Cisco XR 12000 and 12000 Series SPA Interface Processors

The Cisco® Interface Flexibility (I-Flex) design combines shared port adapters (SPAs) and SPA interface processors (SIPs) to help prioritize 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 Systems® routing platforms. The extensible 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 XR 12000 and 12000 Series SIPs (SIP 401, SIP 501, and SIP 601).

Figure 1. Cisco XR 12000 and 12000 Series SIP with the 8XFE-TX, 5X1GE, 2XOC48-POS/RPR, and 1XCHSTM1/OC-3 SPAs



The Cisco XR 12000 and 12000 Series SIP provides:

- A common forwarding and queuing engine responsible for packet classification, forwarding decisions, packet queuing, and accounting without compromising the performance—Each SIP has two forwarding engines, one for ingress and one for egress, allowing the user to implement multiple features and QoS policies at the incoming traffic, independently from the features and the QoS policies applied at the egress interfaces. The multicast replication is done by the egress forwarding engine, hence a very scalable multicast implementation with a native and built-in security and QoS features for multicast flows.
- A modular physical layer interface module (PLIM) front end with intelligent oversubscription that hosts up to four SPAs—Each SPA has a dedicated interface (2.5 or 10 Gbps) to the SPA controller. A fair bandwidth allocation algorithm shares available and excess bandwidth between the SPAs (the oversubscribed SPA does not cause any packet drop on the nonoversubscribed SPA, and any unused bandwidth from one SPA is used by the other SPA). The Cisco XR 12000 and 12000 Series SIP supports three types of SPAs: interface-specific SPAs, service-specific SPAs, and multiservice SPAs.
  - Interface-specific SPAs—Each of these SPAs is optimized for one media and one speed, providing a dense solution ranging from OC-192/STM-64 down to T1/E1 and DS-0, 10-Mb Ethernet, 100-Mb Fast Ethernet, 1 Gigabit, and 10 Gigabit Ethernet.

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- Service-specific SPAs—Each of these SPAs provides additional service processing to the processing power of the engine to offer specific services such as IP Security (IPsec).

- A SPA controller that is responsible for adapting the user traffic flowing between the SPA interfaces and the Layer 3 forwarding engine—The SPA controller provides the ability to prioritize traffic from the SPA into the engine, maintaining QoS behaviors even in oversubscribed configurations. Intelligent oversubscription of 2:1 is performed thanks to two hardware capabilities:
  - 8-MB buffers to absorb a large traffic burst, beyond 10 GB, without packet drops
  - Two priorities of queuing (high and low) to protect higher-priority traffic in case of congestion

Product Features

Table 1 describes the basic features on the Cisco XR 12000 and 12000 Series SIPs.

Table 1. Product Features

Feature	Description
Provider edge	• High number of IPv4, IPv6, Multiprotocol Label Switching (MPLS), and MPLS VPN unicast and multicast routes: up to 1 million IPv4/MPLS or 512,000 IPv6 route entries. • High-density Gigabit Ethernet aggregation capability with up to 20 Gigabit Ethernet ports per SIP with intelligent oversubscription • Building Integrated Timing Supply (BITS) • Layer 3 VPNs over MPLS (RFC 2547) and over IP (MPLS VPNs over Layer 2 Tunneling Protocol Version 3 [L2TPv3]) • Layer 2 VPNs over MPLS (Any Transport over MPLS [AToM]) and over IP L2TPv3)
Protocols	• Layer 3 routing protocols: Border Gateway Protocol Version 4 (BGPv4), Open Shortest Path First (OSPF), Intermediate System-to-Intermediate System (IS-IS), Enhanced Interior Gateway Routing Protocol (EIGRP), Routing Information Protocol (RIP), Distributed Forwarding Information Base (FIB) IP switching, Cisco Discovery Protocol, Internet Control Message Protocol (ICMP), Routing with Resource Reservation (RRR), and others • Hot Standby Router Protocol (HSRP) and Virtual Router Redundancy Protocol (VRRP) • Multicast forwarding with support for source and shared distribution trees and the following protocols: Protocol Independent Multicast-dense mode (PIM-DM); PIM-sparse mode (PIM-SM); Internet Group Management Protocol Versions 1 and 1 (IGMPv1/v2); Cisco Group Management Protocol (GMP); Multiprotocol Border Gateway Protocol (MBGP); Multicast Source Discovery Protocol (MSDP); and others • Comprehensive MPLS protocols such as LDP, RSVP-TE
Reliability and availability	• Online insertion and removal (OIR) enabling insertion and removal of line cards without affecting traffic • Multirouter automatic protection switching (MR-APS) • Layer 3 nonstop forwarding (NSF) and stateful switchover (SSO)
Network management	• Cisco IOS® Software and Cisco IOS XR Software command-line interface (CLI) • Simple Network Management Protocol (SNMP) Management Information Base (MIB)
Statistics and accounting	• Per-VLAN and source-destination MAC address filtering and accounting • Per-class accounting through Modular QoS CLI (MQC) MIB • Border Gateway Protocol (BGP) (source and destination) policy accounting • Input and output full NetFlow Version 8 in hardware • Input and output sampled NetFlow, Versions 5, 8, and 9 in hardware • Byte and packet counting per ingress port for IP and MPLS packets • Byte and packet counting per ingress port for IP and MPLS type-of-service (ToS) bits • Bytes and Packet counting for Modified Deficit Round Robin (MDRR) and Weighted Random Early Detection (WRED) functions • Packet and byte counting for committed-access-rate (CAR) feature • Counting per ingress port for IP prefixes and Cisco Express Forwarding adjacencies
Security	• Access control lists (ACLs) • Unicast Reverse Path Forwarding (URPF) • Filtering on source or destination IP addresses, on transport protocols, or at input or output interfaces

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Feature	Description
QoS	• Hierarchical traffic rate limiting, traffic shaping, and marking using committed access rate (CAR) or MQC • Traffic prioritization and congestion control through Modified Deficit Round Robin (MDRR), Weighted Random Early Detection (WRED), and Low-Latency Queuing (LLQ) • Dynamic queue allocation of 4096 input-shaped queues to any interface (or subinterface), regardless of encapsulation • Advanced queue allocation software providing the ability to dynamically map queues to both main interfaces as well as 802.1q Ethernet VLANs, Frame Relay subinterfaces, and ATM virtual circuits • Input queuing: 2048 unicast MDRR queues, 16 high-priority queues, 8 multicast queues, and 2 fabric priority queues • Output queuing: 8192 MDRR queues dynamically shared across all SPAs

Product Specifications

Table 2 provides specifications for the different Cisco XR 12000 and 12000 Series SIPs.

Table 2. Product Specifications

Interface	Forwarding Engine	Cisco IOS Software Release	Chassis Supported	Port Densities
SIP 401	Engine 5	12.0(32)S or higher	Cisco XR 12400 and 12400 Series Cisco XR 12800 and 12800 Series Cisco XR 12006, XR 12010, and 12006, and 12010	4 single-height SPAs 2 double-height SPAs; or a combination
SIP 501	Engine 5	12.0(32)S or higher	Cisco XR 12400 and 12400 Series Cisco XR 12800 and 12800 Series	4 single-height SPAs up to 2 half-rate SPAs; 2 double-height SPAs; or a combination
SIP 601	Engine 5	12.0(32)S or higher	Cisco XR 12400 and 12400 Series Cisco XR 12800 and 12800 Series	4 single-height SPAs up to 2 full-rate SPAs; 2 double-height SPAs; or a combination

Physical and Electrical Specifications

Table 3 provides details about the physical and electrical specifications of the different Cisco XR 12000 and 12000 Series SIPs.

Table 3. Physical and Electrical Specifications

Interface	Dimensions	Weight	Power	Memory
SIP 401	Height: 1.8 in. (4.57 cm) Depth: 20.62 in. (52.38 cm) Width: 16 in. (40.64 cm)	12.2 lb (5.53 kg) without SPAs 15.2 lb (6.89 kg) with 4 SPAs	240W (with 4 SPAs)	Route: 2 GB Packet: 512 MB
SIP 501	Height: 1.8 in. (4.57 cm) Depth: 20.62 in. (52.38 cm) Width: 16 in. (40.64 cm)	12.2 lb (5.53 kg) without SPAs 15.2 lb (6.89 kg) with 4 SPAs	240W (with 4 SPAs)	Route: 2 GB Packet: 512 MB
SIP 601	Height: 1.8 in. (4.57 cm) Depth: 20.62 in. (52.38 cm) Width: 16 in. (40.64 cm)	12.2 lb (5.53 kg) without SPAs 15.2 lb (6.89 kg) with 4 SPAs	240W (with 4 SPAs)	Route: 2 GB Packet: 512 MB

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Compatibility Matrix

Table 4 provides a compatibility matrix for the different Cisco XR 12000 and 12000 Series SIPs.

Table 4. Supported SPAs

SPA Part Number	SIP 401	SIP 501	SIP 601
SPA-8XCHT1/E1	✓	✓	✓
SPA-2XT3/E3	✓	✓	✓
SPA-4XT3/E3	✓	✓	✓
SPA-2XCT3/DS0	✓	✓	✓
SPA-4XCT3/DS0	✓	✓	✓
SPA-1XCHSTM1/OC3	✓	✓	✓
SPA-4XOC3-POS-V2	✓	✓	✓
SPA-8XOC3-POS	✓	✓	✓
SPA-2XOC12-POS	✓	✓	✓
SPA-4XOC12-POS	✓	✓	✓
SPA-8XOC12-POS	N/S	✓	✓
SPA-2XOC48POS/RPR	N/S	✓	✓
SPA-OC192POS-VSR	N/S	N/S	✓
SPA-OC192POS-LR	N/S	N/S	✓
SPA-OC192POS-XFP	N/S	N/S	✓
SPA-8XFE-TX	✓	✓	✓
SPA-2x1GE	✓	✓	✓
SPA-2X1GE-V2	✓	✓	✓
SPA-5X1GE	N/S	✓	✓
SPA-5X1GE-V2	N/S	✓	✓
SPA-8x1GE	N/S	N/S	✓
SPA-8x1GE-V2	N/S	N/S	✓
SPA-10X1GE	N/S	N/S	✓
SPA-10X1GE-V2	N/S	N/S	✓
SPA-1XTENGE-XFP	N/S	N/S	✓
SPA-1X10GE-L-V2	N/S	N/S	✓
SPA-IPSEC-2G-2	✓	✓	✓

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Environmental Information, Approvals, and Compliance

Table 5 gives standards-compliance information about the Cisco XR 12000 and 12000 Series SIPs.

Table 5. Compliance and Agency Approvals

Feature	Description
Environmental	• Operating temperature: 41 to 104℉ (5 to 40℃) • Storage temperature: –40 to 158℉ (–40 to 70℃) • Relative humidity: ◦ 5 to 85%, noncondensing, operating conditions ◦ Up to 90%, noncondensing, nonoperating conditions, not to exceed 0.024 kg of water per kg of dry air
Safety	• UL/CSA/IEC/EN 60950-1 • AS/NZS 60950
EMI	• FCC Part 15 Class A • ICES 003 Class A • AS/NZS 3548 Class A • CISPR 22 Class A • EN55022 Class A • VCCI Class A
Immunity (basic standards)	• IEC/EN61000-4-2 Electrostatic Discharge Immunity (8-kV contact, 15-V air) • IEC/EN61000-4-3 Radiated Immunity (10 V/m)
ETSI and EN	• EN 300 386 Telecommunications Network Equipment (EMC) • EN55022 Information Technology Equipment (Emissions) • EN55024 Information Technology Equipment (Immunity) • EN50082-1/EN61000-6-1 Generic Immunity Standard
Network Equipment Building Standards (NEBS)	• This product is designed to meet the following requirements: • GR-1089-CORE EMC and Safety • GR-63-CORE Physical Protection • SR-3580 NEBS Criteria Levels (Level 3)

Ordering Information

To place an order, contact your local Cisco representative or visit the ordering page on the Cisco Website. Use the ordering information in Table 6.

Table 6. Ordering Information

Product Part Number	Product Name
12000-SIP-401	Cisco XR 12000 and 12000 Series SPA Interface Processor-401
12000-SIP-401=	Cisco XR 12000 and 12000 Series SPA Interface Processor-401, spare
12000-SIP-501	Cisco XR 12000 and 12000 Series SPA Interface Processor-501
12000-SIP-501=	Cisco XR 12000 and 12000 Series SPA Interface Processor-501, spare
12000-SIP-601	Cisco XR 12000 and 12000 Series SPA Interface Processor-601
12000-SIP-601=	Cisco XR 12000 and 12000 Series SPA Interface Processor-601, spare

Note: Bezel extenders for the Cisco 12000 10-slot and 16-slot chassis are required to allow installation of front covers when 12000-SIP cards are inserted in these chassis. Bezel extender kits are available for the 10-slot chassis (part number ACS-10-BZLX2=) and for the 16-slot chassis (part number ACS-16-BZLX2=).

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For More Information

For more information about the Cisco XR 12000 and 12000 Series SIPs, contact your local Cisco representative or visit: http://www.cisco.com/go/12000.

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