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 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 can be installed in the outside plant, without an enclosure. The routers can be easily deployed in challenging locations such as on lampposts, telephone poles, and sides of walls. By using the Cisco ASR 901S, operators can reduce backhaul operating costs, simplify deployment and provisioning, and enhance their profit opportunities with premium mobile and Ethernet services.

To successfully implement a small cell network requires far more cell sites than in macro networks, and thus significantly more backhaul links. While 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 issue is effectively and efficiently delivering sufficient bandwidth to each of these locations. While 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 ASR 901S platform provides unique 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 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 family of small cell routers designed to support backhaul in deployment of small cell radios. The ASR 901S 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

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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.

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
- Complementarity to the ASR 901 as part of the Cisco Unified RAN Backhaul solution (same features as the ASR 901 to give the customer consistent deployment across macro and small cell backhaul with a common operational environment)
- Full support for Layer 2, Layer 3, and Multiprotocol Label Switching (MPLS) deployment models
- Comprehensive OAM 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 C to 65°C (-40 F to 14 9°F) ambient temperatures.
- Flexible options for different combinations of copper and Small Form-Factor Pluggable (SFP) 1-G 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

Figure 1. Cisco ASR 901S Front, Back, and Bottom Views

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Mechanical Design

The mechanical design of ASR 901S is IP-65 compliant with fanless passive cooling.

- The front side of the chassis has two sections:
  - The upper section is fixed and sealed. It cannot be opened in the field. Internally, this section houses the electrical circuitry.
  - The lower section has a door that can be opened in the field. Opening this door gives users access to the port interfaces and enables them to service the ports (for example, changing 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 on the right end is through an IP-65 compliant gland for DC. An ordinary DC cable runs through the gland. For AC inputs, a special IP-65 compliant connector system is used. The AC input cable can be removed from the system without opening the door.
- 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 IP-65 sealing is used.
- The alarm, management, and console port cat-5e cable is routed through the 4-wire gland.
- ASR 901S has 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

Features and Benefits

Small Cell-Site 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 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- and 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 (Fig. 2) .

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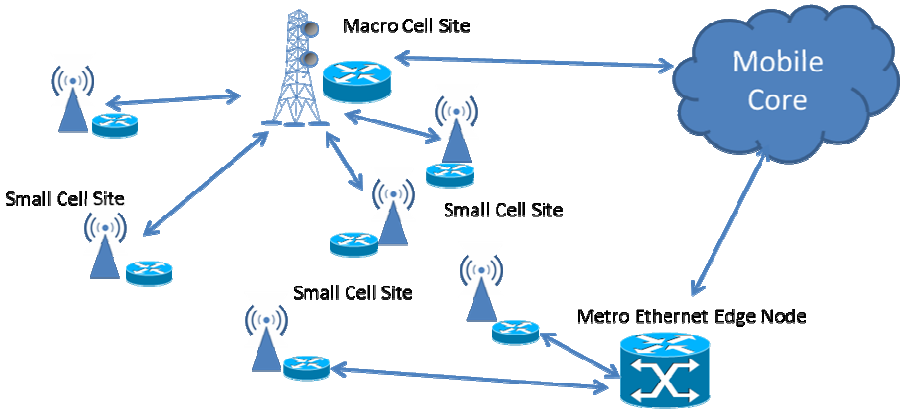
Fig 2. Small Cell Backhaul Network Architecture Diagram



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

Low Total Cost of Ownership

Orders of magnitude more small cells than macro cells burden the old way of deploying wireless networks and strain capital and operational budgets. The ASR 901S helps operators to 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 mount the router, hook up power and cables in easily accessible ports, 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 to 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 ASR 901S, operators can deploy backhaul equipment along with small cell enclosures in harsh outdoor environments. The ASR 901S sealed enclosure can be mounted on lampposts, telephone poles, sides of buildings, H-frames, 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-G copper and SFP ports.

Comprehensive Services

With the Cisco ASR 901S, services can be prioritized and differentiated 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

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enhanced with comprehensive OAM functionality, including Layer 2 CFM, IP service-level agreements (SLAs) for Layer 3, and MPLS OAM.

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 4000 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.

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. The nV-capable Cisco ASR 901S routers can be deployed as satellites of a Cisco ASR 9000 Series system to reduce the complexity of today's mobile Internet networks.

Components and Options

Table 1 lists the hardware parts available for the Cisco ASR 901S Series.

Table 1. Chassis Models for the Cisco ASR 901S Series

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

The Cisco ASR 901S supports a wide range of SFP optics modules. Table 2 lists their part numbers. The operational temperatures supported for the optics are defined by individual SFP or SFP+ modules.

Table 2. SFP Modules Supported with the Cisco ASR 901S

Type	Part Number
Ethernet SFP	GLC-LH-SM, GLC-LH-SMD, GLC-EX-SMD, GLC-ZX-SMD, GLC-LX-SM-RGD, GLC-SX-MM, 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, , GLC-FE-100FX-RGD, 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)

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Software

The Cisco ASR 901S is supported in Cisco IOS® Software. Table 3 describes the Cisco IOS Software feature licenses that are supported.

Table 3. Descriptions of Cisco IOS Software Feature Licenses for Cisco ASR 901S

Cisco IOS Software Feature License	Part Number	Description
Base	SL-A901S-B	Base feature license supports: • Layer 2: Ethernet virtual circuit (EVC) Infra, 802.1Q, 802.1ad, QinQ, 802.3ah, and REP • QoS and 2-level HQoS • 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) • IPv6 static routes, Multiprotocol BGP, IS-IS, OSPFv3, BFDv6 • Ethernet OAM (EOAM): CFM (BD, port level), IP SLA, Y.1731 FM • Clocking: SyncE with Source Specific Multicast (SSM) and Ethernet Sychronization Messaging Channel (ESMC), 1588v2 OC • Security: Port access control list (ACL) and router ACL • Management: Simple Network Management Protocol (SNMP), Secure Schell (SSH), Telnet
Advanced IP Metro	SL-A901S-A	Advanced IP Metro feature license supports: • Base features (above) • MPLS: MPLS using Label Distribution Protocol (LDP), EoMPLS, L3VPN, MPLS OAM, pseudowire redundancy, TE FRR, Labeled BGP (RFC3107) • EOAM: CFM over pseudowire, IP SLA (LSP)

Flexible Software Options

The Cisco ASR 901S supports the Cisco IOS Software Activation feature. With this feature, Cisco IOS Software feature sets can be activated 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 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 4 lists the main features in the Cisco IOS Software licenses for the Cisco ASR 901S.

Table 4. 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), Labeled BGP (RFC3107)
Layer 2: 802.1d, 802.1q, Link aggregation	MPLS OAM
IP routing (BGP, OSPF, IS-IS, static routes), BFD, Multi-Hop BFD, VRF-lite	Pseudowire emulation (EoMPLS)
EVC infrastructure	Pseudowire redundancy
Ethernet OAM (802.1ag, 802.3ah), Y.1731 FM	QoS for L3VPN, L2VPN
MST and REP	TE FRR

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Base Software Services (Default Image)	Advanced Metro IP Services
Synchronous Ethernet on copper and fiber	
IEEE 1588v2 (ordinary clock)	
IPv6 routing (BGP, OSPF, IS-IS, static routes), BFDv6	

Table 5 provides brief descriptions of the Cisco ASR 901S software options.

Table 5. Cisco ASR 901S Software Options

Part Number	Product Name
Feature Set License Options	
SL-A901-B	ASR 901S Base Feature Services
SL-A901-A	ASR 901S Advanced Metro IP Services
Feature Set License Options (Spares)	
SL-A901-A=	ASR 901S Advanced Metro IP Services Paper PAK for Metro IP Services Enablement on Base Feature Services
L-SL-A901-A=	ASR 901S Advanced Metro IP Services E-Delivery PAK for Metro IP Services Enablement on Base Feature Services

Major Features

Table 6 lists the features of the Cisco ASR 901S.

Table 6. Cisco ASR 901S Features

Features
Ethernet Services

• EVCs for:
  ◦ 802.1q
  ◦ 802.1ad (QinQ)
  ◦ Selective QinQ
  ◦ Inner and outer VLAN classification
• IEEE bridging
• REP
• MSTP
• 802.3ad ink aggregation bundles
• EoMPLS
• EoMPLS pseudowire redundancy
• Dynamic Host Configuration Protocol (DHCP) client for Switch Virtual Interface (SVI)
• Link Layer Discovery Protocol (LLDP)
• L2 Protocol peering, forwarding, and tunneling
• Ethernet loopback

Layer 3 and MPLS Services
• Layer 3 routing • Cisco Express Forwarding (CEF) load sharing of Equal Cost Multiple Paths (ECMPs) • OSPF • BGP • IS-IS • BFD support for OSPF, IS-IS, BGP, and static routes • MPLS • LDP with Label Edge Router (LER) and Label Switch Router (LSR) support • ECMP support • MPLS L3VPN • IPv6 routing (BGP, OSPF, IS-IS, static routes), BFDv6 • Two-Way Active Measurement Protocol (TWAMP)

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Features
• Labeled BGP (RFC 3107) • HSRP • VRRP • Multi-hop BFD • MPLS Traffic Engineering/Fast Reroute (TE/FRR)
QoS
• IEEE 802.1p QoS • IP precedence Type of Service (ToS) • Differentiated Services Code Point (DSCP) traffic shaping and policing • Class-Based Weighted Fair Queuing (CBWFQ) • Weighted Random Early Detection (WRED) • Priority queuing • 2-rate 3-color (2R3C) policing • Egress shaping per queue • Modular QoS CLI (MQC) • HQoS • Classification based on class of service (CoS), VLAN ID, DSCP, or IP precedence • QoS ingress and egress statistics • ACL QoS on IPv4 • IPv6 QoS
Timing
• IEEE1588-2008 ordinary clock • ITU-T SyncE support on copper and fiber
OAM
• IEEE 802.1ag Connectivity Fault Management (CFM) • Ethernet Local Management Interface (ELMI) • IEEE 802.3ah Link OAM • MPLS OAM • IP SLA • Y.1731 fault management • Dying Gasp
Security
• Authentication, authorization, and accounting (AAA) with TACACS+ and RADIUS • SSH Protocol v2 • Layer 3 ACLs
Availability
• REP • CEF 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 • TE/FRR
Manageability
• SNMP • SSH, Telnet • Command Line Interface (CLI) • Cisco Prime™ Network: fault, provisioning, and performance management • Remote Monitoring (RMON) • Embedded Event Manager (EEM) Script

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Features
• Data Collection Manager (DCM) • Wireless Wi-Fi interface for management

Product Specifications

Tables 7, 8, and 9 list product, power, and environmental specifications for the Cisco ASR 901S. Table 10 provides safety and compliance information.

Table 7. Cisco ASR 901S System Specifications

Description	Cisco ASR 901S Specification
Dimensions (H x W x D)	10.39 in. x 15.32 in. x 2.5 in. (26.39 cm. x 38.91 cm. x 6.35 cm.)
Weight	13 lb. (6 Kg)
Memory	Flash memory: 128 MB (onboard flash) System memory: 512 MB (DDR3)
Rack mounts	
Ethernet ports	• **FD models** external ports (4 x 1 SFP Gigabit Ethernet) , Internal ports 2 x 10/100/1000 RJ-45 external ports (3 x 1 SFP Gigabit Ethernet + 1 x 10/100/1000 RJ-45) , Internal ports (1 x 10/100/1000 RJ-45) external ports (2 x 1 SFP Gigabit Ethernet + 2 x 10/100/1000 RJ-45) • **AH Models** external ports (3 x 1 SFP Gigabit Ethernet) , Internal ports (2 x 10/100/1000 RJ-45) external ports (2 x 1 SFP Gigabit Ethernet + 1 x 10/100/1000 RJ-45) , Internal ports (1 x 10/100/1000 RJ-45)
Console port	1 (up to 115.2 Kbps)
Fans	Fanless design
Cabling	Closed cable bay for external connections
Power supplies	1 power supply (AC or DC)
Mean Time Between Failure (MTBF)	150,000 hours

Table 8. Power Specifications

Description	Cisco ASR 901S Specifications
Power consumption	DC-input power and power dissipation: • 40W for all DC models AC-input power and power dissipation: • 40W without PoE+ • 70W with 1 PoE+ (1-sec backup) • 100W with 2 PoE+ ports (1-sec backup on 1 PoE+ port only)
AC input voltage and frequency	100-240 Vac, 50-60 Hz
DC Power rating	• DC-input voltage rating: 24 VDC, -48 VDC, -60 VDC • DC-input current rating: 2.8A maximum
Power connector	DC connector: 3-position mating connectors (AMPHENOL ELVP03100) AC connector: AIR-PWR-ST-LT-R3P=

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Table 9. Environmental Specifications

Description	Cisco ASR 901S
Operating temperature	-40 to 149℉ (-40 to 65℃); optics used may limit the temperature range
Nonoperating temperature	-40 to 158℉ (-40 to 70℃)
Relative humidity	10% to 85%, noncondensing, ±5 %
Operational altitude	13,000 ft (4000m) maximum 104℉ (40℃) ambient

Table 10. Safety and Compliance

Type	Standards
Safety	• UL/CSA 60950-1 • IEC/EN 60950-1 • AS/NZS 60950.1
EMC emissions	• FCC 47CFR15, Class B • EN55022, Class B • CISPR 22, Class B • AS/NZS CISPR 22, Class B • ICES 003, Class B • VCCI, Class B • KN 22, Class B
EMC immunity	• EN/IEC61000-4-2 Electrostatic Discharge Immunity - Enclosure • EN/IEC61000-4-3 Radiated Immunity - Enclosure • EN/IEC61000-4-4 Electrical Fast Transient Immunity • EN/IEC61000-4-5 Surge • EN/IEC61000-4-6 Immunity to Conducted Disturbances
Network Equipment Building Standards (NEBS)	This product is designed to meet the following requirements • GR-63-CORE • GR-1089-CORE
ETSI/EN	• EN 300 386 Telecommunications Network Equipment (EMC) • EN55022 Information Technology Equipment (Emissions) • EN55024 Information Technology Equipment (Immunity) • EN61000-6-1 Generic Immunity Standard
Network synchronization	• GR-1244-CORE • ITU-T G.813 • 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.8264 • IEEE1588-2008
Ethernet: 1000Base-T 100Base-T 100Base-FX 1000Base-S 1000BaseL 1000Base-Z 1000Base-E 1000Base-BX-U 1000Base-BX-D	DSPR Technical Requirement 2005 • IEEE 802.3 • IEEE 802.3ae DSPR Technical Condition 2004 • IEEE-802.3ah • ANSI X3.263-1995 • ISO/IEC 9314-3

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Type	Standards
DWDM-SFP-GE: CWDM-SFP-GE: 10000Base-S 10000Base-L 10000Base-Z 10000Base-E	

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 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 minimizing 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 are available as part of the Cisco Carrier Ethernet Switching Service and Support solution and are available directly from Cisco and through resellers.

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. For more information about Cisco Small Cell Solutions, visit www.ciso.com/go/smallcell or contact your local account representative.

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