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Cisco NCS 560-4 Route Switch Processor 4

Contents

Control plane, forwarding plane and management plane elements, centralized network timing, full device programmability, and services orchestration. The Cisco® NCS 560-4 Route Switch Processor 4 (RSP4) is the powerful centralized engine that is designed to accommodate new programmable deployment models and convergence of advanced Layer 2 and Layer 3 services. The NCS 560-4 RSP4 (Figure 1) addresses the evolving requirements for converged service provider networks, delivering a variety of advanced technologies for mobile xHaul, Radio Access Network Aggregation (RAN), carrier Ethernet, and Data Center Interconnect (DCI), such as MPLS, segment routing, segment routing traffic engineering, and advanced Ethernet VPN technologies. With in-built trust anchor hardware infrastructure and software enabled security features, NCS 560-4 RSP4 is trusted and secured platform. The NCS 560-4 RSP4 helps service providers add innovative traffic management, packet switching, intelligent routing, and service creation features.

Product overview

The NCS 560-4 RSP4 modules contain separate control plane, forwarding (data) plane, and management plane components. These include the main control plane CPU for the Cisco IOS-XR® software operating system and platform control software. The forwarding (data) plane packet processing and traffic management are performed by the carrier Ethernet Application-Specific Integrated Circuit (ASIC) embedded in the RSP.

Figure 1.
NCS 560-4 RSP4

Fully distributed and unique packet capabilities for converged access and aggregation networks

The Cisco NCS 560-4 Route Switch Processor 4 is compatible with the following Ethernet interface modules:

- Cisco NCS 560 2-Port 40/ 100GE QSFP28 Module: This module supports two 40/ 100 Gigabit Ethernet ports.

- Cisco ASR 900 Series 8-Port 10GE SFP+ Module: This module supports eight SFP+ ports.

- Cisco ASR 900 Series 8/16-port 1GE SFP/CSFP + 1-port 10GE SFP+/1/2-port GE SFP/CSFP Module: This module supports up to 18 Gigabit Ethernet CSFP ports or up to 16 Gigabit Ethernet CSFP ports and one 10 Gigabit Ethernet SFP+ port.

- Cisco NCS 560 1-Port 100/ 200GE CFP2 DCO Module: This module supports one 100 Gigabit Ethernet port or one 200 Gigabit Ethernet port.

- Cisco NCS 560 2-Port 100GE QSFP28/ QSFP-DD Module: This module supports two 100 Gigabit Ethernet ports.

- Cisco ASR 900 Series 8-Port 10GE SFP+ Ethernet Only Module: This module supports eight SFP+ ports.

- Cisco NCS 560 Series Router 8-Port 10GE (SFP+)/ 25GE SFP28 or 4-Port 50 GE (SFP56) Module. This module supports eight 10/ 25 Gigabit Ethernet ports or four 50 Gigabit Ethernet ports

The Cisco NCS 560-4 Route Switch Processor 4 also supports a field-replaceable Global Navigation Satellite System (GNSS) module that allows direct interface to external antennas. The GNSS module supports several satellite systems, such as the Global Positioning System (GPS), GLONASS, GALILEO, BEIDU, QZSS, and SBAS.

The Cisco NCS 560-4 Route Switch Processor 4 is available in two different memory (TCAM) configurations to support large- and extra-large-scale capabilities. The software is identical between the two RSPs.

The Cisco NCS 560-4 interface module support is not dependent on the type of RSP used. The NCS 560 Series Interface Modules Datasheet contains the slot compatibility matrix for the NCS 560-4 RSP.

Features and benefits

Feature	Benefit
Carrier Ethernet	Delivers essential carrier Ethernet technologies such as Hierarchical Quality of Service (H-QoS), IPv4, IPv6, MPLS, segment routing, Segment Routing Traffic Engineering (SR-TE), On-Demand Next Hop (ODN), Topology Independent Loop Free Alternate (TI-LFA), Layer 2 VPN (VPLS/H-VPLS), Ethernet VPN (EVPN-VPWS), and Layer 3 VPN services. It provides line-rate performance and incorporates innovative traffic management capabilities while providing intelligent packet switching and routing operations. Device programmability and services orchestration capabilities for carrier Ethernet are embedded as part of the Evolved Programmable Network Solution Architecture.
	Is MEF CE 3.0 Certified.
Service enhancement	Provides advanced per-traffic-class metering and offers bidirectional packet-count and byte-count statistics. The service offering is enhanced with Operations, Administration, and Maintenance (OAM) functionality that includes Layer 2 Connectivity Fault Management (CFM), IP Service-Level Agreements (IP SLA) for Layer 3, and MPLS OAM.
Service scale	Provides flexible and high service scalability in a small footprint, delivering high performance and scale for point-to-point and multipoint services, accommodating the requirements from the most demanding wireline and wireless applications.
Clocking and timing services	Offers integrated support for the Global Navigation Satellite System (GNSS), Building Integrated Timing Supply (BITS), 10 MHz, 1 Pulse Per Second (1 PPS), and Time-Of-Day (TOD) interfaces, crucial functions required in a modern unified network. As the central system clocking and timing functions for the NCS 560-4 Router, the Cisco NCS 560 RSPs support Synchronous Ethernet (SyncE) and IEEE 1588-2008 Precision Time Protocol (PTP). The NCS 560-4 router can act as an IEEE 1588-2008 ordinary clock, boundary clock, end-to-end transparent clock, and primary clock function in an IEEE 1588-2008 timing domain.
High availability and modularity	Delivers optional intrachassis hardware redundancy for all hardware components and supports software redundancy with In-Service Software Upgrade (ISSU) support when a pair of route switch processor 4s is inserted in the Cisco NCS 560 system chassis fully modular platform.
	With two RSPs inserted in the Cisco NCS 560-4 router, one RSP operates in active mode, and the other RSP operates in hot standby mode. The Cisco NCS 560 RSP is a Field-Replaceable Unit (FRU), and it can be Online Inserted and Removed (OIR) while the Cisco NCS 560 system is operating. The removal or failure of the active RSP in the Cisco NCS 560 system results in the automatic switchover to the standby RSP.

Feature	Benefit
Management interfaces	Contains the Out-Of-Band (OOB) management interfaces for the system. To offer flexible access to the router, a variety of interfaces are available for management access to the platform, including a dual-mode console port that functions as either a USB console or a serial console port.

In addition to the serial console access, the Cisco NCS 560 RSP contains an Ethernet management port that has no interaction with actual carrier Ethernet ASIC traffic. In addition to the OOB control interfaces, a USB port can connect USB flash devices for loading Cisco IOS software images and configurations on the platform. |

Industry-leading, carrier-class Cisco IOS XR software

The Cisco NCS 560-4 router delivers extra-large scale, service flexibility, and high availability into access and (pre)aggregation networks. It is powered by Cisco IOS XR software, an innovative self-healing, distributed operating system designed for always-on operation. Cisco IOS XR software supports a Software-Maintenance-Update (SMU) capability, which allows bug fixing or even small feature releasing without interrupting existing services.

The Cisco IOS XR software provides scale and serviceability for service providers by:

- Supporting the complete set of Cisco IOS XR software features for a consistent experience
- Scaling advanced service delivery without affecting system performance
- Integrating applications in the network, improving security, reliability, and simplicity
- Facilitating programmability for service orchestration

The initial software support for the Cisco NCS 560-4 router is with IOS XR 6.6.25 software

Product specifications

Tables 1 through 3 list the product specifications and compliance information for the Cisco NCS 560-4 router RSP modules. Individual modules are identified by product number.

Table 1.   Cisco NCS 560-4 RSP 4 product specifications

Product ID	Cisco N560-4-RSP4-E	Cisco N560-4-RSP4
Typical power consumption	166W	146W
Maximum power consumption	190W	160W
RSP CPU DRAM memory	32 GB	32 GB
Flash memory	64 GB	64 GB
Service scale	Extra-large	Large

Product ID	Cisco N560-4-RSP4-E	Cisco N560-4-RSP4
Ethernet interface module compatibility	N560-IMA-2C A900-IMA-8Z A900-IMA-8CS1Z N560-IMA-1W N560-IMA-2C-DD A900-IMA-8Z-L N560-IMA-8Q/4L	N560-IMA-2C A900-IMA-8Z A900-IMA-8CS1Z N560-IMA-1W N560-IMA-2C-DD A900-IMA-8Z-L N560-IMA-8Q/4L
Maximum Transmission Unit (MTU)	Configurable MTU of up to 9646 bytes, for bridging on Gigabit Ethernet, 10, 25, 40 and 100 Gigabit Ethernet	
Maximum interface throughput	800 Gbps	800 Gbps
IP version 4 performance	720 Mpps	720 Mpps
IP version 6 performance	720 Mpps	720 Mpps
Management ports[4]	Copper 10/100/1000Base-T LAN management port – RJ45 connector port Console/Aux RS232 serial ports – RJ45 connector port Console – USB 2.0 type A receptacle connector port	
Timing ports[5]	BITS simultaneous input and output (J1/T1/E1) – RJ48 connector port 1 pps input – mini-coax connector port 1 pps output – mini-coax connector port 2.048/10 MHz input – mini-coax connector port 2.048/10 MHz output – mini-coax connector port	
External USB flash memory	Mass storage – USB 2.0 type A receptacle connector port	
Shipment package size (LxWxH)	14.38 in. x 14.38 in. x 6.25 in.	14.38 in. x 14.38 in. x 6.25 in.
Shipment package weight	6.2 lbs.	6.1 lbs.
MTBF at 104° F (40° C) operating temperature (25° C/77° F ambient temperature)	223,400 hours	237,000 hours

Table 2. Environmental specifications

	Cisco NCS 560-4 router
Operating environment and altitude[1]	–40 to 65° C operating temperature (DC operation, with the 900W or 1200W power supplies) –40 to 65° C operating temperature (AC operation, with the 900W or 1200W power supplies) –60 to 1800 m operating altitude (for full operating temperature range) Up to 4000 m operating altitude (at up to 40° C temperature)

	Cisco NCS 560-4 router
Outside plant	For an outside plant installation, it is required that the system be protected against airborne contaminants, dust, moisture, insects, pests, corrosive gases, polluted air, or other reactive elements present in the outside air. To achieve this level of protection, it is recommended that the unit be installed in a fully sealed enclosure. Examples of such cabinets include IP65 cabinets with heat exchanger complying with Telecordia GR487.
Relative humidity	5% to 95%, noncondensing
Acoustic noise[3]	Acoustic noise peak operation complies with Network Equipment Building Standards (NEBS) GR-63-Core Issue 4 sound power level of 78 dB at 27° C operation as measured by the ANSI S12.10/ISO 7779 NAIS noise measurement test standard.
Storage environment	Temperature: –40 to 70° C; altitude: 15,000 ft. (4570 m)
Seismic	Zone 4
Hazardous substances	Reduction Of Hazardous Substances (ROHS) 6

[1] Minimum temperature range of chassis, fan tray, RSP engine, power supply, optics, and interface modules will dictate the supported operating temperature range. Maximum cooling fan tray module is assumed.

[2] Not more than the following in a one-year period: 96 consecutive hours, or 360 hours total, or 15 occurrences.

[3] The above are for normal (nonfailure) operation. When operating with a fan failure, the above may be exceeded.

Table 3.   Safety and compliance

Type	Standards
Safety	• UL 60950-1, 2nd edition • CAN/CSA C22.2 No. 60950-1-07 2nd edition • IEC 60950-1, 2nd edition • EN 60950-1, 2nd edition • AS/NZS 60950.1:2003
Electromagnetic	• FCC CFR47 Part 15 Class A
Emissions compliance	• EN55022, Class A • CISPR22, Class A • ICES-003, Class A • EN 300 386, Class A • VCCI, Class A • KN22, Class A • EN61000-3-2 to EN61000-3-3

Type	Standards
Immunity compliance	• EN 300 386 • EN 61000-6-1 • EN 50082-1 • CISPR24 • EN 55024 • KN 24 • EN 50121-4 • EN/KN 61000-4-2 to EN/KN 61000-4-6 • EN/KN 61000-4-8 • EN/KN 61000-4-11
NEBS	• GR-63-CORE Issue 4 • GR-1089-CORE Issue 6 • SR-3580 NEBS Level 3
ETSI	• ETS/EN 300 119 Part 4 • ETS/EN 300 019 - Storage: Class 1.2, Transportation: Class 2.3, In-Use/Operational: Class 3.2 • ETS/EN 300 753
Network synchronization	• GNSS • ANSI T1.101 • GR-1244-CORE • GR-253-CORE • ITU-T G.813 • ITU-T G.823 • ITU-T G.824 • ITU-T G.703 clause 5 • ITU-T G.703 clause 9 • ITU-T G.8261/Y.1361 • ITU-T G.781I • ITU-T G.8265.1 • IYU-T G.8273.2 Class-B • ITU-T G.8275.1 • ITU-T G.8275.2 • IEEE1588-2008

Ordering information

Table 4 describes the Cisco IOS XR FCS Software

Table 5 lists the hardware parts available for Cisco NCS 560 RSP 4 modules.

Table 4.   Cisco IOS XR software packages for Cisco NCS 560 RSP modules

Cisco IOS XR FCS Software	XR 6.6.25

Table 5. Hardware components for Cisco NCS 560 RSP modules

Part number	Description
N560-4-RSP4-E	Cisco NCS 560-4 RSP4 Enhanced – 800G, XL Scale (/w ext. TCAM)
N560-4-RSP4-E=	Cisco NCS 560-4 RSP4 Enhanced – 800G, XL Scale (/w ext. TCAM), spare
N560-4-RSP4	Cisco NCS 560-4 RSP4 – 800G, L Scale
N560-4-RSP4=	Cisco NCS 560-4 RSP4 – 800G, L Scale, spare
A900-CM-GNSS	ASR 900 Global Navigation Satellite System Module
A900-CM-GNSS=	ASR 900 Global Navigation Satellite System Module, spare
N560-4-RSP-BLANK	NCS 560-4 Route Switch Processor 4 Blank Cover
N560-4-RSP-BLANK=	NCS 560-4 Route Switch Processor 4 Blank Cover, spare
A900-WWA-RJ48-V	ASR 900 RSP wire wrap adapter for RJ48 connector – Vertical
A900-WWA-RJ48-H	ASR 900 RSP wire wrap adapter for RJ48 connector – Horizontal

Warranty information

Warranty information is available on Cisco.com at the Product Warranties page.

Cisco environmental sustainability

Information about Cisco's environmental sustainability policies and initiatives for our products, solutions, operations, and extended operations or supply chain is provided in the "Environment Sustainability" section of Cisco's Corporate Social Responsibility (CSR) Report.

Reference links to information about key environmental sustainability topics (mentioned in the "Environment Sustainability" section of the CSR Report) are provided in the following table:

Sustainability topic	Reference
Information on product material content laws and regulations	Materials
Information on electronic waste laws and regulations, including products, batteries, and packaging	WEEE compliance

Cisco makes the packaging data available for informational purposes only. It may not reflect the most current legal developments, and Cisco does not represent, warrant, or guarantee that it is complete, accurate, or up to date. This information is subject to change without notice.

Service and support

Cisco offers a wide range of services programs to help accelerate customer success. These innovative services programs are delivered through a unique combination of people, processes, tools, and partners, promoting high levels of customer satisfaction. Cisco Services help you protect your network investment, optimize network operations, and prepare your network for new applications to extend network intelligence and the power of your business. For more information about Cisco Services, refer to Cisco Technical Support Services or Cisco Advanced Services.

Cisco is committed to reducing your total cost of ownership. Cisco offers a portfolio of technical support services to help ensure that Cisco products operate efficiently, remain highly available, and benefit from the most up-to-date system software. The services and support programs described in Table 6 are available as part of the Cisco Carrier Ethernet Switching Service and Support solution and are available directly from Cisco and through resellers.

Table 6.   Service and support

Advanced Services	Features	Benefits
Cisco Total Implementation Solutions (TIS), available directly from Cisco **Cisco Packaged TIS, available through resellers**	• Project management • Site survey, configuration, and deployment • Installation, text, and cutover • Training • Major moves, adds, and changes • Design review and product staging	• Supplement existing staff • Help ensure functions meet needs • Mitigate risk
Cisco SP Base Support and Service Provider-Based Onsite Support, available directly from Cisco **Cisco Packaged Service Provider-Based Support, available through resellers**	• 24-hour access to software updates • Web access to technical repositories • Telephone support through the Cisco Technical Assistance Center (TAC) • Advance replacement of hardware parts	• Facilitate proactive or expedited problem resolution • Lower total cost of ownership by taking advantage of Cisco expertise and knowledge • Reduce network downtime

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Cisco Nexus 9300-FX2 Series Switches

Contents

Product overview

The Cisco Nexus® 9300-FX2 Series switches belongs to the fixed Cisco Nexus 9000 platform based on Cisco Cloud Scale technology. The platform support cost-effective cloud-scale deployments, an increased number of endpoints, and cloud services with wire-rate security and telemetry. The platform is built on modern system architecture designed to provide high performance and meet the evolving needs of highly scalable data centers and growing enterprises.

Cisco Nexus 9300-FX2 series is an extension of Nexus 9300-FX series switches with higher bandwidth capacity. The switches offer a variety of interface options to transparently migrate existing data centers from 1-Gbps, and 10-Gbps speeds to 25- Gbps at the server, and from 10- and 40-Gbps speeds to 50- and 100-Gbps at the aggregation layer. The platforms provide investment protection for customers, delivering large buffers, highly flexible Layer 2 and Layer 3 scalability, and performance to meet the changing needs of virtualized data centers and automated cloud environments.

Cisco provides two modes of operation for Cisco Nexus 9000 Series Switches. Organizations can use Cisco NX-OS Software to deploy the switches in standard Cisco Nexus switch environments (NX-OS mode). Organizations can also deploy the infrastructure that is ready to support the Cisco Application Centric Infrastructure (Cisco ACI™) platform to take full advantage of an automated, policy-based, systems-management approach (ACI mode).

Switch models

Table 1. Cisco Nexus 9300-FX2 Series Switches

Model	Description
Cisco Nexus 9336C-FX2	36 x 40/100-Gbps QSFP28 ports
Cisco Nexus 9336C-FX2-E	36 x 40/100-Gbps QSFP28 ports
Cisco Nexus 93240YC-FX2	48 x 1/10/25-Gbps fiber ports and 12 x 40/100-Gbps QSFP28 ports
Cisco Nexus 93360YC-FX2	96 x 1/10/25-Gbps fiber ports and 12 x 40/100-Gbps QSFP28 ports
Cisco Nexus 93216TC-FX2	96 x 100M/1/10GBASE-T ports and 12 x 40/100-Gigabit QSFP28 ports

The Cisco Nexus 9336C-FX2 Switch (Figure 1) is a 1RU switch that supports 7.2 Tbps of bandwidth and over 2.4 bpps. The switch can be configured to work as 1/10/25/40/50/100-Gbps offering flexible options in a compact form factor. Breakout is supported on all ports. Please see feature table below for more information.

Figure 1.
Cisco Nexus 9336C-FX2 Switch

The Cisco Nexus 9336C-FX2-E Switch (Figure 2) is a 1RU switch that supports 7.2 Tbps of bandwidth and over 2.4 bpps. The switch can be configured to work as 1/10/25/40/50/100-Gbps or as 16-, 32-Gbps Fibre Channel ports[2] offering flexible options in a compact form factor. Breakout is supported on all ports. Please see feature table below for more information.

Figure 2.
Cisco Nexus 9336C-FX2-E Switch

The Cisco Nexus 93240YC-FX2 Switch (Figure 3) is a 1.2RU switch that supports 4.8 Tbps of bandwidth and over 2.5bpps. The 48 ports of downlinks support 1/10/25-Gbps. The 12 uplinks ports can be configured as 40- and 100-Gbps ports, offering flexible migration options. The switch is ideal for a non-oversubscribed solution in a compact form factor. The switch has FC-FEC and RS-FEC enabled for 25Gbps support over longer distances.

Figure 3.
Cisco Nexus 93240YC-FX2 Switch

The Cisco Nexus 93360YC-FX2 Leaf Switch is an 2-Rack-Unit (2RU) Leaf switch that supports 7.2 Tbps of bandwidth and 2.4 bpps across 96 fixed 10/25G SFP+ ports and 12 fixed 40/100G QSFP28 ports (Figure 3). The 96 ports of downlinks support 1/10/25-Gbps. The 12 uplinks ports can be configured as 40- and 100-Gbps ports, offering flexible migration options. The switch has FC-FEC and RS-FEC enabled for 25Gbps support over longer distances. Please see feature table below for more information.

Figure 4.
Cisco Nexus 93360YC-FX2 Switch

The Cisco Nexus 93216TC-FX2 Switch (Figure 5) is a 2RU switch that supports 4.32 Tbps of bandwidth and over 2.5bpps. The 96 10GBASE-T downlink ports on the 93216TC-FX2 can be configured to work as 100-Mbps, 1-Gbps, or 10-Gbps ports. The 12 uplinks ports can be configured as 40- and 100-Gbps ports, offering flexible migration options.

Figure 5.
Cisco Nexus 93216TC-FX2 Switch

Features and benefits

The Cisco Nexus 9300-FX2 series provide the following features and benefits:

- **Architectural Flexibility**

  ◦ Industry leading Software Defined Networking Solution Cisco ACI™ support.

  ◦ Support for standards based VXLAN EVPN fabrics, inclusive of hierarchical multi-site support (refer to VXLAN Network with MP-BGP EVPN Control Plane for more information).

  ◦ Three-tier BGP architectures, enabling horizontal, non-blocking IPv6 network fabrics at web-scale.

  ◦ Segment routing allows the network to forward Multiprotocol Label Switching (MPLS) packets and engineer traffic without Resource Reservation Protocol (RSVP) Traffic Engineering (TE). It provides a control-plane alternative for increased network scalability and virtualization.

  ◦ Comprehensive protocol support for Layer 3 (v4/v6) unicast and multicast routing protocol suites, including BGP, Open Shortest Path First (OSPF), Enhanced Interior Gateway Routing Protocol (EIGRP), Routing Information Protocol Version 2 (RIPv2), Protocol Independent Multicast Sparse Mode (PIM-SM), Source-Specific Multicast (SSM), and Multicast Source Discovery Protocol (MSDP).

- **Extensive Programmability**

  ◦ Day zero automation through Power On Auto Provisioning, drastically reducing provisioning time.

  ◦ Industry leading integrations for leading develops configuration management applications – Ansible, Chef, Puppet, SALT. Extensive Native YANG and industry standard OpenConfig model support through RESTCONF/NETCONF.

  ◦ Pervasive API's for all switch CLI functions (JSON based RPC over HTTP/HTTPs).

- **High Scalability, flexibility, and security**

  ◦ Flexible forwarding tables support up to 1 million shared entries on FX2 models. Flexible use of TCAM space allows for custom definition of Access Control List (ACL) templates.

  ◦ IEEE 802.1ae MAC Security (MACsec[1]) support on all ports of 9300-FX2 models with speed greater than or equal to 1-Gbps, allows traffic encryption at the physical layer and provides secure server, border leaf, and leaf-to-spine connectivity.

- **Intelligent Buffer Management**

  ◦ The platform offers Cisco's innovative [intelligent buffer management](), that offers capability to distinguish mice and elephant flows and apply different queue management schemes to them based on their network forwarding requirements in the event of link congestion.

  ◦ Intelligent buffer management functions are:

  ◦ Approximate Fair Dropping (AFD) with Elephant Trap (ETRAP). AFD distinguishes long-lived elephant flows from short-lived mice flows, by using ETRAP. AFD exempts mice flows from the dropping algorithm so that mice flows will get their fair share of bandwidth without being starved by bandwidth-hungry elephant flows. Also, AFD tracks elephant flows and subjects them to the AFD algorithm in the egress queue to grant them their fair share of bandwidth.

  ◦ ETRAP measures the byte counts of incoming flows and compares this against the user defined ETRAP threshold. After a flow crosses the threshold, it becomes an elephant flow.

  ◦ Dynamic Packet Prioritization (DPP) provides the capability of separating mice flows and elephant flows into two different queues so that buffer space can be allocated to them independently. Mice flows, sensitive to congestion and latency can take priority queue and avoid re-ordering that allows to elephant flows to take full link bandwidth.

- **RDMA over Converged Ethernet – RoCE support**

  ◦ Platform offers lossless transport for RDMA over Converged Ethernet with support of DCB protocols:

  ◦ Priority-based Flow Control – (PFC) to prevent drops in the network and pause frame propagation per priority class.

  ◦ Enhanced Transmission Selection – (ETS) to reserve bandwidth per priority class in network contention situation.

  ◦ Data Center Bridging Exchange Protocol – (DCBX) to discover and exchange priority and bandwidth information with end points.

  ◦ Platform also supports Explicit Congestion Notification – (ECN) that provides end-to-end notification per IP flow by marking packets that experienced congestion, without dropping traffic. The platform is capable to track ECN statistics of number of marked packet that have experienced congestion.

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[1] Please check software release notes to get the latest support for each product to enable MACsec.

- **LAN and SAN Convergence**

  ◦ Fibre Channel and Fibre Channel over Ethernet (FCoE) N-Port Virtualization (NPV) support enables the network administrator to control domain IDs and points of management on a Fibre Channel network as it scales. This feature enables LAN and SAN converged networks on a lossless, reliable Ethernet network.

- **Hardware and software high availability**

  ◦ Virtual Port-Channel (vPC) technology provides Layer 2 multipathing through the elimination of Spanning Tree Protocol. It also enables fully utilized bisectional bandwidth and simplified Layer 2 logical topologies without the need to change the existing management and deployment models.

  ◦ The 64-way Equal-Cost MultiPath (ECMP) routing enables the use of Layer 3 fat-tree designs. This feature helps organizations prevent network bottlenecks, increase resiliency, and add capacity with little network disruption.

  ◦ Advanced reboot capabilities include hot and cold patching.

  ◦ The switches use hot-swappable Power-Supply Units (PSUs) and fans with N+1 redundancy.

- **Purpose-built Cisco NX-OS Software operating system with comprehensive, proven innovations**

  ◦ Single binary image that supports every switch in the Cisco Nexus 9000 series, simplifying image management. The operating system is modular, with a dedicated process for each routing protocol: a design that isolates faults while increasing availability. In the event of a process failure, the process can be restarted without loss of state. The operating system supports hot and cold patching and online diagnostics.

  ◦ Data Center Network Manager (DCNM) is the network management platform for all NX-OS-enabled deployments, spanning new fabric architectures, IP Fabric for Media, and storage networking deployments for the Cisco Nexus®-powered data center. Accelerate provisioning from days to minutes, and simplify deployments from day zero through day N. Reduce troubleshooting cycles with graphical operational visibility for topology, network fabric, and infrastructure. Eliminate configuration errors and automate ongoing change in a closed loop, with templated deployment models and configuration compliance alerting with automatic remediation. Real-time health summary for fabric, devices, and topology. Correlated visibility for fabric (underlay, overlay, virtual and physical endpoints), including compute visualization with VMware.

  ◦ Network traffic monitoring with Cisco Nexus Data Broker builds simple, scalable, and cost-effective network Test Access Points (TAPs) and Cisco Switched Port Analyzer (SPAN) aggregation for network traffic monitoring and analysis.

- **Cisco Tetration Analytics platform support**

  ◦ The telemetry information from the Nexus 9300 Series switches is exported every 100 milliseconds by default directly from the switch's Application-Specific Integrated Circuit (ASIC). This information consists of three types of data: (a) Flow information, this information contains information about endpoints, protocols, ports, when the flow started, how long the flow was active, etc. (b) Inter-packet variation, this information captures any inter-packet variations within the flow. Examples include variation in Time To Live (TTL), IP and TCP flags, payload length, etc. (c) Context details, context information is derived outside the packet header, including variation in buffer utilization, packet drops within a flow, association with tunnel endpoints, etc.

  ◦ The Cisco Tetration Analytics platform consumes this telemetry data, and by using unsupervised machine learning and behavior analysis it can provide outstanding pervasive visibility across everything in your data center in real time. By using algorithmic approaches, the Cisco Tetration Analytics platform provides a deep application insights and interactions, enabling dramatically simplified operations, a zero-trust model, and migration of applications to any programmable infrastructure. To learn more, go to https://www.cisco.com/go/tetration.

- **Cisco Network Assurance Engine (NAE)**

  ◦ Cisco NAE continuously verifies if the network infrastructure is operating as per policy intent and it leverages the power of mathematical models to reason on behalf of the operator in policy, configuration and dynamic state level. NAE can precisely indicate problems in the network, identify which application or part of network is impacted, root-cause the problem and suggest how to fix it. Its continuous verification approach transforms Day 2 Operations from reactive to proactive mode and it does so without using any packet data. NAE helps avoid outages by predicting the impact of changes, reducing network related IT incidents and shrinking the mean time to repair by up to 66%. NAE also helps assure network security and segmentation compliance. To learn more about NAE, visit https://www.cisco.com/c/en/us/products/data-center-analytics/network-assurance-engine/index.html.

Product specifications

The Cisco Nexus 9300-FX2 series offer industry-leading density and performance with flexible port configurations that can support existing copper and fiber cabling (Table 2).

Table 2.   Cisco Nexus 9300-FX2 Series Switches specifications

Feature	Cisco Nexus 9336C-FX2	Cisco Nexus 9336C-FX2-E	Cisco Nexus 93240YC-FX2	Cisco Nexus 93360YC-FX2	Cisco Nexus 93216TC-FX2
Ports	36 x 40/100-Gbps QSFP28 ports	36 x 40/100-Gbps QSFP28 ports	48 x 1/10/25-Gbps and 12 x 40/100-Gbps QSFP28 ports	96 x 1/10/25-Gbps and 12 x 40/100-Gbps QSFP28 ports	96 x 100M/1/10GBASE-T ports and 12 x 40/100-Gbps QSFP28 ports
Supported speeds	1/10/25/40/100-Gbps Ethernet Breakout supported on all ports, 1-36: 100G, 2x50G NRZ, 40G native, 4x10/25G (10G w/QSA) 1G w/QSA except ports 1-6 and 33-36	1/10/25/40/100-Gbps Ethernet Breakout supported on all ports, 1-36: 100G, 2x50G NRZ, 40G native, 4x10/25G (10G w/QSA) 1G w/QSA except ports 1-6 and 33-36	1/10/25-Gbps on downlinks 40/100-Gbps on uplinks	1/10/25-Gbps on downlinks 40/100-Gbps on uplinks Breakout supported ports, 97-108: 4x10/25G	100M/1/10 Gbps RJ45 downlinks 40/100-Gbps on uplinks Breakout supported ports, 97-108: 4x10/25G
FC/FCoE	N/A	16/32-Gbps Fiber Channel	N/A	16/32-Gbps Fiber Channel	N/A
CPU	4 cores	4 cores	4 cores	4 cores	4 cores
System memory	24 GB	24 GB	Upto 24 GB	Upto 24 GB	Upto 24 GB
SSD drive	128 GB	128 GB	128 GB	128 GB	128 GB
System buffer	40 MB	40 MB	40 MB	40 MB	40 MB
Management ports	2 ports: 1 RJ-45 and 1 SFP+	2 ports: 1 RJ-45 and 1 SFP+	2 ports: 1 RJ-45 and 1 SFP+	2 ports: 1 RJ-45 and 1 SFP+	2 ports: 1 RJ-45 and 1 SFP+
USB ports	1	1	1	1	1
RS-232 serial ports	1	1	1	1	1

Feature	Cisco Nexus 9336C-FX2	Cisco Nexus 9336C-FX2-E	Cisco Nexus 93240YC-FX2	Cisco Nexus 93360YC-FX2	Cisco Nexus 93216TC-FX2
Power supplies (up to 2)	750W AC[2], 1100W AC, 1100W DC, 1100W HVAC/HVDC	1100W AC, 1100W DC, 1100W HVAC/HVDC	750W AC[2], 1100W AC, 1100W DC, 1100W HVAC/HVDC	1200W AC, 930W DC, 1200W HVAC/HVDC	1200W AC, 930W DC, 1200W HVAC/HVDC
Typical power (AC)	337W	337W	298W	404W	580W
Maximum power (AC)	719W	705W	708W	900W	965W
Input voltage (AC)	100 to 240V	100 to 240V	100 to 240V	100 to 240V	100 to 240V
Input voltage (High-Voltage AC [HVAC])	100 to 277V	100 to 277V	100 to 277V	100 to 277V	100 to 277V
Input voltage (DC)	–40 to –72V	–40 to –72V	–40 to –72V	–40V to –72V	–40V to –72V
Input voltage (High-Voltage DC [HVDC])	–240 to –380V	–240 to –380V	–240 to –380V	–240V to –380V	–240V to –380V
Frequency (AC)	50 to 60 Hz	50 to 60 Hz	50 to 60 Hz	50 to 60 Hz	50 to 60 Hz
Fans	3 dual fan trays	6	5	3 fan trays	3 fan trays
Airflow	Port-side intake and exhaust	Port-side intake and exhaust	Port-side intake and exhaust	Port-side intake and exhaust	Port-side intake and exhaust
Physical dimensions (H x W x D)	1.72 x 17.3 x 24.5 in. (4.4 x 43.9 x 62.3 cm)	1.72 x 17.3 x 24.7 in. (4.4 x 43.9 x 62.7 cm)	2.1 x 17.3 x 23.3 in. (5.3 x 43.9 x 59.1 cm)	3.38 x 17.41 x 24.14in. (8.59 x 44.23 x 61.31 cm)	3.38 x 17.41 x 23.6 in (8.59 x 44.2 x 59.9 cm)
Acoustics	76.2 dBA at 50% fan speed, 85.3 dBA at 70% fan speed, and 92.3 dBA at 100% fan speed	74.7 dBA at 50% fan speed, 80.4 dBA at 70% fan speed, and 88.1 dBA at 100% fan speed	76.4 dBA at 50% fan speed, 83.3 dBA at 70% fan speed, and 92.1 dBA at 100% fan speed	76.7 dBA at 40% fan speed, 88.7 dBA at 70% Fan speed and 97.4 dBA at 100% Fan speed	76.7 dBA at 40% fan speed, 88.7 dBA at 70% Fan speed and 97.4 dBA at 100% Fan speed
RoHS compliance	Yes	Yes	Yes	Yes	Yes
MTBF	352,590 hours	292,740 hours	365,610 hours	320,040 hours	290,680 hours
Minimum ACI image	ACI-N9KDK9-13.1.2		ACI-N9KDK9-14.0	ACI-N9KDK9-14.1.2	ACI-N9KDK9-14.1.2

Feature	Cisco Nexus 9336C-FX2	Cisco Nexus 9336C-FX2-E	Cisco Nexus 93240YC-FX2	Cisco Nexus 93360YC-FX2	Cisco Nexus 93216TC-FX2
Minimum NX-OS image	NXOS-703I7.3	NXOS-10.1(1)	NXOS-703I7.3	NXOS-9.3(1)	NXOS-9.3(1)

[2] Typical and maximum power values are based on input drawn from the power circuit. The power supply value (for example, 750W AC power supply: NXA-PAC-750W-PI) is based on the output rating to the inside of the switch.

Table 3 lists the performance and scalability specifications for the Cisco Nexus 9300-FX2/FX2-E series switches. (Check the software release notes for feature support information.)

Table 3. Hardware performance and scalability specifications[3]

Item	Cisco Nexus 9300-FX2 Series Switches
Maximum number of IPv4 Longest Prefix Match (LPM) routes[4]	896,000
Maximum number of IPv4 host entries[4]	896,000
Maximum number of IPv6 Longest Prefix Match (LPM) routes[4]	498,000
Maximum number of IPv6 host entries[4]	896,000
Maximum number of MAC address entries[4]	256,000
Maximum number of multicast routes	128,000
Number of Internet Group Management Protocol (IGMP) snooping groups	Shipping: 8,000 Maximum: 32,000
Maximum number of Cisco Nexus 2000 Series Fabric Extenders per switch	16
Maximum number of Access Control List (ACL) entries	Per slice of the forwarding engine: 5000 ingress 2000 egress
Maximum number of VLANs	4096[5]
Number of Virtual Routing and Forwarding (VRF) instances	Shipping: 1,000 Maximum: 16,000
Maximum number of ECMP paths	64
Maximum number of port channels	512
Maximum number of links in a port channel	32
Number of active SPAN sessions	4
Maximum number of VLAN's in Rapid per-VLAN Spanning Tree (RPVST) instances	3,967
Maximum number of Hot-Standby Router Protocol (HSRP) groups	490

Item	Cisco Nexus 9300-FX2 Series Switches
Number of Network Address Translation (NAT) entries	1,023
Maximum number of Multiple Spanning Tree (MST) instances	64
Flow-table size used for Cisco Tetration Analytics platform	64,000
Number of Queues	8

[3] More templates and greater scalability are on the roadmap. Refer to the [Cisco Nexus 9000 Series Verified Scalability Guide](#) documentation for the latest exact scalability values validated for specific software.

[4] Raw capacity of tables.

[5] 127 VLANs out of 4096 are reserved.

Table 4 lists the environmental properties, and Table 5 lists the weight for the Cisco Nexus 9300-FX2 series switches.

Table 4. Environmental properties

Property	Description
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 13,123 ft (0 to 4000m)

Table 5. Weight

Component	Weight
Cisco Nexus 9336C-FX2 without power supplies or fans	18.8 lb (8.5 kg)
Cisco Nexus 9336C-FX2-E Chassis weight per unit	18.8 lb (8.5 kg)
Cisco Nexus 93240YC-FX2 without power supplies or fans	2.2 lb (10 kg)
750W* AC power supply	2.42 lb (1.1 kg)
1100W AC power supply	2.42 lb (1.1 kg)
1100W DC power supply	2.45 lb (1.11 kg)
1100W HVAC/HVDC power supply	2.46 lb (1.12 kg)
Cisco Nexus 93360YC-FX2 without power supplies or fans	27.4 lb (12.4kg)
Cisco Nexus 93216TC-FX2 without power supplies or fans	27.4 lb (12.4 kg)
930W DC Power Supply	2.42 lb (1.1 kg)

Component	Weight
1200W AC power supply	2.64 lb (1.2 kg)
1200W HVAC/HVDC power supply	2.52 lb (1.14kg)
Fan tray: NXA-FAN-65CFM-F or NXA-FAN-65CFM-B	0.6 lb (0.3 kg)
Fan tray: NXA-FAN-35CFM-PE or NXA-FAN-35CFM-PI	0.26 lb (0.1 kg)
NXA-FAN-160CFM-PI or NXA-FAN-160CFM-PE	1.3 lb (0.59 kg)

Table 6 summarizes regulatory standards compliance for the Cisco Nexus 9300-FX2 series switches.

Table 6.   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	NEBS ● 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.

Software licensing and optics supported

The software packaging for the Cisco Nexus 9000 Series offers flexibility and a comprehensive feature set. The default system software has a comprehensive Layer 2 security and management feature set. To enable additional functions, including Layer 3 IP unicast and IP multicast routing and Cisco Nexus Data Broker, you must install additional licenses. To meet customer requirements, licensing is available as both subscription and perpetual. The licensing guide illustrates the software packaging and licensing available to enable advanced features. For the latest software release information and recommendations, refer to the product bulletin at https://www.cisco.com/go/nexus9000.

For details about the optics modules available and the minimum software release required for each supported module, visit https://www.cisco.com/en/US/products/hw/modules/ps5455/products_device_support_tables_list.html.

Ordering information

Table 7 presents ordering information for the Cisco Nexus 9300-FX series switches.

Table 7. Ordering information

Part Number	Product Description
Base Part Numbers	
N9K-C9336C-FX2	Nexus 9K Fixed with 36p 40G/100G QSFP28
N9K-C9336C-FX2-E	Nexus 9K Fixed with 36p 40G/100G QSFP28
N9K-C93240YC-FX2	Nexus 9K Fixed with 48p 1/10G/25G SFP and 12p 40G/100G QSFP28
N9K-C93360YC-FX2	Nexus 9K Fixed with 96p 1/10G/25G SFP and 12p 40G/100G QSFP28
N9K-C93216TC-FX2	96p 100M/1/10GBASE-T and 12p 40G/100G QSFP28
Power Supplies on Nexus 9300-FX2 series	
NXA-PAC-750W-PI*	Nexus 9000 750W AC PS, Port-side Intake
NXA-PAC-750W-PE*	Nexus 9000 750W AC PS, Port-side Exhaust
NXA-PAC-1100W-PI2	Nexus 9000 1100W AC PS, Port-side Intake
NXA-PAC-1100W-PE2	Nexus 9000 1100W AC PS, Port-side Exhaust
NXA-PDC-1100W-PI	Nexus 9000 1100W DC PS, Port-side Intake
NXA-PDC-1100W-PE	Nexus 9000 1100W DC PS, Port-side Exhaust
NXA-PHV-1100W-PI	Nexus 1100W Platinum HV-AC-DC PS, Port-side Intake
NXA-PHV-1100W-PE	Nexus 1100W Platinum HV-AC-DC PS, Port-side Exhaust
NXA-PAC-1200W-PE	Cisco Nexus 1200W AC PS, Port-side Exhaust

Part Number	Product Description
NXA-PAC-1200W-PI	Cisco Nexus 1200W AC PS, Port-side Intake
N9K-PUV-1200W	Cisco Nexus 1200W, 200-277AC,240-380DC, dual airflow PSU
NXA-PDC-930W-PI	Cisco Nexus 930W DC PS, Port-side Intake
NXA-PDC-930W-PE	Cisco Nexus 930W DC PS, Port-side Exhaust
Fans on Nexus 9300-FX2 Series	
NXA-FAN-35CFM-PE	Nexus Single Fan, 35CFM, port side exhaust airflow; supported on Nexus 93240YC-FX2
NXA-FAN-35CFM-PI	Nexus Single Fan, 35CFM, port side intake airflow; supported on Nexus 93240YC-FX2
NXA-FAN-65CFM-PE	Nexus Dual Fan, 65CFM, port side exhaust airflow; supported on Nexus 9336C-FX2
NXA-FAN-65CFM-PI	Nexus Dual Fan, 65CFM, port side intake airflow; supported on Nexus 9336C-FX2
NXA-FAN-160CFM-PI	Cisco NEXUS FAN, 160CFM, PORT-SIDE INTAKE AIRFLOW
NXA-FAN-160CFM-PE	Cisco Nexus Fan, 160CFM, port-side exhaust airflow
Licenses on Nexus 9300-FX2 Series	
C1E1TN9300XF-3Y	ACI & NX-OS Subscription Essential package for 10/25/40G+ Nexus 9K Leaf, 3 Year Term
C1E1TN9300XF-5Y	ACI & NX-OS Subscription Essential package for 10/25/40G+ Nexus 9K Leaf, 5 Year Term
C1A1TN9300XF-3Y	ACI & NX-OS Subscription Advantage package for 10/25/40G+ Nexus 9K Leaf, 3 Year Term
C1A1TN9300XF-5Y	ACI & NX-OS Subscription Advantage package for 10/25/40G+ Nexus 9K Leaf, 5 Year Term
ACI-ES-XF	ACI Essential SW license for a 10/25/40G+ Nexus 9K Leaf
ACI-AD-XF	ACI Advantage SW license for a 10/25/40G+ Nexus 9K Leaf
NX-OS-ES-XF	NX-OS Essential SW license for a 10/25/40G+ Nexus 9K Leaf
NX-OS-AD-XF	NX-OS Advantage SW license for a 10/25/40G+ Nexus 9K Leaf
Power Cords	
CAB-250V-10A-AR	AC Power Cord - 250V, 10A - Argentina (2.5 meter)
CAB-250V-10A-BR	AC Power Cord - 250V, 10A - Brazil (2.1 meter)
CAB-250V-10A-CN	AC Power Cord - 250V, 10A - PRC (2.5 meter)
CAB-250V-10A-ID	AC Power Cord - 250V, 10A, South Africa (2.5 meter)
CAB-250V-10A-IS	AC Power Cord - 250V, 10A - Israel (2.5 meter)
CAB-9K10A-AU	Power Cord, 250VAC 10A 3112 Plug, Australia (2.5 meter)

Part Number	Product Description
CAB-9K10A-EU	Power Cord, 250VAC 10A CEE 7/7 Plug, EU (2.5 meter)
CAB-9K10A-IT	Power Cord, 250VAC 10A CEI 23-16/VII Plug, Italy (2.5 meter)
CAB-9K10A-SW	Power Cord, 250VAC 10A MP232 Plug, SWITZ (2.5 meter)
CAB-9K10A-UK	Power Cord, 250VAC 10A BS1363 Plug (13 A fuse), UK (2.5 meter)
CAB-9K12A-NA	Power Cord, 125VAC 13A NEMA 5-15 Plug, North America (2.5 meter)
CAB-AC-L620-C13	North America, NEMA L6-20-C13 (2.0 meter)
CAB-C13-C14-2M	Power Cord Jumper, C13-C14 Connectors, 2 Meter Length (2 meter)
CAB-C13-CBN	Cabinet Jumper Power Cord, 250 VAC 10A, C14-C13 Connectors (0.7 meter)
CAB-IND-10A	10A Power cable for India (2.5 meter)
CAB-N5K6A-NA	Power Cord, 200/240V 6A North America (2.5 meter)
CAB-HVAC-SD-0.6M	HVAC Power cable for Anderson-LS-25
CAB-HVAC-RT-0.6M	HVAC Power cable with right angle connector for RF-LS-25
Accessories on Nexus 9300-FX2 Series	
NXK-ACC-KIT-1RU	Nexus Fixed Accessory Kit with 4-post rack mount kit

Warranty, service and support

The Cisco Nexus 9300-FX2 series has a 1-year limited hardware warranty. The warranty includes hardware replacement with a 10-day turnaround from receipt of a Return Materials Authorization (RMA).

Cisco offers a range of professional, solution, and product support services for each stage of your Cisco Nexus 9300-FX2 series deployment:

- Cisco Data Center Quick Start Service for Cisco Nexus 9000 Series Switches: This offering provides consulting services that include technical advice and assistance to help deploy Cisco Nexus 9000 Series Switches.

- Cisco Data Center Accelerated Deployment Service for Cisco Nexus 9000 Series Switches: This service delivers planning, design, and implementation expertise to bring your project into production. The service also provides recommended next steps, an architectural high-level design, and operation-readiness guidelines to scale the implementation to your environment.

- Cisco Migration Service for Cisco Nexus 9000 Series Switches: This service helps you migrate from Cisco Catalyst® 6000 Series Switches to Cisco Nexus 9000 Series Switches.

- Cisco Product Support: Support service is available globally 24 hours a day, 7 days a week, for Cisco software and hardware products and technologies associated with Cisco Nexus 9000 Series Switches. Enhanced support options delivered by Cisco also include solution support for Cisco ACI, Cisco SMARTnet™ Service, and Cisco Smart Net Total Care™* service.

  For more information, visit https://www.cisco.com/go/services.

* For Cisco products only.

Cisco environmental sustainability

Information about Cisco's environmental sustainability policies and initiatives for our products, solutions, operations, and extended operations or supply chain is provided in the "Environment Sustainability" section of Cisco's 2018 Corporate Social Responsibility (CSR) Report.

Reference links to **information about key environmental sustainability topics** (mentioned in the "Environment Sustainability" section of the CSR Report) are provided in the following table:

Sustainability Topic	Reference
Information on product-material-content laws and regulations	Materials
Information on electronic waste laws and regulations, including products, batteries and packaging	WEEE Compliance

Reference links to **product-specific environmental sustainability information** that is mentioned in relevant sections of this data sheet are provided in the following table:

Sustainability Topic	Reference
General	
Product Compliance	Table 6. Safety and Compliance Information
Power	
Power Supply	Table 2. Product specifications: Power Supplies, Typical and Max power specification
Material	
Unit Weight	Table 5. Weight
Dimensions and Mean Time between Failures Metrics	Table 2. Product specifications

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For more information

For more information about the Cisco Nexus 9000 Series and latest software release information and recommendations, visit https://www.cisco.com/go/nexus9000.

Document history

New or revised topic	Described In	Date
Updated security information	Features and benefits	July 19, 2023

Printed in USA

C78-742282-23   09/23

The bridge to possible

Cisco Nexus 9300-FX3 Series Switches

Contents

Product overview

Artificial intelligence and machine learning (AI/ML) applications are being used increasingly in today's data centers, and the Cisco Nexus® 9000 Series Switches have the hardware and software capabilities to provide the right latency, congestion-management mechanisms, and telemetry to meet the requirements of those applications. The Cisco Nexus 9000 Series Switches address the need for high-performance, power-efficient, compact switching in the networking infrastructure and are designed to support 400G fabrics for next-generation leaf and spine designs.

Large-cloud and data-center networking teams require a flexible, reliable solution that efficiently manages, troubleshoots, and analyzes their IT infrastructure. In addition, they need security, automation, visibility, analytics, and assurance. Coupled with tools such as Cisco Nexus Dashboard Insights for visibility and Cisco Nexus Dashboard Fabric Controller for automation, Cisco Nexus 9000 Series Switches are ideal platforms for building a high-performance AI/ML network fabric.

Based on the [Cisco Cloud Scale technology](), the Cisco Nexus 9300-FX3 Series is the latest generation of access switches. Building on the Nexus 9300-FX series, the platform supports cost-effective cloud-scale deployments, an increased number of endpoints, and is capable of wire-rate security and telemetry. The platform is built on modern system architecture designed to provide high performance and meet the evolving needs of highly scalable data centers and growing enterprises.

Cisco provides two modes of operation for Cisco Nexus 9000 Series Switches. Organizations can deploy Cisco® Application Centric Infrastructure (Cisco ACI®) or Cisco NX-OS mode.

Cisco ACI is a holistic, intent-driven architecture with centralized automation and policy-based application profiles. It provides a robust transport network for dynamic workloads and is built on a network fabric that combines time-tested protocols with new innovations to create a highly flexible, scalable, and resilient architecture of low-latency, high-bandwidth links. This fabric delivers a network that can support the most demanding and flexible data-center environments.

Designed for the programmable network, the Cisco NX-OS operating system automates configuration and management for customers who want to take advantage of the DevOps operation model and tool sets.

Cisco Nexus 9300 FX3 Switches features and benefits

Table 1. Cisco Nexus 9300 FX3 Switches features and benefits.

Features and benefits	Description
Architectural flexibility	• Cisco Nexus 9000 Series Switches support Cisco Application Centric Infrastructure (Cisco ACI), Cisco NX-OS VXLAN EVPN, Cisco IP Fabric for Media, Cisco Nexus Data Broker, and IP routed or Ethernet switched Layer-2 fabrics using a comprehensive set of unicast and multicast IPv6/IPv4 and Ethernet protocols.
	• Purpose-built Cisco NX-OS Software operating system with comprehensive, proven innovations. The operating system is modular, with a dedicated process for each routing protocol: a design that isolates faults while increasing availability.
	• Industry-leading Cisco Software-Defined Networking (SDN) solution with Cisco ACI support.
	• Support for standards-based VXLAN EVPN fabrics, inclusive of hierarchical multisite support (Refer to VXLAN network with MP-BGP EVPN control plane for more information.)
	• Three-tier BGP architectures, enabling horizontal, nonblocking IPv6 network fabrics at web scale
	• Comprehensive protocol support for Layer-3 (v4 and v6) unicast and multicast routing protocol suites, including BGP, Open Shortest Path First (OSPF), Enhanced Interior Gateway Routing Protocol (EIGRP), Routing Information Protocol Version 2 (RIPv2), Protocol Independent Multicast Sparse Mode (PIM-SM), Source-Specific Multicast (SSM), and Multicast Source Discovery Protocol (MSDP)
	• Segment Routing (SR and SRv6) allows the network to forward multiprotocol label switching (MPLS) packets and engineer traffic without Resource Reservation Protocol (RSVP) Traffic Engineering (TE). It provides a control-plane alternative for increased network scalability and virtualization.
	• Cisco IP Fabric for Media helps you migrate from an SDI router to an IP-based infrastructure. In an IP-based infrastructure, a single cable has the capacity to carry multiple bidirectional traffic flows and can support different flow sizes without requiring changes to the physical infrastructure.
	• Cisco Nexus Dashboard Data Broker provides customers complete observability into their network and solution(s) that can help them to identify and mitigate security threats, realize and remediate performance bottlenecks, adhere to data compliance, and have insight into capacity-planning operations.
Extensive programmability	• Day-0 automation through Power On Auto Provisioning (POAP), drastically reducing provision time
	• Industry-leading integrations for leading DevOps configuration management applications, such as Ansible. Extensive Native YANG, and industry-standard OpenConfig model support through RESTCONF/NETCONF/gNMI
	• REST API interacting with Data Management Engine (DME)
	• Model-driven telemetry enhances network observability
	• Third-party application-hosting using Cisco Application Framework (CAF)
High scalability, flexibility, and security	• Flexible forwarding tables support up to two million shared entries
	• Flexible shared ingress and egress of max 56000 ACL entries
	• IEEE 802.1ae MAC security (MACsec) capability on all ports, which allows traffic encryption at the physical layer and provides secure server, border leaf, and leaf-to-spine connectivity

Features and benefits	Description
AI/ML networking	• Cisco Nexus 9000 Series Switches support innovative congestion management and flow control algorithms along with the latency and telemetry needed to meet the design requirements of AI/ML fabrics. • Priority Flow Control (PFC) is a key capability supported on Cisco Nexus 9000 Series Switches that prevents Ethernet frame drops by signaling, controlling, and managing Ethernet flows along the path by sending pause frames to appropriate senders. • The platform also supports Explicit Congestion Notification (ECN), which provides end-to-end notification per IP flow by marking packets that experienced congestion, without dropping traffic. The platform is capable of tracking ECN statistics, including the number of marked packets that have experienced congestion. • The platform offers lossless transport for Remote Direct Memory Access (RDMA) over converged Ethernet (RoCE) with support of Data-Center Bridging (DCB) protocols: ◦ Enhanced Transmission Selection (ETS) reserves bandwidth per priority class in network contention situations • Data Center Bridging Exchange Protocol (DCBX) can discover and exchange priority and bandwidth information with endpoints. • Weighted Random Early Detection (WRED) is a congestion avoidance technique that allows Cisco Nexus 9000 Series Switches to detect and react to congestion in the network by marking flows that could cause congestion. • The platform offers Cisco's innovative intelligent buffer management, which offers the capability to distinguish mice and elephant flows and apply different queue-management schemes to them based on their network forwarding requirements in the event of link congestion. • Approximate Fair Dropping (AFD) with Elephant Trap (ETRAP). AFD distinguishes long-lived elephant flows from short-lived mice flows by using ETRAP. ETRAP measures the byte counts of incoming flows and compares them against the user-defined ETRAP threshold. After a flow crosses the threshold, it becomes an elephant flow. • Dynamic Packet Prioritization (DPP) provides the capability of separating mice flows and elephant flows into two different queues so that buffer space can be allocated to them independently.
Hardware and software high availability	• Virtual Port-Channel (vPC) technology provides Layer-2 multipathing through the elimination of Spanning Tree Protocol (STP). • Can-do fabric link in the VXLAN environment, eliminating the need for peer-to-peer VPC • The 64-way Equal-Cost Multipath (ECMP) routing enables the use of Layer-3 fat-tree designs. This feature helps organizations prevent network bottlenecks, increase resiliency, and add capacity with little network disruption. • Software Maintenance Upgrades (SMUs) contain fixes for a specific defect and provide a quick resolution of critical issues. • In-Service Software Upgrades (ISSUs) allow upgrades of device software while the switch continues to forward traffic. ISSUs reduce or eliminate the downtime typically caused by software upgrades. • The switches use hot-swappable Power-Supply Units (PSUs) and fans with N+1 redundancy.
Cisco Nexus Dashboard	Cisco Nexus Dashboard is a platform that transforms data-center and cloud-network operations through simplicity, automation, and analytics. Cisco Nexus Dashboard Fabric Controller (NDFC), Cisco Nexus Dashboard Insights (NDI), Cisco Nexus Dashboard Orchestrator (NDO), and Cisco Nexus Dashboard Data Broker (NDDB) are integrated as services into Cisco Nexus Dashboard. Cisco Nexus Dashboard is included with all Cisco Nexus 9000 switch tiered licenses. Cisco Nexus Dashboard Fabric Controller requires a Cisco Data Center Networking (DCN) Essentials license, Cisco Nexus Dashboard Orchestrator requires a DCN Advantage license, and Cisco Nexus Dashboard Insights requires a DCN Premier or a DCN Day 2 Ops add-on license.

Switch model

Table 2.   Cisco Nexus 9300-FX3 Series Switches

Model	Description
Cisco Nexus 93180YC-FX3 Switch	48 x 1/10/25 Gbps fiber ports and 6 x 40/100 Gbps QSFP28 ports
Cisco Nexus 93108TC-FX3P Switch	48 x 100M/1/2.5/5/10 Gbps BASE-T ports 6 x 40/100 Gbps Quad small form-factor pluggable 28 (QSFP28) ports
Cisco Nexus 9348GC-FX3 Switch	48 x 10M/100M/1 Gbps BASE-T ports 4x 10/25 Gbps SFP28 ports 2 x 40/100 Gbps Quad small form-factor pluggable 28 (QSFP28) ports
Cisco Nexus 9348GC-FX3PH Switch	40x 10M/100M/1 Gbps BASE-T ports 8x 10M/100M BASE-T half-duplex ports 4x 10/25 Gbps SFP28 ports 2 x 40/100 Gbps Quad small form-factor pluggable 28 (QSFP28) ports

The **Cisco Nexus 93180YC-FX3 Switch** (Figure 1) is a 1RU switch that supports 3.6 Tbps of bandwidth and 1.2 Bpps. The 48 downlink ports on the 93180YC-FX3 are capable of supporting 1-, 10-, or 25-Gbps Ethernet, offering deployment flexibility and investment protection. The 6 uplink ports can be configured as 40 or 100-Gbps Ethernet, offering flexible migration options. The Cisco Nexus 93180YC-FX3 switch supports standard PTP telecom profiles with SyncE and PTP boundary clock functionality for telco data-center edge environments.

Figure 1.
Cisco Nexus 93180YC-FX3 Switch

The **Cisco Nexus 93108TC-FX3P Switch** (Figure 2) is a compact 1 RU switch that supports 2.16 Tbps of bandwidth and 1.2 Billion packets per second (Bppss). Offering flexible port-speed configurations, the switch supports 48 ports of 100M/1/2.5/5/10G BASE-T on the downlinks. The 6 uplink ports support 40/100G QSFP 28. The 93108TC-FX3P is well suited for network customers requiring more versatility and flexibility in networking speeds.

Figure 2.
Cisco Nexus 93108TC-FX3P Switch

The **Cisco Nexus 9348GC-FX3** Switch (Figure 3) is a 1RU switch that supports 696 Gbps of bandwidth and over 517 Mpps. The 48 1GBASE-T downlink ports on the 9348GC-FX3 can be configured to work as 10-Mbps, 100-Mbps, or 1-Gbps ports. The 4 ports of SFP28 can be configured as 1/10/25-Gbps and the 2 ports of QSFP28 can be configured as 40- and 100-Gbps ports, or a combination of 10-, 25-, 40, 50-, and 100-Gbps connectivity, offering flexible migration options.

The Cisco Nexus 9348GC-FX3 is ideal for customers who require a Gigabit Ethernet ToR switch with local switching.

Figure 3.
Cisco Nexus 9348GC-FX3 Switch

The **Cisco Nexus 9348GC-FX3PH Switch** (Figure 3) is a 1RU switch that supports 696 Gbps of bandwidth and over 517 Mpps. The 40 1GBASE-T downlink ports on the 9348GC-FX3PH can be configured to work as 10-Mbps, 100-Mbps, or 1-Gbps ports. The last 8 downlink ports can be configured to work as 10-Mbps or 100-Mbps only. The 4 ports of SFP28 can be configured as 1/10/25-Gbps, and the 2 ports of QSFP28 can be configured as 40- and 100-Gbps ports, or a combination of 10, 25, 40 ,and 100-Gbps connectivity, offering flexible migration options. The last 8 ports are only of half-duplex functionality and are limited to 10Mbps and 100Mbps speeds only.

The Cisco Nexus 9348GC-FX3PH is ideal for customers who require a Gigabit Ethernet ToR switch with local switching.

Figure 4.
Cisco Nexus 9348GC-FX3PH Switch

Product specifications

The Cisco Nexus 9300-FX3 Series offer industry-leading density and performance with flexible port configurations that can support existing copper and fiber cabling (Table 3).

Table 3. Cisco Nexus 9300-FX3 Series Switch specifications

Feature	Cisco Nexus 93180YC-FX3	Cisco Nexus 93108TC-FX3P	Cisco Nexus 9348GC-FX3	Cisco Nexus 9348GC-FX3PH
Ports	Downlinks: 48 x 1/10/25-Gbps Uplinks: 6 x 40/100-Gbps QSFP28 ports	Downlinks: 48 x 100M/1/2.5/5/10G BASE-T multigigabit-supported ports Uplinks: 6 x 40/100G QSFP28 ports	Downlinks: 48 x 10M/100M/1G BASE-T multigigabit-supported ports Uplinks: 4 x 10/25G SFP28 and 2 x 40/100G QSFP28 ports	Downlinks: 40 x 10M/100M/1G BASE-T and 8 x 10M/100M BASE-T multigigabit-supported half-duplex ports Uplinks: 4 x 10/25G SFP28 and 2 x 40/100G QSFP28 ports
CPU	6 cores	4 cores	4 cores	4 cores
System memory	32 GB capable with 16G defaulted and 16G available as upgradeable option	32 GB capable with 16G defaulted and 16G available as upgradeable option	64 GB capable with 32G defaulted and 32G available as upgradable option	64 GB capable with 32G defaulted and 32G available as upgradable option
SSD drive	128 GB	128 GB	128 GB	128 GB
System buffer	40 MB	40 MB	40 MB	40 MB
Management ports	1 RJ-45 port	2 ports: 1 RJ-45 and 1 SFP+	2 ports: 1 RJ-45 and 1 SFP+	2 ports: 1 RJ-45 and 1 SFP+
USB ports	1	1	1	1
1PPS	GPS 1PPS input or output	NA	NA	NA
10MhZ	GPS 10Mhz input or output.	NA	NA	NA
Time of Date (ToD)	1 RJ-45	NA	NA	NA
ANT	Antenna for GNSS	NA	NA	NA
RS-232 serial ports	1	NA	NA	NA
Power supplies (up to 2)	650W AC, 930W DC, or 1200W HVAC/HVDC	1100W AC port-side intake and port-side exhaust 1900W AC port-side intake only	350W AC port-side intake and port-side exhaust	350W AC port-side intake and port-side exhaust 1900W AC port-side intake and port-side exhaust
Typical power (AC/DC)	325W	360W	226W	238W

Feature	Cisco Nexus 93180YC-FX3	Cisco Nexus 93108TC-FX3P	Cisco Nexus 9348GC-FX3	Cisco Nexus 9348GC-FX3PH
Maximum power (AC/DC)	600W	530W	242W	251W
Input voltage (AC)	100 to 240V	100 to 240V	100 to 240V	100 to 240V
Input voltage (high-voltage AC [HVAC])	200 to 277V	200 to 277V	200 to 277V	200 to 277V
Input voltage (DC)	–48 to –60V	–48 to –60V	–48 to –60V	–48 to –60V
Input voltage (high-voltage DC [HVDC])	–240 to –380V	–240 to –380V	–240 to –380V	–240 to –380V
Frequency (AC)	50 to 60 Hz	50 to 60 Hz	50 to 60 Hz	50 to 60 Hz
Fans	4	4	3	3
Airflow	Port-side intake and exhaust	Port-side intake and exhaust	Port-side intake and exhaust	Port-side intake and exhaust
Physical dimensions (H x W x D)	1.72 x 17.3 x 19.6 in. (4.4 x 43.9 x 49.6 cm)	1.72 x 17.2 x 18 in. (4.4 x 43.6 x 45.7 cm)	1.72 x 17.3 x 19.7 in. (4.4 x 43.9 x 49.9 cm)	1.72 x 17.3 x 19.7 in. (4.4 x 43.9 x 49.9 cm)
Acoustics	Port-side exhaust: Fan speed at 50%:63.4 dBA Fan speed at 70%:74.3 dBA Fan speed at 100%: 83.4 dBA Port-side intake: Fan speed at 50%:64.6 dBA Fan speed at 70%:76.1 dBA Fan speed at 100%: 85.4 dBA	70.1 dBA at 50% fan speed, 78.1 dBA at 70% fan speed, and 86 dBA at 100% fan speed	Port-side exhaust: Fan speed at 40%:60.7dBA Fan speed at 70%:71.9 dBA Fan speed at 100%: 81.6 dBA Port-side intake: Fan speed at 40%:66.1 dBA Fan speed at 70%:73.2 dBA Fan speed at 100%: 79.6 dBA	Port-side exhaust: Fan speed at 40%:60.7dBA Fan speed at 70%:71.9 dBA Fan speed at 100%: 81.6 dBA Port-side intake: Fan speed at 40%:66.1 dBA Fan speed at 70%:73.2 dBA Fan speed at 100%: 79.6 dBA at 100%: 85.4 dBA
RoHS compliance	Yes	Yes	Yes	Yes
MTBF	288,760 Hours	283,100 hours	283,670 hours	263,920 hours
Minimum ACI image	ACI-N9KDK9-15.1.3	ACI-N9KDK9-15.1.3	NA	NA
Minimum NX-OS image	NXOS-10.1.1/NXOS-9.3.7	NXOS-9.3.5	NXOS-10.4.1	NXOS-10.4.1

Table 4 lists the performance and scalability specifications for the Cisco Nexus 9300-FX3 Series Switch. (Check the software release notes for feature support information.)

Table 4. Hardware performance and scalability specifications[1]

Item	Cisco Nexus 9300-FX3 Series Switches
Maximum number of IPv4 Longest Prefix Match (LPM) routes[1]	1,792,000
Maximum number of IPv4 host entries[1]	1,792,000
Maximum number of IPv6 Longest Prefix Match (LPM) routes[1]	896,000
Maximum number of IPv6 host entries[1]	1,792,000
Maximum number of MAC address entries[1]	512,000
Maximum number of multicast routes	128,000
Number of Internet Group Management Protocol (IGMP) snooping groups	Shipping: 8000 Maximum: 32,000
Maximum number of Cisco Nexus 2000 Series Fabric Extenders per switch (supported only on 93180YC-FX3 and 93108TC-FX3P)	16[2]
Maximum number of Access Control List (ACL) entries	Single-slice forwarding engine: 5000 ingress 2000 egress
Maximum number of VLANs	4096[3]
Number of Virtual Routing and Forwarding (VRF) instances	Shipping: 1000 Maximum: 16,000
Maximum number of ECMP paths	128-way
Maximum number of port channels	512
Maximum number of links in a port channel	32
Number of active SPAN sessions	4
Maximum number of VLANs in Rapid per-VLAN Spanning Tree (RPVST) instances	3967
Maximum number of Hot-Standby Router Protocol (HSRP) groups	490
Number of Network Address Translation (NAT) entries	1023

Item	Cisco Nexus 9300-FX3 Series Switches
Maximum number of Multiple Spanning Tree (MST) instances	64
Flow-table size used for Cisco Nexus Dashboard Insights	64,000
Number of queues	8

[1] More templates and greater scalability are on the roadmap. Refer to the [Cisco Nexus 9000 Series Verified Scalability Guide](#) documentation for the latest exact scalability values validated for specific software.

[2] Cisco Capabilities to enable FEX mode, please see latest software release notes for details.
Refer to the [Cisco Nexus 9000 Series Verified Scalability Guide](#) documentation for the latest exact scalability values validated for specific software.

[3] 27 VLANs out of 4096 are reserved.

Table 5 lists the environmental properties, and Table 5 lists the weights of the Cisco Nexus 9300-FX3 Series Switches.

Table 5.   Environmental properties

Property	Description
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 13,123 ft (0 to 4000m)

Table 6.   Weight

Component	Weight
Cisco Nexus 93180YC-FX3 without power supplies or fans	21 lb (9.52 kg)
Cisco Nexus 93108TC-FX3P without power supplies or fans	16 lb (7.25 kg)
Cisco Nexus 9348GC-FX3 without power supplies or fans	14.5 lb (6.5 kg)
Cisco Nexus 9348GC-FX3PH without power supplies or fans	14.7 lb (6.6 kg)
350W AC power supply	2.31 lb (1.0 kg)
650W AC power supply	2.42 lb (1.1 kg)
1900W AC power supply	3.19 lb (1.4 kg)
930W DC power supply	2.42 lb (1.1 kg)
1200W HVDC/HVAC power supply	2.42 lb (1.1 kg)
Fan tray: NXA-FAN-35CFM-PE or NXA-FAN-35CFM-PI	0.26 lb (0.12 kg)

Component	Weight
Fan tray: NXA-SFAN-30CFM-PE or NXA-SFAN-30CFM-PI	0.24 lb (0.10 kg)

Table 7 summarizes regulatory standards compliance for the Cisco Nexus 9300-FX3 Series Switch.

Table 7.   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	NEBS • 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.

Software licensing and optics supported

The software packaging for the Cisco Nexus 9000 Series offers flexibility and a comprehensive feature set. The default system software has a comprehensive Layer-2 security and management feature set. To enable additional functions, including Layer-3 IP unicast and IP multicast routing and Cisco Nexus Data Broker, you must install additional licenses. To meet customer requirements, licensing is available as both subscription and perpetual. The licensing guide illustrates the software packaging and licensing available to enable advanced features. For the latest software release information and recommendations, refer to the product bulletin at https://www.cisco.com/go/nexus9000.

For details about the optics modules available and the minimum software release required for each supported module,
Visit https://www.cisco.com/en/US/products/hw/modules/ps5455/products_device_support_tables_list.html.

Ordering information

Table 8 presents ordering information for the Cisco Nexus 9300-FX3 Series Switches.

Table 8.   Ordering information

Part number	Product description
Base part numbers	
Cisco Nexus N9K-C93180YC-FX3 Switch	Nexus 9300 with 48p 1/10G/25G SFP and 6p 40G/100G QSFP28
Cisco Nexus 93108TC-FX3P Switch	48 x 100M/1/2.5/5/10 Gbps BASE-T ports 6 x 40/100 Gbps Quad small form-factor pluggable 28 (QSFP28) ports
Cisco Nexus 9348GC-FX3 Switch	48 x 10M/100M/1 Gbps BASE-T ports 4x 10/25 Gbps SFP28 ports 2 x 40/100 Gbps Quad small form-factor pluggable 28 (QSFP28) ports
Cisco Nexus 9348GC-FX3PH Switch	40x 10M/100M/1 Gbps BASE-T ports 8x 10M/100M BASE-T half-duplex ports 4x 10/25 Gbps SFP28 ports 2 x 40/100 Gbps Quad small form-factor pluggable 28 (QSFP28) ports
Power supplies	
NXA-PAC-350W-PE	Cisco Nexus 9000 350W AC PS, port-side exhaust
NXA-PAC-350W-PI	Cisco Nexus 9000 350W AC PS, port-side intake
NXA-PAC-650W-PE	Cisco Nexus 9000 650W AC PS, port-side exhaust
NXA-PAC-650W-PI	Cisco Nexus 9000 650W AC PS, port-side intake
NXA-PAC-1900W-PE	Cisco Nexus 9000 1900W AC PS, port-side exhaust
NXA-PAC-1900W-PI	Cisco Nexus 9000 1900W AC PS, port-side intake
NXA-PDC-930W-PE	Cisco Nexus 9000 930W DC PS, port-side exhaust
NXA-PDC-930W-PI	Cisco Nexus 9000 930W DC PS, port-side intake
N9K-PUV-1200W	Cisco Nexus 9300 1200W universal power supply, bidirectional airflow and supports HVAC/HVDC
Fans	
NXA-FAN-35CFM-PE	Cisco Nexus fan, 35CFM, port-side exhaust airflow

Part number	Product description
NXA-FAN-35CFM-PI	Cisco Nexus fan, 35CFM, port-side intake airflow
NXA-SFAN-30CFM-PE	Cisco Nexus fan, 30CFM, port-side exhaust airflow
NXA-SFAN-30CFM-PI	Cisco Nexus fan, 30CFM, port-side intake airflow
Accessories on Cisco Nexus 9300-FX3 Series Switches	
NXK-ACC-KIT-1RU	Cisco Nexus fixed accessory kit with 4-post rack mount kit
NXK-ACC-KIT-2P	Cisco Nexus fixed accessory kit with 2-post rack mount kit

Warranty, service, and support

The Cisco Nexus 9300-FX3 Series has a 1-year limited hardware warranty. The warranty includes hardware replacement with a 10-day turnaround from receipt of a Return Materials Authorization (RMA).

Cisco offers a range of professional, solution, and product support services for each stage of your Cisco Nexus 9300-FX3 Series deployment:

- Cisco Data Center Quick Start Service for Cisco Nexus 9000 Series Switches: this offering provides consulting services that include technical advice and assistance to help deploy Cisco Nexus 9000 Series Switch.

- Cisco Data Center Accelerated Deployment Service for Cisco Nexus 9000 Series Switches: this service delivers planning, design, and implementation expertise to bring your project into production. The service also provides recommended next steps, an architectural high-level design, and operation-readiness guidelines to scale the implementation to your environment.

- Cisco Migration Service for Cisco Nexus 9000 Series Switches: this service helps you migrate from Cisco Catalyst® 6000 Series Switches to Cisco Nexus 9000 Series Switches.

- Cisco Product Support: this support service is available globally 24 hours a day, 7 days a week, for Cisco software and hardware products and technologies associated with Cisco Nexus 9000 Series Switches. Enhanced support options delivered by Cisco also include solution support for Cisco ACI, Cisco SMARTnet™ service, and Cisco Smart Net Total Care®* service.

- For more information, visit https://www.cisco.com/go/services.

* For Cisco products only.

Cisco environmental sustainability

Information about Cisco's environmental sustainability policies and initiatives for our products, solutions, operations, and extended operations or supply chain is provided in the "Environment sustainability" section of Cisco's Corporate Social Responsibility (CSR) Report.

Reference links to **information about key environmental sustainability topics** (mentioned in the "Environment sustainability" section of the CSR Report) are provided in the following table:

Sustainability topic	Reference
Information on product material content laws and regulations	Materials
Information on electronic waste laws and regulations, including products, batteries, and packaging	WEEE compliance

Reference links to **product-specific environmental sustainability information** that is mentioned in relevant sections of this data sheet are provided in the following table:

Sustainability topic	Reference
General	
Product compliance	Table 7. Safety and compliance information
Power	
Power supply	Table 3. Product specifications: power supplies, typical and maximum power specifications
Material	
Unit weight	Table 6. Weight
Dimensions and mean time between failures metrics	Table 3. Product specifications

Cisco makes the packaging data available for informational purposes only. It may not reflect the most current legal developments, and Cisco does not represent, warrant, or guarantee that it is complete, accurate, or up to date. This information is subject to change without notice.

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For more information

For more information about the Cisco Nexus 9000 Series and latest software release information and recommendations,
Visit https://www.cisco.com/go/nexus9000.

Document history

New or revised topic	Described in	Date
-	-	-

The bridge to possible

Cisco Network Convergence System 560-4 Router

Contents

Cisco® NCS 560-4 Router is a full-featured, modular and programmable aggregation platform. It is designed for the cost-effective delivery of converged mobile, residential, and business services. The NCS 560-4 provides Redundancy, shallow depth, low power consumption, high Ethernet interface density and high services scale, optimized for aggregation and remote Point-Of-Presence (POP) applications.

The Cisco NCS 560-4 Router (Figure 1) provides a comprehensive and scalable feature set, supporting Layer 2 VPN, Layer 3 VPN, Ethernet VPN (E-VPN) and Multicast services in a compact design.

Figure 1.
Cisco NCS 560-4 Router

Product highlights

- 4 RU small form factor with depth <300mm

- Fully redundant platform with 50 msec ISSU support

- Side-to-side or front-to-back airflow with a plenum

- 5G ready with support for Segment Routing and EVPN

- 6 x 100G support on NCS560 4 RU

- Supports industrial temperature conditions

- High Density of 1G/10G/40G/100G ethernet ports. 25G/50G on roadmap

- 100G/200G CFP2 DCO support

- 100G QSFP-DD ZR optics support on roadmap

- Low latency forwarding, typically <10 μs

- Precise frequency and phase/time synchronization using the latest industry standards

- Security- Trust Anchor infrastructure, secure boot, image signing, run-time defense

- Part of Cisco Certified Metro Fabric Design

- MEF 3.0 certified for carrier ethernet deployments

- Rich Quality of Service capabilities for different SLAs

- Excellent manageability

Major applications

Broadband aggregation

The modular Cisco NCS 560-4 Router supports broadband aggregation for delivering "any-play" services (voice, video, data, and mobility). Designed to support thousands of subscribers, the NCS 560 includes Quality of Service (QoS) features that allow the routers to scale to a large number of queues per device. Combined with a highly granular, three-level hierarchical QoS algorithm, a large number of queues can result in a greatly enhanced broadband user experience. This full-featured Layer 2 and Layer 3 router supports a variety of broadband applications, including IPTV and Video on Demand (VoD), enhancing and extending the Cisco Evolved Programmable Network architecture.

Pre-aggregation for mobile applications

Deployed as a pre-aggregation platform for mobile backhaul, the NCS 560-4 Router can aggregate cell sites and use Segment Routing (SR, SR-TE) or Multiprotocol Label Switching (MPLS) as a transport for Radio Access Network (RAN) backhaul traffic. It also provides the timing services required in today's converged access networks by offering integrated support for the Building Integrated Timing Supply (BITS), 10 MHz, 1 Pulse Per Second (1PPS), and Time Of Day (TOD) interfaces. The router also supports Synchronous Ethernet (SyncE), IEEE-1588 Precision Time Protocol (G.8275.1 with G.8273.2 - Class B and G.8275.2), and Global Positioning System (GPS) interfaces. In addition, the NCS 560-4 Router can be deployed in small and rugged environments, due to its shallow depth and qualification for extended temperature ranges.

Metro ethernet aggregation

The NCS 560-4 Router is built to meet service provider requirements for Carrier Ethernet aggregation. It is optimized for remote central office and smaller aggregation sites where a full-featured, modular, small-footprint, and fully redundant aggregation platform is needed. This router offers service flexibility and delivers Layer 2, IP, MPLS, and Segment Routing transport for advanced L2VPN, L3VPN, EVPN and multicast services.

Major differentiators

The NCS 560-4 Router helps service providers deliver highly scalable advanced services for residential broadband, mobile, and Metro Ethernet applications. This allows an operator to provide differentiated and cost-effective services to end users.

Flexible deployment options

The NCS 560-4 Router is designed with a compact form factor to accommodate deployment in small spaces. Available with a range of mounting options, the router can be deployed in space-constrained locations such as ETSI 300-mm deep cabinets. The side-to-side airflow design allows two Cisco NCS 560-4 Routers to be mounted back-to-back in a 600-mm cabinet, while the extended temperature range supported by the router allows it to be deployed in locations with minimum environmental control. Small footprint and extended temperature range support allow service providers to extend the reach of their Carrier Ethernet networks to more challenging and remote locations, yet save money on air conditioning.

High availability and modularity

The NCS 560-4 Router is a modular platform. Cisco offers redundant Route Switch Processors (RSPs), AC and DC power supplies, a high-speed fan tray, and a wide range of Ethernet interface modules. The Ethernet interfaces are available in copper and fiber, with speeds ranging from 100 Mbps to 100 Gbps. The interface modules, power supplies, and fan tray are all field replaceable.

The design of the Cisco NCS 560-4 Router delivers in-box hardware redundancy and supports software redundancy with In-Service Software Upgrade (ISSU) support when a pair of route switch processors is inserted in the chassis.

Operational efficiency

The NCS 560-4 Router features essential capabilities that help service providers simplify and automate the management of their networks through device programmability and services orchestration, promoting efficiency gains in the deployment and operation of the networks. The router provides proactive diagnostic and telemetry tools which help service providers avoid potential problems before they occur, troubleshoot any problems, and implement solutions when problems are diagnosed.

System design

The NCS 560-4 Router is built as fully modular systems with a future-ready design. The router chassis supports online field replacement and upgrades of all components. The NCS 560-4 Router is designed to contain three Fan Trays, up to three Power Supplies, two Route Switch Processor (RSP) cards, and up to 6 Interface Module cards. All components support online replacement and field upgrades.

Fan trays

The NCS 560-4 Router has three high-speed fan tray slots, which must be populated for the system to operate. The Fan Trays contain redundant fans. The system continues to operate on single fan failures across the Fan Trays. The system has been designed to remain operational during the replacement of the Fan Trays. The duration of Fan Tray replacement has a hard time limit imposed on reinsertion of the fan tray depending on the system's ambient temperature. In addition to cooling the chassis, the fan tray also contains a connector for dry-contact inputs and several system-level alarm LEDs.

Filter

The NCS 560-4 Router has a built-in, Field-serviceable dust Filter, located on the far right side of the chassis to allow optimal air flow.

Power supplies

AC and DC power supplies are available for NCS 560-4 Router. Depending on the system module configuration, and redundancy requirements, two or three power supplies might be needed. The system supports operation on a single power supply, while two power supplies will function in a load-share configuration and three power supplies will function in a 2+1 protection scheme. Mixing of AC and DC power supplies in a single operational chassis is supported.

Route switch processor

The Cisco NCS 560-4 Route Switch Processor (RSP4) is the centralized card in the system responsible for control plane, forwarding (data) plane and management plane, and also provides the network-timing. The Cisco NCS 560-4 Route Switch Processor is a Field Replaceable Unit (FRU).

Interface modules

The Cisco NCS 560-4 Router is a modular system with six interface module slots (slots 0 to 5). These slots support a variety of Ethernet interface modules, with interface speeds ranging from 100Mbps to 100Gbps.

Software

The Cisco NCS 560-4 Router operates with Cisco IOS® XR Software, which is a modular operating system. This software is designed to provide modular packaging, feature velocity, and powerful resiliency. For more information on the supported features and software capabilities, see the Cisco IOS XR Software for Cisco NCS 560-4 Router data sheet.

Network management

The Cisco NCS 560-4 Router is supported in the Cisco Evolved Programmable Network (EPN) architectures. Cisco Evolved Programmable Networks Manager (EPN-M) is an end-to-end network management solution that drastically simplifies the design, provisioning, and management of carrier-grade networks. It is a comprehensive solution that centralizes and automates service design, fulfillment, assurance, and performance analysis to help service providers and enterprises lower their costs while meeting high customer expectations.

In addition to the support for EPN-M, the Cisco NCS 560-4 Router also supports device programmability and Services Orchestration capabilities through a variety of embedded Transport Controllers, SDN Controllers and Network Services Orchestration Solutions.

Product specifications

Tables 2 through 4 list the product, power, and environmental specifications for the Cisco NCS 560-4 Router. Tables 5 and 6 provide safety, compliance, and certification information.

Table 1.   Cisco NCS 560-4 Router System specifications

Description	Cisco NCS 560-4 Router
Physical specifications[1]	**NCS560-4** Height: 7 in. (177.88 mm) - 4RU Width: 17.44 in. (443 mm) Depth: 9.5 in. (243.1 mm) Weight: • 55.56 lb (25.2 kg) with two RSPs, three DC power supplies, and loaded with a typical combination of interface module cards • 18 lb (8.12 kg) for an empty chassis **N560-4-RSP4E / N560-RSP4** Height: 1.28 in. (32.5 mm) Width: 14.17 in. (360 mm) Depth: 8.66 in. (220 mm) Weight: 6.24 lb (2.83 kg) **N560-4-FAN-H** Height: 2.51 in. (64 mm) Width: 2.6 in. (66 mm) Depth: 8.66 in. (220 mm) Weight: 1.39 lb (0.63 kg) **N560-4-PWR-FAN** Height: 1.77 in. (45 mm) Width: 2.6 in. (66 mm) Depth: 8.66 in. (220 mm) Weight: 1.04 lb (0.47 kg) **N560-4-FILTER** Height: 3.32 in. (84.3 mm) Width: 0.3 in. (7.6 mm) Depth: 9.69 in. (246.1 mm) Weight: 0.17 lb (0.07 kg)
Rack mounts	19 in. rack mount is an integral part of the chassis ETSI rack mount kit adapter 23 in. rack mount kit adapter
Interface modules	6 interface module slots

Description	Cisco NCS 560-4 Router
Route switch processors	2 RSP slots
Fan tray	3 fan trays with fan redundancy at a system level 4 dry contact input alarms on PWR fan tray
Air flow	Side-to-side airflow; inlet on the right side, outlet on the left side when looking from the front. Front-to-back airflow option available through additional Plenum
Power supplies	3 Power supply slots. Up to 3 Power supplies (1200W AC or DC) can be used in Load share mode The System can operate on a single power supply and supports mixing of AC and DC power supplies in a single chassis
Chassis MTBF at 40° C (104° F) operating temperature (25° C / 77° F ambient temperature)	11,780,000 hours
Fan Tray MTBF at 40° C (104° F) operating temperature (25° C / 77° F ambient temperature)	PWR Fan Tray: 989,000 hours High Speed Fan Tray: 857,000 hours

Table 2.   Power specifications

Description	Cisco NCS 560-4 Router
Power consumption	Maximum input power 975W (@ 65 degrees Celsius maximum operating temperature, including loss). This is equivalent to 3327 BTU per hr. Typical input power depends on the actual configuration and can be checked using the Cisco power calculator tool at http://tools.cisco.com/cpc/
AC input voltage and frequency	Voltage range: 85 to 264 VAC, nominal 115 to 230 VAC Frequency Range: 47 to 63 Hz, nominal 50 to 60 Hz
AC Power Supply MTBF at 40° C operating temperature	1,300,000 hours
DC input voltage	For 1200W DC power supply, voltage range: –40.8V to –72V DC, nominal –48V/–60V DC
DC Power Supply MTBF at 40° C operating temperature	1,460,000 hours
Power Supply shipment packaging size (LxWxH)	15.44 in. x 9.44 in. x 4.31 in.
Power Supply shipment weight	3.6 lbs.

Table 3.   Environmental specifications

Description	Cisco NCS 560-4 Router
Operating environment and altitude[1]	-40 to 65°C operating temperature -60 to 1800m operating altitude (for full operating temperature range) Up to 4000m operating altitude (at up to 40°C temperature)
Outside plant	For an outside plant installation, it is required that the router be protected against airborne contaminants, dust, moisture, insects, pests, corrosive gases, polluted air, or other reactive elements present in the outside air. To achieve this level of protection, it is recommended that the unit be installed in an environmentally sealed enclosure. Cabinets that conform to GR-487 are considered environmentally sealed. In addition, closures with a minimum NEMA rating of 4 or a minimum IP 66 rating can be considered environmentally sealed
Relative humidity	5 to 95%, noncondensing
Acoustic noise[3]	Acoustic noise peak operation complies with Network Equipment Building Standards (NEBS) GR-63-Core Issue 5 sound power level of 70 dBA at 27°C operation as measured by the ANSI S12.10/ISO 7779 NAIS noise measurement test standard
Storage environment	Temperature: -40 to 70°C altitude: 15,000 ft (4570m)
Seismic	Zone 4
Hazardous substances	Reduction of Hazardous Substances (ROHS) 6

[1]Minimum temperature range of chassis, fan tray, RSP engine, power supply, optics, and interface modules will dictate the supported operating temperature range. Maximum cooling fan tray module is assumed.

Table 4.   Safety and compliance

Type	Standards
Safety	• UL 60950-1, 2nd edition • CAN/CSA C22.2 No. 60950-1-07 2nd edition • IEC 60950-1, 2nd edition • EN 60950-1, 2nd edition • AS/NZS 60950.1:2003
Electromagnetic	• FCC CFR47 Part 15 Class A
Emissions compliance	• EN 55032:2012/ AC:2013 • EN 55032:2015 • CISPR 32 Edition 2 • EN61000-3-2: 2014 • EN61000-3-3: 2013 • EN 300 386 V1.6.1 • ICES-003 Issue 6: 2016 • VCCI Class A • TCVN 7189: 2009 • CNS13438: 2006

Type	Standards
	- KN 32: 2015
	- EN301 489-19:2017: V2.1.0
	- EN301 489-1:2017: V2.1.1
	- EN 303 413 V1.1.1
Immunity compliance	- CISPR24: 2010 + A1: 2015
	- EN300 386:2012:V1.6.1
	- EN55024: 2010 + A1: 2015
	- TCVN 7317: 2003
	- EN55035:2017
	- EN61000-6-1:2007
	- EN61000-6-2:2005
	- IEC61000-6-1:2016:Ed:3
	- IEC61000-6-2:2016:Ed:3
	- KN35:2015
	- EN301 489-19:2017: V2.1.0
	- EN301 489-1:2017: V2.1.1
NEBS[1]	- GR-63-CORE Issue 5
	- GR-1089-CORE Issue 7
	- SR-3580 NEBS Level 3
	- GR-3108 (Class-1 for non-coated PIDs and Class-2 for conformal coated PIDs)
ETSI	- ETS/EN 300 119 Part 4[1]
	- ETS/EN 300 019 - Storage: Class 1.2, Transportation: Class 2.3, In-Use/Operational: Class 3.2
	- ETS/EN 300 753
Network synchronization	- ANSI T1.101
	- GR-1244-CORE
	- GR-253-CORE
	- ITU-T G.703 clause 5
	- ITU-T G.703 clause 9
	- ITU-T G.781
	- ITU-T G.813
	- ITU-T G.823
	- ITU-T G.824
	- ITU-T G.8261/Y.1361
	- ITU-T G.8265.1
	- ITU-T G.8273.2 - Class B
	- ITU-T G.8275.1
	- ITU-T G.8275.2
	- IEEE1588-2008

[1] Notable exception: Compliant with ETSI racks without doors

Table 5.   Certifications

Description	Cisco NCS 560-4 Router
Common Criteria	Cisco NCS 560-4 Router running Cisco IOS XR 6.6.25 Software
MEF	Carrier Ethernet (CE) 1.0 and CE 2.0. MEF 9 and MEF 14 Carrier Ethernet (CE) 3.0 with XR 6.6.25 Software
IEEE 1588-2008	1588™ SLAVE (IEEE CONFORMITY ASSESSMENT PROGRAM) • IEEE 1588™ Conformity Test Suite for Frequency Synchronization in Telecommunications Networks - Packet Slave Clock • IEEE Std 1588™-2008 and Recommendation ITU-T G.8265.1 (10/2010) with Amendments 1 (04/2011) and 2 (10/2012)

Ordering information

Table 6.   Ordering information for NCS 560 4 RU Hardware

Part Number	Description
N560-4-SYS-E	NCS 560-4 4RU System ATO, 800G, XL scale, Redundant RSP
N560-4-SYS	NCS 560-4 4RU System ATO, 800G, L scale, Redundant RSP
N560-4-SYS-E-BUN1	NCS 560-4 4RU System ATO, 800G, XL scale, Single RSP
N560-4-SYS-BUN1	NCS 560-4 4RU System ATO, 800G, L scale, Single RSP
NCS560-4	NCS 560-4 Router Chassis
NCS560-4=	NCS 560-4 Router Chassis, Spare
N560-4-RSP4E	NCS 560-4 Route Switch Processor 4 Enhanced, 800G, XL scale
N560-4-RSP4E=	NCS 560-4 Route Switch Processor 4 Enhanced, 800G, XL scale, Spare
N560-4-RSP4	NCS 560-4 Route Switch Processor 4, 800G, L scale
N560-4RSP4=	NCS 560-4 Route Switch Processor 4, 800G, L scale, Spare
N560-4-FAN-H	NCS 560-4 High Speed Fan Tray
N560-4-FAN-H=	NCS 560-4 High Speed Fan Tray, Spare
N560-4-PWR-FAN	NCS 560-4 Power High Speed Fan Tray
N560-4-PWR-FAN=	NCS 560-4 Power High Speed Fan Tray, Spare
N560-4-FILTER	NCS 560-4 Filter
N560-4-FILTER=	NCS 560-4 Filter Spare
N560-4-RCKMNT-U	NCS 560-4 Rackmount Universal Adapter - ETSI, 23 inch

Part Number	Description
N560-4-RCKMNT-U=	NCS 560-4 Rackmount Universal Adapter – ETSI, 23 inch, Spare
N560-4-CAB-BRKT	NCS 560-4 Cable Guide Bracket
N560-4-CAB-BRKT=	NCS 560-4 Cable Guide Bracket, Spare
N560-4-F2B-AIR-U	NCS 560-4 Front to Back Airflow Plenum, Universal
N560-4-F2B-AIR-U=	NCS 560-4 Front to Back Airflow Plenum, Universal, Spare
N560-4-F2B-AIR-V	NCS 560-4 Front to Back Airflow Plenum, Vertical Mount
N560-4-F2B-AIR-V=	NCS 560-4 Front to Back Airflow Plenum, Vertical Mount, Spare
A900-PWR1200-A	ASR 900 1200W AC Power Supply
A900-PWR1200-A=	ASR 900 1200W AC Power Supply, Spare
A900-PWR1200-D	ASR 900 1200W DC Power Supply
A900-PWR1200-D=	ASR 900 1200W DC Power Supply, Spare
N560-PWR1200-D-E	NCS 560 1200W DC Power Supply Enhanced, Dying Gasp
N560-PWR1200-D-E=	NCS 560 1200W DC Power Supply Enhanced, Dying Gasp, Spare
N560-4-PWR-BLANK	NCS 560-4 Power Supply Blank Cover
N560-4-PWR-BLANK=	NCS 560-4 Power Supply Blank Cover, Spare
N560-4-RSP-BLANK	NCS 560-4 Route Switch Processor Type-B Blank Cover
N560-4-RSP-BLANK=	NCS 560-4 Route Switch Processor Type-B Blank Cover, Spare
N560-4-IMA-BLANK	NCS 560-4 Interface Module Blank Cover
N560-4-IMA-BLANK=	NCS 560-4 Interface Module Blank Cover, Spare

Table 7.   Ordering information for software licenses available on NCS 560 portfolio

Product ID (PID)	Description
ESS-AC-100G-RTU-1	Access Essentials SW Right-to-Use v1.0 per 100G
ADV-AC-100G-RTU-1	Access Advantage w/o Essentials SW RTU v1.0 100G
ADN-AC-100G-RTU-1	Access Advantage w/ Essentials SW RTU v1.0 100G
ESS-ADN-AC-100G-RT	Access Essentials to Advantage Upgrade RTU per 100G
ESS-AC-100G-SIA-3	Access Essentials SIA 100G 3-5 year term
ESS-AC-100G-SIA-5	Access Essentials SIA 100G 5-10 year term

Product ID (PID)	Description
ADV-AC-100G-SIA-3	Access Advantage w/o Essentials SIA 100G 3-5 year term
ADV-AC-100G-SIA-5	Access Advantage w/o Essentials SIA 100G 5-10 year term
ADN-AC-100G-SIA-3	Access Advantage w/ Essentials SIA 100G 3-5 year term
ADN-AC-100G-SIA-5	Access Advantage w/ Essentials SIA 100G 5-10 year term
ESS-ADN-AC100G-S3	Access Essentials to Advantage Upgrade SIA 100G 3-5 yrs
ESS-ADN-AC100G-S5	Access Essentials to Advantage Upgrade SIA 100G 5-10 yrs
N560-FC-SW	NCS 560 Series additional Software Licenses (RTU, SIA)

Warranty information

Warranty information is available on Cisco.com at the [Product Warranties](#) page.

Product sustainability

Information about Cisco's environmental, social and governance (ESG) initiatives and performance is provided in Cisco's CSR and sustainability [reporting](#).

Table 8.   Product sustainability

Sustainability Topic		Reference
General	Information on product-material-content laws and regulations	[Materials](#)
	Information on electronic waste laws and regulations, including our products, batteries and packaging	[WEEE Compliance](#)
	Information on product takeback and resuse program	[Cisco Takeback and Reuse Program](#)
	Sustainability Inquiries	Contact: csr_inquiries@cisco.com
Material	Product packaging weight and materials	Contact: environment@cisco.com

Service and Support

Cisco offers a wide range of services programs to help accelerate customer success. These innovative services programs are delivered through a unique combination of people, processes, tools, and partners, promoting high levels of customer satisfaction. Cisco Services help you protect your network investment, optimize network operations, and prepare your network for new applications to extend network intelligence and the power of your business. For more information about Cisco Services, refer to Cisco Technical Support Services or Cisco Advanced Services.

Cisco is committed to reducing your total cost of ownership. Cisco offers a portfolio of technical support services to help ensure that Cisco products operate efficiently, remain highly available, and benefit from the most up-to-date system software. The services and support programs described in Table 7 are available as part of the Cisco Carrier Ethernet Switching Service and Support solution and are available directly from Cisco and through resellers.

Table 9.   Service and Support

Advanced Services	Features	Benefits
Cisco Total Implementation Solutions (TIS), available directly from Cisco **Cisco Packaged TIS, available through resellers**	• Project management • Site survey, configuration, and deployment • Installation, text, and cutover • Training • Major moves, adds, and changes • Design review and product staging	• Supplement existing staff • Help ensure functions meet needs • Mitigate risk
Cisco SP Base Support and Service Provider-Based Onsite Support, available directly from Cisco **Cisco Packaged Service Provider-Based Support, available through resellers**	• 24-hour access to software updates • Web access to technical repositories • Telephone support through the Cisco Technical Assistance Center (TAC) • Advance replacement of hardware parts	• Facilitate proactive or expedited problem resolution • Lower total cost of ownership by taking advantage of Cisco expertise and knowledge • Reduce network downtime

Cisco Capital

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Cisco Capital makes it easier to get the right technology to achieve your objectives, enable business transformation and help you stay competitive. We can help you reduce the total cost of ownership, conserve capital, and accelerate growth. In more than 100 countries, our flexible payment solutions can help you acquire hardware, software, services and complementary third-party equipment in easy, predictable payments. Learn more.

Document history

New or revised topic	Described in	Date
Updated Table 7. Ordering information for software licenses available on NCS 560 portfolio	Ethernet Interface Modules	7/14/2021