

# Cisco 10000 Series OC-48c/STM-16 Packet over SONET/SDH Line Card

The Cisco 10000 Series OC-48c/STM-16 Packet over SONET/SDH Line Card is a high-performance interface that provides superior connectivity options from the Cisco 10000 Series to the core network. Packet over SONET/SDH (POS) enables Internet service providers (ISPs) to substantially increase the data load over their optical transport infrastructure. With its line-rate OC-48c/STM-16 capacity (2.488 Gbps), the Cisco 10000 Series OC-48c/STM-16 POS Line Card provides a powerful combination of service, scalability, and flexibility with the industry's broadest set of Layer 3 features (Figure 1).

optical transport infrastructure while lowering ongoing operational costs. It also supports POS high-availability technology ideally suited for Internet and IP networks.

### Product Description

The Cisco 10000 Series OC-48c/STM-16 POS Line Card is a high-capacity, high-performance interface that provides ISPs with an opportunity to use their existing fiber plant to realize a significant increase in bandwidth, coupled with industry-leading network resiliency and fault tolerance. This increased interface capacity enables ISPs to provide new levels

of cost-effective IP services to their expanding customer base by more efficiently using existing resources.

The Cisco 10000 Series OC-48c/STM-16 POS Line Card supports OC-48c/STM-16 bandwidth of 2.488 Gbps of POS traffic. The full-height line card may be used in any line-card slot in the Cisco 10000 Series chassis. The OC-48c/STM-16 POS line card is a standard implementation of POS. It supports advanced features such as SONET automatic protection switching (APS), SDH multiplex section protection (MSP), alarm processing, and performance monitoring, and is fully compatible with standards-based POS implementations on platforms, including the Cisco 12000 Series and the Cisco 7600 Series. Note that the hardware is Spatial Reuse Protocol (SRP) ready, but SRP functions are currently not supported on the platform.

Figure 1  
 Cisco 10000 Series OC-48c/STM-16 Packet over SONET/SDH Line Card for Increased Bandwidth and Service Flexibility

This interface line card enables ISPs to substantially increase the data load over their





## Key Benefits

### **Efficient, High-Performance Bandwidth Utilization**

The Cisco 10000 Series OC-48c/STM-16 POS Line Card provides the unique advantages of efficient bandwidth utilization combined with very high performance. An OC-48c/STM-16 line-rate performance of 2.488 Gbps provides the increased bandwidth required by many ISPs to handle the most demanding user requirements such as faster access to Web pages and data-intensive applications such as real-time video and large file transfers.

The OC-48c/STM-16 POS line card provides more than just a “fat pipe.” The OC-48c/STM-16 POS line card uses an extensive and scalable set of Layer 3 features needed to deliver mission-critical commercial applications and delay-sensitive real-time applications such as voice and video over the cable IP infrastructure. For example, ISPs can offer virtual-private-network (VPN) services through a comprehensive set of Multiprotocol Label Switching (MPLS) capabilities.

### **Fault-Tolerant Backbone Connectivity**

The Cisco 10000 Series OC-48c/STM-16 POS Line Card implements SONET APS, a valuable tool to support network resiliency, fault tolerance, and increased overall network availability. APS provides a very fast Layer 1 mechanism to support 1:1 redundant transmission circuits between SONET devices. APS allows rapid switchover from one fiber connection to another in the event of a fiber cut, module failure, signal failure, or signal degradation. The result is increased network resiliency, minimal loss of data, and reduction in time-consuming reroutes of data.

### **Optimized for IP-Based Differentiated Services**

The Cisco POS solution is optimized to support Internet-based multiservice networks based on IP. The Cisco POS implementation places the IP layer directly above the SONET layer and eliminates the overhead needed to run IP over ATM over SONET for multiservice applications. The performance capacity of the Cisco 10000 enables service providers to provide customers guaranteed and Differentiated Services (DiffServ) through IP-based quality-of-service (QoS) products for their multiservice applications. With the three precedence bits in the IP header, it is possible to provide differentiated classes of service (CoSs) by using Random Early Detection (RED) and Weighted RED (WRED) to support multiservice applications, including data, voice, and video applications.

### **Compatibility and Interoperability Reduces Costs**

POS protects the customer’s investment by providing a new high-performance backbone connection that optimizes existing fiber in the network while remaining compatible with the existing equipment in the network. The Cisco 10000 Series OC-48/STM-16 POS Line Card is fully compatible with existing OC-48/STM-16 POS implementations in the network. By enabling customers to more efficiently use existing fiber and reuse currently installed platforms, the Cisco 10000 Series POS implementation saves the customer money and improves the overall efficiency of the network.



## Key Features

### Chassis

- Single-port OC-48/STM-16 SONET interface with SC connector
- Interface that supports single-mode, short-reach fiber (maximum distance 2 km) or long-reach fiber (maximum distance 80 km)
- Unit power budget, 62W
- Network Equipment Building Standards (NEBS) Level 3 compliance

### SONET/SDH Compliance

- Standards-compliant SONET interface, including GR253, ITU G.707, and G.957 compliance
- Alarm processing
- Performance monitoring
- Error counts for B1, B2, B3
- Threshold crossing alarms (TCAs) for B1, B2, B3 with settable threshold
- Synchronization
- Local (internal) or loop timed (recovered from network)
- 4.3-ppm clock accuracy
- Protection switching—Support for SONET APS protocols as well as SDH MSP protocols
- Local (diagnostic) and line (network) loopback
- Payload mapping
- IETF RFC 1619 Point-to-Point Protocol (PPP) over SONET

### High-Availability Features

- Per-port SONET APS
- Per-port SDH MSP
- Online insertion and removal (OIR)
- Cisco IOS<sup>®</sup> Software Route Processor Redundancy Plus (RPR+)
- Cisco IOS Software Stateful Switchover (SSO) and Nonstop Forwarding (NSF)
- Alarms (SONET- and SDH-based alarms)

## Specifications

### Physical

- Full height; occupies a single chassis slot
- SC duplex connector
- Interface: single mode, short reach or long reach
- Hot-swappable, no slot dependency
- Weight: 4.75 lb (2.16 kg)
- Dimensions (H x W x D): 16.0 x 1.12 x 9.97 in (40.64 x 2.83 x 25.32 cm)



## **Environmental**

- Storage temperature: -38 to 150 F (-40 to 70 C)
- Operating temperature, nominal: 41 to 104 F (5 to 40 C)
- Operating temperature, short term: 23 to 131 F (-5 to 55 C)
- Storage relative humidity: 5 to 95% relative humidity (RH)
- Operating humidity, nominal: 5 to 85% RH
- Operating humidity, short term: 5 to 90% RH
- Operating altitude: -60 to 4000m

## Regulatory Compliance

### **Safety**

The line card meets the following safety standards:

- UL 60950/CAN/CSA-C22.2 No. 60950-00, third edition, dated December 1, 2000, with no deviation considered to be less stringent than IEC 60950
- EN 60950 with Amendments 1-4, for CE Marking to the LVD directive
- IEC 60950 third edition with Amendments 1-4, including all national/group deviations
- AS/NZS 60950:2000
- AS/NZS 3260-1993 with Amendments 1-4
- ACA TS001-1997

### **Laser Safety**

This line card meets the following laser safety standards:

- 21 CRF 1040, Subchapter J
  - EN60825-1
  - EN60825-2

### **Electromagnetic Emissions Certification**

- AS/NZ 3548: 1995 (including AMD I + II) Class B
- EN55022: 1998 Class B
- CISPR 22: 1997
- EN55022: 1994 (including AMD I + II)
- 47 CFR Part 15: 2000 (FCC) Class B
- VCCI V-3/01.4 Class 2
- CNS-13438: 1997 Class B
- GR1089: 1997 (including Rev. 1: 1999)



## Immunity

- EN300386: 2000-TNE EMC requirements; product family standard; high priority of service; central-office and non-central office locations
- EN50082-1: 1992/1997
- EN50082-2: 1995-Generic Immunity Standard, Heavy Industrial
- CISPR24: 1997
- EN55024: 1998-Generic ITE immunity standard
- EN61000-4-2: 1995 + AMD I + II ESD, Level 4/8 kV contact, 15 kV air
- IEC-1000-4-3: 1995+AMD 1-Radiated Immunity, 10 V/m
- IEC-1000-4-4: 1995-Electrical Fast Transients, Level 4/4 kV/B
- IEC-1000-4-5: 1995+AMD 1-DC surge-Class 3; AC surge-Class 4
- EN61000-4-6: 1996+AMD 1-RF conducted immunity, 10 Vrms
- EN61000-4-11: 1995-Voltage Dips and Sags
- ETS300 132-2: 1996+corregendum, Dec. 1996
- GR1089: 1997 (including Rev. 1: 1999)

## Network Equipment Building Standards

The line card meets the following NEBS:

- Level 3 compliant
- Telcordia SR-3580 Criteria Levels, issued 11/95
- GR-1089-CORE: Electromagnetic Compatibility & Electrical Safety, issued 2/99
- GR-63-CORE: Physical Protection Requirements, issued 4/02
- SBC Equipment Requirements: TP76200 MP and TP76400 MP
- Verizon Equipment Requirements: SIT.NEBS.TE.NPI.2002.010

## European Telecommunication Standards Institute

- ETS 300 386-1—Levels for equipment with a “high priority of service” that is installed in “locations other than telecommunication centers”
- ETS 300 386-2:1997—Levels for equipment with a “high priority of service” that is installed in “locations other than telecommunication centers”
- ETSI 300 132-2: December 1994—Power supply interfaces at the input to telecommunications equipment Sections 4.8 and 4.9

## LEDs

- FAIL (yellow, one per card—ON indicates a major failure has disabled the line card)
- ENABLE (green, one per card—ON indicates the port is enabled [administratively up] and operational)
- POS (green, one per card)—
  - ON indicates the line card is operating in POS mode
  - OFF indicates the line card is not operating in POS mode
  - SRP (green, one per card—OFF indicates SRP is not supported)



- Carrier Detect (CD) (green, one per card—ON indicates carrier is detected)
- TX (green, one per card—ON indicates packets are being transmitted)
- RX (green, one per card—ON indicates packets are being received)
- SYNC (green, one per card; currently not supported; SRP is supported in hardware)
- WRAP (yellow, one per card; currently not supported; SRP is supported in hardware)
- PASS THRU (yellow, one per card; currently not supported; SRP is supported in hardware)

### Encapsulation

- IETF RFC 1661, PPP
- IETF RFC 1662, PPP in High-Level Data Link Control (HDLC)-like Framing
- IETF RFC 1490, Frame Relay encapsulation

### Network Management

- Simple Network Management Protocol (SNMP)
- MIB-II RFC 1213
- SONET/SDH MIB RFC 1595

### Power Budget

- Component: OC-48/STM-16 POS line card
- Unit power: 62W

### Optical Power Budget

Connection Type	Transmit Wavelength, nm	Power Budget, dB	Transmit Power, dBm	Typical Span, km	Receive Power, dBm
OC-48 short reach (SR)	1310	7	-10 to -3	2	-18 to 0
OC-48 long reach (LR-2)	1550	24	-2 to +3	80	-28 to -9

## Product System Requirements and Compatibility

### Hardware Requirements

- Chassis—The line card is supported on the Cisco 10008.
- Performance routing engines (PREs)—The line card is supported on Processor Routing Engine 2s (PRE-2s) available on the Cisco 10000 Series.

### Software Requirements

The line card is supported in Cisco IOS Software Release 12.2(15)BZ and later releases. For information about releases that support the line card, refer to:

<http://www.cisco.com/cgi-bin/front.x/Support/HWSWmatrix/hswmatrix.cgi>

## Ordering Information

Part Number	Description
ESR1OC48/P/SRPSMS	1-port OC-48/STM-16 POS/SRP, single mode, short reach
ESR1OC48/P/SRPSMS=	1-port OC-48/STM-16 POS/SRP, single mode, short reach, spare
ESR1OC48/P/SRPSML	1-port OC-48/STM-16 POS/SRP, single mode, long reach
ESR1OC48/P/SRPSML=	1-port OC-48/STM-16 POS/SRP, single mode, long reach, spare

## Service and Support

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Corporate Headquarters  
Cisco Systems, Inc.  
170 West Tasman Drive  
San Jose, CA 95134-1706  
USA  
[www.cisco.com](http://www.cisco.com)  
Tel: 408 526-4000  
800 553-NETS (6387)  
Fax: 408 526-4100

European Headquarters  
Cisco Systems International BV  
Haarlerbergpark  
Haarlerbergweg 13-19  
1101 CH Amsterdam  
The Netherlands  
[www-europe.cisco.com](http://www-europe.cisco.com)  
Tel: 31 0 20 357 1000  
Fax: 31 0 20 357 1100

Americas Headquarters  
Cisco Systems, Inc.  
170 West Tasman Drive  
San Jose, CA 95134-1706  
USA  
[www.cisco.com](http://www.cisco.com)  
Tel: 408 526-7660  
Fax: 408 527-0883

Asia Pacific Headquarters  
Cisco Systems, Inc.  
Capital Tower  
168 Robinson Road  
#22-01 to #29-01  
Singapore 068912  
[www.cisco.com](http://www.cisco.com)  
Tel: +65 6317 7777  
Fax: +65 6317 7799

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