

Cisco ONS 15540 ESPx Extended Services Platform

The Cisco ONS 15540 ESPx Extended Services Platform (Figure 1) with front-panel external connections and a new cross-connect cable-management system is a highly modular, flexible, and scalable next-generation dense wavelength division multiplexing (DWDM) platform that integrates data networking, storage-area networking (SAN), Synchronous Optical Network (SONET), and Synchronous Digital Hierarchy (SDH) technologies over an ultrahigh bandwidth, intelligent optical infrastructure that can support any packet over any wavelength on any platform.

Figure 1

Product Benefits

- New—Front-panel access to transponder International Telecommunication Union (ITU) wavelengths for flexible input-output connectivity options and improved installation and maintenance
- New—Access to optical add/drop multiplexing (OADM) and multiplexer input for direct DWDM wavelength insertion into the Cisco ONS 15540 ESPx filters
- New—Scalable cable-management system that provides efficient control of all client and system optical cables via cable storage and cross-connect drawers
- New—32-channel Array Wave Guide (AWG) optical multiplexer module to provide high-density optical multiplexing in a compact blade with improved cost per wavelength
- Scalable, flexible, and modular architecture in a high-density compact footprint to provide superior operational support and network expansion as needed through its hot-swappable modular line cards, transponders, and optical multiplexers
- Simple network consolidation and comprehensive multiservice support provided by the available Cisco ONS 15540 2.5-Gbps Type 1 variable rate, Type 2 extended range with small form-factor pluggable (SFP) support, and 10GBASE-LR transponders
- Optical, service, and application level performance monitoring, which provides industry-leading supports for service-level agreements (SLAs).

Cisco ONS 15540 ESPx Extended Services Platform





- High availability for critical networks, providing 99.999 percent availability for demanding managed network service providers and enterprise business continuance applications, with hardware redundancy and Automatic Protection Switching (APS) to protect against fiber cuts and equipment failures
- Multiservice integration to transport Enterprise Systems Connection (ESCON), 1Gbps/2Gbps Fiber Connectivity (FICON), 1Gbps/2Gbps Fibre Channel for SAN, Fast Ethernet and Gigabit Ethernet for data networking, and SONET/SDH at OC-3/STM-1, OC-12/STM-4, and OC-48/STM-12

Platform Features

- Compact modular design with external connections
 - External direct connect system; requires cable storage drawer
 - Optional cross connect fiber-management system; requires cross-connect drawer
- 32 protected or 64 unprotected 2.5-Gbps wavelengths support
- 4- or 8-channel OADM with or without optical supervisory channel (OSC)
- 32-channel AWG terminal multiplexer/demultiplexer with OSC
- Dual CPU modules with Cisco IOS® Software support
 - 48VDC or optional 100-240VAC redundant power supplies
- Eight line card motherboard (LCMB) slots:
 - 2.5-Gbps LCMB—Splitter or nonsplitter with support for 4 x Type 1 or Type 2 extended range transponders
 - 10-Gbps LCMB—Splitter or nonsplitter LCMB with support for 2 x 10-Gigabit Ethernet transponders
 - Type 1—Tunable variable rate 16 Mbps–622 Mbps 1310-nanometer (nm) multimode transponder
 - Type 1—Tunable 2.5-Gbps variable rate 16 Mbps–2.5-Gbps 1310 nm single-mode transponder
 - Type 2—Tunable 2.5-Gbps extended range transponder with SFP client transceiver and support for 850-nm multimode and 1310-nm multimode/single-mode interfaces
 - 10GBASE-LR 1310-nm single-mode 10-Gigabit Ethernet transponder with per-wavelength management and performance monitoring
- Multiprotocol support includes:
 - IBM ESCON
 - 1Gbps/2Gbps IBM FICON
 - 1Gbps/2Gbps Fibre Channel
 - Token Ring
 - Fiber Distributed Data Interface (FDDI)
 - Fast Ethernet
 - Gigabit Ethernet
 - 10 Gigabit Ethernet
 - ATM/SONET/SDH at OC-3/STM-1, OC-12/STM-4, and OC-48/STM-12
 - D1 video
- Fault-tolerant, hot-swappable modules
- OADM design
- Optical pass-through capabilities for flexible design options



Node Topologies

- Point-to-point
- Hubbed ring
- Mesh ring

Protection

- Optical-Unidirectional Path Switched Ring
- APS, unidirectional or bidirectional
- Client side—1+1 and Y cable
- Trunk side—1+1 and splitter
- Fiber route diversity—1:1 path protection with switchover time of less than 50 milliseconds (ms)

Optical Management

- Per-fiber Optical Supervisory Channel
- Network Management Support
- Cisco IOS Software
- CiscoView
- Cisco Transport Manager
- Simple Network Management Protocol (SNMP)

CPU Module Specifications

- Description
 - Two redundant CPU modules per chassis
 - RJ-45 RS-232 console port and auxiliary port
 - Fast Ethernet port (network management)
 - One Personal Computer Memory Card International Association (PCMCIA) slot
 - Status and alarm LEDs
 - Cisco IOS Software, Web graphical user interface (GUI), and SNMP management
- Front Panel LEDs
 - Status (Green)
 - Active and standby (Green)
 - Alarm status (minor, major, critical)
 - Alarm status (cutoff, history)
 - Network management Ethernet (NME) status (link, 100 Mbps, full duplex)
- Alarm relay contacts
- Network Element Management Interface
 - RS-232 auxiliary port (RJ-45 connector)
 - 10BASE-T/100BASE-T Ethernet (RJ-45 connector)



Specifications

Table 1 provides technical specifications for the Cisco ONS 15540 ESPx transponder, and Table 2 outlines small form-factor pluggable (SFP) specifications.

Table 1 Cisco ONS 15540 ESPx Transponder Specifications

	Cisco ONS 15540 ESPx Transparent Transponder Type 1/multimode		Cisco ONS 15540 ESPx Transparent Transponder Type 1/ single-mode		Cisco ONS 15540 ESPx Extended Range Transponder Type 2	
	Client	Trunk	Client	Trunk	Client	Trunk
Transmitter power	-5 to 0 dBm	4 to 8 dBm	-5 to 0 dBm	4 to 8 dBm	SFP specific	5 to 10 dBm
Receive sensitivity	-19 to -23 dBm	-32 to -28 dBm	-19 to -23 dBm	-32 to -28 dBm	SFP specific	-32 to -28 dBm
Dispersion	1800 ps/nm		1800 ps/nm		3200 ps/nm	
Supported	<ul style="list-style-type: none"> Fast Ethernet Multimode ESCON FDDI ATM OC-3/STM-1 and OC-12/STM-4 SONET/SDH Packet over SONET (POS) for OC-3 and OC-12 Sysplex Timer (ETR) Control link oscillator (CLO) D1 video 		<ul style="list-style-type: none"> Gigabit Ethernet Fast Ethernet Single-mode ESCON 1Gbps/2Gbps FICON FDDI ATM OC-3/STM-1, OC-12/STM-4, and OC-48/STM-16 SONET/SDH Packet over SONET Sysplex Timer (ETR) CLO FICON 1Gps and 2Gps Fibre Channel D1 video 		<ul style="list-style-type: none"> 15500-XVRA-01A2 (multimode) ESCON SONET OC-3 SDH STM-1 15500-XVRA-03B1 (single-mode) Gigabit Ethernet 1Gbps Fibre Channel/FICON 15500-XVRA-03B2 (single-mode) 2Gbps Fibre Channel/FICON 15500-XVRA-02C1 (multimode) Gigabit Ethernet 1Gbps Fibre Channel/ FICON 15500-XVRA-02C2 (multimode) 2Gbps Fibre Channel/FICON 15500-XVRA-06B1 (single-mode) SONET OC-12 SDH STM-4 15500-XVRA-07B1 (single-mode) SONET OC-48 SDH STM-16 	
Bit rate range	16 Mbps to 622 Mbps		16 Mbps to 2.5 Gbps		SFP specific (see Table 2)	
Client interface	Multimode (50/125 micron/meter)—850 nm Bit error rate (BER)— 10^{-12} (10^{-15} ESCON) Connector type—SC		Single-mode (ITU-T G.652)—1310/1550 nm BER— 10^{-12} (10^{-15} ESCON) Connector type—SC		Multimode—850/1310 (62.5/125 micron/meter) Single-mode—1310/1550 (ITU-T G.652) BER— 10^{-12} (10^{-15} ESCON) Connector type—various	
Trunk interface	Tunable ITU laser Fiber—single-mode (ITU-T G.652) Connector—MU		Tunable ITU laser Fiber—single-mode (ITU-T G.652) Connector—MU		Tunable ITU laser Fiber—single-mode (ITU-T G.652) Connector—MU	



Note: All Cisco ONS 15500 Series transponders have regeneration, retiming, and reshaping capabilities, plus digital monitoring, and are also hot-swappable. Digital monitoring for 2-Gbps Fibre Channel is not available yet.

Table 2 SFP Specifications

SFP Model Number	15500-XVRA-01A2	15500-XVRA-02C1	15500-XVRA-02C2	15500-XVRA-03B1	15500-XVRA-03B2	15500-XVRA-06B1	15500-XVRA-07B1
Fiber/data rates supported	1310-nm multimode OC-3/STM-1, ESCON	850-nm multimode Gigabit Ethernet, FC1	850-nm multimode FC2	1310-nm single-mode Gigabit Ethernet, FC1	1310-nm single-mode Gigabit Ethernet, FC1, FC2	1310-nm single-mode OC-12/STM-4	1310-nm single-mode OC-48/STM-16
Connector type	MTRJ	LC	LC	LC	LC	LC	LC
Receiver specifications							
Receive sensitivity (minimum)	-31 dBm	-21 dBm	-15 dBm	-20.5 dBm	-20.5 dBm	-28 dBm	-18 dBm
Receive sensitivity (typical)	-	-21 dBm	-20 dBm	-25 dBm	-24 dBm	-31 dBm	-22 dBm
Receive overload	-14 dBm	-18 dBm	-13.5dBm	-3 dBm	-3 dBm	-7 dBm	-3 dBm
Input wavelength	1280-1380 nm	770-860 nm	830-860 nm	1270-1600 nm	1270-1600 nm	1100-1600 nm	1270-1600 nm
Optical reflectance	-	12 dB ret. loss	12 dB ret. loss	12 dB ret. loss	12 dB ret. loss	-	12 dB ret. loss
Bit error rate (BER)	10 ⁻¹⁵ *		10 ⁻¹²			10 ⁻¹⁰	
Fiber type	Multimode 50/62.5	Multimode 50/62.5	Multimode 50/62.5	Multimode 50/62.5	Single- mode 9	Single- mode 9	Single- mode 9
Transmitter Specifications							
Transmitter power (maximum)	-15 dBm	-4 dBm	-4 dBm	-3 dBm	-3 dBm	-8 dBm	-3 dBm
Transmitter power (minimum)	-19.5 dBm	-9.5 dBm	-9 dBm	-9.5 dBm	-9.5 dBm	-15 dBm	-9.5 dBm
Output wavelength	1280-1380 nm	830-860 nm	770-860 nm	1275-1350 nm	1275-1350 nm	1261-1360 nm	1285-1340 nm



Table 2 SFP Specifications

SFP Model Number	15500-XVRA-01A2	15500-XVRA-02C1	15500-XVRA-02C2	15500-XVRA-03B1	15500-XVRA-03B2	15500-XVRA-06B1	15500-XVRA-07B1
Extinction ratio	8 dB	9 dB	9 dB	9 dB	9 dB	8.2 dB	9 dB
Spectral width at -3 dB	–	–	–	–	–	4 nm (rms)	–
Spectral width at -20 dB	<175 nm	0.85 nm	<175 nm	<175 nm	2 nm	1 nm	2 nm
Side mode suppression	–	–	–	–	–	30	–
Jitter	0.8 ns	100 ps pp	40 ps pp	40 ps pp	40 ps pp	–	<0.01 UI rms
Fiber type	Multimode 50/62.5	Multimode 50/62.5	Multimode 50/62.5	Multimode 50/62.5	Single-mode 9	Single-mode9	Single-mode9
Typical distance	3 km maximum on multimode fiber (MMF)	500m/50 micron MMF	300m/50 micron MMF	Up to 10 km on single-mode fiber			
		220m/62.5 micron MMF	150m/62.5 micron MMF				

Multiplexer Options

The Cisco ONS 15540 ESPx DWDM platform supports five different optical multiplexer options, for which tables 3 and 4 outline the specifications.

- 4-channel OADM with optical supervisory channel (OSC)—Bands A-H
- 4-channel OADM without OSC—Bands A-H
- 8-channel OADM with OSC—Bands AB/CD/EF/GH
- 8-channel OADM without OSC—Bands AB/CD/EF/GH
- 32-channel AWG with OSC

Table 3 OADM Specifications

Description	Specification
Multiplexer/demultiplexer motherboard	With and without optical splitter
Dimensions	18 x 9 in. (47.5 x 22.9 cm)
Weight	3.5 lb (1.59 kg)
4- and 8-channel OADM modules	
Dimensions	1.0 x 3.3 x 7.7 in. (2.5 x 8.4 x 19.6 cm)
Weight	1.0 lb (0.45 kg)



Table 3 OADM Specifications

Description	Specification
Transport side multiplexer/demultiplexer	
OSC	1562.23 nm
Wavelengths	32 ITU G.692
Connector type	MU
Bit error rate	10E-15 for ESCON, 10E-12 for all other applications
Receiver sensitivity	-32 dBm typical, -28 dBm maximum
Optical signal-to-noise ratio (OSNR)	To guarantee 10E-12 BER on laser receiver, OSNR should be 19 dB for -28-dBm sensitivity and 23 dB for 32-dBm sensitivity
Receive overload	-8 dBm maximum
Input wavelength	1430 nm to 1580 nm
Optical reflectance	-27 dB
Transmitter power	4 dBm minimum, 6 dBm typical, 8 dBm maximum
Wavelength accuracy (room temperature)	+/- 0.015 nm
Output wavelength	1530.33 to 1560.61 nm
Side mode suppression	30 dB
Dispersion tolerance	1800 ps/nm 2 dB penalty
Chirp	0.35-0.40A (measured)
Operating temperature	32 to 104 F (0 to 40 C)
Maximum relative humidity	90 to 95%

Table 4 32-Channel Terminal Multiplexer/Demultiplexer Specifications

Description	Specification
Multiplexer/demultiplexer motherboard	
Dimensions	18 x 9 in. (47.5 x 22.9 cm)
Weight	3.5 lb (1.59 kg)
32-channel AWG terminal multiplexer/demultiplexer	
Dimensions	13.8 x 8.6 in. (33x22 cm)



Table 4 32-Channel Terminal Multiplexer/Demultiplexer Specifications

Description	Specification
Weight	3.5 lb (1.59 kg)
Operating temperature	32 to 149 F (0 to 65°C)
Storage temperature	-40 to 185 F (-40 to 85°C)
Requirement	
Pass band	12.5 GHz
Pass band shape	Gaussian; flat top acceptable
Insertion loss	< 5.4 dB (with connectors)
Insertion loss uniformity among 33 channels	< 1.35 dB (with connectors)
Insertion loss uniformity within a band	< 0.75 dB (with connectors)
Total crosstalk	< 25 dB (demultiplexer)
< 15 dB (multiplexer)	
Tap ratio	-20 1dB (with connectors)
Polarization Dependent Loss	< 0.5dB
Chromatic dispersion	< 15ps/nm
Polarization Mode Dispersion	< 0.5ps
Return loss	> 40dB
Directivity	> 45dB
Total maximum optical power	> 250 mW
Fiber type	SMF -28 or equivalent
Connector for common and OSC, monitor	Low-loss tuned MU/UPC
Connector for add and drop channels	Low-loss MTP female/APC
Insertion loss of MU connector	< 0.15dB
Insertion loss of MTP connector	< 0.35dB
Bending radius	> 25mm

Regulatory Standards Compliance

Cisco ONS 15540 complies with the following standards.

Products bear CE mark, indicating compliance with the 89/366/EEC and 73/23/EEC directives, which includes the following safety and electromagnetic compatibility (EMC) standards:

Safety

- UL 60950
- CAN/CSA-C22.2 No. 60950-00

Cisco Systems, Inc.

- EN 60950
- IEC 60950
- TS 001
- AS/NZS 3260
- IEC 60825-1, -2
- EN 60825-1, -2
- 21CFR 1040

- CISPR22 Class A
- AS/NZS 3548 Class A
- VCCI Class A
- EN 55024
- ETS 300 386
- EN 50082-1
- EN 61000-3-2
- EN 61000-3-3

EMC

- FCC Part 15 (CFR 47) Class A
- ICES-003 Class A
- EN 55022 Class A

Industry EMC, Safety and Environmental Standards

- GR-63-Core NEBS Level 3 Requirements
- GR-1089-Core NEBS Level 3 Requirements



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.
 Capital Tower
 168 Robinson Road
 #22-01 to #29-01
 Singapore 068912
www.cisco.com
 Tel: +65 6317 7777
 Fax: +65 6317 7799

Cisco Systems has more than 200 offices in the following countries and regions. Addresses, phone numbers, and fax numbers are listed on the

Cisco Web site at www.cisco.com/go/offices

Argentina • Australia • Austria • Belgium • Brazil • Bulgaria • Canada • Chile • China PRC • Colombia • Costa Rica • Croatia • Czech Republic • Denmark • Dubai, UAE • Finland • France • Germany • Greece • Hong Kong SAR • Hungary • India • Indonesia • Ireland • Israel • Italy • Japan • Korea • Luxembourg • Malaysia • Mexico • The Netherlands • New Zealand • Norway • Peru • Philippines • Poland • Portugal • Puerto Rico • Romania • Russia • Saudi Arabia • Scotland • Singapore • Slovakia • Slovenia • South Africa • Spain • Sweden • Switzerland • Taiwan • Thailand • Turkey • Ukraine • United Kingdom • United States • Venezuela • Vietnam • Zimbabwe

All contents are Copyright © 1992–2003 Cisco Systems, Inc. All rights reserved. Aironet, Catalyst, Cisco, Cisco IOS, Cisco Systems, the Cisco Systems logo, EtherChannel, SMARTnet, and SwitchProbe are registered trademarks or trademarks of Cisco Systems, Inc. and/or its affiliates in the U.S. and certain other countries.

All other trademarks mentioned in this document or Web site are the property of their respective owners. The use of the word partner does not imply a partnership relationship between Cisco and any other company.
 (0301R) DB/LW4129 01/03