Cisco ASR 900 Route Switch Processor

Centralized network timing. Control plane and data plane elements. The Cisco® ASR 900 Route Switch Processor (RSP) is the powerful centralized engine that provides these features and more for Cisco ASR 900 Series routers. The Cisco ASR 900 RSP (Figure 1) is designed to address the requirements of converged service provider networks - from Carrier Ethernet technologies to advanced services such as Multiprotocol Label Switching (MPLS). It helps providers add innovative traffic management and intelligent packet switching and routing features.

Figure 1.   Cisco ASR 903 Route Switch Processor 1 (Route Switch Processor 2 not shown)

Route Switch Processor Features

The Cisco ASR 900 RSP module contains separate control plane and data plane components. These include the main control plane CPU for the Cisco IOS® XE operating system and platform control software. The data plane packet processing and traffic management is performed by the Cisco Carrier Ethernet application-specific integrated circuit (ASIC).

Cisco Carrier Ethernet ASIC

Powered by the Cisco Carrier Ethernet ASIC and designed specifically for the needs of service providers, the Cisco ASR 900 Series routers deliver essential Carrier Ethernet technologies. These include hierarchical quality of service (HQoS), IPv4, IPv6, MPLS, and Hierarchical Virtual Private LAN Services (HVPLS). The Cisco Carrier Ethernet ASIC provides line-rate performance and supports advanced services including access control list (ACL) and HQoS without affecting performance. The ASIC incorporates innovative traffic management capabilities while providing intelligent packet switching and routing operations.

Service Enhancement

With Cisco ASR 900 Series routers, each service is assigned enhanced QoS and security attributes. The router provides advanced per-traffic-class metering and offers bidirectional packet count and byte count statistics. The service offering is enhanced with operations, administration, and maintenance (OAM) functionality that includes Layer 2 Connectivity Fault Management (CFM), IP service-level agreement (IP SLA) for Layer 3, and MPLS OAM.

Service Scale

The Cisco ASR 900 Series delivers flexible service scalability in a small footprint. The routers deliver high performance and high scale for point-to-point and multipoint VPN services. The HQoS capabilities of the Cisco ASR 900 Series scale to eight queues per service, three levels of scheduling, and buffer sizes capable of accommodating today's most demanding wireline and wireless applications.

Clocking and Timing Services

The Cisco ASR 900 RSPs contain the central system clocking and timing functions for the Cisco ASR 900 Series platform, which are required in a modern unified network. The RSPs offer integrated support for the Building Integrated Timing Supply (BITS), 10 MHz, 1 Pulse Per Second (1 PPS) and Time Of Day (TOD) interfaces. The Cisco ASR 900 Series platform also supports synchronous Ethernet (SyncE), IEEE 1588-2008, and can act as the clock source for network clocking of time-division multiplexing (TDM) and Synchronous Digital Hierarchy/Synchronous Optical Network (SDH/SONET) interfaces.

The Cisco ASR 900 Series can act as an IEEE 1588-2008 Ordinary Clock, Boundary Clock, end-to-end Transparent Clock, and Master Clock function in an IEEE 1588-2008 timing domain.

High Availability and Modularity

The Cisco ASR 900 Series router is a fully modular platform. The design of the router delivers optional intra-chassis hardware redundancy for all hardware components and supports software redundancy with In Service Software Upgrade (ISSU) support when a pair of route switch processors is inserted in the Cisco ASR 903 Router chassis.

With two RSPs inserted in the Cisco ASR 903 Router, one RSP operates in active mode and the other RSP operates in hot standby mode. The Cisco ASR 900 RSP is a field replaceable unit (FRU) and can be online inserted and removed (OIR) while the Cisco ASR 903 Router system is operating. The removal or failure of the active RSP in the Cisco ASR 903 Router results in the automatic switchover to the standby RSP.

Management Interfaces

The Cisco ASR 900 RSP contains the out of band (OOB) management interfaces for the system. To offer flexibility to access the router, there are a variety of interfaces for management access to the platform. This includes a dual-mode console port that functions as either a USB console or a serial console port. In addition to the serial console access, the Cisco ASR 900 RSP contains an Ethernet management port that has no interaction with the actual Carrier Ethernet ASIC traffic. In addition to the OOB control interfaces, there is a USB port to connect USB Flash devices for loading Cisco IOS XE Software images and configurations on the platform.

Ethernet Interface Modules and Multiservice Interface Modules

The Cisco ASR 903 Route Switch Processor 1 (RSP1) is compatible with the following interface modules.

- Cisco ASR 900 Series 1-Port 10GE XFP Module: supports a single 10-Gigabit Ethernet Small Form-Factor Pluggable (XFP) port.
- Cisco ASR 900 Series 8-Port 1GE RJ45 Module: supports eight Copper RJ-45 Gigabit Ethernet ports.
- Cisco ASR 900 Series 8-Port 1GE SFP Module: supports eight Gigabit Ethernet Small Form-Factor Pluggable (SFP) ports.

- Cisco ASR 900 Series 14-Port Serial Module: supports 14 serial ports. The 14 ports are comprised of six 12-in-1 Connectors with support for Asynchronous RS-232 interfaces using EIA/TIA-232 DB-25 connectors and two 68-Pin Connectors which support up to 8 RS-232 and RS-485 interfaces in full or half duplex mode using 4 RS-232 connectors (DB-25, DB-9, or RJ-45).
- Cisco ASR 900 Series 16-Port T1/E1 Module: supports 16 T1 or E1 ports. The port type is software configurable per interface module; mixing of T1 and E1 ports on a single interface module is not supported.
- Cisco ASR 900 Series 4-Port OC3/STM-1 or 1-Port OC12/STM-4 Module: This combination module is designed to be software configurable in four modes: 4xOC-3, 4xSTM-1, 1xOC12, and 1xSTM-4. If the module is configured for 4xOC-3 or 4xSTM-1, then the individual interfaces can be configured to be clear-channel, POS, or channelized in any combination. Support of these modes is software dependent as described in the Cisco IOS XE Software for Cisco ASR 900 Series Router data sheet.

The Cisco ASR 900 RSP2 is compatible with all of the Interface modules that are supported by the Cisco ASR 903 Route Switch Processor 1 (RSP1) additionally, this second RSP is compatible with the following interface modules.

- Cisco ASR 900 Series 2-Port 10GE XFP/SFP+ Module: This module supports two 10-Gigabit Ethernet ports. Each port can individually be used as either a Small Form-Factor Pluggable (XFP) port or as a Small Form-factor Pluggable Plus (SFP+) port.
- Cisco ASR 900 Series 8-Port 1GE RJ45 and 1-port 10GE SFP+ Module: supports eight Copper RJ-45 Gigabit Ethernet ports and one Small Form-factor Pluggable Plus (SFP+) port.
- Cisco ASR 900 Series 8-Port 1GE SFP and 1-port 10GE SFP+ Module: supports eight Gigabit Ethernet Small Form-Factor Pluggable (SFP) ports and one Small Form-factor Pluggable Plus (SFP+) port.

Interface Module Compatibility

The Cisco ASR 900 Interface Modules support is dependent on the combination of the RSP, the chassis, and the interface module slot combination.

- The Cisco ASR 900 RSP2A-128 module supports any combination of interface modules and interface modules slots for the Cisco ASR 902 and ASR 903 routers.
- The Cisco ASR 900 RSP2A-64 module in combination with the Cisco ASR 903 router supports the 1-port 10GE and 2-port 10GE Interface Modules in slot 0, slot 1 and slot 2. The 8-port Gigabit Ethernet as well as the legacy TDM interface modules of less then 10 Gigabit combined speed are supported in slot 3, slot 4 and slot 5. The Interface modules with the combined 8-port Gigabit Ethernet ports and 1-port 10GE interfaces are not supported on the ASR 903 router in combination with the Cisco ASR 900 RSP2A-64 module.
- The Cisco ASR 900 RSP2A-64 module in combination with the Cisco ASR 902 router supports the 1-port 10GE and 2-port 10GE Interface Modules in slot 0, slot 1 and slot 2. The 8 Port Gigabit Ethernet as well as the legacy TDM interface modules of less then 10 Gigabit combined speed are supported in slot 0, slot 2 and slot 3. The Interface modules with the combined 8 port Gigabit Ethernet ports and 1 port 10GE interfaces are supported on the ASR 902 router in slot 0 and slot 2.
- The Cisco ASR 903 RSP1 module in combination with the Cisco ASR 903 Router supports all interface modules with a combined speed of 10GE or less, including the 1-port 10GE Interface Module, in four slots (slot 0 to slot 3). The remaining two slots (slot 4 and slot 5) in the Cisco ASR 903 Router support only the 8-port Gigabit Ethernet and TDM interface modules. Interface Module Slot 5 on the Cisco ASR 903 Router is limited to a maximum of seven Gigabit Ethernet ports with the Cisco ASR 903 RSP1.

- The Cisco ASR 903 RSP1 module in combination with the Cisco ASR 902 Router supports all interface modules with a combined speed of 10GE or less, including the 1-port 10GE Interface Module, in four slots (slot 0 to slot 3). Interface Module Slot 3 on the Cisco ASR 902 Router is limited to a maximum of seven Gigabit Ethernet ports with the Cisco ASR 903 RSP1.

Software

The Cisco ASR 900 Series Router is supported in Cisco IOS XE S Software, a modular operating system. Cisco IOS XE Software is designed to provide modular packaging, feature velocity, and powerful resiliency. The software supports Cisco software activation on the Cisco ASR 900 Series Router. Table 1 describes the Cisco IOS XE universal consolidated packages supported on the router. The functionality is enforced through the appropriate technology package licenses. The available features and related licensing are described in the Cisco IOS XE Software for Cisco ASR 900 Series router data sheet.

The software support for the Cisco ASR 903 chassis was added in Cisco IOS XE Release 3.5.0S, and the support for the Cisco ASR 902 chassis has been added in Cisco IOS XE Release 3.12.0S. The support for Cisco ASR 900 RSP2 has been added in Cisco IOS XE Release 3.13.0S.

Table 1.   Universal Cisco IOS XE Software Consolidated Packages for Cisco ASR 900 RSP Modules

Cisco IOS XE Consolidated Package	Part Number	Description
Cisco ASR 903 Series RSP1 IOS XE - No Payload Encryption	SASR903R1NPEK9	• Provides a consolidated software package for RSP1 • Includes SSH and SNMPv3 support but not dataplane encryption support
Cisco ASR 900 Series RSP2 IOS XE - No Payload Encryption	SASR900R2NPEK9	• Provides a consolidated software package for RSP2 • Includes SSH and SNMPv3 support but not dataplane encryption support

Table 2 lists the hardware parts available for Cisco ASR 900 RSP modules.

Table 2.   Hardware Components for Cisco ASR 900 RSP Modules

Part Number	Description
A903-RSP1A-55	ASR 903 Route Switch Processor 1, Base Scale
A903-RSP1A-55=	ASR 903 Route Switch Processor 1, Base Scale, spare
A903-RSP1B-55	ASR 903 Route Switch Processor 1, Large Scale
A903-RSP1B-55=	ASR 903 Route Switch Processor 1, Large Scale, spare
A900-RSP2A-64	ASR 900 Route Switch Processor 2 - 64G, Base Scale
A900-RSP2A-64=	ASR 900 Route Switch Processor 2 - 64G, Base Scale, spare
A900-RSP2A-128	ASR 900 Route Switch Processor 2 - 128G, Base Scale
A900-RSP2A-128=	ASR 900 Route Switch Processor 2 - 128G, Base Scale, spare
Cisco ASR 900 RSP Accessories	
A90X-RSPA-BLANK=	ASR 90X Route Switch Processor Type-A Blank Cover, spare

Product Specifications

Tables 3 through 6 list the product specifications and compliance information for the Cisco ASR 900 RSP modules.

Table 3.   Cisco ASR 900 RSP Product Specifications

Product ID	A900-RSP2A-64	A900-RSP2A-128	A903-RSP1A-55	A903-RSP1B-55
Power consumption of chassis with 2 power supplies, 1 fan tray and 1 RSP	120W	180W	195W	210W
Power consumption of standby RSP	90W	110W	130W	130W
RSP memory	4 GB	4 GB	2 GB	4 GB
Service scale[1]	Base service scale	Base service scale	Base service scale	Large service scale
Ethernet interface module compatibility[2]	A900-IMA1X A900-IMA2Z A900-IMA8S A900-IMA8S1Z A900-IMA8T A900-IMA8T1Z		A900-IMA1X A900-IMA8S A900-IMA8T	
TDM and ATM interface module compatibility[2]	A900-IMA16D A900-IMA4OS A900-IMASER14A/S		A900-IMA16D A900-IMA4OS A900-IMASER14A/S	
Maximum transmission unit (MTU)	Configurable MTU of up to 9216 bytes, for bridging on Gigabit Ethernet and 10 Gigabit Ethernet			
IP version 4 performance	95 Mpps	180 Mpps	65 Mpps	
IP version 6 performance	95 Mpps	180 Mpps	65 Mpps	
Management ports[3]	Copper 10/100/1000Base-T LAN management port - RJ45 connector port Console/Aux RS232 serial ports - RJ45 connector port Console - USB 2.0 type A receptacle connector port			
Timing ports[4]	BITS simultaneous input and output (J1/T1/E1) - RJ48 connector port 1PPS input - mini-coax connector port 1PPS output - mini-coax connector port 2.048/10MHz input - mini-coax connector port 2.048/10MHz output - mini-coax connector port		BITS simultaneous input and output (T1/E1) - RJ48 connector port 1PPS input - mini-coax connector port 1PPS output - mini-coax connector port 2.048/10MHz input - mini-coax connector port 2.048/10MHz output - mini-coax connector port	
External USB flash memory	Mass storage - USB 2.0 type A receptacle connector port			
MTBF at 40ºC (104ºF) operating temperature	400.000 hours	400.000 hours	300.000 hours	300.000 hours

[1] Detailed service scale differences for the main functions is listed in Table 4. Mixing of different service scale RSP versions in a single Chassis is not supported.

[2] Interface Module and protocol support is dependent on software version, RSP version, Chassis and slot number combinations, see release notes for more details.

[3] At one moment in time either the USB console port or the RS232 Serial Console/Aux port can be active. These ports cannot be active concurrently.

[4] J1 BITS clocking mode is dependent on software version and may only be supported in future software releases.

Table 4.   Maximum Single-Dimensional Service Scale[1, 2]

Product ID	A900-RSP2A-64	A900-RSP2A-128	A903-RSP1A-55	A903-RSP1B-55
MAC addresses	16,000	16,000	16,000	256,000
Bridge domains	4,000	4,000	4,000	4,000
Ethernet flow points	3,998	3,998	3,998	8,000
L3 interfaces	4,000	4,000	256	1,000
IPv4 routes	20,000	20,000	20,000	80,000

Product ID	A900-RSP2A-64	A900-RSP2A-128	A903-RSP1A-55	A903-RSP1B-55
IPv6 routes	4,000	4,000	6,000	40,000
Multicast routes	1,000	1,000	1,000	8,000
MPLS VPN	128	128	128	1,000
MPLS labels	15,994	15,994	15,994	64,000
EoMPLS tunnels per system	4,000	4,000	2,000	8,000
VPLS instances	2,000	2,000	2,000	4,000
Queues	4,000	8,000	4,000	32,000
Classifications	5,000	10,000	5,000	24,000
Ingress policers	3,000	6,000	2,000	16,000
Class maps	1,000	1,000	1,000	4,000
Queue counters (packet and byte)	4,000	8,000	4,000	128,000
Policer counters (packet and byte)	9,000	18,000	6,000	96,000
IPv4 ACL entries[3]	1,500	1,500	1,500	16,000
BFD sessions	1,000	1,000	511	511
IEEE 802.1ag (CFM) at 3.3ms interval	1,000	1,000	256	256

[1] Not all services can be scaled at maximum scale concurrently (multidirectional service scale), above numbers are unidirectional scale numbers.

[2] The scale numbers are hardware capabilities. The actual scale may be limited in a specific software release and only become available in a future software release.

[3] Maximum 500 access control entries per ACL.

Table 5.   Environmental Specifications

Description	Cisco ASR 900 Series
Operating environment and altitude	-40ºC to 65ºC (-40ºF to 149ºF) operating temperature (DC operation) -5ºC to 55ºC (23ºF to 131ºF) operating temperature (AC operation)[2] 0ºC to 40ºC (32ºF to 104ºF) operating temperature (AC operation) -60 m to 1800 m (-196 ft to 5,905 ft) operating altitude (for full operating temperature range) Up to 4000 m (13,123 ft) operating altitude (at up to +40ºC/104ºF temperature)
Relative humidity	5% to 95%, noncondensing
Acoustic noise[1]	Acoustic noise peak operation maximum 55 dBA sound pressure level, bystander position for rack mount products at 20ºC (68ºF) operation as measured by ISO 7779 NAIS noise measurement test standard Acoustic noise peak operation compliant to the Network Equipment Building Standards (NEBS) GR-63-Core Issue 3 sound power level of 78dB at 27ºC (80.6ºF) operation as measured by the ANSI S12.10/ISO 7779 NAIS noise measurement test standard
Storage environment	Temperature: -40 to +70ºC (-40ºF to 158ºF) altitude: 4570 m (15,000 ft)
Seismic	Zone 4

[1] The above are for normal (non-failure) operation. When operating with a fan failure, the above may be exceeded.

Table 6.   Safety and Compliance

Type	Standards
Safety	• UL 60950-1, 2nd edition • CAN/CSA C22.2 No. 60950-1-07 2nd edition • IEC 60950-1, 2nd edition • EN 60950-1, 2nd edition • AS/NZS 60950.1:2003
Electromagnetic	• FCC CFR47 Part 15 Class A

Type	Standards
Emissions compliance	• EN55022, class A • CISPR22, class A • ICES-003, class A • EN 300 386, class A • VCCI, class A • KN22, class A • EN61000-3-2 to EN61000-3-3
Immunity compliance	• EN 300 386 • EN 61000-6-1 • EN 50082-1 • CISPR24 • EN 55024 • KN 24 • EN 50121-4 • EN/KN 61000-4-2 to EN/KN 61000-4-6 • EN/KN 61000-4-8 • EN/KN 61000-4-11
NEBS[1]	• GR-63-CORE Issue 3 • GR-1089-CORE Issue 5 • SR-3580 NEBS Level 3
ETSI	• ETS/EN 300 119 Part 4 • ETS/EN 300 019 - Storage: Class 1.2, Transportation: Class 2.3, In-Use/Operational: Class 3.2 • ETS/EN 300 753
Network synchronization	• ANSI T1.101 • GR-1244-CORE • GR-253-CORE • ITU-T G.813 • ITU-T G.823 • ITU-T G.824 • ITU-T G.703 clause 5 • ITU-T G.703 clause 9 • ITU-T G.8261/Y.1361 • ITU-T G.781 • ITU-T G.8262 • ITU-T G.8264 • IEEE1588-2008

[1] Certification pending, with notable exception: All cabling is provided through the front panel.

Warranty Information

Find warranty information on Cisco.com at the <u>Product Warranties</u> page.

Service and Support

Cisco offers a wide range of services programs to accelerate customer success. These innovative services programs are delivered through a unique combination of people, processes, tools, and partners, resulting in high levels of customer satisfaction. Cisco Services help you protect your network investment, optimize network operations, and prepare your network for new applications to extend network intelligence and the power of your business. For more information about Cisco Services, refer to Cisco Technical Support Services or Cisco Advanced Services.

Cisco is committed to reducing your total cost of ownership. Cisco offers a portfolio of technical support services to help ensure that Cisco products operate efficiently, remain highly available, and benefit from the most up-to-date system software. The services and support programs described in Table 7 are available as part of the Cisco Carrier Ethernet Switching Service and Support solution and are available directly from Cisco and through resellers.

Table 7.   Service and Support

Advanced Services	Features	Benefits
Cisco Total Implementation Solutions (TIS), available directly from Cisco **Cisco Packaged TIS, available through resellers**	• Project management • Site survey, configuration, and deployment • Installation, text, and cutover • Training • Major moves, adds, and changes • Design review and product staging	• Supplement existing staff • Help ensure functions meet needs • Mitigate risk
Cisco SP Base Support and Service Provider-Based Onsite Support, available directly from Cisco **Cisco Packaged Service Provider- Based Support, available through resellers**	• 24-hour access to software updates • Web access to technical repositories • Telephone support through the Cisco Technical Assistance Center (TAC) • Advance Replacement of hardware parts	• Facilitate proactive or expedited problem resolution • Lower total cost of ownership by taking advantage of Cisco expertise and knowledge • Reduce network downtime