

Cisco ONS 15600 Multiservice Switching Platform

Fully Cisco[®] designed and engineered, the Cisco ONS 15600 Multiservice Switching Platform (MSSP) simplifies and revolutionizes bandwidth management in the metro core by allowing service providers to transparently integrate their metro core and metro edge networks, while dramatically reducing initial turnup costs.

The Cisco ONS 15600 MSSP (Figure 1) is a true multiservice switch, providing carrier-class reliability, availability, serviceability, operations, and management. The Cisco ONS 15600 MSSP combines the functionality of multiple metro systems, including SONET/SDH multiplexers and digital cross-connect network elements, in one scalable, easy-to-use platform. The Cisco ONS 15600 MSSP supports all metro topologies such as point-to-point, linear add/drop, rings, and mesh.

Figure 1. Cisco ONS 15600

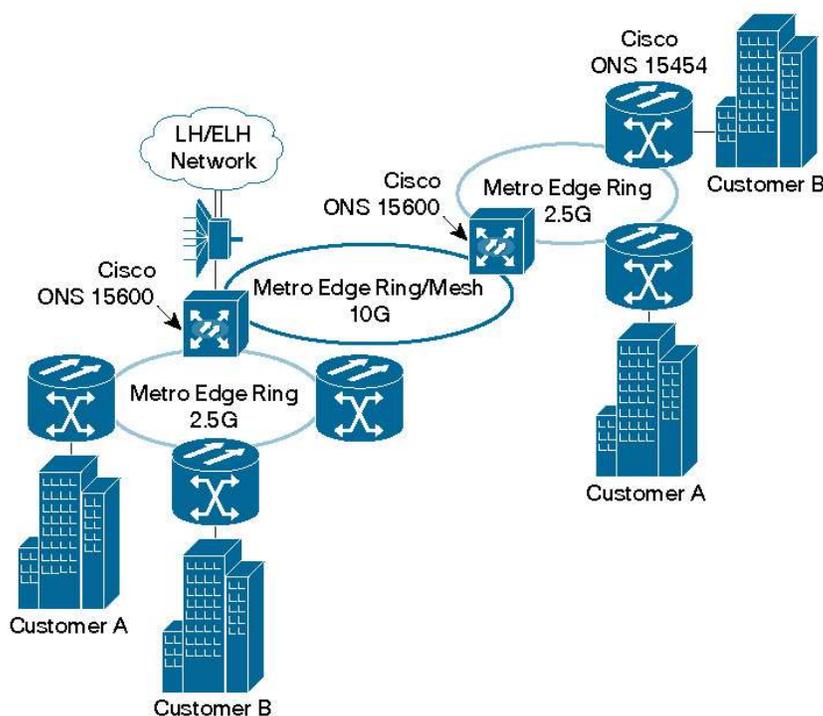


The Cisco ONS 15600 provides superior flexibility in designing next-generation metro networks. It complements the market-leading Cisco ONS 15454 MSPP as well as the Cisco ONS 15300 Series MSPPs. The Cisco ONS 15600 uses the proven architecture and operating software of the Cisco ONS 15454, allowing service providers the opportunity 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.

Lowest First Cost

Deploying the Cisco ONS 15600 MSSP will allow service providers to realize significant reductions in capital expenditures (CapEx) and improved time to revenue with enhanced operational capabilities. With excellent aggregation and concentration of multiple services merged with fully integrated optical transport functionality, the Cisco ONS 15600 MSSP dramatically reduces service-delivery costs. NEBS Level 3 compliant and mounted in a Telcordia NEBS 2000-compliant 7-foot rack 23 inches wide by 23 inches deep, the Cisco ONS 15600 MSSP delivers extremely high bandwidth, port density, and flexibility and has a very small footprint and low first cost. The Cisco ONS 15600 MSSP is easy to install, provision, and upgrade. (See Figure 2.)

Figure 2. Optical Network Diagram



Carrier-Class Reliability and Availability

The Cisco ONS 15600 MSSP provides greater than five-nines reliability, or 99.9995 percent uptime. These reliability figures are a combination of numerous system-level and component-level attributes, including the following:

- System components – The Cisco ONS 15600 MSSP uses components with life spans that well exceed the serviceability lifetime of the five-nines reliability. The use of high-availability components minimizes the chances of a failure because of a component fault. If there is a component fault, the entire Cisco ONS 15600 system is 1:1 protected to help ensure carrier-class availability.
- Restoration time – The Cisco ONS 15600 MSSP supports less than 25ms protection switching time, a 50 percent improvement over current industry standards.
- System exposure – Exposed reset buttons produce a higher probability of vulnerability to faults caused by external forces. To remove that exposure, the Cisco ONS 15600 MSSP eliminates exposed reset buttons that could be pressed inadvertently. Furthermore, all fiber

management and cable routing within the system allows room for maintenance activities yet prevents the fiber connectors from being dislodged and protects against micro-bends.

- Power – The power feeds need to be extremely robust when compared to a typical wire feed and must provide a mechanically rigid power delivery system that would be extremely difficult to displace. Each power feed to the Cisco ONS 15600 MSSP is carried over individually laminated solid metal bars that also provide an integrated approach to power filtering. These power feeds are fully redundant and fully isolated. The power feeds supply power to the A and B power bus bars, which in turn provide power to each shelf component through the redundant power backplane. If one of the power feeds fails, each shelf component automatically selects the working power backplane in an error-free transaction.
- Automatic shutdown – If both central office power feeds fail, the Cisco ONS 15600 MSSP performs an orderly, sequenced system shutdown. This “graceful shutdown” feature allows the platform to power down in an orderly and predictable manner, helping ensure that the platform sustains no damage and the system is ready to return to service when the central office/service point of presence (POP) fault is repaired.
- SONET/SDH backplane – The Cisco ONS 15600 MSSP has fully redundant backplane connectivity to the line interface cards and the cross-connect cards. The Cisco ONS 15600 MSSP traffic moves from the interface cards to the cross-connect cards and back by traffic being placed on both copies of the backplane. Each backplane trace on both copies is constantly monitored for quality. If errors are detected within the system, a hitless redundant copy switch is performed.
- Control backplane – Similar to the other data paths on the Cisco ONS 15600 MSSP, control signals are sent to each shelf component over a fully redundant control backplane. The Cisco ONS 15600 provides both processor redundancy and physical path redundancy for every control link in the system.
- Timing – The Cisco ONS 15600 MSSP provides an internal stratum 3E clock, providing extended holdover when operating in an internal timed mode. This timing or timing derived from an external BITS or line-timed source is provided to each of the shelf components through a redundant timing backplane. All timing in the system is redundant both at the card level and at the external source level.

Carrier-Class Serviceability

The Cisco ONS 15600 MSSP offers servicing features to meet the high expectations of a carrier-class product.

- Backplane connector replacement – The Cisco ONS 15600 MSSP allows for the in-service replacement of backplane connectors if they are damaged. When repair is performed properly with the supplied tool, a backplane can be safely repaired without powering the system down.
- Fully hot-swappable – All system components, including line interface cards, common cards, fan trays, power distribution units (PDUs), and customer access panels, are fully hot-swappable, allowing a service technician to add and remove components without having to remove power from the system.

Carrier-Class Operations

The Cisco ONS 15600 provides carrier-class software features optimized for deployment in today's large carrier networks.

- Fully nonblocking connectivity – Helps ensure that all connections made through the Cisco ONS 15600 are nonblocking, thereby providing a very high degree of network reliability.
- Errorless software upgrades – There are no bit errors observable in overhead or payload streams during a software upgrade on the Cisco ONS 15600. An upgrade is normally characterized by a bulk reconfiguration of the system database and/or a replacement of system software or firmware.
- Multiarea Open Shortest Path First (OSPF) – Enables network scalability to scores of nodes directly connected to the Cisco ONS 15600 MSSP.
- Security features – Security is a top priority for every service provider, because without effective security, provisioned circuits and service provider revenue are at risk. Several security features are provided to offer adequate protection for a service provider's network:
 - Firewall capability – Prevents users outside of the section data communication channel (SDCC) management network from sending traffic into the SDCC management network.
 - Superuser-initiated logout – Allows the superuser to log out another user immediately.
 - Password spinning – Allows a maximum number of login attempts, and blocks that username after the maximum number of attempts has been exceeded.
 - Audit trail – Offers capability to archive the audit trail records.
 - Timeout control – Times out a user session after a specified period of time has passed.
- Provisionable alarms – Alarm severity (critical, major, minor) as well as the service-affecting designation (rot reported, not alarmed) can be provisioned. The software also provides user-defined alarm profiles, along with a default alarm profile that is set to Telcordia or ITU specifications.
- Ease of use – The Cisco ONS 15600 MSSP software enables customers to perform operations, administration, maintenance, and provisioning (OAM&P) tasks in the most efficient manner possible. This is accomplished with such features as a Java-based craft interface (Cisco Transport Controller) self-install wizard, span upgrade wizards, and circuit provisioning wizards.

Scalability

The Cisco ONS 15600 MSSP provides 320 gigabits of switching, grooming, aggregation, and bandwidth management capacity in a single shelf, with each 7-foot Network Equipment Building Systems (NEBS) 2000 rack supporting up to three shelves. Networkwide scalable capacity must extend through the edge and metro core and ultimately to service POPs. The Cisco ONS 15600 MSSP in conjunction with the Cisco ONS 15454 MSPP enables network scalability from the metro edge all the way to the services POP.

Patented Cooling for High Port-Density Long-Reach Optics

The Cisco ONS 15600 MSSP has a patented cooling system that enables it to provide 32 OC-192/STM-64 or 128 OC-48/STM-16/Gigabit Ethernet optical interfaces in a single shelf. This patented cooling system makes it possible for the Cisco ONS 15600 MSSP to scale to higher bit-rate interfaces such as OC-768/STM-256.

SONET/SDH DCC Processing Power Provides Full Visibility of the Network

The Cisco ONS 15600 MSSP is capable of terminating and processing hundreds of DCC channels simultaneously, allowing full network visibility. It is this inherent capability that allows end-to-end services to be provisioned and the complete network to be monitored through management software such as Cisco Transport Controller and Cisco Transport Manager.

Like the Cisco ONS 15454, the Cisco ONS 15600 MSSP uses advanced IP for DCC communications. However, Cisco realizes that many traditional metro edge network elements use the OSI protocol stack for DCC communication. Attempting to communicate with network elements which use OSI in their DCC channel is an interoperability limitation. To address this and to eliminate the need for colocated traditional network elements, the Cisco ONS 15600 MSSP uses the ITU G.7712 standard to terminate OSI-based DCC channels and forward the traffic to the data communication network (DCN) router. The G.7712 standard provides a framework for interworking between network elements that use OSI and IP in the DCC channel.

Management and Provisioning

With the Cisco Transport Controller (Figure 3), an easy-to-use Java-based, point-and-click craft graphical user interface (GUI), the Cisco ONS 15600 MSSP provides scalable bandwidths, easy switching and grooming, A-to-Z circuit provisioning, auto network element discovery with network topology, and custom bandwidth management, allowing service providers to design transport networks around subscriber needs rather than around equipment limitations.

Figure 3. Cisco Transport Controller

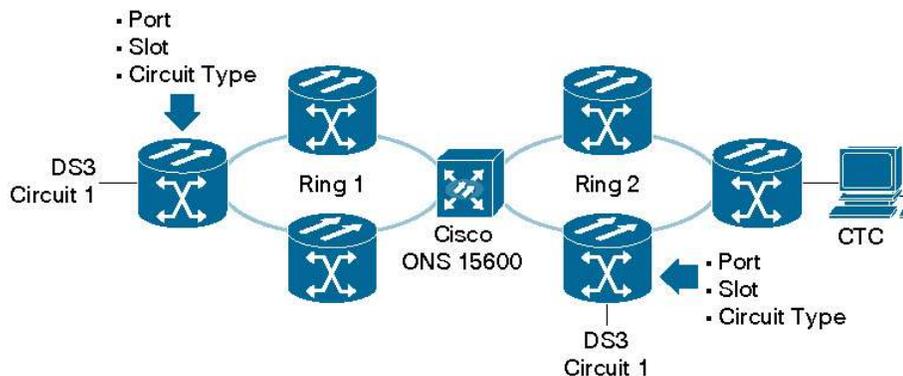


The Cisco ONS 15600 MSSP is also supported by the Cisco Transport Manager. Cisco Transport Manager is the carrier-class element management system that provides advanced capabilities in the functional management areas of configuration, faults, performance, and security for Cisco optical network elements, subnetworks, and networks. Cisco Transport Manager is based on a client-server architecture that scales to support up to 3000 network elements and 100 simultaneous clients. Cisco Transport Manager is a primary enabler for automation in the Internet operations support system (OSS) through the northbound interfaces to a network management system (NMS) or OSS.

The Cisco ONS 15600 MSSP meets all OSS/NMS and Operations Systems Modification of Intelligent Network Elements (OSMINE) requirements, supporting Transaction Language One (TL1), Common Object Request Broker Architecture (CORBA), Simple Network Management

Protocol (SNMP), TIRKS, NMA, and TEMS interfaces. In Figure 4, from the Cisco Transport Controller a DS3 circuit is being provisioned from one end of the network to another, without the need to configure node-to-node provisioning.

Figure 4. A-to-Z Provisioning Example



Technical Specifications

Table 1 gives technical specifications for the Cisco ONS 15600 MSSP.

Table 1. Technical Specifications for Cisco ONS 15600 MSSP

Interface Cards	Ports per Card	Protection
ASAP (Any Service Any Port)	Supports up to four pluggable I/O modules	
4PIO Pluggable I/O Module	Supports up to four OC-3/STM-1, OC-12/STM-4, GE, OC-48/STM-16, or OC-48 STM-16 DWDM SFPs.	1+1, 0:1, ring, mesh
1PIO Pluggable I/O Module	Supports one SR or LR OC-192/STM-64 XFP:	1+1, 0:1, ring, mesh
Common Equipment		
Timing and shelf controller card	Timing and control functions – System initialization, provisioning, alarm reporting, maintenance, diagnostics, IP address detection and resolution, stratum 3E timing, DCC termination, and system fault detection	
Core cross-connect card	Fully redundant, central switching element providing 6144 STS-1/VC-3 (2048 VC-4) switching capacity, fully cross-point, nonblocking, broadcast supporting	
Input/output (I/O) shelf assembly	Shelf assembly with backplane, fan tray assembly (3), fan tray filter, customer access panel (Ethernet interfaces, 32 alarm inputs/outputs, external timing references for T1, E1, and J1)	
Power distribution unit (PDU)	Fully redundant PDU with both A and B side power supplies, including multiple circuit breakers; one PDU supplies power for up to three Cisco ONS 15600 shelves	

Platform Features

Topologies Supported

- 64 UPSR/SNCP (any combination of UPSR/SNCP, BLSR/MS-SPRing, and 1+1 APS/MSP can be mixed within the allowable maximums)
- 32 two-fiber BLSR/MS-SPRing with Dual Ring Interconnect (DRI) support
- 8 OC-192 / 32 OC-48 four-fiber BLSR (4f MS-SPRing: future release)
- 64 1+1 APS/MSP, uni-or bidirectional
- Path Protected Mesh Networking (PPMN)

Node Configurations

- Multiring (mixed UPSR/SNCP, BLSR/MS-SPRing, and 1+1 APS/MSP)
- Linear ADM
- Mesh
- Regenerator
- Star/hub

User Interface – Cisco Transport Controller

- Integrated node and subnetwork GUI craft interface
- Layered graphical views – network, node, and card levels
- A-to-Z circuit routing
 - Automatic internode cross-connect provisioning
 - Detailed circuit map
 - Protected or unprotected circuits
 - Nodal diversity option
 - Balanced traffic option
 - Single session, multiple circuit creation
- Node auto-discovery with provisionable subnetwork domain control
- Provisionable background maps
- System inventory
- Flexible color schemes
- Data export
- Online help
- Dynamic Host Configuration Protocol (DHCP) passthrough
- PC-based client
- Familiar browser interface – Netscape Navigator or Microsoft Internet Explorer

Maintenance

- Loopbacks – facility and terminal
- Protection switching
- Database backup and restore

- Lamp test
- Test and bridging access

Performance Monitoring (SONET/SDH)

- Telcordia GR-253-CORE, G.823, G.825, G.826, G.829
- 15 minute (32 entries), 24 hour (28 entries)
- Near- and far-end reporting
- Provisionable threshold crossing alerts
- Intermediate path performance monitoring (IPPM)
- SNMP Remote Monitoring (RMON)

Alarm Monitoring and Reporting

- Shelf LEDs are: Critical, Major, Minor, Processor
- The following cards have the following LEDs:
 - TSC: STAT, SRV, ACT/STBY, Line, External, Free Run, Holdover, ACO
 - CXC: STAT, SRV
 - SSXC: STAT, SRV
 - ASAP: STAT, SRV, SD, SF, Laser On
 - Fan: STAT
- Cisco Transport Controller
- Cisco Transport Manager
- Thirty-two alarm contact closures (standard) – critical, major, minor, remote

System Upgrades

- Optical span
- Ring protection
- Software (local or remote)

Timing and Synchronization

- Two BITS inputs / two BITS outputs (BITS A and BITS B, user selectable) – 1544 Kbps (G-1244-CORE) 100 ohms balanced.
- Two E1 and 64k external clock inputs / two E1 and 64k clock outputs for use in SDH environments
- Line timing
- Stratum 3E internal oscillator
- Synchronous status messaging (SSM)

Additional Features

- Path trace (J1)
- Drop and continue
- Hairpinning
- DCC tunneling
- SDH transport over SONET (STM-1, STM-4, STM-16, and STM-64)

- Provisionable alarm profiles
- TL1 gateway provisioning
- Integrated fiber routing and storage
- Node data export and printing

Network Management Interface Support

- SNMP Versions 1 and 2c
- TL1 (GR-189-CORE and GR-833-CORE)

System Access

- 10BASE-T LAN, RJ-45 front and rear, provisionable Open Shortest Path First (OSPF)
- DB9 connectors for TL1 terminal

Regulatory and Standards**Compliance**

- NEBS Level 3
- GR-1089-CORE
- GR-63-CORE
- GR-253-CORE
- European Telecommunication Standards Institute (ETSI) EN300-386
- G.781, G.782, G.783, G.811, G.812, G.813

Safety

- UL 60 950
- CSA C22.2, No. 950-95
- IEC 60825 Laser Safety Class 1

EMI

- FCC Part 15 Class A
- Industry Canada ICES-003 Class A

Physical

- Shelf weight: 120 to 206 lb (54.5 to 93.6 kg)
- Shelf dimensions (H x W x D): 25 x 23.6 x 23.6 in. (635 x 600 x 600 mm)
- Rack-mounting: Up to three shelves per 7-foot NEBS 2000 rack

Environmental

- Operating temperature: 23 to 122°F (–5 to 50°C)
- Storage temperature: –40 to 158°F (–40 to 70°C)
- Relative humidity: 0 to 95%, noncondensing
- ETSI 300 019 – Class 3.2 Operation, Class 1.2 Storage

Power

- –48VDC nominal, operating range –40 to –72VDC
- Up to 70 amps
- Dual power input feeds
- Dual A and B side power monitoring



Americas Headquarters
 Cisco Systems, Inc.
 170 West Tasman Drive
 San Jose, CA 95134-1706
 USA
www.cisco.com
 Tel: 408 526-4000
 800 553-NETS (6387)
 Fax: 408 527-0883

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

Europe Headquarters
 Cisco Systems International BV
 Haarlerbergpark
 Haarlerbergweg 13-19
 1101 CH Amsterdam
 The Netherlands
www-europe.cisco.com
 Tel: +31 0 800 020 0791
 Fax: +31 0 20 357 1100

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