

80-Channel Wavelength Cross-Connect Card for the Cisco ONS 15454 Multiservice Transport Platform

The Cisco® ONS 15454 Multiservice Transport Platform (MSTP) provides a comprehensive, intelligent dense wavelength-division multiplexing (DWDM) solution for expanding metropolitan (metro) and regional bandwidth.

Figure 1. 80-Channel Wavelength Cross-Connect Card with Integrated Optical Channel Monitor



Product Overview

Release 9.2 of the Cisco ONS 15454 MSTP expands the platform's reconfiguration options. In addition to the existing 32-channel and 40-channel reconfigurable optical add/drop multiplexer (ROADM) cards, one new card (Figure 1) is introduced in this release to optimize and increase the MSTP's throughput density and extend the flexibility of MSTP nodes.

The new 80-channel wavelength cross-connect card (product number 15454-80-WXC-C) is a double-slot unit, optimized for Degree-2 and Degree-N reconfigurable nodes.

Similarly to the already available 40-channel wavelength cross-connect (40-WXC) card, and thanks to the software functionalities extended from previous releases, the new 80-WXC-C provides multi-degree switching capabilities at the individual wavelength level. Mesh and multi-ring network topologies can now be extended to 50-GHz, 80-channel DWDM systems, with complete flexibility of service routing at all nodes in the network.

The 80-WXC-C can be used in the core of the network to build 50-GHz ROADM nodes. With a simple software configuration, the same unit can also be used to provide colorless multiplexing and demultiplexing to ROADM nodes.

The Cisco ONS 15454 ROADM cards are plug-in modules that deliver the flexibility to access network bandwidth from a single DWDM channel all the way to 80 channels, to support the requirements of service provider and enterprise networks. Table 1 provides deployment details.

Table 1. 80-Channel Wavelength Cross-Connect Card: Deployment Information

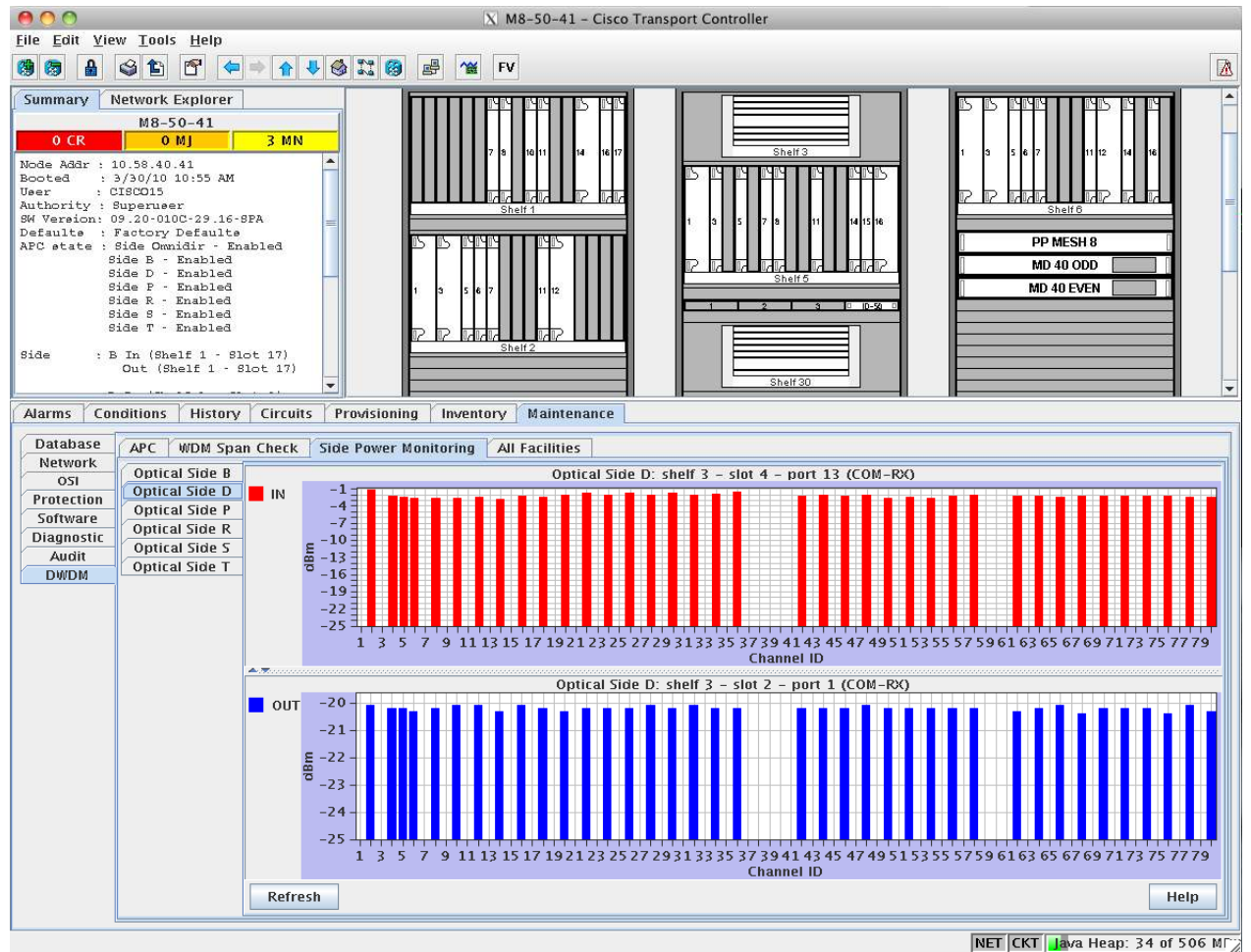
Component	Deployment Application
80-Channel Wavelength Cross-Connect – C Band	This is the primary unit for the 80-channel ROADM solution (both Degree-2 and multi-degree) operating in the C band. It allows the possibility to remotely and automatically control a wavelength to be routed to any direction of a ROADM node. Embedded automatic power control mechanisms allow interfacing with different types of DWDM units without requiring external attenuators. Used in conjunction with Cisco ONS multiplexers and demultiplexers, these mechanisms allow the management of local add/drop traffic in the specific direction supported by the 80-WXC-C unit.
Mesh Patch-Panels Options	
Degree-4 Mesh Patch Panel	This 2-rack-unit (2RU)-high passive unit is used in multi-degree ROADM nodes with up to 4 80-WXC-C units to provide broadcast functionalities and replicate to all the directions of the node the wavelengths to be routed through the ROADM node.
Degree-8 Mesh Patch Panel	This 2RU-high passive unit is used in multi-degree ROADM nodes with up to 8 80-WXC-C units to provide broadcast functionalities and replicate to all the directions of the node the wavelengths to be routed through the ROADM node.
Multiplexer/Demultiplexer Options (Local Add/Drop)	
Cisco ONS 15216 40-channel multiplexer/demultiplexer patch panels	This 2RU-high passive unit can be used in Degree-2 and multi-degree ROADM nodes based on the 80-WXC-C to manage the local add/drop function in the specific direction(s). For additional details, please refer to the data sheet describing the Cisco ONS 15216 Multiplexer/Demultiplexer 40-Channel Patch Panel and Cisco ONS 15216 Multiplexer/Demultiplexer Patch Panel 50-GHz Interleaver De-Interleaver .
Cisco ONS 15454 40-channel multiplexer/demultiplexer	This (active) iPLC unit can be used in Degree-2 and multi-degree ROADM nodes based on the 80-WXC-C to manage the local add/drop function in the specific direction(s). For additional details, please refer to the data sheet describing the 40-Channel ROADM Portfolio for the Cisco ONS 15454 MSTP .
Legacy iPLC Units	32-Channel Wavelength Selective Switch – C Band (15454-32-WSS=) 32-Channel Demultiplexer – C band (15454-32-DMX=) 40-Channel Wavelength Selective Switch – C Band – Odd Channels (15454-40-WSS-C=) 40-Channel Wavelength Selective Switch – C Band – Even Channels (15454-40-WSS-CE=) 40-Channel Demultiplexer – C band – Odd Channels (15454-40-DMX-C=) 40-Channel Demultiplexer – C Band – Even Channels (15454-40-DMX-CE=) 40-Channel Multiplexer – C Band – Odd Channels (15454-40-MUX-C=)

The Cisco ONS 15454 80-WXC-C card operates on the ITU 50-GHz wavelength plan. The card integrates automatic per-channel power monitor and control capabilities, providing node- and network-based automatic-power-level management on each input and output port. Per-channel optical path selection is also done in a completely automated way through Wavelength Path Provisioning (WPP) at the network level, featuring end-to-end, point-and-click wavelength provisioning and easy SONET/SDH-like wavelength management.

The ROADM node architecture has been specifically defined and engineered to provide:

- **High reliability:** Enables complete independence between specific direction-facing units with the possibility to house units in physically separated shelves.
- **Automatic optical power balancing:** Per-channel automatic power control allows an intelligent “self-healing” approach to DWDM, which is unique in the market.
- **Low insertion loss:** Selected technology allows direct integration of different functionalities in the same optical module, reducing to the bare minimum the number of optical connections.
- **Flexibility:** The unit can work either as a core building block for 80 channels Optical Cross-Connect nodes or as a colorless Multiplexer/Demultiplexer. Consequently, 80-WXC ports can be used to manage individual channels (Multiplexer/Demultiplexer operation) or to terminate Optical Multiplex Sections, allowing Networks/Rings interconnection without any O-E-O conversion.

The optical cards incorporate faceplate-mounted LEDs to provide a quick visual check of the operational status of the card. Printed on each of the faceplates is 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 provides the user access for operations, administration, maintenance, and provisioning (OAM&P) of the system. Cisco Transport Controller can also provide a per-channel graphical representation of the optical power levels associated with each individual path in the ROADM nodes (Figure 2).

Figure 2. Cisco Transport Control Per-Channel Optical Power Monitoring Representation

Complete flexibility provided by the 80-channel wavelength cross-connect unit (80-WXC-C) greatly simplifies the design of optical networks in terms of unit placement. However this flexibility alone is not enough to allow users to define any possible optical path at the network level. The Cisco Transport Planner optical design tool features the possibility to design DWDM networks based on ROADMs functionalities and to verify all the possible optical paths and the DWDM interface types defined by the user. The possibility to select any available optical path and any DWDM interface type allows a truly flexible network design. The design is highly customizable by the user, who can compare different solutions and create hypothetical scenarios in a simple and effective way.

The flexibility provided by the smart 80-WXC-C design and Cisco ONS 15454 MSTP software allows building multiple node architectures using the 80-WXC-C as a building block.

Figure 3 shows the internal layout of the 80-WXC-C. The integrated output connection manager (OCM) is connected to all the input and output ports through bidirectional switching. This allows using the unit unidirectionally either as a colorless multiplexer or as a demultiplexer. Similarly to the 40-WXC-C, the unit is used bidirectionally when building the core of ROADMs nodes.

Figure 4 and Figure 5 show the node architectures for Cisco ONS 15454 MSTP, 80-channel, Degree-2 and multi-degree ROADMs nodes. The 80-WXC-C unit is orange when used unidirectionally as a colorless multiplexer or demultiplexer. It is shown in blue when used bidirectionally to build the core of a ROADMs node.

Figure 3. 80-WXC-C Card: Internal Layout

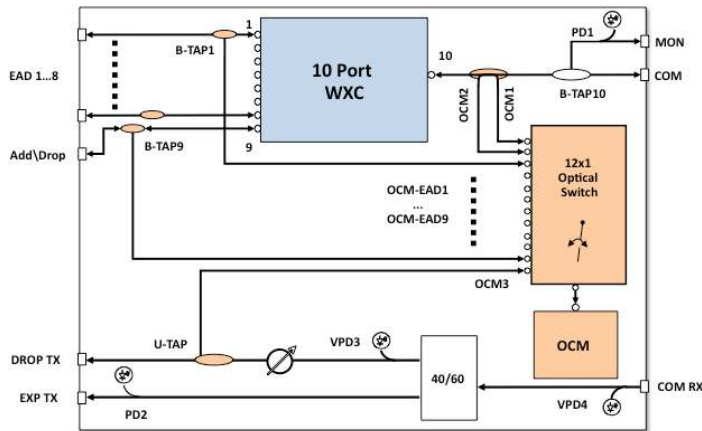


Figure 4. MSTP 80-Channel Degree-2 ROADM Node: Non-Colorless (a) and Colorless (b)

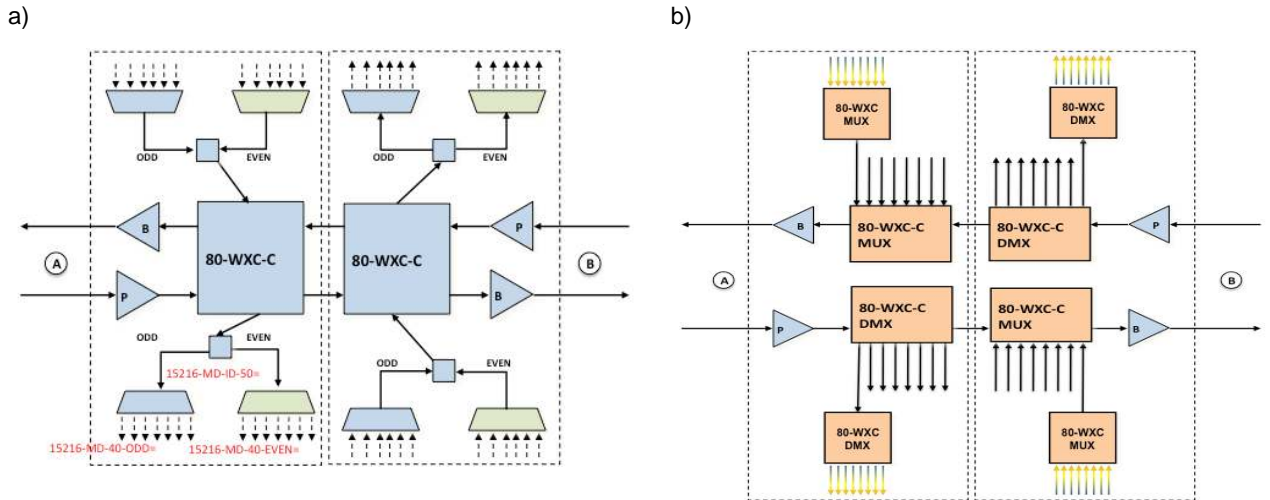
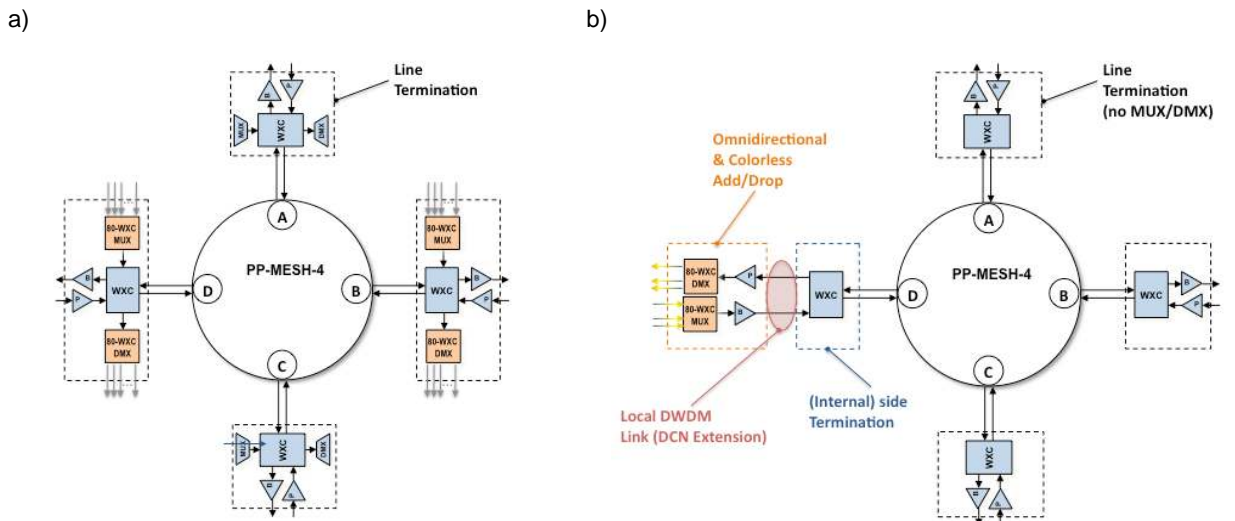


Figure 5. MSTP 80-Channel Multi-Degree Nodes: OXC with Colorless and Non-Colorless Add/Drop (a), Omnidirectional and Colorless (b)



Product Specifications

Tables 2 through 6 give specifications for the 80-channel wavelength cross-connect card.

Table 2. Regulatory Compliance¹

Countries Supported	
ANSI System	ETSI System
<ul style="list-style-type: none"> • Canada • United States • Korea • Japan • European Union 	<ul style="list-style-type: none"> • European Union • Africa • CSI • Australia • New Zealand • China • Korea • India • Saudi Arabia • South America
EMC (Class A)	
<ul style="list-style-type: none"> • ICES-003 (2004) • GR-1089-CORE Issue 4, NEBS EMC and Safety (June 2006) • FCC 47CFR15 (2006) 	<ul style="list-style-type: none"> • EN 300 386 Telecommunications Network Equipment (EMC): 2007 (Note: EMC-1) • CISPR22 (2008) and CISPR24: 2002/ EN55024: 2007: Immunity levels: see EN61000-4-xx • EN55022: 2007 Information Technology Equipment (Emissions)(2006) (EMC-2) • EN55024: 1998/a2: 2003 Information Technology Equipment (Immunity)
Safety	
<ul style="list-style-type: none"> • UL/CSA 60950-1, 2006 • GR-1089-CORE Issue 4, NEBS EMC and Safety (June 2006) 	<ul style="list-style-type: none"> • UL/CSA 60950-1, 2006 • IEC 60950-1(2005/12), 2nd Edition and National Differences as per CB Bulletin 112A
Laser	
<ul style="list-style-type: none"> • UL/CSA 60950-1, 2006 • IEC 60950-1(2005/12), 2nd Edition and National Differences as per CB Bulletin 112A • IEC-60825-2 Edition 3.1, 2007/01 	<ul style="list-style-type: none"> • CDRH (accession letter and report) • IEC 60825-1 Consol. Ed. 1.2 (incl. am1+am2) 2001-08
Environmental	
<ul style="list-style-type: none"> • GR-63-CORE Issue 3, NEBS Physical Protection (Mar 2006) • ETS 300-019-2-1 V2.1.2 (Storage, Class 1.1) 	<ul style="list-style-type: none"> • 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	
<ul style="list-style-type: none"> • G.709 • G.975 	
Miscellaneous	
<ul style="list-style-type: none"> • AT&T Network Equipment Development Standards (NEDS) Generic Requirements, AT&T 802-900-260 • SBC TP76200MP 	<ul style="list-style-type: none"> • Verizon SIT.NEBS.NPI.2002.010 • Worldcom ESD requirement

¹ All compliance testing and documentation may not be completed at release of the product. Check with your sales representative for countries outside of Canada, the United States, and the European Union.

Table 3. System Requirements

Component	Cisco ONS 15454 ANSI	Cisco ONS 15454 ETSI
Processor	TCC2P/TCC2/TNC/TSC	TCC2P/TCC2/TNC/TSC
Cross-connect	None – TDM not supported in Rel. 9.2	None – TDM not supported in Rel. 9.2
Shelf assembly	15454-SA-HD or 15454-SA-HD-DDR shelf assembly with CC-FTA or FTA3 version fan-tray assembly 15454-M6-SA shelf assembly	15454-SA-ETSI shelf assembly with CC-FTA or SDH 48V fan-tray assembly 15454-M6-SA shelf assembly
System software	Release 9.2.0 ANSI or later	Release 9.2.0 ETSI or later

Table 4. Specifications for the 80-WXC-C Card

Specification	80-WXC-C
Management	
Card LEDs	
Failure (FAIL)	Red
Active/standby (ACT/STBY)	Green/yellow
Signal fail (SF)	Yellow
Operating Environment	
Temperature	
Normal	0°C to 40°C (32°F to 104°F)
Short term ¹	–5°C to 55°C (23°F to 131°F)
Relative humidity	
Normal	5% to 85%, non condensing
Short term	5% to 90% RH but not to exceed 0.024 kg water/kg of dry air
Storage Environment	
Temperature	–40°C to 70°C (–40°F to 158°F)
Relative humidity	5% to 95% RH

1. Short-term refers to a period of not more than 96 consecutive hours and a total of not more than 15 days in 1 year. This refers to a total of 360 hours in any given year, but no more than 15 occurrences during that 1-year period.

Table 5. Optical Specifications for the 80-WXC-C Card

Specification	80-WXC-C
Optical Parameters	
Insertion loss (maximum at minimum VOA)	7.0 dB (any path)
Minimum VOA dynamic range	25 dB (EAD – COM, Add/Drop – COM)
Maximum input power	27 dBm
Filter type	Wavelength Selective Switch (WSS)
Minimum transmit filter –1.5 dB bandwidth (all operating conditions and attenuation values)	+/-17 GHz (EAD – COM, Add/Drop – COM)
Adjacent crosstalk (all operating conditions and attenuation values)	37 dB (minimum)
Non-adjacent crosstalk (all operating conditions and attenuation values)	45 dB (minimum)
Maximum Polarization Dependent Loss (PDL) (all operating conditions and attenuation values)	0.8 dB (any path)
Optical power setting accuracy (all operating conditions and attenuation values)	+/-1.0 dB
Minimum return loss	40 dB
Connectors	
Connectors type	LC (all the ports)

Specification	80-WXC-C
Power	
Card power draw	
Typical	20W
Maximum	40W
Physical	
Size	2 slots
Weight	2.72 kg (6.00 lbs)
MTBF (Predicted)	170,039 hrs
Supported shelf slots	
15454-SA-HD-xx	1–5, 12–16
15454-M6-SA	1-5

Table 6. Optical Specifications for Mesh Patch Panel Units (same used with 40-WXC-C)

Specification	PP-MESH-4	PP-MESH-8
Maximum Insertion Loss	7.5 dB	10.6 dB
Maximum Polarization Dependent Loss	0.3 dB	0.5 dB
Maximum PMD	0.1 ps	0.1 ps
Minimum Return Loss	50 dB	50 dB

Ordering Information

Error! Reference source not found. gives ordering information for the Cisco ONS 15454 80-channel wavelength cross-connect card.

Table 7. System Ordering Information

Part Number	Description
15454-80-WXC-C=	80-Chs Wavelength Cross-Connect – C-Band – 50 GHz
15454-PP-MESH-8=	2RU 8-Degree Mesh Patch-Panel
15454-PP-MESH-4=	2RU 4-Degree Mesh Patch-Panel
15454-32-WSS=	32-Channel Wavelength Selective Switch, C-band
15454-32-DMX=	32-Channel Demultiplexer 100 GHz (for use with 32-WSS), C-band
15454-40-WSS-C=	40Chs Wavelength Selective Switch – C-band – Odd
15454-40-DMX-C=	40Chs Demultiplexer – C-band – Odd
15454-40-MUX-C=	40Chs Multiplexer – C-band – Odd
15454-40-WSS-CE=	40Chs Wavelength Selective Switch – C-band – Even
15454-40-DMX-CE=	40Chs Demultiplexer – C-band – Even
15454-MPO-8LC-4=	Multi-fiber patchcord – MPO to 8xLC – 4m
15454-MPO-8LC-6=	Multi-fiber patchcord – MPO to 8xLC – 6m
15454-MPO-8LC-8=	Multi-fiber patchcord – MPO to 8xLC – 8m

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For More Information

For more information about the Cisco ONS 15454 Multiservice Transport Platform, contact your local account representative or visit Cisco at: <http://www.cisco.com/go/optical> or <http://www.cisco.com/go/IPoDWDM>.



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