

Cisco ASR 900 Series 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 ASR 900 Series RSPs (Figures 1–3) address the requirements of converged service provider networks, from Carrier Ethernet technologies to advanced services such as Multiprotocol Label Switching (MPLS). Its three models help providers add innovative traffic management and intelligent packet-switching and routing features. The models include the Cisco ASR 900 Series Route Switch Processor 1 (RSP1A/B), the Cisco ASR 900 Series Route Switch Processor 2 (RSP2A), and the Cisco ASR 900 Series Route Switch Processor 3 (RSP3C).

Product Overview

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

Figure 1. Cisco ASR 902 and ASR 903 Route Sw itch Processor 1B, Route Sw itch Processor2A



Figure 2. Cisco ASR 902 and ASR 903 Route Sw itch Processor 3C



Figure 3. Cisco ASR 907 Route Sw itch Processor3C



Features and Benefits

Feature	Benefit
Carrier Ethernet ASIC	Delivers essential Carrier Ethernet technologies such as hierarchical quality of service (HQoS), IPv4, IPv6, MPLS/flex LSP, and hierarchical virtual private LAN services (HVPLS). It provides line-rate performance and incorporates innovative traffic management capabilities while providing intelligent packet switching and routing operations.
Service enhancement	Provides advanced per-traffic-class metering and offer 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 agreements (IP SLAs) for Layer 3, and MPLS OAM.
Service scale	Provides flexible service scalability in a small footprint delivering high performance and scale for point-to-point and multipoint services, accommodating the requirements from the most demanding wireline and wireless applications.
Clocking and timing services	Offers integrated support for the Global Navigation Satellite System (GNSS), building integrated timing supply (BITS), 10 MHz, 1 pulse per second (1 PPS), and time of day (TOD) interfaces, crucial functions required in a modern unified network. As the central system clocking and timing functions for the ASR 900 Series platform, the Cisco ASR 900 RSPs support synchronous Ethernet (SyncE) and IEEE 1588-2008 and can act as the clock source for network clocking of time-division multiplexing (TDM) and SDH/SONET interfaces. The 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	Delivers optional intrachassis 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 900 system chassis fully modular platform. With two RSPs inserted in the Cisco ASR 903 or in the Cisco ASR 907 systems, 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 it can be online inserted and removed (OIR) while the Cisco ASR 900 system is operating. The removal or failure of the active RSP in the Cisco ASR 900 system results in the automatic switchover to the standby RSP.
Management interfaces	Contains the out-of-band (OOB) management interfaces for the system. To offer flexible access to the router, a variety of interfaces are available for management access to the platform, including 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 actual Carrier Ethernet ASIC traffic. In addition to the OOB control interfaces, a USB port can connect USB flash devices for loading Cisco IOS® Software images and configurations on the platform.

Fully Distributed and Unique Packet/Circuit Capabilities for Converged Access Networks

The Cisco ASR 902/903 Route Switch Processor 1 (RSP1A/B) 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 composed 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 four 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 T1 and E1 ports on a single interface module is not supported.

- Cisco ASR 900 Series 4-Port OC3/STM1 or 1-Port OC12/STM4 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 902/903 Route Switch Processor 2 (RSP2A) is compatible with all the interface modules that are supported by the Cisco ASR 903 Route Switch Processor 1 (RSP1). In addition, this second-generation 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 individual port can be used as either an 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 SFP+ port.
- Cisco ASR 900 Series 8-Port 1GE SFP and 1-port 10GE SFP+ Module: supports eight Gigabit Ethernet SFP ports and one SFP+ port.
- Cisco ASR 900 Series 8-Port T1/E1 Module: supports 8 T1 or E1 ports. The port type is software configurable per interface module. Mixing T1 and E1 ports on a single interface module is not supported.
- Cisco ASR 900 Series 32-Port T1/E1 Module: supports 32 T1 or E1 ports. The port type is software configurable per interface module. Mixing T1 and E1 ports on a single interface module is not supported.

The Cisco ASR 903/907 Route Switch Processor 3 (RSP3C) is compatible with the following multiple Ethernet and TDM/SONET/SDH interface modules:

- Cisco ASR 900 Series 1-Port 100GE CPAK Module: This module supports one 100 Gigabit Ethernet CPAK port.
- Cisco ASR 900 Series 2-Port 40GE QSFP Module: This module supports two QSFP ports.
- Cisco ASR 900 Series 8-Port 10GE SFP+ Module: This module supports eight SFP+ ports.
- Cisco ASR 900 Series 48-Port T1/E1 CEM Module: supports 48 T1 or E1 ports. The port type is software configurable per interface module. Mixing T1 and E1 ports on a single interface module is not supported.
- Cisco ASR 900 Series 48-Port T3/E3 CEM Module: supports 48 T3 or E3 ports. The port type is software configurable per interface module. Mixing T3 and E3 ports on a single interface module is not supported.
- Cisco ASR 900 Series 1-Port 10G (OCn/STM-n) and 8-Port 1G (OCn/STMn) CEM and OTN Module: This combination module is designed to be software configurable in different modes: 1 x OC192/STM-64 or either 4xOC48/STM-16, 8xOC3/STM-1, or 8xOC12/STM-4.

The Cisco ASR 900 Series RSP3C also supports a Global Navigation Satellite System (GNSS) module that allows direct interface to external antennas. The GNSS module is able to support several satellite systems, such as the Global Positioning System (GPS), GLONASS, BEIDU, QZSS, SBAS, and GALILEO.

The Cisco ASR 900 Series RSP3C is available in two different sizes in order to support the differences in form factors of the ASR 900 chassis types. The capabilities of the different form factors are identical, and the software is identical as well. The wide form-factor RSP engine (A900-RSP3C-400-W) is supported in the ASR 907 chassis, while the small form-factor RSP engine (A900-RSP3C-400-S) is supported in the ASR 903 chassis.

The ASR 900 interface module support is dependent on the combination of the RSP, the chassis, software version, and the interface module slot. The Cisco ASR 900 Series Interface Modules Datasheet <http://www.cisco.com/c/en/us/products/collateral/routers/asr-903-series-aggregation-services-routers/datasheet-c78-738338.html> contains the compatibility matrix for the several combinations.

Industry-Leading, Carrier-Class Cisco IOS Software

The ASR 900 Series systems are supported in Cisco IOS XE Software. The Cisco IOS XE Software is designed to provide modular packaging, feature velocity, and powerful resiliency.

The Cisco IOS XE software provides scale and serviceability for service providers by:

- Supporting the complete set of Cisco IOS Software features for a consistent experience
- Scaling advanced service delivery without affecting system performance
- Integrating applications in the network, improving security, reliability, and simplicity
- Facilitating programmability for cloud service orchestration

The software support for the Cisco ASR 903 Chassis was added in Cisco IOS XE Software Release 3.5.0S, and the support for the Cisco ASR 902 Chassis was added in Cisco IOS XE Software Release 3.12.0S. The support for Cisco ASR 900 Series RSP2A was added in Cisco IOS XE Software Release 3.13.0S, with the support for Cisco ASR 900 Series RSP3C being added in Cisco IOS XE Software Release 3.16.1S.

The software support for the TDM/CEM modules with Cisco ASR 900 Series RSP3C was added in Cisco IOS XE Software Release 3.18SP.

Product Specifications

Tables 1 through 4 list the product specifications and compliance information for the Cisco ASR 900 RSP modules. Individual modules are identified by product number.

Table 1. Cisco ASR 900 RSP Product Specifications

Product ID	A900-RSP3C-200-S	A900-RSP3C-400-S A900-RSP3C-400-W	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	340W	A900-RSP3C-400-S: 440W A900-RSP3C-400-W: 480W	A900-RSP2A-64: 120W A900-RSP2A-128: 180W	A903-RSP1A-55: 195W A903-RSP1B-55: 210W
RSP memory (DRAM)	8 GB	8 GB	4 GB	A903-RSP1A-55: 2 GB A903-RSP1B-55: 4 GB
Flash memory (storage)	8 GB	8 GB	2 GB	2 GB
Service scale ^{1, 2, 3}	Large	Large	Base	A903-RSP1A-55: Base A903-RSP1B-55: Large
Ethernet interface module compatibility ⁴	A900-IMA2F A900-IMA8Z A900-IMA2Z A900-IMA1X A900-IMA8S A900-IMA8S1Z A900-IMA8T A900-IMA8T1Z	A900-IMA1C A900-IMA2F A900-IMA8Z A900-IMA2Z A900-IMA1X A900-IMA8S A900-IMA8S1Z A900-IMA8T A900-IMA8T1Z	A900-IMA1X A900-IMA2Z A900-IMA8S A900-IMA8S1Z A900-IMA8T A900-IMA8T1Z	A900-IMA1X A900-IMA8S A900-IMA8T

Product ID	A900-RSP3C-200-S	A900-RSP3C-400-S A900-RSP3C-400-W	A900-RSP2A-64 A900-RSP2A-128	A903-RSP1A-55 A903-RSP1B-55
TDM and ATM interface module compatibility⁴	A900-IMA1Z8S-CX A900-IMA48D-C A900-IMA48T-C A900-IMA4OS	A900-IMA1Z8S-CX A900-IMA48D-C A900-IMA48T-C A900-IMA4OS	A900-IMA8D A900-IMA16D A900-IMA32D 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, 10 and 100 Gigabit Ethernet			
Maximum interface throughput⁵	240 Gbps	480 Gbps	A900-RSP2A-64: 64 Gbps A900-RSP2A-128: 128 Gbps	55 Gbps
IP version 4 performance	300 Mpps	600 Mpps	A900-RSP2A-64: 95 Mpps A900-RSP2A-128: 180 Mpps	65 Mpps
IP version 6 performance	300 Mpps	600 Mpps	A900-RSP2A-64: 95 Mpps A900-RSP2A-128: 180 Mpps	65 Mpps
Management ports	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 ports⁶	BITS simultaneous input and output (J1/T1/E1) - RJ48 connector port 1 pps input - mini-coax connector port 1 pps output - mini-coax connector port 2.048/10 MHz input - mini-coax connector port 2.048/10 MHz output - mini-coax connector port			
External USB flash memory	Mass storage - USB 2.0 type A receptacle connector port			
Shipment package size in inches (LxWxH)	14.38x14.38x6.25	A900-RSP3C-400-S: 14.38x14.38x6.25 A900-RSP3C-400-W: 21.75x15.75x6.56	14.38x14.38x6.25	14.38x14.38x6.25
Shipment package weight	6.2 lbs.	A900-RSP3C-400-S: 6.2 lbs. A900-RSP3C-400-W: 7.0 lbs.	6.2 lbs.	6.2 lbs.
MTBF at 104°F (40°C) operating temperature	230,000 hours	230,000 hours	400,000 hours	300,000 hours

¹ Not all services can be scaled at maximum scale concurrently (multidimensional service scale). The numbers are unidirectional scale numbers.

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

³ [Scale depends on switch device template used.](#)

⁴ Interface module and protocol support is dependent on software version, RSP version, chassis, and slot number combinations. See release notes for more details.

⁵ Higher combined interface bandwidth may be accepted in the router configuration, though beyond the maximum interface throughput the functionality of the router cannot be guaranteed. Oversubscription of RSP1 and RSP2 is not supported. Oversubscription for RSP3 is a roadmap item. See release notes for more details.

⁶ J1 BITS clocking mode is dependent on software version and might only be supported in future software releases.

Table 2. Maximum Single-Dimensional Service Scale^{1,2,3,4}

Product ID	A900-RSP3C-200-S A900-RSP3C-400-S A900-RSP3C-400-W	A900-RSP2A-64 A900-RSP2A-128	A903-RSP1A-55	A903-RSP1B-55
MAC addresses	200,000	16,000	16,000	256,000
Bridge domains	8,000	4,000	4,000	4,000
Ethernet flow points	5,000	3,998	3,998	8,000
L3 interfaces	1,000	1,000	256	1,000
IPv4 routes	128,000	20,000	20,000	80,000
IPv6 routes	12,000	4,000	6,000	40,000
Multicast routes	4,000	1,000	1,000	8,000
MPLS VPN	1,000	128	128	1,000
MPLS labels	32,000	15,994	15,994	64,000
EoMPLS tunnels per system	8,000	4,000	2,000	8,000
VPLS instances	4,000	2,000	2,000	4,000
Queues	48,000	A900-RSP2A-64: 4,000 A900-RSP2A-128: 8,000	4,000	32,000
Classifications	24,000	A900-RSP2A-64: 5,000 A900-RSP2A-128: 10,000	5,000	24,000
Ingress policers	24,000	A900-RSP2A-64: 3,000 A900-RSP2A-128: 6,000	2,000	16,000
Class maps	1,000	1,000	1,000	4,000
Queue counters (packet and byte)	240,000	A900-RSP2A-64: 4,000 A900-RSP2A-128: 8,000	4,000	128,000
Policer counters (packet and byte)	72,000	A900-RSP2A-64: 9,000 A900-RSP2A-128: 18,000	6,000	96,000
IPv4 ACL entries ⁴	1,000	1,500	1,500	16,000
BFD sessions	1,023	1,000	511	511
IEEE 802.1ag (CFM) at 3.3ms interval	1,024	1,000	256	256

¹ Not all services can be scaled at maximum scale concurrently (multidimensional service scale). The numbers above are unidirectional scale numbers.

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

³ [Scale depends on switch device template used.](#)

⁴ Maximum 500 access control entries per ACL.

Table 3. Environmental Specifications

	Cisco ASR 900 Series System
Operating environment and altitude ¹	-40 to 65°C operating temperature (DC operation, with the 900W or 1200W power supplies) -40 to 65°C operating temperature (AC operation, with the 1200W power supplies) -5 to 50°C operating temperature (AC operation, with the 550W power supplies) -60 to 1800m operating altitude (for full operating temperature range) Up to 4000m operating altitude (at up to 40°C temperature)
Outside plant	For an outside plant installation, it is required that the system be protected against airborne contaminants, dust, moisture, insects, pests, corrosive gases, polluted air, or other reactive elements present in the outside air. To achieve this level of protection, it is recommended that the unit be installed in a fully sealed enclosure. Examples of such cabinets include IP65 cabinets with heat exchanger complying with Telcordia GR487.
Relative humidity	5 to 95%, noncondensing

Cisco ASR 900 Series System	
Acoustic noise²	Acoustic noise peak operation complies with Network Equipment Building Standards (NEBS) GR-63-Core Issue 4 sound power level of 78 dB at 27°C operation as measured by the ANSI S12.10/ISO 7779 NAIS noise measurement test standard.
Storage environment	Temperature: -40 to 70°C altitude: 15,000 ft. (4570m)
Seismic	Zone 4
Hazardous substances	Reduction of Hazardous Substances (ROHS) 6

¹ Minimum temperature range of chassis, fan tray, RSP engine, power supply, optics, and interface modules will dictate the supported operating temperature range. Maximum cooling fan tray module is assumed.

² The above values are for normal (nonfailure) operation. When operating with a fan failure, the above may be exceeded.

Table 4. Safety and Compliance

Type	Standards
Safety	<ul style="list-style-type: none"> • 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 Emissions compliance	<ul style="list-style-type: none"> • FCC CFR47 Part 15 Class A • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • GR-63-CORE Issue 3 • GR-1089-CORE Issue 5 • SR-3580 NEBS Level 3
ETSI	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • GNSS • 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

Type	Standards
	<ul style="list-style-type: none"> • ITU-T G.8262 • ITU-T G.8264 • ITU-T G.8265.1 • ITU-T G.8275.1 • IEEE1588-2008

Ordering Information

Table 5 describes the Cisco IOS XE Software universal consolidated packages supported on the system, which include all Cisco IOS XE Software functionalities and features enabled. Table 6 lists the hardware parts available for Cisco ASR 900 RSP modules.

Table 5. Universal Cisco IOS XE Software 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	SA903R1NPEK9318SP	<ul style="list-style-type: none"> • 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	SA900R2NPEK9318SP	<ul style="list-style-type: none"> • Provides a consolidated software package for RSP2 • Includes SSH and SNMPv3 support but not dataplane encryption support.
Cisco ASR 900 Series RSP3 IOS XE – No Payload Encryption	SA900R3NPEK9318SP	<ul style="list-style-type: none"> • Provides a consolidated software package for RSP3 • Includes SSH and SNMPv3 support but not dataplane encryption support.
Cisco ASR 900 Series RSP3 IOS XE – Payload Encryption	SASR900R3K9318SP	<ul style="list-style-type: none"> • Provides a consolidated software package for RSP3 • Includes SSH, SNMPv3, and dataplane encryption support.

Table 6. 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
A900-RSP3C-200-S	ASR 900 Route Switch Processor 3 - 200G, Large Scale
A900-RSP3C-200-S=	ASR 900 Route Switch Processor 3 - 200G, Large Scale, spare
A900-RSP3C-400-S	ASR 903 Router & Switching Processor and Controller - 400G
A900-RSP3C-400-S=	ASR 903 Router & Switching Processor and Controller - 400G, spare
A900-RSP3C-400-W	ASR 907 Router & Switching Processor and Controller - 400G
A900-RSP3C-400-W=	ASR 907 Router & Switching Processor and Controller - 400G, spare
A900-CM-GNSS	ASR 900 Global Navigation Satellite System Module
A900-CM-GNSS=	ASR 900 Global Navigation Satellite System Module, spare
Cisco ASR 900 RSP Accessories	
A90X-RSPA-BLANK=	ASR 90X Route Switch Processor Type-A Blank Cover, spare
A90X-RSPB-BLANK=	ASR 90X Route Switch Processor Type-B Blank Cover, spare

Warranty Information

Warranty information is available on Cisco.com at the [Product Warranties](#) page.

Service and Support

Cisco offers a wide range of services programs to help accelerate customer success. These innovative services programs are delivered through a unique combination of people, processes, tools, and partners, promoting 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	<ul style="list-style-type: none">• Project management• Site survey, configuration, and deployment• Installation, test, and cutover• Training• Major moves, adds, and changes• Design review and product staging	<ul style="list-style-type: none">• 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	<ul style="list-style-type: none">• 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	<ul style="list-style-type: none">• Facilitate proactive or expedited problem resolution• Lower total cost of ownership by taking advantage of Cisco expertise and knowledge• Reduce network downtime

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