Cisco 1-Port Channelized STM-1/OC-3 Shared Port Adapter

The Cisco® I-Flex approach combines shared port adapters (SPAs) and SPA interface processors (SIPs), providing an extensible design that enables service prioritization for data, voice, and video services. Enterprise and service provider customers can take advantage of improved slot economics resulting from modular port adapters that are interchangeable across Cisco routing platforms. The Cisco I-Flex design maximizes connectivity options and offers superior service intelligence through programmable interface processors that deliver line-rate performance. Cisco I-Flex enhances speed-to-service revenue and provides a rich set of quality-of-service (QoS) features for premium service delivery while effectively reducing the overall cost of ownership. This data sheet contains the specifications for the Cisco 1-Port Channelized STM-1/OC3 SPA as shown in Figure 1.

Figure 1. Cisco 1-Port Channelized STM-1/OC-3 SPA

Product Overview

Today's successful businesses require more bandwidth and feature-rich services to maintain a competitive advantage. To serve these business customers better, service providers need scalable solutions that not only increase service agility and flexibility, but also reduce overall network complexity, the time required to provision new services, and the total cost of ownership.

The Cisco 1-Port Channelized STM-1/OC-3 SPA (Figure 1) addresses these needs by sharply reducing the amount of aggregation equipment and interconnectivity needed between edge and backbone routers. The SPA provides Cisco 6500 Switches, 7600 and 12000 Series Routers with support for T1/E1 aggregation. Designed for telcos and Internet service providers (ISPs), the SPA includes one OC-3/STM-1 port, which can be configured with multiple channels of nxT1, T1, fractional T1, or DS-0 in a SONET environment or nxE1, E1, fractional E1, or 64 kbps in an SDH environment.

When the SPA is configured in SDH framing mode, it is capable of supporting channelization into 63 independent E1 channels (VC-12 mapping). When configured for SONET framing mode, the SPA is capable of supporting channelization into 84 independent T1 channels (VT1.5 mapping or CT-3 mapping into STS-1).

Multilink Point-to-Point Protocol (MLPPP) is supported in hardware to enable link aggregation greater than T1. Up to 12 individual T1s can be combined within a multilink bundle that appears to be a single IP link. This allows service providers to provision greater-than-T1 bandwidth on an incremental basis, without requiring migration of the circuit and customer premises equipment (CPE) infrastructure to T3 facilities. A maximum of 42 multilink bundles can be configured on each SPA with at least two T1 links in each bundle.

The Cisco 1-Port Channelized STM-1/OC-3 SPA is hot-swappable and supports service-transparent online insertion and removal (OIR), allowing the SPA to be removed without impacting the carrier card and other SPAs.

Applications

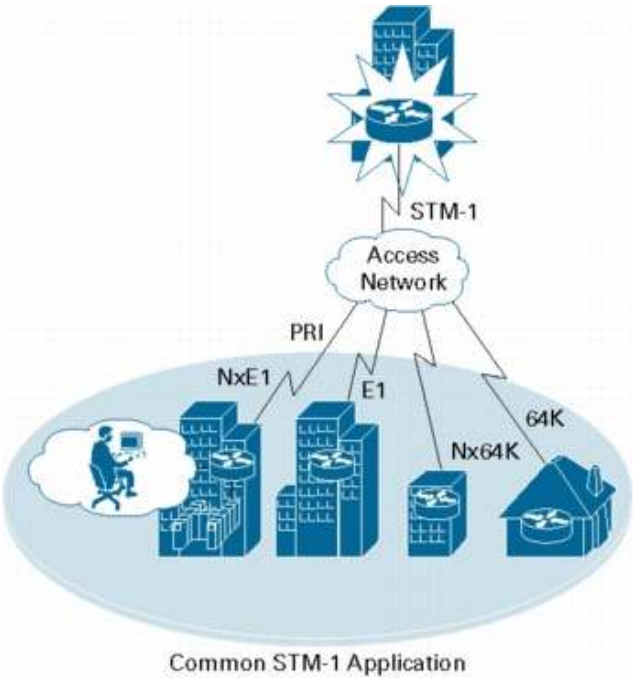
The 1-Port STM1/OC3 SPA enables customers to scale services by upgrading bandwidth from DS0/E1 to T3/E3 connections-all without any additional interfaces in their routers.

Service providers can use deployed SDH to provision both voice and data circuits all the way to the customer premises. The Cisco 1-Port Channelized STM-1/OC-3 SPA takes advantage of existing SDH infrastructure, significantly lowering provisioning costs in terms of transmission and routing equipment.

Service providers can connect multiple T1/E1 leased-line customers into one SPA, greatly reducing the amount of aggregation equipment and interconnectivity needed between edge and remote routers. The SPA also facilitates support of single-router (edge and backbone) POP architectures.

By supporting both Point-to-Point Protocol (PPP) and Frame Relay, the Cisco 1-Port Channelized STM-1/OC-3 SPA allows easy transition of connectivity from Frame Relay networks to direct IP leased-line grooming over SDH networks, thus simplifying the transition to high-bandwidth, full-feature aggregation solutions on Cisco 6500 Switches, 7600 and 12000 Series Routers.

Figure 2.



Common STM-1 Application

Key Features and Benefits

The Cisco 1-Port Channelized STM-1/OC-3 SPA offers many advantages, including:

- Support for channelized OC-3 to T1, channelized STM-1 to E1, clear channel T3/E3, subrate T3/E3, full-rate T1, clear channel E1, channelized T1/E1, and fractional T1/E1
- Up to 84 T1 (or 3 T3) ports, 63 E1 (or 3 E3) ports, or 1024 nxDS-0 channels
- Support for all major encapsulations including Multilink Point-to-Point Protocol (MLPPP) and Multilink Frame Relay (MLFR)
- Support for link fragmentation and interleaving (LFI) over Frame Relay (FRF.12) and MLPPP
- Support for both 1+1 SONET Automatic Protection Switching (APS) and SDH Linear Multiplexer Section Protection (MSP) protocols

Product Specifications

Table 1 lists the product specifications for the Cisco 1-Port Channelized STM-1/OC-3 SPA

Table 1. Product Specifications

Features	Descriptions
Product Compatibility	• Cisco Catalyst 6500 Series Switches • Cisco 7600 Series Routers • Cisco 12000 Series Routers • Cisco XR 12000 Series Routers • Cisco ASR 1000 Series Router • Cisco ASR9000 Series Router

Features	Descriptions
Protocols	Serial encapsulations: • High-Level Data Link Control (HDLC) • Point-to-Point Protocol (PPP), RFC 1662 • Frame Relay, RFC 1490 Multilink support (bundle limit dependent on number of links per bundle; maximum of 12 links per bundle): • Multilink PPP (MLPPP), RFC 1990 • Link fragmentation and interleaving (LFI) over Frame Relay (FRF.12) and MLPPP Networking protocols: • IPv4/IPv6
Cards/Ports/Slots	1 port
Connectivity	OC-3/STM-1 Small Form-Factor Pluggable (SFP) optics module (see optical parameters below)
Features and Functions	Up to 84 T1 (or 3 T3) or 63 E1 (or 3 E3) ports Up to 1022 nxDS-0 channels (where n is 1 to 24) with no T3 configured Up to 400 nxDS-0 channels (where n is 1 to 24) with one or more T3 configured Channelized OC-3 to T1, channelized STM-1 to E1, clear channel T3/E3, subrate T3/E3, full-rate T1, clear channel E1, and channelized T1/E1 supported **SONET multiplexing:** • OC-3 <-> STS-3 <-> STS-1 <-> VTG <-> VT1.5 <-> T1 <-> NxDS-0 • OC3 <-> STS-3 <-> STS-1 <-> T3 <-> T1 <-> NxDS-0 • OC3 <-> STS-3 <-> STS-1 <-> T3 • OC3 <-> STS-3 <-> STS-1 <-> T3 <-> E1 <-> NxDS-0 **SDH multiplexing:** • STM-1 <-> AUG <-> AU-4 <-> VC-4 <-> TUG-3 <-> TUG-2 <-> TU-12 <-> VC-12 <-> E1 <-> NxDS-0 • STM-1 <-> AUG <-> AU-4 <-> VC-4 <-> TUG-3 <-> TU-3 <-> VC-3 <-> T3/E3 • Internal or line-derived (loop) clocking, independently selectable on each T1 or E1 tributary **Loopback capabilities:** • Local and remote loopback at the T3/T1 level • Network loopback at the STM-1/OC-3, T3/E3, and T1/E1 levels • Respond to embedded loopback commands • Insertion of loopback commands into transmitted signal • Bit error rate testing (BERT) pattern generation and detection per channel • Programmable pseudorandom pattern up to 32 bits in length • T3/E3: all 0s, all 1s, 215, 220, 220 QRSS, 223, alternating 0s and 1s, 1-in-8, 3-in-24 • T1/E1: all 0s, all 1s, 211, 215, 220, 220 QRSS, 223, alternating 0s and 1s, 1-in-8, 3-in-24 • 32-bit error-count and bit-count registers • Detect test patterns with bit error rates up to 10-2 • 24-hour history maintained for error statistics and failure counts, at 15-minute intervals • 16- and 32-bit cyclic redundancy check (CRC); 16-bit default **SONET/SDH specific features:** • Compliance with G.707, G.783, G.784, G.957, G.958, GR-253 • Supported SONET/SDH alarm and signal events: ◦ 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 **Line** • Line Alarm Indication Signal (LAIS) • Line Remote Defect Indication (LRDI) • Line Remote Error Indication (LREI) • Error Counts for B2

Features	Descriptions
	Path • Path Alarm Indication Signal (PAIS) • Path Remote Defect Indication (PRDI) • Path Remote Error Indication (PREI) • Error Counts 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) **T3 specific features:** • Channelized T3 with 28 DS-1 lines or 21 E1 lines multiplexed into a T3 • Unchannelized T3 supporting subrate and scrambling formats for Digital Link, ADC/Kentrox, Larscom, Adtran, and Verilink DSUs • C-Bit or M23/M13 framing • Maintenance Data Link (MDL) • T3 Far-End Alarm and Control (FEAC) channel support • Alarm monitoring • Alarm Indication Signal (AIS) • Out of Frame (OOF) • Far-End Receive Failure (FERF) • Performance data collection: • Framing bit errors (FERR) (F- or M-bit errors) • P-bit error counts (path-parity errors) • C-bit error counts • Far-End Block error (FEBE) counts **E3 specific features:** • G.751 framing • Alarm monitoring • Alarm indication signal (AIS) • Out of Frame (OOF) • Far-End Receive Failure (FERF) • Performance data collection: • Framing pattern errors • BIP-8 error counts (path-parity errors) • Far-End Block Error (FEBE) counts • T1 specific features: • D4 Super Frame (SF) or Extended Super Frame (ESF) framing • ANSI T1.403 and AT&T TR 54016 Facility Data Link (FDL) support • Alarm monitoring • Alarm Indication Signal (AIS) • Out of Frame (OOF) • Far-End Alarm Failure (yellow or distant alarm) **Performance data collection:** • CRC/bit errors • Framing bit errors • Line errored seconds • Far-end errored seconds • Far-end severely errored seconds • Far-end unavailable seconds **E1 specific features:** • CRC4 or non-CRC4 framing in conformance with ITU-T G.703 and G.704 • Alarm monitoring • Alarm Indication Signal (AIS) • Out of Frame (OOF) • Remote alarm indication (RAI) • Performance data collection • CRC/bit errors • Framing bit errors • Far-End Block Error (FEBE)

Features	Descriptions
Reliability and Availability	Online insertion and removal (OIR) Field-replaceable SFP optics modules Support for both 1+1 SONET Automatic Protection Switching (APS) and SDH Linear Multiplexer Section Protection (MSP) protocols Single SPA software reset
MIBS	RFC 2558 MIB (SONET/SDH) RFC 2495 MIB (T1/E1) RFC 2496 MIB (T3/E3)
Network Management	Simple Network Management Protocol (SNMP)
Physical Specifications	Weight: 0.75 lbs (0.34 kg) Height: 0.8 inches (2.03 cm) Width: 6.75 inches (17.15 cm) Depth: 7.28 inches (18.49 cm)
Regulatory Compliance	CE marking Safety: UL/CSA/IEC/EN 60950-1, IEC/EN 60825 Laser Safety, AS/NZS 60950, FDA Code of Federal Regulations Laser Safety EMC: FCC Part 15 Class A, ICES 003 Class A, AS/NZS 3548 Class A, CISPR 22 Class B (up to 1GHz), EN55022 Class B (up to 1GHz), VCCI Class A, BSMI Class A, EN 300 386 Telecommunications Network Equipment (EMC), EN50082-1/EN61000-6-1 Generic Immunity Standard, EN55022 Information Technology Equipment (Emissions), EN55024 Information Technology Equipment (Immunity), IEC/EN61000-3-2 Power Line Harmonics, IEC/EN61000-3-3 Voltage Fluctuations and Flicker, IEC/EN61000-4-2 Electrostatic Discharge Immunity (8kV contact, 15kV air), IEC/EN61000-4-3 Radiated Immunity (10V/m), IEC/EN61000-4-4 Electrical Fast Transient Immunity (2kV power, 1kV signal), IEC/EN61000-4-5 Surge AC Port (4kV CM, 2kV DM), IEC/EN61000-4-5 Surge Signal Port (1kV), IEC/EN61000-4-5 Surge DC Port (1kV), IEC/EN61000-4-6 Immunity to Conducted Disturbances (10Vrms), IEC/EN61000-4-8 Power Frequency Magnetic Field Immunity (30A/m), IEC/EN61000-4-11 Voltage Dips, Short Interruptions, and Voltage Variations, GR-1089-CORE NEBS EMC and Safety, GR-63-CORE NEBS Physical Protection, SR-3580 NEBS Criteria Levels (Level 3) Telecom (OC3): GR-253 Telecom (STM-1): G.783, G.957
Environmental Specifications	Operating temperature: 41 to 104°F (5 to 40°C) Storage temperature: –38 to 150°F (–40 to 70°C) Operating humidity: 5 to 85% relative humidity Storage humidity: 5 to 95% relative humidity

Table 2. Optical Parameters

OC-3/STM-1 Transceiver Type	Transmit Power	Maximum Power to Receiver, dBm	Receiver Sensitivity, dBm	Attenuation Range, dB	Nominal Distance Between Stations
Multimode (MM) short reach	–20 dBm min. to –14 dBm max. at 1270 to 1380 nm	–8	–23	0 to 7	Up to 2 km
Single-mode short reach (SR)	–15 dBm min. to –8 dBm max. at 1260 to 1360 nm	–8	–23	0 to 7	Up to 2 km
Single-mode intermediate reach (IR-1)	–15 dBm min. to –8 dBm max. at 1261 to 1360 nm	–8	–28	0 to 12	Up to 15 km
Single-mode long reach (LR-1)	–5 dBm min. to 0 dBm max. at 1263 to 1360 nm	–10	–34	10 to 28	Up to 40 km
Single-mode long reach (LR-2)	–5 dBm min. to 0 dBm max. at 1480 to 1580 nm	–10	–34	10 to 28	Up to 80 km

Features Not Supported

The following features will not be supported:

- E3 multiplexing (channelized E3)

- MLPPP or MLFR with unequal speed links in a bundle or higher-speed links than a T1 in a bundle
- Loopbacks at nxDS-0 channel level
- Unchannelized STM-1/OC-3 Packet over SONET (POS)

Ordering Information

To place an order, visit the Cisco Ordering Home Page. Table 3 lists ordering information for the Cisco 1-Port Channelized STM-1/OC-3 SPA.

Table 3. Ordering Information

Product Name	Part Number
1-Port Channelized STM-1/OC-3 to DS-0 Shared Port Adapter	SPA-1XCHSTM1/OC3
OC-3/STM-1 SFP, Multimode Fiber, Short Reach	SFP-OC3-MM
OC-3/STM-1 SFP, Single-Mode Fiber, Short Reach	SFP-OC3-SR
OC-3/STM-1 SFP, Single-Mode Fiber, Intermediate Reach (IR-1)	SFP-OC3-IR1
OC-3/STM-1 SFP, Single-Mode Fiber, Long Reach (LR-1)	SFP-OC3-LR1
OC-3/STM-1 SFP, Single-Mode Fiber, Long Reach (LR-2)	SFP-OC3-LR2

Service and Support

Cisco offers a wide range of services programs to accelerate customer success. These innovative services programs are delivered through a unique combination of people, processes, tools, and partners, resulting in high levels of customer satisfaction. Cisco services help you to protect your network investment, optimize network operations, and prepare the network for new applications to extend network intelligence and the power of your business. For more information about Cisco Services, see Cisco Technical Support Services or Cisco Advanced Services.

For More Information

For more information about the Cisco 1-Port Channelized STM-1/OC-3 SPA, visit http://www.cisco.com/go/spa or contact your local account representative.

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