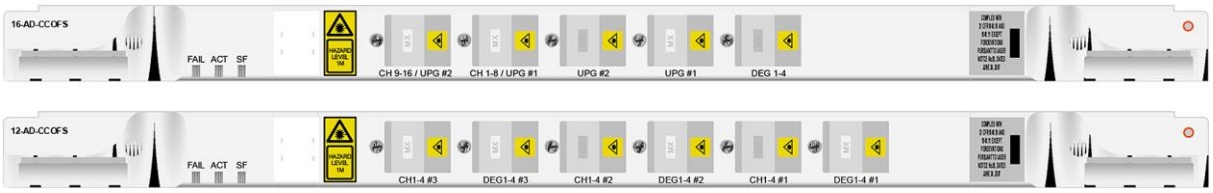
Cisco NCS 2000 Contentionless Add/Drop Line Cards

Optical network agility is a cornerstone of programmable network architectures. The Cisco® Network Convergence System 2000 Series (NCS 2000 Series) Contentionless Add/Drop Line Cards combine nonblocking scale and touchless reconfigurability in an easy-to-use form factor. They allow network operators to add a fully programmable optical layer to their Cisco nLight™ reconfigurable optical add-drop multiplexer (ROADM) infrastructures.

Figure 1. 16-Port (Top) and 12-Port (Bottom) Cisco NCS 2000 Contentionless Add/Drop Line Cards

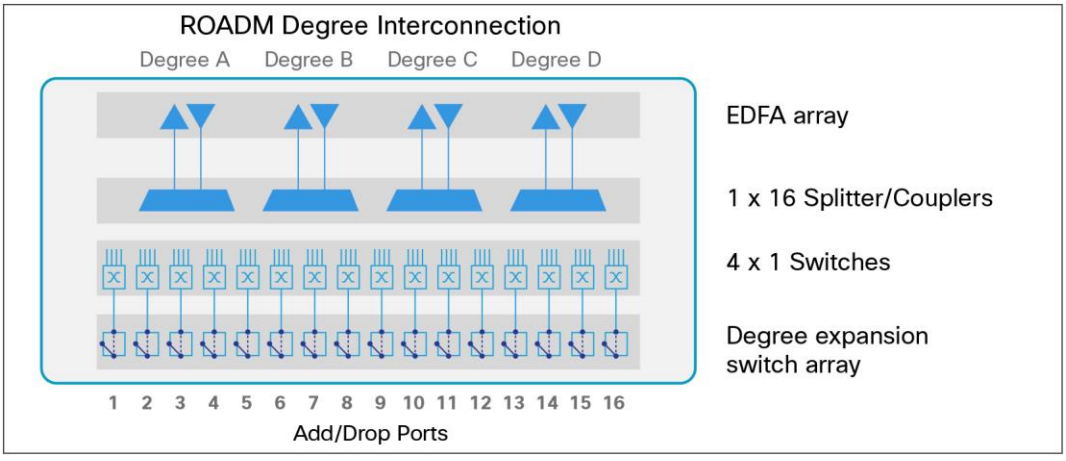


Product Overview

The NCS 2000 Contentionless Add/Drop Line Cards provide colorless, contentionless, omnidirectional, and flex spectrum add/drop functionality to the Cisco nLight ROADM architecture. The cards are available in 16-port and 12-port versions to meet varying scalability requirements.

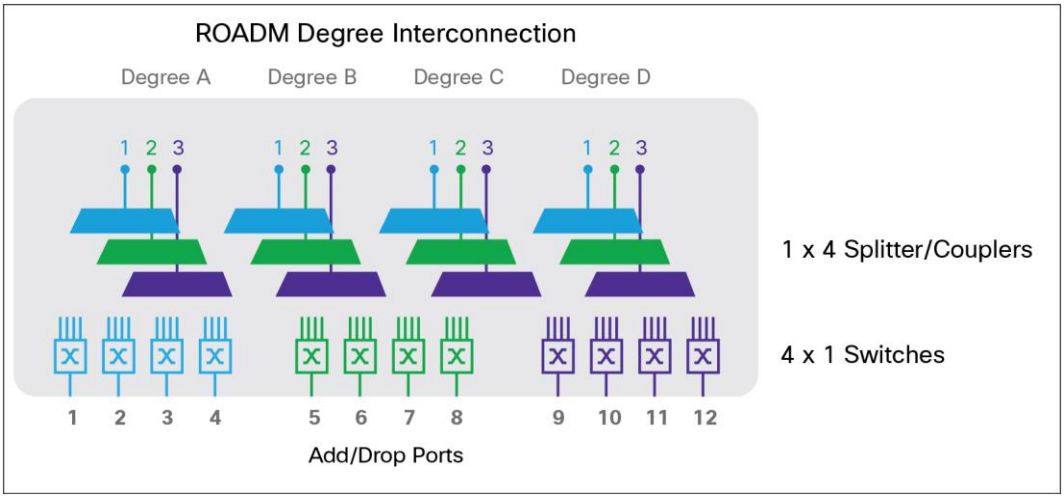
The 16-port line card adds and drops up to 16 channels across four ROADM degrees, and is expandable to 16 degrees with additional cards. An integrated 4 x 16 multicast switch and erbium-doped fiber amplifier (EDFA) array maximizes channel scalability by requiring only one ROADM port per degree. The 16-port line card functional diagram is shown in Figure 2.

Figure 2. 16-Port NCS 2000 Contentionless Add/Drop Line Card Functional Diagram



The 12-port line card adds and drops up to 12 channels across four ROADM degrees. Combining three 4 x 4 multicast switches into one line card, it uses three ROADM ports per degree. The 12-port line card functional diagram is shown in Figure 3.

Figure 3. 12-Port NCS 2000 Contentionless Add/Drop Line Card Functional Diagram



Features and Benefits

The NCS 2000 Contentionless Add/Drop Line Cards operate in tandem with Cisco NCS 2000 Single Module ROADM Line Cards to create an agile dense wavelength-division multiplexing (DWDM) layer, supporting the following agile DWDM innovations:

- Contentionless: Contentionless add/drop refers to the ability of an N-degree ROADM node to accommodate N wavelengths of the same frequency from a single add/drop device.
- Colorless: Colorless ROADM ports are not frequency-specific. This characteristic simplifies provisioning and allows dynamic restoration, because the frequency of an ingress channel can be retuned by software without requiring its fiber to be relocated.
- Omnidirectional: Omnidirectional ROADM ports are not associated with a specific ROADM degree. Therefore, a wavelength reroute does not require a physical fiber move, and it can be executed entirely by software.
- Flex spectrum: The amount of spectrum allocated to a wavelength can be flexibly provisioned to allow for multicarrier superchannels or single wavelengths exceeding today's 50-GHz channel spacing.

The Cisco nLight ROADM architecture (Figure 4) combines, colorless, contentionless, omnidirectional, and flex spectrum (CCOFS) functionalities, which together bring full programmability to the optical layer.

Figure 4. Cisco nLight ROADM Architecture

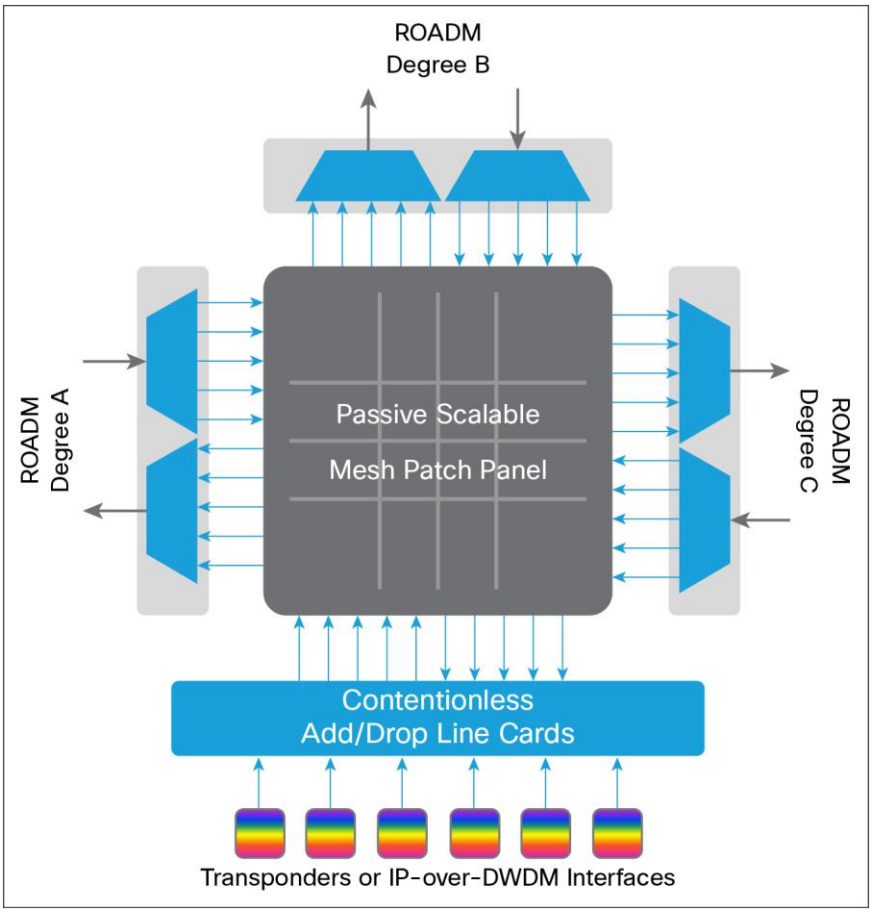


Table 1 summarizes the features and benefits of NCS 2000 Contentionless Add/Drop Line Cards. Specific feature support is hardware and software dependent.

Table 1. Features and Benefits

Feature	Benefit
Colorless, contentionless, and omnidirectional add/drop	Delivers a fully programmability DWDM layer, allowing automated provisioning and orchestrated multilayer restoration, which reduce operating and capital expenses
Flexible spectrum allocation	Improves spectral efficiency by allowing the creation and switching of multicarrier superchannels Prepares networks for future modulation formats exceeding 50 GHz
Single-slot form factor	Reduces footprint and simplifies cabling for the add/drop stage of a ROADM node
Support for up to 16 degrees	Allows highly scalable mesh nodes, with no blocking of add/drop wavelengths within the add/drop structure.
Pay-As-You-Grow Architecture	Two line card variants allow a trade-off between scalability and cost. Multiple line cards can be added to scale channel add/drop count in-service.

Product Specifications

Tables 2 and 3 list the optical specifications for NCS 2000 Contentionless Add/Drop Line Cards. Table 4 lists the physical specifications for the cards.

Table 2. Optical Specifications for NCS 2000 12-port Contentionless Add/Drop Line Cards

Description	Specification
Multicast Switch	
Optical port isolation (minimum)	40 dB
Add and drop section isolation (minimum)	60 dB
Polarization dependent loss (maximum)	0.5 dB
Multicast switch insertion loss (typical)	8 dB

Table 3. Optical Specifications for NCS 2000 16-port Contentionless Add/Drop Line Cards

Description	Minimum	Typical	Maximum
Multicast Switch			
Insertion loss		16.5 dB	
Optical port isolation	40 dB		
Add and drop section isolation	60 dB		
Polarization dependent loss			0.5 dB
Upgrade path loss		1.75 dB	
Add Path EDFA Array			
Per-channel input power range (at CH-RX port)	-4 dBm	0 dBm	4 dBm
Maximum UPG loss (from TP-E to TP-F)			2.5 dBm
Total per-channel input power range (at CH-RX port)	-9 dBm	-5 dBm	4 dBm
Total input power range	-9 dBm		16 dBm
Maximum total output power			17.2 dBm
Signal output power range - Full channel load			14 dBm
Signal output power range - Single channel load	-11 dBm	-2 dBm	
Nominal gain		-2 dB	
Gain range	-5 dB	-2 dB	7 dB
Noise figure at nominal gain			20.5 dB
Drop Path EDFA Array			
Per-channel input power range (at DIR-RX port)	-14 dBm	-10 dBm	-6 dBm
Max UPG loss (from TP-C to TP-D)			2.5 dB
Targeted per-channel output power (at CH-TX port)		-16 dBm	
Total input power range	-14 dBm		6 dBm
Maximum total output power			17.2 dBm
Signal output power range - Full channel load			5 dBm

Description	Minimum	Typical	Maximum
Signal output power range - Single channel load	-15 dBm	-11 dBm	
Nominal gain		-1 dB	
Gain range	-4 dB	-1 dB	3 dB
Noise figure at nominal gain			5 dB

Table 4. Physical Specifications for NCS 2000 Contentionless Add/Drop Line Cards

Description	Specification
Power consumption • **16-port - 4- to 12-degree - Contentionless Add/Drop Unit (Product number: NCS2K-16-AD-CCOFS)** • **12-port - 4-degree - Contentionless Add/Drop Unit (Product number: NCS2K-12-AD-CCOFS)**	 Typical 40W, maximum 50W Typical 20W, maximum 30W
Size	1 slot
Management	
Card LEDs • **Failure (FAIL)** • **Active/standby (ACT/STBY)** • **Signal fail (SF)**	 Red Green/yellow Yellow
Operating Environment	
Temperature	23 to 131°F (-5 to 55°C)
Relative humidity	5 to 95%

Regulatory Compliance

Table 5 summarizes regulatory standard compliance and agency approvals for NCS 2000 Series Contentionless Add/Drop Line Cards.

Table 5. Regulatory Compliance

ANSI System	ETSI System
Countries and Regions Supported	
• Canada • United States • Korea • Japan • European Union	• European Union • Africa • CSI • Australia • New Zealand • China • Korea • India • Saudi Arabia • South America
EMC (Class A)	
• ICES-003, 2004 • GR-1089-CORE Issue 4, NEBS EMC and Safety, June 2006 • FCC 47CFR15, 2007	• ETSI EN 300 386 V1.4.1 (2008-04) Telecommunication network equipment EMC requirements (**Note:** EMC-1) • CISPR22:2008 and EN55022:2006/A1:2007 Information Technology Equipment (Emissions) (EMC-2) • CISPR24: 1997/ A1:2001/A2:2002 and EN55024:1998/A1:2001/A2:2003: Information Technology Equipment - Immunity characteristics - Limits and Methods of Measurement (test levels)

ANSI System	ETSI System
Safety	
• CSA C22.2 #60950-1 - Edition 7, March 2007 • UL 60950-1 - Edition 2, March 2007 • GR-1089-CORE Issue 4, NEBS EMC and Safety, June 2006	• UL 60950-1 - Edition 2, March 2007 • IEC 60950-1 Information technology equipment Safety Part 1: General requirements - Edition 2, 2005 and National Differences as per CB Bulletin 112A • IEC/EN 60950-1 (2006/10) with Amendment 11:2004 to EN 60950-1:2001, 1st Edition and National Differences as per CB Bulletin 112A • EN 60950-1, Edition 2 (2006) Information technology equipment - Safety - Part 1: General requirements • CE Safety Directive: 2006/95/EC
Laser	
• UL 60950-1 - Edition 2, March 2007 • IEC 60825-1: 2001 Ed.1.2 (incl. am1+am2) Safety of laser products Part 1: Equipment classification, requirements and users guide • IEC60825-2 Ed.3 (2004) Safety of laser products Part 2: Safety of optical fiber communication systems + A1:2006	• IEC 60825-1: 2001 Ed.1.2 (incl. am1+am2) Safety of laser products Part 1: Equipment classification, requirements and users guide • IEC60825-2 Ed.3 (2004) Safety of laser products Part 2: Safety of optical fibre communication systems + A1:2006 • 21CFR1040 (2008/04) (Accession Letter and CDRH Report) Automatic Laser Shutdown and restart (ALS) according to ITU-T G.664 (03/06). Guidance for Industry and FDA Staff (Laser Notice No. 50), June 2007 • Laser Products: Conformance with IEC 60825-1 and IEC 60601-2-22; Guidance for Industry and FDA Staff (Laser Notice No. 50), June 2007
Environmental	
• GR-63-CORE Issue 3, Network Equipment Building Standards (NEBS) Physical Protection, March 2006	• ETS 300-019-2-1 V2.1.2 (Storage, Class 1.1) • ETS 300-019-2-2 V2.1.2 (1999-09): Transportation, Class 2.3 • ETS 300-019-2-3 V2.2.2 (2003-04):Operational, Class 3.1E
Optical	
• GR-253-CORE - Issue 04 • ITU-T G.691	• ITU-T G.709 • ITU-T G.975
Quality	
• TR-NWT-000332, Issue 4, Method 1 calculation for 20-year mean time between failure (MTBF)	

Ordering Information

To place an order, visit the Cisco Commerce homepage and refer to Table 6. To download software, visit the Cisco Software Center.

Table 6. Ordering Information

Product Number	Description
NCS2K-12-AD-CCOFS=	12-port - 4-degree - Contentionless Add/Drop Unit
NCS2K-16-AD-CCOFS=	16-port - 4- to 12-degree - Contentionless Add/Drop Unit

Warranty

The following warranty terms apply to the Cisco NCS 2000 Contentionless Add/Drop Line Cards as well as services you may use during the warranty period. Your formal warranty statement appears in the Cisco Information Packet that accompanies your Cisco product.

- Hardware warranty duration: Five years
- Software warranty duration: One year
- Hardware replacement, repair, or refund procedure: Cisco or our service center will use commercially reasonable efforts to ship a replacement part for delivery within 15 working days after receipt of the defective product at the Cisco site. Actual delivery times of replacement products may vary depending on customer location.

Product warranty terms and other information applicable to Cisco products are available at: http://www.cisco.com/go/warranty.

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