

## Cisco ASR 901S Series Aggregation Services Routers

The Cisco® ASR 901S Series Aggregation Services Routers are optimized for the backhaul of true multivendor heterogeneous small cell networks. As mobile operators seek to aggressively deploy small cell networks in an effort to increase capacity and coverage, they will be challenged to do so without straining their capital and operational budgets. The Cisco ASR 901S Series is designed specifically to ease these constraints and enable the wide-scale deployment of small cell networks. The ASR 901S Routers are compact, environmentally hardened, low-power-consumption routers that you can install in an outside plant without an enclosure. You can deploy them easily in challenging locations such as on lampposts, telephone poles, and sides of walls. With the Cisco ASR 901S, you can reduce backhaul operating costs, simplify deployment and provisioning, and enhance your profit opportunities with premium mobile and Ethernet services.

To implement a small cell network successfully requires far more cell sites than in macro networks, and thus significantly more backhaul links. Although small cell networks will inevitably become a reality, service providers are challenged to create an affordable, customized, and flexible backhaul environment that addresses this wide-scale network deployment. A critical requirement is that the small cells must be small enough to mount in challenging low-profile environments such as lampposts. A significant concern is effectively and efficiently delivering sufficient bandwidth to each of these locations. Although small cell backhaul routers require functions similar to those of existing cell-site routers for macro radios, they do have very distinct mechanical requirements to support outdoor deployments. The Cisco ASR 901S is designed to meet service provider requirements for flexible, scalable, and cost-optimized small cell backhaul networks.

This Cisco ASR 901S platform provides distinctive Cisco value to the small cell backhaul market:

- Flexible architecture that supports true multivendor “any-G” heterogeneous radio technology and backhaul topologies
- Dramatically reduced operating expenses (OpEx) and total cost of ownership (TCO) through zero-touch provisioning (ZTP) capabilities and extensive management tools
- Unsurpassed user experiences through Cisco’s best-in-class routing and comprehensive operations, administration, and maintenance (OAM) capabilities

## Product Overview

The Cisco ASR 901S Series is a family of small cell routers designed to support backhaul in deployment of small cell radios. These routers are small-form-factor, environmentally hardened (IP65 rated), low-power, and cost-effective. They complement the Cisco ASR 901 as part of the Cisco end-to-end mobile backhaul solution and transparently integrate into existing operational environments. A Cisco ASR 901S router prioritizes and processes small cell-site voice, data, and signaling traffic as part of the Cisco Unified RAN Backhaul solution for reliable transport across any available backhaul networks (Figure 1).

Designed for small cell sites in outdoor deployments, the Cisco ASR 901S features include:

- Simplified deployment: ZTP, including circuit validation, and extensive management tools to reduce OpEx and TCO
- Wireless management (Wi-Fi) interface to minimize physical access to the unit, helping reduce the network maintenance costs
- Complementary to the Cisco ASR 901 as part of the Cisco Unified RAN Backhaul solution
- Full support for Layer 2, Layer 3, and Multiprotocol Label Switching (MPLS) deployment models
- Comprehensive OA&M capability, Connectivity Fault Management (CFM), Y1731 FM/PM and Y.1564 compliance, and service loopback
- Proven interoperability with multiple microwave vendors
- IP65-compliant, compact, aesthetically pleasing enclosure designed for outdoor deployments and designed to work at -40 to 149°F (-40 to 65°C) ambient temperatures
- Flexible options for different combinations of copper and Small Form-Factor Pluggable (SFP) 1-Gigabit Ethernet ports
- Mechanical mounting options to enable mounting on brackets, walls, lampposts, etc.
- Maximum power consumption <40W without Power over Ethernet Plus (PoE+)
- Support for PoE+ on the copper ports in the AC variant
- Completely fanless passive cooling design
- Wireless Management

**Figure 1.** Cisco ASR 901S

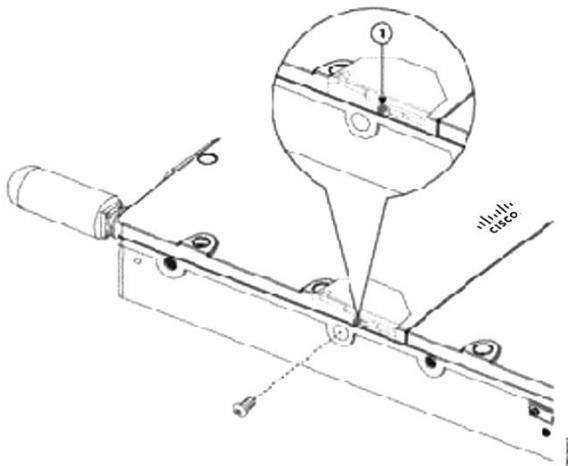


## Mechanical Design

The mechanical design of the Cisco ASR 901S is IP65-compliant with fanless passive cooling:

- The top of the chassis has a single cover that you can remove using a special bit.
  - Opening this cover gives you access to the port interfaces and enables you to service the ports (for example, change the optical modules and cables).
- The cable bay is located in the lower part of the chassis. This space is used to route and fix the cables to the front panel as well as the power entry.
- The power entry is through an IP65-compliant connector for DC and AC power. Each SFP port has a (LC-LC) patch cable from the SFP module to the front panel. For external connectivity, an LC cable system with IP65 sealing is used.
- The alarm, management, and console port Category 5e cable is routed through the 3-wire gland.
- The Cisco ASR 901S has a conduction-cooled fanless design. The bottom part of the chassis acts as the heat sink for all the components.
- Field technicians can press a physical button on the chassis to reset the router and initiate zero-touch provisioning. Figure 2 shows the location of the zero-touch button.

**Figure 2.** Location of Zero-Touch Button



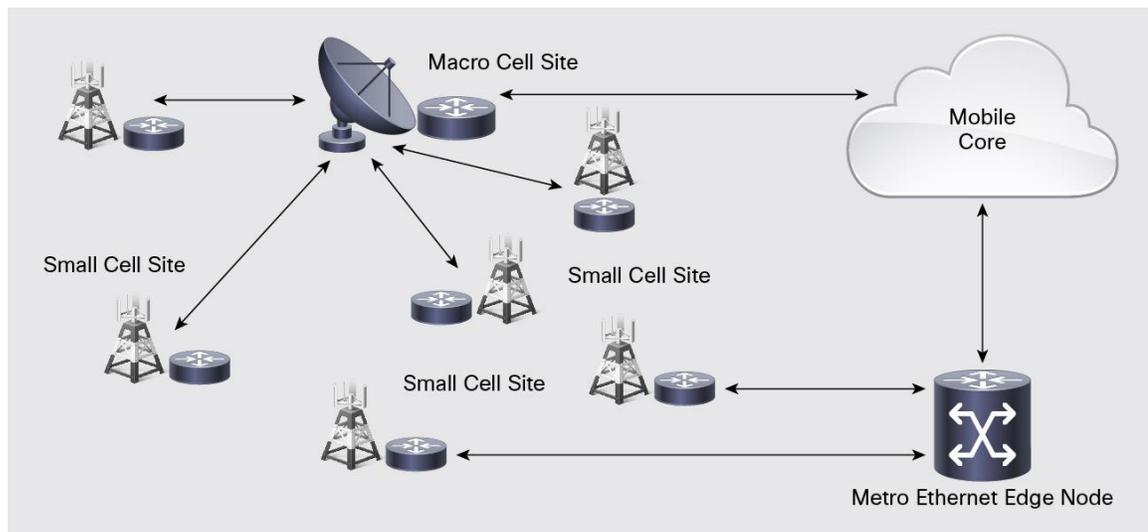
## Features and Benefits

### Small Cell Backhaul for Mobile Applications

Deployed as small cell backhaul routers for a mobile network, the Cisco ASR 901S Routers can aggregate multiple small cells through Ethernet and IP interfaces, and can use MPLS, Resilient Ethernet Protocol (REP), Layer 2 VPN (L2VPN), Layer 3 VPN (L3VPN), and other common transport protocols for Radio Access Network (RAN) backhaul. The ASR 901S prioritizes, differentiates, and segments any combination of second-, third-, or fourth-generation (2G, 3G, or 4G) traffic for backhaul over any combination of IP or Ethernet infrastructures (copper, microwave, or optical).

The exponential growth in mobile data traffic introduced the need for heterogeneous network deployments. With heterogeneous networks, the coverage area of a macro cell is enhanced by adding base stations with shorter coverage to handle some of the traffic of the macro cells. These short-coverage base stations are collectively called small cell base stations and can be categorized according to cell coverage and capacity as micro-, pico-, or femtocells. Some of the traffic is offloaded to the small cells, improving the overall system performance with more evenly distributed traffic volumes, providing better and faster service for mobile clients (Figure 3).

**Figure 3.** Small Cell Backhaul Network Architecture Diagram



To support and monetize the enormous growth in data traffic, mobile networks are evolving to include a mix of denser, higher capacity small cells, including carrier Wi-Fi, deployed at street level on light poles and the sides of buildings. The Cisco ASR 901S offers a flexible solution to support the diverse physical and environmental conditions under which aggregation routers will be deployed in support of small cells.

Adding to the challenge, many of these base stations will be deployed across diverse locations, and many times in locations without existing backhaul infrastructure.

This location diversity is leading the industry to use multiple forms of wireless technology to provide complete coverage while meeting increasing capacity requirements and providing investment protection. Fiber-equivalent performance over wireless will be required to deliver applications and services with all the necessary performance characteristics, including packet-based timing and synchronization, service-level agreement (SLA) assurance, quality of service (QoS), security, and scalability.

To satisfy the global service provider demand for wireless small cell backhaul networks, Cisco has created an ecosystem of wireless solutions that are centered on Cisco's best-in-class mobile backhaul solution, Cisco Unified MPLS for Mobile Transport (UMMT). This flexible architecture supports any access technology from any vendor and dramatically reduces operating costs. The ecosystem pairs the Cisco ASR 901 and the ASR 901S portfolio of mobile backhaul routers with industry-leading wireless backhaul vendors that have proven interoperability and wide deployment by carriers around the world.

The Cisco ASR 901S helps service providers deliver advanced services and reduce operating costs for small cell mobile backhaul.

The key benefits of the Cisco ASR 901S Series Routers follow:

- **Low TCO:** Orders of magnitude more small cells than macro cells burden the old way of deploying wireless networks and strain capital and operational budgets. The Cisco ASR 901S helps operators reduce TCO by simplifying the network deployment through ZTP and extensive management tools. ZTP features such as circuit validation make a large difference in bulk deployments. Field technicians need only to mount the router, hook up power and cables in easily accessible ports, and then press one physical button to reset the router and initiate zero-touch provisioning. The Wi-Fi wireless management allows operators to monitor, configure, and troubleshoot the router without physical attachment, providing convenience for network maintenance and reducing operational expenses. PoE+ support on AC models can power wireless backhaul devices that reduce the number of power connections needed at deployment sites.
- **Green hardware:** The Cisco ASR 901S also helps service providers reduce operating costs by optimizing energy efficiency, allowing cost-effective and responsible resource management. The routers are designed for low power consumption with Reduction of Hazardous Substances (RoHS)-compliant, lead-free components. An indirect benefit is a significant reduction of carbon emissions.
- **“Zero-footprint” deployment:** With the Cisco ASR 901S, you can deploy backhaul equipment along with small cell enclosures in harsh outdoor environments. You can mount the sealed enclosure of the router on lampposts, telephone poles, sides of buildings, and in cabinets or vaults. The ASR 901S packaging is IP65-compliant and has a fanless passive cooling design, which makes it best suited for outdoor deployments. The ASR 901S portfolio provides port flexibility with various combinations of 1-Gigabit Ethernet copper and SFP ports.
- **Comprehensive services:** With the Cisco ASR 901S, you can prioritize services and differentiate them through hierarchical quality of service (HQoS) and security attributes. The ASR 901S offers advanced traffic analytics and performance monitoring and control, including per-traffic-class metering, bidirectional packets, and byte statistics. The service offering is enhanced with comprehensive operations, administration, and maintenance (OA&M) functions, including Layer 2 CFM, IP SLAs for Layer 3, and MPLS OA&M.
- **Service scalability:** The Cisco ASR 901S delivers line-rate performance and flexible service scalability in a compact form factor. With support for up to 32,000 MAC addresses, up to 4,000 bridge domains, and multiple hierarchical queues, the router delivers high performance and scale for all mobile and Carrier Ethernet services.
- **Advanced timing:** The Cisco ASR 901S provides the timing services required in today’s converged access networks by offering integrated support for the Synchronous Ethernet (SyncE) and 1588v2 standards.
- **Real-time adaptive control:** In concert with our microwave partners, Cisco has defined and developed an Adaptive Code Modulation (ACM) protocol that monitors wireless link quality and can reroute traffic, adjust shaping and policing policies, as well as reconfigure the network to maximize quality of experience (QoE). The Cisco wireless backhaul ecosystem supports an end-to-end solution with an interface across multiple backhaul technologies to meet diverse carrier requirements. The Cisco solution is optimized for the backhaul of real-world heterogeneous small cell networks, across RANs with multivendor technologies.
- **Network simplification:** Cisco network virtualization (nV) technology can simplify network operations by reducing the number of components that must be managed, supporting easier configuration. The result is increased network scalability, improved service velocity, and lower operating costs. You can deploy the nV-capable Cisco ASR 901S Routers as satellites of a Cisco ASR 9000 Series system to reduce the complexity of today’s mobile Internet networks.

- **Easy management:** You can manage the Cisco ASR 901S through the Cisco Prime™ Network fault, provisioning, and performance management system. The solution is based on a business-centered framework and an intuitive, workflow-oriented operator experience that provides a scalable and cost-effective management for the next-generation mobile network, from the cell tower all the way to the evolved packet core (EPC).

In addition to the Cisco Prime system, the Cisco ASR 901S is equipped with a secure wireless management system, whereby you can configure, monitor, and troubleshoot the router without having to open the cover. This feature becomes extremely beneficial when you deploy the router in places that are difficult to reach, such as at a top of a pole. The wireless system is only for management and troubleshooting of the router.

## Major Features

Table 1 lists some of the key features of the Cisco ASR 901S.

**Table 1.** Cisco ASR 901S Features

Features
<b>Ethernet Services</b> <ul style="list-style-type: none"> <li>• Ethernet Virtual Connections (EVCs) for: <ul style="list-style-type: none"> <li>◦ 802.1q</li> <li>◦ 802.1ad (QinQ)</li> <li>◦ Selective QinQ</li> <li>◦ Inner and outer VLAN classification</li> </ul> </li> <li>• IEEE bridging</li> <li>• REP</li> <li>• MSTP</li> <li>• 802.3ad link aggregation bundles</li> <li>• Ethernet over MPLS (EoMPLS)</li> <li>• EoMPLS pseudowire redundancy</li> <li>• Dynamic Host Configuration Protocol (DHCP) client for switched virtual interface (SVIs)</li> <li>• Link Layer Discovery Protocol (LLDP)</li> <li>• Layer 2 Protocol peering, forwarding, and tunneling</li> </ul>
<b>Layer 3 and MPLS Services</b> <ul style="list-style-type: none"> <li>• Layer 3 routing</li> <li>• Cisco Express Forwarding load sharing of Equal-Cost Multipaths (ECMPs)</li> <li>• Open Shortest Path First (OSPF)</li> <li>• Border Gateway Protocol (BGP)</li> <li>• Intermediate System-to-Intermediate System (IS-IS)</li> <li>• Bidirectional Forwarding Detection (BFD) support for OSPF, IS-IS, BGP, and static routes</li> <li>• MPLS</li> <li>• Label Distribution Protocol (LDP) with Label Edge Router (LER) and Label Switch Router (LSR) support</li> <li>• ECMP support</li> <li>• MPLS L3VPN</li> <li>• IPv6 routing (BGP, OSPF, IS-IS, and static routes), and BFDv6</li> <li>• Labeled BGP (RFC 3107)</li> <li>• Hot Standby Router Protocol (HSRP) and Virtual Router Redundancy Protocol (VRRP)</li> <li>• Multihop BFD</li> </ul>
<b>QoS</b> <ul style="list-style-type: none"> <li>• IEEE 802.1p QoS</li> <li>• IP Precedence Type of Service (ToS)</li> <li>• Differentiated-services-code-point (DSCP) traffic shaping and policing</li> <li>• Class-Based Weighted Fair Queuing (CBWFQ)</li> <li>• Weighted Random Early Detection (WRED)</li> </ul>

## Features

- Priority queuing
- 2-rate 3-color (2R3C) policing
- Egress shaping per queue
- Modular QoS CLI (MQC)
- 2-level HCoS
- Classification based on class of service (CoS), VLAN ID, DSCP, or IP Precedence
- QoS ingress and egress statistics
- IPv6 QoS

## Timing

- IEEE1588-2008 Ordinary Clock, Slave, and Boundary Clock
- Hybrid Clock
- ITU-T SyncE support on copper and fiber

## OA&M

- IEEE 802.1ag Connectivity Fault Management (CFM)
- Ethernet Local Management Interface (ELMI)
- IEEE 802.3ah Link OA&M
- MPLS OA&M
- IP SLA, and Two-Way Active Measurement Protocol (TWAMP)
- Y.1731 fault and performance management

## Multicast

- IPv4 Multicast: Source-Specific Multicast (SSM) Mapping
- IPv4 Multicast: Internet Group Management Protocol Versions 1, 2, and 3 (IGMPv1, v2, and v3)
- IPv4 Multicast: IGMP Snooping
- IPv6 Multicast: Multicast Listener Discovery Protocol (MLD) Versions 1 and 2
- IPv6 Multicast: Protocol Independent Multicast (PIM)-SSM
- IPv6 Multicast: MLD Snooping

## Security

- Authentication, authorization, and accounting (AAA) with TACACS+ and RADIUS
- Secure Shell (SSH) Protocol Version 2
- Layer 3 access control lists (ACLs)
- IP Security (IPsec)
- Network address and port translation (NAPT)

## Availability

- REP
- Cisco Express Forwarding Load Sharing of ECMPs
- IEEE 802.1s MSTP
- BFD support for OSPF, IS-IS, BGP, and static routes
- Multihop BFD
- HSRP and VRRP
- Pseudowire redundancy
- Traffic Engineering/Fast Reroute (TE/FRR) and Remote Loop-Free Alternate/Fast Reroute (RLFA/FRR)
- Support for 1 second holdover for one PoE+ port on AC units

## Manageability

- Simple Network Management Protocol (SNMP)
- SSH and Telnet
- Cisco Prime Network: Fault, provisioning, and performance management
- Remote Monitoring (RMON)
- Embedded Event Manager (EEM) Script
- Data Collection Manager (DCM)
- Wireless Wi-Fi interface for management (802.11b) with Wi-Fi Protected Access 2-Preshared key (WPA2-PSK) security mechanism

## Product Specifications

Tables 2, 3, and 4 list product, power, and environmental specifications for the Cisco ASR 901S. Table 5 provides safety and compliance information.

**Table 2.** Cisco ASR 901S System Specifications

Description	Cisco ASR 901S Specification
<b>Dimensions (H x W x D)</b>	10.39 x 15.32 x 2.5 in. (26.39 x 38.91 x 6.35 cm)
<b>Weight</b>	DC routers, approx.13.6 lb (6.2 kg) AC routers with PoE+, approx.16.3 lb (7.4 kg)
<b>Memory</b>	Flash memory: 128 MB (onboard flash) System memory: 512 MB (double data rate 3G [DDR3])
<b>Rack mounts</b>	
<b>Ethernet ports</b>	<b>DC Models</b> External ports: Four 1 SFP Gigabit Ethernet; internal ports: Two 10/100/1000 RJ-45 External ports: Three 1 SFP Gigabit Ethernet + One 10/100/1000 RJ-45; internal ports: One 1 SFP Gigabit Ethernet + One 10/100/1000 RJ-45 External ports: Two 1 SFP Gigabit Ethernet + Two 10/100/1000 RJ-45; internal ports: Two 1 SFP Gigabit Ethernet <b>AC Models</b> External ports: (Three 1 SFP Gigabit Ethernet), Internal ports (1 x 1 SFP Gigabit Ethernet + 2 x 10/100/1000 RJ-45) External ports: (2 x 1 SFP Gigabit Ethernet + 1 x 10/100/1000 RJ-45); internal ports: Two 1 SFP Gigabit Ethernet + One 10/100/1000 RJ-45
<b>Console port</b>	1 (up to 115.2 kbps)
<b>Fans</b>	Fanless design
<b>Power supplies</b>	1 power supply (AC or DC)

**Table 3.** Power Specifications

Description	Cisco ASR 901S Specification
<b>PoE+</b>	Supported on the AC models on the two RJ45 Ethernet ports
<b>AC input voltage and frequency</b>	100-240 VAC, 50-60 Hz
<b>DC power rating</b>	DC-input voltage rating: 24 VDC, -48 VDC, and -60 VDC DC-input current rating: 2.8A maximum
<b>Power connector</b>	DC connector: 3-position mating connectors AC connector

**Table 4.** Environmental Specifications

Description	Cisco ASR 901S Specification
<b>Operating temperature</b>	-40 to 149°F (-40 to 65°C); optics used may limit the temperature range
<b>Relative humidity</b>	10 to 85%, noncondensing, ±5 %
<b>Operational altitude</b>	13,000 ft (4000m) maximum 104°F (40°C) ambient

**Table 5.** Safety and Compliance

Type	Standards
<b>Safety</b>	<ul style="list-style-type: none"> <li>• UL/CSA 60950-1</li> <li>• IEC/EN 60950-1</li> <li>• AS/NZS 60950.1</li> </ul>
<b>EMC emissions</b>	<ul style="list-style-type: none"> <li>• FCC 47CFR15, Class B</li> <li>• EN55022, Class B</li> <li>• CISPR 22, Class B</li> <li>• AS/NZS CISPR 22, Class B</li> <li>• ICES 003, Class B</li> <li>• VCCI, Class B</li> <li>• KN 22, Class B</li> </ul>
<b>EMC immunity</b>	<ul style="list-style-type: none"> <li>• EN/IEC61000-4-2 Electrostatic Discharge Immunity - Enclosure</li> <li>• EN/IEC61000-4-3 Radiated Immunity - Enclosure</li> <li>• EN/IEC61000-4-4 Electrical Fast Transient Immunity</li> <li>• EN/IEC61000-4-5 Surge</li> <li>• EN/IEC61000-4-6 Immunity to Conducted Disturbances</li> </ul>
<b>Network Equipment Building Standards (NEBS)</b>	<p>This product is designed to meet the following requirements:</p> <ul style="list-style-type: none"> <li>• GR-63-CORE</li> <li>• GR-1089-CORE</li> </ul>
<b>ETSI/EN</b>	<ul style="list-style-type: none"> <li>• EN 300 386 Telecommunications Network Equipment (EMC)</li> <li>• EN55022 Information Technology Equipment (Emissions)</li> <li>• EN55024 Information Technology Equipment (Immunity)</li> <li>• EN61000-6-1 Generic Immunity Standard</li> </ul>
<b>Network synchronization</b>	<ul style="list-style-type: none"> <li>• GR-1244-CORE</li> <li>• ITU-T G.813</li> <li>• ITU-T G.703 clause 5</li> <li>• ITU-T G.703 clause 9</li> <li>• ITU-T G.8261/Y.1361</li> <li>• ITU-T G.781</li> <li>• ITU-T G.8264</li> <li>• IEEE1588-2008</li> </ul>
<b>Ethernet:</b> 1000BASE-T 100BASE-T 100BASE-FX 1000BASE-S 1000BASE-L 1000BASE-Z 1000BASE-E 1000BASE-BX-U 1000BASE-BX-D DWDM-SFP-GE: CWDM-SFP-GE: 10000BASE-S 10000BASE-L 10000BASE-Z 10000BASE-E	<p>DSPR Technical Requirement 2005:</p> <ul style="list-style-type: none"> <li>• IEEE 802.3</li> <li>• IEEE 802.3ae</li> </ul> <p>DSPR Technical Condition 2004:</p> <ul style="list-style-type: none"> <li>• IEEE-802.3ah</li> <li>• ANSI X3.263-1995</li> <li>• ISO/IEC 9314-3</li> </ul>

## Components and Options

Table 6 lists the hardware parts available for the Cisco ASR 901S Series.

**Table 6.** Chassis Models for Cisco ASR 901S Series

Part Number	Description
<b>A901S-4SG-F-D</b>	4 external ports (4 SFP) + 1 gland interface for internal ports (2 Cu), DC power supply unit (PSU)
<b>A901S-3SG-F-D</b>	4 external ports (3 SFP +1 Cu) + 1 gland interface internal ports (1 Cu), DC PSU
<b>A901S-2SG-F-D</b>	4 external ports (2 SFP + 2 Cu) + 1 gland interface for internal ports, DC PSU
<b>A901S-3SG-F-AH</b>	3 external ports (3 SFP) + 1 gland interface for internal ports (1 SFP, 2 Cu), AC PSU, 1 sec holdover for 1 PoE+ port
<b>A901S-2SG-F-AH</b>	3 external ports (2 SFP + 1Cu) + 1 gland interface for internal ports (2 SFP, 1 Cu), AC PSU, 1 sec holdover for 1 PoE+ port

The Cisco ASR 901S supports a wide range of SFP optics modules. Table 7 lists their part numbers. The operational temperatures supported for the optics are defined by individual SFP.

**Table 7.** SFP Modules Supported with Cisco ASR 901S

<b>Ethernet SFP</b>	GLC-LH-SMD, GLC-EX-SMD, GLC-ZX-SMD, GLC-LX-SM-RGD, GLC-SX-MMD, GLC-SX-MM-RGD, GLC-ZX-SM, GLC-ZX-SM-RGD, GLC-BX-U, GLC-BX-D, SFP-GE-L, SFP-GE-S, SFP-GE-Z, CWDM-SFP-1470, CWDM-SFP-1490, CWDM-SFP-1510, CWDM-SFP-1530, CWDM-SFP-1550, CWDM-SFP-1570, CWDM-SFP-1590, CWDM-SFP-1610, Ranging from DWDM-SFP-3033 to DWDM-SFP-6141 (40 wavelengths), GLC-BX40-D-I, GLC-BX40-U-I, GLC-BX40-DA-I, GLC-BX80-D-I, and GLC-BX80-U-I
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To enable the wireless management, you must mount an antenna needs on the chassis. Table 8 lists the part number for this antenna.

**Table 8.** Wireless Management Antenna

Part Number	Description
<b>A901S-ANTENNA-M</b>	Antenna for wireless management, Male

The Cisco ASR 901S is a versatile router that you can mount on walls, lampposts, etc. Table 9 lists the part numbers for the various mounting bracket kits.

**Table 9.** Mounting Bracket Kits

Part Number	Description
<b>A901S-MNT-POLE</b>	Pole Mounting Kit Accessories
<b>A901S-MNT-WALL</b>	Wall Mounting Kit Accessories

## Software

The Cisco ASR 901S is supported in Cisco IOS<sup>®</sup> Software. Table 10 describes the Cisco IOS Software feature licenses that are supported.

**Table 10.** Descriptions of Cisco IOS Software Feature Licenses for Cisco ASR 901S

Name	PID	Description
<b>Base</b>	SL-A901-B	SL-A901-B Base feature license supports: <ul style="list-style-type: none"> <li>Layer 2: Ethernet virtual circuit (EVC) Infra, 802.1Q, 802.1ad, QinQ, 802.3ah, and REP</li> <li>QoS and 2-level HQoS</li> <li>Layer 3: IPv4 static routes, Border Gateway Protocol (BGP) v4, Intermediate System-to-Intermediate System (IS-IS), Open Shortest Path First (OSPF) v2, Bidirectional Forwarding Detection (BFD), Multi-Virtual Route Forwarding (VRF) (VRF-lite), host connectivity, Hot Standby Router Protocol (HSRP) and Virtual Router Redundancy Protocol (VRRP)</li> <li>IPv6 static routes, Multiprotocol BGP, IS-IS, OSPFv3, BFDv6</li> <li>Ethernet OAM (EOAM): CFM (BD, port level), IP SLA, Y.1731 FM</li> <li>Clocking: SyncE with Source Specific Multicast (SSM) and Ethernet Synchronization Messaging Channel (ESMC), 1588v2 OC</li> <li>Security: Port access control list (ACL) and router ACL</li> <li>Management: Simple Network Management Protocol (SNMP), Secure Schell (SSH), Telnet</li> </ul>
<b>Advanced IP Metro</b>	SL-A901-A	SL-A901-A Advanced IP Metro feature license supports: <ul style="list-style-type: none"> <li>Base features (above)</li> <li>MPLS: MPLS using Label Distribution Protocol (LDP), EoMPLS, L3VPN, MPLS OAM, pseudowire redundancy, TE FRR, Labeled BGP (RFC3107), Remote LFA FRR, Y.1564 over PW and EVC Xconnect</li> <li>E-OAM: CFM over pseudowire, IP SLA (LSP), Y.1731 PM over Pseudowire</li> <li>Management: Y.1731 PM on the EVC Xconnect, Ethernet terminal loopback over Xconnect</li> </ul>
<b>Advanced Time License</b>	SL-A901-T	SL-A901-T supports <ul style="list-style-type: none"> <li>1588v2 Boundary Clock</li> </ul>

## Flexible Software Options

The Cisco ASR 901S supports the Cisco IOS Software Activation feature. With this feature, you can activate Cisco IOS Software feature sets by Cisco software licenses, providing a “pay-as-services-grow” model. This model allows service providers to invest in software resources only when their businesses need it. The Cisco ASR 901S offers two Cisco IOS Software feature licenses. Each license enables feature activation on a per-chassis basis.

- The Base license includes support for Layer 2 and Layer 3 features, Sync-E, and IEEE 1588 Ordinary Clock.
- The Advanced IP Metro license adds the following capabilities to the Base license: MPLS, MPLS VPN support, Ethernet pseudowires, and pseudowire redundancy.

Table 11 lists the main features in the Cisco IOS Software licenses for the Cisco ASR 901S.

**Table 11.** Software Feature Set in Cisco ASR 901S Licenses

Base Software Services (Default image)	Advanced Metro IP Services
EVC infrastructure, 802.1Q, 802.1ad, QinQ, 802.3ah, and REP	All features in Base license plus the following:
QoS, with deep buffers and hierarchical QoS	MPLS (LDP VPN) and Labeled BGP (RFC 3107)
Layer 2: 802.1d, 802.1q, and link aggregation	MPLS OA&M
IP routing (BGP, OSPF, IS-IS, and static routes), BFD, Multihop BFD, and Virtual Route Forwarding Lite (VRF lite)	Pseudowire emulation (EoMPLS)
EVC infrastructure	Pseudowire redundancy
Ethernet OA&M (802.1ag and 802.3ah) and Y.1731 FM	QoS for L3VPN, and L2VPN

Base Software Services (Default image)	Advanced Metro IP Services
MST and REP	TE-FRR
Synchronous Ethernet on copper and fiber	
IEEE 1588v2 (Ordinary Clock)	
IPv6 routing (BGP, OSPF, IS-IS, and static routes) and BFDv6	

Table 12 provides brief descriptions of the Cisco ASR 901S software options.

**Table 12.** Cisco ASR 901S Software Options

Part Number	Product Name
<b>SL-A901-B</b>	ASR 901S Base Feature Services
<b>SL-A901-A</b>	ASR 901S Advanced Metro IP Services
<b>SL-A901-T</b>	Advanced Timing License for 1588v2 Boundary Clock

## Warranty Information

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

## Service and Support

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## For More Information

For more information about Cisco Unified RAN Backhaul solutions, visit [http://www.cisco.com/en/US/netsol/ns675/networking\\_solutions\\_solution\\_category.html](http://www.cisco.com/en/US/netsol/ns675/networking_solutions_solution_category.html).

For more information about Cisco Small Cell Solutions, visit <http://www.cisco.com/go/smallcell> or contact your local Cisco account representative.



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