

## Cisco ASR 1000 Series Embedded Services Processor

### General Information

**Q. What are the Cisco® ASR 1000 Series Embedded Services Processors?**

**A.** The Cisco ASR 1000 Series Embedded Services Processors (ESPs) are centralized forwarding engines for the Cisco ASR 1000 Series Aggregated Services Routers. These modules provide silicon- and hardware-based assistance to sustain high bandwidth and throughput even with features enabled. Four ESPs are offered at this time for the Cisco ASR 1000 Series: 5-, 10-, 10-N-, and 20-Gbps Cisco ASR 1000 ESPs (part numbers ASR1000-ESP5, ASR1000-ESP10, ASR1000-ESP10-N, and ASR1000-ESP20, respectively). The 5-Gbps ESP (ESP5) supports 5 Gbps of bandwidth. The 10-Gbps ESP (ESP10 and ESP10N) and 20-Gbps ESP (ESP20) support 10 Gbps and 20 Gbps of bandwidth, respectively, and you can deploy them in customer networks that require 1 + 1 redundancy (refer to the fault-tolerant configuration in Table 3).

**Q. What is the main difference between the ESP5, ESP10, ESP10N, and the ESP20?**

**A.** The ESP5 supports 5 Gbps of bandwidth, the ESP10 supports 10 Gbps of bandwidth, the ESP10N supports 10 Gbps of bandwidth but does not support IPsec encryption services, whereas the ESP20 supports 20 Gbps of bandwidth.

**Q. Does the ESP10N support Zone Based Firewall?**

**A.** Yes, since Zone Based Firewall does not require IPsec encryption, the ESP10-N supports this feature.

**Q. What gives the ESPs a sustainable competitive advantage?**

**A.** All four ESPs are based on the innovative Cisco QuantumFlow Processor (QFP) for next-generation forwarding and queuing in silicon.

**Q. What features best highlight the category-leading performance of the ESPs?**

**A.** The modules feature hardware-assisted quality of service (QoS), hardware-based encryption (using the industry-leading Nitrox chipset), and special jitter- and latency-minimizing multicast packet replication, allowing for the integration of services and the enablement of features that typically would result in performance degradation from manufacturers' advertised throughput maxima. The ESP10N does not support IPsec encryption services.

When used in combination with the Cisco ASR 1006 Router chassis, a pair of ESP10 or ESP20 modules can be configured in the router (1 + 1 redundancy) to provide carrier-class High Availability.

**Q. What is the ESP10N?**

**A.** The Cisco ASR1000-ESP10-N is the nonencryption version of the ASR1000-ESP10. The ASR1000-ESP10-N can only support noncrypto Cisco IOS® Software images and will never support encryption capabilities such as IPsec. This product was specifically developed to address export and import restrictions of strong encryption technologies to certain countries. In a future release, the ASR1000-ESP10-N will support secured network management features such as SSH, SSL, and SNMPv3 in the No License Required (NLR) images. For

details on Cisco export regulations, refer to the Cisco Global Export Trade website:  
[www.cisco.com/web/about/doing\\_business/legal/global\\_export\\_trade/index.html](http://www.cisco.com/web/about/doing_business/legal/global_export_trade/index.html).

## Product Benefits

### **Q. Where are the 5-, 10-, and 20-Gbps ESPs positioned in a service provider's broadband network?**

- A.** The Cisco ASR 1000 Series Router serves as a broadband aggregation router that terminates 8,000 to 32,000 subscriber sessions; supports features such as Cisco Unified Border Element (SP Edition) (also known as Session Border Controller [SBC]) for voice over IP (VoIP), video Telepresence services, and hardware-assisted Firewall for security; and requires Gigabit Ethernet or 10 Gigabit Ethernet uplink capability.

The Cisco ASR 1000 Series Router is ideally suited for deployment as a Point-to-Point Termination and Aggregation (PTA) device, L2TP Access Concentrator (LAC), or L2TP Network Server (LNS).

### **Q. Where are the 5-, 10-, and 20-Gbps ESPs positioned in a service provider's edge network?**

- A.** The Cisco ASR 1000 Series Router interfaces with the service provider's voice and multimedia (for example, Telepresence) services directly at the edge. This solution requires no overlay network, network appliances, or service blades, resulting in lower operating expenses (OpEx) and flexible deployment models. The Cisco ASR 1000 Series Router supports protected signaling for both voice and video services and helps enable 32,000 voice calls concurrent with up to 20 Gbps of data traffic with accounting, firewall, and call-quality features enabled.

The Cisco ASR 1000 Series Router serves as a WAN aggregation router with high-density Gigabit Ethernet or WAN link aggregation and 10 Gigabit Ethernet uplink capability. Key benefits offered by the Cisco ASR 1000 in this scenario are Layer 2 and Layer 3 VPN functions and line-rate multicast support for triple-play (data, voice, and video) applications for business and residential users.

The Cisco ASR 1000 Series Router is ideally suited for deployment in Internet Protocol Radio Access Network (IPRAN) aggregation systems and as a high-speed managed customer premise equipment (CPE) device.

### **Q. Where are the Cisco 5-, 10-, 10-N-, and 20-Gbps ESPs positioned in an enterprise network?**

- A.** The Cisco ASR 1000 Series Router facilitates a branch-office architecture that offers excellent investment protection with services and scalability. Solution benefits consist of a multigigabit encryption rate (1.8- to 8-Gbps IP Security [IPSec]), optimization of the WAN to route around brownouts in the service provider network to guarantee mission-critical applications, and persistent manageability even if the Cisco IOS Software is down. The ESP10N does not support IPSec VPN services.

The Cisco ASR 1000 Series Router at the WAN aggregation headend or as an Internet gateway delivers multigigabit Cisco IOS Firewall capability in a router without the need for service blades. All firewall processing up to 20 Gbps is performed in silicon by the Cisco QuantumFlow Processor. In addition, the Cisco ASR 1000 Series Router provides high-speed

logging through NetFlow Version 9 and ongoing forwarding with baseline and firewall features enabled without performance degradation.

The Cisco ASR 1000 Series Router can capture Layer 2-through-Layer 7 packet data and route it through the Layer 3 cloud to the data center. No service blades are required in this solution, which offers full packet visibility compared to IP Traffic Export. The Cisco ASR 1000 Series Router delivers one of the highest numbers of monitoring sessions available in the industry.

## Software Releases

### **Q. What is the minimum software release required to support the 5-, 10-, 10-N-, and 20-Gbps ESPs?**

**A.** The minimum software release required for the 5- and 10-Gbps ESPs is Cisco IOS XE Software Release 2.1. The minimum software release required for the 10-N-Gbps and 20-Gbps ESP is Cisco IOS XE Software Release 2.2.

### **Q. What Cisco IOS Software features are supported by 5-, 10-, 10-N-, and 20-Gbps ESPs?**

**A.** The following are some of the features supported with Cisco IOS XE Software Release 2.1 (ESP5 or ESP10) or higher (ESP20: Release 2.2):

- IPv4 and IPv6 Unicast and Multicast
- High Availability: Nonstop Forwarding with Stateful Switchover (NSF/SSO) and In Service Software Upgrade (ISSU)
- Commonly used broadband aggregation features
- QoS
- Security access control lists (ACLs)
- Cisco Unified Border Element (SP Edition)
- Network Based Application Recognition (NBAR) and Cisco IOS Software Flexible Packet Matching (FPM)
- NetFlow
- Compressed Real Time Transport Protocol (CRTP)
- Security features: Firewall, Network Address Translation (NAT), and IP Security (IPsec) (IPsec VPN services are not supported on the ESP10-N)
- Commonly used Multiprotocol Label Switching (MPLS) VPN features

### **Q. How is ISSU supported by the 5-, 10-, 10-N-, and 20-Gbps ESPs?**

**A.** The ESP5 does not support ISSU. The ESP10 supports ISSU in the case where it is installed in the Cisco ASR 1006 Router chassis together with a redundant 10-Gbps ESP. The ESP20 supports ISSU in the case where it is installed in the Cisco ASR 1006 Router chassis together with a redundant 20-Gbps ESP.

### **Q. How is High Availability supported by the 5-, 10-, 10-N-, and 20-Gbps ESPs?**

**A.** The 5-Gbps ESPs do not support High Availability. The 10- and 20-Gbps ESPs offer carrier-class High Availability when they are configured in 1 + 1 redundancy; that is, with a pair of identical modules in one chassis. In this configuration, the 10-Gbps or 20-Gbps ESPs operate in hot-standby mode, helping ensure fully automatic and fast failover from a malfunctioning module to its peer. Failover time is 50 milliseconds or less.

## Technical Background

### Q. What underlies the innovative hardware architecture of the 5-, 10-, 10-N-, and 20-Gbps ESPs?

**A.** The 5-, 10-, and 20-Gbps ESPs are based on the innovative Cisco QuantumFlow Processor multicore chipset. Data-path communication relies on Cisco proprietary high-speed serial links.

### Q. Which functions are performed directly by the Cisco QuantumFlow Processor on board the 5-, 10-, 10-N-, and 20-Gbps ESPs?

**A.** The Cisco QuantumFlow Processor performs all data-plane forwarding functions, including MAC classification, Layer 2 and Layer 3 forwarding, QoS, ACL, VPN, broadband, and NetFlow to name a few.

### Q. What do the ESP bandwidths of 5, 10, and 20 Gbps stand for?

**A.** The ESP bandwidths denote the total forwarding throughput of the modules, regardless of the direction (ingress or egress). High-priority traffic, as long as it is not oversubscribed, is not affected by this bandwidth limit.

### Q. What are the specifics of the Cisco QuantumFlow Processor used on board the 5-Gbps ESP?

**A.** The Cisco QFP chipset on board the ESP5 consists of 20 packet processor elements (PPEs) capable of running four threads each at a clock rate of 900 MHz. The Cisco QuantumFlow Processor is complemented by 256 Mb of memory to support 64,000 queues and 10 Mb of content-addressable memory (ternary content addressable memory [TCAM]). In addition, the ESP5 features 1 Gb of DRAM memory available to its board controller CPU.

### Q. What are the specifics of the Cisco QuantumFlow Processor used on board the 10-Gbps ESPs?

**A.** The Cisco QuantumFlow Processor chipset on board the 10-Gbps ESPs consists of 40 PPEs capable of running four threads each at a clock rate of 900 MHz. The Cisco QuantumFlow Processor is complemented by 512 Mb of memory to support 128,000 queues and 10 Mb of content-addressable memory (TCAM). In addition, the 10-Gbps ESP features 2 Gb of DRAM memory available to its board controller CPU.

### Q. What are the specifics of the Cisco QuantumFlow Processor used on board the 20-Gbps ESPs?

**A.** The Cisco QuantumFlow Processor chipset on board the 20-Gbps ESPs consists of 40 PPEs capable of running four threads each at a clock rate of 1.2 GHz. The Cisco QuantumFlow Processor is complemented by 1 Gb of memory to support 128,000 queues and 40 Mb of content-addressable memory (TCAM). In addition, the 20-Gbps ESP features 4 Gb of DRAM memory available to its board controller CPU.

## Product Ordering

### Q. How do I order the ESPs?

**A.** To place an order, visit the Cisco Ordering Home Page at [www.cisco.com/en/US/ordering/index.shtml](http://www.cisco.com/en/US/ordering/index.shtml) and refer to Table 1.

**Table 1.** Product Ordering

Product Name	Part Number
Cisco ASR 1000 Embedded Services Processor 5Gbps	ASR1000-ESP5

Cisco ASR 1000 Embedded Services Processor 10Gbps	ASR1000-ESP10
Cisco ASR 1000 Embedded Services Processor 10Gbps Non CRYPTO	ASR1000-ESP10-N
Cisco ASR 1000 Embedded Services Processor 20Gbps	ASR1000-ESP20

To download software, visit the Cisco Software Center at [www.cisco.com/kobayashi/sw-center](http://www.cisco.com/kobayashi/sw-center).

**Q. What complementary hardware products is the 5-Gbps ESP compatible with?**

**A.** Refer to Table 2 for a list of Cisco hardware products compatible with the ESP5.

**Table 2.** Cisco ASR 1000 Series ESP5 Compatible Hardware

Product Name	Part Number
Cisco ASR 1002 Router Chassis	ASR1002

**Q. What complementary hardware products are the 10-Gbps ESP and 10-Gbps Non Crypto ESP compatible with?**

**A.** Refer to Table 3 for a list of Cisco hardware products compatible with the ESP10.

**Table 3.** Cisco ASR 1000 Series ESP10 Compatible Hardware

Product Name	Part Number
Cisco ASR 1002 Router Chassis	ASR1002
Cisco ASR 1004 Router Chassis	ASR1004
Cisco ASR 1006 Router Chassis*	ASR1006
Cisco ASR 1000 Route Processor 1	ASR1000-RP1
Cisco ASR 1000 Route Processor 2	ASR1000-RP2
Cisco ASR 1000 SPA Interface Processor 10	ASR1000-SIP10

\* Supports 1 + 1 redundancy when configured with two ESP10 modules.

**Q. What complementary hardware products is the 20-Gbps ESP compatible with?**

**A.** Refer to Table 4 for a list of Cisco hardware products compatible with the ESP20.

**Table 4.** Cisco ASR 1000 Series ESP20 Compatible Hardware

Product Name	Part Number
Cisco ASR 1004 Router Chassis	ASR1004
Cisco ASR 1006 Router Chassis*	ASR1006
Cisco ASR 1000 Route Processor 1	ASR1000-RP1
Cisco ASR 1000 Route Processor 2	ASR1000-RP2
Cisco ASR 1000 SPA Interface Processor 10	ASR1000-SIP10

\* Supports 1 + 1 redundancy when configured with two ESP10 modules.

**Q. What complementary software products are the 5- and 10-Gbps ESPs compatible with?**

**A.** Refer to Table 5 for a list of compatible Cisco software products.

**Table 5.** Software Product Compatibility

Product Name	Part Number
Cisco ASR 1000 Series RP1 IP BASE W/O CRYPTO	SASR1R1-IPB-21SR and SASR1R1-IPB-22SR or higher
Cisco ASR 1000 Series RP1 IP BASE	SASR1R1-IPBK9-21SR and SASR1R1-IPBK9-22SR or higher

Cisco ASR 1000 Series RP1 ADVANCED IP SERVICES	SASR1R1-AISK9-21SR and SASR1R1-AISK9-22SR or higher
Cisco ASR 1000 Series RP1 ADVANCED ENTERPRISE SERVICES	SASR1R1-AESK9-21SR and SASR1R1-AESK9-22SR or higher
Cisco ASR 1000 Series RP2 IP BASE W/O CRYPTO	SASR1R2-IPB-23SR or higher
Cisco ASR 1000 Series RP2 IP BASE	SASR1R2-IPBK9-23SR or higher
Cisco ASR 1000 Series RP2 ADVANCED IP SERVICES	SASR1R2-AISK9-23SR or higher
Cisco ASR 1000 Series RP2 ADVANCED ENTERPRISE SERVICES	SASR1R2-AESK9-23SR or higher

**Q. What complementary software products is the 10-Gbps noncrypto ESP (ESP10-N) compatible with?**

**A.** Refer to Table 6 for a list of compatible Cisco software products.

**Table 6.** Software Product Compatibility

Product Name	Part Number
Cisco ASR 1000 Series RP1 IP BASE W/O CRYPTO	SASR1R1-IPB-22SR or higher
Cisco ASR 1000 Series RP1 ADVANCED IP SERVICES W/O CRYPTO	SASR1R1-AIS-22SR or higher
Cisco ASR 1000 Series RP1 ADVANCED ENTERPRISE SERVICES W/O CRYPTO	SASR1R1-AES-22SR or higher
Cisco ASR 1000 Series RP2 IP BASE W/O CRYPTO	SASR1R2-IPB-23SR or higher
Cisco ASR 1000 Series RP2 ADVANCED IP SERVICES W/O CRYPTO	SASR1R2-AIS-23SR or higher
Cisco ASR 1000 Series RP2 ADVANCED ENTERPRISE SERVICES W/O CRYPTO	SASR1R2-AES-23SR or higher

**Q. What complementary software products is the 20-Gbps ESPs compatible with?**

**A.** Refer to Table 7 for a list of compatible Cisco software products.

**Table 7.** Software Product Compatibility

Product Name	Part Number
Cisco ASR 1000 Series RP1 IP BASE W/O CRYPTO	SASR1R1-IPB-22SR or higher
Cisco ASR 1000 Series RP1 IP BASE	SASR1R1-IPBK9-22SR or higher
Cisco ASR 1000 Series RP1 ADVANCED IP SERVICES	SASR1R1-AISK9-22SR or higher
Cisco ASR 1000 Series RP1 ADVANCED ENTERPRISE SERVICES	SASR1R1-AESK9-22SR or higher
Cisco ASR 1000 Series RP2 IP BASE W/O CRYPTO	SASR1R2-IPB-23SR or higher
Cisco ASR 1000 Series RP2 IP BASE	SASR1R2-IPBK9-23SR or higher
Cisco ASR 1000 Series RP2 ADVANCED IP SERVICES	SASR1R2-AISK9-23SR or higher
Cisco ASR 1000 Series RP2 ADVANCED ENTERPRISE SERVICES	SASR1R2-AESK9-23SR or higher

**Q. Where can I get future product information for the 5-, 10-, 10-N-, and 20-Gbps ESPs?**

**A.** Please check with your local Cisco account representative or go to

[www.cisco.com/go/asr1000](http://www.cisco.com/go/asr1000).

**Q. Where can I get pricing for the 5-, 10-, 10-N-, and 20-Gbps ESPs?**

**A.** Please refer to the Cisco Pricing Tool at <https://tools.cisco.com/qtc/pricing/MainServlet>.



**Americas Headquarters**  
Cisco Systems, Inc.  
San Jose, CA

**Asia Pacific Headquarters**  
Cisco Systems (USA) Pte. Ltd.  
Singapore

**Europe Headquarters**  
Cisco Systems International BV  
Amsterdam, The Netherlands

Cisco has more than 200 offices worldwide. Addresses, phone numbers, and fax numbers are listed on the Cisco Website at [www.cisco.com/go/offices](http://www.cisco.com/go/offices).

CCDE, CCSI, CCENT, Cisco Eos, Cisco HealthPresence, the Cisco logo, Cisco Lumin, Cisco Nexus, Cisco Nurse Connect, Cisco Stackpower, Cisco StadiumVision, Cisco TelePresence, Cisco WebEx, DCE, and Welcome to the Human Network are trademarks; Changing the Way We Work, Live, Play, and Learn and Cisco Store are service marks; and Access Registrar, Aironet, AsyncOS, Bringing the Meeting To You, Catalyst, CCDA, CCDP, CCIE, CCI, CCNA, CCNP, CCSP, CCVP, Cisco, the Cisco Certified Internetwork Expert logo, Cisco IOS, Cisco Press, Cisco Systems, Cisco Systems Capital, the Cisco Systems logo, Cisco Unity, Collaboration Without Limitation, EtherFast, EtherSwitch, Event Center, Fast Step, Follow Me Browsing, FormShare, GigaDrive, HomeLink, Internet Quotient, IOS, iPhone, iQuick Study, IronPort, the IronPort logo, LightStream, Linksys, MediaTone, MeetingPlace, MeetingPlace Chime Sound, MGX, Networkers, Networking Academy, Network Registrar, PCNow, PIX, PowerPanels, ProConnect, ScriptShare, SenderBase, SMARTnet, Spectrum Expert, StackWise, The Fastest Way to Increase Your Internet Quotient, TransPath, WebEx, and the WebEx logo are registered trademarks of Cisco Systems, Inc. and/or its affiliates in the United States and certain other countries.

All other trademarks mentioned in this document or website are the property of their respective owners. The use of the word partner does not imply a partnership relationship between Cisco and any other company. (0903R)