

## Cisco ONS 15454 Multiservice Transport Platform

### Product Overview

The Cisco® ONS 15454 Multiservice Transport Platform sets the industry benchmark for dense wavelength-division multiplexing (DWDM) solutions delivering simple, fast, and intelligent DWDM capabilities and lowering capital and operating expenditures

When Cisco introduced the Cisco ONS 15454 Multiservice Provisioning Platform (MSPP) for the metropolitan (metro) market in 1999, a clear demarcation was created between what is considered “traditional” optical transport equipment and what is now considered “next-generation.” With its significant leap in technology and product migration, the Cisco ONS 15454 MSPP offered traditional time-division multiplexing (TDM) and SONET/SDH services as well as Ethernet and IP services. The platform was scalable and was the fraction of the size of traditional bit-rate-specific equipment. The Cisco ONS 15454 MSPP proved to be cost-effective, and it uniquely met the requirements for the new market segment. The Cisco ONS 15454 MSPP quickly established itself as the market leader.

Continuing with its tradition of innovation and leadership, Cisco has introduced the Cisco ONS 15454 Multiservice Transport Platform (MSTP), which is transforming DWDM networks. The Cisco ONS 15454 MSTP (Figure 1) allows a DWDM system to become as intelligent and flexible as the highly successful Cisco ONS 15454 MSPP, including wide service interface mix, service transparency, flexible topology, completely reconfigurable traffic pattern, and simplified operations.

**Figure 1.** Cisco ONS 15454 Multiservice Transport Platform – ANSI (left) and ETSI (right) mechanics



## Key Features and Benefits

The Cisco ONS 15454 MSTP provides capital and operational efficiency by addressing the increasing demand for multiple services, greater transport capacity, networking flexibility, multiple distance options, and management simplicity in a single platform. With innovative technology, Cisco ONS 15454 MSTP introduces intelligence to DWDM transmission thus allowing the optimization of Next Generation Networks across multiple layers and removing costly Optical-Electrical-Optical (O-E-O) devices for network segmentation or regeneration.

The Cisco ONS 15454 MSTP provides features like multilayer graphical network, node, and card visibility; A-to-Z network-based service provisioning; and graphical software wizards to simplify and speed user operations for such tasks as initial network turn-up, service provisioning, and network, node and bandwidth upgrades. The Cisco ONS 15454 MSTP leverages on the embedded software architecture and Control Plane to introduce a level of operational simplicity unheard of in DWDM networks.

The Cisco ONS 15454 MSTP delivers a rich set of features allowing Customers worldwide to support requirements and needs of Next Generation transport networks:

- Scalable C-band wavelength count (1–80) for superior cost-versus-growth trade-off, with in-service growth to 112 wavelengths through the joint use of C-band and L-band on the same fiber pair
- Transport of 150-Mbps to 40-Gbps wavelength services, as well as aggregated TDM, Ethernet and Storage data services, for maximum service flexibility and bandwidth optimization
- Efficient GE and 10GE transport over DWDM with the Xponder service blades. Available in two version (20-GE client ports and 2-10Gbps trunk ports, or 2-10GE client ports and 2-10Gbps trunk ports), the Xponder provides unprecedented flexibility to map Ethernet services directly onto a Wavelength while performing a variety of Layer-1 or Layer-2 functions. This new approach provides a more efficient use of available bandwidth and unprecedented GE over DWDM mapping and traffic policing flexibility. Possibility to enable the use of G.709 encapsulation and FEC/E-FEC functionalities on the 10GE LAN-PHY wavelength guarantees optimized performances and reach; typical SONET/SDH-like OAM&P to fully support the management functions of previous SONET/SDH-type interfaces while interfacing directly to the DWDM layer; a patented protection scheme able to react to failures in less then 50milliseconds.
- Multi-Service Provisioning Platform (MSPP) On A Blade combining 10G ADM and transport functionalities using multirate SFP (client) and XFP (trunk) configurable interfaces to consolidates many of the aggregation functions traditionally performed on MSPP platform with multiple service blades and common cards. With one blade, carriers are able to aggregate OC-3/STM-1, OC-12/STM-4, OC-48/STM-16 and GE signals (on a user definable port-by-port basis) on to a single-wavelength trunk circuit. Possibility to enable the use of G.709 encapsulation and FEC/E-FEC functionalities on the OC-192/STM-64 wavelength guarantees optimized performances and reach, and complete OAM&P capabilities.
- Flexible transmission capability up to 2,000 miles (more then 3,200 kilometers) through the use of advanced Erbium-Doped Fiber Amplifier (EDFA) amplification, joint Raman and EDFA amplification and FEC or E-FEC technologies to support a wide range of networking applications
- Ready-to-use card architecture for complete flexibility in configuring DWDM network elements: terminal nodes, optical add/drop nodes, degree-2 and multi-degree Reconfigurable Optical Add/Drop (ROADM) nodes, line amplifiers, and dispersion compensation within amplified or unamplified networks
- High shelf density for high-bandwidth (10-Gbps and 40-Gbps) wavelength services
- Fully reconfigurable optical add/drop multiplexers (ROADMs) for superior network flexibility and reduced complexity

- Mesh and multi-ring topology support in the optical domain with the possibility to manage nodes facing up to eight degrees. These capabilities allow Cisco ONS 15454 MSTP users to provide wavelength services and to define virtual private DWDM networks, where a common transport infrastructure can be shared across multiple users or services
- Directionless support for ROADM nodes to allow service creation and restoration in a fully automated way (SW provisioning). This unique capability of the Cisco ONS 15454 MSTP platform is a key enabler for IP-over-DWDM applications where DWDM colored signals from Routers, Switches or SAN platforms can be directly transported and managed in the DWDM network
- Flexible add/drop capabilities, from 1- to full 112-channel granularity, supporting both band and channel optical add/drop multiplexers (OADMs)
- Software-provisionable, Small Form-Factor Pluggable (SFP) and 10 Gigabit Small Form Factor Pluggable Module (XFP) client and DWDM optics modules and full-band wavelength tunability for reduced inventory of spares
- Fully automatic node and network setup with the possibility to use the intuitive DWDM network design tool (Cisco TransportPlanner) to have a PC-aided design, installation, commissioning, and evolution for the network
- Multilevel service monitoring using SONET/SDH and digital-wrapper (G.709) technology to provide complete monitoring and reporting of Performance and Quality parameters for Ethernet, SAN, Video and TDM services
- Integrated Optical Service Channel (OSC) for unparalleled service reliability and platform manageability
- Network topology autodiscovery supported directly at the Network Element (NE) level and allowing Element Manager System (EMS)-like functionalities directly through the platform embedded software
- Network-level and Node-level Alarm Correlation performed directly by the embedded NE software to allow a simpler and faster reaction to fault situations by providing just the root-cause of the problem to the management interface
- Integrated Cisco Transport Controller (CTC) for network-based, point-and-click system and services setup and management
- Virtual Transponder operation for Routers (like Cisco CRS-1 Carrier Routing System) equipped with DWDM physical line interface module (PLIM), allowing end-to-end service provisioning between Routers through the complete DWDM network directly from CTC
- Software-controlled optical power management for fully automated network optical power control, especially during wavelength additions, site additions, and fast transient suppression in the case of a fiber cut
- Support by an advanced, cross-platform optical network management system (NMS), the Cisco Transport Manager (CTM), for unified network operations and interface to an operations support system (OSS).

In addition to the integrated software features, the Cisco ONS 15454 MSTP is supported by an easy-to-use but powerful network design tool, the Cisco TransportPlanner. Cisco TransportPlanner is a user-friendly, Java-based application (fully developed and tested by Cisco) for modeling and optimizing DWDM networks based on the user's network parameters. In addition to network design, Cisco TransportPlanner also reduces operational expenditures by simplifying network deployments through the following:

- Simple drag-and-drop user operation for network and services definition
- Optimized services and units allocation in case of network topology or traffic matrix changes for an already deployed network (delta planning)
- Support for linear, ring, multi-ring and mesh network topologies
- Fully flexible network design with the possibility to optimize the use of the flexibility provided by ROADM (in the optical domain) and by the multirate cards (in the service and application domain)

- Automatic equipment selection
- Layered graphical views of network, wavelength services, and node layout
- Detailed port-to-port fiber-cabling table
- Bill-of-material output
- Network and Node layout
- Exportable configuration file, which can be used for automated node-provisioning and quick network activations

### Wide Service Interface Mix

Cisco ONS 15454 MSTP supports a wide set of interface and service types, which can be fully transparently transported through complex mesh or very simple point-to-point networks. The service interfaces allow network providers to offer new tariffs and allow enterprise customers to natively transport a wide variety of services over a common transport network without unnecessary conversion stages and equipment. Additionally, a wide service mix simplifies the planning for services. The Cisco ONS 15454 MSTP supports a broad range of standards-based services in a single platform, including:

- Aggregated lower-rate TDM services from DS-1/E1 over 2.5-Gbps and 10-Gbps wavelengths
- SONET/SDH wavelength and aggregated services: OC-3/STM-1, OC-12/STM-4, OC-48/STM-16, and OC-192/STM-64
- Data services: private-line, switched and wavelength-based, including 10/100BASE-T, Gigabit Ethernet, 10 Gigabit Ethernet LAN physical layer, and 10 Gigabit Ethernet WAN physical layer
- Storage services: 1-Gbps, 2-Gbps and 4-Gbps Fibre Channel, 10-Gbps Fibre Channel, IBM Fiber Connection (FICON), and Enterprise Systems Connection (ESCON), ETR/CLO, ISC-1, ISC-3
- Video services: D1, DV6000 and high-definition television (HDTV)

### Service Transparency

Critical to offering a wide service mix is a DWDM system's ability to offer the level of transparency required by the service. The Cisco ONS 15454 MSTP solution offers the choice of multiservice aggregation, wavelength aggregation, and wavelength transport, combined with integrated, intelligent DWDM transmission, in a single platform to optimize network costs for any mix of service types. Using digital-wrapper and Optical Transport Network (OTN) technologies (defined in ITU-T G.709) enables transparency, allows enhanced wavelength management and provides extended optical reach thanks to the integrated Forward Error Correction (FEC) and Enhanced Forward Error Correction (E-FEC).

Unique to the market is also the possibility for the Cisco ONS 15454 MSTP to support direct interconnection with DWDM interfaces from Layer 2, Layer 3, and storage area network (SAN) devices. This element integration eliminates the need for costly and complex OEO conversions at the boundaries of the network or where the traffic simply needs to pass through a site without having to terminate on a router (for IP processing) or on a SAN device. In cases where termination is necessary, the Cisco ONS 15454 MSTP hands off the optical wavelength, keeping it in the optical domain without the need to perform an electrical conversion in order to hand off the traffic to the Layer 2, Layer 3, and SAN devices, where the electrical conversion is used only for service processing.

All the intelligent optical transmission-related features and functions can be supported by the Cisco ONS 15454 MSTP with these types of "alien" wavelengths and services as well.

## Protection Options

The Cisco ONS 15454 MSTP provides multiple provisionable interface protection options, which facilitate support for high-availability as well as unprotected service delivery to meet the varied service-level agreements (SLAs) for DWDM transport offerings.

Both 1+1 and Shared protection schemes based on the principles of ITU-T Recommendations can be supported. The following types of 1+1 protection schemes can be supported:

- Path Protection

In this case it is possible to offer complete redundancy of the optical path at the network level but no protection is offered for the unit which is originating the Working and the Protect DWDM signal and deciding among the two DWDM signals on the receive side.

This type of protection can be supported on individual wavelengths by 2.5Gbps Transponder and Muxponder units (leveraging on their Protected version); by the GE and the 10GE XPonder units (operating in Layer2 mode); by the MSPP-On-A-Blade unit; by the OTU2 XPonder unit; and by the Protection Switching Module (PSM), when used in conjunction with unprotected Transponder or Muxponder units, or with an Alien DWDM signal. PSM unit can be used to provide protection for the Multiplexed signal.

- Path & Equipment Protection

In this case it is possible to offer complete redundancy of the optical path at the network level and of the units which are originating the Working and the Protect DWDM signals and deciding among the two DWDM signals on the receive side.

This type of protection can be supported by 2.5Gbps Transponder and Muxponder units (leveraging on their Unprotected version); by 10Gbps Transponder and Muxponder units; by the GE and the 10GE XPonder units (operating in Layer1 and Layer2 mode); by the OTU2 XPonder unit.

- Multiplex Section Protection

In this case it is possible to leverage on the PSM unit to provide protection for the aggregated signal.

Shared protection can be supported by the GE and the 10GE XPonder units leveraging on the revolutionary GR3 Ethernet protection (Cisco patented G.709 Rapid Resilient Ring Ethernet Protection mechanism), when operating in Layer2 mode. By integrating G.709 messaging with a Ethernet VLAN management mechanism, GR3 protection provides SONET/SDH-like switching times and reliability. A recovery time of less than 50ms can be achieved mapping Ethernet directly over DWDM.

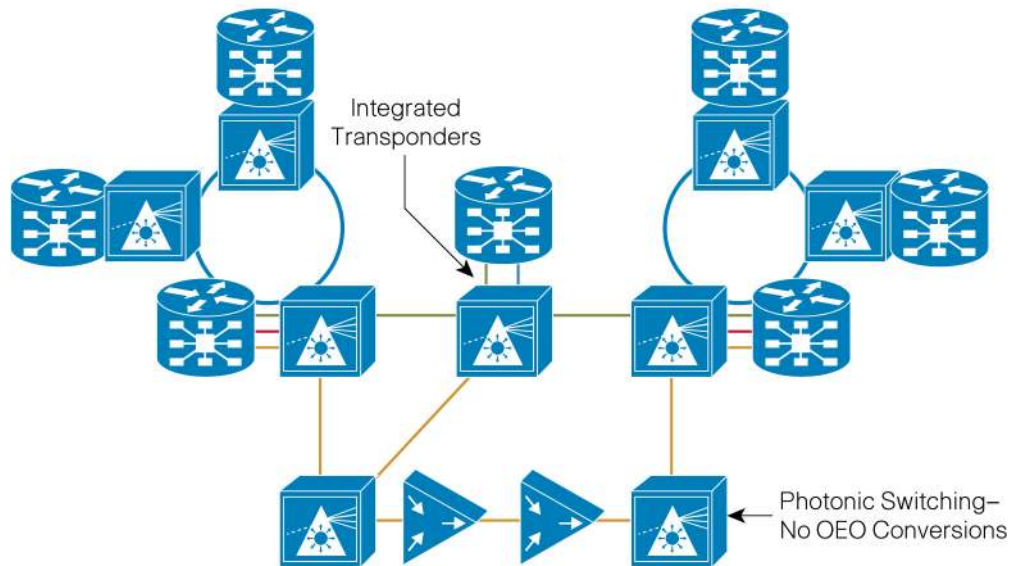
Different units can support different protection options and feature different capabilities which are deeper described in the unit datasheet.

## Topology Flexibility

One recent core network trend is the consolidation of multiple Layer 2/3 networks into a single IP/Multiprotocol Label Switching (IP/MPLS) infrastructure. In spite of this Layer 2/3 convergence, however, the underlying transport layer (Layer 1) of many service provider core networks has continued to use SONET/SDH. This has remained largely the case in many service provider networks globally today, creating OpEx and CapEx concerns for service providers as well as the challenges of profitability and return on investment. Some network inefficiencies result from the way core transport networks are built out today to support the IP or Service layer over the SONET/SDH layer, supported by an underlying DWDM infrastructure. The OEO conversions and the associated electrical processing driven by the layered network architecture result in an additional cost in terms of space, because many racks of shelves may be required in a service provider POP, as well as additional power and cooling that is necessary because of the active electronics components that they contain.

The Cisco ONS 15454 MSTP can be configured to support any metro, regional or core DWDM topology, allowing a single solution to be used for the overall network, independently from the topology and reach. The ultimate topology flexibility is achieved through a set of fully reconfigurable optical add/drop multiplexer (ROADM). Multi-degree ROADMs (2 through 8 degrees of freedom) allow wavelengths to remain in the optical domain while being passed from one ring or network segment to another, further eliminating the need for OEO conversions and leveraging the ability of core routers to initiate DWDM-compatible wavelengths (Figure 2).

**Figure 2.** Cisco Next Generation network strategy



The Cisco ONS 15454 MSTP offers ROADM capability that allows zero to 40 channels of pass-through or add/drop, A-Z wavelength provisioning, and full real-time power monitoring of each individual wavelength. Keeping traffic purely in the optical domain as much as possible has the added advantage of "future-proofing" a transport network. Pure optical transmission is inherently more tolerant to bit-rate variations where moves to higher rates and new protocols may still be required in the future, and hence more robust because photonic processing is intrinsically insensitive to protocol changes, unlike typical electrical processing elements.

### Product Specifications

With its multiservice capability, innovative optical technology, automatic optical power management, and MSPP-like ease of use, the Cisco ONS 15454 MSTP transforms how DWDM networks are built and managed. Combining multiple services and intelligent DWDM, the Cisco ONS 15454 MSTP significantly reduces both capital expenditures and operational expenses for today's metro and regional networks.

### Node Configurations

- Terminal
- Hub
- Line amplifier
- OADM
- Degree-2 ROADM
- Multi-degree ROADM



**Network Configurations**

- Linear point-to-point
- Ring (multiple-hub or no hub)
- Multi-Ring
- Mesh

**Advanced Intelligent Software Features**

- Network topology auto-discovery
- Point-and-click node and network setup and regulation
- Automatic network-level optical power management and monitoring
- Single management interface (single IP address) for all the shelves in a node
- Network-level alarm correlation for a quick and easy troubleshooting (G.798-based)
- DCN extension to provide the possibility to use any available DCN access (including DCC and GCC bytes) for management of nodes
- Automatic Node turn-up for installation and deployment without the use of Cisco TransportPlanner parameters

**User Interface: Cisco Transport Controller**

- Integrated node and sub-network craft GUI
- Layered graphical views: network, wavelength, node, shelf, card
- Node Functional view, automatically generated and aligned with equipment status
- User-provisionable graphics and fonts
  - Background maps
  - Color schemes
- A-to-Z wavelength circuit routing and creation
- Network auto-discovery with provisionable sub-network domain control
- System inventory
- PC-based Java client
- Familiar browser interface
- Complete Performance Monitoring support
  - 15-minute (32 entries) and 24-hour (two entries)
  - Optical layer
  - SONET/SDH layer
  - Ethernet & SAN statistics
  - ITU-T G.709 layer (including FEC/E-FEC)
  - Client interface type-specific
  - Threshold-crossing alerts threshold setting

**Alarm Monitoring and Reporting**

- Shelf LEDs – Critical, major, minor, remote
- Card LEDs – Card failure, active/standby state, signal fail

- Cisco Transport Controller craft interface
  - Layered graphical views with real-time alarm text and coloring: network, wavelength, node, shelf, card
  - Multiple technology views including DWDM and SONET/SDH with MSTP integration
- Environmental alarm contacts
  - 4-alarm output contact closures (standard): critical, major, minor, remote
  - Up to 48 provisionable alarm contacts in systems equipped with Alarm Interface Controller (AIC-I)

**Network Security Features**

- Four-level user control with provisionable timeout durations: super-user, provisioning, maintenance, retrieve
- Multiple user names and logged-in users
- RADIUS based authentication
- SSL, SSH, HTTPS

**Maintenance Features**

- Remote software downloads and in-service, hitless activation
- Loopbacks
- Database backup and restore
- Lamp test

**Timing and Synchronization**

- Two external timing-source inputs (SONET, T1 and SDH E-1, 2 MHz)
- Line timing
- Two timing-source outputs
- Internal Stratum 3
- Synchronous status-messaging support

**Additional Features**

- 100-Mbps user data channel (Fast Ethernet) transported on the optical supervisory channel (OSC)
- Front only (ETSI) or front and rear access (ANSI) shelf assembly options
- A and B fully redundant and monitored DC power inputs

**Carrier-Class Availability**

- Delivers better than 99,999% availability
- All cards hot-swappable
- Fully redundant Network Element processor and database

**Compliance and Certifications**

- Network Equipment Building Standards (NEBS) Level 3 compliance
- ITU-T and CE Mark compliance
- Operations Systems Modification of Intelligent Network Elements (OSMINE) certifications
- Storage-vendor qualification and certifications
- MEF 9 and MEF 14 certification for GE and 10GE Xponder units



## Technical Specifications

Table 1 provides the list of supported modules for Cisco ONS 15454 MSTP.

**Table 1.** Supported modules

Module	Unit Name
<b>COMMON EQUIPMENT</b>	
<b>Shelf assembly</b>	SA-HD, SA-HD-DDR or SA-ETSI version
<b>Fan-tray assembly</b>	CC-FTA, FTA3-T (ANSI) or FTA-48V (ETSI)
<b>Timing, communications, and control card (TCC)</b>	TCC2P
<b>Alarm Interface Controller (AIC) and Alarm Expansion Panel (AEP)</b>	AIC-1 (AEP option for ANSI)
<b>Power, craft, alarm mechanical interface cards (ETSI)</b>	CTP-MIC48V AP-MIC48V
<b>Air Ramp</b>	AIR-RAMP
<b>Slot Filler Card</b> Interface and control Front Mount Electrical Connection (FMEC) (ETSI)	BLANK BLANK-FMEC
<b>Multi-shelf Management cards</b> Integrated Multi-shelf switch Ethernet adapter panel mechanical frame Ethernet adapter panel Multiple Ethernet cable	MS-ISC-100T EAP-MF EAP MEC
<b>Fiber Management</b> Fiber patch panel shelf Fiber jumper storage shelf	PP-64-LC/PP2-64-LC or PP-80-LC FBR-STRG
<b>OPTICAL TRANSMISSION ELEMENTS</b>	
<b>Multiplexer and demultiplexer filters</b> 40-wavelength multiplexer, 100GHz, C band 40-channel demultiplexer, 100-GHz, Odd, C band 40-channel demultiplexer, 100-GHz, Even, C band 32-wavelength multiplexer, 100-GHz, C band 32-wavelength demultiplexer, 100-GHz, C band 32-channel demultiplexer 100-GHz (for use with 32-WSS), C band 32-channel demultiplexer 100-GHz (for use with 32-WSS), L band 4-wavelength multiplexer/demultiplexer, 100-GHz, C band	40-MUX-C 40-DMX-C 40-DMX-CE 32MUX-O 32DMX-O 32-DMX 32-DMX-L 4MD-xx.x
<b>Optical amplifier</b> Pre-amplifier, 50-GHz capable, C band Booster amplifier, 50-GHz capable, C band Optical amplifier, 17dB gain, 50-GHz capable, C band Enhanced Booster amplifier, 50-GHz capable, C band Enhanced optical amplifier, 20dBm output power, 50-GHz capable, C band Raman Amplifier, embedded EDFA, C band Amplifier (can be used as Pre-amplifier or Booster), L band Booster amplifier, 50-GHz capable, L band	OPT-PRE OPT-BST OPT-AMP-17C OPT-BST-E OPT-AMP-C OPT-RAMP-C OPT-AMP-L OPT-BST-L
<b>Reconfigurable optical add/drop multiplexer</b> 40-channel wavelength cross connect, 100-GHz, Odd, C band Degree-4 Mesh patch panel Degree-8 Mesh patch panel 40-channel wavelength selective switch, 100-GHz, Odd, C band 40-channel wavelength selective switch, 100-GHz, Even, C band 32-channel wavelength selective switch, 100-GHz, C band 32-channel wavelength selective switch, 100-GHz, L band	40-WXC-C PP-MESH-4 PP-MESH-8 40-WSS-C 40-WSS-CE 32-WSS 32-WSS-L
<b>Multi-ring/mesh upgrade unit, C band and L band</b>	MMU
<b>Protection Switching Module</b>	PSM

Module	Unit Name
<b>Optical band add/drop multiplexer</b> 1-band, 50-GHz capable, C band 4-band, 50-GHz capable, C band	AD-1B-xx.x AD-4B-xx.x
<b>Optical channel add/drop multiplexer</b> 1-channel, 100-GHz, C band 2-channel, 100-GHz, C band 4-channel, 100-GHz, C band	AD-1C-xx.x AD-2C-xx.x AD-4C-xx.x
<b>Optical service channel</b> Standard Integrated combiner and separator	OSCM OSC-CSM
<b>Dispersion compensation</b> Dispersion-compensation unit shelf assembly (2-slot) Dispersion-compensation units	DCU-SA DCU-<value>
<b>Y-cable protection modules</b> Shelf assembly Y-cable protection module, single-mode Y-cable protection module, multimode	YCBL-LC or FL-SA YCM-SM-LC or CS-SM-Y YCM-MM-LC or CS-MM-Y
<b>System capacity scalability units</b> 50GHz – 100GHz Interleaver/De-Interleaver C and L Band Splitter – Combiner	ID-50 SC-CL
<b>WAVELENGTH INTERFACES</b>	
<b>2.5G Transponder/Muxponder units</b> 2.5-Gbps FEC multirate Transponder – Unprotected 2.5-Gbps FEC multirate Transponder – Protected 2.5-Gbps data Muxponder – Unprotected 2.5-Gbps data Muxponder – Protected	MR-L1-xx.x MRP-L1-xx.x DM-L1-xx.x DMP-L1-xx.x
<b>10G Transponder/Muxponder units</b> 10-Gbps EFEC multirate Transponder – 4chs tunable 10-Gbps EFEC multirate Transponder – Band tunable 4x2.5-Gbps EFEC Muxponder – 4chs tunable 4x2.5-Gbps EFEC Muxponder – Band tunable 10-Gbps EFEC data muxponder – Band tunable	10E-L1-xx.x 10E-L1-y 10ME-L1-xx.x 10ME-L1-y 10DME-y
<b>XPonder units</b> GE XPonder GE XPonder – Enhanced 10GE Xponder 10GE Xponder – Enhanced OTU2 Xponder	GE-XP GE-XPE 10GE-XP 10GE-XPE OTU2-XP
<b>MSPP-On-A-Blade</b>	ADM-10G
<b>PLUGGABLE MODULES</b>	
<b>SONET/SDH</b> SFP – OC-3 SR1/STM-1 I-1.1 – SM SFP – OC-3 SR1/STM-1 – MM SFP – OC-3 IR1/STM-1 S-1.1 – SM SFP – STM-1 Electrical SFP – OC-12 SR1/STM-4, I-4.1 – SM SFP – OC-12 IR1/STM-4 S-4.1 – SM SFP – OC-3 LR2/STM-1 L-1.2 – SM SFP – OC-48 SR1/STM-16 I-16.1 – SM SFP – OC-48 IR1/STM-16 S-16.1 – SM SFP – OC-48 LR2/STM-16 L-16.2 – SM XFP – OC-192 SR1/STM-64 I-64.1 – SM XFP – OC-192 IR2/STM-64 S-64.2 – SM XFP – OC-192 LR2/STM-64 L-64.2 – SM	ONS-SE-Z1 ONS-SI-155-SR-MM ONS-SI-155-I1/ONS-SI-622-I1/SFP3-1-IR/SFP-L.1.1 ONS-SC-155-EL ONS-SE-Z1 ONS-SI-622-I1/SFP12-4-IR/SFP-L.4.1 ONS-SI-155-L2 ONS-SI-2G-S1/ONS-SE-2G-S1 ONS-SI-2G-I1/ONS-SE-Z1/SFP-OC48-IR/SFP-L.16.1 ONS-SI-2G-L2/ONS-SE-2G-L2 ONS-XC-10G-S1 ONS-XC-10G-I2 ONS-XC-10G-L2

Module	Unit Name
<b>Ethernet</b>	
SFP – FE 10Base-T – Electrical	ONS-SE-ZE-EL
SFP – FE 100Base-T – Electrical	ONS-SE-ZE-EL
SFP – FE 100Base-LX – SM	SFP3-1-IR/SFP-L.1.1
SFP – FE 100Base-FX – MM	ONS-SI-155-SR-MM
SFP – GE 1000Base-T – Electrical	ONS-SE-ZE-EL
SFP – GE 1000Base-LX – SM	ONS-SE-G2F-LX/ONS-SE-Z1
SFP – GE 1000Base-SX – MM	ONS-SE-G2F-SX
SFP – GE 1000Base-ZX – SM	ONS-SE-GE-ZX/ONS-SI-GE-ZX
XFP – 10GE Base-LR – SM	ONS-XC-10G-S1
XFP – 10GE Base-LW – SM	ONS-XC-10G-S1
XFP – 10GE Base-ER – SM	ONS-XC-10G-I2
XFP – 10GE Base-EW – SM	ONS-XC-10G-I2
XFP – 10GE Base-ZR – SM	ONS-XC-10G-L2
XFP – 10GE Base-SR – MM	ONS-XC-10G-SR-MM
XFP – 10GE Base-SW – MM	ONS-XC-10G-SR-MM
<b>SAN</b>	
SFP – ESCON 1310 – MM	ONS-SE-200-MM
SFP – Sysplex CLO/ETR – 1310nm – MM	ONS-SE-200-MM
SFP – Fiber Channel 1G/FICON-1G 100-M5-SN-I	ONS-SE-G2F-SX
SFP – Fiber Channel 1G/FICON-1G 100-M6-SN-I	ONS-SE-G2F-SX
SFP – Fiber Channel 1G/FICON-1G 100-SM-LC-L	ONS-SE-G2F-LX
SFP – Fiber Channel 2G /FICON-2G 200-M5-SN-I	ONS-SE-G2F-SX
SFP – Fiber Channel 2G/FICON-2G 200-M6-SN-I	ONS-SE-G2F-SX
SFP – Fiber Channel 2G/FICON-2G 200-SM-LC-L	ONS-SE-G2F-LX
SFP – Fiber Channel 4G/FICON-4G 400-M5-SN-I	ONS-SE-4G-MM
SFP – Fiber Channel 4G/FICON-4G 400-M6-SN-I	ONS-SE-4G-MM
SFP – Fiber Channel 4G/FICON-4G 400-SM-LC-L	ONS-SE-4G-SM
SFP – ISC-Compat 100-SM-LC-L	ONS-SE-G2F-LX
SFP – ISC-Peer-1G 100-SM-LC-L	ONS-SE-G2F-LX
SFP – ISC-Peer-2G 200-SM-LC-L	ONS-SE-G2F-LX
XFP – Fiber Channel 10G 1200-SM-LL-L	ONS-XC-10G-S1
XFP – Fiber Channel 10G 1200-MX-SN-I	ONS-XC-10G-SR-MM
<b>Video</b>	
SFP – D1 Video 1310 – SM	ONS-SI-622-I1/SFP12-4-IR/SFP-L.4.1
SFP – DVB-ASI 1310 – SM	ONS-SI-622-I1/SFP12-4-IR/SFP-L.4.1
SFP – SDI 1310 – SM	ONS-SI-622-I1/SFP12-4-IR/SFP-L.4.1
SFP – HDTV 1310 – SM	ONS-SE-G2F-LX
SFP – DV6000 1310 – SM	ONS-SI-2G-I1/SFP-OC48-IR/SFP-L.16.1
<b>Data</b>	
SFP – FDDI 1310 – SM	ONS-SI-155-I1/SFP3-1-IR/SFP-L.1.1
SFP – T3 Optical 1310 – SM	ONS-SI-155-I1/SFP3-1-IR
<b>xWDM</b>	
SFP – OC-48 CWDM, xxxnm	ONS-SC-Z3-xxxx
SFP – OC-48 DWDM, 100GHz, 15xx.xnm	ONS-SC-2G-xx.x
SFP – STM-16 CWDM, xxxnm	ONS-SC-Z3-xxxx
SFP – STM-16 DWDM, 100GHz, 15xx.xnm	ONS-SC-2G-xx.x
SFP – GE CWDM, xxxnm	ONS-SC-Z3-xxxx
SFP – GE DWDM, 100GHz, 15xx.xnm	ONS-SC-2G-xx.x
SFP – Fiber Channel 1G/FICON-1G CWDM, xxxnm	ONS-SC-Z3-xxxx
SFP – Fiber Channel 1G/FICON-1G DWDM, 100GHz, 15xx.xnm	ONS-SC-2G-xx.x
SFP – Fiber Channel 2G/FICON-2G CWDM, xxxnm	ONS-SC-Z3-xxxx
SFP – Fiber Channel 2G/FICON-2G DWDM, 100GHz, 15xx.xnm	ONS-SC-2G-xx.x
XFP – OC-192 DWDM, 100GHz, 15xx.xnm	ONS-XC-10G-xx.x
XFP – STM-64 DWDM, 100GHz, 15xx.xnm	ONS-XC-10G-xx.x
XFP – 10GE LAN PHY DWDM, 100GHz, 15xx.xnm	ONS-XC-10G-xx.x
XFP – 10G FC DWDM, 100GHz, 15xx.xnm	ONS-XC-10G-xx.x

Table 2 provides details about supported Interfaces and Protection types for the different Wavelength interface modules supported by Cisco ONS 15454 MSTP.

**Table 2.** Wavelength Interfaces details

Modules	Supported Service Interfaces	Protection Supported
<b>2.5-Gbps FEC multirate transponder cards</b> 8 modules, 4-channel tunable for 32-channel, 100-GHz plan, 50-GHz laser stability (C band)	1-Gbps Fibre Channel/FICON 2-Gbps Fibre Channel/FICON ISC-1 ISC-3 ESCON Fast Ethernet (FE) Gigabit Ethernet (GE) T3 (Optical) OC-3/STM-1 OC-12/STM-4 OC-48/STM-16 D1-SDI Video HDTV C-Cor DV-6000 (2.38-Gbps) ETR/CLO	No protection Optical-path protection Optical-path and equipment protection
<b>2.5-Gbps data muxponder cards</b> 8 modules, 4-channel tunable for 32-channel, 100-GHz plan, 50-GHz laser stability (C band)	1-Gbps Fibre Channel/FICON 2-Gbps Fibre Channel/FICON ESCON GE	No protection Optical-path protection Optical-path and equipment protection
<b>10-Gbps EFEC multirate transponder cards (4-channel tunable)</b> 8 modules, 4-channel tunable for 32-channel, 100-GHz plan, 50-GHz laser stability (C band)	10 GE LAN 10 GE WAN OC-192/STM-64 10 Gigabit Fibre Channel	No protection Optical-path and equipment protection
<b>4x 2.5-Gbps EFEC muxponder cards (4-channel tunable)</b> 8 modules, 4-channel tunable for 32-channel, 100-GHz plan, 50-GHz laser stability (C band)	OC-48/STM-16	No protection Optical-path and equipment protection
<b>10-Gbps EFEC multirate transponder cards (full-band tunable)</b> 1 module, full-band tunable for 82-channel, 50-GHz plan and stability (C band) 1 module, full-band tunable for 82-channel, 50-GHz plan and stability (L band)	10 GE LAN 10 GE WAN OC-192/STM-64 10 Gigabit Fibre Channel	No protection Optical-path and equipment protection
<b>4x 2.5-Gbps EFEC muxponder cards (full-band tunable)</b> 1 module, full-band tunable for 82-channel, 50-GHz plan and stability (C band) 1 module, full-band tunable for 82-channel, 50-GHz plan and stability (L band)	OC-48/STM-16	No protection Optical-path and equipment protection
<b>10-Gbps EFEC data muxponder cards (full-band tunable)</b> 1 module, full-band tunable for 82-channel, 50-GHz plan and stability (C band) 1 module, full-band tunable for 82-channel, 50-GHz plan and stability (L band)	1-Gbps Fibre Channel/FICON 2-Gbps Fibre Channel/FICON 4-Gbps Fibre Channel ISC-1 ISC-3 GE	No protection Optical-path and equipment protection
<b>GE XPonder units</b> 1 module, Standard version, two DWDM XFP-based trunk 1 module, Enhanced version, two DWDM XFP-based trunk	GE 10 GE LAN	No protection Optical-path protection Layer-2 Ethernet protection (GR3)
<b>10GE XPonder units</b> 1 module, Standard version, two DWDM XFP-based trunk 1 module, Enhanced version, two DWDM XFP-based trunk	10GE LAN	No protection Optical-path protection Layer-2 Ethernet protection (GR3)
<b>MSPP-On-A-Blade</b> 1 module, DWDM XFP-based trunk	OC-3/STM-1 OC-12/STM-4 OC-48/STM-16 GE	No protection 1+1 APS on Client UPSR on Trunk

Modules	Supported Service Interfaces	Protection Supported
<b>OTU2 XPonder</b> 1 module, DWDM XFP-based trunk	10 GE LAN 10 GE WAN OC-192/STM-64 10 Gigabit Fibre Channel OTU2	No protection Optical-path protection Optical-path and equipment protection

Table 3 and Table 4 provide details about wavelengths supported for the different Wavelengths Plan, in C band and in L band.

Table 5 provides Product Specifications for Cisco ONS 15454 MSTP.

**Table 3.** C band Wavelength Plan

Wavelength (nm)	32-Channels		40-Channels		64-Chs	80-Chs
	Odd	Even	Odd	Even	50GHz	50GHz
1530.3	x		x		x	x
1530.7		x		x	x	x
1531.1	x		x		x	x
1531.5		x		x	x	x
1531.9	x		x		x	x
1532.2		x		x	x	x
1532.6	x		x		x	x
1533.0		x		x	x	x
1533.4			x			x
1533.8				x		x
1534.2	x		x		x	x
1534.6		x		x	x	x
1535.0	x		x		x	x
1535.4		x		x	x	x
1535.8	x		x		x	x
1536.2		x		x	x	x
1536.6	x		x		x	x
1537.0		x		x	x	x
1537.4			x			x
1537.7				x		x
1538.1	x		x		x	x
1538.5		x		x	x	x
1538.9	x		x		x	x
1539.3		x		x	x	x
1539.7	x		x		x	x
1540.1		x		x	x	x
1540.5	x		x		x	x
1540.9		x		x	x	x
1541.3			x			x
1541.7				x		x
1542.1	x		x		x	x
1542.5		x		x	x	x
1542.9	x		x		x	x
1543.3		x		x	x	x

Wavelength	32-Channels		40-Channels		64-Chs	80-Chs
1543.7	x		x		x	x
1544.1		x		x	x	x
1544.5	x		x		x	x
1544.9		x		x	x	x
1545.3			x			x
1545.7				x		x
1546.1	x		x		x	x
1546.5		x		x	x	x
1546.9	x		x		x	x
1547.3		x		x	x	x
1547.7	x		x		x	x
1548.1		x		x	x	x
1548.5	x		x		x	x
1548.9		x		x	x	x
1549.3			x			x
1549.7				x		x
1550.1	x		x		x	x
1550.5		x		x	x	x
1550.9	x		x		x	x
1551.3		x		x	x	x
1551.7	x		x		x	x
1552.1		x		x	x	x
1552.5	x		x		x	x
1552.9		x		x	x	x
1553.3			x			x
1553.7				x		x
1554.1	x		x		x	x
1554.5		x		x	x	x
1554.9	x		x		x	x
1555.3		x		x	x	x
1555.7	x		x		x	x
1556.1		x		x	x	x
1556.5	x		x		x	x
1556.9		x		x	x	x
1557.3			x			x
1557.7				x		x
1558.1	x		x		x	x
1558.5		x		x	x	x
1558.9	x		x		x	x
1559.3		x		x	x	x
1559.7	x		x		x	x
1560.2		x		x	x	x
1560.6	x		x		x	x
1561.0		x		x	x	x



Wavelength	32-Channels		40-Channels		64-Chs	80-Chs
1561.4			x			x
1561.8				x		x

**Table 4.** L band Wavelength Plan – 32-Channel Odd

λ (nm)	λ (nm)	λ (nm)	λ (nm)	λ (nm)	λ (nm)	λ (nm)	λ (nm)
1577.8	1581.1	1584.5	1587.8	1591.2	1594.6	1598.0	1601.4
1578.6	1582.0	1585.3	1588.7	1592.1	1595.4	1598.8	1602.3
1579.5	1582.8	1586.2	1589.5	1592.9	1596.3	1599.7	1603.1
1580.3	1583.6	1587.0	1590.4	1593.7	1597.1	1600.6	1604.0

**Table 5.** Product Specification

Item	Specification
<b>Nodes per network</b>	60
<b>Wavelengths</b> C band L band	80 + 1 (OSC) (with 50 GHz channels spacing) 32 + 1 (OSC)
<b>Wavelength spacing</b>	100 GHz (50 GHz channels spacing available)
<b>Optical reach, single span, point-to-point (amplified)</b> 80 channels 40 channels 20 channels	103 miles (160 km) 113 miles (180 km) 122 miles (200 km)
<b>Number of spans</b>	40
<b>Ring circumference</b>	2,000 miles (3,200 km)
<b>Fiber type</b>	Single-mode fiber (G.652, G.653 G.655, G.656)
<b>Power requirements</b> Terminal node ROADM node Degree-2 Degree-8 OADM node Amplified Passive Line amplifier node EDFA Raman	Typical/Maximum 253W/403W  352W/446W 705W/1,088W  250W/334W 174W/212W  200W/307W 288W/415W
<b>Physical Dimensions</b> ANSI Shelf Assembly Rack Mounting Shelf Assembly ETSI Shelf Assembly Rack Mounting Shelf Assembly	19" or 23" EIA rack-mounting 18.5in (H) x 17.6in (W) x 12.0in (D)  600mm or 19" rack-mounting <sup>1</sup> 616.5mm (H) x 445mm (W) x 280mm (D)
<b>Environmental Conditions</b> Storage Temperature Operating Temperature Normal Short Term <sup>2</sup> Relative Humidity Normal Short Term <sup>2</sup>	–40°C to 70°C (–40°F to 158°F)  0°C to 55°C (32°F to 131°F) –5°C to 55°C (23°F to 131°F)  5% to 85%, non condensing 5% to 90% but not to exceed 0.024 kg water/kg of dry air

1. 19" mounting brackets have to be ordered separately

2. 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.)

## Regulatory Standards Compliance

Table 6 summarizes regulatory standard compliance and agency approvals. Table 7 provides a list of standards which are applicable to Cisco ONS 15454 MSTP but for which compliance may be applicable to selected sections only.

**Table 6.** Regulatory standard compliance and agency approvals

ANSI (15454) System	ETSI (15454E) System
<b>Supported Countries</b>	
<ul style="list-style-type: none"> <li>• Canada</li> <li>• United States</li> <li>• Korea</li> </ul>	<ul style="list-style-type: none"> <li>• Europe</li> <li>• Latin America</li> <li>• Japan</li> <li>• Asia Pacific</li> <li>• Middle-East and Africa</li> </ul>
<b>EMC (Class A)</b>	
<ul style="list-style-type: none"> <li>• ICES-003 Issue 4 (2004)</li> <li>• GR-1089-CORE, Issue 4 (Type 2 and Type 4 equipment)</li> <li>• GR-1089-CORE – Issue 03 (Oct 2002) (Objective O3-2 – Section 3.2.1 – Radiated Emissions requirements with all doors open)</li> <li>• FCC 47CFR15, Class A subpart B (2006)</li> </ul>	<ul style="list-style-type: none"> <li>• EN 300 386 v1.3.3 (2005) and v1.4.1 (2007)</li> <li>• CISPR 22 – Fifth edition (2005-04) Class A and the amendment 1 (2005-07)</li> <li>• CISPR 24 – First edition (1997-09) and amendment 1 (2001-07) and amendment 2 (2002-10).</li> <li>• EN 55022:1998 Class A – CENELEC Amendment A2:2003</li> <li>• EN 55024:1998 – CENELEC Amendment A1:2001 and Amendment A2:2003</li> <li>• Resolution 237 (Brazil)</li> <li>• VCCI V-3/2006.04</li> <li>• EN 61000-6-1:2001</li> <li>• EN 61000-6-2:1999</li> </ul>
<b>Safety</b>	
<ul style="list-style-type: none"> <li>• UL/CSA 60950 -1 First Edition (2003)</li> <li>• GR-1089-CORE, Issue 4 (Type 2 and Type 4 equipment)</li> </ul>	<ul style="list-style-type: none"> <li>• UL/CSA 60950 -1 First Edition (2003)</li> <li>• IEC 60950-1 (2001/10)/Amendment 11:2004 to EN 60950-1:2001, 1st Edition (with all country deviations)</li> </ul>
<b>Environmental</b>	
<ul style="list-style-type: none"> <li>• GR-63-CORE, Issue 3 (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 (Transportation, Class 2.3)</li> <li>• ETS 300-019-2-3 V2.1.2 (Operational, Class 3.1E)</li> <li>• EU WEEE regulation</li> <li>• EU RoHS regulation</li> </ul>
<b>Power &amp; Grounding</b>	
<ul style="list-style-type: none"> <li>• GR-1089-CORE, Issue 4</li> </ul>	<ul style="list-style-type: none"> <li>• ETS 300 132-2</li> </ul>
<b>Optical Safety</b>	
<ul style="list-style-type: none"> <li>• EN or IEC-60825-2 Third edition (2004-06)</li> <li>• EN or IEC 60825-1 Consol. Ed. 1.2 – incl. am1+am2 (2001-08)</li> <li>• 21CFR1040 (2004/04) (Accession Letter and CDRH Report)</li> <li>• IEC-60825-2 Third edition (2004-06)</li> <li>• ITU-T G.664 (2006)</li> </ul>	
<b>Miscellaneous</b>	
<ul style="list-style-type: none"> <li>• Acoustic Noise <ul style="list-style-type: none"> <li>◦ GR-63-CORE, Issue 3 (2006)</li> <li>◦ ETS 300 753 ed.1 (1997-10)</li> </ul> </li> <li>• Rain, Sand, Dust and Moisture Proofing <ul style="list-style-type: none"> <li>◦ AS 1939-1990, 4.2, IP 53</li> </ul> </li> <li>• Mechanical Shock &amp; Bumps <ul style="list-style-type: none"> <li>◦ AS1099- 2.27</li> </ul> </li> <li>• Customer specific requirements <ul style="list-style-type: none"> <li>◦ AT&amp;T Network Equipment Development Standards (NEDS) Generic Requirements, AT&amp;T 802-900-260</li> <li>◦ SBC TP76200MP</li> <li>◦ Verizon SIT.NEBS.NPI.2002.010</li> </ul> </li> </ul>	

**Table 7.** Standards applicable to Cisco ONS 15454 MSTP

Standard	Title
<b>Optical Fiber</b>	
ITU-T G.652 (A,B,C,D)	Characteristics of a single-mode optical fibre and cable
ITU-T G.653	Characteristics of a dispersion-shifted single-mode optical fibre and cable#
ITU-T G.654	Characteristics of a cut-off shifted single-mode optical fibre and cable
ITU-T G.655	Characteristics of a non-zero dispersion-shifted single-mode optical fibre and cable
ITU-T G.656	Characteristics of a fibre and cable with non-zero dispersion for wideband optical transport
<b>Optical Systems</b>	
ITU-T G.691	Optical interfaces for single channel STM-64 and other SDH systems with optical amplifiers
ITU-T G.692	Optical interfaces for multichannel systems with optical amplifiers
ITU-T G.693	Optical interfaces for intra-office systems
ITU-T G.694.1	Spectral grids for WDM applications: DWDM frequency grid
ITU-T G.694.2	Spectral grids for WDM applications: CWDM wavelength grid
ITU-T G.695	Optical interfaces for coarse wavelength division multiplexing applications
ITU-T G.697	Optical monitoring for DWDM systems
Telcordia GR-253-CORE – Issue 04	Synchronous Optical Network (SONET) Transport Systems: Common Generic Criteria
<b>Optical Amplifiers</b>	
ITU-T G.661	Definition and test methods for the relevant generic parameters of optical amplifier devices and subsystems
ITU-T G.662	Generic characteristics of optical amplifier devices and subsystems
ITU-T G.663	Application related aspects of optical amplifier devices and subsystems
ITU-T G.665	Generic characteristics of Raman amplifiers and Raman amplified subsystems
<b>Performance Monitoring and Management Interface</b>	
ITU-T G.826	End-to-end error performance parameters and objectives for international, constant bit-rate digital paths and connections
ITU-T G.829	Error performance events for SDH multiplex and regenerator sections
ITU-T G.874	Management aspects of the optical transport network element
Telcordia GR-253-CORE – Issue 04	Synchronous Optical Network (SONET) Transport Systems: Common Generic Criteria
Telcordia GR-474-CORE	Alarm and Control for Network Elements
Telcordia GR-2998-CORE	Generic Requirements for WDM EMSs
<b>Ethernet</b>	
IEEE 802.1D	IEEE Standard for local and metropolitan area networks — Media access control (MAC) Bridges
IEEE 802.1Q	IEEE Standard for Local and Metropolitan Area Networks — Virtual Bridged Local Area Networks
IEEE 802.1ad	Amendment to IEEE 802.1Q-2005. IEEE Standard for Local and metropolitan area networks — Virtual Bridged Local Area Networks
IEEE 802.3ab	1000BASE-T Gbit/s Ethernet over twisted pair at 1 Gbit/s (125 MB/s)
IEEE 802.3ae	10 Gbit/s (1,250 MB/s) Ethernet over fiber; 10GBASE-SR, 10GBASE-LR, 10GBASE-ER, 10GBASE-SW, 10GBASE-LW, 10GBASE-EW
MEF 9	Abstract Test Suite for Ethernet Services at the UNI
MEF 14	Abstract Test Suite for Traffic Management Phase 1
ITU-T Y.1731	OAM functions and mechanisms for Ethernet based networks

Standard	Title
<b>SONET, SDH and OTN</b>	
ITU-T G.707	Network node interface for the synchronous digital hierarchy (SDH)
ITU-T G.709	Interfaces for the Optical Transport Network (OTN)
ITU-T G.781	Synchronization layer functions
ITU-T G.783	Characteristics of synchronous digital hierarchy (SDH) equipment functional blocks
ITU-T G.784	Synchronous digital hierarchy (SDH) management
ITU-T G.798	Characteristics of optical transport network hierarchy equipment functional blocks
ITU-T G.805	Generic functional architecture of transport networks
ITU-T G.811	Timing characteristics of primary reference clocks
ITU-T G.812	Timing requirements of slave clocks suitable for use as node clocks in synchronization networks
ITU-T G.813	Timing characteristics of SDH equipment slave clocks (SEC)
ITU-T G.823	The control of jitter and wander within digital networks which are based on the 2048 kbit/s hierarchy
ITU-T G.824	The control of jitter and wander within digital networks which are based on the 1544 kbit/s hierarchy
ITU-T G.825	The control of jitter and wander within digital networks which are based on the synchronous digital hierarchy (SDH)
ITU-T G.8251	The control of jitter and wander within the optical transport network (OTN)
ITU-T G.841	Types and characteristics of SDH network protection architectures
ITU-T G.872	Architecture of optical transport networks
ITU-T G.957	Optical interfaces for equipments and systems relating to the synchronous digital hierarchy
ITU-T G.959.1	Optical transport network physical layer interfaces
ITU-T G.Sup43	Transport of IEEE 10GBASE-R in optical transport networks (OTN)
ITU-T G.7041	Generic framing procedure (GFP)
ANSI T1.105	Synchronous Optical Network (SONET) – Basic Description including Multiplex Structure, Rates, and Formats

**Ordering Information**

To place an order, visit the Cisco Ordering homepage. To download software, visit the Cisco Software Center.

Table 8 provides ordering information.

**Table 8.** Ordering Information

Product ID	Description
<b>Common Equipment</b>	
15454-SA-HD= 15454-SA-HD-DDR= 15454E-SA-ETSI=	Shelf assembly, Cisco ONS 15454
15454-TCC2P-K9= 15454E-TCC2P-K9=	Timing, Communications, and Control Card, Version 2 Plus (TCC2P)
15454-CC-FTA= 15454E-CC-FTA= 15454-FTA3-T= 15454E-FTA-48V=	Controlled cooling fan-tray assembly, includes fan-tray filter  Fan-tray assembly, includes fan-tray filter
15454E-CTP-MIC48V=	Mechanical interface card, craft, timing, and power inputs, ETSI
15454E-AP-MIC48V=	Mechanical interface card, alarm, and power inputs, ETSI
15454-AIR-RAMP= 15454E-AIR-RAMP=	Air ramp (ships with ANSI 19" and 23" and ETSI 600mm mounting brackets)
15454-AIC-I= 15454E-AIC-I=	Alarm Interface Controller, international card
15454-BLANK= 15454E-BLANK= 15454E-BLANK-FMEC=	Shelf slot-filler panel, fits any slot in Cisco ONS 15454 ANSI shelf assembly Shelf slot-filler panel, fits any slot in Cisco ONS 15454 ETSI shelf assembly Shelf FMEC slot-filler panel, fits Cisco ONS 15454 ETSI shelf assembly
15454-MS-ISC-100T=	Integrated 100T Ethernet switch for multi-shelf management
15454-EAP-MF=	Mechanical frame for Ethernet adapter panel (ships with ANSI 19" and 23" and ETSI 600mm mounting brackets)
15454-EAP=	Ethernet adapter panel (to be used with MS-ISC-100T to allow proper cable management)

Product ID	Description
15454-MEC=	Multiple Ethernet cable to replicate the MS-ISC-100T Ethernet ports on the EAP unit
15454-PP-64-LC=	64-port fiber patch-panel shelf, 1 rack unit (RU) high, LC-to-LC connectors, 32 duplex LC adapters, supports up to 8 multi-fiber cable assemblies (1 MPO to 8x LC), includes 2 MPO to 8x LC 2.3-meter cable assemblies (uninstalled). Ships with ANSI 19" and 23" and ETSI 600mm mounting brackets.
15454-PP2-64-LC=	64-port fiber patch-panel shelf, 2 RUs high, LC-to-LC connectors, 32 duplex LC adapters, includes 8 MPO to 8x LC 2.3-meter cable assemblies (pre-cabled). Ships with ANSI 19" and 23" and ETSI 600mm mounting brackets.
15454-PP-80-LC=	80-port fiber patch-panel shelf, 2 RUs high, LC-to-LC connectors, 40 duplex LC adapters, includes 10 MPO to 8x LC 2.3-meter cable assemblies (pre-cabled). Ships with ANSI 19" and 23" and ETSI 600mm mounting brackets.
15454-PP-MESH-4=	Degree-4 Mesh Patch Panel, 2 RUs high, 1x LC and 1x MPO adapter per direction. Ships with ANSI 19" and 23" and ETSI 600mm mounting brackets.
15454-PP-MESH-8=	Degree-8 Mesh Patch Panel, 2 RUs high, 1x LC and 1x MPO adapter per direction. Ships with ANSI 19" and 23" and ETSI 600mm mounting brackets.
15454-FBR-STRG=	Fiber-storage shelf, supports eight 2-meter ribbon cables (8-fiber) plus 40 2-meter 2-mm fiber cables. Ships with ANSI 19" and 23" and ETSI 600mm mounting brackets.
15216-FL-SA=	FlexLayer shelf assembly, 4 module slots, 1 RU high, Cisco FlexLayer platform. Ships with ANSI 19" and 23" mounting brackets.
15216-CS-SM-Y=	Y-cable splitter/combiner module for 2 wavelengths protection, single-mode fiber, single-width module, installs in Cisco FlexLayer (15216-FL-SA=) shelf assembly
15216-CS-MM-Y=	Y-cable splitter/combiner module for 2 wavelengths protection, multimode fiber, single-width module, installs in Cisco FlexLayer (15216-FL-SA=) shelf assembly
15454-YCBL-LC=	Y-cable storage shelf, 2 RUs high, supports up to 8 Y-cable splitter/combiner modules. Ships with ANSI 19" and 23" and ETSI 600mm mounting brackets.
15454-YCM-SM-LC=	Y-cable splitter/combiner module for 1 wavelength protection, single-mode fiber, LC adapters, installs in Cisco Y-cable storage (15454-YCBL-LC=) shelf assembly
15454-YCM-MM-LC=	Y-cable splitter/combiner module for 1 wavelength protection, multimode fiber, LC adapters, installs in Cisco Y-cable storage (15454-YCBL-LC=) shelf assembly
<b>Service Interfaces<sup>1</sup></b>	
15454-10DME-C=	10-Gbps E-FEC data muxponder card, 8x SFP-based client interfaces, full C-band tunable on 50-GHz ITU wavelengths (Odd and Even), DWDM line with LC connectors
15454-10DME-L=	10-Gbps E-FEC data muxponder card, 8x SFP-based client interfaces, full L-band tunable on 50-GHz ITU wavelengths, DWDM line with LC connectors
15454-10E-L1-C=	10-Gbps E-FEC multirate transponder card, 1x XFP-based client interface, full C-band tunable on 50-GHz ITU wavelengths (Odd and Even), DWDM line with LC connectors
15454-10E-L1-L=	10-Gbps E-FEC multirate transponder card, 1x XFP-based client interface, full L-band tunable on 50-GHz ITU wavelengths, DWDM line with LC connectors
15454-10E-L1-xx.x=	10-Gbps E-FEC multirate transponder card, 1x XFP-based client interface, 4-channel tunable on 32-channels Odd 100-GHz ITU wavelengths (50-GHz stability), DWDM line with LC connectors – C band
15454-10GE-XP=	10GE E-FEC Ethernet CrossPonder, 2x XFP-based client interfaces, 2x XFP-based trunk interfaces
15454-10GE-XPE=	10GE E-FEC Ethernet Enhanced CrossPonder, 2x XFP-based client interfaces, 2x XFP-based trunk interfaces
15454-10ME-L1-C=	4x OC-48/STM-16 E-FEC muxponder card, 4x SFP-based client interfaces, full C-band tunable on 50-GHz ITU wavelengths (Odd and Even), DWDM line with LC connectors
15454-10ME-L1-L=	4x OC-48/STM-16 E-FEC muxponder card, 4x SFP-based client interfaces, full L-band tunable on 50-GHz ITU wavelengths, DWDM line with LC connectors
15454-10ME-xx.x=	4x OC-48/STM-16 E-FEC muxponder, 4x SFP-based client interfaces, 4-channel tunable on 32-channels Odd 100-GHz ITU wavelengths (50-GHz stability), DWDM line with LC connectors – C band
15454-ADM-10G=	10Gbps E-FEC ADM-On-A-Blade, 16x SFP-based client interfaces, 1x XFP-based interconnection interface, 2x XFP-based trunk interfaces
15454-DM-L1-xx.x=	2.5-Gbps data muxponder card, 8x SFP-based client interfaces, 4-channel tunable on 32-channels Odd 100-GHz ITU wavelengths (50-GHz stability), unprotected DWDM line with LC connectors – C band
15454-DMP-L1-xx.x=	2.5-Gbps data muxponder card, 8x SFP-based client interfaces, 4-channel tunable on 32-channels Odd 100-GHz ITU wavelengths (50-GHz stability), protected DWDM line with LC connectors – C band
15454-GE-XP=	GE E-FEC Ethernet CrossPonder, 20x SFP-based client interfaces, 2x XFP-based trunk interfaces
15454-GE-XPE=	GE E-FEC Ethernet Enhanced CrossPonder, 20x SFP-based client interfaces, 2x XFP-based trunk interfaces

<sup>1</sup> Wavelength plan is outlined in Tables 3 and 4 in this document. Cisco online lead-time tool is available for determining the lead-time of individual wavelengths, if different.

Product ID	Description
15454-MR-L1-xx.x=	100-Mbps to 2.5-Gbps FEC multirate transponder card, 1x SFP-based client interface, 4-channel tunable on 32-channels Odd 100-GHz ITU wavelengths (50-GHz stability), unprotected DWDM line with LC connectors – C band
15454-MRP-L1-xx.x=	100-Mbps to 2.5-Gbps FEC multirate transponder card, 1x SFP-based client interface, 4-channel tunable on 32-channels Odd 100-GHz ITU wavelengths (50-GHz stability), protected DWDM line with LC connectors – C band
15454-OTU2-XP=	4x OTN E-FEC Multirate Xponder, 2x XFP-based trunk/client FEC interfaces, 2x XFP-based trunk/client E-FEC interfaces
<b>Optical Transmission Elements</b>	
15454-32-DMX=	32-channel demultiplexer 100-GHz (for use with 32-WSS), C-band, MPO connectors for drop path, LC connector for interconnection, includes one 2-meter 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 connector for interconnection, includes one 2-meter LC/LC fiber-optic cables
15454-32DMX-O=	32-channel demultiplexer card, C-band, Odd grid, 100-GHz, MPO connectors for drop path, LC connector for interconnection, includes one 2-meter LC/LC fiber-optic cables
15454-32MUX-O=	32-channel multiplexer card, C-band, Odd grid, 100-GHz, MPO connectors for add path, LC connector for interconnection
15454-32-WSS=	32-channel wavelength selective switch 100-GHz, C-band, MPO connectors for add path, LC connectors for interconnection, includes two 2-meter LC/LC fiber-optic cables
15454-32-WSS-L=	32-channel wavelength selective switch 100-GHz, L-band, MPO connectors for add path, LC connectors for interconnection, includes two 2-meter LC/LC fiber-optic cables
15454-40-DMX-C=	40-channel demultiplexer 100-GHz (for use with 40-WSS-C, 40-MUX-C or 40-WXC-C), C-band, Odd grid, MPO connectors for drop path, LC connector for interconnection, includes one 2-meter LC/LC fiber-optic cables
15454-40-DMX-CE=	40-channel demultiplexer 100-GHz (for use with 40-WSS-CE), C-band, Even grid, MPO connectors for drop path, LC connector for interconnection, includes one 2-meter LC/LC fiber-optic cables
15454-40-MUX-C=	40-channel multiplexer 100-GHz (for use with 40-DMX-C or 40-WXC-C), C-band, Odd grid, MPO connectors for add path, LC connector for interconnection, includes one 2-meter LC/LC fiber-optic cables
15454-40-WSS-C=	40-channel wavelength selective switch 100GHz, C-band, Odd grid, MPO connectors for add path, LC connectors for interconnection, includes two 2-meter LC/LC fiber-optic cables
15454-40-WSS-CE=	40-channel wavelength selective switch 100-GHz, C-band, Even grid, MPO connectors for add path, LC connectors for interconnection, includes two 2-meter LC/LC fiber-optic cables
15454-40-WXC-C=	40-channel wavelength cross connect 100-GHz, C-band, Odd grid, MPO connector for interconnection with Mesh Patch Panel, LC connectors for interconnection, includes one 2-meter LC/LC fiber-optic cable
15454-4MD-xx.x=	4-channel multiplexer and demultiplexer card, C-band, 100-GHz, LC connectors, includes two 2-meter LC/LC fiber-optic cables
15454-AD-1B-xx=	1-band OADM, C-band, 100-GHz, LC connectors, includes two 2-meter LC/LC fiber-optic cables
15454-AD-1C-xx.x=	1-channel OADM, C-band, 100-GHz, LC connectors, includes two 2-meter LC/LC fiber-optic cables
15454-AD-2C-xx.x=	2-channel OADM, C-band, 100-GHz, LC connectors, includes two 2-meter LC/LC fiber-optic cables
15454-AD-4B-xx=	4-band OADM, C-band, 100-GHz, LC connectors, includes two 2-meter LC/LC fiber-optic cables
15454-AD-4C-xx.x=	4-channel OADM, C-band, 100-GHz, LC connectors, includes two 2-meter LC/LC fiber-optic cables
15454-MMU=	Multi-ring/mesh upgrade unit, C band and L band (for use with 32-WSS/32-DMX or 32-WSS-L/32-DMX-L), LC connectors, includes two 2-meter LC/LC fiber-optic cables
15454-OPT-AMP-17C=	Optical amplifier, 17dBm Output Power, 17dB Gain, can be configured as preamplifier or booster, C-band, 80 channel, 50-GHz compatible, LC connectors, includes two 2-meter LC/LC fiber-optic cables
15454-OPT-AMP-C=	Enhanced optical amplifier, 20dBm Output Power, can be configured as preamplifier or booster, C-band, 80 channel, 50-GHz compatible, LC connectors, midstage access, includes one LC/LC loopback (to be used if DCU is not required) and two 2-meter LC/LC fiber-optic cables
15454-OPT-AMP-L=	Optical amplifier, 20dBm Output Power, can be configured as preamplifier or booster, L-band, 64 channel, 50-GHz compatible, LC connectors, midstage access, includes one 4-dB LC/LC attenuated loopback (to be used if DCU is not required) and two 2-meter LC/LC fiber-optic cables
15454-OPT-BST=	Optical booster amplifier, 17dBm Output Power, C-band, 80 channel, 50-GHz compatible, LC connectors, includes two 2-meter LC/LC fiber-optic cables
15454-OPT-BST-E=	Optical enhanced booster amplifier, 20dBm Output Power, C-band, 80 channel, 50-GHz compatible, LC connectors, includes two 2-meter LC/LC fiber-optic cables
15454-OPT-BST-L=	Optical booster amplifier, 17dBm Output Power, L-band, 64 channel, 50-GHz compatible, LC connectors, includes two 2-meter LC/LC fiber-optic cables
15454-OPT-PRE=	Optical preamplifier, 17dBm Output Power, C-band, 80 channel, 50-GHz compatible, LC connectors, midstage access, includes one 4-dB LC/LC attenuated loopback (to be used if DCU is not required)



Product ID	Description
15454-OPT-RAMP-C=	Optical Raman amplifier with embedded EDFA, 500mW total counter-propagating Raman pump power, 17dBm EDFA Output Power, C-band, 80 channel, 50-GHz compatible, LC connectors, midstage access, includes one LC/LC loopback (to be used if DCU is not required) and two 2-meter LC/LC fiber-optic cables
15454-OSC-CSM=	Optical service channel card, integrated combiner/separator, 1510-nm, LC connectors, includes two 2-meter LC/LC fiber-optic cables
15454-OSCM=	Optical service channel card, 1510-nm, LC connectors, includes two 2-meter LC/LC fiber-optic cables
15454-PSM=	Protection Switching Module, LC connectors
15216-DCU-SA=	Dispersion-compensation unit shelf, two module slots, 1 RU high. Ships with ANSI 19" and 23" and ETSI 600mm mounting brackets.
15216-DCM-<value>	Dispersion-compensation module, LC connectors, different fiber types and lengths supported for both C-band and L-band as part of the Cisco ONS 15216 product family
15216-ID-50=	50 GHz/100GHz Optical Interleaver and De-interleaver Module, single-width module, installs in Cisco FlexLayer shelf assembly (15216-FL-SA)
15216-SC-CL=	C-band and L-band Splitter and Combiner Module, single-width module, installs in Cisco FlexLayer shelf assembly (15216-FL-SA)
<b>Pluggable Optics Modules</b>	
15454-SFP3-1-IR= 15454E-SFP-L.1.1=	OC-3/STM-1/D1-SDI SFP optics module, intermediate-reach, 1310-nm, single-mode, LC connector
ONS-SI-155-SR-MM=	OC-3/STM-1 SFP optics module, intermediate-reach, 1310-nm, multi-mode, industrial temperature, LC connector
ONS-SI-155-I1=	OC-3/STM-1 SFP optics module, intermediate-reach, 1310-nm, single-mode, industrial temperature, LC connector
ONS-SI-155-L2=	OC-3/STM-1 SFP optics module, long-reach, 1550-nm, single-mode, industrial temperature, LC connector
ONS-SC-155-EL=	SFP – STM-1 Electrical, standard coaxial (75ohm) connector
15454-SFP12-4-IR= 15454E-SFP-L.4.1=	OC-12/STM-4 SFP optics module, intermediate-reach, 1310-nm, single-mode, LC connector
ONS-SI-622-I1=	OC-12/STM-4/OC-3/STM-1 SFP optics module, intermediate-reach, 1310-nm, single-mode, industrial temperature, LC connector
15454-SFP-OC48-IR= 15454E-SFP-L.16.1=	OC-48/STM-16 SFP optics module, intermediate-reach, 1550-nm, single-mode, LC connector
ONS-SE-2G-S1=	OC-48/STM-16 SFP optics module, short-reach/intra-office, 1310-nm, single-mode, LC connector
ONS-SI-2G-S1=	OC-48/STM-16 SFP optics module, short-reach/intra-office, 1310-nm, single-mode, industrial temperature, LC connector
ONS-SE-2G-L2=	OC-48/STM-16 SFP optics module, long-reach/long-haul, 1550-nm, single-mode, LC connector
ONS-SI-2G-L2=	OC-48/STM-16 SFP optics module, long-reach/long-haul, 1550-nm, single-mode, industrial temperature, LC connector
ONS-SE-Z1=	OC-48/STM-16/OC-12/STM-4/OC-3/STM-1 SFP optics module, 1310-nm, single-mode, LC connector
ONS-SC-Z3-XXXX=	OC-48/STM-16/GE SFP optics module, CWDM, XXXX-nm, single-mode, Commercial temperature, LC connector
ONS-SE-200-MM=	ESCON SFP optics module, short-reach, 1310-nm, multi-mode, LC connector
ONS-SE-G2F-LX=	GE, Fibre Channel (1- and 2-Gbps) and HDTV SFP optics module, long-reach, 1310-nm, single-mode, LC connector
ONS-SE-G2F-SX=	GE and Fibre Channel (1- and 2-Gbps) SFP optics module, short-reach, 850-nm, multimode, LC connector
ONS-SE-GE-ZX=	GE SFP optics module, 1000BASE-ZX interface, 1550-nm, single-mode, LC connector
ONS-SI-GE-ZX=	GE SFP optics module, 1000BASE-ZX interface, 1550-nm, single-mode, Industrial temperature, LC connector
ONS-SE-ZE-EL=	10/100/1000 Ethernet SFP electrical module, Base-T interface, RJ45 connector
ONS-SE-4G-SM=	4-Gbps Fibre Channel SFP optics module, 1310-nm, single-mode, LC connector
ONS-SE-4G-MM=	4-Gbps Fibre Channel SFP optics module, 850-nm, multi-mode, LC connector
ONS-SC-2G-xx.x=	OC-48/STM-16 SFP optics module, DWDM, 15xx.x-nm, single mode, LC connector
ONS-XC-10G-SR-MM=	10 GE/10-Gbps Fibre Channel XFP optics module, short-reach, 850-nm, multi-mode, LC connector
ONS-XC-10G-S1=	OC-192/STM-64/10 GE/10-Gbps Fibre Channel XFP optics module, short-reach, 1310-nm, single-mode, LC connector

Product ID	Description
ONS-XC-10G-L2=	OC-192/STM-64 XFP optics module, long-reach, 1550-nm, single-mode, LC connector
ONS-XC-10G-I2=	OC-192/STM-64 IR2/10 GE XFP optics module, intermediate-reach, 1550-nm, single-mode, LC connector
ONS-XC-10G-xx.x=	OC-192/STM-64/10 GE XFP optics module, DWDM, 15xx.x-nm, single-mode, LC connector
<b>Cable Assemblies</b>	
15454-MPO-MPO-2=	Multi-fiber patchcord – MPO 8-fiber ribbon to MPO 8-fiber ribbon, single mode, 2.0 meters (m)
15454-MPO-MPO-4=	Multi-fiber patchcord – MPO 8-fiber ribbon to MPO 8-fiber ribbon, single mode, 4.0m
15454-MPO-MPO-6=	Multi-fiber patchcord – MPO 8-fiber ribbon to MPO 8-fiber ribbon, single mode, 6.0m
15454-MPO-MPO-8=	Multi-fiber patchcord – MPO 8-fiber ribbon to MPO 8-fiber ribbon, single mode, 8.0m
15454-MPO-8LC-2=	Cable assembly, MPO 8-fiber ribbon to 8x LC/PC, single-mode, 2.3m
15454-LC-LC-2=	Cable assembly, LC/PC-to-LC/PC, single-mode, 2.0m, 2-mm jacket
15216-LC-LC-5=	Cable assembly, LC/PC-to-LC/PC, single-mode, 4.0m, 2-mm jacket
15216-LC-LC-10=	Cable assembly, LC/PC-to-LC/PC, single-mode, 6.0m, 2-mm jacket
15216-LC-LC-20=	Cable assembly, LC/PC-to-LC/PC, single-mode, 8.0m, 2-mm jacket
15216-LC-LC-MM-2=	Cable assembly, LC/PC-to-LC/PC, multi-mode, 2.0m, 2-mm jacket
15216-LC-LC-MM-5=	Cable assembly, LC/PC-to-LC/PC, multi-mode, 5.0m, 2-mm jacket
15216-LC-SC-5=	Cable assembly, LC/PC-to-SC/UPC, single-mode, 4.0m, 2-mm jacket
15216-LC-SC-10=	Cable assembly, LC/PC-to-SC/UPC, single-mode, 6.0m, 2-mm jacket
15216-LC-SC-20=	Cable assembly, LC/PC-to-SC/UPC, single-mode, 8.0m, 2-mm jacket
<b>Software and User Documentation</b>	
15454-LIC-9.0.0K9 15454E-LIC-9.0.0K9	Right-to-use upgrade license, Release 9.0.0, Cisco ONS 15454
15454-R9.0.0SWK9= 15454E-R9.0.0SWK9=	System software, Release 9.0.0, Cisco ONS 15454, CD-ROM
SF15454-R9.0.0K9 SF15454E-R9.0.0K9	System software, Release 9.0.0, Cisco ONS 15454, ordered with TCC2P cards (preloaded)
15454-DOC9.9.0PP= 15454E-DOC9.9.0PP=	User document, Cisco ONS 15454, Release 9.0.0, Cisco ONS 15454, paper version
15454-DOC9.0.0CD= 15454E-DOC9.0.0CD=	User document, Cisco ONS 15454, Release 9.0.0, Cisco ONS 15454, CD version

## Warranty

The following are warranty terms that apply to Cisco ONS 15454 MSTP 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 (5) Years
- Software Warranty Duration: One (1) Year
- Hardware Replacement, Repair, or Refund Procedure: Cisco or its service center will use commercially reasonable efforts to ship a replacement part for delivery within fifteen (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 the following URL:

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

## Service and Support

Cisco offers a wide range of services programs to accelerate customer success. These innovative services programs are delivered through a unique combination of people, processes, tools, and partners, resulting in high

levels of customer satisfaction. Cisco services help you to protect your network investment, optimize network operations, and prepare your network for new applications to extend network intelligence and the power of your business.

For more information about Cisco Services, refer to [Cisco Technical Support Services](#) or [Cisco Advanced Services](#).

### For More Information

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



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