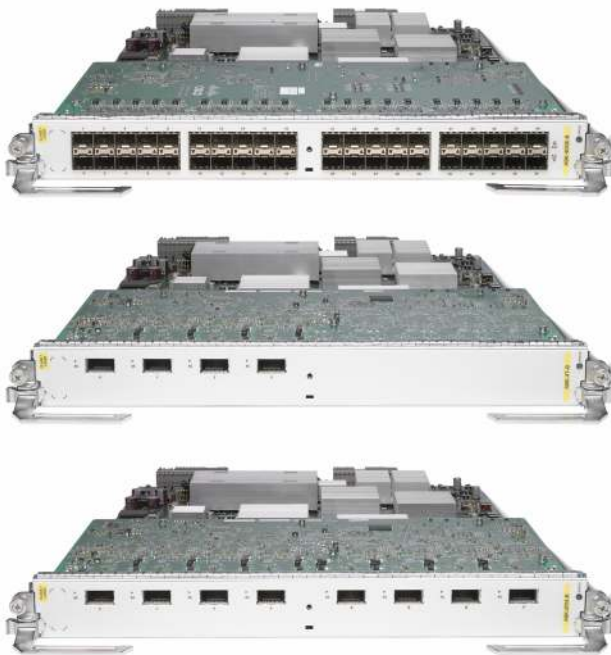


Cisco ASR 9000 Series Ethernet Line Cards

Product Overview

The Cisco® ASR 9000 Series Ethernet Line Cards are the latest generation of service provider focused Carrier Ethernet line cards from Cisco. These line cards deliver economical, scalable, highly available, line-rate Ethernet and IP services. The Cisco ASR 9000 Series Line Cards together with the Cisco ASR 9000 Series platforms are designed to provide the fundamental infrastructure for scalable Carrier Ethernet networks, enabling profitable business, residential, and mobile services (Figure 1).

Figure 1. Cisco ASR 9000 Series Ethernet Line Cards: 40-Port Gigabit Ethernet, 4-Port 10 Gigabit Ethernet, and 8-Port 10 Gigabit Ethernet



Features and Benefits

Each Cisco ASR 9000 Series Ethernet Line Card provides both dense hierarchical QoS and simultaneous support for both Layer 2 and Layer 3 services and features, enabling operators to qualify and stock a single line card that can be deployed in any combination of Layer 2 and Layer 3 service applications, thereby reducing capital expenditures (CapEx) and operating expenses (OpEx), as well as reducing the time required to develop and deploy new services. With up to 384k queues, 32,000 interfaces, 1 million routes, 1 million MAC addresses, and 20,000 VPNs, the Cisco ASR 9000 Series Ethernet Line Cards set a new standard for service density, enabling operators to offer predictable, managed transport services while optimizing the use of network assets. With its synchronization circuitry and dedicated backplane timing traces for accessing the route switch processor's (RSP's) Stratum-3 subsystem, the Cisco ASR 9000 Ethernet Line Cards provide standards-based line-interface functions for delivering and deriving transport-class network timing, enabling support of network-synchronized services and applications such as mobile backhaul and time-division multiplexing (TDM) migration. Recognizing that real-time media dominate next-generation services, Cisco has integrated media-monitoring technology into the Cisco ASR 9000 Ethernet Line

Cards. This multimedia technology enables real-time standards-based monitoring and statistics collection of real-time video and voice flows, enabling proactive maintenance and management of today's media-rich services.

Table 1 lists the features and benefits of the Cisco ASR 9000 Series Line Cards.

Table 1. Features and Benefits¹ of Cisco ASR 9000 Series Line Cards

Feature	Benefit
Portfolio	
40-port Gigabit Ethernet	40-port 100/1000Mbps, Small Form-Factor Pluggable (SFP)-based line card
4-port 10 Gigabit Ethernet	4-port 10Gbps, XFP-based line card
8-port 10 Gigabit Ethernet	8-port 10Gbps, XFP-based line card
Interface Support	
Mixed fiber and electrical	Short reach (SR), intermediate reach (IR), long reach (LR), coarse wavelength-division multiplexing (CWDM), dense wavelength-division multiplexing (DWDM), and 100/1000BASE-T
Scalable and Integrated Multiservice Support	
Layer 2 and Layer 3 services	Combined IP, Multiprotocol Label Switching (MPLS), Ethernet, Layer 2 VPN (L2VPN), and Layer 3 VPN (L3VPN) services
Service density	Up to 32,000 Layer 2 and Layer 3 services interfaces and 384k queues
Routes and MACs	Up to 1 million IPv4 routes and 1 million IEEE MAC addresses
VPNs	Up to 16,000 L2VPNs and 4,000 L3VPNs
(R)Evolutionary Monitoring	
Carrier-class operations, administration, and maintenance (OA&M)	802.1ag, 802.3ah, Y.1731, IP service-level agreement (IP SLA), virtual circuit connectivity verification (VCCV), ping, and traceroute
Multimedia monitoring	Standard-based loss and jitter statistics of media (for example, voice and video) flows
Carrier-Grade OS	
Cisco IOS® XR Software	Modular, patchable, restartable, scalable, highly available, carrier-core and edge proven operating system
T-Class Synchronization	
Synchronization	Derive and provide synchronization from and to Ethernet interfaces, Cisco ASR 9000 Route Switch Processor (RSP), and network synchronization interfaces
Pluggable	Description
XFPs	
XFP-10GLR-OC192SR=	Multirate 10GBASE-LR and OC-192/STM-64 SR-1 XFP, SMF
XFP-10GZR-OC192LR=	Multirate 10GBASE-ZR and OC-192/STM-64 LR-2 XFP, SMF
XFP-10GER-192IR+=	Multirate 10GBASE-ER and OC-192/STM-64 IR-2 XFP, SMF
XFP-10G-MM-SR=	Multirate 10GBASE-SR XFP, MMF
DWDM	ITU standard, 100-GHz spacing
SFPs	
SFP-GE-S=	1000BASE-SX SFP (digital optical monitoring [DOM]), multimode fabric (MMF), 550m and 220m
SFP-GE-L=	1000BASE-LX/LH SFP (DOM), SMF 10 km, MMF, 550m
SFP-GE-Z=	1000BASE-ZX Gigabit Ethernet SFP (DOM), SMF, 70 km
GLC-BX-D=	1000BASE-BX SFP, 1490NM
GLC-BX-U=	1000BASE-BX SFP, 1310NM
SFP-GE-T=	1000BASE-T SFP (Network Equipment Building Standards [NEBS] 3), unshielded twisted pair (UTP), 100m
GLC-GE-100FX=	100BASE-FX SFP, MMF, 2 km
DWDM	ITU standard, 100-GHz spacing
CWDM	CWDM

¹ Specific feature and scale support is software dependent.

Extended Line Cards

Each Cisco ASR 9000 Series Line Card is available in both base and extended versions. The extended version of the line card provides typically twice the service interface scale, and approximately three times the queue density scale of the base line card.

Advanced IP Service License

The Cisco ASR 9000 Series Line Cards can be optimized for IP service delivery with the addition of an Advanced IP Service software license. This optional line-card software license optimizes the forwarding plane for IP service delivery, including support for higher-scale L3VPNs.

Product Specifications

Table 2 provides product specifications.

Table 2. Product Specifications²

Description	Specification
Cisco IOS XR Software support	<ul style="list-style-type: none"> • Modular software design: Cisco IOS XR Software is a continuation of the Cisco networking leadership in helping customers realize the power of their networks and the Internet. The software provides exceptional routing-system scalability, high availability, service isolation, and manageability to meet the mission-critical requirements of next-generation networks. • Operating system infrastructure protection: Cisco IOS XR Software provides a microkernel architecture that forces all but the most critical functions, such as memory management and thread distribution, outside of the kernel. This setup prevents failures in applications, file systems, and even device drivers from causing widespread service disruption. • Process and thread protection: Each process -- even individual process threads -- are executed in its own protected memory space, and communications between processes are accomplished through well-defined, secure, and version-controlled application programming interfaces (APIs). This setup significantly minimizes the effect that any process failure can have on other processes. • Cisco In Service Software Upgrade (ISSU): Cisco IOS XR Software release modularity sustains system availability during installation of a software upgrade. ISSUs or hitless software upgrades (HSUs) allow most Cisco ASR 9000 software features to be upgraded with little or no effect on deployed services. Operators may target particular system components for upgrades based on software packages or composites that group selected features. Cisco preconfigures and tests these packages and composites to help ensure system compatibility. • Process restart: The line cards offer the ability to restart critical control-plane processes both manually and automatically in response to a process failure vs. restarting the entire operating system. This feature helps to support the Cisco IOS XR Software goal of continuous system availability and allows for quick recovery from process or protocol failures with minimal disruption to customers or traffic. • State checkpointing: The line cards offer the ability to maintain a memory and critical operating state across process restarts so that routing adjacencies and signaling state can be maintained during an RSP switchover.
Flexible Ethernet services	<ul style="list-style-type: none"> • Ethernet virtual connections (EVCs): Ethernet services are supported using individual EVCs to carry traffic belonging to a specific service type or end user through the network. EVC-based services can be used in conjunction with MPLS-based L2VPNs and native Ethernet switching deployments. • Flexible VLAN classification: VLAN classification into Ethernet flow points (EFPs) includes single-tagged VLANs, double-tagged VLANs (QinQ and 802.1ad), contiguous VLAN ranges, and noncontiguous VLAN lists. • IEEE Bridging: The line cards support native bridging based on IEEE 802.1Q, IEEE 802.1ad, and QinQ VLAN encapsulation mechanisms. • IEEE 802.1s Multiple Spanning Tree (MST): MST extends the 802.1w Rapid Spanning Tree Protocol (MSTP) to multiple spanning trees, providing rapid convergence and load balancing. • MST Access Gateway: The MST Access Gateway provides a resilient, fast-convergence mechanism for aggregating and connecting to Ethernet-based access rings.

² Specific feature and scale support is software dependent.

Description	Specification
L2VPN services	<ul style="list-style-type: none"> • Virtual Private LAN Services (VPLS): These services are included in a class of VPN that supports the connection of multiple sites in a single bridged domain over a managed IP/MPLS network. VPLS presents an Ethernet interface to customers, simplifying the LAN and WAN boundary for service providers and customers, and enabling rapid and flexible service provisioning, because the service bandwidth is not tied to the physical interface. All services in a VPLS appear to be on the same LAN, regardless of location. • Hierarchical VPLS (H-VPLS): H-VPLS provides a level of hierarchy at the edge of the VPLS network for increased scale. Two options of H-VPLS are supported: QinQ access and Ethernet over MPLS (pseudowire) access. • Virtual Private Wire Service (VPWS) with Ethernet over MPLS (EoMPLS): EoMPLS transports Ethernet frames across an MPLS core using pseudowires. Individual EFPs or traffic from an entire port can be transported over the MPLS backbone using pseudowires to an egress interface or subinterface. • Pseudowire redundancy: Pseudowire redundancy supports the definition of a backup pseudowire to protect a primary pseudowire that fails. • Multisegment pseudowire stitching: Multisegment pseudowire stitching is a method for interworking two pseudowires together to form a cross-connect relationship.
Multicast	<ul style="list-style-type: none"> • IPv4 Multicast: The line cards support Internet Group Management Protocol Versions 2 and 3 (IGMPv2 and v3), Protocol Independent Multicast Source Specific Multicast (PIM-SSM), PIM sparse mode (PIM-SM), PIM SSM Mapping, Multicast Source Discovery Protocol (MSDP), and Anycast rendezvous point (RP). • IGMP v2 and v3 snooping: This Layer 2 mechanism efficiently tracks multicast membership on an L2VPN network. Individual IGMP joins are snooped at the VLAN level or pseudowire level and then results are summarized into a single upstream join message. In residential broadband deployments, this scenario enables the network to send only channels that are being watched to the downstream users.
OA&M	<ul style="list-style-type: none"> • Ethernet OA&M (IEEE 802.3ah): Ethernet link layer OA&M is a vital component of EOA&M that provides physical-link OA&M to monitor link health and assist in fault isolation. Along with 802.1ag, Ethernet link layer OA&M can be used to assist in rapid link-failure detection and signaling to remote end nodes of a local failure. • Ethernet OA&M (IEEE 802.1ag): Ethernet Connectivity Fault Management (E-CFM) is a subset of EOA&M that provides numerous protocols and procedures that allow discovery and verification of the path through 802.1 bridges and LANs. • MPLS OA&M: The line cards support label switched path (LSP) ping, LSP traceroute, and VCCV.
Layer 3 routing	<ul style="list-style-type: none"> • IPv4 routing: Cisco IOS XR Software supports a wide range of IPv4 services and routing protocols, including Border Gateway Protocol (BGP), Intermediate System-to-Intermediate System (IS-IS), Open Shortest Path First (OSPF), static, IPv4 Multicast, Routing Policy Language (RPL), and Hot Standby Router Protocol (HSRP)/Virtual Router Redundancy Protocol (VRRP) features. • IPv6 routing: Cisco IOS XR Software supports IPv6 services, including OSPFv3 and static routing. • BGP Prefix Independent Convergence (PIC): BGP PIC provides the ability to converge BGP routes using the fast-convergence innovation that is unique to Cisco IOS XR Software.
MPLS L3VPN	<ul style="list-style-type: none"> • MPLS L3VPN: The IP VPN feature for MPLS allows a Cisco IOS Software or Cisco IOS XR Software network to deploy scalable IPv4 Layer 3 VPN backbone services. An IP VPN is the foundation that companies use for deploying or administering value-added services, including applications and data-hosting network commerce, and telephony services to business customers. • Carrier supporting carrier (CSC): CSC allows an MPLS VPN service provider to connect geographically isolated sites using another backbone service provider and still maintain a private address space for its customer VPNs. CSC is implemented as defined by IETF RFC 4364.
MPLS Traffic Engineering (TE)	<ul style="list-style-type: none"> • MPLS TE: Cisco IOS XR Software supports MPLS protocols such as Traffic Engineering/Fast Reroute (TE-FRR), Resource Reservation Protocol (RSVP), Label Distribution Protocol (LDP), and Targeted Label Distribution Protocol (T-LDP). • MPLS TE Preferred Path: Preferred tunnel path functions let you map pseudowires to specific traffic engineering tunnels. Attachment circuits are cross-connected to specific MPLS TE tunnel interfaces instead of remote provider-edge router IP addresses (reachable using Interior Gateway Protocol [IGP] or LDP).
High availability	<ul style="list-style-type: none"> • MPLS TE-FRR: MPLS TE-FRR delivers Layer 3 protection switching for networks currently configured with MPLS LSP. MPLS TE-FRR provides temporary rerouting around a failed link or node. • Bidirectional Forwarding Detection (BFD): BFD is a detection protocol that is designed to provide fast-forwarding path-failure detection times for all media types, encapsulations, topologies, and routing protocols. • 802.3ad Link Aggregation Bundles: The line cards support a bundle of multiple links to provide added resiliency and the ability to load balance traffic over multiple member links.
Manageability	<ul style="list-style-type: none"> • Cisco IOS XR Software manageability: This feature provides industry-standard management interfaces, including modular command-line interface (CLI), Simple Network Management Protocol (SNMP), and native XML interfaces. • Cisco Active Network Abstraction (ANA): Cisco ANA is a flexible, vendor-neutral management framework for a multitechnology, multiservice network environment. Operating between the network and the operations-support-system (OSS) layer, Cisco ANA aggregates virtual network elements (VNEs) into a software-based virtual network, much as real network elements create the real-world network. Cisco ANA dynamically discovers network components and tracks the status of network elements in near real time. • Cisco ANA offers service providers: <ul style="list-style-type: none"> ◦ Simplified integration of OSS applications with network information ◦ A flexible common infrastructure for managing network resources ◦ Consistent procedures and interfaces for all network elements

Description	Specification
Security	<p>Cisco IOS XR Software: Cisco IOS XR Software provides comprehensive network security features, including access control lists (ACLs); control-plane protection; routing authentications; authentication, authorization, and accounting (AAA) and TACACS+; IP Security (IPsec); Secure Shell (SSH) Protocol; SNMPv3; and leading Routing Policy Language (RPL) support.</p> <p>Layer 2 ACLs: You can use this security feature to filter packets under an EVC based on MAC addresses.</p> <p>Layer 3 ACLs: This feature provides ACL matching by IPv4 packet attributes.</p> <p>Security: Many critical security features are supported:</p> <ul style="list-style-type: none"> • 802.1ad Layer 2 Control Protocol (L2CP) and bridge-protocol-data-unit (BPDU) filtering • MAC limiting per EFP or bridge domain • Unicast, multicast, and broadcast storm-control blocking on any interface or port • Unknown Unicast Flood Blocking (UUFB) • Dynamic Host Configuration Protocol (DHCP) snooping • Unicast Reverse Path Forwarding (URPF) • Control-plane security
Connectivity	100-Mbps, 1-Gbps, and 10-Gbps 802.3 Ethernet
Memory	2-Gbps control plane
Options	Each line card available as either a base or extended line card; the extended line card provides typically twice the service scale of the base line card
Reliability and availability	110,000 mean time between failure (MTBF)
MIBs	<p>Support for a large number of hardware and product-specific as well as software feature MIBs; following is a partial list of MIBs supported; Cisco has further documentation available on any restrictions related to these MIBs as part of the "Cisco ASR 9000 MIB Guide"; the SNMP implementation and related details are also provided in the "System Manageability White Paper":</p> <ul style="list-style-type: none"> • IP-MIB (RFC4293) • CISCO-BULK-FILE-MIB • CISCO-CONFIG-COPY-MIB • CISCO-CONFIG-MAN-MIB • CISCO-ENHANCED-IMAGE-MIB • CISCO-ENHANCED-MEMORY-POOL-MIB • CISCO-ENTITY-FRU-CONTROL-MIB • CISCO-ENTITY-SENSOR-MIB • ENTITY-MIB • CISCO-ENTITY-ASSET-MIB • ENTITY-STATE-MIB • ENTITY-SENSOR-MIB • CISCO-ENTITY-ALARM-MIB • CISCO-FLASH-MIB • CISCO-IF-EXTENSION-MIB • CISCO-MEMORY-POOL-MIB • CISCO-RF-MIB (1:1 RP Card) • CISCO-SYSLOG-MIB • EVENT-MIB • IF-MIB as well as RFC1213-MIB • SNMP-COMMUNITY-MIB • SNMP-FRAMEWORK-MIB • SNMP-NOTIFICATION-MIB • SNMP-TARGET-MIB • IPv6-MIB • BRIDGE-MIB • DOT3-OAM-MIB • CISCO-IETF-PW-MIB • CISCO-CLASS-BASED-QOS-MIB • ETHERLIKE-MIB • BGP4-MIB Including Cisco extensions. • MPLS TE STD MIB • TE-FRR-MIB • CISCO-IETF-IPROUTE-MIB
Physical dimensions (H x W x D); weight	14 x 1.72 x 20.5 in.; 14 lb
Power	Maximum 375W; typical 310W
Network Equipment Building Standards (NEBS)	<p>Cisco ASR 9010 is designed to meet (qualification in progress):</p> <ul style="list-style-type: none"> • SR-3580: NEBS Criteria Levels (Level 3) • GR-1089-CORE: NEBS EMC and Safety • GR-63-CORE: NEBS Physical Protection
Operating temperature (nominal)	41 to 104°F (5 to 40°C)
Operating temperature (short-term)³	23 to 131°F (–5 to 55°C)
Operating humidity (nominal) (relative humidity)	10 to 85%
Storage temperature	–40 to 158°F (–40 to 70°C)
Storage (relative humidity)	5 to 95% Note: Not to exceed 0.024 kg water or kg of dry air

³ Short term refers to a period of not more than 96 consecutive hours and a total of not more than 15 days in 1 year. (This number refers to a total of 360 hours in any given year, but, no more than 15 occurrences during that 1-year period.)

Description	Specification
Operating altitude	–60 to 4000m (up to 2000m conforms to IEC, EN, UL, and CSA 60950 requirements)
ETSI standards	Cisco ASR 9010 is designed to meet (qualification in progress): <ul style="list-style-type: none"> • EN300 386: Telecommunications Network Equipment (EMC) • ETSI 300 019 Storage Class 1.1 • ETSI 300 019 Transportation Class 2.3 • ETSI 300 019 Stationary Use Class 3.1 • EN55022: Information Technology Equipment (Emissions) • EN55024: Information Technology Equipment (Immunity) • EN50082-1/EN-61000-6-1: Generic Immunity Standard
EMC standards	Cisco ASR 9010 is designed to meet: <ul style="list-style-type: none"> • FCC Class A • ICES 003 Class A • AS/NZS 3548 Class A • CISPR 22 (EN55022) Class A • VCCI Class A • BSMI Class A • IEC/EN 61000-3-2: Power Line Harmonics • IEC/EN 61000-3-3: Voltage Fluctuations and Flicker
Immunity	Cisco ASR 9010 is designed to meet: <ul style="list-style-type: none"> • IEC/EN-61000-4-2: Electrostatic Discharge Immunity (8kV Contact, 15kV Air) • IEC/EN-61000-4-3: Radiated Immunity (10V/m) • IEC/EN-61000-4-4: Electrical Fast Transient Immunity (2kV Power, 1kV Signal) • IEC/EN-61000-4-5: Surge AC Port (4kV CM, 2kV DM) • IEC/EN-61000-4-5: Signal Ports (1kV) • IEC/EN-61000-4-5: Surge DC Port (1kV) • IEC/EN-61000-4-6: Immunity to Conducted Disturbances (10Vrms) • IEC/EN-61000-4-8: Power Frequency Magnetic Field Immunity (30A/m) • IEC/EN-61000-4-11: Voltage DIPS, Short Interruptions, and Voltage Variations
Safety	Cisco ASR 9010 is designed to meet: <ul style="list-style-type: none"> • UL/CSA/IEC/EN 60950-1 • IEC/EN 60825 Laser Safety • ACA TS001 • AS/NZS 60950 • FDA—Code of Federal Regulations Laser Safety

System Requirements

You can deploy Cisco ASR 9000 Line Cards in any Cisco ASR 9000 Series platform with Cisco IOS XR Software Release 3.7.2.

Ordering Information

Each line card is available in both a base and extended version. Relative to the base version, the extended line card typically provides twice the number of services interfaces and approximately three times the queue density.

You can also purchase the Cisco ASR 9000 Series Line Cards with an optional -B or -E Advanced IP Software Line Card License that you can use to enable features for the support of L3VPN services on the line Card. The -B Line Cards can only be used with the -B Advanced IP Software License. For infrastructure applications requiring no more than 8 VPNs on a line card, you may alternatively purchase an Infrastructure VRF Line Card License that can be used on either a -B or -E Line Card.

Table 3 provides ordering information for the Cisco ASR 9000 Series Line Cards.

Table 3. Ordering Information

Product Name	Part Number
40-Port GE Line Card, Requires SFPs	A9K-40GE-B
40-Port GE Extended Line Card, Requires SFPs	A9K-40GE-E
4-Port 10GE Line Card, Requires XFPs	A9K-4T-B
4-Port 10GE Extended Line Card, Requires XFPs	A9K-4T-E
8-Port 10GE DX Line Card, Requires XFPs	A9K-8T/4-B
8-Port 10GE DX Extended Line Card, Requires XFPs	A9K-8T/4-E
L3VPN Service Line Card License – For use with -B Line Cards	A9K-AIP-LIC-B
L3VPN Service Line Card License – For use with -E Line Cards	A9K-AIP-LIC-E
Infrastructure VRF LC License	A9K-IVRF-LIC

To Download the Software

Visit the [Cisco Software Center](#) to download Cisco IOS Software.

Cisco Services for Cisco ASR 9000

Through a lifecycle services approach, Cisco delivers comprehensive support to service providers to help them successfully deploy, operate, and optimize their IP Next-Generation Networks (IP NGNs). Cisco Services for the Cisco ASR 9000 Aggregation Services Router provide the services and proven methodologies that help assure service deployment with substantial return on investment, operational excellence, optimal performance, and high availability. These services are delivered using leading practices, tools, processes, and lab environments developed specifically for Cisco ASR 9000 deployments and post implementation support. The Cisco Services team addresses your specific requirements, mitigates risk to existing revenue-generating services, and helps accelerate time to market for new network services.

For more information about Cisco Services, contact your local Cisco account representative or visit <http://www.cisco.com/go/spservices>.



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