Cisco Nexus 5600 Platform 10-Gbps Switches

Product Overview

In today's data centers, virtualization deployments have become commonplace, and this trend is increasing rapidly with the availability of 10 Gigabit Ethernet servers at attractive prices. The combination of increased adoption of these servers and applications with higher bandwidth requirements is increasing the need for dense 10 and 40 Gigabit Ethernet switching. Moreover, data center architectures are changing as application environments create new demands for IT infrastructure. Application workloads are deployed across a mix of virtualized and nonvirtualized server and storage infrastructure, requiring a network infrastructure that provides consistent connectivity, security, and visibility across a range of bare-metal, virtualized, and cloud computing environments.

The Cisco Nexus® 5600 platform is the third generation of the Cisco Nexus 5000 Series Switches: the industry's leading data center server access switches. The Cisco Nexus 5600 platform switches can be categorized into 10-Gbps and 40-Gbps switches. This data sheet focuses on the 10-Gbps switches only. Cisco Nexus 5600 platform 10-Gbps switches are the successors to the industry's widely adopted Cisco Nexus 5500 platform switches. The switches maintain all the existing Cisco Nexus 5500 platform features, including LAN and SAN convergence (unified ports and Fibre Channel over Ethernet [FCoE]), fabric extenders, and Cisco® FabricPath. In addition, the Cisco Nexus 5600 platform 10-Gbps switches bring integrated line-rate Layer 2 and 3 capabilities with true 40 Gigabit Ethernet support (on uplink and network-facing ports), Cisco programmable fabric innovations, Network Virtualization Using Generic Routing Encapsulation (NVGRE), Virtual Extensible LAN (VXLAN) bridging and routing, network programmability and visibility, large buffer capacity, and significantly greater scalability and performance for highly virtualized, automated, and cloud environments.

The Cisco Nexus 5600 platform 10-Gbps switches include both 1-rack-unit (1RU) and 2RU switches built to meet the challenges of today's data centers with a flexible, agile, and energy-efficient design. These 10-Gbps switches are an important component of the Cisco Unified Data Center architecture, complementing existing Cisco Nexus switches. These energy-efficient switches offer 10 and 40 Gigabit Ethernet and FCoE, providing integrated Layer 2 and 3 features at wire speed and low latency of approximately 1 microsecond for any packet size. With a choice of port-side intake and fan-side intake airflow options to align with cold-aisle and hot-aisle placement in the data center, the 10-Gbps switches are designed for a broad range of traditional data center and large-scale virtualized cloud deployments.

The 10-Gbps switches together with the Cisco NX-OS Software operating system provides customers with features and capabilities that are widely deployed in data centers around the world. NX-OS is a purpose-built data center operating system designed for performance, resiliency, scalability, manageability, and programmability. It meets Ethernet and storage networking requirements, providing a robust and comprehensive feature set that can meet the demanding requirements of virtualization and automation in present and future data centers.

The Cisco Nexus 5600 platform 10-Gbps switches are designed for top-of-rack (ToR) and middle-of-row (MoR) deployment in data centers that support enterprise applications, service provider hosting, and cloud computing environments.

Models and Configurations

The Cisco 5600 platform 10-Gbps switches come in these configurations.

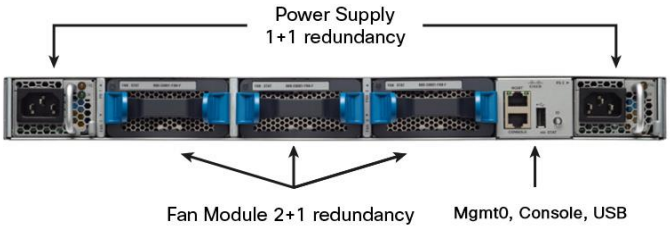
Cisco Nexus 5672UP Switch

- The Cisco Nexus 5672UP Switch (Figure 1) is a 10 and 40 Gigabit Ethernet (40-Gbps on uplink and network-facing ports) switch offering wire-speed performance for up to seventy-two 10 Gigabit Ethernet ports (using Quad Small Form-Factor Pluggable [QSFP] breakout cables). The Cisco Nexus 5672UP Switches are Layer 2 and 3 nonblocking 10 and 40 Gigabit Ethernet and FCoE-capable switches with up to 1.44 terabits per second (Tbps) of internal bandwidth. The Cisco Nexus 5672UP offers 48 fixed 1 and 10 Gigabit Ethernet ports, of which the last 16 ports (highlighted in orange on the chassis for easy identification) are unified ports. All 48 fixed ports support classical Ethernet and FCoE. In addition, the 16 unified ports provide 8-, 4-, and 2-Gbps Fibre Channel, as well as 10 Gigabit Ethernet and FCoE connectivity options. The Cisco Nexus 5672UP also offers 6 ports of 40 Gbps using QSFP transceivers for Ethernet and FCoE support. The Cisco Nexus 5672UP has three fan modules and two power supplies. The Cisco Nexus 5672UP supports VXLAN in bridging and routing modes on all ports at line rate, enabling the migration of virtual machines between servers across Layer 3 networks.

Figure 1. Cisco Nexus 5672UP Switch (Port-Side View)

The Cisco Nexus 5672UP is constructed with the components shown in Figure 2. The Cisco Nexus 5672UP has two 1+1 redundant, hot-swappable power supplies and three hot-swappable independent fans with support for 2+1 redundancy.

Figure 2. Cisco Nexus 5672UP Switch (Fan-Side View)



The Cisco Nexus 5672UP supports both port-side intake (red handle) and fan-side intake (blue handle) airflow options for flexible mounting.

Cisco Nexus 5672UP-16G Switch

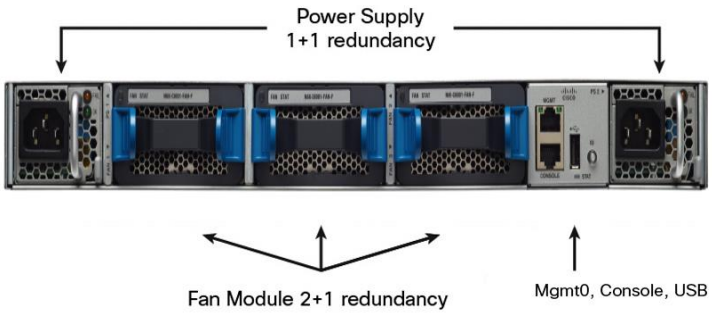
- The Cisco Nexus 5672UP-16G Switch (Figure 3) is a 10 and 40 Gigabit Ethernet (40-Gbps on uplink and network-facing ports) switch offering wire-speed performance for up to seventy-two 10 Gigabit Ethernet ports (using QSFP breakout cables). The Cisco Nexus 5672UP-16G Switches are Layer 2 and 3 nonblocking 10 and 40 Gigabit Ethernet and FCoE-capable switches with up to 1.44 Tbps of internal bandwidth. The Cisco Nexus 5672UP-16G offers 48 10 Gigabit Ethernet ports, of which the first 24 ports are capable of doing 1/10G Ethernet and the last 24 ports (highlighted in orange on the chassis for easy identification) are unified ports that support 16-, 8-, 4-, and 2-Gbps Fibre Channel. All 48 fixed ports support classical Ethernet and FCoE.

The 24 unified ports provide 16-, 8-. 4-, and 2-Gbps Fibre Channel as well as 10 Gigabit Ethernet and FCoE connectivity options. The Cisco Nexus 5672UP-16G also offers 6 ports of 40 Gbps using QSFP transceivers for Ethernet and FCoE support. The Cisco Nexus 5672UP-16G has three fan modules and two power supplies and supports VXLAN in bridging and routing modes on all ports at line rate, enabling the migration of virtual machines between servers across Layer 3 networks. The switch also offers 128 buffer-to-buffer credits, helping provide SAN extension of up to 16 kilometers at 16-Gbps Fibre Channel speeds.

Figure 3. Cisco Nexus 5672UP-16G Switch (Port-Side View)

The Cisco Nexus 5672UP-16G platform is constructed with the components shown in Figure 4. The Cisco Nexus 5672UP-16G has two 1+1 redundant, hot-swappable power supplies and three hot-swappable independent fans with support for 2+1 redundancy.

Figure 4. Cisco Nexus 5672UP-16G Switch (Fan-Side View)



The Cisco Nexus 5672UP-16G supports both port-side intake (red handle) and fan-side intake (blue handle) airflow options for flexible mounting.

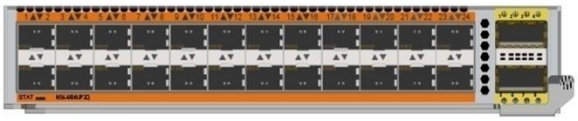
Cisco Nexus 56128P Switch

The Cisco Nexus 56128P Switch (Figure 5) is a 2RU switch that supports 2.56 Tbps of bandwidth across 48 fixed 1 and 10 Gigabit Ethernet SFP+ ports and four 40-Gbps QSFP+ ports. The 48 ports on the base chassis support 10 Gigabit Ethernet and FCoE. The 4 QSFP ports support 40 Gigabit Ethernet and FCoE.

Figure 5. Cisco Nexus 56128P Switch (Port-Side View)

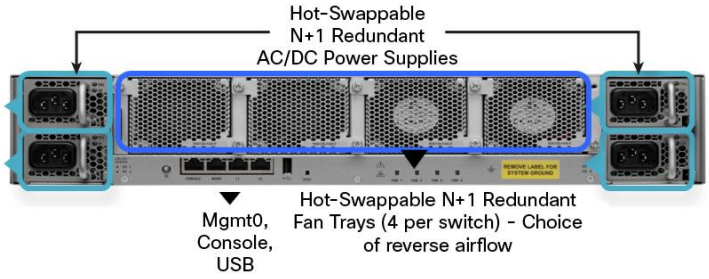
The Cisco Nexus 56128P also offers two slots for a generic expansion module (GEM). The GEM (Figure 6) for the Cisco Nexus 56128P provides 24 SFP+ ports for 10 Gigabit Ethernet and FCoE or 2-, 4-, and 8-Gbps Fibre Channel, and 2 QSFP+ ports for 40 Gigabit Ethernet and FCoE. The expansion module supports native 40 Gigabit Ethernet on the QSFP+ ports. The GEM is supported on the Cisco Nexus 56128P chassis only and can be populated in either of the two expansion slots.

Figure 6. Cisco Nexus 56128P Generic Expansion Module



The Cisco Nexus 56128P is constructed with the components shown in Figure 7. The Cisco Nexus 56128P has four 2+2 redundant, hot-swappable power supplies and four 3+1 redundant, hot-swappable independent fans. The Cisco Nexus 56128P supports both port-side intake (red handle) and fan-side intake (blue handle) airflow options.

Figure 7. Cisco Nexus 56128P Switch (Fan-Side View)



The Cisco Nexus 56128P supports VXLAN bridging and routing modes on all ports at line rate, enabling the migration of virtual machines between servers across Layer 3 networks.

With the Cisco Nexus 5600 10-Gbps platform, organizations can quickly and easily upgrade existing data centers through advanced Cisco bidirectional (BiDi) optics, which enable the use of existing 10 Gigabit Ethernet fiber (a pair of multimode fiber strands) to carry 40 Gigabit Ethernet to the aggregation layer or to the spine (in a leaf-and-spine configuration) without requiring any change to the existing cabling infrastructure. Additionally, the platform can be deployed in MoR or EoR configurations to meet the 10 and 40 Gigabit Ethernet connectivity requirements of multiple racks or pods.

When used with Cisco Nexus 2000 Series Fabric Extenders, the Cisco Nexus 5600 platform 10-Gbps switches can support even more servers in a collapsed access- and aggregation-layer design, supporting 1 and 10 Gigabit Ethernet connectivity across multiple racks.

Features and Benefits

The following are some of the primary features of the Cisco Nexus 5600 10-Gbps platform switches:

- **Optimization for virtualization and cloud deployments:** Today, high-performance servers deployed in the cloud can support many more virtual machines and workloads than ever before. The requirement to be able to deploy new servers on demand puts additional strain on the network fabric. The 10-Gbps switches address this challenge by providing scalability and performance, making it an excellent platform for meeting current and future needs.

- **Density and resilience:** 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 as possible and delivering to rack servers benefits traditionally offered only on blade servers. 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 or back-to-front 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.
- **Energy efficiency:** The 10-Gbps switches help data centers operate within their space, power, and cooling parameters while reducing their carbon footprints. The switch power supplies are also capable of maintaining 90 percent efficiency at load conditions of as low as 25 percent utilization. This capability allows the switch to make efficient use of power while still being appropriately sized to support the conditions of a full system load.
- **Low latency:** Cut-through switching enables these switches to support approximately 1 microsecond of port-to-port latency for any packet size with features enabled.
- **Intelligent Cisco Switched Port Analyzer (SPAN) and Encapsulated SPAN (ERSPAN):** SPAN and ERSPAN can be used for troubleshooting and robust monitoring of traffic. The SPAN and ERSPAN capabilities are nondisruptive, with only extra bandwidth capacity used for SPAN and ERSPAN traffic. Enhancements include more efficient allocation of bandwidth to SPAN and ERSPAN traffic so that any fabric bandwidth not used for data traffic can be allocated to SPAN or ERSPAN traffic. The switch can support up to 31 line-rate SPAN and ERSPAN sessions.
- **Flexible buffer management:** The 10-Gbps switches support a 25-MB packet buffer shared by every 3 ports of 40 Gigabit Ethernet or every 12 ports of 10 Gigabit Ethernet. The flexible buffer management capability allows dynamic tuning of the sizes of the shared and dedicated buffers in the event of congestion.
- **Multicast enhancements:** These switches support line-rate Layer 2 and 3 multicast throughput for all frame sizes. They offer optimized multicast replication through the fabric and at the egress point. Support is provided for 32,000 multicast routes and for Internet Group Management Protocol (IGMP) snooping tables in hardware. Multicast enhancements include flow-based hashing for multicast traffic over a port channel and enhanced Bidirectional Protocol-Independent Multicast (Bidir-PIM) support. The switch also supports IP-based forwarding for IGMP snooping.
- **Inter-Switch Link (ISL):** The Cisco Nexus 5672UP-16G switch supports 16-Gbps Fibre Channel ISLs in a Fibre Channel–only environment or, in the case of FCoE, 40-Gbps ISLs. With six such 40-Gbps links available, the ISLs support bandwidth of 240 Gbps. Improved buffer-to-buffer credits (up to 128) on the new switch now provide support for 16-Gbps Fibre Channel ISLs across distances of up to 16 kilometers.

For a complete list of the latest software features supported on the Cisco Nexus 5600 10-Gbps platform, see the product bulletin at http://www.cisco.com/c/en/us/products/collateral/switches/nexus-5000-series-switches/bulletin-c25-735319.html.

Applications

The Cisco Nexus 5600 10-Gbps platform supports a number of application scenarios, making it a versatile data center option.

Cisco Fabric Extender Architecture: High-Density Fabric Extender Aggregator

Cisco Fabric Extender Technology (FEX Technology) enables you to build a single, modular fabric that extends from Cisco Nexus switches to Cisco Unified Computing System™ (Cisco UCS®) servers, to adapters (Cisco Adapter FEX), and to virtual machines (Cisco Data Center Virtual Machine FEX [VM-FEX]). FEX Technology is based on the emerging standard IEEE 802.1BR. Designing the network using FEX Technology provides flexibility, reduced cabling infrastructure, and a single point of management, helping customers scale their networks. When the 10-Gbps switches are part of a fabric that includes Cisco Nexus 2200 and 2300 platform fabric extenders, you can use these fabric extenders in single- or dual-connected mode, using enhanced virtual port-channel (vPC+) technology to two upstream 10-Gbps switches. Servers and end hosts can connect to single or dual Cisco Nexus 2200 and 2300 platform fabric extenders using network interface card (NIC) teaming when the parent Cisco Nexus 5600 platform 10-Gbps switch has vPC+ enabled.

Following are some common deployment options using the Cisco Nexus 2000 Series (including the 2200 and 2300 platforms) and 5600 10-Gbps platform:

- Rack servers with 100 Megabit Ethernet, 1 Gigabit Ethernet, or 10 Gigabit Ethernet NICs; the fabric extender can be physically located at the top of the rack, and the 10-Gbps switch can reside in the middle or at the end of the row, or the fabric extender and the 10-Gbps switch can both reside in the middle or at the end of the row
- Rack servers with 10 Megabit Ethernet NICs in full duplex mode connected using the Cisco Nexus 2248TP-E Fabric Extender in conjunction with the Cisco Nexus 5600 platform
- Mixed 1 and 10 Gigabit Ethernet environments in which rack servers are running at either speed in the same rack or in adjacent racks
- 10 Gigabit Ethernet and FCoE deployments using servers with converged network adapters (CNAs) for unified fabric environments
- 10GBASE-T server connectivity with ease of migration from 1 to 10GBASE-T and effective reuse of structured cabling
- 1 and 10 Gigabit Ethernet blade servers with pass-through blades
- Low-latency, high-performance computing environments
- Virtualized access

In addition to these options, the 10-Gbps switches provide unique value as a high-density fabric extender aggregation platform. For example, the switches can be used in conjunction with the Cisco Nexus 2348UPQ, 2348TQ, 2332TQ, 2248PQ, 2232PP, 2248TP-E, 2232TM-E, 2232TM, 2248TP, and 2224TP Fabric Extenders as a high-density switching system, consolidating 10 Gigabit Ethernet connections in a single management plane. In addition, a variety of blade fabric extender options can be aggregated into the Cisco Nexus 5600 10-Gbps platform switches using 10 Gigabit Ethernet, providing a single point of management for blade server deployments.

Table 1 lists the fabric extenders that are supported by the Cisco Nexus 5600 10-Gbps platform switches. For more information about the products and the minimum software releases supported, see the Cisco Nexus 2200 and 2300 platform data sheets and release notes.

Table 1. Supported Fabric Extenders

Fabric Extender	Description
Cisco Nexus 2332TQ	32 x 1/10GBASE-T port host interfaces (SFP+) and up to 4 QSFP+ 10/40 Gigabit Ethernet fabric interfaces; FCoE support up to 30m with Category 6a or 7 cables
Cisco Nexus 2348TQ	48 x 1/10GBASE-T port host interfaces (SFP+) and up to 6 QSFP+ 10/40 Gigabit Ethernet fabric interfaces; FCoE support up to 30m with Category 6a or 7 cables
Cisco Nexus 2348UPQ	48 x 1 and 10 Gigabit Ethernet and unified port host interfaces (SFP+) and up to 6 QSFP+ 10/40 Gigabit Ethernet fabric interfaces
Cisco Nexus 2224TP	24 x 100/1000BASE-T host interfaces and 2 x 10 Gigabit Ethernet fabric interfaces (SFP+)
Cisco Nexus 2248TP	48 x 100/1000BASE-T host interfaces and 4 x 10 Gigabit Ethernet fabric interfaces (SFP+)
Cisco Nexus 2248TP-E	48 x 100/1000BASE-T host interfaces and 4 x 10 Gigabit Ethernet fabric interfaces (SFP+; 32-MB shared buffer)
Cisco Nexus 2232PP	32 x 1/10 Gigabit Ethernet and FCoE host interfaces (SFP+) and 8 x 10 Gigabit Ethernet and FCoE fabric interfaces (SFP+)
Cisco Nexus 2248PQ	48 x 1/10 Gigabit Ethernet SFP+ host interface and 4 x 40 Gigabit Ethernet (16 x 10 Gigabit Ethernet SFP+) network interfaces
Cisco Nexus 2232TM	32 x 1/10GBASE-T host interfaces and 8 x 10 Gigabit Ethernet (SFP+) uplink modules
Cisco Nexus 2232TM-E	32 x 1/10GBASE-T host interfaces and 8 x 10 Gigabit Ethernet (SFP+) uplink modules (lower power consumption and improved bit error rate [BER])
Cisco Nexus B22HP	16 x 1/10GBASE-KR internal host interfaces and 8 x 10 Gigabit Ethernet fabric interfaces (SFP+; network interfaces)
Cisco Nexus B22F	16 x 10GBASE-KR internal host interfaces and 8 x 10 Gigabit Ethernet fabric interfaces (SFP+; network interfaces)
Cisco Nexus B22DELL	16 x 10GBASE-KR internal host interfaces and 8 x 10 Gigabit Ethernet fabric interfaces (SFP+; network interfaces)
Cisco Nexus B22IBM	14 x 1/10GBASE-KR internal host interfaces and 8 x 10 Gigabit Ethernet fabric (SFP+; network interfaces)

Large-Scale Fabric (Layers 2 and 3): Leaf and Spine Architecture

Data center designs are evolving, with customers seeking to build large-scale nonblocking fabrics to accommodate different applications, creating patterns of heavy east-west and north-south traffic. The Cisco Nexus 5600 platform 10-Gbps switches are well suited for leaf and spine nodes in a Layer 2 or 3 fabric design. Leaf-and-spine designs using high-density and low-latency switches lead to flatter network architecture, allowing connections that scale from hundreds to more than 10,000 servers with high bidirectional bandwidth and helping ensure low-latency fabric with a low hop count. The spine switches create a nonblocking, low-latency fabric, forwarding packets between leaf switches. The leaf switches provide connectivity to servers. Use of a highly meshed architecture helps ensure the highest possible network availability with little impact on customer traffic in the event of a failure. The 10-Gbps switches can be deployed as Layer 2 or 3 spine or leaf switches, providing a high degree of design flexibility.

Multihop FCoE

Cisco Unified Fabric combines data center and storage networks to deliver a single high-performance, highly available, and scalable network. With the Cisco Nexus 5600 10-Gbps platform switches, Cisco can support end-to-end data center convergence, from the server to storage, by delivering multihop FCoE capability in the data center. The FCoE capability complements the existing FCoE function on the Cisco Nexus 5600 10-Gbps platform. With this broad selection of standards-based FCoE switches, Cisco provides unified fabric support to both the access and core network layers, supporting all storage traffic (FCoE, Small Computer System Interface over IP [iSCSI], and network-attached storage [NAS]) over a simplified infrastructure based on lossless 10 and 40 Gigabit Ethernet.

High-Performance Computing

The Cisco Nexus 5600 10-Gbps platform switches can be deployed as high-density small form-factor (SFF) access-layer switches to consolidate a large number of 10 Gigabit Ethernet servers in deployments that call for only a small number of hops from the server to the upstream network to reduce latency. They have a high density of 10 Gigabit Ethernet ports per rack unit, approximately 1 microsecond of latency port to port for any packet size, integrated line-rate Layer 2 and 3 features, scalability, and integrated data analytics with programmability. They address the needs of high-performance computing (HPC) and high-frequency trading (HFT) environments, for which InfiniBand solutions lack management visibility and high performance of bulk data transfers across traditional applications.

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

Cisco NX-OS Software Overview

NX-OS is a purpose-built data center operating system designed for performance, resiliency, scalability, manageability, and programmability. NX-OS meets Ethernet and storage networking requirements, providing a robust and comprehensive feature set that can meet the demanding requirements of virtualization and automation in present and future data centers. The enhanced Cisco fabric solution allows the transparent integration of the virtual and physical devices on a unified network. In addition, users can use the comprehensive NX-OS service set to create unique innovations for customized solutions. With its MIBs, native XML interface, and command-line interface (CLI) like that of Cisco IOS® Software, NX-OS provides drastically simplified management for the devices in which it runs.

For a complete list of all the features and benefits of NX-OS, see http://www.cisco.com/en/US/prod/collateral/iosswrel/ps9494/ps9372/data_sheet_c78-652063.html.

Cisco Prime Data Center Network Manager

Cisco Prime™ Data Center Network Manager (DCNM) provides LAN and SAN management capabilities for the Cisco Nexus and Cisco MDS 9000 Families. DCNM provides a GUI that reduces operating expenses (OpEx) compared to traditional CLI methods and allows efficient operation control, monitoring, provisioning, and troubleshooting for your NX-OS devices. The main features include the following:

- Unified fabric visibility and topology display with VMware vSphere integration shows the connectivity from the virtual machine to the VMware ESX host and to the switch and the storage array.
- Event aggregation and filtering helps you quickly find the information you need and identify network problems.
- Deployment wizards and user-modifiable templates help you implement best practices.
- Role-based access control (RBAC) helps secure devices and provide appropriate delegation.
- Integrated domain dashboards, health monitoring, reporting, change tracking, and user auditing provides comprehensive management capabilities.
- Trend monitoring of ports and traffic allow you to optimize your existing resources and anticipate new resource requirements.

Specifications

Table 2 lists the specifications for the Cisco Nexus 5600 10-Gbps platform switches. For a complete list of features supported, see the software release notes at http://www.cisco.com/c/en/us/td/docs/switches/datacenter/nexus5600/sw/release/notes/7x/Nexus5600_Release_Notes_7x.html.

Table 2. Product Specifications

Performance
• Cisco Nexus 5672UP-16G: Layer 2 and 3 hardware forwarding at 1.44 Tbps; 1071 million packets per second (mpps; 64-byte packets) • Cisco Nexus 5672UP: Layer 2 and 3 hardware forwarding at 1.44 Tbps; 1071 mpps (64-byte packets) • Cisco Nexus 56128P: Layer 2 and 3 hardware forwarding at 2.56 Tbps; 1904 mpps (64-byte packets) • Support for up to 256,000 combined entries of MAC addresses and Address Resolution Protocol (ARP) entries • Low latency of approximately 1 microsecond using cut-through forwarding for predictable, consistent traffic latency regardless of packet size, traffic pattern, or features enabled on 10 and 40 Gigabit Ethernet interfaces • 25-MB buffer per 12 x 10 Gigabit Ethernet SFP+ interfaces • Line-rate traffic throughput on all ports in Layer 2 and 3 mode
Interfaces
• Cisco Nexus 5672UP-16G: 48 fixed 10 Gigabit Ethernet SFP+ ports with 24 of the 48 ports being unified, and 6 fixed 40 Gigabit Ethernet QSFP+ ports with 10 and 40 Gigabit Ethernet FCoE support on all respective ports and 2/4/8/16-Gbps Fibre Channel on all the unified ports. First 24 ports can support 1G Ethernet. • Cisco Nexus 5672UP: 48 fixed 1/10 Gigabit Ethernet SFP+ ports with 16 of the 48 ports being unified, and 6 fixed 40 Gigabit Ethernet QSFP+ ports with 10 and 40 Gigabit Ethernet FCoE support on all respective ports and 2/4/8-Gbps Fibre Channel on all the unified ports • Cisco Nexus 56128P: 48 fixed 1/10 Gigabit Ethernet SFP+ ports with 4 x 40 Gigabit Ethernet QSFP+ fixed ports and 2 expansion slots • Expansion module: 24 SFP+ unified ports plus 2 x 40 Gigabit Ethernet QSFP+ ports • Conversion of 40 Gigabit Ethernet ports to 10 Gigabit Ethernet interfaces through QSFP+ breakout cable • Fabric extension through the Cisco Nexus 2200 and 2300 platforms
Layer 2 Features
• Layer 2 switch ports and VLAN trunks • IEEE 802.1Q VLAN encapsulation • Support for up to 4000 VLANs • Support for up to 4000 access control list (ACL) entries • 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 • vPC shutdown • Link Aggregation Control Protocol (LACP): IEEE 802.3ad • Advanced port-channel 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 • VLAN remapping • FabricPath • EvPC and vPC+ with FabricPath • Adapter FEX • Data Center VM-FEX • Support for up to 24 fabric extenders (Layer 2) with each Cisco Nexus 5672UP, 5672UP-16G, and 56128P Switch • RDMA over Converged Ethernet (RoCE) using Data Center Bridging (DCB) support (DCB Exchange [DCBX] no drop and priority flow control

[PFC])
Layer 3 Features
• Layer 3 interfaces: Routed ports, switch virtual interface (SVI), port channels, subinterfaces, and port-channel subinterfaces • Support for up to 32,000 IPv4 and 8000 IPv6 host prefixes • Support for up to 8000 multicast routes (IPv4) • Support for up to 8000 IGMP snooping groups • Support for 4000 Virtual Routing and Forwarding (VRF) entries • Support for up to 4096 VLANs • Equal-Cost Multipathing (ECMP) up to 64 ways • 4000 flexible ACL entries • Routing protocols: Static, Routing Information Protocol Version 2 (RIPv2), Enhanced Interior Gateway Routing Protocol (EIGRP), Open Shortest Path First Version 2 (OSPFv2), Border Gateway Protocol (BGP), and Intermediate System-to-Intermediate System (IS-IS) • IPv6 routing protocols: Static, OPFv3, BGPv6, and EIGRPv6 • IPv6 VRF-lite • BFD support: OSPFv2, BGPv4, EIGRP, and VRF instances • Policy-Based Routing (IPv4 and IPv6) • Hot-Standby Router Protocol (HSRP) and Virtual Router Redundancy Protocol (VRRP) • IP direct broadcast • vPC+ routing protocol peering • 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), Bidir-PIM, Multicast Source Discovery Protocol (MSDP), IGMPv2 and v3, and Multicast VLAN Registration (MVR) • 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) • Support for up to 24 fabric extenders on each Cisco Nexus 5600 10-Gbps platform switch
Quality of Service (QoS)
• Layer 2 IEEE 802.1p (class of service [CoS]) • 8 unicast queues and 8 multicast queues per port • Per-port QoS configuration • CoS trust • Port-based CoS assignment • Modular QoS CLI (MQC) compliance: IPv4 and IPv6 • ACL-based QoS classification (Layers 2, 3, and 4) • Flexible TCAM carving • MAC and ARP hardware carving • MQC CoS marking • Per-port virtual output queuing • CoS-based egress queuing • Egress strict-priority queuing • Egress port-based scheduling: Deficit Weighted Round-Robin (DWRR) • Control-Plane Policing (CoPP): IPv4 and IPv6
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 and 4 ACLs: IPv4 and IPv6, Internet Control Message Protocol (ICMP and ICMPv6), TCP, User Datagram Protocol (UDP), etc. • Ingress policing • VLAN-based ACLs (VACLs) • Port-based ACLs (PACLs) • Named ACLs • Optimized ACL distribution • ACLs on virtual terminals (vtys) • ACL logging (IPv4 only) • Dynamic Host Configuration Protocol (DHCP) snooping with Option 82 • Dynamic ARP Inspection

- IP source guard
- DHCP relay (up to 32 destinations)
- Ethernet port security
- IPv6 RACL, PACL, and VACL
- iSCSI type-length-value (TLV)

High-Availability Features

- Cisco In-Service Software Upgrade (ISSU) for Layer 2
- Hot-swappable field-replaceable power supplies and fan modules
- N+1 and N+N 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
- Port-based locator and beacon LEDs
- Configuration synchronization
- Configuration rollback
- Secure Shell Version 2 (SSHv2)
- Telnet
- Authentication, authorization, and accounting (AAA)
- AAA with RBAC
- RADIUS
- TACACS+
- Syslog (8 servers)
- Embedded packet analyzer
- SNMPv1, v2, and v3 (IPv4 and IPv6)
- 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
- SPAN on physical, PortChannel and VLAN
- ERSPAN
- Ingress and egress packet counters per interface
- Network Time Protocol (NTP)
- Cisco Generic Online Diagnostics (GOLD)
- Comprehensive bootup diagnostic tests
- Cisco Embedded Event Manager (EEM)
- Cisco Call Home
- Cisco Smart Call Home
- Default Interface
- Cisco Fabric Manager
- Cisco Prime DCNM
- CiscoWorks LAN Management Solution (LMS)

Data Center Bridging

- CEE- and IEEE-compliant PFC (per-priority Pause frame support: IEEE 802.1Qbb)
- PFC link distance support: 20 km
- CEE-compliant DCBX Protocol
- CEE- and IEEE-compliant enhanced transmission selection

FCoE Features (Require Storage Services License)

- T11 standards-compliant FCoE (Fibre Channel-BB-5)
- T11 FCoE Initialization Protocol (FIP) (Fibre Channel-BB-5)
- Any 10 or 40 Gigabit Ethernet port configurable as FCoE
- SAN administration separate from LAN administration
- Fibre Channel forwarding (FCF)
- Fibre Channel enhanced port types: VE, VF and VNP
- Direct attachment of FCoE targets
- Fabric Device Management Interface (FDMI)
- Fibre Channel ID (FCID) persistence
- Distributed device alias services
- In-order delivery
- Port tracking
- Cisco FCoE 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
- Distributed device alias services
- Host-to-switch and switch-to-switch Fibre Channel-SP authentication
- Fabric Shortest Path First (FSPF)
- Standard zoning
- Enhanced zoning
- Cisco Fabric Analyzer
- Cisco DCNM-SAN
- Storage Management Initiative Specification (SMI-S)
- Boot from SAN over vPC and Enhanced vPC (EvPC)
- FCP
- VSAN trunking
- Fabric Device Management Interface (FDMI)
- Fibre Channel ID (FCID) persistence
- Distributed device alias services
- In-order delivery
- Port tracking
- Cisco NPV technology
- Fabric binding for Fibre Channel
- Port security
- Fibre Channel traceroute
- Fibre Channel ping
- Fibre Channel debugging

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

Ethernet MIBs

- CISCO-VLAN-MEMBERSHIP-MIB
- CISCO-Virtual-Interface-MIB
- CISCO-VTP-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
- LLDP-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 • CISCO-PORTSECURITY-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 • CISCO-FCOE-MIB • CISCO-PORTCHANNEL-MIB • CISCO-ZS-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 • IEEE 802.3ba: 40 Gigabit Ethernet (Applies to 40G SR4, SR4-S, LR4, LR4-S, and CSR4 optics only) • SFF 8431 SFP+ CX1 support • RMON

Power Supply

Table 3 lists the power supply properties of the Cisco Nexus 5600 10-Gbps platform.

Table 3. Power Supply Properties

Power Supply Properties	N55-PAC-1100W	N55-PDC-1100W	NXA-PAC-1100W	NXA-PHV-1100W
Typical operating power	650 watts (W)	650W	650W	650W
Maximum power	1100W	1100W	1100W	1100W
Input voltage	94 to 240 VAC	–40 to –72 VDC	94 to 240 VAC	90 to 350 HVAC, 192 to 420 HVDC
Frequency	47 to 63 Hz	–	47 to 63 Hz	47 to 63 Hz
Efficiency	98% (50 to 100% load)	88%	98% (50 to 100% load)	92 to 94% (50 to 99% load)
RoHS compliance	Yes	Yes	Yes	Yes
Hot-swappable	Yes	Yes	Yes	Yes
Heat dissipation	45 BTU/hr	260 BTU/hr	45 BTU/hr	170 to 130 BTU/hr
Front-to-back (fan-side intake) airflow power supply	Yes	Yes	Yes	Yes
Back-to-front (port-side intake) airflow power supply	Yes	No	Yes	Yes

Environment

Table 4 lists the environment properties of the Cisco Nexus 10-Gbps 5600 platform.

Table 4. Environment Properties

Property	Cisco Nexus 5600 Platform
Physical (height x width x depth)	• Cisco Nexus 5672UP and 5672UP-16G: 1.75 x 17.3 x 30 in. (4.4 x 43.9 x 76.2 cm) • Cisco Nexus 56128P: 3.5 x 17.3 x 30 (8.8 x 43.9 x 76.2 cm)
Operating temperature	32 to 104°F (0 to 40°C)
Nonoperating (storage) temperature	–40 to 158°F (–40 to 70°C)
Humidity	5 to 95% (noncondensing)
Altitude	0 to 10,000 ft (0 to 3000m)
Weight	• Cisco Nexus 5672UP/5672UP-16G: 32 lb (2 power supplies) • Cisco Nexus 56128P: 60 lb (2 expansion modules and 4 power supplies)

Regulatory Standards Compliance

Table 5 summarizes regulatory standards compliance for the Cisco Nexus 5600 10-Gbps platform.

Table 5. 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.

Cisco Nexus 5600 10-Gbps Platform Transceiver and Cabling Options

The Cisco Nexus 5600 platform 10-Gbps switches support a wide variety of 1, 10, and 40 Gigabit Ethernet connectivity options. Table 6 lists the transceivers supported for 1 and 10 Gigabit Ethernet connectivity, and Table 7 lists the 40 Gigabit Ethernet QSFP+ transceivers supported.

Table 6. Cisco Nexus 5600 Platform 1 and 10 Gigabit Ethernet and 4-, 8-, and 16-Gbps Fibre Channel SFP+ Transceiver Support Matrix

Cisco SFP	Description
FET-10G	10-Gbps SFP+ module for Cisco Nexus 2000 Series to Cisco Nexus 5000 Series connectivity
SFP-10G-SR	10GBASE-SR SFP+ module (multimode fiber [MMF])
SFP-10G-SR-S	10GBASE-SR SFP Module, Enterprise-Class
SFP-10G-LR	10GBASE-LR SFP+ module (single-mode fiber [SMF])
SFP-10G-LR-S	10GBASE-LR SFP Module, Enterprise-Class
SFP-10G-ER	10GBASE-ER-SFP+ module (SMF)
SFP-10G-ER-S	10GBASE-ER SFP Module, Enterprise-Class
SFP-H10GB-CU1M	10GBASE-CU SFP+ cable, 1m (Twinax cable)
SFP-H10GB-CU1.5M	10GBASE CU SFP+ cable, 1.5m (passive Twinax cable)
SFP-H10GB-CU2M	10GBASE CU SFP+ cable, 2m (passive Twinax cable)
SFP-H10GB-CU2.5M	10GBASE CU SFP+ cable, 2.5m (passive Twinax cable)
SFP-H10GB-CU3M	10GBASE-CU SFP+ cable, 3m (Twinax cable)
SFP-H10GB-CU5M	10GBASE-CU SFP+ cable, 5m (Twinax cable)
SFP-H10GB-ACU7M	10GBASE-CU SFP+ cable, 7m (active Twinax cable)
SFP-H10GB-ACU10M	10GBASE-CU SFP+ cable, 10m (active Twinax cable)
SFP-10G-AOC1M	10GBASE-AOC SFP+ cable, 1m
SFP-10G-AOC2M	10GBASE-AOC SFP+ cable, 2m
SFP-10G-AOC3M	10GBASE-AOC SFP+ cable, 3m
SFP-10G-AOC5M	10GBASE-AOC SFP+ cable, 5m
SFP-10G-AOC7M	10GBASE-AOC SFP+ cable, 7m
SFP-10G-AOC10M	10GBASE-AOC SFP+ cable, 10m
GLC-T	1000BASE-T SFP
GLC-ZX-SMD	1000BASE-ZX SFP transceiver module, SMF, 1550-nm wavelength, dual LC/PC connector, digital optical monitoring (DOM); not supported on Cisco Nexus 5672UP-16G
GLC-SX-MMD	Gigabit Ethernet SFP, LC connector SX transceiver (MMF), extended temperature range and DOM
GLC-EX-SMD	1000BASE-EX SFP transceiver module, SMF, 1310-nm wavelength, dual LC/PC connector, digital optical monitoring (DOM); not supported on Cisco Nexus 5672UP-16G
GLC-LH-SMD	Gigabit Ethernet SFP, LC connector LX/LH transceiver (SMF), extended temperature range and DOM
SFP-GE-T	1000BASE-T SFP, extended temperature range; not supported on Cisco Nexus 5672UP-16G
DS-SFP-FC16G-SW	16-Gbps Fibre Channel shortwave SFP+, LC connector (16-Gbps Fibre Channel support only on last 24 ports of Cisco Nexus 5672UP-16G)
DS-SFP-FC16G-LW	16-Gbps Fibre Channel longwave SFP+, LC connector (16-Gbps Fibre Channel support only on last 24 ports of Cisco Nexus 5672UP-16G)
DS-SFP-FC8G-SW	8-Gbps Fibre Channel shortwave SFP+, LC connector (Fibre Channel support only on last 24 ports of Cisco Nexus 5672UP-16G, on last 16 ports of Cisco Nexus 5672UP, and on GEM on Cisco Nexus 56128P)
DS-SFP-FC8G-LW	8-Gbps Fibre Channel longwave SFP+, LC connector (Fibre Channel support only on last 24 ports of Cisco Nexus 5672UP-16G, on last 16 ports of Cisco Nexus 5672UP, and on GEM on Cisco Nexus 56128P)
DS-SFP-FC4G-SW	4-Gbps Fibre Channel shortwave SFP, LC connector (Fibre Channel support only on last 24 ports of Cisco Nexus 5672UP-16G, on last 16 ports of Cisco Nexus 5672UP, and on GEM on Cisco Nexus 56128P)
DS-SFP-FC4G-LW	4-Gbps Fibre Channel long-wave SFP, LC connector (Fibre Channel support only on last 24 ports of Cisco Nexus 5672UP-16G, on last 16 ports of Cisco Nexus 5672UP, and on GEM on Cisco Nexus 56128P)

Table 7. Cisco Nexus 5600 Platform 40 Gigabit Ethernet QSFP+ Transceiver Support Matrix (on 6 Uplink Ports)

Cisco QSFP	Description
QSFP-40G-SR4	40GBASE-SR4 QSFP module, MMF, MPO connector. 100m
QSFP-40G-SR4-S	40GBASE-SR4 QSFP module, MPO connector, enterprise class
QSFP-40G-CSR4	40GBASE extended CSR4 QSFP module, MMF, 300m
QSFP-40G-LR4	40GBASE extended LR4 QSFP module, LC connector, 10 km
QSFP-40G-LR4-S	QSFP 40GBASE-LR4 module, LC connector, 10 km, enterprise class
WSP-Q40GLR4L	QSFP 40 Gigabit Ethernet, LR4 Lite, LC connector, 2 km
QSFP-40G-SR-BD	QSFP40G BiDi short-reach transceiver
QSFP-40G-ER4	QSFP 40GBASE-ER4 Module, LC connector, 40 km
QSFP-4SFP10G-CU1M	40GBASE-CR4 QSFP+ to 4 10GBASE-CU SFP+ passive direct-attach copper transceiver assembly, 1m
QSFP-4SFP10G-CU3M	40GBASE-CR4 QSFP+ to 4 10GBASE-CU SFP+ passive direct-attach copper transceiver assembly, 3m
QSFP-4SFP10G-CU5M	40GBASE-CR4 QSFP+ to 4 10GBASE-CU SFP+ passive direct-attach copper transceiver assembly, 5m
QSFP-4x10G-AC7M	40GBASE-CR4 QSFP+ to 4 10GBASE-CU SFP+ direct-attach breakout cable, 7m, active
QSFP-4x10G-AC10M	40GBASE-CR4 QSFP+ to 4 10GBASE-CU SFP+ direct-attach breakout cable, 10m, active
QSFP-H40G-CU1M	40GBASE-CR4 QSFP+ direct-attach copper cable, 1m, passive
QSFP-H40G-CU3M	40GBASE-CR4 QSFP+ direct-attach copper cable, 3m, passive
QSFP-H40G-CU5M	40GBASE-CR4 QSFP+ direct-attach copper cable, 5m, passive
QSFP-H40G-ACU7M	40GBASE-CR4 QSFP+ direct-attach copper cable, 7m, active
QSFP-H40G-ACU10M	40GBASE-CR4 QSFP+ direct-attach copper cable, 10m, active
QSFP-4X10G-AOC1M	40GBASE-AOC QSFP to 4 SFP+ active optical breakout cable, 1m
QSFP-4X10G-AOC2M	40GBASE-AOC QSFP to 4 SFP+ active optical breakout cable, 2m
QSFP-4X10G-AOC3M	40GBASE-AOC QSFP to 4 SFP+ active optical breakout cable, 3m
QSFP-4X10G-AOC5M	40GBASE-AOC QSFP to 4 SFP+ active optical breakout cable, 5m
QSFP-4X10G-AOC7M	40GBASE-AOC QSFP to 4 SFP+ active optical breakout cable, 7m
QSFP-4X10G-AOC10M	40GBASE-AOC QSFP to 4 SFP+ active optical breakout cable, 10m
QSFP-H40G-AOC1M	40GBASE-AOC QSFP direct-attach active optical cable, 1m
QSFP-H40G-AOC2M	40GBASE-AOC QSFP direct-attach active optical cable, 2m
QSFP-H40G-AOC3M	40GBASE-AOC QSFP direct-attach active optical cable, 3m
QSFP-H40G-AOC5M	40GBASE-AOC QSFP direct-attach active optical cable, 5m
QSFP-H40G-AOC7M	40GBASE-AOC QSFP direct-attach active optical cable, 7m
QSFP-H40G-AOC10M	40GBASE-AOC QSFP direct-attach active optical cable, 10m
QSFP-H40G-AOC15M	40GBASE-AOC QSFP direct-attach active optical cable, 15m
CVR-QSFP-SFP10G	QSFP to SFP 10-Gbps adapter. All 1-Gbps and 10-Gbps Ethernet optics listed in Table 6 are supported.

The platform supports an innovative Twinax copper cabling solution that connects to standard QSFP connectors for in-rack use and optical cabling for longer cable runs (Table 8).

For in-rack or adjacent-rack cabling, the Cisco Nexus 5600 10-Gbps platform switch supports QSFP+ direct-attach 40 Gigabit Ethernet copper cables, an innovative solution that integrates transceivers with Twinax cables into an energy-efficient, low-cost, and low-latency solution. QSFP+ direct-attach 40 gigabit Twinax copper cables use only 1.5 watts of power per transceiver and introduce approximately 0.1 microsecond of latency per link.

An alternative to copper cables is fiber through active optical cables that integrate the transceivers with multimode fiber.

For longer cable runs, the Cisco Nexus 5600 10-Gbps platform supports multimode, short-reach optical QSFP+ transceivers. These optical transceivers use approximately 1.5 watts per transceiver and have a latency of approximately 0.1 microsecond.

Table 8. Cisco Nexus 5600 10-Gbps Platform Cabling Support Matrix

Connector (Media)	Cable	Distance	Maximum Power Consumption	Transceiver Latency
SFP+ CU copper	Twinax	1, 1.5, 2, 2.5, 3, and 5m	Approximately 0.1W	Approximately 0.1 microsecond
SFP+ ACU copper	Active Twinax	7 and 10m	Approximately 0.1W	Approximately 0.1 microsecond
SFP+ fiber	Active Optical	1, 2, 3, 5, 7, and 10m		
FET-10G MMF **SFP+ SR MMF** **SFP+ SR-S MMF**	MMF (OM2) MMF (OM3)	82m 100m	1W	Approximately 0.1 microsecond
SFP+ LR SMF **SFP+ LR-S SMF**	SMF	10 km	1W	Approximately 0.1 microsecond
SFP+ ER SMF **SFP+ ER-S SMF**	SMF	40 km	1.5W	Approximately 0.1 microsecond
QSFP CU copper	Twinax	1, 3, and 5m	Approximately 1.5W	Approximately 0.25 microsecond
QSFP ACU copper	Active Twinax	7 and 10m	Approximately 1.5W	Approximately 0.1 microsecond
QSFP fiber	Active Optical	1, 2, 3, 5, 7, and 10m		
QSFP SR4 MMF **QSFP SR4-S MMF**	MMF (OM3) MMF (OM4)	100m 150m	Approximately 1.5W	Approximately 0.1 microsecond
QSFP CSR4 MMF	MMF (OM3) MMF (OM4)	300m 400m	Approximately 1.5W	Approximately 0.1 microsecond
QSFP LR4 SMF **QSFP LR4-S SMF**	SMF	10 km	Approximately 3.5W	Approximately 0.1 microsecond
QSFP LR4L	MMF	2 km	Approximately 3.5W	Approximately 0.1 microsecond
QSFP ER4 SMF **QSFP ER4-S SMF**	SMF	40 km	Approximately 3.5W	Approximately 0.1 microsecond
QSFP BIDI	MMF (OM3)[1] MMF (OM4)[2] MMF (OM4+)[3]	100m 125m 150m	Approximately 3.5W	Approximately 0.1 microsecond

[1] Connector loss budget for OM3 fiber is 1.5 dB.

[2] 125m over OM4 fiber is with an engineered link with 1 dB budget for connector loss.

[3] 150m over OM4+ fiber is an engineered link with 1 dB budget for connector loss. One of the recommended fibers for OM4+ is Panduit's Signature Core Fiber. Refer to the following link for additional information: http://www.panduit.com/en/signature-core.

Cisco NX-OS Software Packaging for Cisco Nexus 5600 Platform 10-Gbps Switches

The software packaging for the Cisco Nexus 5600 10-Gbps platform offers flexibility and a comprehensive feature set. The default system software has a comprehensive Layer 2 feature set with a number of security and management features. To enable advanced Layer 2 and 3 functions, additional licenses need to be installed.

Table 9 lists the license details and features supported with each license on the Cisco Nexus 5600 platform 10-Gbps switches.

Table 9. Software Packaging and Licensing

License Package	Part Number	Features Supported
FabricPath Services Package: ENHANCED_LAYER2_PKG	N5672-EL2-SSK9 N56128-EL2-SSK9	FabricPath
FCoE NPV Package: FCOE_NPV_PKG	N56-FNPV-SSK9	FCoE NPV
Layer 3 Base Services Package: LAN_BASE_SERVICES_PKG[1]	N56-BAS1K9	Unlimited static routes and maximum of 256 dynamic routes: • Static routes • RIPv2 • OSPFv2 and OSPFv3 • EIGRP stub • HSRP[2] • VRRP[3] • IGMP v2 and v3 • PIMv2 (sparse mode) • VRF-lite • RACL • Network Address Translation (NAT)
Layer 3 Enterprise Services Package: LAN_ENTERPRISE_SERVICES_PKG[4, 5]	N56-LAN1K9	N56-LAN1K9 license includes the following features in addition to the ones with the N56-BAS1K9 license: • BGP • PBR • Full EIGRP • PIMv2 (all modes) • Layer 3 IS-IS[6] • uRPF • MSDP • Sampled NetFlow • VXLAN flood and learn
Network Services Package: NETWORK_SERVICES_PKG	N56-SERVICES1K9[7]	• Cisco Remote Integrated Services Engine • Cisco Intelligent Traffic Director (ITD)
Storage Protocols Services Package: Fibre Channel_FEATURES_PKG **ENTERPRISE_PKG**	N56-12P-SSK9 N56-16P-SSK9 N5672-72P-SSK9 N56128-128P-SSK9	• Native Fibre Channel • FCoE • NPV • Fibre Channel port security • Fabric binding • Fibre Channel security protocol (Fibre Channel-SP) authentication
VM-FEX Package	N56-VMFEX9	Data Center VM-FEX

[1] LAN_BASE_SERVICES_PKG provides unlimited static routes and a maximum of 256 dynamic routes across all the protocols.

[2] Although this feature can be enabled and configured in the CLI without this license, it does not function until the license is installed.

[3] Although this feature can be enabled and configured in the CLI without this license, it does not function until the license is installed.

[4] The LAN_BASE_SERVICES_PKG license needs to be installed to use the LAN_ENTERPRISE_SERVICES_PKG license.

[5] Routes above 256 for all protocols are included in the LAN_ENTERPRISE_SERVICES_PKG license.

[6] Layer 3 IS-IS is available starting with Cisco NX-OS 7.0(1) N1 (1).

[7] N56-SERVICES1K9 is available starting with Cisco NX-OS 7.2(0)N1(1). If you need to use Remote Integrated Services Engine and ITD features with the Cisco NX-OS 7.1(1)N1(1), use the ENHANCED_LAYER2_PKG license.

Cisco ONE Software

Licenses can be purchased individually for each feature as shown in Table 9 or through Cisco ONE™ Software for Data Center Networking which is available for the Cisco Nexus 5600 platform 10-Gbps switches.

Cisco ONE Software provides a new way for customers to purchase and use our infrastructure software. It offers a simplified consumption model focused on common customer scenarios for the data center, WAN, and LAN.

Cisco ONE Software and services provide customers with four main benefits:

- Software suites that address typical customer use scenarios at an attractive price
- Investment protection of the customer's software purchase through software services-enabled license portability
- Access to ongoing innovation and new technology with Cisco Software Support Service (SWSS)
- Flexible licensing models to smoothly distribute the customer's software spending over time

For ordering information for Cisco ONE Software for the Cisco Nexus 5600 platform 10-Gbps switches, click here.

Ordering Information

Table 10 provides ordering information for the Cisco Nexus 5600 10-Gbps platform switches. Notice that you can order the Cisco Nexus 2200 platform fabric extenders either separately or along with the Cisco Nexus 5600 platform 10-Gbps switches.

Table 10. Ordering Information

Part Number	Description
Chassis	
N5K-C5672UP-16G	Cisco Nexus 5672UP-16G 1RU, 24p 10-Gbps SFP+, 24 Unified Ports, 6p 40G QSFP+
N5K-C5672UP-16G=	Cisco Nexus 5672UP-16G 1RU, 24p 10-Gbps SFP+, 24 Unified Ports, 6p 40G QSFP+, Spare
N5K-C5672UP	Cisco Nexus 5672UP 1RU, 32 p 10-Gbps SFP+, 16 Unified Ports, 6p 40G QSFP+
N5K-C5672UP=	Cisco Nexus 5672UP 1RU, 32 p 10-Gbps SFP+, 16 Unified Ports, 6p 40G QSFP+, Spare
N5K-C56128P	Cisco Nexus 56128P 2RU, 48x 10-Gbps SFP+, 4 x 40G QSFP+ Fixed Ports (Base)
N5K-C56128P=	Cisco Nexus 56128P 2RU, 48x 10-Gbps SFP+, 4 x 40G QSFP+ Fixed Ports, Spare (Base)
Fan Modules	
N6K-C6001-FAN-F	Cisco Nexus 5672UP/5672UP-16G Fan Module, Front-to-Back (Fan Side Intake) Airflow
N6K-C6001-FAN-F=	Cisco Nexus 5672UP/5672UP-16G Fan Module, Front-to-Back (Fan Side Intake) Airflow, spare
N6K-C6001-FAN-B	Cisco Nexus 5672UP/5672UP-16G Fan Module, Back-to-Front (Port Side Intake) Airflow
N6K-C6001-FAN-B=	Cisco Nexus 5672UP/5672UP-16G Fan Module, Back-to-Front (Port Side Intake) Airflow, spare
N56128-FAN-B=	Cisco Nexus 56128P Fan Module, Back-to-Front (Port Side Intake) Airflow, spare
N56128-FAN-B	Cisco Nexus 56128P Fan Module, Back-to-Front (Port Side Intake) Airflow
N56128-FAN-F=	Cisco Nexus 56128P Fan Module, Front-to-Back (Fan Side Intake) Airflow, spare
N56128-FAN-F	Cisco Nexus 56128P Fan Module, Front-to-Back (Fan Side Intake) Airflow
Expansion Modules	
N56-M24UP2Q	Cisco Nexus 56128P Expansion Module, 24x 10-Gbps SFP+ UP, 2 x QSFP+ fixed ports
N56-M24UP2Q=	Cisco Nexus 56128P Expansion Module, 24x 10-Gbps SFP+ UP, 2 x QSFP+ fixed ports, Spare

Part Number	Description
Power Supplies	
N55-PDC-1100W(=)	Cisco Nexus 5500/6000/5600 PSU Front-to-Back Airflow module spare, DC, - 40 to -72VDC, 1100W
N55-PAC-1100W(=)	Cisco Nexus 5500/6000/5600 PSU Front-to-Back Airflow module spare, AC, 94 to 240 VAC, 1100W
NXA-PAC-1100W(=)	Cisco Nexus 5500/6000/5600 Platinum PSU Front-to-Back Airflow module spare, A/C, 100-240V, 1100W
NXA-PAC-1100W-B(=)	Cisco Nexus 5500/6000/5600 Platinum PSU Back-to-Front Airflow module spare, A/C, 100-240V, 1100W
NXA-PHV-1100W(=)	Cisco Nexus 5500/6000/5600 Platinum HV-AC-DC PS, Front-to-Back Airflow module spare, 1100W
NXA-PHV-1100W-B(=)	Cisco Nexus 5500/6000/5600 Platinum HV-AC-DC PS, Back-to-Front Airflow module spare, 1100W
Software	
N6KUK9-730N1.1A	Cisco Nexus 5600/6000 Base OS Software Rel 7.3(0)N1(1)
N6KUK9-730N1.1A=	Cisco Nexus 5600/6000 Base OS Software Rel 7.3(0)N1(1), spare
N6KUK9-707N1.1	Cisco Nexus 5600/6000 Base OS Software Rel 7.0(7)N1(1)
N6KUK9-707N1.1=	Cisco Nexus 5600/6000 Base OS Software Rel 7.0(7)N1(1), spare
Cables and Optics	
FET-10G	10-Gbps SFP+ module for Cisco Nexus 2000 Series to Cisco Nexus 5000 Series connectivity
SFP-10G-SR	10GBASE-SR SFP+ module (multimode fiber [MMF])
SFP-10G-SR-S	10GBASE-SR SFP Module, Enterprise-Class
SFP-10G-LR	10GBASE-LR SFP+ module (single-mode fiber [SMF])
SFP-10G-LR-S	10GBASE-LR SFP Module, Enterprise-Class
SFP-10G-ER	10GBASE-ER-SFP+ module (SMF)
SFP-10G-ER-S	10GBASE-ER SFP Module, Enterprise-Class
SFP-H10GB-CU1M	10GBASE-CU SFP+ cable 1m (Twinax cable)
SFP-H10GB-CU1.5M	10GBASE CU SFP+ cable, 1.5m (passive Twinax cable)
SFP-H10GB-CU2M	10GBASE CU SFP+ cable, 2m (passive Twinax cable)
SFP-H10GB-CU2.5M	10GBASE CU SFP+ cable, 2.5m (passive Twinax cable)
SFP-H10GB-CU3M	10GBASE-CU SFP+ cable 3m (Twinax cable)
SFP-H10GB-CU5M	10GBASE-CU SFP+ cable 5m (Twinax cable)
SFP-H10GB-ACU7M	10GBASE-CU SFP+ cable 7m (active Twinax cable)
SFP-H10GB-ACU10M	10GBASE-CU SFP+ cable 10m (active Twinax cable)
SFP-10G-AOC1M	Cisco 10GBASE-AOC SFP+ Cable 1 Meter
SFP-10G-AOC2M	Cisco 10GBASE-AOC SFP+ Cable 2 Meter
SFP-10G-AOC3M	Cisco 10GBASE-AOC SFP+ Cable 3 Meter
SFP-10G-AOC5M	Cisco 10GBASE-AOC SFP+ Cable 5 Meter
SFP-10G-AOC7M	Cisco 10GBASE-AOC SFP+ Cable 7 Meter
SFP-10G-AOC10M	Cisco 10GBASE-AOC SFP+ Cable 10 Meter
GLC-T	1000BASE-T SFP
GLC-ZX-SMD	1000BASE-ZX SFP transceiver module, SMF, 1550-nm wavelength, dual LC/PC connector, Digital Optical Monitoring (DOM)
GLC-EX-SMD	1000BASE-EX SFP transceiver module, SMF, 1310-nm wavelength, dual LC/PC connector, DOM
GLC-SX-MMD	Gigabit Ethernet SFP, LC connector SX transceiver (MMF), extended temperature range and DOM
Cisco GLC-LH-SMD	Gigabit Ethernet SFP, LC connector LX/LH transceiver (SMF), extended temperature range and DOM
SFP-GE-T	1000BASE-T SFP, extended temperature range
DS-SFP-FC16G-SW	16-Gbps Fibre Channel shortwave SFP+, LC connector (16G Fibre Channel support only on last 24 ports (highlighted in Orange on the chassis for easy identification) of the Cisco Nexus 5672UP-16G
DS-SFP-FC16G-LW	16-Gbps Fibre Channel longwave SFP+, LC connector (16G Fibre Channel support only on last 24 ports (highlighted in Orange on the chassis for easy identification) of the Cisco Nexus 5672UP-16G)

Part Number	Description
DS-SFP-FC8G-SW	8 Gbps Fibre Channel SW SFP+, LC connector (Fibre Channel support only on last 24 ports (highlighted) of the Cisco Nexus 5672UP-16G, on last 16 ports (highlighted) of Cisco Nexus 5672UP and UP GEM module on 56128P)
DS-SFP-FC8G-LW	8 Gbps Fibre Channel LW SFP+, LC connector, (Fibre Channel support only on last 24 ports (highlighted in Orange on the chassis for easy identification) of the Cisco Nexus 5672UP-16G, on last 16 ports (highlighted) of Cisco Nexus 5672UP and UP GEM module on 56128P)
DS-SFP-FC4G-SW	4 Gbps Fibre Channel-SW SFP, LC connector, (Fibre Channel support only on last 16 ports (highlighted) of Cisco Nexus 5672UP and UP GEM module on 56128P)
DS-SFP-FC4G-LW	4 Gbps Fibre Channel-LW (up to 10 km) SFP, LC connector, (Fibre Channel support only on last 16 ports (highlighted) of Cisco Nexus 5672UP and UP GEM module on 56128P)
QSFP-40G-SR4	40GBASE-SR4 QSFP module, (multi-mode fiber, MMF at 100m)
QSFP-40G-SR4-S	40GBASE-SR4 QSFP Module, MPO Connector, Enterprise-Class
QSFP-40G-CSR4	40GBASE Extended CSR4 QSFP module, (multimode fiber, MMF at 300m)
QSFP-40G-SR-BD	Cisco QSFP40G BiDi Short-reach Transceiver
QSFP-40G-ER4	Cisco 40GBASE-ER4 QSFP+ transceiver module for SMF, duplex LC connector
QSFP-40G-LR4	Cisco 40GBASE-LR4 QSFP+ transceiver module for SMF, duplex LC connector
QSFP-40G-LR4-S	QSFP 40GBASE-LR4 Module, LC connector, 10km, Enterprise-Class
WSP-Q40GLR4L	QSFP 40G Ethernet - LR4 Lite, LC connector, 2 km
QSFP-4SFP10G-CU1M	Cisco 40GBASE-CR4 QSFP+ to 4 10GBASE-CU SFP+ passive direct-attach copper transceiver assembly, 1m
QSFP-4SFP10G-CU3M	Cisco 40GBASE-CR4 QSFP+ to 4 10GBASE-CU SFP+ passive direct-attach copper transceiver assembly, 3m
QSFP-4SFP10G-CU5M	Cisco 40GBASE-CR4 QSFP+ to 4 10GBASE-CU SFP+ passive direct-attach copper transceiver assembly, 5m
QSFP-4x10G-AC7M	Cisco 40GBASE-CR4 QSFP+ to 4 10GBASE-CU SFP+ direct-attach breakout cable, 7-meter, active
QSFP-4x10G-AC10M	Cisco 40GBASE-CR4 QSFP+ to 4 10GBASE-CU SFP+ direct-attach breakout cable, 10-meter, active
QSFP-H40G-CU1M	Cisco 40GBASE-CR4 QSFP+ direct-attach copper cable, 1-meter, passive
QSFP-H40G-CU3M	Cisco 40GBASE-CR4 QSFP+ direct-attach copper cable, 3-meter, passive
QSFP-H40G-CU5M	Cisco 40GBASE-CR4 QSFP+ direct-attach copper cable, 5-meter, passive
QSFP-H40G-ACU7M	Cisco 40GBASE-CR4 QSFP+ direct-attach copper cable, 7-meter, active
QSFP-H40G-ACU10M	Cisco 40GBASE-CR4 QSFP+ direct-attach copper cable, 10-meter, active
QSFP-4X10G-AOC1M	Cisco 40GBase-AOC QSFP to 4 SFP+ Active Optical breakout Cable, 1m
QSFP-4X10G-AOC2M	Cisco 40GBase-AOC QSFP to 4 SFP+ Active Optical breakout Cable, 2m
QSFP-4X10G-AOC3M	Cisco 40GBase-AOC QSFP to 4 SFP+ Active Optical breakout Cable, 3m
QSFP-4X10G-AOC5M	Cisco 40GBase-AOC QSFP to 4 SFP+ Active Optical breakout Cable, 5m
QSFP-4X10G-AOC7M	Cisco 40GBase-AOC QSFP to 4 SFP+ Active Optical breakout Cable, 7m
QSFP-4X10G-AOC10M	Cisco 40GBase-AOC QSFP to 4 SFP+ Active Optical breakout Cable, 10m
QSFP-H40G-AOC1M	Cisco 40GBase-AOC QSFP direct-attach Active Optical Cable, 1m
QSFP-H40G-AOC2M	Cisco 40GBase-AOC QSFP direct-attach Active Optical Cable, 2m
QSFP-H40G-AOC3M	Cisco 40GBase-AOC QSFP direct-attach Active Optical Cable, 3m
QSFP-H40G-AOC5M	Cisco 40GBase-AOC QSFP direct-attach Active Optical Cable, 5m
QSFP-H40G-AOC7M	Cisco 40GBase-AOC QSFP direct-attach Active Optical Cable, 7m
QSFP-H40G-AOC10M	Cisco 40GBase-AOC QSFP direct-attach Active Optical Cable, 10m
QSFP-H40G-AOC15M	40GBASE-AOC QSFP direct-attach active optical cable, 15m
CVR-QSFP-SFP10G=	Cisco 40GBASE QSFP to SFP+/SFP Adapter (QSA) for all 1-Gbps and 10-Gbps Ethernet optics listed in table 6.
Power Cords	
CAB-250V-10A-AR	AC Power Cord - 250V, 10A - Argentina (2.5m)
CAB-9K10A-AU	Power Cord, 250VAC 10A 3112 Plug, Australia (2.5m)
CAB-250V-10A-BR	AC Power Cord - 250V, 10A - Brazil(2.1m)
CAB-250V-10A-CN	AC Power Cord - 250V, 10A - PRC (2.5m)

Part Number	Description
CAB-9K10A-EU	Power Cord, 250VAC 10A CEE 7/7 Plug, EU (2.5m)
CAB-IND-10A	10A Power cable for India (2.5m)
CAB-250V-10A-IS	AC Power Cord - 250V, 10A - Israel (2.5m)
CAB-9K10A-IT	Power Cord, 250VAC 10A CEI 23-16/VII Plug, Italy (2.5m)
CAB-250V-10A-ID	AC Power Cord - 250V, 10A, South Africa(2.5m)
CAB-9K10A-SW	Power Cord, 250VAC 10A MP232 Plug, SWITZ (2.5m)
CAB-9K10A-UK	Power Cord, 250VAC 10A BS1363 Plug (13 A fuse), UK (2.5m)
CAB-9K12A-NA	Power Cord, 125VAC 13A NEMA 5-15 Plug, North America (2.5m)
CAB-AC-250V/13A	North America, NEMA L6-20 250V/20A plug-IEC320/C13 receptacle (2.0m)
CAB-N5K6A-NA	Power Cord, 200/240V 6A North America (2.5m)
CAB-C13-CBN	Cabinet Jumper Power Cord, 250 VAC 10A, C14-C13 Connectors (0.7m)
CAB-C13-C14-2M	Power Cord Jumper, C13-C14 Connectors, 2 Meter Length (2m)
CAB-C13-C14-AC	Power cord, C13 to C14 (recessed receptacle), 10A (3m)
Accessory Kit	
N5596-ACC-KIT=	Cisco Nexus 56128P Chassis Accessory Kit, spare
N5672-ACC-KIT=	Cisco Nexus 5672UP/5672UP-16G Chassis Accessory Kit, spare

Warranty

The Cisco Nexus 5600 10-Gbps platform switches have 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 5600 10-Gbps 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 Cisco Smart Call Home service capability, which offers proactive diagnostics and real-time alerts on your Cisco Nexus 5600 platform 10-Gbps switch. Spanning the entire network lifecycle, Cisco Services offerings help increase investment protection, optimize network operations, support migration operations, and strengthen your IT expertise.

Cisco Capital Financing to Help You Achieve Your Objectives

Cisco Capital® financing can help you acquire the technology you need to achieve your objectives and stay competitive. We can help you reduce capital expenditures (CapEx), accelerate your growth, and optimize your investment dollars and ROI. Cisco Capital financing gives you flexibility in acquiring hardware, software, services, and complementary third-party equipment. And there's just one predictable payment. Cisco Capital financing is available in more than 100 countries. Learn more.

For More Information

- Cisco Nexus 5600 platform 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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