Cisco NCS 2000 16-port Flex Spectrum ROADM Line Card

The Cisco® Network Convergence System 2000 evolves the Cisco ROADM portfolio by introducing Cisco nLight ROADM technology. By supporting touchless reconfigurability through colorless, omnidirectional, and contentionless add/drop, networks built upon nLight ROADM can instantly respond to new bandwidth requests, route around network failures, and dynamically adjust their topology - all without manual intervention.

The Cisco NCS 2000 16-port Flex Spectrum ROADM Line Card (NCS2K-16-WXC-FS) is a double-slot unit that provides multidegree switching capabilities, not only at the individual wavelength level, but also with flexible spectrum allocations. You can use the 16-port Flex Spectrum ROADM Line Card in the core of the network to build ROADM nodes with 96 channels spaced at 50 GHz, Flex Spectrum channels, or a combination of the two. The same unit can provide colorless multiplexing and demultiplexing to ROADM nodes.

Figure 1. Cisco 16-port Flex Spectrum ROADM Line Card

Features and Benefits

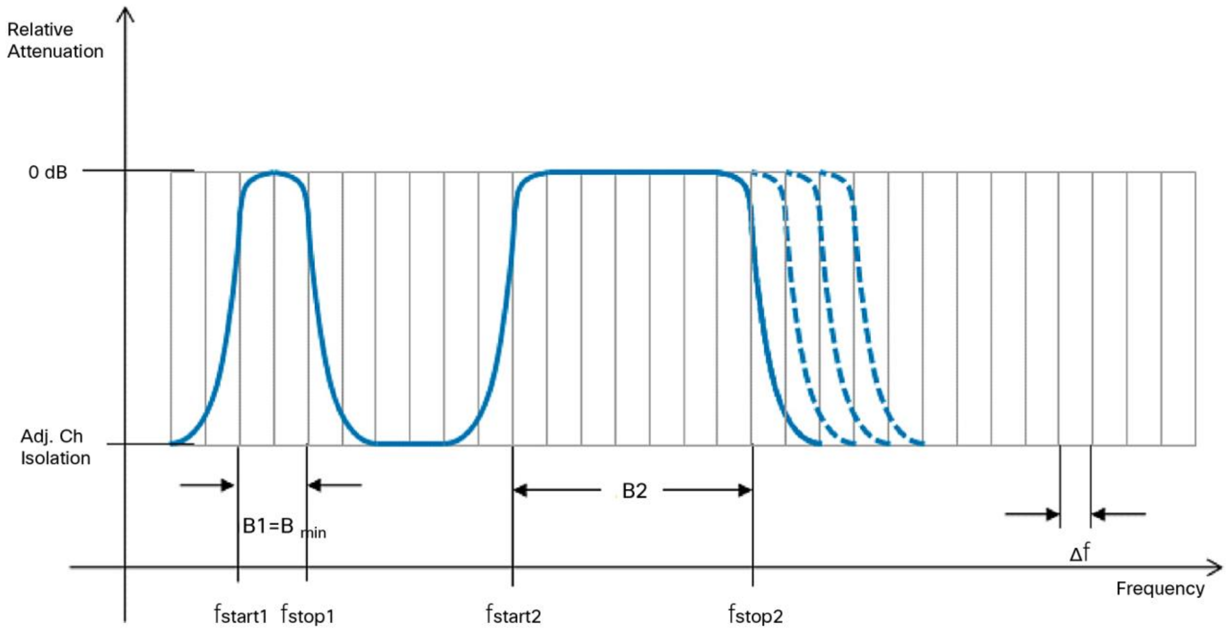
The 16-port Flex Spectrum ROADM Line Card creates an agile dense wavelength-division multiplexing (DWDM) layer, which provides the foundation for converged transport architectures, delivering features that allow programmability and agility in provisioning and recovery operations. Wavelength add/drop and routing are entirely software-driven, eliminating manual operator intervention to reduce operating expenses (OpEx) and accelerate provisioning and recovery.

This line card supports the following agile DWDM innovations and benefits:

- Colorless ROADM ports are not frequency-specific. This 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.
- Contentionless add/drop allows an N-degree ROADM node to accommodate N wavelengths of the same frequency from a single add/drop device.

- Omnidirectional ROADM ports are not associated to a specific ROADM degree. Therefore a wavelength reroute does not require a physical fiber move, and it can be executed entirely by software.
- With 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 (Figure 2).

Figure 2. The Flex Spectrum Concept



Together, colorless, contentionless, omnidirectional, and Flex Spectrum (CCOFS) functionalities bring programmability to the optical layer, allowing direct and complete control by packet-layer devices and centralized network orchestrators.

Additional features of the 16-port Flex Spectrum ROADM Line Card include:

- High reliability: The line card node architecture allows complete independence among the direction-facing units, including the ability to house units in physically separated shelves.
- Flexibility: The 16-port Flex Spectrum ROADM Line Card can work either as a core building block of a ROADM node or as a colorless multiplexer/demultiplexer. Consequently, you can use 16-port Flex Spectrum ROADM Line Card ports to manage individual channels (multiplexer/demultiplexer operation) or to terminate optical multiplex sections, allowing network or ring interconnection without optical-electrical-optical (OEO) conversion.

Product Description

The 16-port Flex Spectrum ROADM Line Card is a 2-slot unit which has 36 input/output fibers among the following connectors:

- Two LC-duplex adapters for common (COM) and upgrade (UPG) ports
- Four MPO connectors for add, drop, and express (EXP) ports

The line card incorporates faceplate-mounted LEDs to provide a quick visual check of the operational status of the card. Each faceplate shows an icon (an orange circle), which is mapped to shelf-slot icons indicating the shelf-slot where the card can be physically installed. The cards are supported by the integrated Cisco Transport Controller craft manager, which gives the user access to system operations, administration, maintenance, and provisioning (OAM&P). Cisco Transport Controller can also provide a per-channel graphical representation of the optical power levels associated with each path in the ROADM node.

Figure 3 shows the internal layout of the 16-port Flex Spectrum ROADM Line Card, and Figure 4 shows the high-level nLight ROADM architecture, in this case of a 3-degree node.

Figure 3. 16-port Flex Spectrum ROADM Line Card Unit Layout

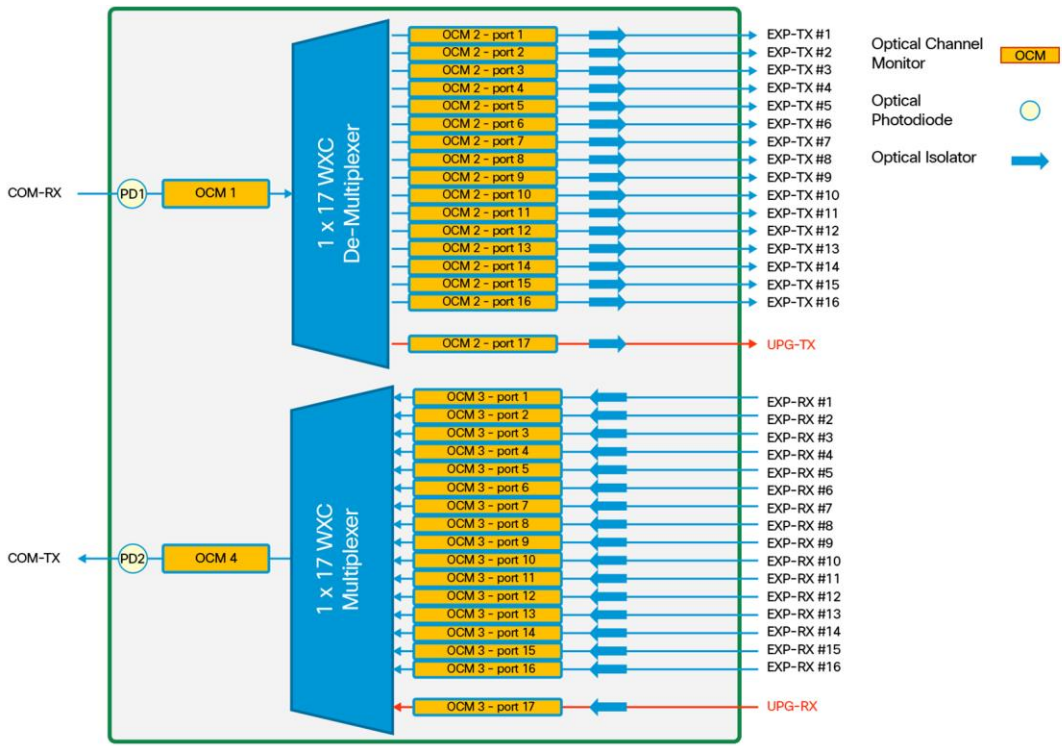
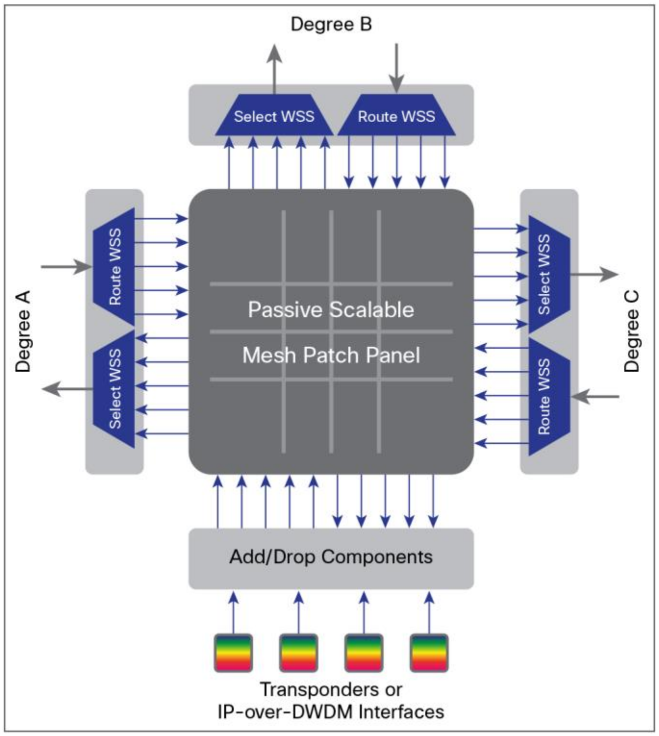


Figure 4. Cisco nLight ROADM Architecture



Product Specifications

Tables 1 and 2 list the optical and physical specifications, respectively, for the 16-port Flex Spectrum ROADM Line Card. Table 3 shows regulatory compliance.

Table 1. Optical Specifications

Parameter	Value
Channel grid	96 channels, 50 GHz-spaced ITU grid
Central wavelength - Channel 1	191.350 THz (1566.72 nm)
Central wavelength - Channel 96	196.100 THz (1528.77 nm)
Flex Spectrum "slice" width	12.5 GHz
Minimum settable channel bandwidth	50 GHz - 4 slices
Maximum settable "super-channel" bandwidth	500 GHz - 40 slices
Total number of slices	384 slices - 4800 GHz
f_start of first slice	191.325 GHz
Insertion loss	Minimum 4 dB, maximum 8 dB
Optical port isolation (COM - EXP path)	20 dB (for 15-25 dB of extra attenuation) 23 dB (for 0-15 dB of extra attenuation)
Polarization dependent loss (all paths)	Maximum 0.7dB (0-10 dB attenuation) Maximum 0.9dB (10-15 dB of attenuation)
Variable optical attenuator (VOA) attenuation setting accuracy	1.5 dB maximum (Attenuation 10--15 dB)
Per-channel maximum input power	13 dBm

Table 2. Physical Specifications

Parameter	Value
Power	Maximum 100W
Size **Dimensions (H x W x D)**	2 slots 13.1 x 4.90 x 9.84 in. (33.27 x 24.99 cm)
Weight	9.92 lb (4.5 kg)
Mean time between failure (MTBF) (predicted)	162,273 hours
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 85%

Table 3. Regulatory Compliance[1]

Countries Supported	
ANSI System	**ETSI System**
• 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 6, NEBS EMC and Safety (May 2011) • 47 FCC part15 (2011)	• EN 300 386 Telecommunications Network Equipment (EMC): 2008 (Note: EMC-1) • CISPR22 Ed.6 (2008) and CISPR24: Ed.2 (2010) • EN55024 Ed.2 2010: Immunity levels: see EN61000-4-xx • EN55022: 2007 Information Technology Equipment (Emissions)(2006) (EMC-2)
Safety	
• UL/CSA 60950-1,Second Ed 2011 • GR-1089-CORE Issue 6, NEBS EMC and Safety (May 2011)	• UL/CSA 60950-1,Second Ed 2011 • IEC 60950-1(2005/12), 2nd Edition and National Differences as per CB Bulletin 112A • + Amendment 1: 2009
Laser	
• UL/CSA 60950-1,Second Ed 2011 • IEC 60950-1(2005/12), 2nd Edition and National Differences as per CB Bulletin 112A • + Amendment 1: 2009 • IEC-60825-2 Edition 3.1, 2007/01	• CDRH (accession letter and report) • IEC 60825-1 Ed. 2 2007-03
Environmental	
• GR-63-CORE Issue 4, NEBS Physical Protection (Apr 2012) • ETS 300-019-2-1 V2.1.2 (2000-09) (Storage, Class 1.1)	• ETS 300-019-2-2 V2.2.1 (2011-11): Transportation, Class 2.3 • ETS 300-019-2-3 V2.2.2 (2003-04): stationary use, Class 3.1E

Table 4 lists amplifiers that are compatible with the 16-port Flex Spectrum ROADM Line Card.

Table 4. Amplifiers Compatible with the 16-port Flex Spectrum ROADM Line Card

Part Number	Description
NCS2K-EDRA2-26	21dBm Erbium Doped Raman Amplifier + Bst 26dB Span - C-Band
NCS2K-EDRA2-35	21dBm Erbium Doped Raman Amplifier + Bst 35dB Span - C-Band
NCS2K-EDRA1-26	21dBm Erbium Doped Raman Amplifier 26dB Span - C-Band
NCS2K-EDRA1-35	21dBm Erbium Doped Raman Amplifier 35dB Span - C-Band
15454- OPT-EDFA-17	Enhanced C-band 96 channel EDFA amplifier 17 dB max gain, 50 GHz compatible, LC connector
15454- OPT-EDFA-24	Enhanced C-band 96 channel EDFA amplifier 24 dB max gain, 50 GHz compatible, LC connector
15454-M-RAMAN-CTP	High-Power Counter-Propagating, 1W optical pump output power, C-band, 96-channel 50-GHz Raman unit with 2 ES 2000 PS PC - LC 2m cables
15454-M-RAMAN-COP	High-Power Co-Propagating, 1W optical pump output power, C-band, 96-channel 50-GHz Raman unit with 1 ES 2000 PS PC 2m cable

Ordering Information

To place an order, visit the Cisco Ordering Home Page and refer to Table 5.

Table 5. 16-port Flex Spectrum ROADM Line Card Ordering Information

Product Name	Description
NCS2K-16-WXC-FS=	16-ports Wavelength X-Connect and Mux/Demux - Flex Spectrum

Warranty

The following warranty terms apply to the Cisco Network Convergence System 2006 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 Cisco’s 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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