Cisco Network Convergence System 4000 Series

Product Overview

The Cisco® Network Convergence System 4000 (NCS 4000) Series is a converged optical service platform providing dense wavelength-division multiplexing (DWDM), Optical Transport Network (OTN), Multiprotocol Label Switching (MPLS), Carrier Ethernet, and label switch router (LSR) or IP multiservice capabilities (Figure 1). It delivers massive scale through a state-of-the-art silicon and system design, while offering dramatic network efficiency and simplification led by innovations in usability, automation, service management, turn-up, and monitoring.

Figure 1.　Cisco NCS 4016 Chassis (Right) and NCS 4009 Chassis (Left)

To facilitate packet-optical integration, the form factor of the NCS 4000 Series is compliant with typical carrier environments, with a notably shallow footprint to address ANSI and ETSI transport equipment requirements. You can deploy the system in 19- or 23-in.-wide ANSI footprints and 600x600-mm-ETSI footprints.

Two chassis form factors are available:

- The Cisco NCS 4016 is a 24-rack-unit (24RU), rack-mountable solution offering 16 service line-card slots, each with a full-duplex bandwidth of 400 Gbps, with different cards for packet forwarding, OTN switching, and coherent DWDM transponder or trunk capability.
- The Cisco NCS 4009 is a 15-rack-unit (15RU), rack-mountable solution offering 9 service line-card slots, each with a full-duplex bandwidth of 400 Gbps, with different cards for packet forwarding, OTN switching, and coherent DWDM transponder or trunk capability.

Depending on the specific card configuration, the NCS 4000 Series supports numerous capabilities, including:

- Packet switching and routing
- OTN switching
- DWDM transponding and muxponding

You can use the NCS 4000 Series as a converged packet-optical platform by simultaneously combining all of these functions.

Features and Benefits

The key capabilities of the Cisco NCS 4000 Series platform include:

- Packet switching: Packet switching includes IP transport, MPLS, LSR, and Carrier Ethernet, supporting 10, 40, and 100 Gigabit Ethernet interfaces with optional OTN (OTU-2, OTU-3, or OTU-4) encapsulation.

- OTN switching: OTN switching includes full optical channel data unit level 0 (ODU-0) switching with ports supporting SONET/SDH, Ethernet, and Channelized OTN; 10 Gigabit Ethernet (OTU-2), 40 Gigabit Ethernet (OTU-3), and 100 Gigabit Ethernet (OTU-4).

- Ultra-dense integrated DWDM: This feature offers full DWDM integration with support for IP-over-DWDM features including the Cisco nLight Control Plane Protocol.

- Hybrid traffic: OTN and packet switching can occur simultaneously, providing the ability to route or switch packet flows within a larger OTN container.

- Superior power efficiency: Cisco CPAK® pluggable transceivers and innovative silicon and power management solutions reduce power draw and increase density.

The Cisco NCS 4000 Series implements numerous architectural innovations, including:

- Agnostic fabric: This highly scalable fabric supports both packet and time-division multiplexing (TDM) switching, plus shelf and multichassis scale to more than 100 Tbps.

- Virtualized infrastructure: This innovative hypervisor-based software architecture supports full decoupling of the control and data planes. The architecture supports service integration capabilities that offer considerable flexibility to deploy applications within the platform or in the cloud.

- Multichassis and back-to-back (B2B) configurations: In a multichassis configuration, the system can deliver more than 100 Tbps of fully nonblocking switching capacity in a configuration with 24 line-card chassis and 6 fabric chassis (24 + 6).

- Full in-service software upgrade (ISSU) with zero topology loss (ZTL) and zero packet loss (ZPL): This feature offers improved adherence to service-level agreements (SLAs) and performance of software upgrades without requiring a maintenance window. This robust ISSU capability applies to the WDM, TDM, and packet capabilities of the system.

- State-of-the-art backplane technology ready to scale to 800 Gbps per slot: This technology provides the ability to scale the system by a factor of four within the initial footprint.

The NCS 4000 Series integrates easily with the Cisco NCS 2000 Series for fully programmable reconfigurable optical add-drop multiplexer (ROADM) functions. Integration can occur at the network element, control plane, and/or network management levels, meeting the diverse needs of widely varying operational models.
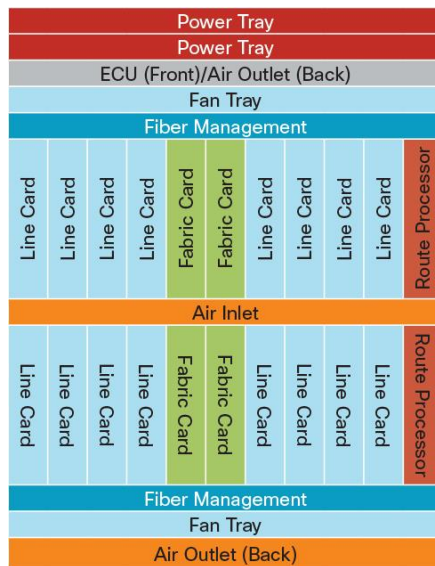
Platform Architecture
Cisco NCS 4016 Chassis

The NCS 4016 chassis is designed to accommodate:

- Two route processors, which also act as shelf controllers for WDM or OTN applications
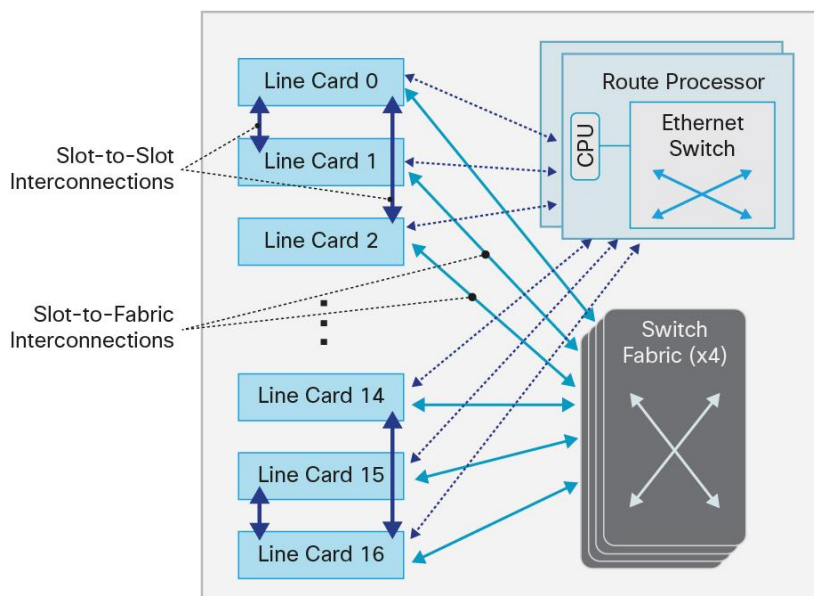- Four fabric cards
- Sixteen line cards

The NCS 4016 system supports four fabric cards, which are agnostic cross-connects based on a flexible cell-switching architecture, used in a Clos configuration. The route processors handle all control functions, including both the route-processing function and the line-card processing functions necessary for high-scale Layer 1, 2, and 3 services (Figure 2).

Figure 2.   Cisco NCS 4016 Shelf Architecture

Each line card is connected through the backplane to each of the four fabrics, which operate in a 3 + 1 redundant configuration (Figure 3). Additional backplane connections are available to pair slots within each quadrant of the NCS 4016 chassis, allowing direct backplane interconnection of line cards without fabric access.

Figure 3.   Cisco NCS 4016 Backplane Architecture

Cisco NCS 4009 Chassis

The NCS 4009 chassis is designed to accommodate:

- Two route processors, which also act as shelf controllers for WDM or OTN applications
- Four fabric cards
- Nine line cards

The NCS 4009 system supports four fabric cards, which are agnostic cross-connects based on a flexible cell switching architecture. The route processors handle all control functions, including both the route-processing function and the line-card processing functions necessary for high-scale Layer 1, 2, and 3 services (Figure 4).

Figure 4.　Cisco NCS 4009 Shelf Architecture
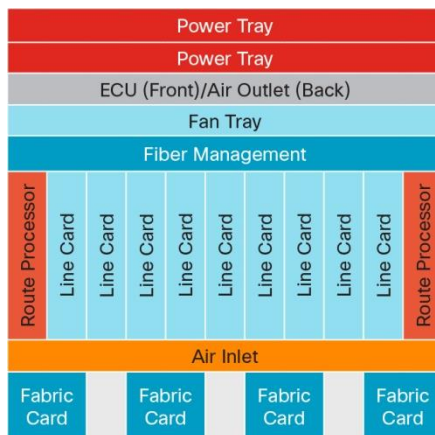
Each line card is connected through the backplane to each of the four fabrics, which operate in a 3 + 1 redundant configuration (Figure 5). Additional backplane connections are available to pair slots of the NCS 4009 chassis, allowing direct backplane interconnection of line cards without fabric access.

Figure 5.　Cisco NCS 4009 Backplane Architecture
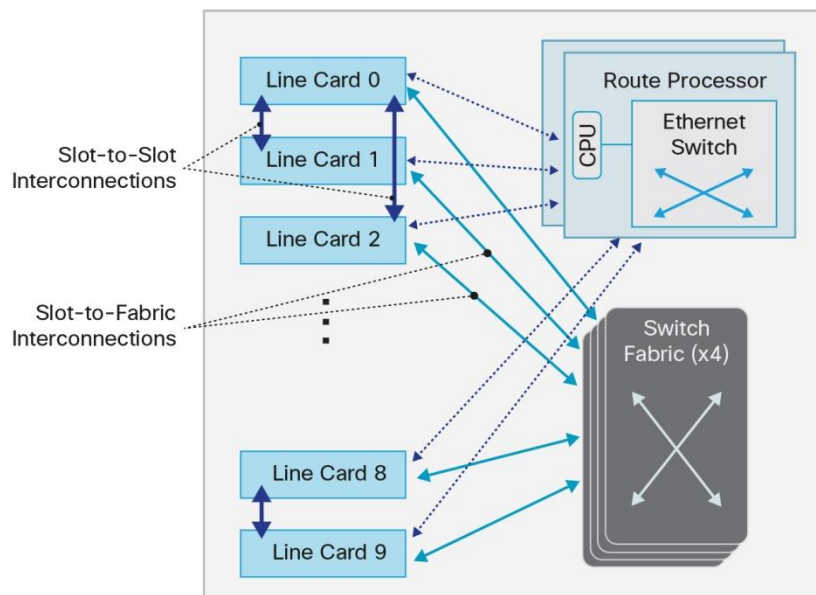
OTN Functions

The NCS 4000 Series provides full ITU G.872-compliant OTN switching functions. It supports ODU-0 to ODU-4 multilayer switching and grooming, including nested OTN switching. The NCS 4016 system supports single-chassis switching of 3.2 Tbps fully nonblocking at ODU-0 level (2560 ODU-0 or ODU-Flex data units) while the NCS 4009 system supports single-chassis switching of 1.8 Tbps fully nonblocking at ODU-0 level (1440 ODU-0 or ODU-Flex data units).

The NCS 4000 Series is compliant with ITU G.709/G.798, allowing the cascading of at least 20 OTN cross-connects while maintaining jitter and wander specifications. It also complies with ITU G.709 operations, administration, and maintenance (OAM) standards, with six levels of tandem connection monitoring (TCM) support.

OTN configuration, provisioning, and protection are managed by a Generalized MPLS (GMPLS)-based OTN control plane supporting an embedded User-Network Interface (UNI) as the communication interface between control planes managing different transport layers within the same system. The control-plane instance runs inside the optical domain (overlay network scenario), providing an external UNI to client nodes for invocation of on-demand services.

As an extension of the Cisco nLight Control Plane Protocol, an OTN circuit between ingress and egress nodes can be established statically or dynamically using Resource Reservation Protocol (RSVP) signaling. An OTN circuit is established and maintained as a label switched path (LSP) between the ingress and egress LSRs, switched through transit LSRs. An LSP can be established as a soft permanent connection (SPC) when the request comes from the user interface.

Protection Mechanisms

The Cisco NCS 4000 Series platform provides a variety of different protection mechanisms operating at different layers. Although pure Layer 3, Layer 2, Layer 1, and Layer 0 protection mechanisms are defined, a holistic approach to protection is critical when multiple layers are operating simultaneously.

Currently supported protection mechanisms are:

- Layer 1: OTN: Subnetwork Connection Protection (SNCP/I, SNCP/N, and SNCP/S), 1+1

Management Solution

The NCS 4000 Series solution integrates a state-of-the-art local craft interface, which can install, configure, monitor, and troubleshoot NCS 4000 Series applications both at the node and network levels.

Cisco Evolved Programmable Network Manager (EPN-M) provides end-to-end management as well as full fault, configuration, accounting, performance, and security (FCAPS) functionalities for the Cisco NCS 4000 Series, NCS 2000 Series, and Cisco ONS devices. It also provides end-to-end management of OTN and IP + Optical converged services, making it possible to manage transport and IP networks with fewer steps to promote operational efficiency.

Cisco NCS 4000 Series Line Cards

The following line cards are available for the NCS 4000 Series:

Commons:

- NCS 4000 Router Processor and Controller
- NCS 4000 External Connection Unit
- NCS 4016 Agnostic Cross Connect - Multi-chassis
- NCS 4009 Agnostic Cross Connect - Single-chassis

NCS 4000 Line card:

- NCS 4000 24 Port Low rate OTN Line Card - SFP
- NCS 4000 2x 100G CPAK 10x10G SFP+ OTN/Packet Line Card
- NCS 4000 2 x 100G CP-DQPSK - Full C band Tunable Line Card
- NCS 4000 400G OTN/Packet/WDM Combo Line card

Route Processor

The Cisco NCS 4000 Route Processor is based on an Intel IvyBridge 10-core CPU with 32 Gigabytes of RAM and equipped with a 50-Gigabyte solid-state drive (SSD). A second SSD is accessible through the faceplate on the external connection unit (ECU) to provide access to logging data and additional storage space. A USB flash memory device is also available for debugging capabilities.

Figure 6.   Route Processor Line Card
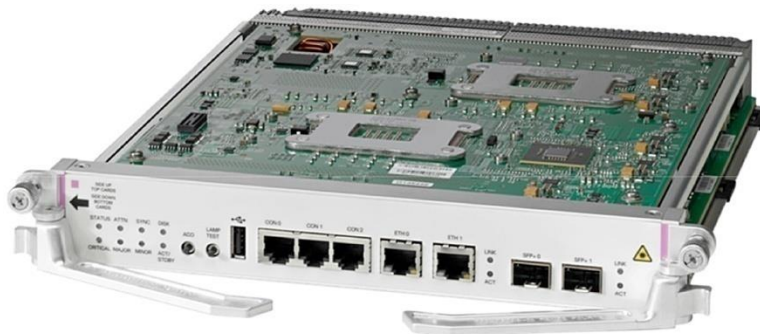
The route processor holds the control, timing, monitoring, and management functions of the NCS 4000 Series chassis. Multiple LEDs are available on the face plate to summarize the status of the system. The route processor provides external interfaces through an ECU and supports the following interfaces on the front panel:

- One USB 2.0 for CPU access
- Two RJ-45 10/100/1000 Ethernet interfaces
- Two enhanced Small Form-Factor Pluggable (SFP+) 10 Gigabit Ethernet management interfaces

External Connection Unit

The ECU provides all shelf electrical I/O connectivity to the active and standby route-processor line cards (Figure 7). In addition, the ECU houses two 1.8-in. SSDs, plus the serial interface connector for the touch screen. The ECU board and carrier have openings to permit exhaust air from the fans to pass through the ECU and flow through the power filters for cooling. The available interfaces of the ECU are listed in Table 1.

Figure 7.   External Connection Unit
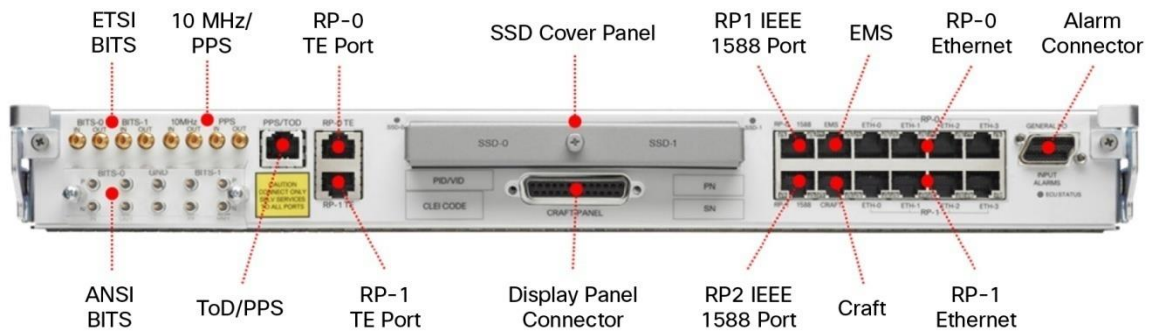
Table 1.   External Connection Unit Interfaces

| I/O Standard	I/O Connector Type	Quantity	Function
Fast or Gigabit Ethernet	RJ-45	1	Management of administrative virtual machine
Fast or Gigabit Ethernet	RJ-45	1	Management of Cisco IOS® XR virtual machine
Fast or Gigabit Ethernet	RJ-45	6	Multishelf management of Cisco NCS 2006
Fast or Gigabit Ethernet	RJ-45	2	IEEE 1588 Ethernet port
Proprietary	RJ-45	2	Proprietary timing expansion ports
Proprietary	Small Computer System Interface (SCSI)	2	2 dry contacts or alarm SCSI connectors
Telecom E1	Mini BNC	2	Building Integrated Timing - ETSI In/Out
Telecom T1	Mini BNC	2	Building Integrated Timing - ANSI In/Out
SSD	1.8-in. drive	2	1 SDD for RP0 + 1 SDD for RP1
Touch screen connector	Universal Asynchronous Receiver/Transmitter (UART)	1	ECU touchscreen connections
RS-422	RJ-45	1	IEEE 1588 Time of Day/Pulse Per Second (TOD/PPS)
	Mini BNC	2	IEEE 1588 10-MHz Clock In/Out
	Mini BNC	2	IEEE 1588 Synch In/Out

Fabric Line Cards

The Cisco NCS 4016 system supports four fabric line cards operating in a 3 + 1 redundant configuration (Figure 8). Each fabric card supports equally distributed connectivity across all 16 line cards. The fabric card is managed directly by the centralized route processor.

Two versions of fabric card are available: 200G and 400G fabric card (Figure 9).

Figure 8.   NCS 4016 200G Multichassis Fabric Line Card
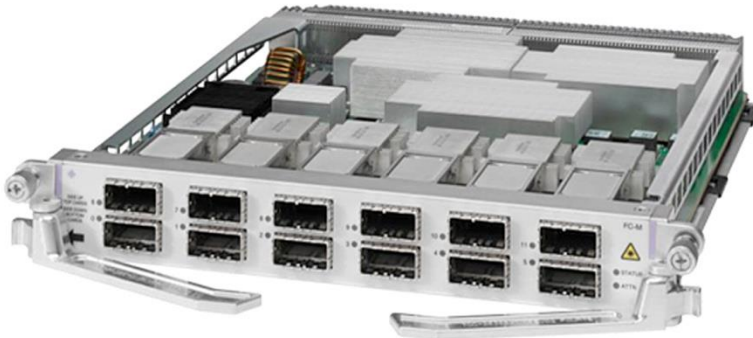
Figure 9.   NCS 4016 400G Multichassis Fabric Line Card (NCS 4016 Fabric V2)

The fabric is considered agnostic because it switches cells of variable sizes without knowledge of the protocol being transported, whether OTN or Ethernet. Each NCS 4016 line card is connected to all four fabric cards, one of which is redundant, allowing for full operation with three functional planes. Twelve front-panel connectors (CXP for 200G version and CXP2 for 400G version) allow a single-chassis system to migrate to a back-to-back or multichassis configuration.

The Cisco NCS 4009 system supports four fabric line cards operating in a 3 + 1 redundant configuration. Each fabric card supports equally distributed connectivity across all nine line-cards. The fabric card is managed directly by the centralized route processor. The NCS 4009 also supports two versions of fabric line cards at 200G or 400G that are unique to the NCS 4009 and are optimized for single-chassis applications.

Figure 10.   NCS 4009 200G Single-Chassis Fabric Line Card

Figure 11. NCS 4016 400G Single-Chassis Fabric Line Card (NCS 4009 Fabric V2)
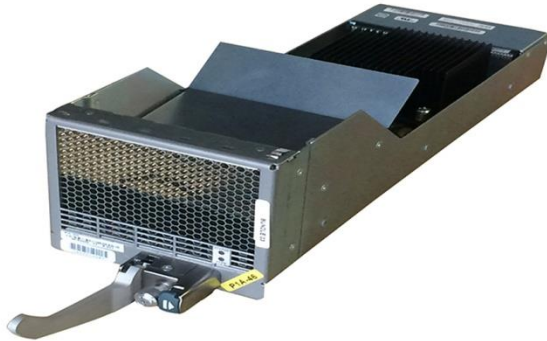
Powering

NCS 4016 is designed for up to 12KW from infrastructure standpoint (cooling capacity, thermal management and power distribution) while NCs 4009 is design for up 6.5KW.

Two different versions of chassis is available, AC Power and DC Power.

Power Input is on the back of the Power Entry Modules (on the Top of the chassis) even if a mechanical adapter is available to port the inputs on the front allowing "front access" only application.

DC Power

Up to 8 Power Supplier Units feeds the two Power Entry Modules of the chassis (on top of the chassis)

Supported PSU Redundancy is M+N (up to 6+2 or 7+1).

Each PSU (showed in Figure below) supports two feeds from two pairs of redundant 48V sources with a nominal power of 1,750W

Figure 12. Cisco NCS 4000 DC Power System Unit - 1750 W - Balanced A and B

System can be upgraded during lifetime without any traffic disruption; adding PSU after PSU pending number of Line Cards used

Base config is with 3x PSU (2+1 DC).

50 A nominal feed shall be provided connected with 4 AWG cables

Figure 13. NCS 4016 Dual DC Power Entry Module equipped with 4 x DC PSU for each of the PEM
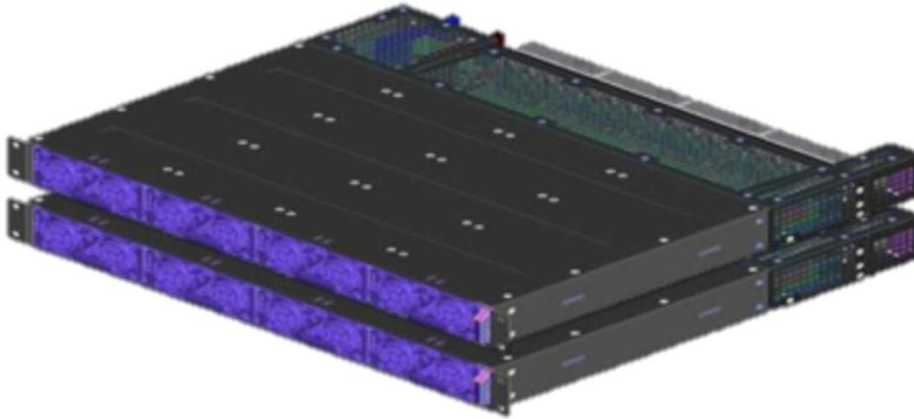
AC Power

Up to 8 Power Supplier Units feeds the two Power Entry Module of the chassis (on top of the chassis), supporting N+N PSU Redundancy

Each AC PSU (showed in below picture) supports 3KW, with Single-phase 220V, 15A circuits

Figure 14. Cisco NCS 4000 AC Power System Unit - 3000 W

System can be upgraded during lifetime without any traffic disruption; adding PSU after PSU pending number of Line Cards used

Base config is with 2x PSU (2+2 AC).

Figure 15. NCS 4016 Dual AC Power Entry Module equipped with 4 x AC PSU for each of the PEM
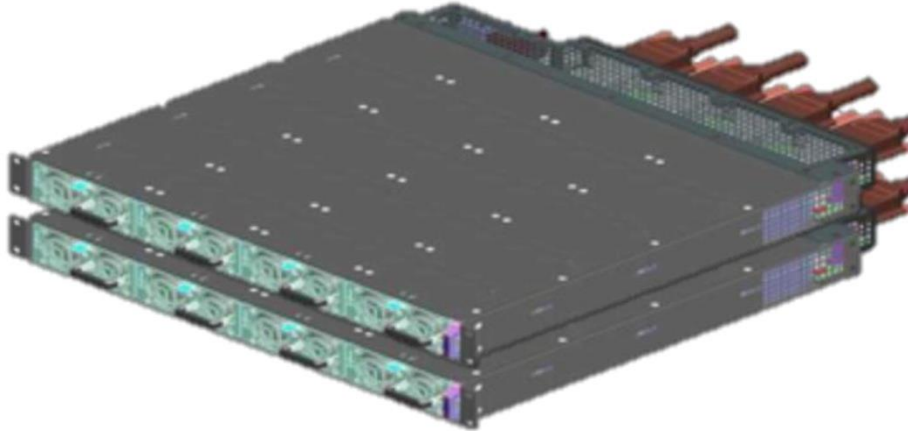
Fans

NCS 4016 chassis accommodates two fan trays. The fan trays exist in the chassis exhaust baffle and pull air through the system. Each fan tray consists of 6 fans and a fan control board. The 6 fans in a fan tray are controlled by 3 separate control circuits, and are powered from 3 independent power feeds

Figure 16. Fan trays
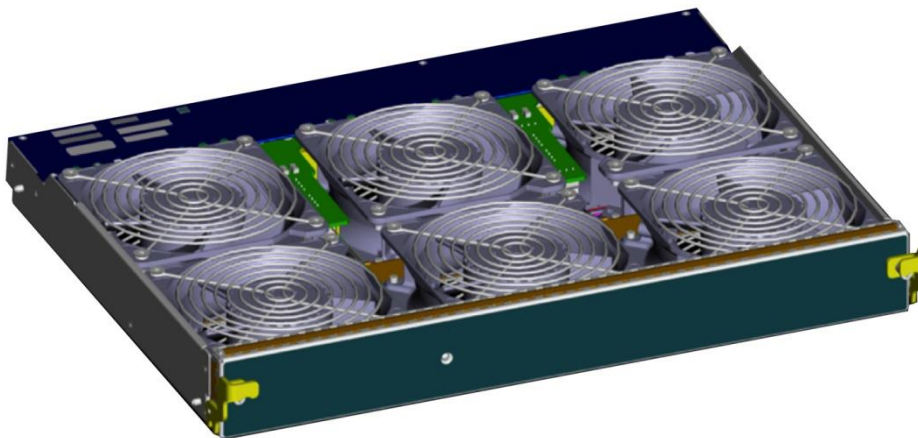
Fan tray in the bottom slot must be inserted reversed up compared to the one inserted in the top slot.

In NCS 4009, a single fan tray is positioned at the exhaust of each card cage. Fan Tray is common between NCS 4016 and NCS 4009

Product Specifications

Table 2 lists the specifications of the Cisco NCS 4000 Series platform.

Table 2.   Cisco NCS 4000 Product Specifications

Feature	Description	
Software compatibility	Cisco IOS XR Software Release 5.2.4.7 onward is required to support 200G fabric for both NCS 4016 and NCS 4009 Cisco IOS XR Software Release 6.0.1 is required to support 400G fabric (V2 fabric) for NCS 4016 Cisco IOS XR Software Release 6.1.2 is required to support 400G fabric (V2 fabric) for NCS 4009	
Protocols	Control plane: • Simple Network Management Protocol (SNMP) • Programmatic interfaces (XML) • GUI (Cisco Transport Controller) Control management: • SNMP • Programmatic interfaces (XML) • GUI (Cisco Transport Controller) • Command-line interface (CLI) • Transaction Language 1 (TL1) Security: • Message Digest Algorithm 5 (MD5) • IP Security (IPsec) Protocol • Secure Shell (SSH) Protocol Version 2 (SSHv2) • Secure FTP (SFTP) • Secure Sockets Layer (SSL)	
Components	Each NCS 4016 chassis supports: • Two route processors • Two fan trays and filters • Four fabric cards • One ECU • Two power shelves (either DC or AC) • Cisco NCS 4000 Series Line Cards	Each NCS 4009 chassis supports: • Two route processors • One fan trays and filters • Four fabric cards • One ECU • Two power shelves (either DC or AC) • Cisco NCS 4000 Series Line Cards
Line cards	OTN/Packet line cards: • Converged 2x100G, 10G line card OTN line cards: • 24 Port Low rate OTN Line Card - SFP DWDM line card: • 2 x 100G CP-DQPSK - Full C band Tunable Line Card	
Features and functions	OTN switching: • Full ODU-0 level switching with ports supporting SONET/SDH, Ethernet, Channelized OTN, 10 Gigabit Ethernet (GE) (OTU-2), 40 GE (OTU-3), and 100 GE (OTU-4) • ODU-Flex support • 6-level TCM DWDM functions: • 100 Gbps CP-DQPSK 96chs tunable 4500 km capable reach WDM interfaces OTN over DWDM functions: • Any mix of OTN and WDM services in the same chassis up to chassis capacity • OTNoWDM services without need of external cable connectivity between OTN and WDM line card (backplane connectivity between OTN LC and WDM LC)	
System capacity	NCS 4016: 400 Gbps per line card for 6.4-Tbps total switching capacity per chassis	NCS 4009: 400 Gbps per line card for 3.6-Tbps total switching capacity per chassis

Feature	Description
Reliability and availability	System redundancy: • Power-shelf redundancy N+M • Fan-tray redundancy 1:1 • Route-processor redundancy 1:1 • Fabric-card redundancy 1:4 Software features: • Line-card online insertion and removal (OIR) support • Fabric-card OIR support • Out of resource management • Virtual machine (VM) redundancy • O-SNCP/I 1 + 1 protection • O-SNCP/N 1 + 1 protection • O-SNCP/S 1 + 1 protection • 1 + R ODUk restoration in real time • 1 + 1 automatic protection switching (APS) for SONET client
MIBs	SNMP framework support: • SNMPv1 • SNMPv2c • SNMPv3 • MIB II, including interface extensions (RFC 1213) • SNMP-FRAMEWORK-MIB • SNMP-TARGET-MIB • SNMP-NOTIFICATION-MIB • SNMP-USM-MIB • SNMP-VACM-MIB System management: • CISCO- BULK-FILE-MIB • CISCO-CONFIG-COPY-MIB • CISCO-CONFIG-MAN-MIB • CISCO-FLASH-MIB • CISCO-MEMORY-POOL-MIB • Cisco FTP Client MIB • Cisco Process MIB • Cisco Syslog MIB • CISCO-SYSTEM-MIB • CISCO-CDP-MIB • IF-MIB (RFC 2233/RFC 2863) Quality of service (QoS): • MQC-MIB (Cisco Class-Based QoS MIB) • CISCO-PING-MIB Chassis: • ENTITY-MIB (RFC 2737) • CISCO-entity-asset-MIB • CISCO-entity-sensor-MIB • CISCO-FRU-MIB (Cisco-Entity-FRU-Control-MIB) Fabric: • CISCO-Fabric-Mcast-MIB • CISCO-Fabric-Mcast-Appl-MIB Traps: • RFC 1157 • Authentication • Linkup • Linkdown • Coldstart • Warmstart

Feature	Description
Network management	• Enhanced CLI • XML interface • SNMP and MIB support • Cisco Transport Controller local craft interface • TL1 • Cisco Prime Network
Programmatic interfaces	• XML schema support
Power	Support for both DC and AC power modules[*]: • 3-kW AC power module • 1.75-kW DC power modules • Worldwide ranging AC (200 to 240V; 50 to 60 Hz; 16A maximum) • Worldwide ranging DC (-40 to -72V; 50A maximum)
Environmental conditions	• Storage temperature: -40 to 158°F (-40 to 70°C) • Operating temperature: ◦ Normal: 41 to 104°F (5 to 40°C) ◦ Short term: 23 to 122°F (-5 to 50°C)[**] ◦ Relative humidity: 5 to 85%
Physical Specifications	**NCS 4016** • Height: 42 in. (1067 mm) • Width: 17.5 in. (444 mm) Depth: • DC power: 17.71 in. (450 mm) including cosmetic door, fiber horizontal cable management, and backplane rear cover • AC power: 18.7 in. (475 mm) including cosmetic door, fiber horizontal cable management, and backplane rear cover. AC power cables will extend to 550 mm. Weight: • Unloaded: 157.6 lb (71.5 kg) • Fully Loaded: 283.3 lb (128.5kg) **NCS 4009** • Height: 26.25 in. (667 mm) • Width: 17.5 in. (444 mm) Depth: • DC power: 17.71 in. (450 mm) including cosmetic door, fiber horizontal cable management, and backplane rear cover • AC power: 18.7 in. (475 mm) including cosmetic door, fiber horizontal cable management, and backplane rear cover. AC power cables will extend to 550 mm. Weight: • Unloaded: 105.1 lb (48 kg)
Rack Mounting	• ANSI 19 in. or 23 in. • ETSI 600x600
Airflow	Front-to-back

[*] Mixing of AC and DC modules is not supported.

[**] Short term refers to a period of not more than 96 consecutive hours and a total of not more than 15 days in 1 year. (This number refers to a total of 360 hours in any given year, but no more than 15 occurrences during that 1-year period.)

Approvals and Compliance

Table 3 lists compliance and agency approvals for the Cisco NCS 4000 Series platform.

Table 3. Compliance and Agency Approvals for Cisco NCS 4000 Series

Feature	Description
Safety standards	• UL/CSA/IEC/EN 60950-1 • IEC/EN 60825 Laser Safety • FDA: Code of Federal Regulations Laser Safety
Electromagnetic interference (EMI)	• FCC Class A • ICES 003 Class A • CISPR 22 (EN55022) Class A • VCCI Class A • IEC/EN 61000-3-2: Power Line Harmonics • IEC/EN 61000-3-3: Voltage Fluctuations and Flicker

Feature	Description
Immunity (basic standards)	• IEC/EN-61000-4-2: Electrostatic Discharge Immunity • IEC/EN-61000-4-3: Radiated Immunity • IEC/EN-61000-4-4: Electrical Fast Transient Immunity • IEC/EN-61000-4-5: Surge AC Port • IEC/EN-61000-4-5: Signal Ports • IEC/EN-61000-4-5: Surge DC Port • IEC/EN-61000-4-6: Immunity to Conducted Disturbances • IEC/EN-61000-4-11: Voltage Dips, Short Interruptions, and Voltage Variations
ETSI and EN	• EN300 386: Telecommunications Network Equipment (EMC) • EN55022: Information Technology Equipment (Emissions) • EN55024: Information Technology Equipment (Immunity) • EN50082-1/EN-61000-6-1: Generic Immunity Standard
Network Equipment Building Standards (NEBS)	This product is designed to meet the following requirements (qualification in progress): • SR-3580: NEBS Criteria Levels (Level 3) • GR-1089-CORE: NEBS EMC and Safety • GR-63-CORE: NEBS Physical Protection

Warranty Information

Find warranty information on Cisco.com at the [Product Warranties](#) page.

Ordering Information

To place an order, visit the [Cisco Ordering Home Page](#) and refer to Table 4. To download software, visit the [Cisco Software Center](#).

Table 4.   Ordering Information for Cisco NCS 4000 Series Products

Part Number	Description
Cisco NCS 4000 Series Common Equipment	
NCS4009-SA-AC=	NCS4009 shelf assembly - AC Power
NCS4009-SA-DC=	NCS 4009 shelf assembly - DC Power
NCS4009-FC-S=	NCS 4009 Agnostic Cross connect – Single-chassis
NCS4009-FC2-S=	NCS 4009 Agnostic Cross connect - Single-chassis - V2
NCS4009-DOOR=	NCS 4009 Door
NCS4016-SA-DC=	NCS 4016 shelf assembly - DC Power
NCS4016-SA-AC=	NCS4016 shelf assembly - AC Power
NCS4016-FC-M=	NCS 4016 Agnostic Cross connect - Multi-chassis
NCS4016-FC2-M=	NCS 4016 Agnostic Cross connect - Multichassis - V2
NCS4016-DOOR=	NCS 4016 Door
NCS4K-AC-PEM=	NCS 4000 AC Power Entry Module - Power Tray
NCS4K-AC-PSU=	NCS 4000 AC Power System Unit - 3000 W
NCS4K-BLANK=	NCS 4000 Blank Filler
NCS4K-CRAFT=	NCS 4000 Craft Panel
NCS4K-DC-FA=	NCS 4000 AC Power front connection adapter
NCS4K-DC-PEM=	NCS 4000 DC Power Entry Module - Power Tray
NCS4K-DC-PSU-V1=	NCS 4000 DC Power System Unit - 1750 W - Balanced A and B
NCS4K-ECU=	NCS 4000 External Connection Unit
NCS4K-FTA=	NCS 4000 Fan tray Assembly
NCS4K-FTF=	NCS 4000 Fan Tray Filter
NCS4K-RP=	NCS 4000 Router Processor and Controller (32G RAM)

Part Number	Description
NCS4K-SSD-100G=	NCS 4000 100G SSD disk for ECU
NCS4K-SSD-200G=	NCS 4000 200G SSD disk for ECU
Cisco NCS 4000 Line Cards	
NCS4K-24LR-O-S=	NCS 4000 24-port Low rate OTN LC - SFP
NCS4K-2H10T-OP-KS=	NCS 4000 2x 100G CPAK 10x10G SFP+ OTN/Packet Line Card
NCS4K-2H-W=	NCS 4000 2x 100G CP-DQPSK - Full C band Tunable
NCS4K-4H-OPW-QC2=	NCS 4000 400G Packet/OTN/WDM - QSFP28/CFP2 - Line card
Cisco NCS 4000 Accessories	
NCS4K-AC-CBL-IEC=	NCS 4000 AC Power Cable - IEC compliant
NCS4K-AC-CBL-NEMA=	NCS 4000 AC Power Cable - NEMA compliant
NCS4K-CBL-HKA=	NCS 4000 Housekeeping Alarm cable
NCS4K-INST-KIT=	NCS 4000 system Installation Kit

Cisco Services for Migrating Converged IP + Optical Solutions

Services from Cisco and our partners help you get the most value from your investments in the Cisco converged IP + Optical solution, quickly and cost-effectively. We can help you design, implement, and validate your solution to speed migration and cutover. Coordinate every step through to interworking. Strengthen your team. And make the most of tomorrow's opportunities. Learn more at: http://www.cisco.com/go/spservices.

Cisco Capital

Financing to Help You Achieve Your Objectives

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

For More Information

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