Cisco ASR 9000 Series Aggregation Services Routers

Product Overview

The Cisco® ASR 9000 Series Aggregation Services Routers represent an exciting new paradigm in high-end routing, with exceptional scalability, carrier-class reliability, environmentally conscious design, incredible flexibility, and an attractive price-to-performance benchmark. The Cisco ASR 9000 Series has a wide product portfolio (Figure 1), ranging from the 9001 (2RU) to the 9922 (44RU), with each system designed to provide true carrier-class reliability using the Cisco IOS® XR operating system, comprehensive system redundancy, and a full complement of network resiliency schemes. The Cisco ASR 9000 Series also offers service and application-level intelligence focused on optimized video delivery and mobile aggregation. Finally, the Cisco ASR 9000 Series is designed to simplify and enhance the operational and deployment aspects of service-delivery networks.

Figure 1. Cisco ASR 9000 System

The Cisco ASR 9000 Series is an operationally simple, future-optimized platform using next-generation hardware and software. The following are highlights of this next-generation platform.

- The Cisco ASR 9000 System brings increased power and simplicity to the edge, and the ASR 9000v sets the industry benchmark as a virtualized compact carrier-class converged access and aggregation platform. Leveraging Cisco's "network virtualization" or nV Technology, the Cisco ASR 9000 System offers exceptional pay as you grow scale, carrier-class reliability, and simplified service provisioning.

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- Cisco IOS XR modular operating system: The Cisco ASR 9000 Series uses the Cisco IOS XR operating system, made famous by the highly successful Cisco CRS Carrier Routing System platform in core deployments. Cisco IOS XR operating system is purpose-built for distributed systems such as the Cisco ASR 9000 Series and uses a microkernel architecture to achieve true modularity. This modularity provides the path to nonstop operations during software image upgrades or module changes, without affecting normal platform operations.
- Fully distributed system: The Cisco ASR 9000 Series operates in a fully distributed fashion; all packet-forwarding decisions and actions take place on the individual line cards. These high-density Ethernet line cards are equipped with a specialized network processor that provides a flexible programming infrastructure with high-density Hierarchical Quality-of-Service (H-QoS) services, security, and integrated Synchronous Ethernet (SyncE). The distributed nature of the Cisco ASR 9000 Series improves resiliency by adding a new dimension in scale for features such as Bidirectional Forwarding Detection (BFD) and Ethernet Operations, Administration, and Maintenance (EOAM).
- Operationally efficient and redundant hardware: The Cisco ASR 9000 Series provides an infrastructure where all common components, Route Switch Processors (RSPs), switching fabric, fans, and power supplies, are completely redundant. In addition, the platform is designed to use power on an as-needed basis, depending on system requirements. Power has been modularized for a true pay-as-you-grow approach, reducing capital expenditures (CapEx) and providing an operationally efficient deployment. The Cisco ASR 9000 Series also provides a space-optimized small-platform option that uses the Series's common components and retains a central office deployment-ready capability using a patent pending side-to-back airflow design.
- Environmentally conscious design: In today's world of increasing awareness of human impact on the environment and the resultant fiscal implications, Cisco ASR 9000 Series routers bring a fresh new "conscious" approach to product development. From optimal thermal design to the architecture of the power infrastructure, from the placement of line card components to the pitch of each slot, every design aspect has one goal in mind - reduced environmental impact through lowered power consumption and decreased cooling requirements. Even the product packaging process was evaluated to minimize the use of packaging material and thereby reduce waste at customer locations. The Cisco ASR 9000 Series is an example of the continued Cisco commitment to efficient and future-friendly product design.
- Ready for the transition to IPv6: Cisco is delivering on its strategy of building out IPv6 next-generation networks to simplify design, deployment and management of services for global service providers. The ASR 9000 Series Integrated Service Module (ISM) provides a single touch point for carrier-grade IPv6 deployment across thousands of devices.

The Cisco ASR 9000 Series offers a significant added value compared to the prior generations of Carrier Ethernet routing offerings with significantly higher switching capacity, optimizing power and cooling requirements, offering an innovative modular power architecture, incorporating a grounds-up High Availability design, and taking advantage of the Cisco IOS XR modular operating system to significantly lower the Total Cost of Ownership (TCO) for service providers the world over.

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Solving the Challenges of Tomorrow, Today

The Cisco ASR 9000 Series is built upon the premise of addressing the challenges that service providers face when deploying current networks and planning for the networks of tomorrow.

- Power-efficient deployments: The Cisco ASR 9000 Series has a significantly improved energy efficient design thanks to its low Gbps/Watt ratio. This amazing breakthrough ultimately translates to lower power costs, lower carbon footprint, and the ability to serve more customers and deliver more services in less rack space.
- Increasing average revenue per user (ARPU): Service providers may increase the price models of existing services or increase the service offerings per user. While traditional service prices continue to decline, the Cisco ASR 9000 Series helps establish a new financial reality by facilitating reliable and scalable video, next-generation mobile aggregation, and advanced Carrier Ethernet service offerings.
- Managing services efficiently: The Cisco ASR 9000 Series provides leading-edge network, device, and service management through a full complement of management solutions. Cisco Prime provides a framework for service activation provisioning, assurance, and management. Combining these elements with a comprehensive set of Ethernet and Multiprotocol Label Switching (MPLS) OAM capabilities, the Cisco ASR 9000 Series provides an operator-friendly environment.
- Network convergence: A common objective among service providers is to migrate their networks to a single, converged infrastructure that supports all services. This goal is compelling because it ultimately results in decreased CapEx and operating expenses (OpEx) because of a reduction in network elements. The Cisco ASR 9000 Series is a critical component in optimizing service transport infrastructure because of its service flexibility, comprehensive feature set, wide interface capability, and transparent integration of Carrier Ethernet and WAN interfaces as the foundation for services delivery. The Cisco ASR 9000 Series provides a powerful single solution to the providers' Multiservice Edge (MSE), Ethernet-optimized MSE (E-MSE) and Carrier Ethernet (CE) needs.
- Meeting tomorrow's service requirements: Designed into the Cisco ASR 9000 Series are critical capabilities supporting the services of tomorrow. Providing increased bandwidth capabilities for network devices at economically viable prices is one of the primary criteria for true carrier transport platforms. The Cisco ASR 9000 Series can scale to unprecidented levels, providing the ideal foundation for a full suite of next-generation services. Another crucial component for true network and service convergence is the integration of service intelligence in network elements. The Cisco ASR 9000 Series has been designed to offer advanced subscriber management using silicon-based security and video services. The Cisco ASR 9000 Series offers integrated video-on-demand (VoD) streaming and caching, inline video quality monitoring, accelerated fast channel change, and real-time video error correction.

Hardware

The Cisco ASR 9000 Series Aggregation Services Routers provide unsurpassed 10 Gigabit Ethernet and 100 Gigabit Ethernet scale and density. The Cisco ASR 9000 and ASR 9900 Series routers provide an in-place upgrade roadmap to a higher density of 10 Gigabit Ethernet and 100 Gigabit Ethernet ports without the need for a complete chassis replacement. These line cards, offered in base and extended-scale configurations, are complemented by the nonblocking fabric (on the Route Switch Processor [RSP] for the Cisco 9006, 9010 and 9904 routers and on separate fabric cards for the Cisco 9912 and 9922 routers), and by the innovative backplane (BP), thermal, and power infrastructure on the chassis.

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The modular power architecture of Cisco ASR 9000 Series (available in both AC and DC versions) includes three power supplies: 3-kW AC, 2-kW DC, and 1.5-kW DC. For the Cisco ASR 9922, only 2-kW DC and 3-kW AC power supplies are applicable. The power supplies are housed in field-serviceable Power Entry Modules (PEMs), which come in AC and DC forms. Each PEM can hold up to four modules of its corresponding type with no power zones or placement restrictions (mixing of AC and DC supplies is not supported). Service providers can add more power as their bandwidth and feature requirements increase over time, by adding more line cards to the chassis. This capability translates to lower CapEx initially and optimal OpEx over the product life.

The Cisco ASR 9000 Series also features a fully integrated timing infrastructure, allowing the routers to take in timing inputs (for example, Synchronous Ethernet, Building Integrated Timing Supply [BITS], and Data Over Cable Service Interface Specification [DOCSIS] Timing Interface [DTI]) and distribute them over the backplane to each slot. This capability allows extensive support for transparent mobile convergence, mobile Radio Access Network (RAN) backhaul, and Time-Division Multiplexing (TDM) circuit emulation, without sacrificing performance or scale.

The optimized thermal infrastructure of the Cisco ASR 9000 Series is designed to be scalable to support future capacity requirements. Variable-speed high-efficiency fans provide reduced power requirements under normal operating environments while retaining the capability to cool current and future line cards under extreme conditions.

Table 1 lists the chassis hardware available for the Cisco ASR 9000 Series.

Table 1. Hardware Available for Cisco ASR 9000 Series

Product Description	Product Number
Cisco ASR 9000 Series Chassis	
Cisco ASR 9010 chassis	ASR-9010-AC ASR-9010-DC ASR-9010-AC-V2 ASR-9010-DC-V2
Cisco ASR 9006 chassis	ASR-9006-AC ASR-9006-DC ASR-9006-AC-V2 ASR-9006-DC-V2
Cisco ASR 9922 chassis	ASR-9922-AC ASR-9922-DC
Cisco ASR 9912 chassis	ASR-9912-AC ASR-9912-DC
Cisco ASR 9904 chassis	ASR-9904-AC ASR-9904-DC
Cisco ASR 9000 Series Power Infrastructure	
AC power supply, 3000W	A9K-3KW-AC, PWR-3KW-AC-V2
DC power supply, 2100W	A9K-2KW-DC, PWR-2KW-DC-V2
DC power supply, 1500W (not applicable to 9922 router)	A9K-1.5KW-DC
Cisco ASR 9000 Series Thermal Infrastructure	
Cisco ASR 9010 fan, 2 fan trays per chassis	ASR-9010-FAN ASR-9010-FAN-V2
Cisco ASR 9006 fan, 2 fan trays per chassis	ASR-9006-FAN
Cisco ASR 9922 fan, 4 fan trays per chassis	ASR-9922-FAN
Cisco ASR 9912 fan, 2 fan trays per chassis	ASR-9912-FAN

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Product Description	Product Number
Cisco ASR 9904 fan, 1 fan tray per chassis	ASR-9904-FAN
Cisco ASR 9010 fan filter, 1 per chassis	ASR-9010-FILTER
Cisco ASR 9006 fan filter, 1 per chassis	ASR-9006-FILTER
Cisco ASR 9922 fan filter, 1 center and 2 side filters per chassis	ASR-9922-FLTR-CEN, ASR-9922-FLTR-LR
Cisco ASR 9912 fan filter, 1 center and 2 side filters per chassis	ASR-9912-FLTR-CEN, ASR-9900-FLTR-LR

More details about the individual Cisco ASR 9000 Series components, such as the RSPs, the Ethernet line cards, and the Shared Port Adapter (SPA) and SPA Interface Processor (SIP) are available in the respective data sheets:

- Cisco ASR 9000 Series Route Switch Processor
- Cisco ASR 9000 Series Ethernet Line Cards
- Cisco ASR 9000 Series SPA Interface Processor 700

Software

Cisco ASR 9000 Series routers deliver exceptional scale, service flexibility, and high availability to Carrier Ethernet transport networks. The routers are powered by Cisco IOS XR Software, an innovative self-healing, distributed operating system designed for always-on operation while scaling system capacity up to 96 Tbps. This is the same operating system that powers industry-leading routers such as the Cisco CRS Carrier Routing System, bringing the same reliability, scalability, performance, and comprehensive features that have made the Cisco CRS the dominant entity in the service provider core. Cisco IOS XR Software also allows for an end-to-end IP/MPLS solution to service provider requirements based on the same software, thereby reducing the operational complexity of managing multiple operating systems. Cisco IOS XR Software Release 3.7.2 introduced support for the Cisco ASR 9000 Series routers, which are designed to address the Carrier Ethernet foundation for visual networking. The Cisco ASR 9000 Series further enhances the IP Next-Generation Network (IP NGN) Carrier Ethernet design for converged, resilient, intelligent, and scalable transport of consumer, business, wholesale, and mobile services.

Cisco ASR 9000 Series Carrier Ethernet applications include business services such as Layer 2 VPN (L2VPN) and L3VPN, IPTV, Content Delivey Networks (CDNs), and Mobile Backhaul transport networks. Features supported include Ethernet Services; L2VPN; IPv4, IPv6, and L3VPN; Layer 2 and Layer 3 Multicast; IPoDWDM, SyncE, EOAM and MPLS OAM, Layer 2 and Layer 3 access control lists (ACLs), H-QoS, MPLS Traffic Engineering Fast Reroute (MPLS TE-FRR), Multichassis Link Aggregation (MC-LAG), Integrated Routing and Bridging (IRB) and Cisco Nonstop Forwarding (NSF) and Nonstop Routing (NSR).

Cisco IOS XR Software Releases 4.0.0 and 4.0.1 introduce support for a comprehensive portfolio of SPAs to facilitate the MSE and E-MSE capabilities of the Cisco ASR 9000 Series. These capabilities allow enterprises to offer powerful business VPN services with strong SLA (service-level agreement) enforcement. Such services typically require simultaneous scale increases across multiple dimensions, for example, the number of Virtual Route Forwarding (VRF) interfaces, IPv4 and IPv6 route scaling, BFD sessions and instances of BGP NSR interfaces. A Cisco ASR 9000 Series system configuration requiring high multidimensional scale requires the Cisco ASR 9000 Series A9K-RSP440-SE to support the increased system scale.

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Table 2 provides a summary of the software features the Cisco ASR 9000 Series offers.

Table 2. Software Feature Highlights

Features
Cisco IOS XR Software
• Modular software design • OS infrastructure protection • Process and thread protection • Process restart • State checkpoint
Ethernet Services
• Ethernet Virtual Connections (EVCs) • Flexible VLAN classification • Flexible VLAN translation • IEEE bridging • IEEE 802.1s Multiple Spanning Tree (MST) • MST Access Gateway • L2VPN   ◦ Virtual Private LAN Services (VPLS), Hierarchical VPLS (H-VPLS), Virtual Private Wire Service (VPWS), Ethernet over MPLS (EoMPLS), pseudowire redundancy, and multisegment pseudowire stitching
Layer 3 Services

• Layer 3 Routing:
  ◦ IPv4 Routing (BGP, Intermediate System-to-Intermediate System [IS-IS], and Open Shortest Path First [OSPF]), Route Policy Language (RPL), Hot Standby Router Protocol (HSRP), Virtual Router Redundancy Protocol (VRRP), IPv6 routing, and BGP Prefix Independent Convergence (PIC)
• MPLS:
  ◦ Label Distribution Protocol (LDP), Targeted LDP (T-LDP), Resource Reservation Protocol (RSVP), Differentiated Services (DiffServ)-aware traffic engineering, MPLS L3VPN (including Carrier Supporting Carrier [CSC]), IPv6 Provider Edge and IPv6 VPN to Provider Edge
  ◦ MPLS Traffic Engineering (including TE-FRR)
  ◦ MPLS TE Preferred Path

MSE and E-MSE
• Packet Over SONET and Packet Over Synchronous Digital Hierarchy (SDH) • Non-Ethernet interface support up to OC192/STM64 • Frame Relay, Point-to-Point Protocol (PPP), High-Level Data Link Control (HDLC), • Frame Relay Fragmentation.16 (FRF.16) Multilink Frame Relay (MLFR), Multilink Point-to-Point Protocol (MLPPP), Link Fragment Interleaving, FRF.12 • Any Transport over MPLS (AToM) • Internet Protocol header Compression (IPHC) • Link Noise Monitoring (LNM) • System granularity scales down to nxDS0 • Full NetFlow
QoS
• More than 3 million queues per system (ASR 9000 Series); more than 6 million queues per system (ASR 9900 Series) • Class-Based Weighted Fair Queuing (CBWFQ) • Weighted Random Early Detection (WRED) • Priority Queuing with propagation • 2-rate 3-color (2R3C) Policing • Modular QoS CLI (MQC) • 4-level H-QoS • In-Service Modification

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Features
Multicast
• IPv4 Multicast: ◦ Source-based and shared distribution trees, Protocol Independent Multicast sparse mode (PIM-SX), PIM Source Specific Multicast (PIM SSM), Automatic route processing (AutoRP), Multiprotocol BGP (MBGP), Multicast Virtual Private Network (MVPN), and Multicast Source Discovery Protocol (MSDP) • Internet Group Management Protocol Versions 2 and 3 (IGMPv2 and v3): ◦ IGMPv2 and v3 snooping
Manageability and Availability
• High availability: ◦ Cisco IOS XR high-availability feature set, MPLS TE-FRR, BFD, 802.3ad Link Aggregation Bundles, NSF, MC-LAG, and NSR • Manageability: ◦ Cisco IOS XR manageability feature set, Cisco ANA, MIB, XML, and Simple Network Management Protocol (SNMP) • OAM: ◦ Ethernet OAM (IEEE 802.3ah and IEEE 802.1ag) ◦ MPLS OAM (label switched path [LSP] ping, LSP traceroute, and Virtual Circuit Connectivity Verification [VCCV])
Security
• Cisco IOS XR Software: Provides comprehensive network security features, including ACLs; control-plane protection; routing authentications; authentication, authorization, and accounting (AAA) and TACACS+; Secure Shell (SSH) Protocol; SNMPv3; and leading RPL support • Layer 2 ACLs: Can be used to filter packets under an EVC based on MAC addresses • Layer 3 ACLs: Provides ACL matching by IPv4 packet attributes • Security: Critical security features supported: ◦ 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 ◦ Dynamic ARP Inspection (DAI) ◦ IP Source Guard (IPSG) Note: Site to Site IPSec VPN is not currently supported on the ASR 9000 platform
MIB
• Support for a large number of hardware and product-specific as well as software feature MIBs; following is a partial list of MIBs supported ◦ 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, 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, and CISCO-IETF-IPMROUTE-MIB, IEEE-8021-CFM-MIB, andDOT3-OAM-MIB

Product Specifications

Table 3 provides details on the Cisco ASR 9010 and ASR 9006. Table 4 provides details on the Cisco ASR 9922, ASR 9912, and ASR 9904. All of these systems are designed to the same high standards of performance and reliability, feature the same power and thermal innovations, and can share the line cards, PEMs, and power supplies, for maximum flexibility in your network planning. The RSPs can be shared between the Cisco ASR 9010, 9006, and 9904 chassis; the 9922 and 9912 chassis comes with their own RPs and up to seven fabric cards.

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Table 3. Cisco ASR 9006 and ASR 9010[1]

Specification	Model	
	Cisco ASR 9006	Cisco ASR 9010
Categories		
Physical specifications	Height: 17.5 in. (444.5 mm) Width: 17.5 in. (444.5 mm) Depth: • With doors: 31.45 in. (798.8 mm) • Without doors: 28.65 in. (727.2 mm) Weight: • 110 lbs (50 kg) (unloaded) • 230 lbs (106.8 kg) (fully loaded)	Height: 36.75 in. (933.5 mm) Width: 17.5 in. (444.5 mm) Depth: • With doors: 31.45 in. (798.8 mm) • Without doors: 28.65 in. (727.2 mm) Weight: • 191 lbs (86.8 kg) (unloaded) • 375 lbs (170.5 kg) (maximum)
Slot orientation	Horizontal	Vertical
Cisco ASR 9000 Series RSP	Dual redundant RSPs in 2 slots	Dual redundant RSPs in 2 slots
Route processor	NA	NA
Fabric cards	NA	NA
Cisco ASR 9000 Series line cards	4 line card slots	8 line card slots
"Commons" Components	2 RSPs 2 fan trays 1 PEM (either DC or AC) 1 fan filter	2 RSPs 2 fan trays 2 PEMs (either DC or AC) 1 fan filter
Reliability and availability	Fabric redundancy Fan redundancy Feed redundancy Power-supply redundancy RSP redundancy Software redundancy	Fabric redundancy Fan redundancy Feed redundancy Power-supply redundancy RSP redundancy Software redundancy
Rack mounting	19-in. 21- and 23-in. adapters available Note: Minimum 17.75-in. opening between posts is needed for proper operation	19-in. 21- and 23-in. adapters available
Cabinet mounting	Yes Note: Doors not recommended in enclosed cabinets	Yes Note: Doors not recommended in enclosed cabinets
Wall mounting	No	No
Airflow	Side-to-back	Front-to-back
Performance		
Fabric	1 per RSP: • Active/Active nonblocking operation mode in dual RSP redundant configuration • Fully redundant in dual RSP redundant configuration • Built-in service-intelligence and traffic-prioritization capability	1 per RSP: • Active/Active nonblocking operation mode in dual RSP redundant configuration • Fully redundant in dual RSP redundant configuration • Built-in service-intelligence and traffic-prioritization capability
Thermal	2 fan trays: • 6 high-efficiency fans per tray • Variable-speed fans for optimal thermal performance • No single point of failure	2 fan trays: • 12 high-efficiency fans per tray • Variable-speed fans for optimal thermal performance • No single point of failure

[1] Specific features are hardware and software dependent

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Specification	Model	
	Cisco ASR 9006	Cisco ASR 9010
Power		
Modularity	Up to 4 power modules (AC or DC) for future scalability Multiple power module types: • 3-kW AC power module • 2.1 and 1.5-kW DC power modules Note: Mixing of AC and DC modules is not supported. DC modules can be mixed and matched	Up to 8 power modules (AC or DC) for future scalability Multiple power module types: • 3-kW AC power module • 2.1 and 1.5-kW DC power modules Note: Mixing of AC and DC modules is not supported. DC modules can be mixed and matched
Redundancy	• Module redundancy: 1:N-1:1 • Feed redundancy	• Module redundancy: 1:N-1:1 • Feed redundancy • PEM redundancy
Power zones	None Fully load-sharing power infrastructure	None Fully load-sharing power infrastructure
Power input	Worldwide ranging AC (200-240V; 50-60 Hz; 16A maximum) Worldwide ranging DC (-40 to -72V; 50A nominal, 60A maximum)	Worldwide ranging AC (200-240V; 50-60 Hz; 16A maximum) Worldwide ranging DC (-40 to -72V; 50A nominal, 60A maximum)
Power module airflow	Side-to-back	Front-to-back
Environmental Specifications (All Entries Applicable to 9006, 9010)		
Operating temperature (nominal)	41 to 104ºF (5 to 40ºC)	
Operating temperature (short-term)[2]	23 to 131ºF (-5 to 55ºC)	
Operating humidity (nominal) (relative humidity)	5 to 95%	
Operating humidity (short-term)	5 to 90% Note: Not to exceed 0.024 kg water per 1 kg of dry air	
Storage temperature	-40 to 158ºF (-40 to 70ºC)	
Storage (relative humidity)	5 to 95% Note: Not to exceed 0.024 kg water per 1 kg of dry air.	
Operating altitude	-60 to 4000m (up to 2000m conforms to IEC/EN/UL/CSA 60950 requirements)	
Regulatory Compliance (All Entries Applicable to ASR 9006 and 9010)		
Network Equipment Building Standards (NEBS)	Cisco ASR 9010 and 9006 routers are designed to meet (qualification in progress): • SR-3580: NEBS Criteria Levels (Level 3) • GR-1089-CORE: NEBS EMC and Safety • GR-63-CORE: NEBS Physical Protection • VZ.TPR.9205: Verizon TEEER	
ETSI Standards	Cisco ASR 9010 and 9006 routers are designed to meet (qualification in progress): • 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	

[2] 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.)

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Specification	Model	
	Cisco ASR 9006	Cisco ASR 9010
EMC standards emission	Cisco ASR 9010 and 9006 routers are designed to meet: • FCC Class 47CFR15 A • ICES 003 Class A • AS/NZS CISRP22 Class A • CISPR 22 (EN55022) Class A • VCCI Class A • BSMI Class A • IEC/EN 61000-3-12: Power Line Harmonics • IEC/EN 61000-3-11: Voltage Fluctuations and Flicker • EN55022: Information Technology Equipment (Emissions) • EN 50121-4: Railway EMC	
EMC standards immunity	Cisco ASR 9010 and 9006 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 Surge Ports (1kV) • IEC/EN-61000-4-5: Surge DC Port (1kV CM, 1kV DM) • 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 • EN55024: Information Technology Equipment (Immunity) • EN50082-1/EN-61000-6-1: Generic Immunity Standard • EN 50121-4: Railway EMC	
Safety	Cisco ASR 9010 and 9006 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	

Table 4. Cisco ASR 9904, ASR 9912, and ASR 9922[3]

Specification	Model		
	Cisco ASR 9904	Cisco ASR 9912	Cisco ASR 9922
Categories			
Physical specifications	Height: 10.38 in. (6 RU) Width: 17.75 in. Depth: 25.00 in Weight: • 68.8 lb (unloaded) • 122.8 lb (maximum)	Height: 52.5 in. (30 RU) Width: 17.60 in. Depth: • With doors: 31.10 in. (764.6 mm) • Without doors: 29.37 in. (746 mm) Weight: • 265 lb (unloaded) • 611 lb (maximum)	Height: 77 in. (44 RU) Width: 17.75 in. Depth: • With doors: 31.45 in. (798.8 mm) • Without doors: 28.65 in. (727.2 mm) Weight: • 300 lb (unloaded) • 1038 lb (maximum)
Slot orientation	Horizontal	Vertical	Vertical
Cisco ASR 9000 Series RSP	Dual redundant RSPs in 2 slots	RSPs segregated into RP and FC	RSPs segregated into RP and FC
Route processor	-	Dual redundant RPs in 2 slots	Dual redundant RPs in 2 slots
Fabric cards	-	6+1 redundant FCs	6+1 redundant FCs

[3] Specific features are hardware and software dependent.

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Specification	Model		
	Cisco ASR 9904	Cisco ASR 9912	Cisco ASR 9922
Cisco ASR 9000 Series line cards	2 line card slots	10 line card slots	20 line card slots
"Commons" Components	2 RSPs 1 fan tray 1 PEM (either DC or AC) 1 fan filter	2 RPs 7 FCs 2 fan trays 3 DC PEMs or 3 AC PEMs 1 center filter, 2 side filters	2 RPs 7 FCs 4 fan trays 4 DC PEMs or 4 AC PEMs 1 center filter, 2 side filters
Reliability and availability	Fabric redundancy Feed redundancy Power-supply redundancy RSP redundancy Software redundancy	Fabric redundancy Fan redundancy Feed redundancy Power-supply redundancy RP redundancy Software redundancy	Fabric redundancy Fan redundancy Feed redundancy Power-supply redundancy RP redundancy Software redundancy
Rack mounting	19-in. 21- and 23-in. adapters available Note: Minimum 17.75-in. opening between posts is needed for proper operation.	19-in. 21- and 23-in. adapters available	19-in. 21- and 23-in. adapters available
Cabinet mounting	Yes	Yes Note: Doors not recommended in enclosed cabinets	Yes Note: Doors not recommended in enclosed cabinets
Wall mounting	No	No	No
Airflow	Side to side, with baffles for front-to-back	Front-to-back	Front-to-back
Performance			
Fabric	1 per RSP: • Active/Active nonblocking operation mode in dual RSP redundant configuration • Fully redundant in dual RSP redundant configuration Built-in service-intelligence and traffic-prioritization capability	7 switch fabric card slots • Supports 6+1 redundancy • Operate in Active/Active non-blocking mode • Built-in service-intelligence and traffic-prioritization capability	7 switch fabric card slots • Supports 6+1 redundancy • Operate in Active/Active non-blocking mode • Built-in service-intelligence and traffic-prioritization capability
Thermal	1 fan tray: • 12 high-efficiency fans per tray • Variable-speed fans for optimal thermal performance	2 fan trays: • 12 high-efficiency fans per tray • Variable-speed fans for optimal thermal performance • No single point of failure	4 fan trays • 12 high-efficiency fans per tray • Variable-speed fans for optimal thermal performance • No single point of failure
Power			
Modularity	Up to 4 power modules (AC or DC) for future scalability Multiple power module types: • 3-kW AC power module • 2.1-kW DC power modules Note: Mixing of AC and DC modules is not supported. DC modules can be mixed and matched.	Up to 12 power modules (AC or DC) for future scalability Multiple power module types: • 3-kW AC power module • 2.1-kW DC power modules Note: Mixing of AC and DC modules is not supported. DC modules can be mixed and matched. Modules from different vendors can be mixed and matched.	Up to 16 DC or AC power modules for future scalability Low-power option Multiple power module types: • 3-kW AC power module • 2.1-kW DC power modules Note: Mixing of AC and DC modules is not supported. Modules from different vendors can be mixed and matched.
Redundancy	• DC: N+1 redundancy • AC: A/B feeds, N+N redundancy	• DC: N+1 redundancy • AC: A/B feeds, N+N redundancy	• DC: N+1 redundancy • AC: A/B feeds, N+N redundancy
Power zones	None Fully load-sharing power infrastructure	None Fully load-sharing power infrastructure	None Fully load-sharing power infrastructure

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Specification	Model		
	Cisco ASR 9904	Cisco ASR 9912	Cisco ASR 9922
Power input	Worldwide ranging AC (200-240V; 50-60 Hz; 16A maximum) Worldwide ranging DC (-40 to -72V; 50A nominal, 60A maximum)	Worldwide ranging AC (200-240V; 50-60 Hz; 16A maximum) Worldwide ranging DC (-40 to -72V; 50A nominal, 60A maximum)	Worldwide ranging AC (200-240V; 50-60 Hz; 16A maximum) Worldwide ranging DC (-40 to -72V; 50A nominal, 60A maximum)
Power module airflow	Front-to-back	Front-to-back	Front-to-back
Environmental Specifications (All Entries Applicable to 9904, 9912 and 9922)			
Operating temperature (nominal)	41 to 104ºF (5 to 40ºC)		
Operating temperature (short-term)[4]	23 to 131ºF (-5 to 55ºC)		
Operating humidity (nominal) (relative humidity)	5 to 95%		
Operating humidity (short-term)	5 to 90% Note: Not to exceed 0.024 kg water per 1 kg of dry air		
Storage temperature	-40 to 158ºF (-40 to 70ºC)		
Storage (relative humidity)	5 to 95% Note: Not to exceed 0.024 kg water per 1 kg of dry air.		
Operating altitude	-60 to 4000m (up to 2000m conforms to IEC/EN/UL/CSA 60950 requirements)		
Regulatory Compliance (All Entries Applicable to 9904, 9912 and 9922)			
Network Equipment Building Standards (NEBS)	Cisco ASR 9904, 9912 and 9922 routers are designed to meet (qualification in progress): • SR-3580: NEBS Criteria Levels (Level 3) • GR-1089-CORE: NEBS EMC and Safety • GR-63-CORE: NEBS Physical Protection • VZ.TPR.9205: Verizon TEEER		
ETSI Standards	Cisco ASR 9904, 9912 and 9922 routers are designed to meet (qualification in progress): • 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		
EMC standards emission	Cisco ASR 9904, 9912 and 9922 routers are designed to meet: • FCC Class 47CFR15 A • ICES 003 Class A • AS/NZS CISRP22 Class A • CISPR 22 (EN55022) Class A • VCCI Class A • BSMI Class A • IEC/EN 61000-3-12: Power Line Harmonics • IEC/EN 61000-3-11: Voltage Fluctuations and Flicker • EN55022: Information Technology Equipment (Emissions) • EN 50121-4: Railway EMC		

[4] 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.)

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Specification	Model		
	Cisco ASR 9904	Cisco ASR 9912	Cisco ASR 9922
EMC standards immunity	Cisco ASR 9904, 9912 and 9922 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 Surge Ports (1kV) • IEC/EN-61000-4-5: Surge DC Port (1kV CM, 1kV DM) • 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 • EN55024: Information Technology Equipment (Immunity) • EN50082-1/EN-61000-6-1: Generic Immunity Standard • EN 50121-4: Railway EMC		
Safety	Cisco ASR 9904, 9912 and 9922 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		

Cisco Services for Cisco ASR 9000 Series

Through a lifecycle services approach, Cisco delivers comprehensive support for service providers to help them successfully deploy, operate, and optimize their IP Next-Generation Networks. Cisco Services for the Cisco ASR 9000 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 postimplementation 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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