



Q&A

Cisco XR 12000 and 12000 Series

Q. What is the Cisco® XR 12000 Series?

- A.** The Cisco XR 12000 Series routers accelerate the service provider evolution toward IP next-generation networks (NGNs), combining the unparalleled innovation of Cisco IOS® XR Software with the investment protection of the market-leading Cisco 12000 Series. Offering secure virtualization, continuous system operation, and multiservice scale, the Cisco XR 12000 Series provides intelligent routing solutions that scale from 2.5- to 10-Gbps capacity per slot, helping enable next-generation IP/Multiprotocol Label Switching (MPLS) networks.

Q. What is the IP NGN?

- A.** For Cisco Systems®, the IP NGN is a sweeping transformation of both a service provider's entire network and its business. This transformation does not end at a single point—service providers cannot simply buy an IP NGN. Like carriers' business and service plans, the IP NGN constantly evolves to adapt to customer demand and new technology opportunities. Nevertheless, it is still possible to give specifics about this transformation:
- The Cisco IP NGN is about more than voice; it encompasses all of a service provider's current and future services. It is important to recognize that most growth will occur in services such as data and video. Although voice services—in their current forms—will initially be a significant aspect of the service portfolio, they will evolve over time to richer, all-media services involving voice, video, and data.
 - The movement toward IP NGN involves the entire service provider network. It concerns not only the bandwidth in the access network, but also high-quality bandwidth delivered throughout the network.
 - The IP NGN is about more than making changes to one network—it is about creating a single network for delivering all services.

Q. What are the significant focal areas for service providers in implementing an IP NGN?

- A.** The Cisco IP NGN vision describes how it is possible to use a single network advantageously by using three layers of convergence—application convergence, service convergence, and network convergence:
- **Application convergence**—Carriers can integrate new IP data, voice, and video applications over a single broadband infrastructure for increased profitability. Application convergence opens the doors to “all-media services” such as videoconferencing, which is effectively a new service that is not simply voice, video, or data, but an integration of all three. This and other innovative value-added services can be delivered over any broadband connection. Service providers will have a range of new possibilities for revenue and portfolio differentiation.
 - **Service convergence**—The Cisco IP NGN makes a service available to end users across any access network. For example, a service available in the office can be available over a wireless LAN, a broadband connection, or a cellular network. All these access networks can transfer the service and the state of connection transparently as the user roams, using the most efficient and cost-effective means possible. This kind of “service agility” creates a stronger relationship between the carrier and end user and can help increase customer retention.
 - **Network convergence**—Creating a converged network is a goal that many carriers are already pursuing through their efforts to eliminate multiple service-specific networks or to reduce multiple layers within a network. A “many services, one network” model in which a single network can support all existing and new services will dramatically reduce the total cost of ownership for service providers.

Q. What is secure virtualization?

- A.** The Cisco XR 12000 Series is powered by Cisco IOS XR Software, which allows you to isolate public and private services through the virtualization of a single router into separate physical and logical partitions. Service providers can use secure virtualization to consolidate multiple IP overlay networks that were deployed to maintain specific services or network functions. Cisco IOS XR Software supports secure virtualization with the innovative Cisco Service Separation architecture, which provides the ability to logically and physically separate the control planes of different services on a single router. Services and customers are isolated from each other for maximum security and increased operational and management efficiency.

Q. What is a secure domain router (SDR)?

- A.** SDRs are components of the Cisco Service Separation architecture that provide independent physical routing instances within a single router system, resulting in secure, isolated fault and administrative services to allow service providers to safely consolidate multiple networks or services onto a single system. Virtualized SDRs establish isolated software routing instances within an SDR, providing independent configuration, administration, and routing processes. SDRs help operators reduce capital expenditures (CapEx) through asset consolidation, and reduce operating expenses (OpEx) through network and system consolidation.

Q. How does the Cisco XR 12000 support continuous system operation?

- A.** Cisco IOS XR Software has been optimized to operate in routing platforms, such as the Cisco CRS-1 Carrier Routing System and the Cisco XR 12000 Series, that can scale and distribute control-plane processing in addition to performing distributed forwarding. Cisco IOS XR Software is built on a distributed, microkernel-based operating system infrastructure that allows distribution of processes and subsystems to any of potentially thousands of processing resources, and includes critical optimizations to allow for the support of millions of routes, thousands of interfaces, and thousands of peers. Cisco IOS XR Software includes support for nonstop forwarding (NSF), stateful switchover (SSO), in-service software upgrades (ISSUs), control-plane data checkpointing, service separation, and embedded management elements that allow the Cisco CRS-1 and Cisco XR 12000 Series to provide continuous system operation required in converged IP NGNs.

Q. How does the Cisco XR 12000 offer multiservice scale?

- A.** With distributed processing intelligence, robust quality of service (QoS), and multicast mechanisms, the Cisco XR 12000 Series allows providers to scale both services and customers with predictable performance.
- Cisco IOS XR Software distributes processing intelligence to each Cisco IP Services Engine (ISE) line card and to additional route processors installed in the system. Distributed processing intelligence removes software limitations to system scale and allows network operators to take full advantage of the aggregate capacity of installed hardware in the system.
 - Dedicated queuing application-specific integrated circuits (ASICs) on each ISE line card provide unparalleled per-customer QoS that protects against jitter and delay of video and time-sensitive data and voice applications without affecting scale or performance. The dedicated ingress and egress queuing ASICs offer service providers great scalability and performance.
 - Multicast replication is handled by the fabric to avoid service-disrupting congestion associated with routing systems that replicate frames at the line-card level.

Q. What are the major components of the Cisco XR 12000 Series?

- A.** Built upon a foundation of investment protection, the Cisco XR 12000 Series provides fully upgradable, single-chassis platforms ranging from 2.5- to 10-Gbps capacity per slot. The Cisco XR 12000 Series gives you a graceful upgrade path for your installed base of market-leading Cisco 12000 Series routers as you transition toward a converged IP NGN infrastructure. The Cisco XR 12000 Router consists of the latest hardware advances of the Cisco 12000 Router, including the ISE line cards, the performance route processor (Cisco XR 12000 and 12000 Series Performance Route Processor-2 [PRP-2]), as well as the industry-proven chassis and multigigabit switch fabric. A proven hardware foundation is coupled with the company's latest addition to the Cisco IOS Software Family, Cisco IOS XR Software. This combination provides carrier-class scalability, high availability, and service flexibility required

by the demanding IP/MPLS NGNs. The Cisco XR 12000 provides the migration path for high-end routing systems already in service, including the world's most widely deployed carrier-class gigabit router, the Cisco 12000 Series.

Q. What is the relationship between the Cisco XR 12000 and the Cisco 12000?

- A.** The Cisco XR 12000 Series and Cisco 12000 Series routers are a portfolio of intelligent routing solutions that scale from 2.5- to 10-Gbps capacity per slot, helping enable carrier-class IP/MPLS networks and accelerating your company's evolution to IP NGNs. Currently more than 500 customers use an installed base of more than 25,000 Cisco 12000 Series routers with Cisco IOS Software. To meet the current and future needs of these customers, Cisco Systems® will continue to invest in Cisco IOS and Cisco IOS XR Software and in new hardware. The Cisco XR 12000 Series offers you a smooth upgrade path for your installed base of market-leading Cisco 12000 Series as you transition to a converged IP NGN infrastructure.

CISCO XR 12000 ORDERING INFORMATION

Q. How do I order a Cisco XR 12000?

- A.** There are no changes to the ordering procedure. Use the same ordering tools you use for other Cisco 12000 products.

Q. How do I verify the Cisco XR 12000 chassis configuration?

- A.** Use the dynamic configuration tool and enter the chassis part number at:
http://www.cisco.com/en/US/ordering/or13/or8/ordering_ordering_help_dynamic_configuration_tool_launch.html.

Q. What are the differences between the models in the Cisco XR 12000 and 12000 Series?

- A.** The Cisco XR 12000 and 12000 Series offers a broad range of chassis sizes and bandwidth capacity. Table 1 lists the different Cisco XR 12000 and 12000 Series chassis available.

Table 1. Available Cisco XR 12000 and 12000 Series Chassis

Product Specification	Cisco XR 12000 and 12000 Series 16-Slot Chassis	Cisco XR 12000 and 12000 Series 10-Slot Chassis	Cisco XR 12000 and 12000 Series 6-Slot Chassis	Cisco XR 12000 and 12000 Series 4-Slot Chassis
Slot capacity	16 slots	10 slots	6 slots	4 slots
Aggregate switching capacity	• Cisco 12016: 80 Gbps • Cisco 12416: 320 Gbps • Cisco 12816: 1280 Gbps	• Cisco 12010: 50 Gbps • Cisco 12410: 200 Gbps • Cisco 12810: 800 Gbps	• Cisco 12006: 30 Gbps • Cisco 12406: 120 Gbps	Cisco 12404: 80 Gbps
Full-duplex throughput per slot	• Cisco 12016: 2.5 Gbps/slot • Cisco 12416: 10 Gbps/slot • Cisco 12816: 40 Gbps/slot	• Cisco 12010: 2.5 Gbps/slot • Cisco 12410: 10 Gbps/slot • Cisco 12810: 40 Gbps/slot	• Cisco 12006: 2.5 Gbps/slot • Cisco 12406: 10 Gbps/slot	Cisco 12404: 10 Gbps/slot

Q. What chassis are supported for the Cisco XR 12000 in Cisco IOS XR Software Release 3.3?

- A.** Cisco IOS XR Software Release 3.3 supports the Cisco 12400 chassis variants. Specifically it supports the Cisco 12404, 12406, 12410, and 12416 Routers. Also supported in this release are the Cisco 12006, 12008, 12012, and 12016 chassis. Although the Cisco 12012 and 12008 chassis are no longer orderable, these chassis are supported in Release 3.2 to help the installed base migrate to Cisco IOS XR Software. Future support includes the Cisco 12800 (Cisco 12816 and 12810) chassis.

Q. What line cards are supported on the Cisco XR 12000?

- A.** The following list provides details about the supported line cards on the Cisco XR 12000:

Shared port adapters (SPAs) Interface Processor (SIP)

- SIP-600
- SIP-601
- SIP-501

- SIP-401

Shared port adapters (SPAs):

- 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
- SPA-2XOC48POS/RPR
- SPA-OC192POS-VSR
- SPA-OC192POS-LR
- SPA-OC192POS-XFP
- SPA-8XFE-TX
- SPA-2X1GE
- SPA-2X1GE-V2
- SPA-5X1GE
- SPA-5X1GE-V2
- SPA-10X1GE
- SPA-10X1GE-V2
- SPA-1XTENGE-XFP
- SPA-1X10GE-L-V2
- SPA-IPSEC-2G

PoS/SDH

- 4-port OC12 POS-I-SC
- 4-port OC12 POS-M-SC
- 1-port OC48 POS-LR-SC
- 1-port OC48 POS-SR-SC
- 16-port OC3 POS-I-LC
- 16-port OC3 POS-M-MJ
- 8-port OC3 POS-IR-LC
- 8- port OC3 POS-MM-MJ

- 4-port OC3 POS-IR-LC
- 4-port OC3 POS-LR-LC
- 4-port OC3 POS-MM-MJ-B

Gigabit Ethernet

- 4-port GE-SFP-LC

Services

- Packet services card for session border control
- SPA-IPSEC-2.5G

Note: The recommended route memory configuration for these cards is 1 GB.

Q. What SPAs are supported in the different SIPs?

A. Table 2 provides a compatibility matrix for the different Cisco XR 12000 and 12000 Series SIPs.

Table 2. Cisco XR 12000 and 12000 Series SIPs

SPA Part Number	SIP 401	SIP 501	SIP 601	SIP 600
SPA-8XCHT1/E1	✓	✓	✓	N/S
SPA-2XT3/E3	✓	✓	✓	N/S
SPA-4XT3/E3	✓	✓	✓	N/S
SPA-2XCT3/DS0	✓	✓	✓	N/S
SPA-4XCT3/DS0	✓	✓	✓	N/S
SPA-1XCHSTM1/OC3	✓	✓	✓	N/S
SPA-4XOC3-POS-V2	✓	✓	✓	N/S
SPA-8XOC3-POS	✓	✓	✓	N/S
SPA-2XOC12-POS	✓	✓	✓	N/S
SPA-4XOC12-POS	✓	✓	✓	N/S
SPA-8XOC12-POS	N/S	✓	✓	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	✓	✓	✓	N/S
SPA-2x1GE	✓	✓	✓	N/S
SPA-2X1GE-V2	✓	✓	✓	N/S
SPA-5X1GE	N/S	✓	✓	✓
SPA-10X1GE	N/S	N/S	✓	✓
SPA-1XTENGE-XFP	N/S	N/S	✓	✓
SPA-5X1GE-V2	N/S	✓	✓	✓
SPA-10X1GE-V2	N/S	N/S	✓	✓
SPA-1X10GE-L-V2	N/S	N/S	✓	✓

SPA-IPSEC-2.5G	✓	✓	✓	N/S
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Q. What is the recommended Cisco XR 12000 and 12000 Route Processor and hardware configuration?

- A.** Both PRP-1 and PRP-2 are supported on Cisco 12000 Series routers. The Cisco PRP-2 with at least 2 GB of memory is the recommended Cisco 1200 router processor for Cisco IOS XR Software.

Q. What is the service plan for the new Cisco XR 12000?

- A.** Cisco Technical Support Services have been extended to the Cisco XR 12000 Series. These services are positioned to deliver solutions that meet customers' needs today and support their transition to IP NGNs. Highlights include service pricing that addresses features, functions, and software capabilities in a nonlinear approach and competitive service pricing based on total cost of ownership for multiyear engagements.

CISCO IOS XR SOFTWARE

Q. What is Cisco IOS XR Software?

- A.** The newest member of the Cisco IOS Software Family, Cisco IOS XR Software is a distributed processing operating system that was developed to address the requirements for scalability, availability, and service flexibility that arise from the creation of converged IP NGNs that consolidate data, voice, and video services. Cisco IOS XR Software was specifically designed and optimized to operate in platforms that can scale and distribute processing as well as perform distributed forwarding, such as the Cisco CRS-1 and Cisco XR 12000 Series.

Q. Who will be the primary users of Cisco IOS XR Software?

- A.** Designed for the next generation of IP/MPLS-based networks, Cisco IOS XR Software has been optimized to meet the requirements of massive scalability up to 92 Tbps, continuous system operation, and exceptional service flexibility needed for converged IP NGNs.

Q. What is the Cisco IOS XR Software operating system architecture?

- A.** Cisco IOS XR Software is built on a preemptive, memory-protected, multitasking, microkernel-based operating system architecture that allows the process and thread distribution necessary to take advantage of the distributed processing, multi-CPU architecture found in the Cisco CRS-1 and the Cisco XR 12000 Series. In Cisco IOS XR Software, features can be loaded and unloaded dynamically; processes reside in their own protected memory space; they are restartable; and they communicate with each other through an advanced, reliable message-passing mechanism. Also, Cisco IOS XR Software implements a two-stage forwarding architecture where forwarding decisions are made on both the ingress and egress line cards.

Q. What is meant by "restartability"?

- A.** Restartability is an important component of Cisco IOS XR Software design for high availability. Given the highly modular software architecture, hundreds of processes make up Cisco IOS XR Software. If a software fault occurs in one of the active processes, the Cisco IOS XR Software automatically terminates only the offending process, reclaims all systems resources, and restarts the individual process without having to reboot the router. Processes can checkpoint operational state information to recover failed processes faster. Process restartability is the foundation used for software fault recovery for unplanned outages and process upgradability for planned or maintenance outages. All software processes are restartable.

Q. Is Cisco IOS XR Software the next-generation replacement for Cisco IOS Software?

- A.** No. Cisco IOS XR Software is the newest member of the Cisco IOS Software Family and is designed to support the unique distributed processing and forwarding architectures of the Cisco CRS-1 and Cisco XR 12000 in order to address the scalability, availability, and service flexibility requirements for IP NGNs. It is not a replacement for the other software members of the Cisco IOS Software Family.

Q. Does Cisco IOS XR Software use the same command-line interface (CLI) as Cisco IOS Software?

A. The Cisco IOS XR Software CLI is similar to that for Cisco IOS Software, but there are additional commands and variations in command syntax or semantics where necessary to account for the unique operating system infrastructure and capabilities of Cisco IOS XR Software.

Q. Can I upgrade from a Cisco 12000 Series router to a Cisco XR 12000 Series router?

A. Absolutely. Both the Cisco 12000 and Cisco XR 12000 Series routers are built upon a foundation of investment protection. Cisco IOS XR Software upgrade kits are available to help you migrate your current Cisco 12000 hardware and software. To learn more about upgrades, contact your local Cisco account representative.

Q. Can Cisco IOS XR Software and Cisco IOS Software interoperate in the same network?

A. Cisco took special care to preserve the interoperability from edge to edge in Cisco networks when the company introduced Cisco IOS XR Software as the newest member of the Cisco IOS Software Family. This common heritage of Cisco IOS Software technologies preserves, for yet another generation, Cisco end-to-end network capability that continues to be one of the major incentives for customers to choose Cisco as their single network vendor.

CISCO 12000 SERIES

Q. What is the Cisco 12000 Series?

A. For service providers that face the challenge of building IP networks to meet customer demand while increasing profitability, the Cisco 12000 Series offers the only portfolio 10-Gbps systems with the capacity, performance, service enablers, and operational efficiencies to build the most competitive IP networks. Elements of the Cisco 12000 Series include:

- An array of chassis options that fit your scaling and real-estate requirements
- A superior distributed architecture where important components are distributed across line cards, helping ensure higher performance and system availability
- An extensive portfolio of line cards and options such as redundant gigabit route processors and a 1:N redundant, modular switch fabric that delivers interface diversity, high performance, and high availability
- Industry-leading Cisco IOS Software to help enable the delivery of a comprehensive suite of software features that are needed to support today's networks and tomorrow's value-added services
- Cisco 12000 Router Manager to help customers deploy, configure, and manage Cisco 12000 Series products

Q. Which line cards are available for the Cisco 12000 Series?

A. The following list provides details about the supported line cards on Cisco 12000 Series:

SIP

- SPA Interface Processor-401 (SIP 401)
- SPA Interface Processor-501 (SIP 501)
- SPA Interface Processor-601 (SIP 601)
- SPA Interface Processor-600 (SIP 600)

Shared port adapters (SPAs)

- SPA-8XCHT1/E1
- SPA-2XT3/E3
- SPA-4XT3/E3
- SPA-2XCT3/DS0

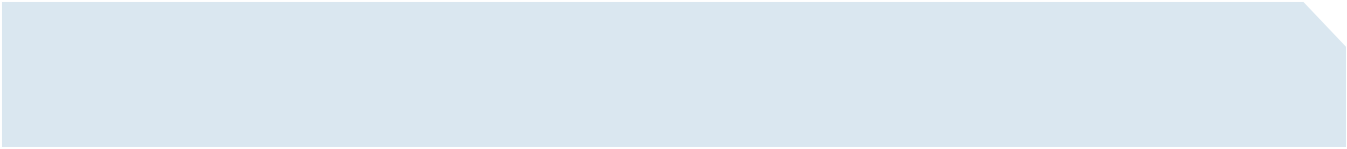
- SPA-4XCT3/DS0
- SPA-1XCHSTM1/OC3
- SPA-4XOC3-POS-V2
- SPA-8XOC3-POS
- SPA-2XOC12-POS
- SPA-4XOC12-POS
- SPA-8XOC12-POS
- SPA-2XOC48POS/RPR
- SPA-OC192POS-VSR
- SPA-OC192POS-LR
- SPA-OC192POS-XFP
- SPA-8XFE-TX
- SPA-2X1GE
- SPA-2X1GE-V2
- SPA-5X1GE
- SPA-5X1GE-V2
- SPA-10X1GE
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- SPA-1XTENGE-XFP
- SPA-1X10GE-L-V2
- SPA-IPSEC-2G

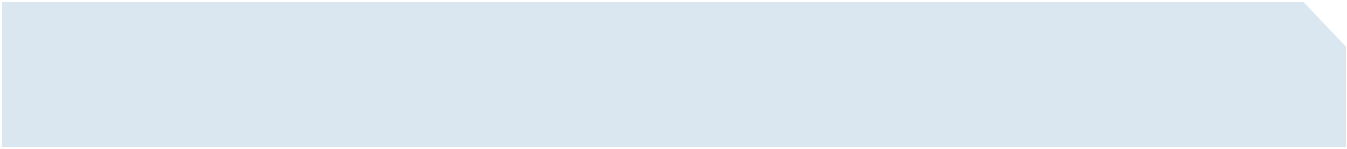
PoS/SDH

- 1-port OC-48c/STM-16c Packet over SONET/SDH (PoS) ISE line card
- 4-port OC-12c/STM-4c PoS ISE line card
- 16-, 8-, and 4-port OC-3c/STM-1c PoS ISE line cards
- 1-port OC-192c/STM-64c PoS S line card
- 4-port OC-48c/STM-16c PoS S line card
- 2-port OC-192c/STM-64c PoS line card
- 8-port OC-48c/STM-16c PoS line card
- 1-port OC-12c/STM-4c PoS line card
- 8- and 16-port OC-3/STM-1 PoS line cards

Gigabit Ethernet

- 4-port Gigabit Ethernet ISE line card
- Modular Gigabit Ethernet line card
- 1-port 10-Gigabit Ethernet line card
- Fast Ethernet

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- 8-port Fast Ethernet line card



Channelized

- 1-port Channelized OC-48/STM-16 PoS ISE line card
- 4-port Channelized OC-12/STM-4 PoS ISE line card
- 1-port Channelized OC-12/STM-4 (DS-1/E1) ISE line card

ATM

- 4-port OC-12c/STM-4c ATM ISE line card
- 4-port OC-3c/STM-1c ATM ISE line card

TDM

- 6- and 12-port DS-3 line cards
- 6- and 12-port E3 line cards

DPT

- 4-port OC-12/STM-4 DPT ISE line card
- 4-port OC-48c/STM-16c DPT line card
- 1-port OC-192c/STM-64c DPT line card



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