Cisco Network Convergence System (NCS) Converged 2x100 Gbps, 10 Gbps Line Card

The Cisco® Network Convergence System 200 Gbps Hybrid Line Card (Figure 1) provides multirate and protocol flexibility (OTN, Carrier Ethernet) to enable multilayer technology convergence for next-generation Converged Packet Optical Transport Systems.

The NCS 4000 Multilayer Converged LC provides the ability to deploy OTN packets at 10 Gbps and 100 Gbps rates using an agnostic switch fabric to switch up to 200 Gbps I/O capacity.

Figure 1.   NCS 4000 2x 100G CPAK 10x10G SFP+ OTN/Packet Line Card

OTN provides robust transport services that use many of the benefits of SONET/SDH such as resiliency and performance monitoring, while adding enhanced multirate capabilities in support of packet traffic, plus the transparency required by DWDM networks. OTN is the ideal technology to bridge the gap between next-generation IP and legacy time-division multiplexing (TDM) networks by acting as a converged transport layer for newer packet-based and existing TDM services. (See Table 1.)

Table 1.   Features and Benefits

Feature	Benefit
Technology agility	Combines multiple network elements into one Agnostic switch fabric for I/O diversity
Operational agility	Faster time to market for deploying services across layers to address evolving market needs
Scalability	Multichassis capability to address bandwidth requirements up to 153.6 Tbps Multiple chassis footprint for LC
Cisco IOS® XR Software	Industry-leading software stability

Converged Packet-Optical Networks

Next-generation optical transport networks are evolving toward multilayer, multirate, and converged networks to provide efficient transport and economies of scale to enable service providers to deploy cloud data center interconnect while maintaining support for legacy networks. Converged packet optical networks enable service providers to deploy transport networks with a faster time to market and time to revenue.

- Combine per-layer (DWDM, OTN, packet) network elements into a single platform.
- Agnostic cell-based switch fabric for I/O diversity
- Virtualized software infrastructure for rapid deployment
- Lower operational expenditure: manage/deploy single network element instead of three
- Technology agility: any combination of OTN, DWDM, and packet
- Statistical multiplexing on a per-ODU basis for improved WAN infrastructure utilization
- Cisco IOS-XR Software for industry-leading stability and functionality

Interfaces

The NCS 4000 2 x 100G, 2 x 10 Gbps Combo line card supports any combination of the following interfaces, up to:

- Ten 10 Gigabit Ethernet interfaces through SFP+ pluggables
- Ten OC-192/STM-64 interfaces through SFP+ pluggables
- Two 100 GigE LAN PHY interfaces through CPAK pluggables
- Two 100 OTU-4 interfaces through CPAK pluggables

The OC192/STM-64 interfaces will be supported over OTN only.

The card is capable of supporting two operational modes

- 2 x 100 Gbps mode: the line card will provide the following interface types with the total I/O capacity of up to 200 Gbps:
  - 2 x 100 Gbps OTN or 2 x 100 GigE interfaces with no access to the SFP+ interfaces
  - Twenty 10 GigE interfaces with a 10x10 Gbps breakout cable attached to the 100 Gbps CPAK interfaces
  - Ten OC-192/STM-64 interfaces on the SFP+ receptacles
- 1 x 100 Gbps, 10 x 10 Gbps SFP+ mode: the line card will provide:
  - One 100 GigE or 100 GigE OTN CPAK interface
  - Ten SFP+ receptacles for ten 10 GigE interfaces
  - Ten SFP+ receptacles for ten STM-64 interfaces
  - Ten SFP+ receptacles for ten OC-192 interfaces

Figure 2.   NCS 4000 2x 100G CPAK 10x10G SFP+ OTN/Packet Line Card Architecture
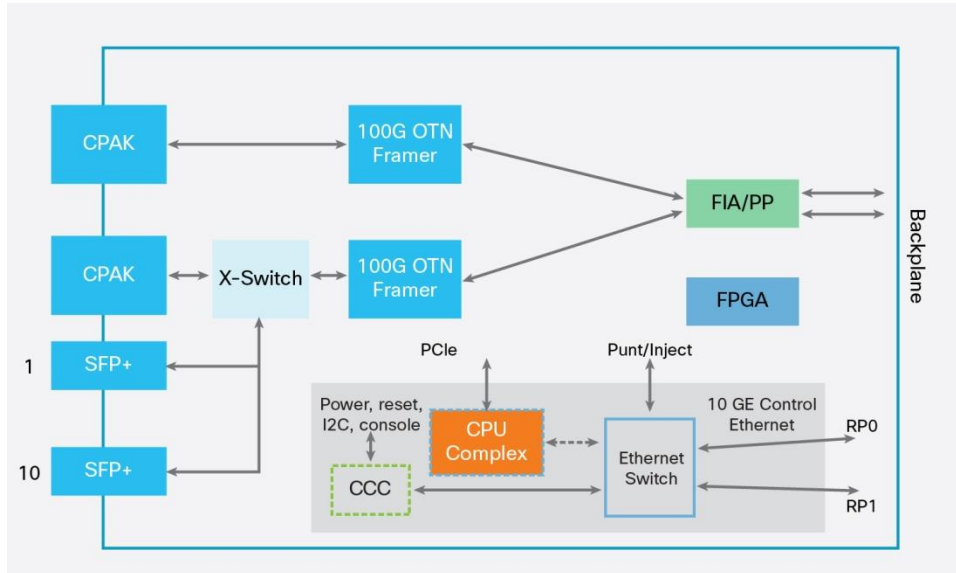
OTN Support

OTU-1 and OTU-2 ports support generic forward error correction (GFEC). The card is capable of supporting up to 2-level ODU-4, ODU-3, ODU-2, ODU-1, ODU-0, and ODU-Flex switching functions by interconnecting with the centralized agnostic switch fabric. (See Table 2.)

The NCS 4000 2 x 100G, 2 x 10 Gbps Combo line card supports any combination of 100 Gigabit Ethernet and OTU-4 interfaces using Cisco CPAK pluggable transceivers (Figure 2). The Cisco CPAK pluggable transceiver utilizes complementary metal-oxide semiconductor (CMOS) photonics technology to dramatically reduce the size and power consumption of 100 Gbps interfaces while maintaining IEEE and ITU protocol compliance. Two CPAK receptacles are hosted on the faceplate.

Table 2.   OTN Line-Card Mapping

Rate	Mapping
10 Gigabit Ethernet	G.Sup43 7.1/G.709 17.2.4: CBR10.3G à OPU2e G.709 17.4: GFP-F à OPU2 G.Sup43 7.3/G.709 17.4.1: GFP-F à Extended OPU
OC-192/STM-64	OC192/STM-64: CBRI CBRB ODU2 AMP/BMP
100 Gigabit Ethernet	IEEE 802.3ba
100 Gigabit OTN	G.709v3

The card supports up to two-level ODU-4, ODU-3, ODU-2, ODU-0, and ODU-Flex nested switching functions by interconnecting with the centralized agnostic switch fabric; 100 Gigabit Ethernet signals are mapped using generic mapping procedure (GMP) over ODU-4 according to ITU-T G.709 v3 (Section 17.7.5).

The 100 Gbps ports a standard G.975 Reed-Solomon FEC algorithm, which can be enabled or disabled through software configuration.

Extending nLight Silicon to the client-facing interface, the client ports use Cisco CPAK pluggable transceivers supporting 100GBASE-SR10, 100GBASE-LR-4, and the OTU-4 equivalent interfaces. The extremely compact dimensions and low power consumption of CPAK enable superb system density of greater than one 100 Gigabit Ethernet transponder per rack unit. (See Figure 3 and Table 3.)

Figure 3. Cisco CPAK 100GBASE-LR4 Module (left), 100GBASE-SR10 Module (Mid) and CPAK 10x10G-LR with MPO-to-20-LC Fan-Out (right)

Table 3. Performance Monitoring Parameters

Area	Parameter Name		Description
OTN	OTUk SM	ODUk PM	
	BBE-SM	BBE-PM	Number of background block errors
	BBER-SM	BBER-PM	Background block error ratio
	ES-SM	ES-PM	Number of errored seconds
	ESR-SM	ESR-PM	Errored seconds ratio
	SES-SM	SES-PM	Number of severely errored seconds
	SESR-SM	SESR-PM	Severely errored seconds ratio
	UAS-SM	UAS-PM	Number of unavailable seconds
	FC-SM	FC-PM	Number of failure counts
FEC	Bit errors		Number of corrected bit errors
	Uncorrectable words		Number of uncorrectable words

Packet Features

The NCS Converged Packet Optical line card supports packet features as defined in Table 4 on a per-ODU or on a per-interface basis.

Table 4. HW Readiness Feature Set

Functionality	Featured Mechanism
Layer 2 transport	Carrier Ethernet, MPLS
Layer 2 and Layer 2+ services	Carrier Ethernet: EPL, EVPL MPLS-TE: P2P circuits (VPWS)
Ethernet virtual circuit	IEEE 802.1q, IEEE 802.1ad
IGP	OSPF-TE
Quality of service (per port)	Policing, queuing/shaping Single-rate, dual-color policer (1R2C) Single-rate, three-color policer (1R3C) Dual-rate, three-color policer (2R3C)
Ethernet OAM	IEEE 802.1ag CFM IEEE 802.3ah EFM

Functionality	Featured Mechanism
Sync-E	ITU-T G.8261 ITU-T G.8262

Platform Support

Table 5 shows **Platform Supported by** NCS 4000 2x 100G CPAK 10x10G SFP+ OTN/Packet Line Card.

Table 5.   Supported HW Platform and SW Releases

Product Family	Platforms Supported	Cisco IOS Software Images (Feature Sets) Supported
NCS 4000	NCS 4016, NCS 4009	Cisco IOS XR Software 5.2.4.x onwards

Product Specifications

Table 6 lists product specifications.

Table 6.   Product Specifications at System Level

Parameter	Scale
Total number of 10 GigE interfaces	320
Total number of OC-192 interfaces	320
Total number of STM-64 interfaces	320
Total number of 100 GigE interfaces	32
Total number of 100 GigE OTN interfaces	32
Total number of Ethernet virtual circuits (EVCs)	16,000
Total number of MPLS LSPs	4000
Total number of MPLS pseudowire (VPWS)	16,000
Total number of IEEE 802.1ag CFM MEPs	16,000
Total number of IEEE 802.3ah EFM sessions	320
MAC address table size (chassis)	256,000
Total number of QoS policies (1R2C)	16.000

Pluggable Interfaces

Cisco NCS 4000 Line Cards use pluggable transceivers to provide a pay-as-you-grow model and flexibility to support different reaches. Table 7 summarizes supported pluggables.

Table 7.   Cisco NCS 4000 Pluggable Interfaces

Pluggable	Rate and Reach	Product ID
SFP+	10 GE SR/SW	ONS-SC+-10G-SR=
	10 GE LR/LW OC-192 SR STM-64 I-64.1 OTU-2 P1I1 2D1	ONS-SC+-10G-LR=
	10 GE ER/EW OC-192 IR-2 STM-64 S-64.2 OTU-2 P1S1-2D2	ONS-SC+-10G-ER=
	10 GE ZR OC192 LR-2	ONS-SC+-10G-ZR=

Pluggable	Rate and Reach	Product ID
CPAK	STM-64 L-64.2 OTU-2 P1L1-2D2	
	C-band tunable	ONS-SC+-10G-C=
	100 GE SR10	CPAK-100G-SR10=
	100 GE LR4 OTU-4 4I1-9D1F	CPAK-100G-LR=
	OTU-2 P1L1-2D2 10GE LR	CPAK-10X10G-LR=

Physical Specifications

Table 8 lists the power consumption, weight, and dimensions of NCS 4000 Converged Packet Optical Line Cards.

Table 8.   Cisco NCS 4000 Physical Specifications

Unit	Maximum Power (W)	Typical Power (W)	Weight	Dimensions (H x W x D)
20x100 Gbps, 10 Gbps Combo Converged Line Card	246	290	5.5 lbs (2.5 kg)	10 x 12.5 x 1.55 in. (254 x 317.5 x 39.37 mm)
MTBF	345570 hrs			
Weight	2.98 kg (6.57 lbs)			

System Requirements

Table 9 describes physical specifications.

Table 9.   Cisco NCS 4000 Physical Specifications

Disk space	32 Gbps
Hardware	Dual RP, fabric
Memory	2 Gbps RAM
Software	IOS XR 5.2.4.x onwards

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 10 provides ordering information.

Table 10.   Ordering Information

Part Number	Product Description
NCS4K-2H10T-OP-KS	NCS 4000 2x 100G CPAK 10x10G SFP+ OTN/Packet Line Card
NCS4K-2H10T-OP-KS=	NCS 4000 2x 100G CPAK 10x10G SFP+ OTN/Packet Line Card
CPAK-100G-LR4=	CPAK-100G-LR4 Transceiver module, 10km SMF
CPAK-100G-SR10=	CPAK-100G-SR10 Transceiver module, 100m OM3 MMF
CPAK-10X10G-LR=	CPAK-10X10GLR, Transceiver module, 10 x 10Gb/s 10km SMF
NCS2K-MF-MPO-20LC=	MPO-16 to 20xLC Fan-Out - w/Connection Verification
ONS-SC+-10G-SR=	SFP+ SR - Commercial Temp

Part Number	Product Description
ONS-SC+-10G-LR=	SFP+ LR - Commercial Temp
ONS-SC+-10G-ER=	SFP+ ER - Commercial Temp
ONS-SC+-10G-ZR=	SFP+ ZR - Commercial Temp
ONS-SC+-10G-C=	SFP+ -10G MR, Full C Band Tuneable DWDM SFP+, 50 Ghz, LC

Warranty Information

Find warranty information on Cisco.com at the Product Warranties page

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

For more information about the Cisco Network Convergence System 4000 Series, visit http://www.cisco.com/go/ncs4000 or contact your local Cisco account representative.

·ı|ı·ı|ı·
CISCO™

Printed in USA

C78-736604-01   06/16