Cisco ASR 9000 Series Route Switch Processor RSP5-X

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The Cisco® ASR 9000 Series Route Switch Processor 5-X (ASR 9000 RSP5-X) is the latest generation system processor for the Cisco ASR 9000 Series Routers. It supports high-density 100 and 400 Gigabit Ethernet line cards and provides backward compatibility with the Cisco ASR 9000 Series third and fourth generation family of line cards. The Cisco ASR 9000 Series RSP5-X system architecture is designed to accommodate new programmable deployment models and convergence of Layer 2 and Layer 3 services, as required by today's wireline, Data-Center-Interconnect (DCI), mobile transport and 5G applications.

The ASR 9000 Series RSP5-X brings the time-tested and robust carrier-class capabilities of Cisco IOS® XR Software to the Carrier Ethernet edge. The operating system supports true software process modularity. It also allows each process to run in separate protected memory, including each routing protocol, along with multiple instances of control, data, and management planes supported. The software also supports distributed route processing.



Figure 1.
Cisco ASR 9000 Route Switch Processor RSP5-X – SE, Premium



Figure 2.
Cisco ASR 9000 Route Switch Processor RSP5-X – TR, Premium

The ASR 9000 Series RSP5-X is designed to deliver the high scalability, performance, and fast convergence required for today's and tomorrow's demanding video, cloud, and mobile services. These features provide exceptional scale, service flexibility, and high availability. Some examples include:

- Switch fabric architecture for the ASR 9904, ASR 9010, ASR 9006, as well as the hybrid switch fabric architecture for the Cisco ASR 9910 and ASR 9906 Fabric Cards:
- Distributed switch fabric architecture
- Uses the integrated switch fabrics located on the RSPs
- Also uses the switch fabrics located on dedicated switch fabric cards (ASR 9910 and ASR 9906)
- Control of up to seven switch fabrics (two located on the RSPs and five on dedicated switch fabric cards on the ASR 9910 and ASR 9906) to provide the same scalability and high availability as on the Cisco ASR 9922 Router and ASR 9912 Router chassis
- Multistage, low-latency, non-blocking architecture
- Service intelligence and traffic prioritization

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- Superior network-timing capabilities with support for:
  - Global Positioning System (GPS) via Time of Day (ToD), 10-MHz and 1-PPS interfaces
  - Building Integrated Timing Supply (BITS) interfaces
  - Precision Time Protocol (PTP), or IEEE 1588-2008, through dedicated 10/1-Gbps Optical port
  - G.8273.2 Boundary Clock Class C

Route Switch Processor types

The ASR 9000 Series RSP5-X is available in service-edge-optimized and packet-transport-optimized models. The service-edge-optimized version offers the higher amount of memory that is essential for large-scale, comprehensive service deployment. Both versions of the route switch processor support service-optimized, as well as transport-optimized, line cards. Different line cards can be mixed on the same chassis, providing maximum design flexibility.

Features and benefits of the ASR 9000 Series RSP5-X are listed in Table 1.

Table 1. Features and Benefits of the ASR 9000 Series RSP5-X in XR 7.6.2 or Later

<table>
<tr><th>Feature</th><th colspan="6">Benefit</th></tr>
<tr><td>Highly scalable fabric</td><td colspan="6">• Designed to support high 1-, 10-, 25- 40- 100- and 400-Gbps port densities
• Provides built-in scalability for investment protection</td></tr>
<tr><td rowspan="6">Fabric capacity</td><td colspan="6">Control of up to seven switch fabrics (two located on the RSP and five on dedicated switch fabric cards)
Offers traffic load balancing simultaneously across up to seven fabrics</td></tr>
<tr><td>Switching Capacity</td><td>9910 (bps)</td><td>9906 (bps)</td><td>9010 (bps)</td><td>9006 (bps)</td><td>9904 (bps)</td></tr>
<tr><td>Non Redundant per Router</td><td>33.6T</td><td>16.8T</td><td>17.6T</td><td>8.8T</td><td>8.4T</td></tr>
<tr><td>N +1 per Router</td><td>28.8T</td><td>14.4T</td><td>8.8T</td><td>4.4T</td><td>3.6T</td></tr>
<tr><td>Non Redundant per line card Slot</td><td>4.2T</td><td>4.2T</td><td>2.2T</td><td>2.2T</td><td>4.2T</td></tr>
<tr><td>N+1 per linecard slot</td><td>3.6T</td><td>3.6T</td><td>1.1T</td><td>1.1T</td><td>1.8T</td></tr>
<tr><td>Bidirectional per RSP5-X to each linecard slot</td><td>600G</td><td>600G</td><td>1.1T</td><td>1.1T</td><td>1.8T</td></tr>
<tr><td>Distributed forwarding-plane architecture</td><td colspan="6">Allows line cards to support independent forwarding for enhanced performance and scale</td></tr>
</table>

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Feature	Benefit
Memoryless switch fabric	Provides transparent non-blocking, low-latency packet forwarding
Virtual output queuing and arbitration	• Offers service intelligence with prioritization of traffic (unicast and multicast) • Provides an efficient congestion-management mechanism and avoids problems related to head-of-line blocking
Centralized arbiter	Uses an efficient credit mechanism to help ensure transparent switchover with zero packet loss
IEEE 1588 support	Delivers timing services over the packet network efficiently and reliably. Provides dedicated 1588 10/1G optical port.
G.8273.2 Boundary Clock Class C support	Delivers better timing accuracy for 5G mobile networks.
Two independent clock source connections: BITS ports	Offers redundant, centralized network synchronization support
Two 128GB Solid-State Drives (SSDs)	Allows storing of core dumps and helps reduce the system Mean Time To Repair (MTTR)
Embedded Universal Series Bus (eUSB) memory port	Provides access to onboard Universal Serial Bus (USB) flash-memory devices for software image storing and upgrades
Front-panel external USB 2.0 port	Provides access to USB flash-memory devices for quick software image loading and recovery
Front-panel LEDs	Provides visual indication of route switch processor status (active or standby), power management, and activity on SSD
Management ports	Provides easy access to system console
Processor	8 cores, 2.7 GHz

Table 2 lists all the hardware available for the ASR 9000 Series RSP5-X.

Table 2. Cisco ASR 9000 Series RSP5-X Hardware

Product number	Product description
A9K-RSP5-X-TR	ASR 9000 Series Route Switch Processor 5 for Packet Transport, Premium
A9K-RSP5-X-SE	ASR 9000 Series Route Switch Processor 5 for Service Edge, Premium

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Table 3 lists the technical specifications for the ASR 9000 Series RSP5-X.

Table 3. Technical Specifications for Cisco ASR 9000 Series RSP5-X Hardware XR 7.6.2 or Later

Technical specifications
Internal Memory
• Control of up to seven switch fabrics (two located on the RSP and five on dedicated switch fabric cards) • ASR 9000 Series RSP5-X for Packet Transport (product number: A9K-RSP5-X-TR): 24GB Error-Correcting Code (ECC)-protected DRAM. • ASR 9000 Series RSP5-X for Service Edge (product number: A9K-RSP5-X-SE): 48GB ECC-protected DRAM • Solid-state drive: Two 128GB SSDs • 8GB embedded USB • USB 2.0 Type A receptacle
Timing System
• Timing: Two independent clock source connections (BITS). • IEEE 1588 PTP 10/1G optical port
GPS
• ToD (RS-422) • 1-pps RS-422 or 1.0/2.3 50-ohm RF connector • 10-MHz in/out 1.0/2.3 50-ohm RF connector
Management
• Two 100/1000BASE-T (RJ-45) LAN management ports • One console port • One auxiliary port
Alarms
• Alarm outputs: Critical alarm (CR), Major alarm (MJ), and Minor alarm (MN)
LEDs
• Amber Alarm Cutoff (ACO) and lamp test • System Synchronization alarm (SYNC) • GPS • Fabric-card fault indicator • SSD • FAIL

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Software

The Cisco ASR 9000 Series Aggregation Services Router delivers superior scale, service flexibility, and high availability into access and aggregation networks. It is powered by Cisco IOS XR Software, an innovative self-healing, distributed operating system designed for always-on operation. Cisco IOS XR Software supports a Software-Maintenance-Update (SMU) capability, which allows bug fixing or even small feature releasing without interrupting existing services. It also supports Field-Programmable Device (FPD) upgrades, which can be used to update Field-Programmable Gate Arrays (FPGAs) and more while systems are running.

Cisco ASR 9000 Series Carrier Ethernet applications include business services such as Layer 2 VPN (L2VPN) and Layer 3 VPN (L3VPN), Internet Protocol Television (IPTV), Content-Delivery Networks (CDNs), and mobile backhaul transport networks. Features supported include Ethernet Services; L2VPN; IPv4, IPv6, and L3VPN; Layer 2 and Layer 3 Multicast; IP over Dense Wavelength-Division Multiplexing (IPoDWDM); SyncE; PTP, Ethernet Operations, Administration, and Management (EOAM) and Multiprotocol Label Switching (MPLS) Operations, Administration, and Management (OAM); Layer 2 and Layer 3 Access Control Lists (ACLs); Hierarchical Quality of Service (H-QoS); Segment Routing (SR), Segment Routing v6 (SRv6), RSVP- and SR-Traffic Engineering; TI-LFA and RSVP-based FRR; EVPN; Multi-Chassis Link Aggregation (MC-LAG); Integrated Routing and Bridging (IRB); Cisco Nonstop Forwarding (NSF) and Nonstop Routing (NSR); Point-to-Multipoint Traffic Engineering (P2MP-TE) and mLDP; Lawful Intercept; Smart Call Home (SCH).

The Cisco ASR 9000 Series Multiservice Edge (MSE) and Ethernet MSE (E-MSE) capabilities allow enterprises to offer powerful business VPN services with strong Service-Level Agreement (SLA) 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, Bidirectional Forwarding Detection (BFD) sessions, and instances of Border Gateway Protocol (BGP) Cisco NSR interfaces. A Cisco ASR 9000 Series system configuration requiring high multiple-dimensional scale requires the service-edge optimized route switch processor model to support the increased system scale.

Timing synchronization is an integral part of traditional circuit-based networks, so the availability of equivalent functions in next-generation Ethernet-based architectures has quickly become a critical requirement. Cisco ASR 9000 Series chassis have GPS, and BITS connections on the route switch processor, along with SyncE and PTP support natively on the line cards, which gives mobile providers ample options for time and frequency synchronization. Additionally, the Cisco ASR 9000 Route Switch Processor supplies centralized clocking functions throughout the system, providing consolidated timing distribution and recovery to and from the line cards.

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Product specifications

Table 4 provides details about the Cisco ASR 9000 Series RSP5-X, which supports the Cisco ASR 9900 and ASR 9000 chassis series. Cisco ASR 9000 Series systems are designed with high standards of performance and reliability. They feature the same power and thermal innovations, and they can share line cards for maximum flexibility in your network planning.

Table 4. Product specifications in XR 7.6.2 or Later

Category	Part number or specification	
Route switch processor	A9K-RSP5-X-TR A9K-RSP5-X-SE	
Part numbers of supported line cards	**5th Generation** • **A99-4T-FC** • A99-10X400GE-X-SE • A99-10X400GE-X-TR • **A99-32HG-FC** • A99-32X100GE-X-SE • A99-32X100GE-X-TR • **A9K-20HG-FLEX-FC** • A9K-20HG-FLEX-SE • A9K-20HG-FLEX-TR • **A9K-8HG-FLEX-FC** • A9K-8HG-FLEX-SE • A9K-8HG-FLEX-TR • **A99-4HG-FLEX-FC** • A99-4HG-FLEX-SE • A99-4HG-FLEX-TR • **A9K-4HG-FLEX-FC** • A9K-4HG-FLEX-SE • A9K-4HG-FLEX-TR • **A99-4HG-FLEX-X-FC** • A99-4HG-FLEX-X-SE • **A9K-4HG-FLEX-X-FC** • A9K-4HG-FLEX-X-SE **4th Generation** • **A99-32X100GE-FC** • A99-32X100GE-TR • A99-32X100GE-CM • **A9K-16X100GE-FC**	**3rd Generation** • **A99-12X100GE-FC** • A99-12X100GE • A99-12X100GE-CM • **A99-8X100GE-FC** • A99-8X100GE-SE • A99-8X100GE-TR • A99-8X100GE-CM • **A9K-8X100GE-FC** • A9K-8X100GE-SE • A9K-8X100GE-TR • A9K-8X100GE-CM • **A9K-4X100GE-FC** • A9K-4X100GE-SE • A9K-4X100GE-TR • **A9K-400GE-LAN-FC** • A9K-4X100GE • **A99-48X10GE-1G-FC** • A99-48X10GE-1G-TR • A99-48X10GE-1G-SE • **A9K-48X10GE-1G-FC** • A9K-48X10GE-1G-TR • A9K-48X10GE-1G-SE • A9K-48X10GE-1G-CM • **A9K-24X10GE-1G-FC** • A9K-24X10GE-1G-TR • A9K-24X10GE-1G-SE • A9K-24X10GE-1G-CM

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Category	Part number or specification	
	• A9K-16X100GE-TR • A9K-16X100GE-CM • **A99-16X100GE-X-FC** • A99-16X100GE-X-SE	• **A9K-MOD400-FC** • A9K-MOD400-SE • A9K-MOD400-TR • A9K-MOD400-CM • **A9K-MOD200-FC** • A9K-MOD200-SE • A9K-MOD200-TR
Redundancy	• No single point of failure • 1 + 1 route switch processor redundancy (both route switch processors must be of the same kind) • Software redundancy	
Physical specifications (includes ejector bracket/lever)	Each route switch processor occupies 1 slot; a redundant route switch processor configuration occupies 2 slots. • Height: 1.63 in. (4.10 cm) • Width: 15.86 in. (40.28 cm) • Depth: 24.62 in. (62.53 cm) • Weight: 19.86 lb (9.01 kg)	
Environmental Specifications		
Operating temperature (nominal)	41 to 104° F (5 to 40° C)	
Operating aisle temperature (short-term)	23 to 131° F (-5 to 55° C) **Note:** 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 (a total of 360 hours in any given year, but no more than 15 occurrences during that 1-year period).	
Operating humidity (nominal) (relative humidity)	5 to 90%	
Operating humidity (short-term)	5 to 93% Note: Not to exceed 0.026 kg water/kg of dry air	
Storage temperature	-40 to 158° F (-40 to 70° C)	
Storage (relative humidity)	5 to 95%	
Operating altitude	-60 to 4000m (up to 2000m conforms to IEC/EN/UL/CSA 60950 requirements) **Note:** Max operating temperature (Short-Term) will be derated by 1° C for every 300m altitude if router operates above 1800m altitude	

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Category	Part number or specification
Compliance	
Network Equipment Building Standards (NEBS)	The ASR 9000 Series is designed to meet these standards (qualification in progress): • SR-3580: NEBS Criteria Levels (Level 3) • GR-1089-CORE: NEBS Electromagnetic Compatibility (EMC) and Safety • GR-63-CORE: NEBS Physical Protection
ETSI standards	The ASR 9000 Series is designed to meet these standards: • 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 3.1E • EN55022: Information Technology Equipment (Emissions) • EN55024: Information Technology Equipment (Immunity) • EN50082-1/EN-61000-6-1: Generic Immunity Standard
EMC standards	The ASR 9000 Series is designed to meet these standards: • 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 • EN 50121-4: Railway EMC
Immunity standards	The ASR 9000 Series is designed to meet these standards: • 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 • EN 50121-4: Railway EMC

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Category	Part number or specification
Safety standards	The ASR 9000 Series is designed to meet these standards: • UL/CSA/IEC/EN 60950-1 • UL/CSA/IEC/EN 62368-1 • IEC/EN 60825 Laser Safety • FDA: Code of Federal Regulations Laser Safety • AS/NZS 62368-1

Cisco Services for Cisco ASR 9000 Series Route Switch Processors

Through a lifecycle services approach, Cisco delivers comprehensive support to service providers to help them successfully deploy, operate, and optimize their Cisco Prime™ Evolved Programmable Networks. 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: https://www.cisco.com/go/spservices.

Ordering information

Table 5 provides ordering information for the Cisco ASR 9000 Series RSP5-X.

Table 5. Ordering information

Product description	Supported Software Release	Part Number
ASR 9000 Route Switch Processor 5 for Packet Transport - Premium	Cisco IOS XR Software Release 7.6.2 and later	A9K-RSP5-X-TR
ASR 9000 Route Switch Processor 5 for Packet Transport – Premium, Spare	Cisco IOS XR Software Release 7.6.2 and later	A9K-RSP5-X-TR=
ASR 9000 Route Switch Processor 5 for Service Edge - Premium	Cisco IOS XR Software Release 7.6.2 and later	A9K-RSP5-X-SE
ASR 9000 Route Switch Processor 5 for Service Edge – Premium, Spare	Cisco IOS XR Software Release 7.6.2 and later	A9K-RSP5-X-SE=

To place an order, visit the Cisco Ordering Homepage and refer to Table 5.

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Product sustainability

Information about Cisco's environmental, social and governance (ESG) initiatives and performance is provided in Cisco's CSR and sustainability reporting.

Table 6. Product sustainability

Sustainability Topic		Reference
General	Information on product-material-content laws and regulations	Materials
	Information on electronic waste laws and regulations, including our products, batteries and packaging	WEEE Compliance
	Information on product takeback and resuse program	Cisco Takeback and Reuse Program
	Sustainability Inquiries	Contact: csr_inquiries@cisco.com
Material	Product packaging weight and materials	Contact: environment@cisco.com

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For more information

https://www.cisco.com/c/en/us/products/routers/asr-9000-series-aggregation-services-routers/index.html

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Document history

Table 7. Document history

New or Revised Topic	Described In	Date
Added SKUs for new 5th Generation line cards that offer native 1G support	Product specifications, Features and Benefits of the ASR 9000 Series RSP5, Technical Specifications for Cisco ASR 9000 Series RSP5 Hardware	July 10, 2025
Initial revision of RSP-X data sheet	New Data sheet	June, 2022

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Printed in USA C78-2978852-01 07/25

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