5596UP with 2 1100W power supplies, 3 unified port expansion modules, and 4 fan modules	47.5 lb (21.55 kg)

Software Requirements

The Cisco Nexus 5500 platform is supported by Cisco NX-OS Software Release 5.0 and later. The Cisco Nexus 5548UP, 5596UP, Unified Port expansion module, and Layer 3 modules are supported by Cisco NX-OS Software Release 5.0(3)N1.1 and later. Cisco NX-OS interoperates with any networking OS, including Cisco IOS Software, that conforms to the networking standards mentioned in this data sheet.

For the latest software release information and recommendations, please see the product bulletin at http://www.cisco.com/go/nexus5000.

Regulatory Standards Compliance

Table 9 summarizes regulatory standards compliance for the Cisco Nexus 5500 platform.

Table 9. Regulatory Standards Compliance: Safety and EMC

Specification	Description
Regulatory compliance	Products should comply with CE Markings according to directives 2004/108/EC and 2006/95/EC
Safety	• UL 60950-1 Second Edition • CAN/CSA-C22.2 No. 60950-1 Second Edition • EN 60950-1 Second Edition • IEC 60950-1 Second Edition • AS/NZS 60950-1 • GB4943
EMC: Emissions	• 47CFR Part 15 (CFR 47) Class A • AS/NZS CISPR22 Class A • CISPR22 Class A • EN55022 Class A • ICES003 Class A • VCCI Class A • EN61000-3-2 • EN61000-3-3 • KN22 Class A • CNS13438 Class A
EMC: Immunity	• EN55024 • CISPR24 • EN300386 • KN 61000-4 series
RoHS	The product is RoHS 6 compliant with exceptions for leaded ball grid array (BGA) balls and lead press-fit connectors

Ordering Information

Table 10 presents ordering information for the Cisco Nexus 5500 platform. Note that the Cisco Nexus 2000 Series Fabric Extenders can be ordered either separately or along with the Cisco Nexus 5500 platform.

Table 10. Ordering Information

Part Number	Description
Chassis	
N5K-C5548P-FA	Chassis includes 32 fixed ports, Front-to-Back Airflow, 2 750W AC Power Supplies, Fan Trays, 1 Expansion Slot
N5K-C5548UP-FA	Chassis includes 32 fixed unified ports, Front-to-Back Airflow, 2 750W AC Power Supplies, Fan Trays, 1 Expansion Slot
N5K-C5596UP-FA	Chassis includes 48 fixed unified ports, Front-to-Back Airflow, 2 1100W AC Power Supplies, Fan Trays, 3 Expansion Slots
Fan Modules	
N5548P-FAN=	Cisco Nexus 5548P/5548UP Fan Module, Front-to-Back Airflow, Spare

Part Number	Description
N5596UP-FAN=	Cisco Nexus 5596UP Fan Module, Front-to-Back Airflow, Spare
Power Supplies	
N55-PAC-750W(=)	Cisco Nexus 5548P/5548UP PSU Front-to-Back Airflow module spare, A/C, 100-240V, 750W
N55-PAC-1100W(=)	Cisco Nexus 5596UP PSU Front-to-Back Airflow module spare, A/C, 100-240V, 1100W
Miscellaneous	
N55-M-BLNK(=)	Cisco Nexus 5500 Blank module cover
Software	
N5KUK9-502N1.1(=)	Cisco Nexus 5000 Base OS Software Release 5.0(2)N1(1)
N5KUK9-503N1.1(=)	Cisco Nexus 5000 Base OS Software Release 5.0(3)N1(1)
N55-8P-SSK9(=)	Cisco Nexus 5500 8-Port Storage Protocol Services License
N5000FMS1K9(=)	Cisco Nexus 5000 Series Fabric Manager Server License
N55-LAN1K9(=)	Cisco Nexus 5500 Layer 3 Enterprise Software License
N55-BAS1K9(=)	Cisco Nexus 5500 Layer 3 Base Software License
Expansion Modules and Daughter Card	
N55-M16P(=)	16-port 1/10GE Ethernet/FCoE module (Requires SFP+ for 8Gbps or SFP for 4Gbps operation)
N55-M8P8FP(=)	8-port FC (8/4/2/1G) + 8-port Eth/FCoE Module
N55-M16UP(=)	16-port Unified Port Expansion Module
N55-D160L3(=)	Nexus 5548 Layer 3 Daughter Card
N55-M160L3(=)	Nexus 5596 Layer 3 Expansion Module
Cables and Optics	
SFP-10G-SR(=)	10GBASE-SR SFP+ Module
SFP-10G-LR(=)	10GBASE-LR SFP+ Module
SFP-H10GB-CU1M(=)	10GBASE-CU SFP+ Cable 1 Meter
SFP-H10GB-CU3M(=)	10GBASE-CU SFP+ Cable 3 Meter
SFP-H10GB-CU5M(=)	10GBASE-CU SFP+ Cable 5 Meter
SFP-H10GB-ACU7M(=)	Active Twinax cable assembly, 7m
SFP-H10GB-ACU10M(=)	Active Twinax cable assembly, 10m
GLC-T(=)	1000BASE-T SFP
GLC-SX-MM(=)	GE SFP, LC connector SX transceiver
GLC-LH-SM(=)	GE SFP, LC connector LX/LH transceiver
SFP-GE-T(=)	1000BASE-T SFP, Extended Temperature Range
SFP-GE-S(=)	GE SFP, LC connector SX transceiver, with Digital Optical Monitoring (DOM) and Extended Temperature Range
SFP-GE-L(=)	GE SFP, LC connector LX/LH transceiver, with Digital Optical Monitoring (DOM) and Extended Temperature Range
DS-SFP-FC4G-SW(=)	4Gbps Fibre Channel-SW SFP, LC
DS-SFP-FC4G-LW(=)	4Gbps Fibre Channel-LW SFP, LC
DS-SFP-FC8G-SW(=)	8Gbps Fibre Channel-SW SFP+, LC
DS-SFP-FC8G-LW(=)	8Gbps Fibre Channel-LW SFP+, LC
Power Cords	
CAB-AC-250V/13A(=)	Power Cord for North America, 250VAC/13A, NEMA L6-20
CAB-C13-C14-JMPR(=)	Cabinet Jumper Power Cord, 250 VAC 10A, C14-C13 Connectors
CAB-C13-C14-2M(=)	Cabinet Jumper Power Cord, 250 VAC 10A, C14-C13 Connectors, 2-Meter length
CAB-C13-CBN(=)	Cabinet Jumper Power Cord, 250 VAC 16A, C14-C13 Connectors
CAB-9K12A-NA(=)	Power Cord, 125VAC 13A NEMA 5-15 Plug, North America
CAB-IND-10A(=)	10A Power cable for India
CAB-9K10A-AU(=)	Power Cord, 250VAC 10A 3112 Plug, Australia

Part Number	Description
CAB-9K10A-EU(=)	Power Cord, 250VAC 10A CEE 7/7 Plug, EU
CAB-9K10A-IT(=)	Power Cord, 250VAC 10A CEI 23-16/VII Plug, Italy
CAB-9K10A-SW(=)	Power Cord, 250VAC 10A MP232 Plug, Switzerland
CAB-9K10A-UK(=)	Power Cord, 250VAC 13A BS1363 Plug (13 A fuse), UK
SFS-250V-10A-AR(=)	SFS Power Cord - 250V, 10A - Argentina
SFS-250V-10A-CN(=)	SFS Power Cord - 250V, 10A - PRC
SFS-250V-10A-ID(=)	SFS Power Cord - 250V, 10A - India
SFS-250V-10A-IS(=)	SFS Power Cord - 250V, 10A - Israel
Accessory Kit	
N5548-ACC-KIT=	Accessory Kit for Nexus 5548 Chassis
N5596-ACC-KIT=	Accessory Kit for Nexus 5596 Chassis

Warranty

The Cisco Nexus 5500 platform has a 1-year limited hardware warranty. The warranty includes hardware replacement with a 10-day turnaround from receipt of a return materials authorization (RMA).

Service and Support

Cisco offers a wide range of services to help accelerate your success in deploying and optimizing the Cisco Nexus 5500 platform in your data center. The innovative Cisco Services are delivered through a unique combination of people, processes, tools, and partners and are focused on helping you increase operation efficiency and improve your data center network. Cisco Advanced Services uses an architecture-led approach to help you align your data center infrastructure with your business goals and achieve long-term value. Cisco SMARTnet® Service helps you resolve mission-critical problems with direct access at any time to Cisco network experts and award-winning resources. With this service, you can take advantage of the Smart Call Home service capability, which offers proactive diagnostics and real-time alerts on your Cisco Nexus 5500 platform. Spanning the entire network lifecycle, Cisco Services offerings help increase investment protection, optimize network operations, support migration operations, and strengthen your IT expertise.

For More Information

- Cisco Nexus 5000 Series Switches: http://www.cisco.com/go/nexus5000
- Cisco Nexus 2000 Series Fabric Extenders: http://www.cisco.com/go/nexus2000
- Cisco NX-OS Software: http://www.cisco.com/go/nxos

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