Cisco Nexus 5000 Series Switches

Product Overview

The Cisco® Nexus 5000 Series is a family of line-rate, low-latency, lossless 10 Gigabit Ethernet, Cisco Data Center Ethernet, and Fibre Channel over Ethernet (FCoE) switches for data center applications (Figure 1).

Figure 1. The Cisco Nexus 5000 Series includes the Cisco Nexus 5020 that supports 10 Gigabit Ethernet, Cisco Data Center Ethernet, and FCoE

Today's data centers are increasingly filled with dense, rack-mount and blade servers that host powerful multicore processors. The rapid increase of in-rack computing density, along with the increasing use of virtualization software, combine to push the demand for 10 Gigabit Ethernet and consolidated I/O: applications for which the Cisco Nexus 5000 Series is the perfect match. With low latency, front-to-back cooling, and rear-facing ports, the Cisco Nexus 5000 Series is designed for data centers transitioning to 10 Gigabit Ethernet as well as for those ready to deploy a unified fabric that can handle their LAN, SAN and server cluster, networking all over a single link (or dual links for redundancy).

The switch family, using cut-through architecture, supports line-rate 10 Gigabit Ethernet on all ports while maintaining consistent low latency independent of packet size and services enabled. The product family supports Cisco Data Center Ethernet capabilities that increase the reliability, efficiency and scalability of Ethernet networks. These features allow the switch to support multiple traffic classes over a lossless Ethernet fabric, thus enabling consolidation of LAN, SAN and cluster environments. Its ability to connect 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 consolidated I/O adapters called converged network adapters (CNAs) that combine 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 family is compatible with third-party integrated transceivers and Twinax cabling solution that deliver very cost-effective connectivity for 10 Gigabit Ethernet to the servers at the rack level, eliminating expensive optical transceivers.

The Cisco Nexus 5000 Series switch fabric uses cut-through technology that enables consistent low-latency Ethernet solutions independent of packet size regardless of the network services enabled. The product family is designed for data center environments, with front-to-back cooling and network ports in the rear, bringing switching into close proximity with servers and making cable

runs short and simple. The switch family is highly serviceable, with redundant, hot-pluggable power supplies and fan modules. Its software is based on data center–class Cisco NX-OS Software for high reliability and ease of management.

Cisco Nexus 5020 56-Port Switch

The Cisco Nexus 5020 is a two rack-unit (2RU), 10 Gigabit Ethernet, Cisco Data Center Ethernet, and FCoE 1/2/4 Gbps Fibre Channel switch built to provide 1.04 terabits per second (Tbps) throughput with very low latency. It has 40 fixed 10 Gigabit Ethernet, Cisco Data Center Ethernet, and FCoE Small Form Factor Pluggable Plus (SFP+) ports. Two expansion module slots can be configured to support up to 12 additional 10 Gigabit Ethernet, Cisco Data Center Ethernet, and FCoE SFP+ ports, up to 16 Fibre Channel switch ports, or a combination of both. The switch has a serial console port and an out-of-band 10/100/1000 Mbps Ethernet management port. The switch is powered by 1+1 redundant, hot-pluggable power supplies, and 4+1 redundant, hot-pluggable fan modules to provide highly reliable front-to-back cooling.

Expansion Module Options

The Cisco Nexus 5000 Series is equipped to support expansion modules that can be used to increase the number of 10 Gigabit Ethernet, Cisco Data Center Ethernet, and FCoE ports; connect to Fibre Channel storage area networks (SANs) with 1/2/4 Gbps Fibre Channel switch ports; or both. The Cisco Nexus 5020 supports any combination of two modules from the following offerings (Figure 2):

- An Ethernet module that provides six ports of 10 Gigabit Ethernet, Cisco Data Center Ethernet and FCoE via SFP+ interface.
- A Fibre Channel plus Ethernet module that provides four ports of 10 Gigabit Ethernet, Cisco Data Center Ethernet and FCoE via SFP+ interface and four ports of 1/2/4 Gbps native Fibre Channel connectivity via SFP interface.
- A Fibre Channel module that provides eight ports of 1/2/4 Gbps native Fibre Channel via SFP interface for transparent connectivity with existing Fibre Channel networks. (future)

Figure 2. From Left to Right: 6-Port 10 Gigabit Ethernet, Cisco Data Center Ethernet, and FCoE Module; 4-Port Fibre Channel plus 4-Port 10 Gigabit Ethernet, Cisco Data Center Ethernet, and FCoE Module; 8-Port Native Fibre Channel Expansion Module

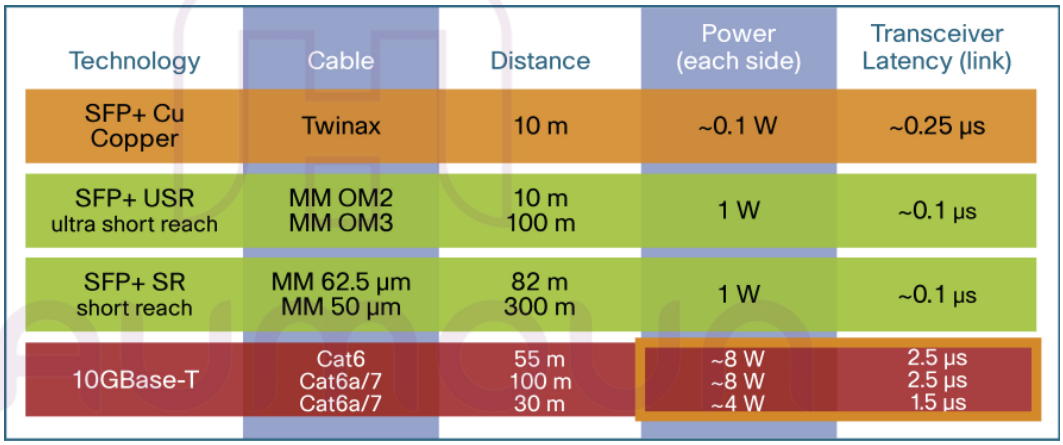
Efficient Transceiver and Cabling Options

The high bandwidth of 10 Gigabit Ethernet poses challenges to transmissions that are overcome by the transceiver and cabling options supported by the Cisco Nexus 5000 Series. The product family supports an innovative Twinax copper cabling solution that connects to standard SFP+ connectors for in-rack use, and optical cabling for longer cable runs (Figure 3).

- For in-rack or adjacent-rack cabling, the Cisco Nexus 5000 Series supports SFP+ direct attached 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 attached 10 Gigabit Twinax copper cables uses only 0.1 watt (W) of power per transceiver and introduces only approximately 0.25 microsecond of latency per link.
- For longer cable runs, the Cisco Nexus 5000 Series supports multimode, short-reach optical SFP+ transceivers. These optical transceivers use approximately 1W per transceiver and have latency of less than 0.1 microsecond.

Both of these options provide lower latency and higher energy efficiency than 10GBASE-T. This standard uses transceivers that consume 4 to 8W per transceiver and contribute a latency of up to 2.5 microseconds per link, making the 10GBASE-T standard a significant contributor to network-level power consumption.

Figure 3. The Cisco Nexus 5000 Series Supports SFP+ Direct Attached 10 Gigabit Copper for In-Rack Cabling, and Optical Solutions for Longer Connections



Compatibility with Consolidated Adapters

Cisco and its partners have developed CNAs that present both an Ethernet NIC and a Fibre Channel HBA to the server operating system, allowing IT departments to deploy FCoE in a completely transparent manner, using the same operating system drivers, management software, and best practices they use with both networks today. These adapters participate in autonegotiation with the switch, simplifying administration while helping reduce configuration errors. Custom application-specific integrated circuit (ASIC) based converged network adapters are available from Emulex and QLogic, and software-based converged network adapters are available from Intel.

Features and Benefits

The switch family's rich feature set makes it ideal for top-of-rack or middle-of-row access-layer applications. It protects investments in data center racks with Cisco Data Center Ethernet and FCoE features that allow IT departments to consolidate networks based on their own requirements and timing.

- The combination of high port density, lossless Ethernet, wire-speed performance, and extremely low latency makes the switch an ideal product to meet the growing demand for 10 Gigabit Ethernet with the capability to support Cisco Data Center Ethernet in enterprise and service provider data centers, protecting enterprises' investments. The switch family has sufficient port density to support single or 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, closer 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 to use a range of interconnect solutions, including copper Twinax cable for short runs and fiber for long runs.
- Cisco Data Center Ethernet features increase network scalability, support I/O consolidation, ease management of multiple traffic flows, and optimize performance. Although implementing SAN consolidation requires only the lossless fabric provided by the Ethernet pause mechanism, the Cisco Nexus 5000 Series provides additional features that create an even more easily managed, high-performance, unified network fabric. Cisco Data Center Ethernet features supported by the Cisco Nexus 5000 Series are outlined in Table 1.

Table 1. Cisco Data Center Ethernet Features and Benefits

Cisco Data Center Ethernet 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
Bandwidth Management	Enables consistent management of Quality-of-Service (QoS) at the network level by providing consistent scheduling of different traffic types (E.g.: IP, storage)
Data Center Bridging Exchange (DCBX) Protocol	Simplifies network deployment and reduces configuration errors by providing autonegotiation of Cisco Data Center Ethernet features between the NIC and the switch and between switches
Congestion Management (Backward Congestion Notification [BCN])	Pushes congestion to network edges, providing better control over QoS (future release). The Nexus 5000 hardware supports a pre-cursor to the IEEE 802.1Qau called Backwards Congestion Notification (BCN). BCN will be productized based on availability of other system components, such as adapters and core switches/routers
Layer 2 Multipathing	Allows Active-Active uplinks from access switch. Increases network performance and Layer 2 domain scale

- FCoE is part of the unified network fabric that enables I/O consolidation at the rack level. 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. Additional switch features include delayed drop, which helps increase resiliency after bursts of traffic, and Ethernet Host Virtualizer (EHV), which supports higher performance and massive scalability (Table 2).

Table 2. Additional Switch Features and Benefits

Feature	Business Benefit
FCoE	• Transparently encapsulates Fibre Channel packets into Ethernet • Enables I/O consolidation at the rack level by significantly reducing network-related cabling, power, and cooling
Delayed drop	• Uses the Ethernet pause mechanism to absorb short-term traffic bursts, improving network resiliency and reliability • Can be configured on a per-traffic-flow basis
Ethernet Host Virtualizer	• Allows the switch to take ownership of Layer 2 connectivity for subordinate hosts • For the upstream switch, uplink ports look like a multi-homed server • Simplifies the network as viewed from the aggregation layer, supporting massive scale, high-performance active-active links, and fine-grained network resource control

- I/O consolidation in racks and rows helps reduce capital and operational costs by reducing the number of server adapters, cables, and upstream switches needed to support I/O at the rack level. Rather than the overhead of a redundant pair of adapters for each of up to three networks (LAN, SAN, and cluster), I/O consolidation supports all three networks on a single link. The switch family connects to native Fibre Channel networks, protecting existing investments in storage networks. The switch family's support for FCoE also supports data center I/O consolidation. As FCoE-enabled switching becomes available across the data center, FCoE traffic can travel over a unified network fabric directly to future FCoE-enabled storage devices or to native Fibre Channel SANs.
- Energy efficiency achieved through the use of the Cisco Nexus 5000 Series switches helps data centers better 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 5000 Series. The switch hardware is also designed for energy efficiency. Variable-speed fans consume only the amount of power necessary to cool the chassis at any point in time. The switch power supplies are sized to support worst-case scenarios where inefficient SFP+ transceivers maximize power draw; however, when low-power cabling solutions are deployed, the switch family'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 consistency of both Cisco NX-OS Software and Cisco MDS 9000 SAN-OS Software management models and tools. The switch family network features can be managed using the Cisco command-line interface (CLI) , and the Fibre Channel and FCoE features can be managed through Cisco Fabric Manager Suite. In a future release Cisco Data Center Network Manager (DCNM) and Cisco VFrame will support the Nexus 5000 switch family. 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, Extensible Markup Language (XML), and the Cisco CLI are made available to customers for switch management through third-party or custom-developed tools. The switch family is based on Cisco NX-OS for superior operational 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 5000 Series supports a number of application scenarios that use it as an access-layer switch co-located with servers in data center racks or for middle-of-row deployments.

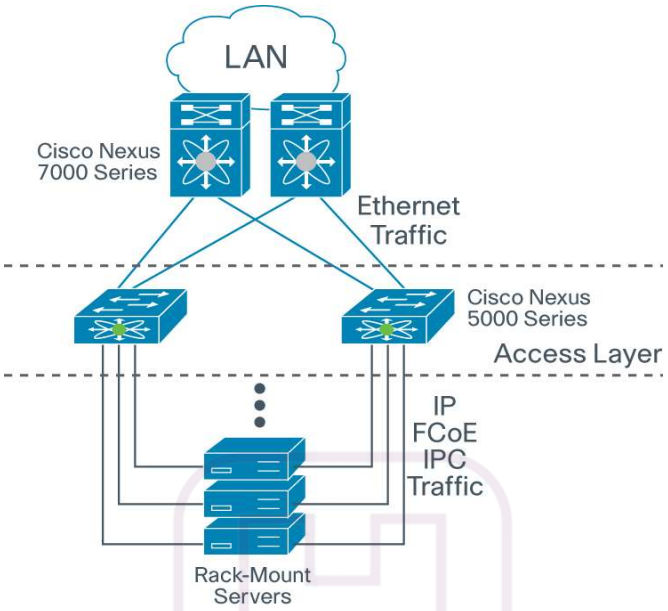
- As an access-layer switch, it can be used purely as a 10 Gigabit Ethernet switch, consolidating 10 Gigabit Ethernet connections into a smaller number of server connections trunked to the aggregation layer.
- As a rack-level I/O consolidation platform, the switch carries Ethernet traffic from servers to the aggregation layer and carries FCoE traffic to existing Fibre Channel SANs.
- As a crucial element in data center I/O consolidation, the switch paves the way with I/O consolidation at the access layer and interoperability with Cisco Nexus and other standards-based products.

The capability of the Cisco Nexus 5000 Series to function in all these capacities helps protect investment in the data center with a deployment model in which additional features are enabled as they are needed.

Rack-Level 10 Gigabit Ethernet Access-Layer Switch

The switch family is designed with the density, performance, front-to-back cooling, and rear port configuration that makes it ideal for aggregating a large number 10 Gigabit Ethernet links from servers into a smaller number of uplinks to aggregation-layer switches. The switch port density allows each switch to support a single rack or neighboring racks using the SFP+ direct attached 10 Gigabit copper cabling option. The Cisco Nexus 5000 Series switches can be purchased with only the Ethernet capabilities enabled, allowing IT departments to deploy them in parallel with existing Fibre Channel SANs. Figure 4 shows an active-active pair of Cisco Nexus 5000 Series switches cross-connected to redundant Ethernet NICs in servers. Instead of using multiple 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.

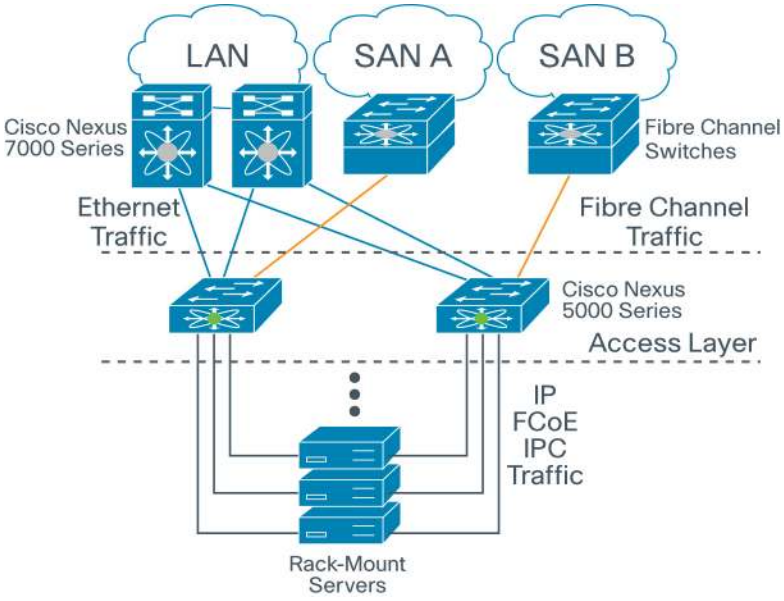
Figure 4. The Cisco Nexus 5000 Series Can Be Deployed as a Top-of-Rack, Access-Layer Switch in Parallel with Existing Fibre Channel SANs



Unified Fabric with FCoE: I/O Consolidation

The switch family is built to consolidate multiple networks—LAN, SAN, and Server Cluster—onto a single unified fabric, saving the capital and operational expenses associated with multiple parallel networks, switching infrastructure, and cabling mechanisms within racks. The Cisco Nexus 5000 Series Switches are compatible with third-party consolidated I/O adapters that present separate Ethernet and Fibre Channel NICs to the server operating system, allowing existing drivers and Fibre Channel management software to work transparently with FCoE. Upstream, two different expansion modules support direct connections from the Cisco Nexus 5000 Series to existing native Fibre Channel SANs.

Figure 5. 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

The switch family supports FCoE on links to upstream switches, allowing customers to choose the point at which they break out to native Fibre Channel. It can connect directly to future storage systems that support FCoE, and the transparent way in which Fibre Channel is encapsulated within Ethernet allows customers to continue to use their existing administration and management tools.

Product Architecture

The Cisco Nexus 5000 Series is built around two custom components: a unified crossbar fabric and a unified port controller ASIC. Each Cisco Nexus 5000 Series 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, Cisco Data Center 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, non-blocking 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 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 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 rich 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 Features and Benefits

- **Software compatibility:** Cisco NX-OS Release 4.0 interoperates with Cisco products running any variant of the Cisco IOS Software operating system. Cisco NX-OS Release 4.0 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 very quickly. Thus, modular fixes can be developed, tested, and delivered in a very 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. 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 e-mail-based notification of critical system events. A versatile range of message formats is available for optimal compatibility with pager services, standard e-mail, and XML-based automated parsing applications. It offers alert grouping capabilities and customizable destination profiles. This feature can be used, for example, to directly page a network support engineer, send an e-mail 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 maximizing 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. A rich 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.

Product Specifications

Performance

- Layer 2 hardware forwarding at 1.04 Tbps or 773.8 million packets per second (Mpps)
- MAC address table entries: 16,000
- Low latency cut-through design provides predictable, consistent traffic latency regardless of packet size, traffic pattern, or enabled-features

Layer 2 Features

- Layer 2 switch ports and VLAN trunks
- IEEE 802.1Q VLAN encapsulation
- Support for up to 1000 VLANs and virtual SANs (VSANs) per switch
- Rapid Per-VLAN Spanning Tree Plus (PVRST+)
- Multiple Spanning Tree Protocol (MSTP) (IEEE 802.1s): 64 instances
- Spanning Tree PortFast and PortFast Guard
- Spanning Tree UplinkFast and BackboneFast
- Spanning Tree Root Guard
- Spanning Tree Bridge Assurance (future)
- NIC teaming
- Internet Group Management Protocol (IGMP) Versions 1, 2, and 3 snooping
- IGMP snooping querier
- Protocol Independent Multicast (PIM) snooping (future)
- Cisco EtherChannel® technology
- Link Aggregation Control Protocol (LACP): IEEE 802.3ad
- Advanced PortChannel hashing based on Layer 2, 3, and 4 information
- Multi-Chassis EtherChannel (MCEC) (future)
- Ethernet Host Virtualizer (future)
- Jumbo frames on all ports (up to 9216 bytes)
- Pause frames (IEEE 802.3x)
- Storm control (unicast, multicast, and broadcast)
- Address Resolution Protocol (ARP)
- Private VLANs
- Private VLAN over trunks

QoS

- Layer 2 IEEE 802.1p (CoS)
- 8 hardware queues per port
- Per-port QoS configuration
- CoS trust
- Modular QoS CLI (MQC) compliance
- Color-aware aggregate policing

- Policed drop
- Per-port Virtual Output Queueing
- CoS-based egress queuing
- Egress strict-priority queuing
- Egress port-based scheduling: Weighted Round-Robin (WRR)
- Ingress policing on physical Ethernet and virtual Ethernet interfaces
- Delayed drop (future)

Security

- Ingress access control lists (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)
- Named ACLs
- ACL logging and statistics
- Time-based ACLs
- Optimized ACL distribution
- IEEE 802.1X (future)
- Port security (future)
- Cisco TrustSec (future)

High Availability Features

- 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 management or console ports
- CLI-based console to provide detailed out-of-band management
- SSHv2
- Telnet
- AAA
- RADIUS
- TACACS+
- Syslog
- SNMP v1, 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 (CHAP)
- Digital certificates for management between switch and RADIUS server
- Cisco Discovery Protocol (CDP) Versions 1 and 2
- Role-based Access Control (RBAC)
- Switched Port Analyzer (SPAN) on physical, PortChannel, VLAN and Fibre Channel interfaces
- Enhanced Remote SPAN (ERSPAN) (future)
- Ingress and egress packet counters per interface
- Network Time Protocol (NTP)
- Power-on self-test (POST)
- Cisco GOLD: Ethernet and Fibre Channel
- Comprehensive bootup diagnostic tests
- Call Home
- Smart Call Home
- Cisco Fabric Manager
- Cisco DCNM (future)
- Cisco VFrame (future)

Cisco Data Center Ethernet

- Priority flow control (per-priority pause frame support)
- Data Center Bridging Exchange (DCBX) Protocol
- IEEE 802.1Qaz: Bandwidth management
- IEEE 802.1Qau: Congestion management (BCN) (future)
- Layer 2 multipathing (future)

Fibre Channel Features (requires Storage Services License)

- Fibre Channel over Ethernet (FCoE)
- Fibre Channel Protocol
- Fibre Channel standard port types: E, F, and NP
- Fibre Channel enhanced port types: TE and VF
- Up to 64 buffer credits per port
- Virtual SANs (VSANs)
- Fibre Channel (SAN) PortChannel
- Native Interop Mode 2
- Native Interop Mode 3
- VSAN trunking
- Fabric Device Management Interface (FDMI)
- Fibre Channel ID (FCID) persistence
- Dynamic port VSAN membership (future)
- Distributed device alias services

- In-order delivery
- Port tracking
- McDATA native interoperability
- N-port virtualization (NPV)
- N-port identifier virtualization (NPIV)
- QoS: 2 levels (future)
- Fabric services: Name server, registered state change notification (RSCN), login services, name-server zoning
- Per-VSAN fabric services
- Cisco Fabric Services
- Diffie-Hellman Challenge Handshake Authentication Protocol (DHCHAP) and Fibre Channel Security Protocol (FC-SP)
- Distributing 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
- Automatic failure detection and restart of applications (future)
- 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

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

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

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

Industry Standards

- IEEE 802.1D: Spanning Tree Protocol
- IEEE 802.1p: CoS prioritization
- IEEE 802.1Q: VLAN tagging
- 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
- IEEE 802.3ae: 10 Gigabit Ethernet
- SFP+ support
- RMON

Physical Specifications

SFP+ Optics

Cisco Nexus 5000 Series products support 10 Gigabit Ethernet SFP+ copper Twinax cables for short distances and SFP+ optics for longer distances. SFP+ has several advantages compared to other 10 Gigabit Ethernet connectivity options:

- Smallest 10 Gigabit Ethernet form-factor
- Optical interoperability with gXENPAK, X2, and XFP interface types
- Lowest power consumption
- Hot-swappable device

AC Power Supply

- Typical Operating Power: 480W
- Maximum Power: 750W
- Input voltage: 180–264 VAC
- Frequency: 47–63Hz
- Efficiency: 90% or better at full load, and maintain efficiency down to 25% load
- RoHS compliant: Yes
- Hot swappable: Yes
- Heat dissipation: 2566 BTU/hr

Environment

- Physical (Height x Width x Depth): 3.47 in. (8.8 cm) x 17.3 in. (43.9 cm) x 30.0 in. (76.2 cm)

- Operating Temperature: 0 to 40°C (32 to 104°F)
- Non-operating Temperature: –40 to 70°C (-40 to 158° F)
- Humidity: 5 to 95% (non-condensing)
- Altitude: 0 to 10,000 ft (0 to 300m)

Weight

Table 3. Weight of the Cisco Nexus 5020

Cisco Nexus 5020 with 1 power supply and 5 fan modules	44 lbs (20 Kg)
Cisco Nexus 5020 AC power supply	4 lbs (2 Kg)
Cisco Nexus 5000 Expansion Module	1 lb (0.5 Kg)
Cisco Nexus 5020 fully loaded	50 lbs (23 Kg)

Software Requirements

Cisco Nexus 5000 Series Switches are supported by Cisco NX-OS Release 4.0 and higher. Cisco NX-OS interoperates with any networking OS, including Cisco IOS Software, that conforms to the networking standards mentioned in the data sheet. The minimum software requirement is Cisco NX-OS Release 4.0(0)N1(1).

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

Regulatory Standards Compliance

Table 4 summarizes regulatory standards compliance.

Table 4. 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 • CAN/CSA-C22.2 No. 60950-1 • EN 60950-1 • IEC 60950-1 • 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	• EN50082-1 • EN61000-6-1 • EN55024 • CISPR24 • EN300386 • KN 61000-4 series
RoHS	The product is RoHS 5 compliant with exceptions for leaded ball grid array (BGA) balls and lead press-fit connectors.

Ordering Information

Table 5. Ordering Information

Chassis	
N5K-C5020P-BF	Cisco Nexus 5000 2RU Chassis no PS, 5 Fan Modules, 40 ports (req SFP+)
Fan Modules	
N5K-C5020-FAN=	Cisco Nexus 5020 Fan Module, Spare
Power Supplies	
N5K-PAC-1200W(=)	Cisco Nexus 5020 PSU module, A/C, 208v 1200W
N5K-P2-BLNK(=)	Cisco Nexus 5020 PSU module, Blank slot cover
Expansion Modules	
N5K-M1600(=)	Cisco Nexus 5000 1000 Series Module 6-port 10 Gigabit Ethernet (req SFP+)
N5K-M1-BLNK(=)	Cisco Nexus 5000 1000 Series Expansion Module Blank
Software	
N5KUK9-400N1.1(=)	Cisco Nexus 5000 Base OS Software Release 4.0
Cables and Optics	
SFP-10G-SR(=)	10GBASE-SR 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
Power Cables	
CAB-N5K6A-NA(=)	Cisco Nexus N5000 AC Power Cable, 6A, 250V, North America, 2.5m
CAB-AC-250V/13A(=)	Cisco Nexus N5000 AC Power Cable, 13A, 250V, North America, 2.5m
CAB-C13-C14-JMPR(=)	Cisco Nexus N5000 AC Power Cable, 6A, 250V, Power Strip Type
SFS-250V-10A-AR(=)	Cisco Nexus N5000 AC Power Cable, 10A, 250V, Argentina, 2.5m
CAB-9K10A-AU(=)	Cisco Nexus N5000 AC Power Cable, 10A, 250V, Australia, 2.5m
SFS-250V-10A-CN(=)	Cisco Nexus N5000 AC Power Cable, 10A, 250V, China, 2.5m
CAB-9K10A-EU(=)	Cisco Nexus N5000 AC Power Cable, 10A, 250V, Europe, 2.5m
SFS-250V-10A-ID(=)	Cisco Nexus N5000 AC Power Cable, 10A, 250V, India, 2.5m
SFS-250V-10A-IS(=)	Cisco Nexus N5000 AC Power Cable, 10A, 250V, Israel, 2.5m
CAB-9K10A-IT(=)	Cisco Nexus N5000 AC Power Cable, 10A, 250V, Italy, 2.5m
CAB-9K10A-SW(=)	Cisco Nexus N5000 AC Power Cable, 10A, 250V, Switzerland, 2.5m
CAB-9K10A-UK(=)	Cisco Nexus N5000 AC Power Cable, 10A, 250V, United Kingdom, 2.5m
Accessory Kit	
N5020-ACC-KIT=	Cisco Nexus 5020 Accessory Kit, Spare

Warranty

The Cisco Nexus 5000 Series 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 5000 Series 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 operational efficiency and improve your data center network. Cisco Advanced Services use 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 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 5000 Series switches. Spanning the entire network lifecycle, Cisco Services help maximize investment protection, optimize network operations, support migration operations, and strengthen your IT expertise. For more information about Cisco Nexus services, visit http://www.cisco.com/go/nexusservices.

For More Information

Cisco Nexus 5000 Series Switches: http://www.cisco.com/go/nexus5000.

Cisco Data Center Ethernet: http://www.cisco.com/go/dce.

Cisco NX-OS: http://www.cisco.com/go/nxos.

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