Cisco ASR 9000 Series 400G and 200G Modular Line Cards

Product Overview

The new Cisco® ASR 9000 Series 400G (Figure 1) and 200G Modular Line Cards provide customers with a highly flexible solution. They support multiple combinations of Ethernet ports, all in a single slot of the Cisco ASR 9000 Series Aggregation Services Routers (ASR 9000 Series). These modular line cards have two open bays (bay 0 and bay 1) for plugging in ASR 9000 Series modular port adapters (MPA), which gives network operators the flexibility to choose the ideal port density, speed, and optic based on their network requirements. With ASR 9000 Series modular line cards and the MPA portfolio, Cisco continues to focus on investment protection, along with consistent feature support, broad interface availability, and the latest technology. The latest additions to the MPA portfolio include the Cisco ASR 9000 Series 20-Port 10GE Modular Port Adapter (Figure 2), the 2-Port 100GE Modular Port Adapter (Figure 3), and the 1-port 100G Modular Port Adapter (Figure 4). The minimum software release versions for these new MPAs are shown in Table 5 and Table 6. Supported pluggable interfaces are shown in Table 4.

Using modular line cards along with port adapters, the ASR 9000 Series can support a wide range of customer applications, including video on demand, Internet Protocol Television (IPTV), point-to-point video, Internet video, and cloud-based computing. The line cards can also be used to deliver economical, scalable, highly available, line-rate Ethernet, and IP/Multiprotocol Label Switching (IP/MPLS) edge services. Cisco ASR 9000 Series line cards and routers are designed to provide the fundamental infrastructure for scalable Carrier Ethernet and IP/MPLS networks, supporting profitable business, residential, and mobile services.

Figure 1. Cisco ASR 9000 Series 400G Modular Line Cards

Figure 2. Cisco ASR 9000 Series 20-port 10G Modular Port Adapter

Figure 3. Cisco ASR 9000 Series 2-Port 100G Modular Port Adapter

Figure 4.　　Cisco ASR 9000 Series 1-port 100G Modular Port Adapter

Features and Benefits

ASR 9000 Series line cards are fully compatible with the Cisco ASR 9922 Router, ASR 9912 Router, ASR 9910 Router, ASR 9904 Router, ASR 9010 Router, and ASR 9006 Router, as well as ASR 9000 Series route switch processors (RSPs), route processors, and other Typhoon network processing unit (NPU)-based line cards. Total bandwidth is dependent on the number and type of RSPs installed.

The new 400G and 200G modular line cards deliver the ability to mix and match modular port adapters so that customers can customize each slot in the ASR 9000 to their specific port demands. For example, in the case of the 400G modular line cards, a 20-port 10 Gigabit Ethernet modular port adapter can be matched with a 2-port 100 Gigabit Ethernet modular port adapter, all in a single slot, for a total bandwidth of 400 gigabits per slot. In the case of a 200G modular line card, two 1-port 100 Gigabit Ethernet modular port adapters can be used per slot for a total of 200 gigabits per slot, or a single 2-port 100 Gigabit Ethernet or a single 20-port 10 Gigabit Ethernet modular port adapter can be used to get 200 gigabits per slot. Both the 200G and 400G modular cards are compatible with all earlier generations of port adapters.

The Cisco ASR 9000 Series 400G and 200G Modular Line Cards provide simultaneous support for both Layer 2 and Layer 3 services and features. This capability helps operators qualify and stock a single line card that can be deployed in any combination of Layer 2 and Layer 3 applications. It also helps reduce capital expenditures (CapEx) and operating expenses (OpEx), as well as reduce the time required to develop and deploy new services. Cisco modular line cards set exceptional standards for service density, allowing operators to offer predictable, managed transport services while optimizing the use of network assets.

Table 1 lists the features and benefits of Cisco modular line cards. Specific feature and scale support is hardware and software dependent.

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

Feature	Benefit
Interface Support	
Pluggable 1-Gigabit Small Form-Factor Pluggable (SFP), 10-Gigabit (SFP+ and XFP), 40-Gigabit Quad SFP (QSFP) and 100-Gigabit (CFP2-ER4/CPAK SR and LR) interfaces	Provide the capability to mix and match interface types across a single line card (For a complete list of supported interfaces, please see Cisco ASR 9000 Transceiver Modules: Line Card Support data sheet.)
G.709 and Advanced FEC	Standard G.709 providing transmission-layer operations, administration, and maintenance (OA&M); G.709 Standard FEC and Advanced FEC for enhanced transmission system performance
Scalable and Integrated Multiservice Support	
Layer 2 and Layer 3 services	Combined IP, MPLS, Ethernet, Layer 2 VPN (L2VPN), and Layer 3 VPN (L3VPN) services
Evolutionary Monitoring	
Carrier-class OA&M	NetFlow, IEEE 802.1ag, IEEE 802.3ah, ITU Y.1731, IP service-level agreement (IP SLA), virtual circuit connectivity verification (VCCV), ping, and traceroute
Carrier-Grade OS	
Cisco IOS® XR Software	Modular, patchable, scalable, and highly available carrier-core and edge-proven operating system

Feature	Benefit
Layer 2 Encryption	
MACsec encryption	IEEE 802.1AE [1] standards-based Layer 2 hop-by-hop encryption that provides data confidentiality and integrity for media access independent protocols
	MACsec is supported only on the 400G and 200G modular line cards when used with the following MPAs:[*]
	• 20-port 10 Gigabit Modular Port Adapter (A9K-MPA-20X10GE)
	• 1-port 100 Gigabit Modular Port Adapter (A9K-MPA-1X100GE)
	• 2-port 100 Gigabit Modular Port Adapter (A9K-MPA-2X100GE)
	[*] Please note that there are minimum XR SW requirements to support MACsec in these MPAs.

Line Card Types

ASR 9000 Series modular line cards are available in service edge - optimized and packet transport - optimized variants.

- Service edge - optimized line cards are designed for customer deployments requiring enhanced quality of service (QoS).
- Packet transport - optimized line cards are designed for network deployments where basic QoS is required.

Different line card types may be mixed within the same system.

Feature licenses are also available to activate advanced features on the line cards, as described in the "Software Licensing" section of this document.

Product Specifications

Table 2 provides product specifications for ASR 9000 Series modular line cards.

Table 2.   Product Specifications

Description	Specification
Chassis compatibility	Compatible with the Cisco ASR 9922, 9912, 9910, 9904, 9010, and 9006 routers
Port density	In the 400G modular line card, up to 2 modular port adapters are supported per line card for up to:
	• 40-port 10G or 40-port 1G interfaces
	• 4-port 40G interfaces
	• 4-port 100G interfaces
	In the 200G modular line card, two modular port adapters are supported per line card, except for the 2-port 100 Gigabit modular port adapter and the 20-port 10 Gigabit modular port adapter. The 2-port 100 Gigabit and 20-port 10 Gigabit modular adapters are supported only in bay 0 of the 200G modular line card. The achievable port density on this line card is as follows:
	• 20-port 10G or 40-port 1G interfaces
	• 4-port 40G interfaces
	• 2-port 100G interfaces
Ethernet	• IEEE 802.3 compliant
	• 10 Gigabit Ethernet PHY monitoring
	• IEEE 802.x flow control
	• Full-duplex operation
	• 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

Description	Specification
Card density	Maximum number of line cards per system: • Cisco ASR 9922: 20 • Cisco ASR 9912: 10 • Cisco ASR 9910: 8 • Cisco ASR 9904: 2 • Cisco ASR 9010: 8 • Cisco ASR 9006: 4
Options	Each line card is available as either a service edge - optimized line card (enhanced QoS) or a packet transport - optimized line card (basic QoS)
Reliability and availability	Line card online insertion and removal (OIR) support without system impact
Network Equipment Building Standards (NEBS)	Cisco ASR 9000 Series Routers are designed to meet: • 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 104ºF (5 to 40ºC)
Operating temperature (short-term)1	23 to 131ºF (-5 to 55ºC)
Operating humidity (nominal) relative humidity	10 to 85%
Storage temperature	-40 to 158ºF (-40 to 70ºC)
Storage relative humidity	5 to 95% **Note:** Not to exceed 0.024 kg of water per kg of dry air
Operating altitude	-60 to 4000m (up to 2000m conforms to IEC, EN, UL, and CSA 60950 requirements)
ETSI standards	Cisco ASR 9000 Series Routers are designed to meet: • 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 9000 Series Routers are designed to meet: • 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 9000 Series Routers are designed to meet: • 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

Description	Specification
Safety	Cisco ASR 9000 Series Routers are designed to meet: • UL/CSA/IEC/EN 60950-1 • IEC/EN 60825 Laser Safety • ACA TS001 • AS/NZS 60950 • FDA: Code of Federal Regulations Laser Safety

[1] 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.)

Weights and Dimensions

Table 3 shows the different physical dimensions and associated weight of ASR 9000 Series modular line cards and modular port adapters, which are identified by their product ordering numbers.

Table 3.   Physical Dimensions

Part Number	Physical Dimensions	Weight
A9K-MOD400-SE	14.5 W x 1.72 H x 24.25 L (including ejector levers)	21 lb (9.5 kg)
A9K-MOD400-TR	14.5 W x 1.72 H x 24.25 L (including ejector levers)	21 lb (9.5 kg)
A9K-MOD200-SE	14.5 W x 1.72 H x 24.25 L (including ejector levers)	19 lb (8.62 kg)
A9K-MOD200-TR	14.5 W x 1.72 H x 24.25 L (including ejector levers)	19 lb (8.62 kg)
A9K-MPA-20X10GE	6.37 W x 1.36 H x 6.70 L 6.37 W x 1.36 H x 8.30 L (including Jackscrew)	35.2 oz (0.99 kg)
A9K-MPA-2X100GE	6.37 W x 1.36 H x 6.70 L 6.37 W x 1.36 H x 8.30 L (including Jackscrew)	38.4 oz (1.09 kg)
A9K-MPA-1X100GE	6.37 W x 1.36 H x 6.70 L 6.37 W x 1.36 H x 8.30 L (including jackscrew)	32.4 oz (0.91 kg)
A9K-MPA-20X1GE	6.37 W x 1.36 H x 6.70 L 6.37 W x 1.36 H x 8.30 L (including jackscrew)	34 oz (0.96 kg)
A9K-MPA-2X10GE	6.37 W x 1.36 H x 6.70 L 6.37 W x 1.36 H x 8.30 L (including jackscrew)	28 oz (0.7 kg)
A9K-MPA-4X10GE	6.37 W x 1.36 H x 6.70 L 6.37 W x 1.36 H x 8.30 L (including jackscrew)	31 oz (0.87 kg)
A9K-MPA-8X10GE	6.37 W x 1.36 H x 6.70 L 6.37 W x 1.36 H x 8.30 L (including jackscrew)	28 oz (0.79 kg)
A9K-MPA-1X40GE	6.37 W x 1.36 H x 6.70 L 6.37 W x 1.36 H x 8.30 L (including jackscrew)	26 oz (est.) (0.7 kg)
A9K-MPA-2X40GE	6.37 W x 1.36 H x 6.70 L 6.37 W x 1.36 H x 8.30 L (including jackscrew)	28 oz (0.79 kg)

Pluggable Interfaces

Cisco ASR 9000 Series line cards support a wide range of SFP, XFP, and QSFP pluggable interfaces. Please see the Cisco ASR 9000 Transceiver Modules: Line Card Support data sheet for a complete list.

Table 4 lists the pluggable interface support available for the new ASR 9000 Series MPAs, identified by their product ordering numbers.

Table 4.   Pluggable Interface Support for New Modular Port Adapters[*]

Part Number	Compatible Optics[*]
A9K-MPA-20X10GE	SFP+ optics

Part Number	Compatible Optics[*]
A9K-MPA-2X100GE	CFP2-ER4, CPAK-100G-LR4, CPAK-10x10LR, CPAK-100G-SR10, CPAK-100G-ER4L, CPAK-100G-CWDM4 (The CPAK optics are supported through a CFP2-CPAK adapter.)
A9K-MPA-1X100GE	CFP2-ER4, CPAK-100G-LR4, CPAK-10x10LR, CPAK-100G-SR10, CPAK-100G-ER4L, CPAK-100G-CWDM4 (The CPAK optics are supported through a CFP2-CPAK adapter.)

[*] Please note that there are minimum XR requirements to support each of these optics.

System Requirements

ASR 9000 Series line cards may be deployed in the 20-slot, 10-slot, 8-slot, 4-slot, and 2-slot chassis with Cisco IOS XR Software. Tables 5 and 6 show the system software requirements for these chassis, as identified by their product ordering numbers.

Table 5.   ASR 9000 Series 400G Modular Line Card System Software Requirements

Part Number	Software Release Support
A9K-MOD400-SE	Cisco IOS XR 5.3.2
A9K-MOD400-TR	Cisco IOS XR 5.3.2
A9K-MPA-20X10GE	Cisco IOS XR 5.3.2
A9K-MPA-2X100GE	Cisco IOS XR 6.0.1
A9K-MPA-1X100GE	Cisco IOS XR 6.0.1
A9K-MPA-20X1GE	Cisco IOS XR 5.3.3
A9K-MPA-8X10GE	Cisco IOS XR 5.3.2
A9K-MPA-4X10GE	Cisco IOS XR 5.3.2
A9K-MPA-2X10GE	Cisco IOS XR 5.3.2
A9K-MPA-2X40GE	Cisco IOS XR 5.3.2
A9K-MPA-1X40GE	Cisco IOS XR 5.3.2

Table 6.   ASR 9000 Series 200G Modular Line Card System Software Requirements

Part Number	Software Release Support
A9K-MOD200-SE	Cisco IOS XR 6.0.1
A9K-MOD200-TR	Cisco IOS XR 6.0.1
A9K-MPA-20X10GE	Cisco IOS XR 6.0.1
A9K-MPA-2X100GE	Cisco IOS XR 6.0.1
A9K-MPA-1X100GE	Cisco IOS XR 6.0.1
A9K-MPA-20X1GE	Cisco IOS XR 6.0.1
A9K-MPA-8X10GE	Cisco IOS XR 6.0.1
A9K-MPA-4X10GE	Cisco IOS XR 6.0.1
A9K-MPA-2X10GE	Cisco IOS XR 6.0.1
A9K-MPA-2X40GE	Cisco IOS XR 6.0.1
A9K-MPA-1X40GE	Cisco IOS XR 6.0.1

Software Licensing

Cisco modular line card offer two optimization versions. In addition, optional per-line-card feature licenses can be used to turn on advanced features. Layer 3 VPN licenses provide access to VPN routing and forwarding (VRF) instances on a per-line-card basis. They include the Infrastructure VRF license to support up to 8 VRF instances and Advanced IP licenses to support up to full-scale VRF instances. The Advanced Optical license activates G.709 and FEC capabilities for dense wavelength-division multiplexing (DWDM) systems on a per-line-card basis. The Advanced Video license activates the inline video monitoring feature on a per-line-card basis. Table 7 lists the line card feature licenses, which are identified by their ordering numbers.

Table 7.   Feature Licenses for Cisco ASR 9000 Series 400G and 200G Modular Line Cards

License Number	Feature Description
A9K-400G-IVRF	Infrastructure VRF license to activate up to 8 VRF instances per 400G modular line card
A9K-400G-AIP-SE	Advanced IP license to activate full-scale VRF instances per 400G service edge optimized line card
A9K-400G-AIP-TR	Advanced IP license to activate full-scale VRF instances per 400G packet transport optimized line card
A9K-400G-OPT-LIC	Advanced Optical license to activate G.709 and FEC per 400G modular line card
A9K-200G-IVRF	Infrastructure VRF license to activate up to 8 VRF instances per 200G modular line card
A9K-200G-AIP-SE	Advanced IP license to activate full-scale VRF instances per 200G service edge optimized line card
A9K-200G-AIP-TR	Advanced IP license to activate full-scale VRF instances per 200G packet transport optimized line card
A9K-200G-OPT-LIC	Advanced Optical license to activate G.709 and FEC per 200G modular line card

Ordering Information

Table 8 provides ordering information for the Cisco ASR 9000 Series modular line cards and modular port adapters. Please visit Cisco Commerce Workspace to order.

Table 8.   Ordering Information

Part Number	Product Description
A9K-MOD400-SE	ASR 9000 400G Modular Line Card, Service Edge Optimized, requires modular port adapters
A9K-MOD400-TR	ASR 9000 400G Modular Line Card, Packet Transport Optimized, requires modular port adapters
A9K-MOD200-SE	ASR 9000 200G Modular Line Card, Service Edge Optimized, requires modular port adapters
A9K-MOD200-TR	ASR 9000 200G Modular Line Card, Packet Transport Optimized, requires modular port adapters
A9K-MPA-20X10GE	ASR 9000 20-port 10-Gigabit Ethernet Modular Port Adapter, requires SFP+ optics
A9K-MPA-2X100GE	ASR 9000 2-port 100-Gigabit Ethernet Modular Port Adapter, requires CFP2-ER4 or CPAK optics (please refer to Table 4.)
A9K-MPA-1X100GE	ASR 9000 1-port 100-Gigabit Ethernet Modular Port Adapter, requires CFP2-ER4 or CPAK optics (please refer to Table 4.)
A9K-MPA-20X1GE	ASR 9000 20-port 1-Gigabit Ethernet Modular Port Adapter, requires SFP optics
A9K-MPA-2X10GE	ASR 9000 2-port 10-Gigabit Ethernet Modular Port Adapter, requires XFP optics
A9K-MPA-4X10GE	ASR 9000 4-port 10-Gigabit Ethernet Modular Port Adapter, requires XFP optics
A9K-MPA-8X10GE	ASR 9000 8-port 10-Gigabit Ethernet Modular Port Adapter, requires SFP+ optics
A9K-MPA-1X40GE	ASR 9000 1-port 40-Gigabit Ethernet Modular Port Adapter, requires QSFP optics
A9K-MPA-2X40GE	ASR 9000 2-port 40-Gigabit Ethernet Modular Port Adapter, requires QSFP optics

Downloading the Software

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

Cisco Services for the Cisco ASR 9000 Series

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 Cisco ASR 9000 Series Aggregation Services Routers 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 Series 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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For More Information

For more information on ASR 9000 Series routers please visit:
http://www.cisco.com/c/en/us/td/docs/routers/asr9000/hardware/overview/guide/asr9kOVRGbk.html.

Printed in USA

C78-735809-03   05/16