

Cisco ONS 15454 Multiservice Transport Platform

The Cisco® ONS 15454 Multiservice Transport Platform sets the industry benchmark for dense wavelength-division multiplexing (DWDM) solutions by using proven Cisco Multiservice Provisioning Platform networking technologies to deliver simple, fast, and intelligent DWDM capabilities and lower capital and operating expenditures.

Transforming Metropolitan and Regional Networks

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 ranging from DS-1/E1 to OC-192/STM-64, as well as Ethernet and IP services. The platform was scalable and was the fraction of the size of traditional bit-rate-specific equipment. In addition to providing greater capability and scalability from a platform that used less space and power, 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 in metro optical networking, Cisco has introduced the Cisco ONS 15454 Multiservice Transport Platform (MSTP), which is transforming metro and regional DWDM networks. The Cisco ONS 15454 MSTP (Figure 1) allows a metro or regional/LH 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 mechanics (left) and ETSI mechanics (right)



Wide Service Interface Mix

A metro network, being close to or on a customer's premises—unlike its long-haul counterpart—requires support for a great diversity of service interfaces. 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, with its MSPP capabilities, 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 and high-definition television (HDTV)

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 metro transport offerings.

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 technology (defined in ITU-T G.709) enables transparency while still allowing enhanced wavelength management and providing extended optical reach with 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 ITU interfaces from Layer 2, Layer 3, and storage area network (SAN) devices. All the intelligent optical transmission-related features and functions can be supported by the Cisco ONS 15454 MSTP with these types of wavelengths and services as well.

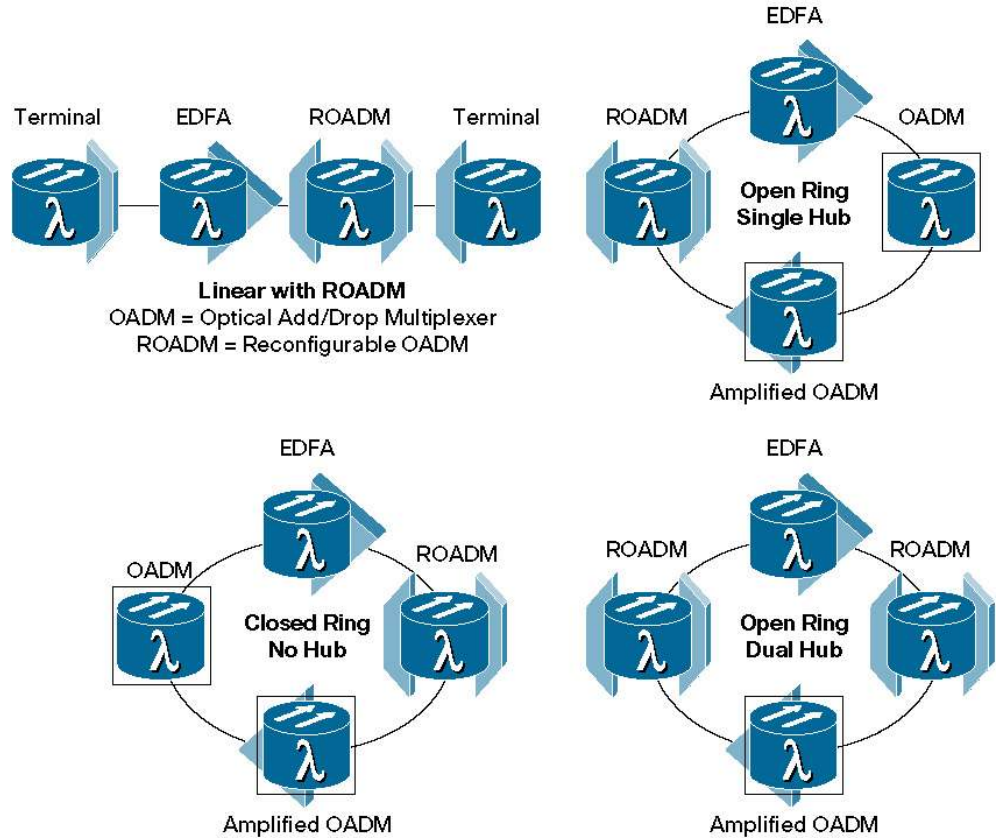
Topology Flexibility

Traditional first-generation metro DWDM solutions were optimized for point-to-point transmission. Metro and regional/LH DWDM networks require the possibility to support point-to-point as well as ring topologies with more complex traffic patterns, which may also extend across multiple networks. The Cisco ONS 15454 MSTP can be configured to support any metro or regional/LH DWDM topology (Figure 2), allowing a single solution to be provisioned for the network.

The ultimate topology flexibility is achieved through a fully reconfigurable optical add/drop multiplexer (ROADM). The Cisco ONS 15454 MSTP offers ROADM capability that allows zero to

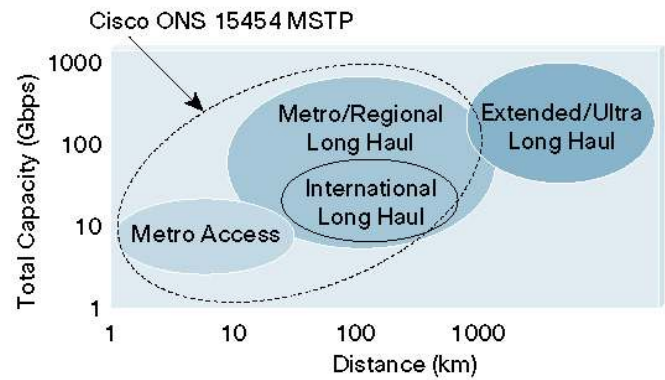
40 channels of passthrough or add/drop, A-Z wavelength provisioning, and full real-time power monitoring of each individual wavelength.

Figure 2. Network Flexibility with Cisco ONS 15454 MSTP



In addition to flexibility in network topology, the Cisco ONS 15454 MSTP supports flexibility in reach to enable a common platform to meet requirements for metro access, metro core, and regional/LH networking (Figure 3). Coupling Cisco MSPP and MSTP capabilities, the Cisco ONS 15454 helps simplify network deployments by reducing the proliferation of single-application network elements.

Figure 3. Metropolitan and Regional Network Requirements



Simplified, Cost-Effective Operation

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, a metro-optimized Cisco ONS 15454 MSTP introduces intelligence to metro DWDM transmission while addressing the continued need for increased bandwidth.

The Cisco ONS 15454 MSTP uses the operational simplicity introduced in the Cisco ONS 15454 MSPP with user features such as multilayer graphical network, node, and card visibility; A-to-Z network-based wavelength service provisioning; and graphical software wizards to simplify and speed user operations for such tasks as initial ring turn-up, service provisioning, and network node and bandwidth upgrades. The Cisco ONS 15454 MSTP uses this architecture to introduce a level of operational simplicity unheard of in metro DWDM networks. Using IP in the optical service channel and MSPP-like software, the Cisco ONS 15454 MSTP supports the following:

- Scalable wavelengths (1–80) for superior cost-versus-growth trade-off, with in-service growth to 112 wavelengths
- Transport of 150-Mbps to 40-Gbps wavelength services, as well as aggregated TDM and data services, for maximum service flexibility
- 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 GE ports onto a 10Gbps Wavelength 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.
- Multiservice Provisioning Platform (MSPP) on a blade combining add/drop multiplexer (ADM) and transponder functionality 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, OC-12, OC-48 and GE signals (on a user definable port-by-port basis) on to a single-wavelength trunk circuit
- Flexible transmission capability up to 1240 miles (2000 kilometers) through the use of advanced 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, line amplifiers, and dispersion compensation within amplified or unamplified networks
- High shelf density for high-bandwidth (10-Gbps) wavelength services
- Fully reconfigurable degree-2 optical add/drop multiplexers (ROADMs) for superior network flexibility and reduced complexity
- Mesh and multiring topology support in the optical domain with the possibility to manage nodes facing up to eighth degrees
- 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, and commissioning for the network
- Multilevel service monitoring using SONET/SDH and digital-wrapper (G.709) technology with an integrated optical service channel for unparalleled service reliability
- Network topology autodiscovery
- Integrated Cisco Transport Controller for network-based, point-and-click setup and regulation for rapid node and network activation
- 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 element management system, the Cisco Transport Manager, for unified network operations and interface to a network management system (NMS) and operations support system (OSS)

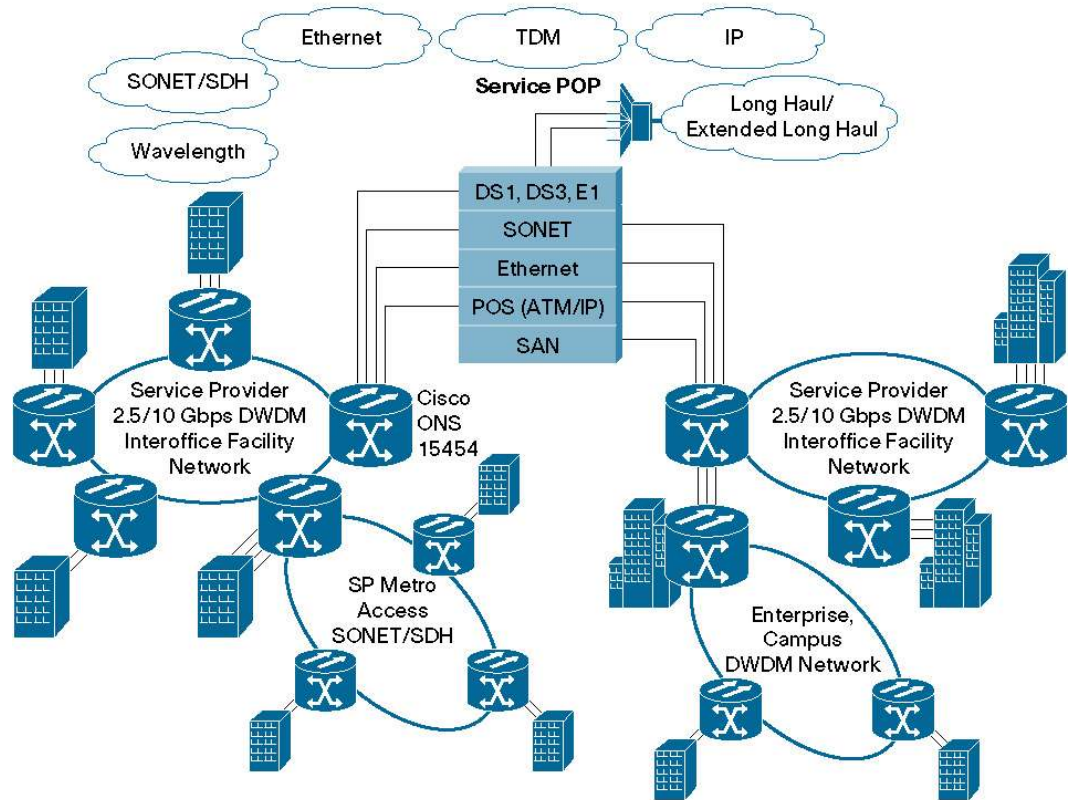
In addition to the integrated software features, the Cisco ONS 15454 MSTP is supported by a simple but powerful network design tool, the Cisco TransportPlanner. Cisco TransportPlanner is a user-friendly PC application for modeling Cisco DWDM networks; it optimizes the deployment based on the user's network 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
- Optimized services and units deployment in case of topology or traffic matrix changes for a deployed network (delta planning)
- Support for linear, ring, multiring and mesh network topologies
- Fully flexible network design with the possibility to optimize the use of the flexibility provided by ROADMs (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 views
- Detailed port-to-port fiber-cabling table
- Bill-of-material output
- Exportable configuration files, which can be uploaded to the Cisco Transport Controller craft tool, for automated node-provisioning setup and quick network activations

Cisco ONS 15454 MSTP Migration

With its multiservice capability, innovative optical technology, automatic optical power management, and MSPP-like ease of use, the Cisco ONS 15454 MSTP transforms how metro and regional/LH 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 (Figure 4).

Figure 4. Metro Network with Cisco ONS 15454 MSTP



The Cisco ONS 15454 MSTP includes the following features:

Node Configurations

- Terminal
- Hub
- Line amplifier
- OADM
- Degree-2 ROADM
- Multidegree ROADM

Network Configurations

- Linear point-to-point
- Open ring, single hub
- Open ring, multiple-hub
- Closed ring, no hub
- Mesh and multiple-ring topologies

Advanced Intelligent Software Features

- Network topology autodiscovery
- Point-and-click node and network setup and regulation
- Automatic network 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 subnetwork craft GUI
- Layered graphical views: network, wavelength, node, shelf, card
- User-provisionable graphics and fonts
 - Background maps
 - Color schemes
- A-to-Z wavelength circuit routing and creation
- Network autodiscovery with provisionable subnetwork domain control
- System inventory
- PC-based client
- Familiar browser interface—Netscape Navigator or Microsoft Internet Explorer
- Complete Performance Monitoring support
 - 15-minute (32 entries) and 24-hour (two entries)
 - Optical layer
 - SONET/SDH layer
 - 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: superuser, provisioning, maintenance, retrieve
- Multiple user names and logged-in users

Maintenance Features

- Remote software downloads and in-service, hitless activation
- Loopback
- 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 (recovered from line optics)
- Internal Stratum 3 holdover
- 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 monitored DC power inputs

Compliance and Certifications

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

Cisco ONS 15454 MSTP Technical Specifications

Tables 1–7 provide technical specifications and ordering information for Cisco ONS 15454 MSTP elements.

Table 1. Common Equipment

Module	Model Number
Shelf assembly	SA-HD, SA-HD-DDR or SA-ETSI version
Fan-tray assembly	CC-FTA, FTA3-T (ANSI) or FTA-48V (ETSI)
Timing, communications, and control card (TCC)	TCC2P
Alarm Interface Controller (AIC) and Alarm Expansion Panel (AEP)	AIC-1 (AEP option for ANSI)
Power, craft, alarm mechanical interface cards (ETSI)	CTP-MIC48V AP-MIC48V
Air Ramp	AIR-RAMP
Slot Filler Card Interface and control Front Mount Electrical Connection (FMEC) (ETSI)	BLANK BLANK-FMEC
Multishelf Management cards Integrated Multishelf switch Ethernet adapter panel mechanical frame Ethernet adapter panel Multiple Ethernet cable	MS-ISC-100T EAP-MF EAP MEC
Fiber Management Fiber patch panel shelf Fiber jumper storage shelf	PP-64-LC / PP2-64-LC or PP-80-LC FBR-STRG

Table 2. Wavelength Interfaces

Modules	Supported Service Interfaces	Protection Supported
2.5-Gbps FEC multirate transponder cards 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
2.5-Gbps data muxponder cards 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
10-Gbps EFEC multirate transponder (4-channel tunable) 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
4x 2.5-Gbps/10-Gbps EFEC muxponder cards (4-channel tunable) 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

Modules	Supported Service Interfaces	Protection Supported
10-Gbps EFEC multirate transponder cards (full-band tunable) 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
4x 2.5-Gbps/10-Gbps EFEC muxponder cards (full-band tunable) 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
10-Gbps EFEC data muxponder cards (full-band tunable) 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/FICON ISC-1 ISC-3 GE	No protection Optical-path and equipment protection
GE XPonder unit 1 module, two DWDM XFP-based trunk	GE	No protection Optical-path protection Layer-2 Ethernet protection (GR ³)
10GE XPonder unit 1 module, two DWDM XFP-based trunk	10GE LAN	No protection Optical-path protection Layer-2 Ethernet protection (GR ³)
MSPP-On-A-Blade 1 module, DWDM XFP-based trunk	OC-3 OC-12 OC-48 GE	No protection 1+1 APS on Client UPSR on Trunk

Table 3. Transmission Elements

Module	Unit name
Multiplexer and demultiplexer filters 40-wavelength multiplexer, 100GHz, C band 32-wavelength multiplexer, 100-GHz, C band 32-wavelength demultiplexer, 100-GHz, C band 4-wavelength multiplexer/demultiplexer, 100-GHz, C band	40-MUX-C 32MUX-O 32DMX-O 4MD-xx.x
Optical amplifier Preamplifier, 50-GHz capable, C band Booster amplifier, 50-GHz capable, C band Enhanced Booster amplifier, 50-GHz capable, C band Optical amplifier, 17dB gain, 50-GHz capable, C band Amplifier (can be used as Preamplifier or Booster), L band Booster amplifier, 50-GHz capable, L band	OPT-PRE OPT-BST OPT-BST-E OPT-AMP-17C OPT-AMP-L OPT-BST-L
Reconfigurable optical add/drop multiplexer 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 demultiplexer, 100-GHz, Odd, C band 40-channel wavelength selective switch, 100-GHz, Even, C band 40-channel demultiplexer, 100-GHz, Even, C band 32-channel wavelength selective switch, 100-GHz, C band 32-channel demultiplexer 100-GHz (for use with 32-WSS), C band 32-channel wavelength selective switch, 100-GHz, L band 32-channel demultiplexer 100-GHz (for use with 32-WSS), L band	40-WXC-C PP-MESH-4 PP-MESH-8 40-WSS-C 40-DMX-C 40-WSS-CE 40-DMX-CE 32-WSS 32-DMX 32-WSS-L 32-DMX-L
Multiring/mesh upgrade unit, C band and L band	MMU

Module	Unit name
Optical band add/drop multiplexer 1-band, 50-GHz capable, C band 4-band, 50-GHz capable, C band	AD-1B-xx.x AD-4B-xx.x
Optical channel add/drop multiplexer 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
Optical service channel Standard Integrated combiner and separator	OSCM OSC-CSM
Dispersion compensation Dispersion-compensation unit shelf assembly (2-slot) Dispersion-compensation units	DCU-SA DCU-<value>
Y-cable protection modules 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

Table 4. Targeted Networks

Module	Description
Nodes per network	20
Wavelengths C band L band	40 + 1 (OSC) (scalable to 80) 32 + 1 (OSC) (scalable to 64)
Wavelength spacing	100 GHz (scalable to 50 GHz)
Optical reach, single span, point-to-point (amplified) 40 channels 16 channels	106 miles (170 km) 122 miles (195 km)
Number of spans	20
Ring circumference	1240 miles (2000 km)
Fiber type	Single-mode fiber (G.652, G.655, G.653)
Power requirements Hub node ROADM node OADM node <ul style="list-style-type: none"> • Amplified • Passive Line amplifier node	Typical/maximum 296W/388W 352W/446W 368W/488W 250W/334W 174W/212W 238W/366W

Table 5. 32-Channel Wavelength Plan – Odd – C band

λ (nm)	λ (nm)	λ (nm)	λ (nm)	λ (nm)	λ (nm)	λ (nm)	λ (nm)
1530.3	1534.2	1538.1	1542.1	1546.1	1550.1	1554.1	1558.1
1531.1	1535.0	1538.9	1542.9	1546.9	1550.9	1554.9	1558.9
1531.9	1535.8	1539.7	1543.	1547.7	1551.7	1555.7	1559.7
1532.6	1536.6	1540.5	1544.5	1548.5	1552.5	1556.5	1560.6

Table 6. 40-Channel Wavelength Plan – Odd – C band

λ (nm)	λ (nm)	λ (nm)	λ (nm)	λ (nm)	λ (nm)	λ (nm)	λ (nm)
1530.3	1534.2	1538.1	1542.1	1546.1	1550.1	1554.1	1558.1
1531.1	1535.0	1538.9	1542.9	1546.9	1550.9	1554.9	1558.9
1531.9	1535.8	1539.7	1543.	1547.7	1551.7	1555.7	1559.7
1532.6	1536.6	1540.5	1544.5	1548.5	1552.5	1556.5	1560.6
1533.4	1537.4	1541.3	1545.3	1549.3	1553.3	1557.3	1561.4

Table 7. 40-Channel Wavelength Plan – Even – C band

λ (nm)	λ (nm)	λ (nm)	λ (nm)	λ (nm)	λ (nm)	λ (nm)	λ (nm)
1530.7	1534.6	1538.5	1542.5	1546.5	1550.5	1554.5	1558.5
1531.5	1535.4	1539.3	1543.3	1547.3	1551.3	1555.3	1559.3
1532.2	1536.2	1540.1	1544.1	1548.1	1552.1	1556.1	1560.2
1533.0	1537.0	1540.9	1544.9	1548.9	1552.9	1556.9	1561.0
1533.8	1537.7	1541.7	1545.7	1549.7	1553.7	1557.7	1561.8

Table 8. 32-Channel Wavelength Plan – L band

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	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	1590.4	1593.7	1597.1	1600.6	1604.0

Table 9. ANSI/ETSI Ordering Information¹

Product ID	Description
Common Equipment	
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 (includes ANSI and ETSI 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 multishelf management
15454-EAP-MF=	Mechanical frame for Ethernet adapter panel
15454-EAP=	Ethernet adapter panel (to be used with MS-ISC-100T to allow proper cable management)

¹ Product names with an "E" (15454E, for example) are for ETSI network elements.

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 multifiber cable assemblies (1 MPO to 8 LC), includes 2 MPO to 8x LC 2.3-meter cable assemblies (uninstalled). Shipped with ANSI and ETSI 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). Shipped with ANSI and ETSI 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). Shipped with ANSI and ETSI mounting brackets.
15454-PP-MESH-4=	Degree-4 Mesh Patch Panel, 2 RUs high, 1x LC and 1x MPO adapter per direction. Shipped with ANSI and ETSI mounting brackets.
15454-PP-MESH-8=	Degree-8 Mesh Patch Panel, 2 RUs high, 1x LC and 1x MPO adapter per direction. Shipped with ANSI and ETSI mounting brackets.
15454-FBR-STRG=	Fiber-storage shelf, supports eight 2-meter ribbon cables (8-fiber) plus 40 2-meter 2-mm fiber cables. Shipped with ANSI and ETSI mounting brackets.
15216-FL-SA=	FlexLayer shelf assembly, 4 module slots, 1 RU high, Cisco FlexLayer platform. Shipped with ANSI 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 shelf assembly (15216-FL-SA)
15216-CS-MM-Y=	Y-cable splitter/combiner module for 2 wavelengths protection, multimode fiber, single-width module, installs in Cisco FlexLayer shelf assembly (15216-FL-SA)
15454-YCBL-LC=	Y-cable storage shelf, 2 RUs high, supports up to 8 Y-cable splitter/combiner modules. Shipped with ANSI and ETSI mounting brackets.
15454-YCM-SM-LC=	Y-cable splitter/combiner module for 1 wavelength protection, single-mode fiber, LC adapters
15454-YCM-MM-LC=	Y-cable splitter/combiner module for 1 wavelength protection, multimode fiber, LC adapters
Service Interfaces²	
15454-MR-L1-xx.x=	100-Mbps to 2.5-Gbps FEC multirate transponder card, 1x SFP-based client interface, 4-channel tunable on 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 100-GHz ITU wavelengths (50-GHz stability), protected DWDM line with LC connectors – C band
15454-DM-L1-xx.x=	2.5-Gbps data muxponder card, 8x SFP-based client interfaces, 4-channel tunable on 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 100-GHz ITU wavelengths (50-GHz stability), protected DWDM line with LC connectors – C band
15454-G1K-4 15454E-G1K-4	GE card, 4 gigabit interface converter (GBIC) slots, GBICs supported: SX, LX, ZX, and DWDM, transponder-mode operation only in Release 4.6.0 or later
15454-10E-L1-xx.x=	10-Gbps E-FEC multirate transponder card, 1x XFP-based client interface, 4-channel tunable on 100-GHz ITU wavelengths (50-GHz stability), DWDM line with LC connectors – C band
15454-10ME-xx.x=	4x OC-48/STM-16 E-FEC muxponder, 4x SFP-based client interfaces, 4-channel tunable on 100-GHz ITU wavelengths (50-GHz stability), DWDM line with LC connectors – C band
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, DWDM line with LC connectors
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, DWDM line with LC connectors
15454-10DME-C=	10-Gbps E-FEC data muxponder card, 8x SFP-based client interfaces, full C-band tunable on 50-GHz ITU wavelengths, 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
15454-10ME-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

² Wavelength plan is outlined in Tables 5 to 8 in this document. Cisco online lead-time tool is available for selection of orderable wavelengths.

Product ID	Description
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-GE-XP=	GE E-FEC Ethernet CrossPonder, 20x SFP-based client interfaces, 2x XFP-based trunk interfaces
15454-10GE-XP=	10GE E-FEC Ethernet CrossPonder, 2x XFP-based client interfaces, 2x XFP-based trunk interfaces
15454-ADM-10G=	10Gbps E-FEC MSPP-On-A-Blade, 16x SFP-based client interfaces, 1x XFP-based interconnection interface, 2x XFP-based trunk interfaces
Optical Transmission Elements	
15454-OSCM=	Optical service channel card, 1510-nm, LC connectors, includes 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-OPT-PRE=	Optical preamplifier, 17dBm Output Power, C-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)
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, 64 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, 64 channel, 50-GHz compatible, 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, 64 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
15454-32-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
15454-40-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
15454-32-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
15454-32-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
15454-40-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
15454-32-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
15454-40-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
15454-40-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-MMU=	Multiring / 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
15454-32MUX-O=	32-channel multiplexer card, C-band, Odd grid, 100-GHz, MPO connectors for add path, LC connector for interconnection
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

Product ID	Description
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-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-4C-xx.x=	4-channel OADM, 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-4B-xx=	4-band OADM, C-band, 100-GHz, LC connectors, includes two 2-meter LC/LC fiber-optic cables
15216-DCU-SA=	Dispersion-compensation unit shelf, two module slots, 1 RU high
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
Pluggable Optics Modules	
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 connectors
ONS-SI-155-SR-MM=	OC-3/STM-1 SFP optics module, intermediate-reach, 1310-nm, multimode, industrial temperature, LC connectors
ONS-SI-155-L2=	OC-3/STM-1 SFP optics module, long-reach, 1550-nm, single-mode, industrial temperature, LC connectors
15454-SFP12-4-IR= 15454E-SFP-L.4.1=	OC-12/STM-4 SFP optics module, intermediate-reach, 1310-nm, single-mode, LC connectors
ONS-SI-622-I1=	OC-12/STM-4/OC-3/STM-1 SFP optics module, intermediate-reach, 1310-nm, single-mode, industrial temperature, LC connectors
15454-SFP-OC48-IR= 15454E-SFP-L.16.1=	OC-48/STM-16 SFP optics module, intermediate-reach, 1550-nm, single-mode, LC connectors
ONS-SE-2G-S1=	OC-48/STM-16 SFP optics module, short-reach/intra-office, 1310-nm, single-mode, LC connectors
ONS-SI-2G-S1=	OC-48/STM-16 SFP optics module, short-reach/intra-office, 1310-nm, single-mode, industrial temperature, LC connectors
ONS-SE-2G-L2=	OC-48/STM-16 SFP optics module, long-reach/long-haul, 1550-nm, single-mode, LC connectors
ONS-SI-2G-L2=	OC-48/STM-16 SFP optics module, long-reach/long-haul, 1550-nm, single-mode, industrial temperature, LC connectors
ONS-SE-Z1=	OC-48/STM-16/OC-12/STM-4/OC-3/STM-1 SFP optics module, 1310-nm, single-mode, LC connectors
ONS-SE-200-MM=	ESCON SFP optics module, short-reach, 1310-nm, multimode, LC connectors
ONS-SE-G2F-LX=	GE, Fibre Channel (1- and 2-Gbps) and HDTV SFP optics module, long-reach, 1310-nm, single-mode, LC connectors
ONS-SE-G2F-SX=	GE and Fibre Channel (1- and 2-Gbps) SFP optics module, short-reach, 850-nm, multimode, LC connectors
ONS-SE-GE-ZX=	GE SFP optics module, 1000BASE-ZX interface, 1550-nm, single-mode, LC connectors
ONS-SI-GE-ZX=	GE SFP optics module, 1000BASE-ZX interface, 1550-nm, single-mode, Industrial temperature, LC connectors
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 connectors
ONS-SE-4G-MM=	4-Gbps Fibre Channel SFP optics module, 850-nm, multimode, LC connectors
ONS-XC-10G-S1=	OC-192/STM-64/10 GE/10-Gbps Fibre Channel XFP optics module, short-reach, 1310-nm, single-mode, LC connectors
ONS-XC-10G-L2=	OC-192/STM-64 XFP optics module, long-reach, 1550-nm, single-mode, LC connectors
ONS-XC-10G-<value>=	OC-192/STM-64/10 GE XFP optics module, DWDM, 15<value>-nm, single-mode, LC connectors
Cable Assemblies	

Product ID	Description
15454-MPO-MPO-2=	Multifiber patchcord - MPO 8-fiber ribbon to MPO 8-fiber ribbon, single mode, 2.0 meters (m)
15454-MPO-MPO-4=	Multifiber patchcord - MPO 8-fiber ribbon to MPO 8-fiber ribbon, single mode, 4.0m
15454-MPO-MPO-6=	Multifiber patchcord - MPO 8-fiber ribbon to MPO 8-fiber ribbon, single mode, 6.0m
15454-MPO-MPO-8=	Multifiber 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-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
Software and User Documentation	
15454-LIC-8.0.0K9 15454E-LIC-8.0.0K9	Right-to-use upgrade license, Release 8.0.0, Cisco ONS 15454
15454-R8.0.0SWK9= 15454E-R8.0.0SWK9=	System software, Release 8.0.0, Cisco ONS 15454, CD-ROM
SF15454-R8.0.0K9 SF15454E-R8.0.0K9	System software, Release 8.0.0, Cisco ONS 15454, ordered with TCC2P cards (preloaded)
15454-DOC8.0.0P= 15454E-DOC8.0.0P=	User document, Cisco ONS 15454, Release 8.0.0, Cisco ONS 15454, paper version
15454-DOC8.0.0C= 15454E-DOC8.0.0C=	User document, Cisco ONS 15454, Release 8.0.0, Cisco ONS 15454, CD version



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