

Cisco IOS XE Software for NCS 4200 Series Network Convergence Systems

Cisco IOS[®] Software is always evolving to provide you with more features of higher quality. Cisco IOS XE Software releases provide a modular structure for Cisco[®] NCS 4200 Series Network Convergence Systems. Why is this modularity important? It allows the software to significantly enhance quality and performance by taking advantage of the separation of the data plane and the control plane.

Product Overview

The NCS 4200 Series products provide a purpose-built solution that enables service providers to meet their legacy TDM requirements as well as their current and future needs for Ethernet services. With high-density TDM, SONET/SDH, OTN, and Carrier Ethernet (FE, GE, 10GE, 40GE, and 100GE) interfaces, the NCS 4200 Series delivers any-to-any connectivity using a packet-based network (MPLS/Flex LSP) more efficiently than any other packet transport mechanism and is not bounded by TDM transport inefficiencies.

The Cisco IOS XE Software available on the NCS 4200 Series portfolio (Figure 1) includes all features and licenses required for Metro SONET/SDH, OTN, IP, and MPLS aggregation services.

Figure 1. Cisco NCS 4200 Series Portfolio



Features and Benefits

Feature	Benefit
Support for TDM and SONET/SDH migration to modernized packet-based optical metro network	Provides cost-effective delivery of circuit emulation (CEM) and carrier Ethernet (CE) capabilities over a redundant and protected packet-based network (MPLS/FlexLSP).
Metro carrier Ethernet aggregation	Enables the service flexibility and delivery of Layer 2, Layer 3, IP, and MPLS transport for advanced L2VPN, L3VPN, and multicast services.
Industry-leading, carrier-class circuit emulation (CEM) technology	Delivers any-to-any connectivity using a packet-based network (MPLS/Flex LSP) using TDM, PDH, SONET/SDH, and carrier Ethernet (FE, GE, and 10GE) interfaces.
Next-generation access network with fully distributed and unique packet capabilities	Supports state-of-the-art Pseudowire Emulation Edge-to-Edge (PWE3), Hierarchical Quality of Service (H-QoS), and next-generation IP/MPLS. Cisco's MPLS FlexLSP guarantees resiliency (sub-50 ms switchover time), fault propagation, connectivity verification, statistical multiplexing, and scalability, with RSVP-TE extensions as the control plane for bidirectional tunnel (LSP) setup and programmability for SDN functionality support.
Operation efficiency with end-to-end network management	Supported by the Evolved Programmable Network Manager (EPN-M), which enables business agility and operational efficiencies through automated device operations, fast provisioning, and proactive assurance.
Comprehensive variety of interfaces and protocols	Ethernet interfaces are available in copper and fiber, with speeds ranging from 10 Mbps to 100 Gbps. Legacy interfaces are available in speeds ranging from nxDS0 to OC-192/STM-64 for Plesiochronous Digital Hierarchy (PDH), Synchronous Digital Hierarchy (SDH), and Synchronous Optical Network (SONET). Optical Transport Network (OTN) wrapping functionalities are also supported.

Software Releases and Options

Cisco NCS 4200 Series systems are supported in Cisco IOS XE Software as of Cisco IOS XE Software Release 3.18.0SP. The release is designed to provide modular packaging, feature velocity, and powerful resiliency.

Consolidated Software Packages

Three consolidated software packages contain a superset of all features activated. Table 1 describes the Cisco IOS XE Software universal consolidated packages supported on the Cisco NCS 4200 systems and the functionality supported in each of these universal images.

Table 1. Universal Cisco IOS XE Software Consolidated Packages for Cisco NCS 4200 Series Systems

Cisco IOS XE Consolidated Package	Part Number	Description
Cisco NCS 4206/4216 Series RSP3 IOS XE 3.18SP Universal - No Payload Encryption	SNCS42R3NK9318SP	<ul style="list-style-type: none"> Provides a consolidated package Offers complete Cisco IOS XE Software feature support
Cisco NCS 4201 Series RSP3 IOS XE 3.18SP Universal - No Payload Encryption	SNCS4201NK9318SP	<ul style="list-style-type: none"> Provides a consolidated package Offers complete Cisco IOS XE Software feature support
Cisco NCS 4202 Series RSP3 IOS XE 3.18SP Universal - No Payload Encryption	SNCS4202NK9318SP	<ul style="list-style-type: none"> Provides a consolidated package Offers complete Cisco IOS XE Software feature support
Cisco NCS 4206/4216/4216 F2B Series RSP3 IOS XE 16.5.1 Universal - No Payload Encryption	SNCS42R3NK9165	<ul style="list-style-type: none"> Provides a consolidated package Offers complete Cisco IOS XE Software feature support
Cisco NCS 4201 Series RSP3 IOS XE 16.5.1 Universal - No Payload Encryption	SNCS4202NK9165	<ul style="list-style-type: none"> Provides a consolidated package Offers complete Cisco IOS XE Software feature support
Cisco NCS 4202 Series RSP3 IOS XE 16.5.1 Universal - No Payload Encryption	SNCS4201NK9165	<ul style="list-style-type: none"> Provides a consolidated package Offers complete Cisco IOS XE Software feature support

Cisco IOS XE Software Release Schedule

The Cisco IOS XE Software delivery schedule allows customers to qualify releases more quickly and have a definitive release schedule for new software images. This schedule is summarized in the following highlights.

- **Time-based releases:** Releases are planned for delivery three times a year (every four months). New software features and hardware are introduced in each release. Releases have fewer incremental features included when compared with traditional Cisco IOS Software releases, reducing customer qualification time.
- **Two release support durations:** Each Cisco IOS XE Software release is classified as either a Standard Support or Extended Support release. A Standard Support release has a total engineering support lifetime of one year or 18 months starting with Release 3.18.0SP, with two or three scheduled rebuilds. The Extended Support release provides a total engineering support lifetime of two or four years, starting with Release 3.18.0SP, with four or up to 10 scheduled rebuilds. For more information about the Cisco IOS XE Software end-of-life policy and associated support milestones for specific Cisco IOS XE Software releases, visit <http://www.cisco.com>.
- **Rebuilds scheduled at regular intervals:** Rebuilds are created only for bug fixes, and no new features are included in a rebuild image. For a release rebuild schedule, visit the [Cisco IOS XE Software support timeline](#) for details.

Major Software Features

Table 2 lists the features supported by Cisco IOS XE Software in Cisco NCS 4200 Series systems. Availability of features is dependent on software release, route switch processor (RSP) version, and implementation schedule. Check release notes for additional details.

Table 2. Cisco NCS 4200 Series System Software Features

Features
Ethernet Services
<ul style="list-style-type: none">• Ethernet Flow Point (EFP) with support for:<ul style="list-style-type: none">◦ 802.1q◦ 802.1ad◦ Selective QinQ◦ Inner and Outer VLAN classification◦ VLAN local significance◦ One VLAN tag ingress push◦ Pop one VLAN tag◦ Pop two VLAN tags◦ Trunk-EFP construct for configuration simplification• Ethernet Private Line (EPL) and Ethernet Virtual Private Line (EVPL) using Local Connect• IEEE 802.1s Multiple Spanning Tree (MST)• Per VLAN Spanning Tree Plus (PVST+)• Rapid Per VLAN Spanning Tree Plus (RPVST+)• Unidirectional Link Detection (UDLD)• Link Layer Discovery Protocol (LLDP)• Cisco Discovery Protocol (CDP)• Resilient Ethernet Protocol (REP)• ITU G.8032• 802.3ad/802.1ax Link Aggregation Control Protocol (LACP)• Multichassis Link Aggregation Control Protocol (mLACP)• Layer 2 Protocol Tunneling (L2PT)• VPLS, HVPLS, Virtual Private Wire Service (VPWS), and EoMPLS

Features

- Routed Pseudowire and Routed VPLS
- Static Multicast MAC addresses
- IGMP snooping on Ethernet Flow Point
- Link Pass Through
- Pseudowire redundancy
- Hot Standby Pseudowire
- Multisegment Pseudowire
- Flow Aware Transport Pseudowire (FAT PW) - RFC 6391
- Multi-Chassis Link Aggregation Group (MC-LAG)
- Ethernet loopback on EFP and Trunk EFP
- Multicast Label Distribution Protocol v4 (mLDPv4)
- Multicast Label Distribution Protocol v6 (mLDPv6)
- MAC Security
- VPLS over port-channel and bridge domain interface
- Segment Routing

TDM, SONET/SDH, and OTN Services

- Clear Channel and Channelized T1 and E1 ports
- Clear Channel and Channelized (cbit, unframed) T3 and E3 ports
- Channelized OC3/12/48/192 and STM-1/-4/-16/-64 ports
- High Order (HO) and Low Order (LO) SONET/SDH Switching
- Automatic Switching Protection (APS)
- Single Router Automated Protection switching (SR-APS)
- Multirouter Automated Protection switching (MR-APS)
- Access Circuit Redundancy (ACR)
- Multiplex Section Protection (MSP)
- Unidirectional Path Switched Ring (UPSR)
- Sub Network Connection Protection (SNCP)
- SONET Data Communications Channel (SDCC)
- Line Data Communications Channel (LDCC)
- Synchronization Status Messaging (SSM)
- Optical Transport Network (OTN) (G.709)
- Pseudowire setup and maintenance using the Label Distribution Protocol (LDP) - RFC 4447
- Structure-Agnostic Time Division Multiplexing (TDM) over Packet (SAToP) - RFC 4553
- Synchronous Optical Network/Synchronous Digital Hierarchy (SONET/SDH) Circuit Emulation over Packet (CEP) – RFC 4842
- Single Router Automated Protection switching (SR-APS)
- Multirouter Automated Protection switching (MR-APS)
- Access Circuit Redundancy (ACR)
- TDM Loopbacks
- Integrated BERT Testing
- Pseudowire redundancy
- Hot Standby Pseudowire
- Multisegment Pseudowire

Layer 3 and MPLS Services

- Hot Standby Router Protocol (HSRP)
- Virtual Router Redundancy Protocol (VRRP)
- Layer 3 routing on Routed interfaces and Bridge Domain Interfaces (BDI)
- Cisco Express Forwarding (CEF) load sharing of Equal Cost Paths (ECMP)
- Open Shortest Path First (OSPF) Version 2, RFC 2328
- Open Shortest Path First (OSPF) Version 3, RFC 5340
- Border Gateway Protocol (BGP) Version 4, RFC 4271
- BGP 4-byte Autonomous System number (ASN)
- BGP TCP Path MTU Discovery
- BGP Prefix-Independent Convergence (PIC) Edge and Core for IPv4 and MPLS VPN
- Intermediate System to Intermediate System (IS-IS) – RFC 7142
- BFD for OSPF, IS-IS, BGP, Multicast, and static routes

Features

- BFD over Ethernet, Routed port, HDLC and PPP interfaces
- BFD for HSRP group client
- Multihop BFD
- Multiprotocol Label Switching (MPLS)
- MPLS FlexLSP
- MPLS FlexLSP with Shared Risk Link Group (SRLG) Protection
- MPLS FlexLSP with non-revertive, sticky mode
- Ethernet VPN (EVPN) VPWS single homed
- LDP with Label Edge Router (LER) and Label Switch Router (LSR)
- MPLS L3VPN
- MPLS Traffic Engineering Fast Re-Route (TE-FRR)
- Dynamic Resource Reservation Protocol – Traffic Engineering (RSVP-TE) label allocation
- MPLS Point-to-Multipoint Traffic Engineering
- RSVP-TE Extensions for Associated Bidirectional Label Switched Paths (LSPs) – RFC 7551
- RSVP-TE Extensions to RSVP for LSP Tunnels – RFC 3209
- IP Loop Free Alternate Fast Re-Route (LFA FRR)
- Remote Loop Free Alternate Fast Re-Route (R-LFA FRR)
- Internet Group Management Protocol (IGMP) version 1 – RFC 1112
- IPv4 and IPv6 multicast
- PIM-SM, PIM Source Specific Multicast (PIM SSM), PIM SSM mapping
- IGMPv2 – RFC 2236
- IGMPv3 – RFC 3376
- IGMP group limiting
- Multicast Listener Discovery (MLD)
- Multicast VPN (MVPN) based on IETF Rosen Draft
- Multicast VPN (MVPN) based on Label Distribution Protocol (mLDP)
- Multicast VPN with GRE over Bridge Domain Interface (BDI)
- Segment Routing (SR)

IPv6

- Hardware based IPv6 data forwarding
- Addressing and discovery
- Manual IPv6 interface addressing
- ICMPv6 (RFC 4443)
- IPv4 and IPv6 dual stack
- IPv6 static routing
- OSPF for IPv6 (RFC 5340)
- DHCPv6 with relay function
- DHCPv6 server and client
- BFD for OSPF, IS-IS, BGP, and IPv6 static routes
- BFD on IP unnumbered interface
- IPv6 Provider Edge (6PE)
- IPv6 VPN Provider Edge (6VPE)
- IPv6 QoS

QoS

- Modular QoS CLI (MQC)
- Hierarchical QoS (HQoS)
- Port shaper and Low Latency Queuing (LLQ) in the presence of an EFP
- IEEE 802.1p Class of Service (COS) based QoS
- Classification based on inner and outer CoS
- IP Precedence Type of Service (ToS) based QoS
- Differentiated Services Code Point (DSCP) based QoS
- Differentiated Services MPLS-TE per Requirements for Support of Differentiated Services-aware MPLS Traffic Engineering – RFC 3564
- Egress marking of COS, ToS, DSCP, and MPLS EXP QoS fields
- Classification using Access Control List (ACL)
- 2-rate 3-color (2R3C) ingress Policing

Features

- Differentiated Services Code Point (DSCP) traffic shaping
- Class-Based Weighted Fair Queuing (CBWFQ)
- Priority Queuing with up to 2 priority queues
- Weighted Random Early Detect (WRED)
- Egress shaping per queue
- Egress policing per queue
- Resource Reservation Protocol (RSVP) Call Admission Protocol (CAC)

Timing

- IEEE 1588-2008 Ordinary Clock over Ethernet, IP, and MPLS
- IEEE 1588-2008 end-to-end Transparent Clock over Ethernet, IP, and MPLS
- IEEE 1588-2008 Boundary Clock over Ethernet, IP, and MPLS
- IEEE 1588-2008 precision time protocol (PTP) telecom profile for frequency synchronization – ITU-T G.8265.1/Y.1365.1
- Hybrid clocking
- T1/E1 line timing
- OCn/STM-n Line Timing
- Adaptive Clock Recovery (ACR)
- Differential Clock Recovery (DCR)
- Global navigation satellite system (GNSS) ports; Time of Day (ToD), 10MHz, 1 Pulse Per Second (1PPS)
- Building Integrated Timing Supply (BITS)
- ITU-T G.781 and GR-1244-CORE/GR-253-CORE based Clock Selection
- ITU-T SyncE with Ethernet Synchronization Messaging Channel (ESMC) (G.8261, G.8262, G.8264)
- ITU-T G.8275.2 Telecom Profile
- Synchronization Status Messages (SSM) (G.781, G.707, G.704)
- SyncO Ready (under Discussion by ITU-T ST15)
- Explicit Pointer Adjustment Relay (EPAR)
- Hop-by-Hop PTP Redundancy

OAM

- IEEE 802.1ag Connectivity Fault Management (CFM) over EFP
- IEEE 802.3ah Link OAM
- MPLS Fault Management Operations, Administration, and Maintenance – RFC 6427
- MPLS Generic Associated Channel (G-Ach) – RFC 5586
- BFD Connectivity Verification per OAM Framework for MPLS-Based Transport Networks – RFC 6371
- On-demand CV/Route Tracing per Mechanism for Performing Label Switched Path Ping (LSP Ping) over MPLS Tunnels – RFC 6424
- ITU-T Y.1731 Fault Management (FM) over EFP
- ITU-T Y.1731 Performance Management (PM) over EFP for Delay Measurement (DM) and Synthetic Loss Measurement (SLM)
- ITU-T Y.1564 Ethernet Service Activation Test methodology (SAT)
- Ethernet Local Management Interface (E-LMI), as a provider edge (PE) device
- CFM extensions for microwave adaptive code modulation (ACM) actual air bandwidth exchange
- Two-Way Active Measurement Protocol (TWAMP) with VRF support – RFC 5357

Security

- Authentication, authorization, and accounting (AAA) with TACACS+ and RADIUS
- SSH Protocol v2
- MAC limiting per bridge domain (BD)
- Storm control for Port Mode
- Layer 3 Access Control Lists (ACL) for IPv4 and IPv6
- IPv4 unicast reverse path forwarding (uRPF) strict mode
- MAC security
- Dynamic Arp Inspection (DAI)
- DHCP Snooping with option 82 insertion
- DHCP Option 82 Configurable Circuit ID and Remote ID
- Security Architecture for the Internet Protocol (IPsec)
- Advanced Encryption Standard (AES) CCM Mode with IPsec Encapsulating Security Payload (ESP) (IKEv2/IKEv1)
- Extended Sequence Number support
- Dead Peer Detection for IKE

Features
<ul style="list-style-type: none"> • Anti-Replay for IPSec • IPSec feature to negotiate traffic type/port for a session • Facilitation of generating CSR File for Certificates • Support for X.509 certificates • CRL support for PKI • Online Certificate Status Protocol (OCSP) – RFC 6960 • Storm Control
Manageability
<ul style="list-style-type: none"> • SNMP • MIBs • Dying Gasp message • Embedded Event Manager (EEM) • Cisco Discovery Protocol (CDP) • 802.1ab Link Layer Discovery Protocol (LLDP) • Port Level Local SPAN (SPAN) • Port Level Remote SPAN (RSPAN) • Cisco IOS Software Command Line Interface (CLI) • Cisco Prime[®] Network: fault, provisioning, and performance management

Ordering Information

Table 3 lists the Cisco NCS 4200 Series software licenses.

Table 3. Cisco NCS 4200 Series Software Licenses

Part Number	Description
SNCS42R3NK9318SP	Cisco NCS 4206/4216 Series RSP3 IOS XE 3.18SP Universal - No Payload Encryption
SNCS4201NK9318SP	Cisco NCS 4201 Series RSP3 IOS XE 3.18SP Universal - No Payload Encryption
SNCS4202NK9318SP	Cisco NCS 4202 Series RSP3 IOS XE 3.18SP Universal - No Payload Encryption
SNCS42R3NK9165	Cisco NCS 4206/4216/4216 F2B Series RSP3 IOS XE 16.5.1 Universal - No Payload Encryption
SNCS4201NK9165	Cisco NCS 4201 Series RSP3 IOS XE Universal 16.5.1 - No Payload Encryption
SNCS4202NK9165	Cisco NCS 4202 Series RSP3 IOS XE Universal 16.5.1 - No Payload Encryption

Warranty Information

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

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 4 are available as part of the Cisco Carrier Ethernet Switching Service and Support solution and are available directly from Cisco and through resellers.

Table 4. Service and Support

Advanced Services	Features	Benefits
<p>Cisco Total Implementation Solutions (TIS), available directly from Cisco</p> <p>Cisco Packaged TIS, available through resellers</p>	<ul style="list-style-type: none"> • Project management • Site survey, configuration, and deployment • Installation, test, and cutover • Training • Major moves, adds, and changes • Design review and product staging 	<ul style="list-style-type: none"> • Supplement existing staff • Help ensure functions meet needs • Mitigate risk
<p>Cisco SP Base Support and Service Provider-Based Onsite Support, available directly from Cisco</p> <p>Cisco Packaged Service Provider-Based Support, available through resellers</p>	<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • 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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