

Cisco 7600 Series 4-, 8-, and 16-Port **OC-3c/STM-1** OC-3c/STM-1 POS/SDH OSM

High-Density, OC-3c/STM-1 Connectivity for Consolidated Service Provider POPs with Service Delivery over IP or MPLS Core Networks

The rapid growth of Internet-enabled user applications has led to a dramatic growth in the bandwidth provisioned through service provider networks. To accommodate this growth, service providers are consolidating their various existing network architectures that deliver traditional Layer 2 WAN transport, such as Frame Relay and ATM, with architectures that deliver Layer 3 WAN services, such as high-speed Internet access and Layer 3 virtual private networks (VPNs). This consolidation optimizes service providers' capital investments so that all such expenditures simultaneously benefit all network services.

Achieving network consolidation is particularly challenging at network aggregation points. The devices at these network aggregation points must be able to deliver a wide variety of Layer 2 and Layer 3 services, while providing efficient transfer of network traffic from customer access nodes to

the core network and back. Therefore, these aggregation devices must simultaneously provide scalable bandwidth and interface density between the access and core networks; support a wide range of network protocols, as well as quality-of-service (QoS), security, and accounting features; and be compatible with existing SONET infrastructure.

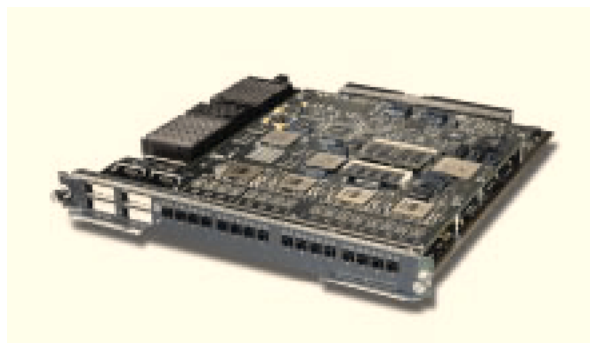
The Cisco 7600 Series Routers meet these requirements because it provides the performance, density, and features that are needed for network aggregation devices in consolidated network architectures.

To provide aggregation services over an existing SONET infrastructure, the Cisco 7600 can be configured to support various SONET interface cards, such as the four-, eight-, and sixteen-port OC-3c STM-3

Packet-over-SONET (POS) Optical Services Modules (OSMs). These interface cards include both the original OSMs and the new enhanced OSMs, which deliver advanced IP and Multiprotocol Label Switching (MPLS) services based on the Cisco Parallel Express Forwarding (PXF) network processor. The 4-port and 8-port OC-3c POS OSMs include 1 PXF per interface card, whereas the 16-port OC-3c POS OSMs include 2 PXF processors per interface card.

Figure 1

Eight-Port OC-3c/STM-1 POS Optical Services Module for Cisco 7600 Series and Catalyst 6500 Series





OC-03 OSM Feature Summary

The 4-, 8- and 16-port OC-3c/STM-1 POS OSMs support the following capabilities:

Feature	Benefit
Multiple OC-3 POS interfaces per OSM	High-density OC-3 connectivity per chassis and per rack
Upgradable programmed feature sets using the Cisco PXF network processor	Greater flexibility to support new features through software upgrades, while delivering performance similar to ASIC-based designs
Throughput of up to 6 Mpps per PXF IP services processor	High performance to support optical interface speeds as high as OC-48
Additional four ports of Gigabit Ethernet, in addition to the OC-3 SONET ports	Simultaneous WAN and LAN access to meet diverse applications
Compatibility with either the Cisco 7600 or the Cisco Catalyst 6500 chassis (if appropriate upgrades are made)	Investment protection for customers with a large installed base of Cisco 7600 or Cisco Catalyst 6500 chassis

Enhanced Optical Service Modules

With support for all of the same features as the original Cisco 7600 OSMs, the Enhanced OSM interface cards enable the Cisco 7600 platform to provide greater functionality. Major differences between the features of the original and Enhanced OSMs include:

Enhancement	Benefit
Increase in DMA memory from 64 MB to 256 MB per PXF network processor	Support for larger traffic shaping queues. The Enhanced OSMs supports at minimum of 8000 QoS queues per PXF network processor
Increase from 255 to at least 511 and a maximum of 1023 virtual routing and forwarding (VRF) instances per chassis for MPLS Layer 3 configurations	Increased service density per chassis for support of MPLS VPN services for end customers
Support for enhanced QoS feature of Weighted Random Early Detection (WRED)	Improved delivery of service-level agreements to end customers
Future support for Layer 2 network services, including Frame Relay and ATM, based on MPLS network architectures	Ability to deliver both Layer 2 services, such as Frame Relay, Ethernet, and ATM, and Layer 3 services, such as Internet access and 2547 VPNs, in a consolidated network architecture

Investment Protection

The Cisco 7600 is specifically designed to enable Cisco customers to take advantage of their existing investments in Cisco equipment. In addition to the Original OSM and Enhanced OSM interface modules, the Cisco 7600 can be configured with any combination of traditional Cisco Catalyst® 6000 LAN interfaces, and can also be configured with Cisco 7500 and 7200 WAN port adapters. As a result, the Cisco 7600 offers outstanding scalability, with WAN interfaces from DS0 through OC48/STM-16 and LAN interfaces from 10/100-Mbps Ethernet to Gigabit Ethernet and 10 Gigabit Ethernet.



Designed for Service Provider Environments

Each Cisco 7600 provides an NEBS-3-compliant chassis. The Cisco 7600 route processing and forwarding is a fully redundant configuration with the ability to route using such core protocols as BGP4, IS-IS, and OSPF, as well as support for QoS and packet filtering. The Cisco 7600 supports a 256-Gbps switch fabric that enables high aggregate throughput, as well as high port density to optimize space use in central office.

Table 1 Two- and Four-Port OC-3c/STM-1 POS OSM Chassis and Rack Density*

OC-3c/STM-1 POS OSM	Cisco 7609 Chassis Density	Cisco 7609 Rack Density
OSM-4OC3-POS-X	32 OC-3 ports and 34 Gigabit Ethernet ports	64 OC-3 ports and 68 Gigabit Ethernet ports
OSM-8OC3-POS-X	64 OC-3 ports and 34 Gigabit Ethernet ports	128 OC-3 ports and 68 Gigabit Ethernet ports
OSM-16OC3-POS-X	112 OC-3 ports and 30 Gigabit Ethernet ports	224 OC-3 ports and 60 Gigabit Ethernet ports

* when configured with:
 One Supervisor 2 with MSFC2 and PFC2 per Cisco 7609 chassis
 Seven 16-port OC-3 POS modules per Cisco 7609 chassis
 Eight 4-, 8-, or 16-port OC-3 POS modules per Cisco 7609 chassis
 Two Cisco 7609 chassis per 7-foot rack

Ordering Information

Table 2 Enhanced OSMs for 4-, 8-, and 16-Port OC-3c/STM-1 POS Versions

Part Number	Description
OSM-4OC3-POS-SI+	4-port OC-3/STM-1 SONET/SDH Enhanced OSM, SI with 4 GE
OSM-4OC3-POS-SI+=	4-port OC-3/STM-1 SONET/SDH Enhanced OSM, SI with 4 GE, SPARE
OSM-8OC3-POS-SI+	8-port OC-3/STM-1 SONET/SDH Enhanced OSM, SI with 4 GE
OSM-8OC3-POS-SI+=	8-port OC-3/STM-1 SONET/SDH Enhanced OSM, SI with 4 GE, SPARE
OSM-8OC3-POS-SL+	8-port OC-3/STM-1 SONET/SDH Enhanced OSM, SL with 4 GE
OSM-8OC3-POS-SL+=	8-port OC-3/STM-1 SONET/SDH Enhanced OSM, SL with 4 GE, SPARE
OSM-16OC3-POS-SI+	16-port OC-3/STM-1 SONET/SDH Enhanced OSM, SI with 4 GE
OSM-16OC3-POS-SI+=	16-port OC-3/STM-1 SONET/SDH Enhanced OSM, SI with 4 GE, SPARE
MEM-OSM-128M	128-MB ECC Memory for Optical Services Modules
MEM-OSM-256M	256-MB ECC Memory for Optical Services Modules
MEM-OSM-512M	512-MB ECC Memory for Optical Services Modules



Table 3 Original OSMs for Two- and Four-Port OC-3c/STM-1 POS Versions

Part Number	Description
OSM-4OC3-POS-SI	4-port OC-3/STM-1 SONET/SDH OSM, SI with 4 GE
OSM-4OC3-POS-SI=	4-port OC-3/STM-1 SONET/SDH OSM, SI with 4 GE, SPARE
OSM-8OC3-POS-MM	8-port OC-3/STM-1 SONET/SDH OSM, MM with 4 GE
OSM-8OC3-POS-MM=	8-port OC-3/STM-1 SONET/SDH OSM, MM with 4 GE, SPARE
OSM-8OC3-POS-SI	8-port OC-3/STM-1 SONET/SDH OSM, SI with 4 GE
OSM-8OC3-POS-SI=	8-port OC-3/STM-1 SONET/SDH OSM, SI with 4 GE, SPARE
OSM-8OC3-POS-SL	8-port OC-3/STM-1 SONET/SDH OSM, SL with 4 GE
OSM-8OC3-POS-SL=	8-port OC-3/STM-1 SONET/SDH OSM, SL with 4 GE, SPARE
OSM-16OC3-POS-MM	16-port OC-3/STM-1 SONET/SDH OSM, MM with 4 GE
OSM-16OC3-POS-MM=	16-port OC-3/STM-1 SONET/SDH OSM, MM with 4 GE, SPARE
OSM-16OC3-POS-SI	16-port OC-3/STM-1 SONET/SDH OSM, SI with 4 GE
OSM-16OC3-POS-SI=	16-port OC-3/STM-1 SONET/SDH OSM, SL with 4 GE, SPARE
OSM-16OC3-POS-SL	16-port OC-3/STM-1 SONET/SDH OSM, SI with 4 GE
OSM-16OC3-POS-SL=	16-port OC-3/STM-1 SONET/SDH OSM, SL with 4 GE, SPARE
MEM-OSM-128M	128-MB ECC Memory for Optical Services Modules
MEM-OSM-256M	256-MB ECC Memory for Optical Services Modules
MEM-OSM-512M	512-MB ECC Memory for Optical Services Modules

Note that “=” denotes a spare order (for example, OSM-8OC3-POS-SI= is the spare order number when OSM is not ordered in a system).

Technical Specifications

OC-3c/STM-1 POS Specifications

SONET/SDH Compliance

- Telecordia (Bellcore) GR-253-CORE (as applicable)
- ITU-T G.707, G.957, G.825 (as applicable)
- Support for 1+1 SONET Automatic Protection Switching (APS) as per GR253-CORE—per port, per line card, per chassis (as applicable)
- Support for 1+1 SDH Multiplex Section Protection (MSP) as per G.783 Annex A—per port, per line card, per chassis (as applicable)



Encapsulations

- IETF RFC 1661, Point-to-Point Protocol (PPP)
- IETF RFC 1662, PPP in HDLC like Framing
- IETF RFC 2615, PPP over SONET/SDH with 1+x43 Self-Synchronous Payload Scrambling

SONET/SDH Errors, Alarms, and Performance Monitoring

- Signal Failure Bit Error Rate (SF-ber)
- Signal Degrade Bit Error Rate (SD-ber)
- Signal Label Payload Construction (C2)
- Path Trace Byte (J1)
- Section:
 - Loss of Signal (LOS)
 - Loss of Frame (LOF)
 - Error Counts for B1
 - Threshold Crossing Alarms (TCA) for B1
- Line:
 - Line Alarm Indication Signal (LAIS)
 - Line Remote Defect Indication (LRDI)
 - Line Remote Error Indication (LREI)
 - Error Counts for B2
 - Threshold Crossing Alarms (TCA) for B2
- Path:
 - Path Alarm Indication Signal (PAIS)
 - Path Remote Defect Indication (PRDI)
 - Path Remote Error Indication (PREI)
 - Error Counts for B3
 - Threshold Crossing Alarms (TCA) for B3
 - Loss of Pointer (LOP)
 - New Pointer Events (NEWPTR)
 - Positive Stuffing Event (PSE)
 - Negative Stuffing Event (NSE)
 - Path Unequipped Indication Signal (PUNEQ)
 - Path Payload Mismatch Indication Signal (PPLM)
- SONET/SDH Synchronization:
 - Local (Internal) Timing (for inter-router connections over dark fiber or WDM equipment)
 - Loop (Line) Timing (for connection to SONET/SDH equipment)
 - 20 ppm Clock Accuracy over Full Operating Temperature



- Network Management:
 - Local Loopback
 - Network Loopback
 - NetFlow Data Export
 - RFC 1595, Performance Statistics for Timed Intervals (Current, 15 Minute, Multiple 15 Minute, and 1 Day intervals)
 - Regenerator Section
 - Multiplex Section
 - Path Errored Seconds
 - Severely Errored Seconds
 - Severely Errored Framed Seconds
- Connector
 - MTRJ connector

Table 4 POS Optical Specifications

Fiber Interface	Output Power		Input Power	Input Sensitivity	Wavelength	
	Min	Max	Max	Min	Min	Max
MM	-19.0 dBm	-14.0 dBm	-14.0 dBm	-26.0 dBm	1270 nm	1380 nm
SM-IR	-15.0 dBm	-8.0 dBm	-8.0 dBm	-28.0 dBm	1261 nm	1360 nm
SM-LR	-5.0 dBm	0.0 dBm	-8.0 dBm	-28.0 dBm	1285 nm	1335 nm

Gigabit Ethernet Specifications

IEEE 802.3z Compliant

GBIC-based Gigabit Ethernet Interfaces with SC connectors:

Table 5 Gigabit Ethernet Optical Specifications

GBIC	Distance
1000BASE-LX: 50 micron multimode fiber	Up to 550 m
1000 BASE-LX: 9/10 micron single-mode fiber	Up to 5 km
1000 BASE-LH: 62.5 micron multimode fiber	Up to 550 m
1000 BASE-LH: 50 micron multimode fiber	Up to 550 m
1000 BASE-LH: 9/10 micron single-mode fiber	Up to 10 km
1000 BASE-ZX: 9/10 micron single-mode fiber	Up to 70 km
1000 BASE-ZX: dispersion-shifted fiber	Up to 100 km



- Support for IEEE 802.1Q VLAN Trunking with up to 4000 simultaneous VLANs
- Support for Hot Standby Routing Protocol (HSRP)
- IEEE 802.3x Support for autonegotiation flow control
- Support for Jumbo frames with an MTU of 9192 bytes

Cisco 7600 System Features

- Hardware-based Cisco Express Forwarding at 30 Mpps
- ACL application at 30 Mpps
- QoS classification at 30 Mpps
- Policy Routing at 30 Mpps
- Support for 128,000 traffic accounting entries per system
- Support for Online Insertion and Removal (OIR)
- Support for SNMP I and II and four RMON groups per port: Statistics, History, Alarms, and Events

Physical Specifications

- Occupies one slot in any Cisco 7600 chassis
- Occupies one slot in any Cisco Catalyst 6500 series chassis
 - WS-C6506—Cisco Catalyst 6506 chassis
 - WS-C6509—Cisco Catalyst 6509 chassis
 - WS-C6509-NEB—Cisco Catalyst 6509 chassis for NEBs Environments
- Four, 8, or 16 OC-3c/STM-1 ports supported per OSM
- Four Gigabit Ethernet Optical ports per OSM
- Up to eight 4- or 8-port OC-3c/STM-1 OSMs, or seven 16-port OC-3c/STM-1 OSMs supported in a 9-slot chassis
- Required with either Cisco 7600 or Cisco Catalyst 6500 chassis:
 - Supervisor Engine 2: WS-X6K-S2-MFSC2
- Recommended with either Cisco 7600 or Catalyst 6500 chassis:
 - Switch Fabric Module –256 Gbps Crossbar Fabric: WS-C6500-SFM
- Dimensions (H x W x D): 1.2 x 14.4 x 16 in. (3.0 x 35.6 x 40.6 cm)
- Weight: 11.0 lb (5 kg)
- Power Requirement: 141W (2-port), 201W (4-port)
- Mean Time Between Failure (MTBF): seven years for system configuration

Indicators and Interfaces

- Status: green (operational)/red (faulty)/orange (module booting or running diagnostics)
- Link good: green (port active)/orange (disabled)/off (not active/connected)/blinking orange (failed diagnostic and disabled)



Processors and Memory

- One 262 MHz R7000 MIPS RISC Processor
- Configurable packet/route table memory options:
 - 64 MB ECC SDRAM (default)
 - 128 MB ECC SDRAM
 - 256 MB ECC SDRAM
 - 512 MB ECC SDRAM

Parallel Express Forwarding (PXF) IP Services Processor(s)

Enhanced OSMs:

- Provides up to 6 Mpps of distributed IP service application per PXF IP Services Processor
- Nonconfigurable PXF memory per line card:
 - 256-MB SDRAM of route table memory per PXF IP Services Processor
 - 256-MB SDRAM of packet buffer memory per PXF IP Services Processor (CRC Checks per Packet)
 - 8-MB SSRAM of packet processing memory per PXF IP Services Processor

Original OSMs:

- Provides up to 3.9 Mpps of distributed IP service application per PXF IP Services Processor
- Nonconfigurable PXF memory per line card:
 - 64-MB SDRAM of route table memory per PXF IP Services Processor
 - 128-MB SDRAM of packet buffer memory per PXF IP Services Processor (CRC Checks per Packet)
 - 4-MB SSRAM of packet processing memory per PXF IP Services Processor

MIB Support

SONET MIB (RFC 1595)

RFC 1157 SNMP

RFC 1901 - 1907 SNMP v2c

SNMP v3 MIB

IF-MIB (RFC 1573)

CISCO-STACK-MIB

CISCO-CDP-MIB

RMON MIB (RFC 1757)

ENTITY-MIB (RFC 2037)

HC-RMON

RFC1213-MIB (MIB-II)

SMON-MIB

IP Statistics MIB

HSRP MIB

CAR MIB

WRED MIB

RSVP MIB

Cisco RTTMON MIB

Environmental Conditions

Operating temperature: 32 to 104 F (0 to 40 C)

Storage temperature: -4 to 149 F (-20 to 65 C)

Relative humidity: 5 to 90%, noncondensing

Operating altitude: -500 to 10,000 ft

Regulatory Compliance

Safety Compliance

UL 1950

CAN/CSA C22.2 No.950-95

EN 60825-1 Laser Safety (Class 1)

21CFR1040 Laser Safety

IEC60825-2

EN60950

IEC 60950

TS 001

AS/NZS 3260

EMC Compliance

FCC Part 15 (CFR 47) Class A

VCCI Class A

EN55022 Class A

CISPR 22 Class A

AS/NZS 3548 Class A

EN55024

CE Marking

NEBS Level 3 Compliance

The Cisco 7600 chassis and Cisco Catalyst 6509 chassis have been certified as NEBS Level 3 compliant, according to the following specifications:

- GR-63-CORE - NEBS: Physical Protection
- GR-1089-CORE - NEBS: EMC and Safety

ETSI Compliance

ETS-300386-2 Switching Equipment

Minimum Software Revision

- **Enhanced OSMs**
 - Cisco IOS® Software Release 12.1(12)E
- **Original OSMs**
 - Cisco Catalyst Operating System Version 6.1.2
 - Cisco IOS® Software Release 12.1E

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