

## Reconfigurable Optical Add/Drop Multiplexing Portfolio 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-area (metro) and regional bandwidth.

### Product Overview

The Cisco ONS 15454 MSTP offers a fully integrated reconfigurable optical add/drop multiplexing (ROADM) solution, shown in Figure 1, for delivering any wavelength to any location in a metro or regional network. The ROADM cards are part of the Cisco ONS 15454 MSTP intelligent DWDM architecture engineered to reduce DWDM complexity and speed the deployment of next-generation networking solutions.

**Figure 1**

Reconfigurable Optical Add/Drop Multiplexing Units



Plug-in modules that deliver flexible access to network bandwidth from a single DWDM channel all the way to 32 channels, Cisco ONS 15454 ROADM cards support the requirements of service provider and enterprise networks. Table 1 outlines the ROADM module types available for the Cisco ONS 15454 MSTP with the applications they are designed to support.

**Table 1.** ROADM Units with Applications

Component	Deployment Application
<b>32-channel wavelength selective switch (WSS) – C band</b>	This unit is the key unit for the ROADM solution operating in the C band. It can remotely and automatically control assignment of a wavelength to a network node. Dynamic Gain Equalization (DGE) is an automatic per-channel power control capability, allowing this unit to be deployed also in selected line amplification sites in the network to improve overall system performance.
<b>32-channel demultiplexer – C band</b>	This unit operates with the 32-channel WSS in C band ROADM nodes to provide access to channels to be dropped locally. Embedded automatic power control mechanisms enable it to interface with different types of DWDM units without requiring external attenuators.
<b>32-channel WSS – L band</b>	This unit is the key unit for the ROADM solution operating in the L band. It can remotely and automatically control assignment of a wavelength to a network node. DGE allows this unit to be deployed also in selected line amplification sites in the network to improve overall system performance.
<b>32-channel demultiplexer – L band</b>	This unit operates with the 32-channel WSS in L band ROADM nodes to provide access to channels to be dropped locally. Embedded automatic power control mechanisms enable it to interface with different types of DWDM units without requiring external attenuators.

The Cisco ONS 15454 ROADM cards operate on the ITU 100-GHz wavelength plan. Each card integrates automatic per-channel optical power control capabilities, providing automatic node- and network-based power level management. Per-channel optical path selection is also done automatically through Wavelength Path Provisioning (WPP) at network level, featuring GUI-based wavelength provisioning and easy SONET/SDH-like wavelength management.

The ROADM node architecture provides:

- High reliability – Complete independence between west- and east-facing units allows units to be housed in two separate shelves.
- Automatic optical power balancing – Per-channel automatic power control allows a unique “self healing” intelligent approach to DWDM.
- Low insertion loss – Direct integration of different functionalities in the same optical module reduces optical connections to the bare minimum.
- Fast switching – Currently deployed units can provide shared optical protection directly in the optical domain with a protection time comparable with what SONET/SDH guarantees.

The optical cards incorporate LEDs on the faceplate to provide a quick visual check of the card’s operational status. An icon on each faceplate is mapped to shelf-slot icons indicating the shelf slot where the card can be installed. The cards are supported by the integrated Cisco Transport Controller craft manager, which provides access for operations, administration, maintenance, and provisioning for the system. Utilizing the embedded units capabilities, 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).

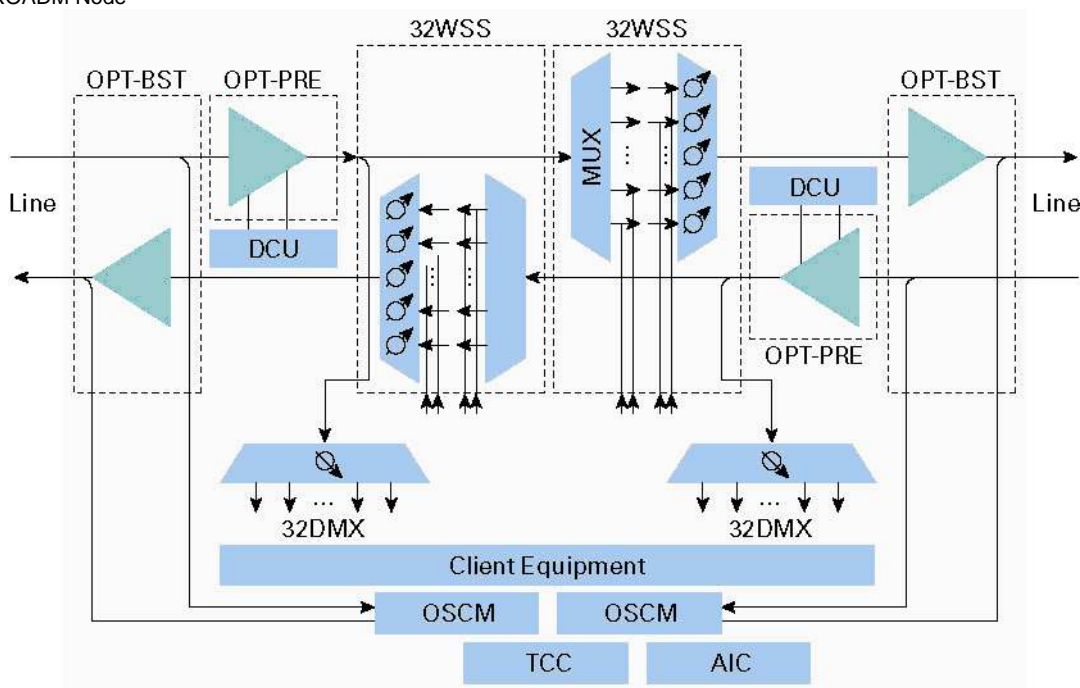
**Figure 2**  
Cisco Transport Control Per-Channel Optical Power Monitoring



The flexibility provided by the ROADM unit simplifies the design of optical networks. With the Cisco MetroPlanner optical design tool, you can design DWDM networks based on ROADM functions and verify all possible optical paths and DWDM interface types. This fully flexible method of network design allows you to compare different solutions and create “what-if” scenarios in a simple and effective way.

Figure 3 shows a sample signal-flow diagram for a Cisco ONS 15454 MSTP C-band ROADM node, outlining the use for each unit type.

**Figure 3**  
MSTP C-band ROADM Node



## Product Specifications

Tables 2 through 5 give specifications of the Cisco ONS 15454 ROADM cards. Figures 4 and 5 are functional diagrams for the Cisco ONS 15454 ROADM cards.

**Table 2.** Regulatory Compliance<sup>1</sup>

ANSI System	ETSI System
<b>Countries</b>	
Canada, United States, Mexico, Korea, Japan, European Union	European Union, Australia, New Zealand, Singapore, China, Mexico, Hong Kong, Korea
<b>EMC emissions (radiated, conducted)</b>	
<ul style="list-style-type: none"> <li>ICES-003</li> <li>GR-1089-CORE</li> <li>47CFR15</li> <li>VCCI V-3/2000.04</li> <li>CISPR24</li> </ul>	<ul style="list-style-type: none"> <li>EN 300 386-TC</li> <li>EN50081-1</li> <li>EN55022</li> <li>AS/NZS3548, Amendment 1 + 2 1995</li> </ul>
<b>EMC immunity</b>	
<ul style="list-style-type: none"> <li>GR-1089-CORE</li> <li>CISPR24</li> <li>EN50082-2</li> </ul>	<ul style="list-style-type: none"> <li>EN300-386-TC</li> <li>EN55024</li> </ul>
<b>Safety</b>	
<ul style="list-style-type: none"> <li>CAN/CSA-C22.2 No. 60950-00 Third Ed., 12/1/2002</li> <li>GR-1089-CORE</li> <li>GR-63-CORE</li> <li>TS001</li> </ul>	<ul style="list-style-type: none"> <li>UL 60950 Third Ed., 12/1/2000</li> <li>EN60950 (to A4)</li> <li>IEC60950/EN60950, Third Ed.</li> <li>AS/NZS3260 Supplement 1, 2, 3, 4, 1997</li> </ul>
<b>Environmental</b>	
<ul style="list-style-type: none"> <li>GR-63-CORE</li> <li>AT&amp;T Network Equipment Design Specifications (NEDS)</li> </ul>	<ul style="list-style-type: none"> <li>ETS 300-019 (Class 3.1E) (Note 2)</li> </ul>
<b>Structural dynamics</b>	
<ul style="list-style-type: none"> <li>GR-63-CORE</li> <li>AT&amp;T NEDS</li> </ul>	<ul style="list-style-type: none"> <li>ETS 300-019 (Class 3.1E) (Note 2)</li> </ul>
<b>Power and grounding</b>	
<ul style="list-style-type: none"> <li>SBC (TP76200MP)</li> <li>ETS 300-132-1 (DC power)</li> </ul>	<ul style="list-style-type: none"> <li>ETS 300-253 (grounding)</li> </ul>
<b>Optical</b>	
<ul style="list-style-type: none"> <li>GR-253-CORE</li> <li>G.692</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>	

<sup>1</sup> 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.

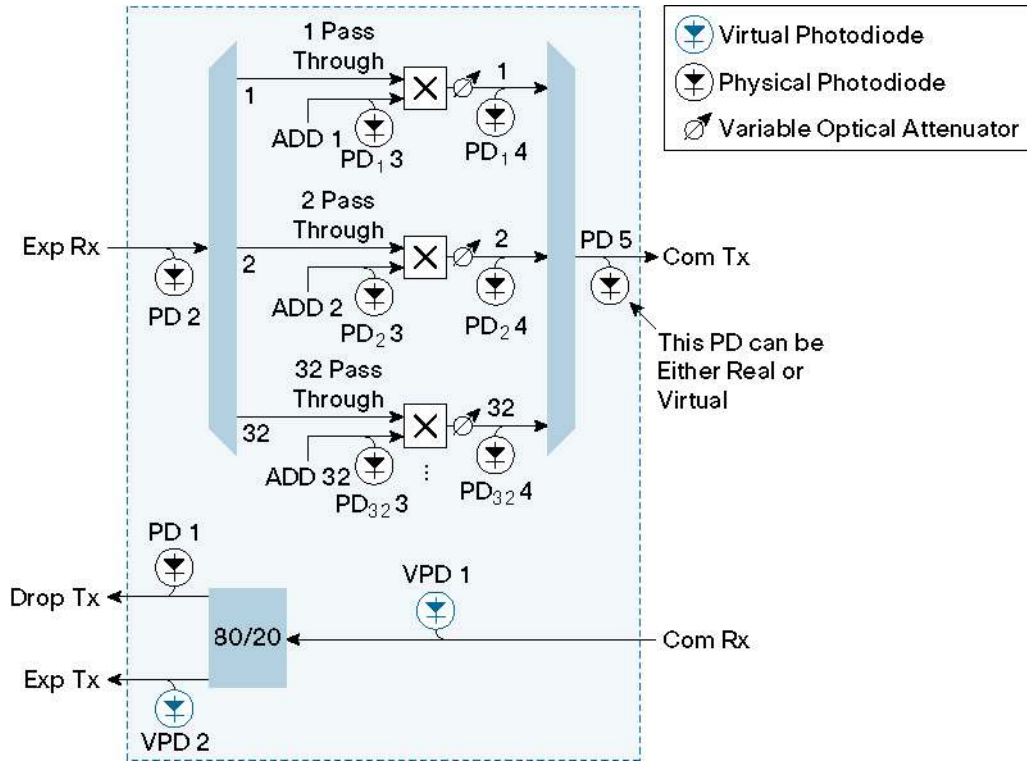
**Table 3.** System Requirements

Component	Cisco ONS 15454 ANSI	Cisco ONS 15454 ETSI
<b>Processor</b>	TCC2P/TCC2	TCC2P/TCC2
<b>Cross-connect</b>	All (not required)	All (not required)
<b>Shelf assembly</b>	15454-SA-HD or 15454-SA-HD-DDR shelf assembly with FTA3 version fan-tray assembly	15454-SA-ETSI shelf assembly with SDH 48V fan-tray assembly
<b>System software</b>	Release 5.0.0 ANSI or greater for C-band units Release 7.0.0 ANSI or greater for L-band units	Release 5.0.0 ETSI or greater for C-band units Release 7.0.0 ETSI or greater for L-band units

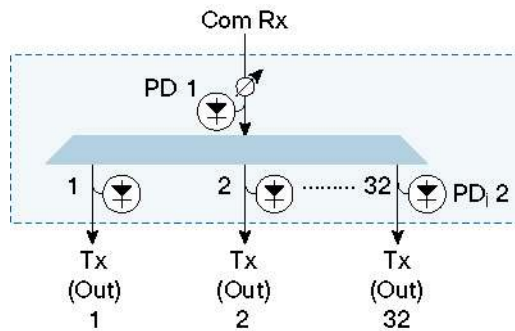
**Table 4.** ROADM Card Specifications

Specification	32-Channel Wavelength Selective Switch – C Band	32-Channel Demultiplexer – C Band	32-Channel Wavelength Selective Switch – L Band	32-Channel Demultiplexer – L Band
<b>Management</b>				
Card LEDs				
Failure (FAIL)	Red	Red	Red	Red
Active/standby (ACT/STBY)	Green/yellow	Green/yellow	Green/yellow	Green/yellow
Signal fail (SF)	Yellow	Yellow	Yellow	Yellow
<b>Operating environment</b>				
Temperature	–5 to 55°C 23 to 131°F	–5 to 55°C 23 to 131°F	–5 to 55°C 23 to 131°F	–5 to 55°C 23 to 131°F
Humidity	5 to 95% RH	5 to 95% RH	5 to 95% RH	5 to 95% RH
<b>Storage environment</b>				
Temperature	–40 to 70°C –40 to 158°F	–40 to 70°C –40 to 158°F	–40 to 70°C –40 to 158°F	–40 to 70°C –40 to 158°F
Humidity	5 to 95% RH	5 to 95% RH	5 to 95% RH	5 to 95% RH

**Figure 4**  
Functional Diagrams of 32-Channel WSS Cards



**Figure 5**  
Functional Diagrams of 32-Channel DMX Cards



**Table 5.** Specifications for ROADM Cards

Specification	32-Channel Wavelength Selective Switch – C Band	32-Channel Demultiplexer – C Band	32-Channel Wavelength Selective Switch – L Band	32-Channel Demultiplexer – L Band
<b>Optical parameters</b>				
Insertion loss (maximum at minimum VOA)	11.3 dB (EXP-RX – COM-TX) 1.6 dB (COM-RX – EXP-TX) 8.0 dB (Add 1-32 – COM-TX) 8.5 dB (COM-RX – DROP-TX)	5.8 dB	11.3 dB (EXP-RX – COM-TX) 1.6 dB (COM-RX – EXP-TX) 8.0 dB (Add 1-32 – COM-TX) 8.5 dB (COM-RX – DROP-TX)	5.8 dB
Minimum VOA dynamic range	20 dB (EXP-RX – COM-TX) 25 dB (Add 1-32 – COM-TX)	25 dB	25 dB	25 dB
Maximum input power	25 dBm	25 dBm	25 dBm	25 dBm
Filter type	Array wave guide (AWG)	AWG	AWG	AWG
Minimum transmit filter –1 dB bandwidth (all operating conditions and attenuation values)	±135 pm (EXP-RX COM-TX) ±160 pm (Add COM-TX)	±100 pm	±135 pm (EXP-RX COM-TX) ±160 pm (Add COM-TX)	±100 pm
Adjacent crosstalk (all operating conditions and attenuation values)	23 dB (minimum) 30 dB (typical)	25 dB (minimum)	23 dB (minimum) 30 dB (typical)	25 dB (minimum)
Non-adjacent crosstalk (all operating conditions and attenuation values)	30 dB (minimum) 42 dB (typical)	34 dB (minimum)	30 dB (minimum) 42 dB (typical)	34 dB (minimum)
Total crosstalk (all operating conditions and attenuation values)	20 dB (minimum) 27 dB (typical)	20 dB (minimum)	20 dB (minimum) 27 dB (typical)	20 dB (minimum)
Maximum polarization dependent loss (PDL) (all operating conditions and attenuation values)	3.5 dB (Add 1-32 – COM-TX) 0.2 dB (COM-RX – EXP-TX) 0.4 dB (COM-RX – DROP-TX)	0.6 dB	3.5 dB (Add 1-32 – COM-TX) 0.2 dB (COM-RX – EXP-TX) 0.4 dB (COM-RX – DROP-TX)	0.6 dB
Optical power setting accuracy (all operating conditions and attenuation values)	±0.7 dB	–	±0.7 dB	–
Minimum return loss	40 dB	40 dB	40 dB	40 dB
<b>Connectors</b>				
Channel input/output ports	MPO	MPO	MPO	MPO
Composite ports	LC	LC	LC	LC
<b>Power</b>				
Card power draw				
Typical	50W	15W	50W	15W
Maximum	65W	25W	65W	25W
<b>Physical</b>				
Size	2 slots	1 slot	2 slots	1 slot
Supported shelf slots	1–6, 12–17	1–6, 12–17	1–6, 12–17	1–6, 12–17

## Ordering Information

Table 6 gives ordering information for the Cisco ONS 15454.

**Table 6.** System Ordering Information

Part Number	Description
15454-32-WSS=	32-Channel Wavelength Selective Switch, C-band, MPO connectors for add path, LC connectors for interconnection, includes two 2-m LC/LC fiber-optic cables
15454-32-WSS-L=	32-Channel Wavelength Selective Switch, L-band, MPO connectors for add path, LC connectors for interconnection, includes two 2-m LC/LC fiber-optic cables
15454-32-DMX=	32-Channel Demultiplexer 100 GHz (for use with 32-WSS), C-band, MPO connectors for drop path, LC connectors for interconnection, includes one 2-m LC/LC fiber-optic cables
15454-32-DMX-L=	32-Channel Demultiplexer 100 GHz (for use with 32-WSS), L-band, MPO connectors for drop path, LC connectors for interconnection, includes one 2-m LC/LC fiber-optic cables

**Corporate Headquarters**

Cisco Systems, Inc.  
170 West Tasman Drive  
San Jose, CA 95134-1706  
USA  
www.cisco.com  
Tel: 408 526-4000  
800 553-NETS (6387)  
Fax: 408 526-4100

**European Headquarters**

Cisco Systems International BV  
Haarlerbergpark  
Haarlerbergweg 13-19  
1101 CH Amsterdam  
The Netherlands  
www-europe.cisco.com  
Tel: 31 0 20 357 1000  
Fax: 31 0 20 357 1100

**Americas Headquarters**

Cisco Systems, Inc.  
170 West Tasman Drive  
San Jose, CA 95134-1706  
USA  
www.cisco.com  
Tel: 408 526-7660  
Fax: 408 527-0883

**Asia Pacific Headquarters**

Cisco Systems, Inc.  
168 Robinson Road  
#28-01 Capital Tower  
Singapore 068912  
www.cisco.com  
Tel: +65 6317 7777  
Fax: +65 6317 7799

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