

# Cisco ASR 9000 Series Modular Line Cards

## Product Overview

The Cisco® ASR 9000 Series modular line cards provide customers with a flexible solution supporting multiple combinations of Ethernet ports, all in a single slot of the Cisco ASR 9000 Series Aggregation Services Routers. Modular line cards support a wide range of interfaces and densities offering the benefits of network scalability with lower initial costs and ease of upgrades. The Cisco ASR 9000 modular line cards and modular port adapter portfolio continues the Cisco focus on investment protection along with consistent feature support, broad interface availability, and the latest technology.

Using the modular line cards, the Cisco ASR 9000 Series can support customer applications including video-on-demand, Internet Protocol Television (IPTV), point-to-point video, Internet video, and cloud-based computing. These line cards can also be used to deliver economical, scalable, highly available, line-rate Ethernet and IP/Multiprotocol Label Switching (IP/MPLS) edge services. The 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).

**Figure 1.** Cisco ASR 9000 Series Modular Line Cards



## Features and Benefits

The Cisco ASR 9000 Series modular line cards are fully compatible with the Cisco ASR 9922, 9010, and 9006 systems, route switch processors (RSPs), and line cards. No hardware upgrade to the chassis or cooling system is required. Total bandwidth is dependent on the number and type of RSPs installed.

The new line cards deliver the ability to mix and match modular port adapters so that customers can customize each slot in the Cisco ASR 9000 to their specific port demands. As an example, a 4-port 10-Gigabit Ethernet modular port adapter can be matched with a 20-port 1-Gigabit Ethernet modular port adapter, all in a single slot.

Each Cisco ASR 9000 Series modular line card provides simultaneous support for both Layer 2 and Layer 3 services and features, helping operators to qualify and stock a single line card that can be deployed in any combination of Layer 2 and Layer 3 applications. These capabilities help to reduce capital expenditures (CapEx) and operating expenses (OpEx), as well as reduce the time required to develop and deploy new services. The Cisco modular line cards set a new standard for service density, allowing operators to offer predictable, managed transport services while optimizing the use of network assets.

The line cards, with their synchronization circuitry and dedicated backplane timing traces for accessing the RSP's Stratum-3 subsystem, provide standards-based line-interface functions for delivering and deriving transport-class network timing, allowing support of network-synchronized services and applications such as mobile backhaul and time-division multiplexing (TDM) migration. Coupled with the Cisco RSP-440 route switch processor, the line cards can also be used for applications requiring IEEE 1588v2 synchronization services. Recognizing that real-time media dominate next-generation services, Cisco has integrated media-monitoring technology into the Cisco Modular line cards. This multimedia technology allows real-time monitoring and statistics collection of real-time video and voice flows, facilitating proactive maintenance and management of today's interactive services.

Addressing the advantages of consolidating IP and dense wavelength-division multiplexing (DWDM) networking, G.709 with Advanced Forward Error Correction (FEC) is provided. G.709 provides visibility into the DWDM transmission system to permit rapid detection and recovery from transmission-layer and DWDM impairments. G.709 can also be configured for proactive protection if signal degradation is detected; it prevents traffic loss and link outage. Advanced FEC extends transmission-layer performance, delivering extended performance over an amplified system without the cost of regeneration or transponders.

Table 1 lists the features and benefits of the 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
<b>Interface Support</b>	
Pluggable 1-Gigabit Small Form-Factor Pluggable (SFP), 10-Gigabit SFP (XFP), and 40-Gigabit Quad SFP (QSFP) interfaces	Provide the capability to mix and match interface types across a single line card; for a complete list of supported interfaces, please see <a href="#">Cisco ASR 9000 Transceiver Modules: Line Card Support</a> 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
<b>Scalable and Integrated Multiservice Support</b>	
Layer 2 and Layer 3 services	Combined IP, MPLS, Ethernet, Layer 2 VPN (L2VPN), and Layer 3 VPN (L3VPN) services
<b>Evolutionary Monitoring</b>	
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
Video monitoring (VidMon)	VidMon, providing real-time monitoring of video flows, including issuance of alarm upon degradation
<b>Carrier-Grade OS</b>	
Cisco IOS® XR Software	Modular, patchable, restartable, scalable, highly available, carrier-core and edge-proven operating system
<b>T-Class Synchronization</b>	
Synchronous Ethernet	Derives and provides synchronization from and to Ethernet interfaces, Cisco ASR 9000 Series RSPs, and network synchronization interfaces
IEEE 1588-2008	Cisco ASR 9000 Series support of the IEEE 1588-2008 protocol provides the capability to distribute precision time

## Line Card Types

The Cisco 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 turn on advanced features on the line cards, as described in the “Software Licensing” section later in this document.

## Product Specifications

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

**Table 2.** Product Specifications

Description	Specification
<b>Chassis compatibility</b>	Compatible with the Cisco ASR 9922, 9010, 9006 and 9001 systems
<b>Port density</b>	Up to 2 modular port adapters are supported per line card..
<b>Ethernet</b>	<ul style="list-style-type: none"><li>• IEEE 802.3 compliant</li><li>• 10 Gigabit Ethernet PHY monitoring</li><li>• IEEE 802.x flow control</li><li>• Full-duplex operation</li><li>• 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</li></ul>
<b>Card density</b>	Maximum number of line cards per system: Cisco ASR 9922 = 20, Cisco ASR 9010 = 8, and Cisco ASR 9006 = 4
<b>Options</b>	Each line card is available as either a Service Edge Optimized (enhanced QoS) or Packet Transport Optimized (basic QoS) line card.
<b>Reliability and availability</b>	Line card online insertion and removal (OIR) support without system impact
<b>Network Equipment Building Standards (NEBS)</b>	Cisco ASR 9000 Series Routers are designed to meet: <ul style="list-style-type: none"><li>• SR-3580: NEBS Criteria Levels (Level 3)</li><li>• GR-1089-CORE: NEBS EMC and Safety</li><li>• GR-63-CORE: NEBS Physical Protection</li></ul>
<b>Operating temperature (nominal)</b>	41 to 104°F (5 to 40°C)
<b>Operating temperature (short-term)<sup>1</sup></b>	23 to 131°F (–5 to 55°C)
<b>Operating humidity (nominal) relative humidity</b>	10 to 85%
<b>Storage temperature</b>	–40 to 158°F (–40 to 70°C)
<b>Storage relative humidity</b>	5 to 95% Note: Not to exceed 0.024 kg of water per kg of dry air
<b>Operating altitude</b>	–60 to 4000m (up to 2000m conforms to IEC, EN, UL, and CSA 60950 requirements)

<sup>1</sup> 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
<b>ETSI standards</b>	<p>Cisco ASR 9000 Series Routers are designed to meet:</p> <ul style="list-style-type: none"> <li>• EN300 386: Telecommunications Network Equipment (EMC)</li> <li>• ETSI 300 019 Storage Class 1.1</li> <li>• ETSI 300 019 Transportation Class 2.3</li> <li>• ETSI 300 019 Stationary Use Class 3.1</li> <li>• EN55022: Information Technology Equipment (Emissions)</li> <li>• EN55024: Information Technology Equipment (Immunity)</li> <li>• EN50082-1/EN-61000-6-1: Generic Immunity Standard</li> </ul>
<b>EMC standards</b>	<p>Cisco ASR 9000 Series Routers are designed to meet:</p> <ul style="list-style-type: none"> <li>• FCC Class A</li> <li>• ICES 003 Class A</li> <li>• AS/NZS 3548 Class A</li> <li>• CISPR 22 (EN55022) Class A</li> <li>• VCCI Class A</li> <li>• BSMI Class A</li> <li>• IEC/EN 61000-3-2: Power Line Harmonics</li> <li>• IEC/EN 61000-3-3: Voltage Fluctuations and Flicker</li> </ul>
<b>Immunity</b>	<p>Cisco ASR 9000 Series Routers are designed to meet:</p> <ul style="list-style-type: none"> <li>• IEC/EN-61000-4-2: Electrostatic Discharge Immunity (8kV Contact, 15kV Air)</li> <li>• IEC/EN-61000-4-3: Radiated Immunity (10V/m)</li> <li>• IEC/EN-61000-4-4: Electrical Fast Transient Immunity (2kV Power, 1kV Signal)</li> <li>• IEC/EN-61000-4-5: Surge AC Port (4kV CM, 2kV DM)</li> <li>• IEC/EN-61000-4-5: Signal Ports (1kV)</li> <li>• IEC/EN-61000-4-5: Surge DC Port (1kV)</li> <li>• IEC/EN-61000-4-6: Immunity to Conducted Disturbances (10Vrms)</li> <li>• IEC/EN-61000-4-8: Power Frequency Magnetic Field Immunity (30A/m)</li> <li>• IEC/EN-61000-4-11: Voltage DIPS, Short Interruptions, and Voltage Variations</li> </ul>
<b>Safety</b>	<p>Cisco ASR 9000 Series Routers are designed to meet:</p> <ul style="list-style-type: none"> <li>• UL/CSA/IEC/EN 60950-1</li> <li>• IEC/EN 60825 Laser Safety</li> <li>• ACA TS001</li> <li>• AS/NZS 60950</li> <li>• FDA: Code of Federal Regulations Laser Safety</li> </ul>

## Weights and Dimensions

Table 3 shows the different physical dimensions and associated weight of the ASR 9000s modular line cards and modular port adapters.

**Table 3.** Physical Dimensions

PID	Physical Dimensions	Weight
A9K-MOD80-SE/TR	14.5 W x 1.72 H x 22.40 L 14.5 W x 1.72 H x 24.25 L (including ejector levers)	17.5 lbs. (est.) (7.93 Kg)
A9K-MOD160-SE/TR	14.5 W x 1.72 H x 22.4 L 14.5 W x 1.72 H x 24.25 L (including ejector levers)	18 lbs. (8.16 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)	1.75 lbs (0.79 Kg)

PID	Physical Dimensions	Weight
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. (0.7 Kg)

## Pluggable Interfaces

The Cisco ASR 9000 Series Modular 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.

## System Requirements

The Cisco ASR 9000 Series Modular Line Cards may be deployed in the 20-slot, 10-slot and 6-slot chassis, with Cisco IOS XR Software Release 4.2.0 or later. Table 4 shows the system software requirements.

**Table 4.** System Software Requirements

Hardware Part Number	Software Release Support
A9K-Mod80 –TR/SE	Cisco IOS XR 4.2.0
A9K-Mod160 –TR/SE	Cisco IOS XR 4.2.1

## Software Licensing

### Line Card Feature Licenses

In addition to the two optimization versions of the Cisco modular line cards, optional per-line-card feature licenses can be used to turn on advanced features on the line cards. 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 enables G.709 and FEC for DWDM systems on a per-line-card basis. The Advanced Video license enables inline video monitoring feature on a per-line-card basis. Table 5 lists the line card feature licenses.

**Table 5.** Feature Licenses for Cisco ASR 9000 Series Modular Line Cards

License Part Number	Feature Description
A9K-IVRF-LIC	Infrastructure VRF license to enable up to 8 VRF instances per Modular line card
A9K-MOD80-AIP-SE	Advanced IP license to enable full-scale VRF instances per Service Edge Optimized Mod80 line card
A9K-MOD80-AIP-TR	Advanced IP license to enable full-scale VRF instances per Packet Transport Optimized Mod80 line card
A9K-MOD80-OPT-LIC	Advanced Optical license to enable G.709 and FEC per Mod80 line card
A9K-MOD80-VID-LIC	Advanced Video license to enable inline video monitoring per Mod80 line card
A9K-MOD160-AIP-SE	Advanced IP license to enable full-scale VRF instances per Service Edge Optimized Mod160 line card
A9K-MOD160-AIP-TR	Advanced IP license to enable full-scale VRF instances per Packet Transport Optimized Mod160 line card
A9K-MOD160-OPT-LIC	Advanced Optical license to enable G.709 and FEC per Mod160 line card
A9K-MOD160-VID-LIC	Advanced Video license to enable inline video monitoring per Mod160 line card

## System-Level Feature Licenses

Cisco modular line cards also support the deployment of advanced features based on Cisco ASR 9000 Series system-level licenses. The Lawful Intercept license enables lawful intercept for surveillance of packet streams that flow through Cisco ASR 9000 ports. The Advanced Mobile license enables Synchronous Ethernet and IEEE 1588-2008 protocols to distribute precision time and frequency across the network. The Broadband Network Gateway (BNG) license enables high-scale Ethernet BNG with session and subscriber awareness. Inline video monitoring on Cisco Modular line cards can also be enabled using a system-level Advanced Video License. Table 6 lists the system licenses supported by Cisco Modular line cards.

**Table 6.** System-Level Feature Licenses Supported by Cisco Modular Line Cards

License Part Number	Feature Description
A9K-LI-LIC	Lawful Intercept license to enable lawful intercept of packet streams for surveillance
A9K-MOBILE-LIC	Advanced Mobile license to enable Synchronous Ethernet and IEEE 1588-2008 protocols to distribute precision timing and frequency
A9K-BNG-LIC-8K	Broadband Network Gateway license to enable high scale Ethernet BNG with session/subscriber awareness
A9K-SYS-VID-LIC	Advanced Video license to enable inline video monitoring for all linecards in the system

## Ordering Information

Table 7 provides ordering information for the Cisco ASR 9000 Series modular line cards and modular port adapters.

**Table 7.** Ordering Information

Part Number	Product Description
A9K-MOD80-SE	ASR 9000 Mod80 Modular Line Card, Service Edge Optimized, requires modular port adapters
A9K-MOD80-TR	ASR 9000 Mod80 Modular Line Card, Packet Transport Optimized, requires modular port adapters
A9K-MOD160-SE	ASR 9000 Mod160 Modular Line Card, Service Edge Optimized, requires modular port adapters
A9K-MOD160-TR	ASR 9000 Mod160 Modular Line Card, Packet Transport Optimized, requires modular port adapters
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 the 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.

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

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