

## Packet-over-SONET Uplink with Enhanced Gigabit Ethernet Module for the Catalyst 8540 Platform

THE CATALYST® 8540 OC-12C/STM-4 PACKET-OVER-SONET UPLINK WITH ENHANCED GIGABIT ETHERNET MODULE IS IDEAL FOR SUPPORTING A HIGH-SPEED PACKET-OVER-SONET BACKBONE APPLICATIONS THAT REQUIRE NON-BLOCKING, WIRE-SPEED PERFORMANCE. THIS INTERFACE MODULE HAS ONE PACKET-OVER-SONET UPLINK PORT AND ONE ENHANCED GIGABIT ETHERNET PORT. THE PACKET-OVER-SONET UPLINK WITH ENHANCED GIGABIT ETHERNET MODULE IS SUPPORTED BY THE CATALYST 8540 PLATFORM, A HIGH-END MULTISERVICE SWITCH THAT ALLOWS CUSTOMERS TO HAVE INTEGRATED L3 AND ATM SWITCHING IN ONE HIGH-PERFORMANCE PLATFORM.



### Feature Support

The following features and capabilities are supported in the Packet-over-SONET Uplink with Enhanced Gigabit Ethernet Module.

Feature	Description
<b>Wirespeed Routing</b>	Wirespeed routing on both OC-12 Packet-over-SONET uplink and Enhanced Gigabit Ethernet port
<b>Built-in ACL</b>	Access Control List support on both Packet-over-SONET uplink and Enhanced Gigabit Ethernet ports
<b>Large Routing Table</b>	Up to 256K routing table entries
<b>QoS Capabilities</b>	Module developed with enhanced on-board processor to provide QoS capabilities
<b>Optics</b>	Single Mode Fiber Intermediate Reach and Single Mode Fiber Long Reach versions
<b>Cisco IOS</b>	Feature rich software for advanced networking applications

### Layer 3 Feature Summary

- Cisco Express Forwarding (CEF) for wire-speed forwarding for IP, IPX, and IP Multicast
- Load sharing (up to 6 equal cost paths)
- Multicast forwarding with up to 12,000 (S,G)
- Up to 256K routing entries
- Access Control List support:
  - Standard/Extended IP access lists (1-99;1301-1999/100-199;2000-2699) in hardware; both inbound and outbound
  - Standard IPX access lists (800-899) without source node; both inbound and outbound
  - Named access lists
  - Cisco IOS ACLs for control-plane traffic
- Multiprotocol Routing:
  - OSPF
  - EIGRP
  - BGPv4
  - RIP v1 and v2
- Maximum transfer unit (MTU): OC-12/STM-4 POS (9188 bytes); Gigabit Ethernet (1500 bytes)

- Internet Group Management Protocol (IGMP) and Cisco Group Management Protocol (CGMP) server
- Hot Standby Router Protocol (HSRP) for Gigabit Ethernet
- Cisco Discovery Protocol (CDP)

#### **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), Path Unequipped alarm (UNEQ-P)
  - 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) 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
- Local (diagnostic) and line (network) loopback
- Payload mapping
  - IETF RFC 2615, Point-to-Point Protocol (PPP) over SONET/SDH
  - $x^{43} + 1$  self-synchronous scrambler

#### **Gigabit Ethernet**

- Standards-compliant IEEE 802.3z interface
- Gigabit EtherChannel Support
- Modular GBIC Interface Support

#### **Layer 2**

##### Packet-over-SONET

- Transparent Bridging (PPP/HDLC encapsulation)

##### Gigabit Ethernet

- Transparent Bridging
- VLAN encapsulation: ISL;802.1Q
- IRB

#### **Operations and Management**

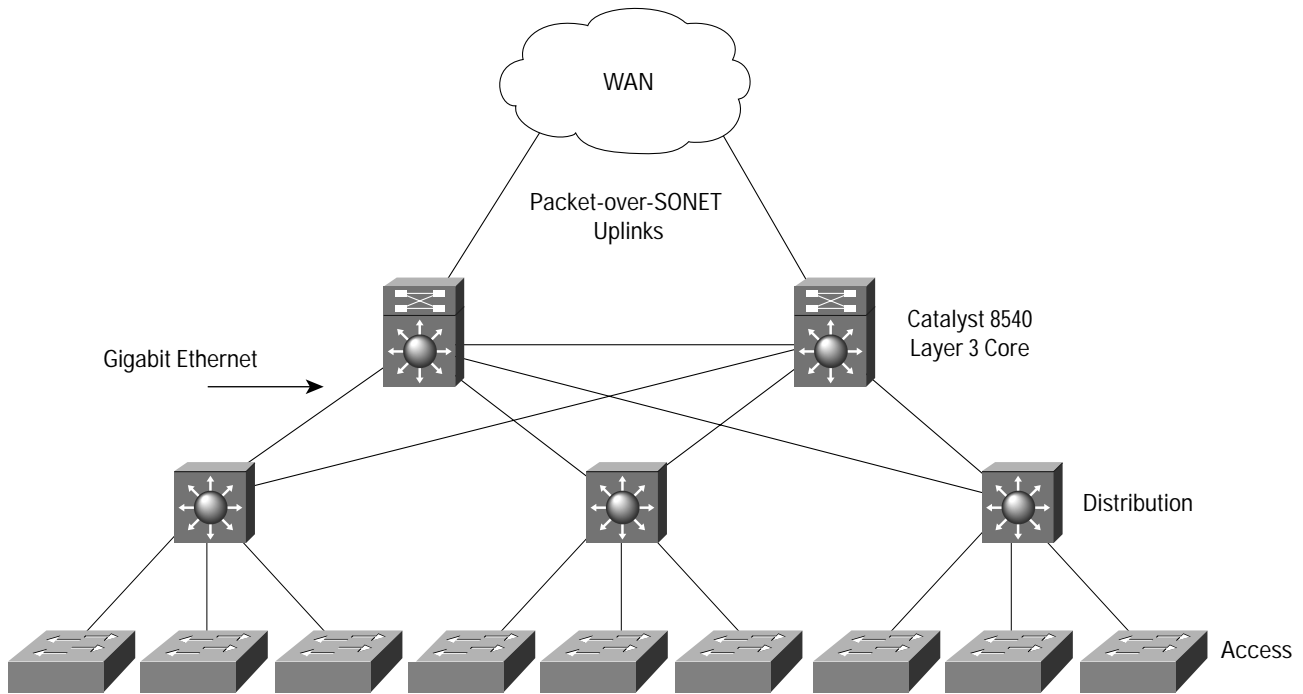
- Online Insertion and Removal (OIR)
- CiscoView
- Simple Network Management Protocol (SNMP)
- SONET MIB (RFC 1595)
- ETHERLIKE-MIB (RFC 1643)
- MIB II (RFC 1213)
- IF-MIB (RFC 1573)
- Bridge MIB (RFC 1493)
- CISCO-CDP-MIB
- ENTITY-MIB (RFC 2037)

#### **Applications**

The Packet-over-SONET Uplink with Enhanced Gigabit Ethernet Module is designed specifically to meet the demanding needs of large enterprise and service provider networks.

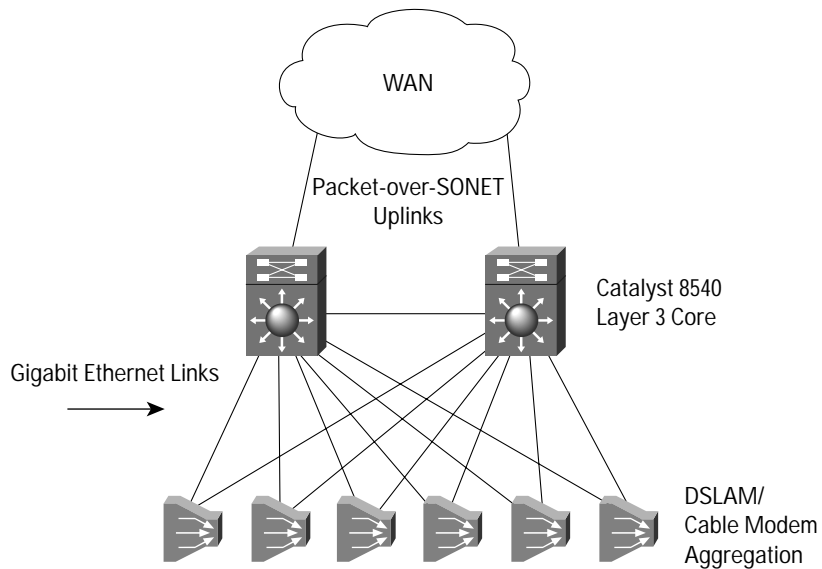
Up to eight of the Packet-over-SONET Uplink with Enhanced Gigabit Ethernet Modules may be placed in a Catalyst 8540 chassis, providing 8 ports of OC-12 Packet-over-SONET and 8 ports of nonblocking, wire-speed Gigabit Ethernet capacity in the core of an Enterprise network.

Figure 1 Enterprise Core Network



Service providers can use the Packet-over-SONET Uplink with Enhanced Gigabit Ethernet Module to aggregate Gigabit Ethernet traffic before it is sent out over an OC-12 Packet-over-SONET WAN uplink.

Figure 2 Service Provider Point-of-Presence



## Specifications

### Physical Specification

- Occupies one slot in the Catalyst 8540 platform
- Dimensions (H x W x D): 1.2 x 14.4 x 16.0 in.  
(3.0 x 36.6 x 40.6 cm)

### Standard Network Protocols

#### SONET/SDH:

- Telcordia (Bellcore GR-253 as applicable)
- ITU-T G.957 as applicable
- ITU-T G.707 as applicable

#### Gigabit Ethernet:

- Ethernet: IEEE 802.3z, IEEE 802.3x, 1000BaseX

### Encapsulation

#### SONET/SDH:

- IETF RFC 1661, PPP
- IETF RFC 1662, PPP in HDLC-like framing
- Cisco HDLC

### Safety Compliance

The Catalyst 8540 Packet-over-SONET Uplink with Enhanced Gigabit Ethernet Module, when installed in a system, complies with the following compliance and safety standards:

- UL 1950
- CSA C22.2 No.950
- EN 60825-1
- EN60950
- IEC 950
- IEC 60825-1
- TS 001
- CE marking
- AS/NZS 3260
- 21CFR1040
- Network Equipment Building Systems (NEBS) Level 3

### EMC Compliance

The Catalyst 8540 Packet-over-SONET Uplink with Enhanced Gigabit Ethernet Module, when installed in a system, complies with the following EMI standards:

- FCC Part 15 (CFR 47) Class A
- VCCI Class B
- EN55022 Class B
- CISPR 22 Class B
- CE marking
- AS/NZS 3548 Class B

### 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

### ETSI

- ETS-300386-2

### LED Indicators

#### Packet-over-SONET:

- Tx (transmit) activity: active (on), idle (off)
- Rx (receive) activity: active (on), idle (off)
- Alarm activity: active (on), idle (off)
- CD (carrier detect) activity: active (on), idle (off)

#### Gigabit Ethernet:

- OP-DET: optical signal detected (on), no signal (off)
- Full Duplex: full duplex mode (always on)
- RX-SYNC: link synchronized (on)
- Link: link active (on), link idle (off)
- Tx (transmit) activity: active (on), idle (off)
- Rx (receive) activity: active (on), idle (off)

### Interfaces

#### Packet-over-SONET:

- SC

#### Gigabit Ethernet:

- GBIC only

**Optical Power Budget Packet-over-SONET/SDH Catalyst 8540 OC-12/STM-4 Optics**

Parameter	SMF Intermediate Reach	SMF Long Reach
Line Rate	622 Mbps	622 Mbps
Connector Type	SC	SC
Launch Power (Max.)	-8 dBm	+2 dBm
Launch Power (Min.)	-15 dBm	-3 dBm
Receiver Power (Max.)	-8 dBm	-8 dBm
Receiver Power (Min.)	-28 dBm	-28 dBm
Optical Path Power Penalty	1 dB	1 dB
Power Budget	13 dB	25 dB
Maximum Distance <sup>1</sup>	15 km	40 km

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

**Maximum Station-to-Station Cabling Distance (Gigabit Ethernet)**

Using one of the following GBIC types:

- 1000BaseSX: 50-um multimode fiber: up to 550 m
- 1000BaseLX: 62.5-um multimode fiber: up to 550 m
- 1000BaseLX: 50-um multimode fiber: up to 550 m
- 1000BaseLX: 9/10-um single-mode fiber: up to 5 km
- 1000BaseLH: 62.5-um multimode fiber: up to 550 m
- 1000BaseLH: 50-um multimode fiber: up to 550 m
- 1000BaseLH: 9/10-um single-mode fiber: up to 10 km
- 1000BaseZX: 9/10-um single-mode fiber: up to 70 km
- 1000BaseZX: disposition-shifted fiber: up to 100 km

**Ordering Information**

**Required Software**

Platform		
Catalyst 8540 MSR	12.0(10)W5(18)	S854R2-12.0.10W or higher
Catalyst 8540 CSR	12.0(10)W5(18)	S854R3-12.0.10W or higher

**Product Availability and Part Numbers**

Part Number	Product Description	Availability
C85-POSOC12L-64K	C8540 1-port POS OC-12c/STM-4 SMF-IR with 1-port Enhanced Gigabit Ethernet 64K	Q2CY00
C85-POSOC12L-256K	C8540 1-port POS OC-12c/STM-4 SMF-IR with 1-port Enhanced Gigabit Ethernet 256K	Q2CY00
C85-POSOC12L-64K	C8540 1-port POS OC-12c/STM-4 SMF-LR with 1-port Enhanced Gigabit Ethernet 64K	Q2CY00
C85-POSOC12L-256K	C8540 1-port POS OC-12c/STM-4 SMF-LR with 1-port Enhanced Gigabit Ethernet 256K	Q2CY00

Note: The Gigabit Ethernet port on this interface module requires a GBIC (Gigabit Interface Converter). GBICs are sold separately from the Packet-over-SONET Uplink with Enhanced Gigabit Ethernet Module.

**GBIC Part Numbers**

Part Number	Product Description	Availability
WS-G5484	1000BaseSX "short-wavelength" GBIC (MMF only)	Now
WS-G5486	1000BaseLX/LH "long-wavelength/long-haul" GBIC (single mode or multimode)	Now
WS-G5487	1000BaseZX "extended-reach" GBIC (single mode)	Now

Note: The maximum number of 1000BaseZX GBICs in one Catalyst 8540 switch is limited to eight because of EMC compliance regulations.



**Corporate Headquarters**

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

**European Headquarters**

Cisco Systems Europe  
11, Rue Camille Desmoulins  
92782 Issy Les Moulineaux  
Cedex 9  
France  
<http://www-europe.cisco.com>  
Tel: 33 1 58 04 60 00  
Fax: 33 1 58 04 61 00

**Americas**

**Headquarters**  
Cisco Systems, Inc.  
170 West Tasman Drive  
San Jose, CA 95134-1706  
USA  
<http://www.cisco.com>  
Tel: 408 526-7660  
Fax: 408 527-0883

**Asia Headquarters**

Nihon Cisco Systems K.K.  
Fuji Building, 9th Floor  
3-2-3 Marunouchi  
Chiyoda-ku, Tokyo 100  
Japan  
<http://www.cisco.com>  
Tel: 81 3 5219 6250  
Fax: 81 3 5219 6001

**Cisco Systems has more than 200 offices in the following countries. Addresses, phone numbers, and fax numbers are listed on the Cisco Connection Online Web site at <http://www.cisco.com/go/offices>.**

Argentina • Australia • Austria • Belgium • Brazil • Canada • Chile • China • Colombia • Costa Rica • Croatia • Czech Republic • Denmark • Dubai, UAE Finland • France • Germany • Greece • Hong Kong • Hungary • India • Indonesia • Ireland • Israel • Italy • Japan • Korea • Luxembourg • Malaysia Mexico • The Netherlands • New Zealand • Norway • Peru • Philippines • Poland • Portugal • Puerto Rico • Romania • Russia • Saudi Arabia • Singapore Slovakia • Slovenia • South Africa • Spain • Sweden • Switzerland • Taiwan • Thailand • Turkey • Ukraine • United Kingdom • United States • Venezuela

Copyright © 2000, Cisco Systems, Inc. All rights reserved. Catalyst, Cisco, Cisco IOS, Cisco Systems, the Cisco Systems logo, and EtherChannel are registered trademarks of Cisco Systems, Inc. or its affiliates in the U.S. and certain other countries. All other trademarks mentioned in this document are the property of their respective owners. The use of the word partner does not imply a partnership relationship between Cisco and any of its resellers. (9912R) 04/00 LW