

# 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

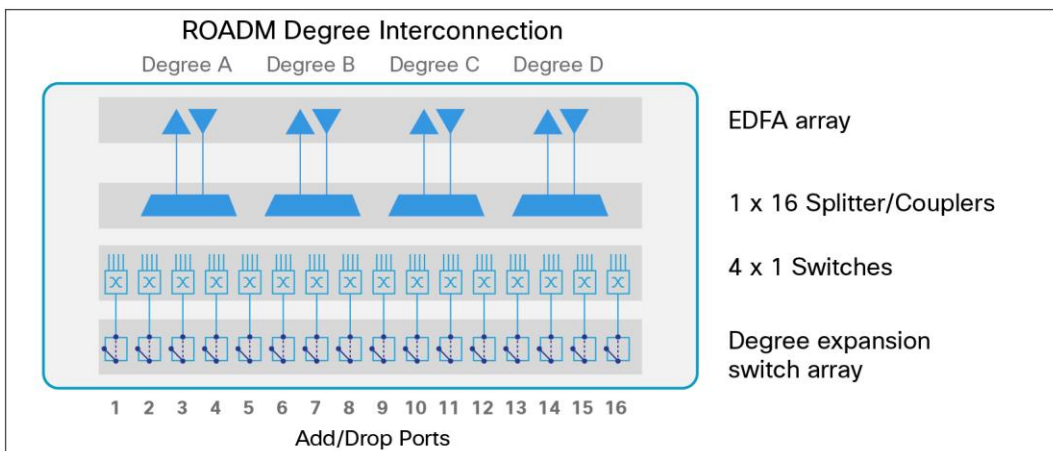


## Product Overview

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.

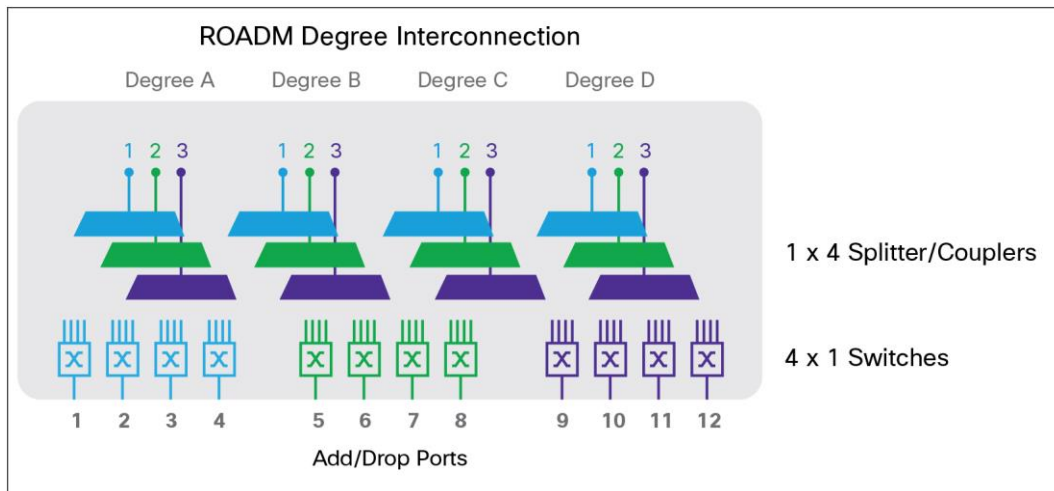
The 16-port line card adds and drops up to 16 channels across four ROADM degrees, and is expandable to 16 degrees with additional cards. An integrated 4 x 16 multicast switch and erbium-doped fiber amplifier (EDFA) array maximizes channel scalability by requiring only one ROADM port per degree. The 16-port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

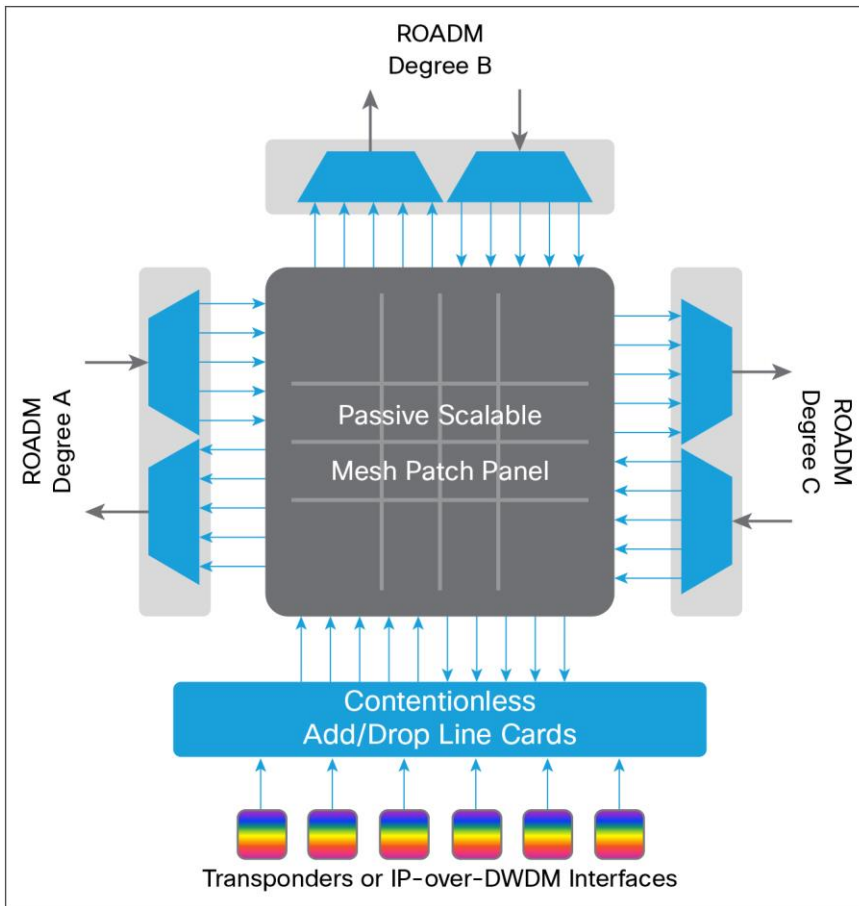


Table 1 summarizes the features and benefits of NCS 2000 Contentionless Add/Drop Line Cards. Specific feature support is hardware and software dependent.

**Table 1.** Features and Benefits

Feature	Benefit
<b>Colorless, contentionless, and omnidirectional add/drop</b>	Delivers a fully programmability DWDM layer, allowing automated provisioning and orchestrated multilayer restoration, which reduce operating and capital expenses
<b>Flexible spectrum allocation</b>	Improves spectral efficiency by allowing the creation and switching of multicarrier superchannels Prepares networks for future modulation formats exceeding 50 GHz
<b>Single-slot form factor</b>	Reduces footprint and simplifies cabling for the add/drop stage of a ROADM node
<b>Support for up to 16 degrees</b>	Allows highly scalable mesh nodes, with no blocking of add/drop wavelengths within the add/drop structure.
<b>Pay-As-You-Grow Architecture</b>	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
<b>Multicast Switch</b>	
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
<b>Multicast Switch</b>			
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	
<b>Add Path EDFA Array</b>			
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
<b>Drop Path EDFA Array</b>			
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
<b>Power consumption</b> <ul style="list-style-type: none"> <li>16-port - 4- to 12-degree - Contentionless Add/Drop Unit (Product number: NCS2K-16-AD-CCOFS)</li> <li>12-port - 4-degree - Contentionless Add/Drop Unit (Product number: NCS2K-12-AD-CCOFS)</li> </ul>	Typical 40W, maximum 50W  Typical 20W, maximum 30W
Size	1 slot
<b>Management</b>	
<b>Card LEDs</b> <ul style="list-style-type: none"> <li>Failure (FAIL)</li> <li>Active/standby (ACT/STBY)</li> <li>Signal fail (SF)</li> </ul>	Red Green/yellow Yellow
<b>Operating Environment</b>	
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
<b>Countries and Regions Supported</b>	
<ul style="list-style-type: none"> <li>Canada</li> <li>United States</li> <li>Korea</li> <li>Japan</li> <li>European Union</li> </ul>	<ul style="list-style-type: none"> <li>European Union</li> <li>Africa</li> <li>CSI</li> <li>Australia</li> <li>New Zealand</li> <li>China</li> <li>Korea</li> <li>India</li> <li>Saudi Arabia</li> <li>South America</li> </ul>
<b>EMC (Class A)</b>	
<ul style="list-style-type: none"> <li>ICES-003, 2004</li> <li>GR-1089-CORE Issue 4, NEBS EMC and Safety, June 2006</li> <li>FCC 47CFR15, 2007</li> </ul>	<ul style="list-style-type: none"> <li>ETSI EN 300 386 V1.4.1 (2008-04) Telecommunication network equipment EMC requirements (<b>Note:</b> EMC-1)</li> <li>CISPR22:2008 and EN55022:2006/A1:2007 Information Technology Equipment (Emissions) (EMC-2)</li> <li>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)</li> </ul>

ANSI System	ETSI System
<b>Safety</b>	
<ul style="list-style-type: none"> <li>• CSA C22.2 #60950-1 - Edition 7, March 2007</li> <li>• UL 60950-1 - Edition 2, March 2007</li> <li>• GR-1089-CORE Issue 4, NEBS EMC and Safety, June 2006</li> </ul>	<ul style="list-style-type: none"> <li>• UL 60950-1 - Edition 2, March 2007</li> <li>• IEC 60950-1 Information technology equipment Safety Part 1: General requirements - Edition 2, 2005 and National Differences as per CB Bulletin 112A</li> <li>• IEC/EN 60950-1 (2006/10) with Amendment 11:2004 to EN 60950-1:2001, 1<sup>st</sup> Edition and National Differences as per CB Bulletin 112A</li> <li>• EN 60950-1, Edition 2 (2006) Information technology equipment - Safety - Part 1: General requirements</li> <li>• CE Safety Directive: 2006/95/EC</li> </ul>
<b>Laser</b>	
<ul style="list-style-type: none"> <li>• UL 60950-1 - Edition 2, March 2007</li> <li>• IEC 60825-1: 2001 Ed.1.2 (incl. am1+am2) Safety of laser products Part 1: Equipment classification, requirements and users guide</li> <li>• IEC60825-2 Ed.3 (2004) Safety of laser products Part 2: Safety of optical fiber communication systems + A1:2006</li> </ul>	<ul style="list-style-type: none"> <li>• IEC 60825-1: 2001 Ed.1.2 (incl. am1+am2) Safety of laser products Part 1: Equipment classification, requirements and users guide</li> <li>• IEC60825-2 Ed.3 (2004) Safety of laser products Part 2: Safety of optical fibre communication systems + A1:2006</li> <li>• 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</li> <li>• Laser Products: Conformance with IEC 60825-1 and IEC 60601-2-22; Guidance for Industry and FDA Staff (Laser Notice No. 50), June 2007</li> </ul>
<b>Environmental</b>	
<ul style="list-style-type: none"> <li>• GR-63-CORE Issue 3, Network Equipment Building Standards (NEBS) Physical Protection, March 2006</li> </ul>	<ul style="list-style-type: none"> <li>• ETS 300-019-2-1 V2.1.2 (Storage, Class 1.1)</li> <li>• ETS 300-019-2-2 V2.1.2 (1999-09): Transportation, Class 2.3</li> <li>• ETS 300-019-2-3 V2.2.2 (2003-04):Operational, Class 3.1E</li> </ul>
<b>Optical</b>	
<ul style="list-style-type: none"> <li>• GR-253-CORE - Issue 04</li> <li>• ITU-T G.691</li> </ul>	<ul style="list-style-type: none"> <li>• ITU-T G.709</li> <li>• ITU-T G.975</li> </ul>
<b>Quality</b>	
<ul style="list-style-type: none"> <li>• TR-NWT-000332, Issue 4, Method 1 calculation for 20-year mean time between failure (MTBF)</li> </ul>	

## 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
<b>NCS2K-12-AD-CCOFS=</b>	12-port - 4-degree - Contentionless Add/Drop Unit
<b>NCS2K-16-AD-CCOFS=</b>	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.

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Product warranty terms and other information applicable to Cisco products are available at:

<http://www.cisco.com/go/warranty>.

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