Q&A

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. The following ESPs are offered at this time for the Cisco ASR 1000 Series: 5-, 10-, 10-N-, 20-, 40-, 100- and 200-Gbps Cisco ASR 1000 ESPs (part numbers ASR1000-ESP5, ASR1000-ESP10, ASR1000-ESP10-N, ASR1000-ESP20, ASR1000-ESP40, ASR1000-ESP100, and ASR1000-ESP200, respectively). The 5-Gbps ESP (ESP5) supports 5 Gbps of bandwidth; the 10-Gbps ESP (ESP10 and ESP10-N) and 20-Gbps ESP (ESP20) support 10 Gbps and 20 Gbps of bandwidth, respectively; the 40-Gbps ESP (ESP40) supports 40 Gbps of bandwidth; the 100-Gbps ESP (ESP100) supports 100 Gbps of bandwidth, and the 200-Gbps ESP (ESP200) supports 200 Gbps of bandwidth. You can deploy the ESPs in customer networks that require 1 + 1 redundancy.

Q. What is the main difference between the ESP5, ESP10, ESP10-N, ESP20, ESP40, ESP100, and ESP200?

A. The ESP5 supports 5 Gbps of bandwidth, the ESP10 supports 10 Gbps of bandwidth, and the ESP10-N supports 10 Gbps of bandwidth but does not support IP Security (IPsec) encryption services. The ESP20 supports 20 Gbps of bandwidth, the 40-Gbps ESP (ESP40) supports 40 Gbps of bandwidth, the 100-Gbps ESP (ESP100) supports 100 Gbps of bandwidth, and the 200-Gbps ESP (ESP200) supports 200 Gbps of bandwidth.

Q. Does the ESP10N support the Cisco IOS® Zone-Based Firewall feature?

A. Yes, because the Cisco IOS Zone-Based Firewall feature does not require IPsec encryption, the ESP10-N supports this feature.

Q. What gives the ESPs a sustainable competitive advantage?

A. All 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), industry-leading hardware-based encryption, and special jitter- and latency-minimizing multicast packet replication. These features allow the integration of services and the enablement of features that typically would result in performance degradation from manufacturers' advertised throughput maxima. The ESP10-N does not support IPsec encryption services.

When used in combination with the Cisco ASR 1006 or ASR 1013 Router chassis, a pair of ESP10, ESP20, ESP40, or ESP100 modules (on the Cisco ASR 1006) and a pair of ESP40, ESP100, or ESP200 modules (on the Cisco ASR 1013) can be configured on the router (1 + 1 redundancy) to provide carrier-class high availability.

Q. What is the ESP10-N?

A. The Cisco ASR 1000 ESP10-N is the nonencryption version of the Cisco ASR 1000 ESP10. The Cisco ASR 1000 ESP10-N can support only noncrypto Cisco IOS Software images and will never support encryption capabilities such as IPsec. Cisco developed this product specifically to address export and import restrictions of strong encryption technologies to certain countries. In a future release, the Cisco ASR 1000 ESP10-N may support secured network management features such as Secure Shell (SSH) Protocol, Secure Sockets Layer (SSL), and Simple Network Management Protocol Version 3 (SNMPv3) in the no-license-required (NLR) images. For details about Cisco export regulations, refer to the Cisco Global Export Trade website: http://www.cisco.com/web/about/doing_business/legal/global_export_trade/index.html.

Product Benefits

Q. Where are the 5-, 10-, 20-, 40-, 100-, and 200-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 64,000 subscriber sessions and supports features such as Cisco Unified Border Element Service Provider Edition (also known as Session Border Controller [SBC]) for voice over IP (VoIP), video telepresence services, and hardware-assisted firewall for security. The router requires Gigabit Ethernet or 10 Gigabit Ethernet uplink capability.

Q. 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).Where are the 5-, 10-, 20-, 40-, 100-, and 200-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 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 200 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 Series 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 premises equipment (CPE) device.

The 100- and 200-Gbps ESPs enable the Cisco ASR 1000 Series Router with potentially higher broadband session numbers.

Q. Where are the Cisco 5-, 10-, 10-N-, 20-, 40-, 100-, and 200-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 78-Gbps) IPsec, optimization of the WAN to route around brownouts in the service provider network for guaranteeing 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 at up to 100 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 2.5-, 5-, 10-, 10-N-, 20-, 40-, 100-, and 200-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- and 20-Gbps ESP is Cisco IOS XE Software Release 2.2. The minimum software release required for the 40-Gbps ESP is Cisco IOS XE Software Release 3.1S. The minimum software release required for the 2.5-Gbps ESP is Cisco IOS XE Software Release 2.4, and the minimum software release required for the 100-Gbps ESP is Cisco IOS XE Software Release 3.7.1. The minimum software release required for the 200-Gbps ESP is Cisco IOS XE Software 3.10.0.

Q. What Cisco IOS Software features are supported by the 2.5-, 5-, 10-, 10-N-, 20-, 40-, and 100-Gbps ESPs?

A. The following are some of the features supported with Cisco IOS XE Software Release 2.1 (ESP5 or ESP10), Release 2.2 (ESP20), Release 2.4 (ESP2.5), Release 3.1S (ESP40), Release 3.7S (ESP100), or Release 3.10S (ESP200):

- 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 and the Cisco Intelligent Services Gateway (ISG)
- Quality of Service (QoS)
- Security access control lists (ACLs)
- Cisco Unified Border Element (Service Provider 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 IPsec (IPsec VPN services are not supported on the ESP10-N.)
- Commonly used Multiprotocol Label Switching (MPLS) Layer 2 and Layer 3 VPN features

Q. How is high availability supported by the 2.5-, 5-, 10-, 10-N-, 20-, 40-, 100-, and 200-Gbps ESPs?

A. ESP high availability is determined by chassis. Cisco ASR 1001, ASR 1002, ASR 1002-F, ASR 1002-X, and ASR 1004 Routers do not support redundant ESPs, so these chassis do not support ESP high availability. The Cisco ASR 1006 Router supports ESP10, ESP20, ESP40, and ESP100 high availability. The Cisco ASR 1013 Router supports ESP40, ESP100, and ESP200 high availability.

Cisco IOS XE Software Release 3.1S supports stateful interchassis redundancy for the firewall and NAT features for the ASR 1002, ASR 1002-F, and ASR 1004.

Technical Background

Q. What underlies the hardware architecture of the 2.5-, 5-, 10-, 10-N-, 20-, 40-, 100-, and 200-Gbps ESPs?

A. The 2.5-, 5-, 10-, 20-, 40-, 100-, and 200-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 onboard the 5-, 10-, 10-N-, 20-, 40-, 100-, and 200-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 2.5, 5, 10, 20, 40, 100, and 200 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 onboard the 2.5-Gbps ESP?

A. The Cisco QFP chipset onboard the ESP2.5 consists of 20 packet processor elements (PPEs) capable of running four threads each at a clock rate of 900 MHz. ESP2.5 is available only when integrated on the Cisco ASR 1002-F Router.

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

A. The Cisco QFP chipset onboard the ESP5 consists of 20 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 onboard the 10-Gbps ESPs?

A. The Cisco QuantumFlow Processor chipset onboard 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 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 onboard the 20-Gbps ESPs?

A. The Cisco QuantumFlow Processor chipset onboard 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 TCAM. In addition, the 20-Gbps ESP features 4 Gb of DRAM memory available to its board controller CPU.

Q. What are the specifics of the Cisco QuantumFlow Processor used onboard the 40-Gbps ESPs?

A. The Cisco QuantumFlow Processor chipset onboard the 40-Gbps ESPs consists of 40 PPEs capable of running four threads. The Cisco QuantumFlow Processor is complemented by 1 Gb of memory to support 128,000 queues and 40 Mb of content-addressable memory (TCAM).

Q. What are the specifics of the Cisco QuantumFlow Processor used onboard the 100-Gbps ESPs?

A. The Cisco QuantumFlow Processor chipset onboard the 100-Gbps ESPs consists of 124 PPEs capable of running four threads per PPE. The Cisco QuantumFlow Processor is complemented by 4 GB of memory to support 232,000 queues and 80 Mb of content-addressable memory (TCAM).

Q. What are the specifics of the Cisco QuantumFlow Processor used onboard the 200-Gbps ESPs?

A. The Cisco QuantumFlow Processor chipset onboard the 200-Gbps ESPs consists of 248 PPEs capable of running four threads per PPE. The Cisco QuantumFlow Processor is complemented by 8 GB of memory to support 464,000 queues and two 80-Mb content-addressable memory (TCAM) modules.

Product Ordering

Q. How do I order the ESPs?

A. To place an order, visit the Cisco Ordering Home Page at 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
Cisco ASR 1000 Embedded Services Processor 40Gbps	ASR1000-ESP40
Cisco ASR 1000 Embedded Services Processor 100Gbps	ASR1000-ESP100
Cisco ASR 1000 Embedded Services Processor 200Gbps	ASR1000-ESP200

To download software, visit the Cisco Software Center at 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. With what complementary hardware products are the 10-Gbps and 10-Gbps noncrypto ESPs compatible?

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. With what complementary hardware products is the 20-Gbps ESP compatible?

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 ESP20 modules.

Q. With what complementary hardware products is the 40-Gbps ESP compatible?

A. Refer to Table 5 for a list of Cisco hardware products compatible with the ESP40.

Table 5. Cisco ASR 1000 Series ESP40 Compatible Hardware

Product Name	Part Number
Cisco ASR 1006 Router Chassis*	ASR1006
Cisco ASR 1013 Router Chassis*	ASR1013
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 ESP40 modules.

Q. With what complementary hardware products is the 100-Gbps ESP compatible?

A. Refer to Table 6 for a list of Cisco hardware products compatible with the ESP100.

Table 6. Cisco ASR 1000 Series ESP100 Compatible Hardware

Product Name	Part Number
Cisco ASR 1006 Router Chassis*	ASR1006
Cisco ASR 1013 Router Chassis*	ASR1013
Cisco ASR 1000 Route Processor 2	ASR1000-RP2
Cisco ASR 1000 SPA Interface Processor 10	ASR1000-SIP10
Cisco ASR 1000 SPA Interface Processor 40	ASR1000-SIP40
Cisco ASR1000 1600w AC Power Supply	ASR1013/06-PWR-AC
Cisco ASR1000 1600w DC Power Supply	ASR1013/06-PWR-DC

* Supports 1+1 redundancy when configured with two ESP100 modules.

Q. With what complementary hardware products is the 200-Gbps ESP compatible?

A. Refer to Table 7 for a list of Cisco hardware products compatible with the ESP200.

Table 7. Cisco ASR 1000 Series ESP200 Compatible Hardware

Product Name	Part Number
Cisco ASR 1013 Router Chassis*	ASR1013
Cisco ASR 1000 Route Processor 2	ASR1000-RP2
Cisco ASR 1000 SPA Interface Processor 40	ASR1000-SIP40
Cisco ASR1000 1600w AC Power Supply	ASR1013/06-PWR-AC
Cisco ASR1000 1600w DC Power Supply	ASR1013/06-PWR-DC

* Supports 1+1 redundancy when configured with two ESP200 modules.

Q. Where can I get future product information for the 5-, 10-, 10-N-, 20-, 40-, 100-, and 200-Gbps ESPs?

A. Please check with your local Cisco account representative or visit: http://www.cisco.com/go/asr1000.

Q. Where can I get pricing for the 5-, 10-, 10-N-, 20-, 40-, 100-, and 200-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.

Printed in USA C67-449980-07 08/13