Cisco Gigabit Synchronous Ethernet Shared Port Adapter

The Cisco® Interface Flexibility (I-Flex) design combines shared port adapters (SPAs) and SPA interface processors (SIPs), taking advantage of an extensible design that helps enable service prioritization for voice, video, and data 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 2-Port Gigabit Synchronous Ethernet Shared Port Adapter (Figure 1).

Figure 1.   Cisco 2-Port Gigabit Synchronous Ethernet SPA

Product Overview

The Cisco 2-Port Gigabit Synchronous Ethernet SPA (SPA-2X1GE-SYNCE) is compatible with the Cisco 2-Port GigE SPA-v2 (SPA-2X1GE-V2) in terms of the supported capabilities. The Cisco 2-Port Gigabit Synchronous Ethernet SPA also provides additional services, such as time and frequency distribution across Ethernet networks using the following technologies:

- **Synchronous Ethernet (SyncE):** Defined by ITU-T standards such as G.8261, G.8262, G.8264, and G.781, this technology uses the PHY Ethernet layer to transmit frequency to remote sites. SyncE provides one-to-one parity with SONET/SDH networks for timing capability with the advantages of Ethernet networks. In comparison to SONET/SDH, Ethernet networks are indifferent to timing; only network elements and Ethernet interfaces along the synchronization path must support SyncE. According to the SyncE requirements, exchange of QL (Quality Level) over Ethernet Synchronization Messaging Channel (ESMC), as well as Synchronization Status Messages (SSMs) for SONET/SDH interfaces are supported.

- **IEEE Standard 1588-2008:** This standard specifies a protocol known as Precision Time Protocol Version 2 (PTPv2), which is designed to provide precise timing and synchronization over packet-based infrastructures. PTP uses packet communication to synchronize two IEEE 1588-2008 clocks.

Applications

Service providers need to deliver timing efficiently to cell sites, base stations, Node-Bs, access equipment, as well as pre-aggregation, aggregation, and time-division multiplexing (TDM) equipment in their networks. Packet networks, being nonsynchronous by nature, pose a challenge to service providers who plan migration to an all-packet architecture. The requirements of such service providers include:

- Synchronous Ethernet within Metro Ethernet networks, as an example, for Mobile Backhaul networks
- Circuit Emulation Service (TDM over pseudowires)
- Packet-based frequency delivery to base stations or TDM pseudowire nodes
- Precise time distribution for performance measurement with IP Service Level Agreements (SLAs) or EOAM (for example, ITU-T Y.1731)
- Precise phase distribution for TDD base stations

Service providers who have migrated to packet networks often use an external TDM circuit to provide timing to remote network elements. Such external TDM circuits are an expensive solution when there are many remote network elements that need timing, especially for mobile operators who have thousands of cell sites and for whom timing is crucial for the radio interface. The Cisco 2-Port Gigabit Synchronous Ethernet SPA with integrated synchronization capabilities deployed at such service providers will result in a simplified network topology and efficient device management of network elements.

Cisco 2-Port Gigabit Synchronous Ethernet SPAs work with multiple applications, including:

- Layer 1 clock frequency distribution: In this mode, the Cisco 2-Port Gigabit Synchronous Ethernet SPA can recover the received SyncE clock, synchronizing to a source traceable to PRC/PRS via ESMC/SSM, and use it to transmit physical layer frequency signals to the next node.
- Layer 2 and Layer 3 timing (time, phase, and frequency) are supported through IEEE 1588-2008 functions and protocol.
- External timing interfaces: These interfaces provide connections to external timing devices, such as Synchronization Supply Unit (SSU) or Building Integrated Timing Supply (BITS), and can be used as an input of a frequency clock source, or as an output to clean up accumulated wander on a system that receives clocking from the PHY layer.
- GPS timing interfaces: These interfaces can be used for external Global Navigation Satellite Systems (GNSSs) or LORAN receiver devices as an input reference and can be selected as output references for some other equipment (for example, a PON with OLT, DSLAM, multiservice node, or test equipment). The interfaces support:
  - Connections to external frequency, phase, and time sources
  - Translation of the received clock to IEEE 1588-2008 messages
  - Transmission to external equipment of recovered frequency, phase, and time

- IEEE 1588-2008 may be deployed in either Direct SPA mode (using the Gigabit Ethernet interfaces of the SPA) or Service SPA mode along with line cards (that is, using any other interface in the host equipment). The Cisco 2-Port Gigabit Synchronous Ethernet SPA supports the ordinary clock (either as primary or secondary) and boundary clock modes.
- Timing signal translation: This feature provides translation of physical-layer timing signals into PTP messages, or the reverse, allowing a mixture of the timing options in the same network, depending on remote-node timing support.

Key Features and Benefits

The Cisco 2-Port Gigabit Synchronous Ethernet SPAs are available on the Cisco 7600 Series Routers and offer benefits of network scalability with lower initial costs and ease of upgrades. The salient features of the SPA are as listed in Table 1.

Table 1.   Features and Benefits

Features and Functions	Description
Gigabit Ethernet	• Full-duplex operation (Auto-negotiation support shall be added in a Future Release) • 802.1Q VLAN termination • 802.1ad QinQ termination (stacked VLAN processing) • Jumbo Frames support (9188 bytes) • Support for command-line interface (CLI)-controlled online insertion and removal (OIR) • Bridge protocol data unit (BPDU), Cisco Discovery Protocol, and VLAN Trunking Protocol (VTP) filtering • Layer 2 Protocol (BPDU, Cisco Discovery Protocol, and VTP) Tunneling • Layer 2 access list (MAC address-based filtering) • Up to 8000 VLANs per SPA and subject to a limit of 4000 VLANs per port for 802.1q • Up to 5000 MAC accounting entries per SPA (source MAC accounting on the ingress, and destination MAC accounting on the egress) • Up to 2000 MAC address entries for destination MAC address filtering per SPA, and up to 1000 MAC address filtering entries per port • Per-port byte and packet counters for policy drops; oversubscription drops; cyclic redundancy check (CRC) error drops; packet sizes; and unicast, multicast, and broadcast packets • Per-VLAN byte and packet counters for policy drops; oversubscription drops; and unicast, multicast, and broadcast packets • Per-port byte counters for good bytes and dropped bytes
SyncE, IEEE1588–2008 and SSM/ESMC	• ITU-T G.8262 (Synchronous Ethernet Equipment Clock [EEC] and hybrid mode) • ITU-T G.781 (clock selection, SSM) • ITU-T G.8264 (SyncE, ESMC) • IEEE 1588-2008 (PTPv2 and clock functions) • GR-253-CORE (clock switchover) • GR-1244-CORE (holdover) • ITU-T G.811–813 (timing characteristics) • ITU-T G.823–825 (control of jitter and wander) • ITU-T G.8261 (control of jitter and wander, SyncE)

Product Specifications

Table 2 provides specifications for the Cisco 2-Port Gigabit Synchronous Ethernet SPA.

Table 2.   Product Specifications

Description	Specification
Product compatibility	Cisco 7600 Series Routers (on 7600-SIP-400) Cisco ASR 1000 Series Router (IEEE 1588-2008 not supported)
Port density per SPA	2 Gigabit Ethernet ports (usable in combination of Small Form-Factor Pluggable [SFP] ports for a total of 2 Gigabit Ethernet ports)

Physical interfaces	• Built-in RJ-45
	• Clock interfaces
	  ◦ Four DIN 1.0/2.3 interfaces
	  ◦ One mini-BNC interface
	• Two SFP Interfaces for Gigabit Ethernet and Synchronous Transport Module/Optical Carrier (STM/OC) SFPs
	The above interfaces support:
	• External timing interface (BITS) in/out (1944 kbps, 2048 kbps, 2048 kHz)
	• GPS 1PPS/10 MHz In/Out
	• GPS ToD (NTP format) in/out (on built-in RJ-45)
	ToD and 1 PPS OUT when SPA is configured in PTP secondary mode.

LED indicators	SPA status: Bicolored green and amber LEDs encode the SPA status as follows:
	• LED Off: SPA is powered off.
	• LED Green: SPA is powered on and operational.
	• LED Amber: SPA is powered on and initializing (or being configured).
	In addition to the status LED, the SPAs also have a bicolored, surface-mounted, right-angled LED dedicated to each port to indicate port status. The green and amber LEDs encode the port status as follows:
	• LED Off: Port is not enabled by software.
	• LED Green: Port is enabled by software, and there is a valid Ethernet link.
	• LED Amber: Port is enabled by software, but there is a problem with the Ethernet link.
	The Rx Synchronization Port LEDs encode the port status as follows:
	• LED Off: Port is not enabled by software.
	• LED Green: Port is enabled by software, and there is a valid synchronization signal coming in with an expected frequency.
	• LED Amber: Port is enabled by software and there is a problem with the synchronization signal, such as:
	  ◦ Loss of signal (LoS)
	  ◦ Loss of framing (LoF) for T1/E1 lines
	  ◦ Wrong incoming frequency
	The Tx Synchronization Port LEDs, encode the port status as follows:
	• LED Off: Port is not enabled by software.
	• LED Green: Port is enabled by software, and the source of the line is in a good state.
	• LED Amber: Port is enabled by software, but the source of the line is not available, and the output runs in holdover mode.

Description	Specification
Network management	Network management using: • Host-system CLI • Simple Network Management Protocol (SNMP) Inventory- and asset management-related MIBs: • Entity-MIB (RFC 2737) • Cisco-entity-asset-MIB Fault management: • Cisco-entity-field-replaceable unit (FRU)-control-MIB • Cisco-entity-alarm-MIB • Cisco-entity-sensor-MIB Physical interface management: • IF-MIB • Etherlike-MIB (RFC 2665) Other MIBs: • Remote Monitoring (RMON)-MIB (RFC 1757) • Cisco-class-based-QoS-MIB • MPLS-related MIBs • Ethernet MIB/RMON
Reliability and availability	OIR of the SPA within the SIP and the optics within the SPA Field-replaceable SFP optical modules
Physical specifications	Weight: 2 lb (0.91 kg) Height: 0.8 in. (2.03 cm) (single height) Width: 6.75 in. (17.15 cm) Depth: 7.28 in. (18.49 cm)
Power	19.5W
Environmental specifications	Storage temperature: –38 to 150°F (–40 to 70°C) Operating temperature, nominal: 32 to 104°F (0 to 40°C) Operating temperature, short term: 32 to 131°F (0 to 55°C) Storage relative humidity: 5 to 95% relative humidity Operating humidity, nominal: 5 to 85 percent relative humidity Operating humidity, short term: 5 to 90 percent relative humidity Operating altitude: –60 to 4000m

Description	Specification
Compliance and agency approvals	**Safety** • UL 60950-1 • CSA C22 No. 60950-1 • N 60950-1 • IEC 60950-1 • AS/NZS 60950 • EN 60825-1 • EN 60825-2 • 21 CRF 1040 **EMC** • FCC Part 15-Class A • ICES 003-Class A • CISPR 22 Class A • EN 55022 Class A • EN 300386 Class A • AS/NZS Class A • VCCI-Class A • EN 50082-1 • EN 55024 • IEC/EN61000-4-2 Electrostatic Discharge Immunity (8-kV contact, 15-kV air) • IEC/EN61000-4-3 Radiated Immunity (10 V/m) • IEC/EN61000-4-4 Electrical Fast Transient Immunity (2-kV power, 1-kV signal) • IEC/EN61000-4-5 Surge AC Port (4-kV CM, 2-kV DM) • IEC/EN61000-4-5 Surge Signal Port (1-kV indoor) • IEC/EN61000-4-5 Surge DC Port (1 kV) • IEC/EN61000-4-6 Immunity to Conducted Disturbances (10 Vrms) • IEC/EN61000-4-8 Power Frequency Magnetic Field Immunity (30 A/m) • IEC/EN61000-4-11 Voltage Dips, Short Interruptions, and Voltage Variations **Industry Standards** The Cisco 2-Port Gigabit Synchronous Ethernet SPAs are designed to meet the following requirements (some qualifications are currently in progress): • SR-3580 Network Equipment Building Standards (NEBS): criteria levels (Level 3 compliant) • GR-63-CORE-NEBS: Physical protection • GR-1089-CORE-NEBS: EMC and safety

Ordering Information

To place an order, visit the [Cisco Ordering Home Page](#) and refer to Table 3.

Table 3.   Ordering Information

Product Name	Part Number
Cisco 2-Port SyncE Gigabit Ethernet Shared Port Adapter	SPA-2X1GE-SYNCE
Cisco 2-Port SyncE Gigabit Ethernet Shared Port Adapter, Spare	SPA-2X1GE- SYNCE =
Cisco Extended Temperature SX SFP	SFP-GE-S
Cisco Extended Temperature SX SFP, Spare	SFP-GE-S=
Cisco Extended Temperature LX/LH SFP	SFP-GE-L
Cisco Extended Temperature LX/LH SFP, Spare	SFP-GE-L=
Cisco Extended Temperature ZX SFP	SFP-GE-Z
Cisco Extended Temperature ZX SFP, Spare	SFP-GE-Z=
Cisco DWDM optics	CWDM
Cisco CWDM optics	CWDM

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Printed in USA

C78-612423-03   1/14