



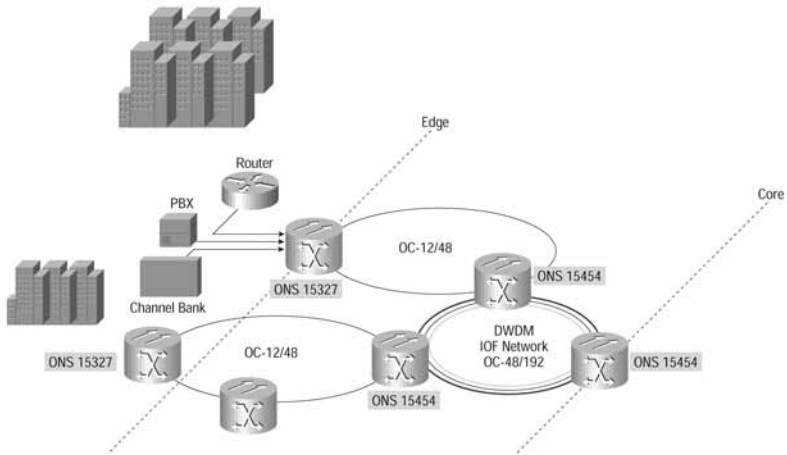
Optical Networking

Optical Networking at a Glance

Product	Features	Page
Cisco ONS 15216 and 15501 Optical Transmission Families	<p>Cisco ONS 15216 Metro DWDM Series</p> <ul style="list-style-type: none"> • Supports 32 ITU-grid wavelengths at 100 GHz spacing and provides unprecedented transport flexibility with optical filtering • Combines wavelengths launched by the Cisco ONS 15454, and ONS 15530-creates a more desirable cost per-wavelength • Optical Add/Drop Multiplexing (OADM) • Optical Performance Monitoring and Amplification • Compact, modular design <p>Cisco ONS 15501 Optical Amplifier</p> <ul style="list-style-type: none"> • Constant flat gain of 17 dB over the 1530nm to 1563nm band simplifies network design. • Metro optimized auto gain control and variable gain • Low noise figure of <6.0 dB allows the use multiple amplifiers in cascade • Input power range of -29 to 0 dBm 	8-3
Cisco ONS 15302/15305 SDH Multiservice Provisioning Platforms (MSSPs)	<p>Ultra-compact integrated systems that extend next-generation optical networks (access nodes or CPE):</p> <ul style="list-style-type: none"> • Low-cost access/customer premise equipment (CPE) platform • E1, E3, DS3, 10/100 BaseT Ethernet and GigE • STM-1 (15302) or STM-1/4/16 (15305) 	8-4
Cisco ONS 15310 SONET Multiservice Provisioning Platform (MSPP)	<p>Compact 1 RU single system controller design, optimized for data and TDM services over protected SONET transport.</p> <ul style="list-style-type: none"> • 1RU AC or dual-DC power chassis • Single system controller/timing/synchronization • 2x small form-factor pluggable (SFP) optical ports for rings • 21 DS1s, 3 DS3s • 1 expansion slot • Fan-cooled 	8-4
Cisco ONS 15327 SONET Multiservice Provisioning Platform (MSPP)	<p>Integrated optical networking platform and unprecedented multiservices on demand:</p> <ul style="list-style-type: none"> • Offers optimized bandwidth management, high-speed IP-based data services, rapid service provisioning, and multiple optical interfaces • Aggregates and switches TDM10/100 BaseT Ethernet and GigE, data and video services • Compact footprint (3 rack-units), modular design and industrially hardened 	8-4
Cisco ONS 15454 SONET/SDH Multiservice Provisioning Platform (MSPP)	<p>Integrates the functions of legacy SONET or SDH network elements with next-generation SONET/SDH transport, integrated DWDM optical networking, and multiservice interfaces:</p> <ul style="list-style-type: none"> • 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, 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 and 2-Gbps Fibre Channel, 10-Gbps Fibre Channel, IBM Fiber Connection (FICON), and Enterprise Systems Connection (ESCON), ETR/CLO, ISC-1 • Video services—D1 and high-definition television (HDTV) • Combines multiplexing, optical networking, and switching functionality in one easy-to-use platform that supports all metro topologies 	8-4
Cisco ONS 15500 Metro DWDM Series	<p>Designed for carrying mission critical storage, data, and legacy applications over a highly available metro optical DWDM network:</p> <ul style="list-style-type: none"> • Offers a market-leading service aggregation capabilities for services such as ESCON, Fibre Channel, FICON, and Gigabit Ethernet • The ONS 15540 ESPx system offers external cross connect functionality and supports high-density transparent services (e.g., 1Gb and 2Gb Fibre Channel, Gigabit Ethernet, SONET/SDH) and enhanced configuration flexibility 	8-5

Product	Features	Page
Cisco ONS 15501 Erbium Doped Fiber Amplifier	<ul style="list-style-type: none"> • Designed for Enterprise and Service Provider environments • Low-noise, gain flattened C-band optical amplifier • Complements the Cisco ONS 155xx DWDM solution • Capable of extending 100GHz, 32-channel, 2.5Gbps / 10Gbps optical infrastructure over longer distances 	8-5
Cisco ONS 15530 Metro DWDM Aggregation Platform	<p>High-density and scalable dense wavelength division multiplexing (DWDM) multiservice aggregation platform</p> <ul style="list-style-type: none"> • Ideal for both enterprises and managed service providers • Network consolidation of storage, data, and legacy applications • Up to 8 Fibre Channel / FICON / GbE services or up to 40 ESCON services per wavelength • New—Support for up to 4-ports of 2 Gbps Fibre Channel services per wavelength • New—8-port Multi Service Muxponder supports up to 8 multiservice interfaces (T1/E1, OC3-STM-1, ESCON, D1 Video, FE, GE, 1GFC, and ITS) per wavelength • Scales from 2.5Gbps to 10Gbps • Supports wide range of protocols over a highly-available optical infrastructure • Highly resilient network with flexible topology design options 	8-5
Cisco ONS 15540 Extended Services Platform	<p>Highly modular and scalable next-generation Dense Wave Division Multiplexing (DWDM) platform offering Industry Leading Wavelength Density</p> <ul style="list-style-type: none"> • Ideal for enterprises requiring Business Continuance (BC) and Disaster Recovery (DR) Solutions and service providers offering Enterprise Business Continuance (BC) and Disaster Recovery (DR) Managed Services • Delivers the integration of data, storage and metro networking • Ultra-high bandwidth intelligent optical infrastructure 	8-6
Cisco ONS 15454 Multiservice Platform (MSTP)	<p>Delivers integrated, intelligent DWDM functionality for metropolitan and regional networks (up to 32 wavelengths per node):</p> <ul style="list-style-type: none"> • 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, 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 and 2-Gbps Fibre Channel, 10-Gbps Fibre Channel, IBM Fibre Connection (FICON), and Enterprise Systems Connection (ESCON), ETR/CLO, ISC-1 • Video services—D1 and high-definition television (HDTV) 	8-7
Cisco ONS 15600 Multiservice Switching Platform (SONET/SDH)	<p>Allows service providers to seamlessly integrate their metro core and metro edge networks, 8-8 while dramatically reducing initial turn up costs.</p> <ul style="list-style-type: none"> • Provides 320 gigabits of switching, grooming, aggregation, and bandwidth management capacity in a single shelf • Supports 32, OC-192/STM-64 long reach or 128, OC-48/STM-16 long reach optical interfaces in a single shelf • Combines the functionality of multiple metro systems including SONET/SDH multiplexers and digital cross-connect network elements • Provides carrier-class availability, serviceability, and management • Scalable, easy-to-use platform supports all metro topologies 	8-8
Cisco Transport Manager (CTM 5.0)	<p>Advanced optical transport domain manager that delivers element and network management 8-8 layer functionality:</p> <ul style="list-style-type: none"> • Efficiently manages the entire Cisco ONS product family and Cisco CR-12000 Series routers • Provides a resilient, adaptable, and integrated carrier-class EMS solution • Powerful GUI-based management system makes advanced management capabilities such as A-to-Z circuit provisioning easy to learn and use • Cost-effective, using industry-standard platforms such as Sun Solaris, Oracle, and Microsoft Windows to fit smoothly into various IT environments • Offers a variety of northbound interface options (e.g., SNMP, TL1 and CORBA) 	8-8
Cisco 10720 Internet Router	<p>Service provider-class metro access services router</p> <ul style="list-style-type: none"> • Equipped with 24 ports of Ethernet technology for customer access and dynamic packet transport (DPT) technology for metro optical connectivity • With DPT architecture, enables optimal fiber connectivity as well as features such as IP class of service, TLS, VoIP and VPN services <p>See Chapter 1—Routers for more information on the Cisco 10720 Internet Router</p>	1-47

Sample Metro Optical Transport Solution Overview



Cisco ONS 15216 Metro DWDM Series

The Cisco ONS 15216 Metro DWDM solution supercharges wavelength services by supporting up to 32 ITU-grid wavelengths, and provides unprecedented transport flexibility with optical filtering, Optical Add/Drop Multiplexing (OADM), Optical Performance Monitoring and Amplification. It allows service providers to deliver more services per wavelength and more wavelengths per fiber.



The Cisco ONS 15216 Metropolitan Dense Wavelength-Division Multiplexing (DWDM) FlexLayer filter solution is an ultraflexible filter architecture that allows cable multiple system operators and service providers to build “pay-as-you-grow” networks with the flexibility to upgrade in-service without provisioning channels that are not required. This approach creates a more desirable per-wavelength cost.

The FlexLayer architecture allows for deployment of point-to-point, point-to-multipoint, ring, bus, and tree-and-branch architectures. These networks can be deployed as unprotected or protected networks, and they may also be deployed in transmit-only applications for broadcast networks. This flexibility is inherent in the design of the FlexLayer architecture.

For More Information

See the ONS 15216 Metro DWDM System Web site:

<http://www.cisco.com/en/US/products/hw/optical/ps1996/ps1999/index.html>

Cisco ONS 15302/15305 SDH Multiservice Access Platforms (MSAP)



The Cisco ONS 15302/ONS 15305 Multiservice CPE and Aggregation solutions are ultra-compact integrated systems that offer cost effective solutions. These platforms provide native multiservice capabilities (i.e., TDM interfaces, multiplexing and Ethernet data interfaces).

The ONS 15302 CPE platform provides the STM-1 uplink (protected or unprotected STM-1 optical uplink, 1+1 MSP, future SNCP) and E1 customer interfaces (12 E1 ports) interfaces. It provides native Ethernet customer access via 4-port 10/100BaseT module that supports full layer 2 capacity, bridging, VLANs, spanning tree, and priority management. An optional WAN module is available for point to multi-point applications.

The ONS 15305 Aggregation platform provides the following TDM interfaces—protected or unprotected optical interfaces (8 port S-1.1 optical module, 2 port S-4.1 optical module, 1 port S-16.1 optical module, 1+1 MSP, SNCP, 2F MS-SPRING for STM-16) and electrical customer interfaces (8 and 63 port E1 modules and a 6 port E3/DS3 module). This product also provides native Ethernet customer access via an 8-port 10/100BaseT module and a 2-port GigE module (supports full layer 2 capacity, bridging, VLANs, spanning tree, and priority management). An optional WAN module is available for point to multi-point applications.

For More Information

See the ONS 15302/ONS 15305 web site: <http://www.cisco.com/go/ons15300>

Cisco ONS 15454 and 15327 Multiservice Provisioning Platforms

The Cisco ONS 15454 and ONS 15327 Multi-service Provisioning Platforms (MSPP) are key building blocks in today's optical networks due to their unprecedented transport performance and economics. They offer supercharged transport capability by combining the best of traditional SONET TDM (time division multiplexing) and statistical multiplexing in single units.



The Cisco ONS 15454 aggregates traditional facilities such as DS1, DS3, STS-1, OC-3, OC-12, and OC-48 including multi-wavelength DWDM optics, but it also supports data interfaces for 10/100/GigE, data and video. This enables drastically improved efficiencies in the transport layer and breakthrough cost savings for initial and life cycle deployment. A single ONS 15454 shelf can support combinations of OC-3/c, OC-12/c, OC-48/c, and OC-192. The new Cisco ONS 15454 SDH MSPP offers an international optical transport solution that combines the best of traditional SDH TDM and statistical multiplexing in a single platform. The Cisco ONS 15454 SDH MSP can aggregate traditional services such as E1, E3, DS3, STM-1, STM-4, STM-16 and STM-64 including multi-wavelength DWDM optics, but is also designed to support data interfaces such as Ethernet/IP.

The Cisco ONS 15327 combines industry-leading bandwidth capacity and service diversity in a very compact footprint, enabling service providers to achieve radical economics at the metro edge. Based on the same technology as the industry leading Cisco ONS 15454, the ONS 15327 supports high optical bandwidth and has the ability to drop a DS1 from an OC-48 stream. With comprehensive STS- and VT-level bandwidth management and integrated data switching, the Cisco ONS 15327 also serves as a digital cross-connect without the need for additional equipment. It aggregates and switches TDM, Ethernet, and ATM services, and can be managed using the Cisco Transport Manager element management system.

For More Information

See the ONS 15454 SONET Web site: <http://www.cisco.com/go/ons15454>

See the ONS 15454 SDH Web site: <http://www.cisco.com/go/15454sdh>

See the ONS 15327 Web site: <http://www.cisco.com/go/ons15327>

Cisco ONS 15501 Erbium Doped Fiber Amplifier

The Cisco ONS 15501 is a low-noise, gain-flattened C-band optical erbium doped fiber amplifier designed to extend the distance of today's metro high-bandwidth optical network beyond existing optical budget constraints. The Cisco ONS 15501 complements the Cisco ONS 155xx DWDM and Catalyst 6500 solutions, providing customers with the capability to extend their 2.5-Gbps or 10-Gbps optical infrastructures over greater distances. Packaged in a one-rack-unit (1RU) chassis, the Cisco ONS 15501 incorporates features such as 17-dB constant flat gain, automatic gain control, and low noise figure for excellent Optical Signal to Noise Ratio (OSNR) characteristics.

For More Information

See the Cisco ONS 15501 Web site: <http://www.cisco.com/go/ons15501>

Cisco ONS 15530

The Cisco ONS 15530 is a highly scalable dense wavelength division multiplexing (DWDM) multiservice aggregation platform that integrates storage, data networking, and legacy applications over an ultra-high-bandwidth, intelligent optical infrastructure. The ONS 15530 supports Fibre Channel extension over DWDM via buffer-to-buffer credit support to significantly increase disaster recovery distances; Industry-leading aggregation of IBM Coupling Facility Links used in IBM GDPS storage networks; New Low-band Variable Rate Small Form-factor Pluggable Optics for expanded protocol support.

Key Features

- New—ONS 15530 4-Port 1-Gbps/2-Gbps Fibre Channel Aggregation Card provides efficient wavelength usage by aggregating up to four 2-Gbps Fibre Channel, IBM Fiber Connection (FICON), and IBM Intersystem Channel (ISC) services onto a single 10-Gbps wavelength
- New—8-port Multi Service Muxponder provides the aggregation of up to 8 low speed services such as T1/E1, OC3-STM-1, ESCON, D1 Video, FE, GE, 1 Gbps FC, and ITS per 2.5 Gbps wavelength
- Industry leading Service Aggregation—up to 4 ports of 2 Gbps Fibre Channel, up to 8 ports of Fibre Channel, FICON, or Gigabit Ethernet or up to 40 ports of ESCON per wavelength
- Capacity—Fiber capacity is maximized when used with a 32-wavelength system providing up to 256 Fibre Channel, FICON, or Gigabit Ethernet services or up to 1280 ESCON services on a single fiber pair.
- Scalability—up to 32 wavelengths ranging from 2.5 Gbps to 10 Gbps
- Multiservice Interfaces—Customers have a single scalable platform that supports low speed copper legacy services such as T1/E1 (PBX interconnect), OC-3/STM-1, Fast Ethernet and D1 Video, in addition to high density ESCON, GE, and 1Gb FC services

- Service mixing—Ability to mix a combination of Fibre Channel, FICON, ESCON, and Gigabit Ethernet services over the same wavelength
- Complete Amplification Solution—Enables enterprises and service providers to further expand their optical DWDM networks over greater distances when used with the ONS 15501 EDFA optical amplifier and the VOA (Variable Optical Attenuator) modules

For More Information

See the Cisco ONS 15530 Web site: <http://www.cisco.com/go/ons15530>

Cisco ONS 15540 Extended Services Platform (ESPx)

The ONS 15540 Extended Services Platform with external cross connect capability (ESPx) is a highly modular, flexible, and scalable next generation dense wave division multiplexer (DWDM) platform that integrates data networking, storage area networking (SAN), time division multiplexing, (TDM) Synchronous Optical Network (SONET) and Synchronous Digital Hierarchy (SDH) technologies over an ultra high bandwidth, intelligent optical infrastructure that can support any packet, over any wavelength on any platform.



- Flexible Multi-Protocol Support—The Cisco ONS 15540 offers both variable rate transparent and fixed rate multi-protocol transponders that feature user selectable small form factor pluggables (SFPs) and support a variety of industry standard data rates between 16Mbps to 2.5Gbps as well as 10Gb Ethernet
- Scalable, flexible, and modular architecture in a high-density compact footprint—Provides superior operational support and network expansion on an as needed basis through its hot swappable modular lines cards, transponders, and optical multiplexers
- Simple Network Consolidation and Comprehensive Multi Service Support provided by the available ONS 15540 2.5GB and 10GbE transponders
- Optical, Service, and Application Level Performance Monitoring—provides industry-leading supports for service level agreements (SLAs)
- High Availability for mission critical networks—Provides 99.999% availability for demanding Managed Network Service Providers and enterprise business continuance applications, with hardware redundancy and automatic protection switching to protect against fiber cuts and equipment failures
- Multi-Service Integration—Transports ESCON, FICON, 1Gb/2GB Fibre Channel for Storage Area Networking (SAN), Fast and Gigabit Ethernet, and 10 Gb Ethernet for data networking, and SONET/SDH at OC-3/STM1, OC-12/STM4, and OC-48/STM12

Key Features:

- Compact modular design with external connectorization: External Direct Connect system from Line card to OADMs; Optional cross connect and fiber management system
- Transparent Tunable Variable data rate Type 1 Transponders: 16Mbps to 622Mbps MM fiber support; 16Mbps to 2.5Gbp SM fiber support; 16 Tunable transponders support 32 channels for reduced sparing costs; Multi-protocol support for Enterprise

- Tunable Type 2 Transponders with Multi Protocol Small form Factor Pluggables (SFPs): Variable data rate support between 16Mbps to 2.5Gbps; 16 Tunable transponders support 32 channels for reduced sparing costs; Multi-protocol SFP Support—Now featuring Variable Rate SFPs and support for IBM Sysplex/GDPS applications.
- Standards based Management support for SNMP, Ciscoview and Cisco Transport Manager (CTM)
- Protection Switch Module provides highly cost effective solution for fiber trunk protection
- Standards based Optical architecture conforming to ITU G.692 100GHz channel spacing
- This system has been qualified by IBM for Geographically Dispersed Parallel Sysplex (GDPS), and by EMC for Symmetrix Synchronous support as tested in their E-LAB environment

For More Information

See the Cisco ONS 15500 Series Web site: <http://www.cisco.com/go/ons15500>

Cisco ONS 15454 SONET/SDH Multiservice Transport Platform (MSTP)

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



A metropolitan 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 enable 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. 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).

For More Information

See the ONS 15454 MSTP web site:

<http://www.cisco.com/en/US/products/hw/optical/ps2006/ps5320/index.html>

Cisco ONS 15600 Multiservice Switching Platform

The Cisco ONS 15600 provides unparalleled flexibility in designing next generation metro networks. Fully engineered and optimized for metro networks, the Cisco ONS 15600 MSSP simplifies and revolutionizes bandwidth management in the metro core by allowing service providers to seamlessly integrate their metro core and metro edge networks, while dramatically reducing initial turn up costs. Delivering scalability to 960 Gbps of traffic in a single rack, it complements the market-leading Cisco ONS 15454 Multiservice Provisioning Platform (MSPP) by leveraging its proven architecture and operating software. This allows service providers to dramatically simplify their metro networks and realize immediate cost, space and operational benefits. The Cisco ONS 15600 MSSP provides complete integration of metro core and edge networks for service provisioning and network management.



For More Information

See the ONS 15600 Series web site: <http://www.cisco.com/go/ons15600>

Cisco Transport Manager (CTM 5.0) (Optical Element/Network Management)

Cisco Transport Manager is an integrated optical element management system for Cisco ONS 15000 series optical networking platforms. CTM manages configuration, fault isolation, performance, and security for Cisco optical network elements. With integrated support for SONET, SDH, DWDM and Ethernet, along with open interfaces to operations support systems (OSS), CTM delivers the full power of Cisco's wide range of advanced optical systems to today's network operators and enterprises.

CTM is a powerful tool that increases the productivity of the network operations staff. The system provides GUI-based point-and-click network management. As such, CTM has a low learning curve while providing advanced management capabilities such as A-to-Z circuit provisioning. Explorer-style navigation, the extensive use of wizards, tool tips, legends, and online help make it easy for an operator to perform tasks quickly and efficiently. Many otherwise tedious, time-consuming, and error-prone tasks can be fully streamlined using CTM's features.

CTM works for small networks, but can also scale up to 2500 network elements and 100 concurrent clients per server. This solution is appropriate for small enterprise networks as well as large service provider networks. CTM is extremely cost-effective (uses industry-standard platforms such as Sun Solaris, Oracle8i, and Microsoft Windows). CTM fits smoothly into most companies' information technology environments. Using scalable Sun server platforms, customers can minimize up-front investment, but still accommodate growth by adding additional processors, memory, and disk space.

For More Information

See the CTM Series web site:

<http://www.cisco.com/en/US/products/sw/opticsw/ps2204/index.html>