

Cisco 12000 Series One-Port OC-48c/STM-16c POS/SDH Line Card

The rapid acceptance and accelerated growth of the Internet is quickly transforming the mix of traffic crossing public networks. To compete effectively in a data-driven economy, service providers need an optical transport infrastructure optimized for packets combined with the scalability and the flexibility to support unimagined IP-based applications.

Cisco Systems, Inc. has developed the Cisco 12000 Series One-Port OC-48c/STM-16c POS/SDH line card which provides a unique combination of performance and class-of-service (CoS) features for delivering advanced end-to-end networking features. The high performance switching engine integrates WRED and our innovative ASIC-based queue scheduling algorithm Modified Deficit Round Robin (MDRR). These allow service providers to offer differentiated services with deterministic traffic behavior in the core of the network. This product combines leadership features with industry-leading cost-per-bit metrics for 2.5 Gbps packet optimized transport infrastructures (i.e. \$27.1 per Mbit). Taken together, service providers can use this product to build flexible and cost-effective infrastructures to compete effectively in an Internet-driven economy.

The Cisco 12000 Series One-Port OC-48c/STM-16c POS/SDH line card can be configured with either short-reach 1310 nm optics or long-reach 1550 nm optics. Using short-reach 1310 nm optics, a service provider can connect into a traditional SONET/SDH solution or a transponder-based dense wavelength division multiplexing (DWDM) solution. Using long-reach 1550 nm optics (24 dBm power budget), a service provider can light dark fiber and connect two Cisco 12000 Series Internet Routers in a point-to-point configuration to eliminate a transport layer of equipment, helping reduce networking and operational costs.

Figure 1
Cisco 12000 Series One-Port OC-48c/STM-16c POS/SDH Line Card



Table 1

Feature Highlights

Feature	Description
Port Density	1 concatenated OC-48/STM-16 port
Switching Performance	4 Mpps for IP, and multiprotocol label switching (MPLS), Frame Relay ¹
CoS	Differentiated CoS queues, weighted random early detection (WRED) and modified deficit round robin (MDRR) without performance degradation
Cisco IOS®	Rich software feature set and advanced networking features
Optics	Short-reach 1310 nm and long-reach 1550 nm lasers
Cost-Per-Bit	\$27.1 per Mbit

1. Post initial First Customer Ship (FCS) release

Layer 3 Feature Summary

- 4 Mpps forwarding rate for IP, Frame Relay Switching¹, and Multiprotocol Label Switching (MPLS)
- IP and MPLS load balancing (6 paths)
- IP and MPLS CoS—128 CoS queues per destination line card (2088 CoS queues total)
- Random Early Detection (RED), and Weighted Random Early Detection (WRED)
- Modified Deficit Round Robin (MDRR)
- Packet/byte count, SONET/SDH errors, queue size, and WRED statistics without performance degradation.
- MPLS traffic engineering using Routing with Resource Reservation (RRR)
- MPLS Virtual Private Network (VPN)¹
- Multicast forwarding
- Per Interface Rate Control (PIRC)¹
- Extended access control lists (EACLs)¹
- A Cisco Express Forwarding (CEF) table that can accommodate up to one million forwarding entries
- Maximum Transfer Unit (MTU) 9188 byte
- 64 MB of route table memory, expandable to 256 MB
- 128 MB of packet forwarding table memory (PSA)
- 256 MB of packet buffer memory, expandable to 512 MB

1. Post initial First Customer Ship (FCS) release

SONET/SDH Layer

- Standards-compliant SONET/SDH interface
- Alarm processing
 - Loss of Signal (LOS), Loss of Frame (LOF), Line Alarm Indicator Signal (LAIS), Path Alarm Indicator Signal (PAIS), Loss of Pointer (LOP), Line Remote Defect Indicator (LRDI), Path Remote Defect Indicator (PRDI), Signal Failure (SF), Signal Degrade (SD), Line Remote Error Indicator (Line FEBE), Path Remote Error Indicator (Path FEBE)
- Performance monitoring
 - Error counts for B1, B2, B3
 - Threshold crossing alerts (TCA), Far End Block Error Path (FEBE) for B1, B2, B3 with settable threshold
- Synchronization
 - Local (internal) or loop timed (recovered from network)
 - 20 ppm clock accuracy over full operating temperature range
 - Pointer activity monitoring
- Protection switching
 - Support both SONET Automatic Protection Switching (APS) and SDH multiplex section protection (MSP) protocols
- Local (diagnostic) and line (network) loopback
- Payload mapping
 - IETF request for comment (RFC) 2615, Point-to-Point Protocol (PPP) over SONET/SDH
 - 1 + X⁴³ self-synchronous scrambler

Operations and Management

- CiscoView
- SONET Management Information Base (MIB) RFC 1595 supported through Simple Network Management Protocol (SNMP)
- IP manager
- MIB-II
- On-line insertion and removal (OIR)

System-Level Requirements

- A minimum of one clock scheduler card (CSC) and three switch fabric cards (SFCs) required for OC-48/STM-16 deployment 11.2(18)GS2 Cisco IOS or higher
- 12.0(6)S Cisco IOS or higher

Specifications

Physical

- Occupies a single slot
- Weight: 6 lb (2.7 kg)
- Height: 14 in. (35.6 cm)
- Depth: 18 in. (45.7 cm)

Environmental

- Operating temperature: 32 to 104 F (0 to 40 C)
- Storage temperature: -4 to 149 F (-20 to 65 C)
- Relative humidity: 10 to 90%, noncondensing

Regulatory Compliance

SONET/SDH

- Telcordia (Bellcore GR-253 as applicable)
- ITU-T G.957 as applicable
- ITU-T G.958 as applicable

Encapsulation

- IETF RFC 1490, Frame Relay Encapsulation
- IETF RFC 1661, PPP
- IETF RFC 1662, PPP in HDLC like framing
- IETF RFC 2015, PPP over SONET/SDH

Safety

- UL 1950
- CSA 22.2-No. 950
- EN60950
- EN41003
- AUSTEL TS001
- AS/NZS 3260
- EN60825 laser safety (Class 1)

EMI

- FCC Class A
- AS 3548 Class A
- EN55022 Class B (up to 1GHz)
- VCCI Class B (up to 1GHz)

Immunity

- IEC-1000-4-2 ESD
- IEC-1000-4-3 radiated immunity
- IEC-1000-4-4 EFT
- IEC-1000-4-5 surge
- IEC-1000-4-6 low frequency common immunity
- IEC-1000-4-11 voltage dips and sags
- IEC-1000-3-2 power line harmonics

NEBS

- SR-3580—NEBS: criteria levels (Level 3 compliant)
- GR-63-Core—NEBS: physical protection
- GR-1089-Corn—NEBS: EMC and safety

ETSI

- ETS-300386-2

LEDs

- Enable
- Receive carrier
- Receive packets
- Alpha-numeric management display

Optical Power Budget Packet-over-SONET/SDH Cisco 12000 OC-48/STM-16 Optics

The Cisco OC-48/STM-16 long-reach optics are compliant with the Table 4-6 optical parameters, and the short-reach optics are compliant with the Table 4-11 optical parameter of the GR-253-Core Synchronous Optical Network (SONET) transport systems: Common Generic Criteria, Issue 2 (Bellcore, December 1995).

Table 2

Optical Power Budget—Packet-over-SONET SDH Cisco 12000 OC-48/STM-16 Optics

Parameter	Short-Reach 1310nm SR-1	Long-Reach 1550nm LR-2
Line Rate	2488.32 Mbps	2488.32 Mbps
Connector Type	SC/FC Simplex	SC/FC Simplex
Launch Power (Max.)	-3 dBm	3 dBm
Launch Power (Min.)	-10 dBm	-2 dBm
Receiver Power (Max.)	0 dBm	-9 dBm
Receiver Power (Min.)	-18 dBm	-28 dBm
Optical Path Power Penalty	1 dBm	2 dBm
Allowable Range	0-7 dBm	0-24 dBm
Maximum Distance ¹	2 km	80 km

1. Worst-case scenario considering fiber quality, connectors, patch panel, and splices.

Note: A typical single-mode optical cable has a transmission loss of 0.4-0.5 dB/km at the 1310 nm region. The splicing loss will be 0.2-0.3 dB each, and splicing will be made at every one to three kilometers (conduit) or two to five kilometers (direct burial). At 1550 nm, the cable loss will typically drop to 0.25 dBm/km.

Table 3

Product Availability and Part Numbers

Product Descriptions	Part Number	Availability
1-Port OC-48/STM-16 SONET/SDH 1310 nm short-reach with SC Connector	OC48E/POS-SR-SC-B	Now
1-Port OC-48/STM-16 SONET/SDH 1550 nm long-reach with SC Connector	OC48E/POS-LR-SC-B	Now

For More Information

For additional information, please visit our Web site at <http://www.cisco.com/en/US/products/hw/routers/ps167/index.html>.

Table 4

Line Card Memory Options

Product Number	Description
MEM-DFT-LC-2X64	128 MB line card program/route memory (2 x 64 MB)
MEM-GRP/LC-128	128 MB GRP and LC program/route memory (1x128 MB)
MEM-GRP/LC-256	256 MB GRP and LC program/route memory (2x128 MB)
Default Memory	Line-card buffer memory, 128 MB/128 MB (TX/RX)
MEM-PKT-512-UPG	Line-card buffer memory, 256 MB/256 MB (TX/RX)



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