

Cisco Enhanced Gateway GPRS Support Node — Release 3.0

Product Overview

The Cisco® Enhanced Gateway GPRS Support Node (eGGSN) Release 3.0 runs on the Cisco 7600 Series Routers, which scale in capacity with the addition of the Cisco Service and Application Module for IP (SAMI). The Cisco eGGSN is part of Cisco's mobile Internet offering and delivers high performance, scalability, and resiliency, coupled with advanced content-filtering and charging services.

All of the features required for a successful mobile Internet deployment are provided, including advanced service awareness, quality of service (QoS) enforcement, traffic management, static and dynamic policy control, versatile charging capabilities including online and offline charging, content-aware billing, content filtering, service control, traffic analysis, and data mining in a highly scalable, fault-tolerant package.

The Cisco eGGSN is just one component of a complete mobile packet core architecture. It is designed to support all the needs of today's demanding High-Speed Packet Access (HSPA) Radio Access Network (RAN) environment, and can easily be upgraded to Evolved Packet Core (EPC) functionality to support tomorrow's Long Term Evolution (LTE) RAN deployments.

Features and Benefits

Capacity and Performance

Cisco's eGGSN for the Cisco 7600 Series Router exceeds the industry's current capacity and performance thresholds by an order of magnitude. Recent [performance testing by Current Analysis](#) demonstrated that a Cisco GGSN can achieve nearly 75 Gbps of throughput. This performance positions the Cisco eGGSN as an essential part of the broadband mobile Internet transformation. The Cisco eGGSN will allow operators to stay ahead of the explosive growth in mobile data traffic driven by powerful new devices, high-speed RANs, compelling applications, and attractive billing plans.

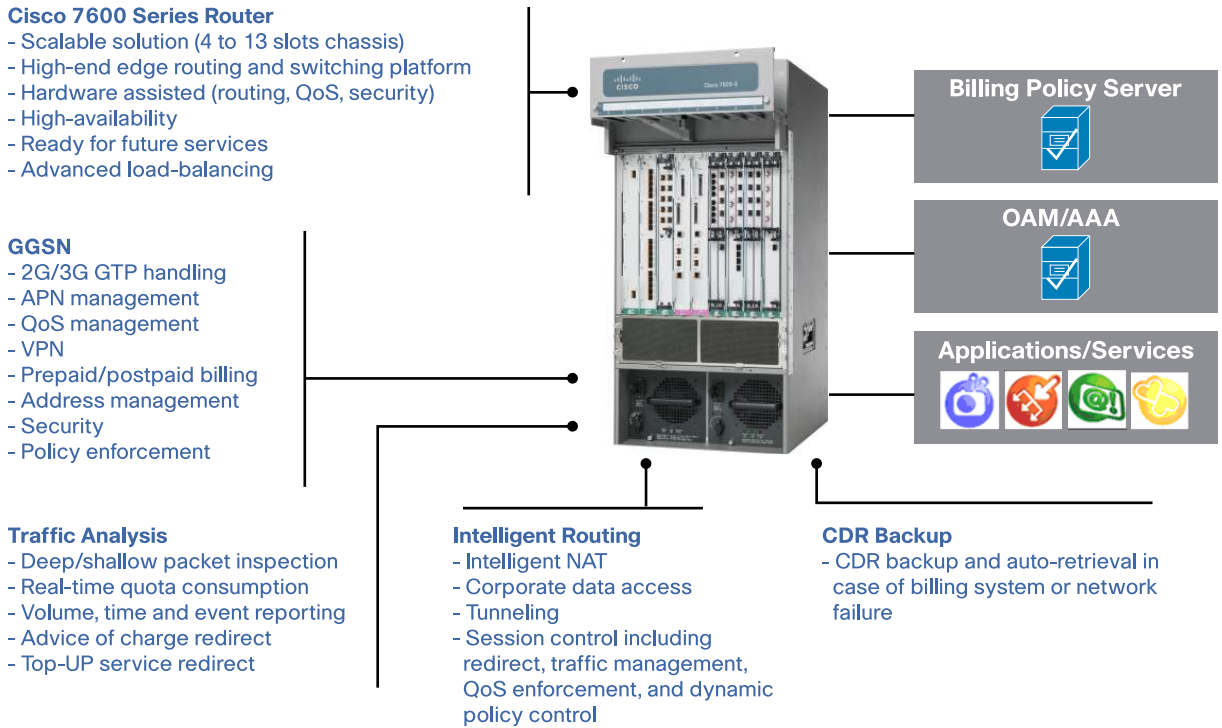
The high scalability of the Cisco eGGSN is made possible by adding a Cisco SAMI blades to the Cisco 7600 Series chassis. The SAMI's multiprocessor architecture allows for simultaneous scaling of GPRS Tunneling Protocol-Control (GTP-C) plane traffic and GTP-U user plane traffic, while delivering advanced services for a large number of Packet Data Protocol (PDP) contexts. Its parallel architecture is designed to minimize the traditional performance loss when advanced content-based services are activated in a mobile gateway.

A single SAMI blade delivers aggregate throughput of over 1 million packets per second and a PDP density of 800,000 active PDP contexts while operating in mobile gateway mode. The throughput and session density scale linearly with each additional SAMI blade in the Cisco 7600 Series chassis.

With the SAMI, the Cisco eGGSN takes advantage of recent technology advances while preserving the stability and feature richness of the existing software applications.

Figure 1 shows the main features of the eGGSN, release 3.

Figure 1. Features of Cisco eGGSN Release 3



Scaling

Within the Cisco eGGSN, the Cisco Exchange Director distributes PDP contexts among the SAMI blades. It presents a single virtual IP address to the Serving GPRS Support Nodes (SGSNs). In addition to transparent server farm expansion, the Exchange Director allows for portions of the Cisco eGGSN to be taken out of service, for example, during software upgrades.

The Exchange Director’s dynamic feedback mechanism is used to monitor the load and resources across the SAMI blades and redistribute new PDP contexts accordingly. Also, if a PDP context is rejected due to context admission control during QoS negotiation, it can be reassigned to another SAMI blade. Finally, the Cisco eGGSN continuously monitors the availability of the surrounding infrastructure so that user traffic can be routed through paths with full service availability.

Advanced Content Charging and Services

The Cisco eGGSN supports a variety of billing models and capabilities that are integral to a mobile operator’s commercial deployment of content-based and value-added services. The Cisco eGGSN supports a standards-based offline charging mode with a variety of call detail record (CDR) generation triggers. It also supports online charging capabilities, PDP context granularity, as well as service-differentiated content measurement that includes a rich set of content-filtering and packet inspection criteria. Each service that a subscriber accesses can have a different balance allocation and can be billed at a different rate, including provisions for free services as well as services that provide a credit. A balance allocation can be a specified number of transactions, a specified number of bytes, or service duration.

Service Control and Bandwidth Management

Cisco eGGSN filtering and content inspection capabilities are not restricted to billing applications. Content filtering capabilities enable service providers to provide specific traffic treatment including redirection, rate limiting, and policing. They also allow operators to gather subscriber network, service, and content usage data for data-mining applications.

Standards-Based Interoperability

The Cisco eGGSN is part of Cisco's mobile Internet architecture, which can readily interface to all the control elements in a mobile network, including multiple RANs, back-end billing systems, and content-filtering and compression solutions. Mobile operators can install and deploy this architecture without disrupting any services.

Reliability and Availability

The Cisco eGGSN enables stateful session redundancy, providing for continuation of user sessions as well as redundancy of prepaid quota and charging information, thereby protecting against single-node outages. Additionally, Cisco offers the Internet Small Computer System Interface (iSCSI) for protection of charging information against failure of the Charging Gateway or the Service Control Operating System (prepaid usage).

Investment Protection

The Cisco eGGSN offers a scalable platform based on the Cisco 7600 Series Router platform, which scales in capacity with the addition of SAMI blades. For future migration to LTE, a simple software upgrade will enable operators to evolve the Cisco eGGSN into a Serving Gateway (SGW) or Packet Data Node (PDN) Gateway.

Cisco eGGSN application software is based on standard Cisco IOS® Software, which delivers many services including routing, VPN, QoS, packet handling, firewall, security, etc. The Cisco eGGSN is continuously evolving to provide a smooth path to support all of the upcoming Third-Generation Partnership Project (3GPP) architectural standards.

Network Management

Network management functions provide mechanisms to support operations, administration, and maintenance (OA&M) functions related to the Cisco eGGSN. The Cisco eGGSN management has a wide range of console and Simple Network Management Protocol (SNMP) management tools designed to reduce operational costs. The Cisco eGGSN is supported by the Cisco Mobile Wireless Center (MWC), which helps enable remote fault management, Access Point Name (APN) management, and configuration management for the Cisco eGGSN. The Cisco MWC is a suite of element management system (EMS) applications that enhance the delivery of new mobile wireless services. Based on CiscoWorks, the Cisco MWC addresses the element management requirements of mobile operators and provides fault, configuration, accounting, performance, and security (FCAPS) functions as mobile operators transition their service delivery networks from 2G circuit-based traffic to 2.5G and 3G IP-based services. For more details about the Cisco MWC, go to: <http://www.cisco.com/en/US/partner/products/sw/netmgtsw/ps820/index.html>.

Cisco eGGSN Release 3.0 Highlights

Cisco eGGSN release 3.0 added enhancements enable more flexible deployments tailored to the service provider's needs. The release also enhanced the security and traffic separation offerings.

The signaling enhancements on the Gy interface offer greater flexibility to interface to various application partners.

The service control offering was greatly enhanced by introducing dynamic policy control to allow tailoring gateway behaviors to dynamic traffic conditions on the network.

The traffic controls were enhanced with additional protocols including Peer-to-Peer, instant messaging, and email detection, tightly tied to billing and dynamic policy control.

Table 1 outlines the details of the Cisco eGGSN features.

Table 1. Cisco eGGSN Features

Platform	Scalability and Performance
<ul style="list-style-type: none"> • Multiaccess gateway platform: eGGSN, Access Service Network (ASN) Gateway, Evolved Packet Core (EPC), packet data serving node (PDSN), Security Gateway, etc. • Cisco 7600 Series Router • Scalability from 4 to 13 slots • Up to 720 Gbps backplane capacity • Wide selection of interface modules: WAN connectivity from OC-48/STM-16 to DS-0 and LAN connectivity from 10 Gigabit Ethernet (1-port, 2-port, 4-port, and 8-port) through 10-Mbps Ethernet • Deployment flexibility, can support a mix of mobile gateway service modules and other service modules: firewall, security, load balancing, etc. 	<ul style="list-style-type: none"> • Packet-per-second processing independent of packet size • Linear scaling with additional modules • Throughput of greater than 1 million pps per module • High session density per module • High session activation rate
3GPP Signaling	Resiliency
<ul style="list-style-type: none"> • GTPv0 and GTPv1 support • 3GPP-compliant interfaces: Gn, Ga, Gi, Gp, Gy, Gx • IPv4, IPv6, and Point-to-Point Protocol (PPP) PDP type • Transparent, nontransparent, and anonymous access • Controllable SGSN echo request • GGSN-initiated PDP context update • Direct tunnel support 	<ul style="list-style-type: none"> • High availability: 99.999% • Stateful session redundancy • Stateful geo-redundancy • Fully redundant platform for either inter- or intra-chassis redundancy • Routing/switching engine stateful failover • Online insertion and removal of supervisor and application modules
APN Features	Quality of Service
<ul style="list-style-type: none"> • Highly customizable APN settings • Virtual APN (single APN) capability with service control • RADIUS-based (dynamic) per-user APN assignment • Highly scalable APN solution • Service-based forwarding • Advanced service charging • Protocol-aware event differentiation for WAP1, WAP2, Real-Time Streaming Protocol (RTSP), email (POP3, IMAP, SMTP), iMode, HTTP, and FTP. 	<ul style="list-style-type: none"> • 3GPP QoS including HSPA+ • Dynamic QoS updates • DiffServ marking • Secondary PDP context support • Per APN call-admission control • Per APN/Per PDP context traffic policing • Bandwidth management with rate limiting/blocking/redirection
IP Address Management	IMS (IP Multimedia Support)
<ul style="list-style-type: none"> • Static address (provisioned in Home Location Register [HLR]) • Local address pools • Remote allocation via RADIUS or Dynamic Host Configuration Protocol (DHCP) • Stateless autoconfiguration for IPv6 • Overlapping address support • Downloadable pool names 	<ul style="list-style-type: none"> • IPv6 PDP support • Proxy Call Session Control Function (P-CSCF) discovery for IPv4 and IPv6 • P-CSCF load balancing • Enhanced QoS features
Security	VPN and Corporate Access
<ul style="list-style-type: none"> • RADIUS authentication • Traffic separation (Gn, Gi, Ga, etc.) • Antispoofing • Firewalls, intrusion detection • Access lists • Traffic redirection • Per APN packet filtering for IPv4 and IPv6 • Content filtering 	<ul style="list-style-type: none"> • Overlapping address and APN to Virtual Route Forwarding (VRF) binding support • Per APN/VRF routing protocol support: OSPF, BGP, IS-IS, etc. • PPP-regeneration for L2TP access • Routing behind MS • Generic routing encapsulation (GRE) VPN • VLAN (802.1q) VPN • IPsec VPN • Multiprotocol Label Switching (MPLS) VPN

Service Charging <ul style="list-style-type: none"> • 3GPP-compliant Ga interface • Push and pull billing models • Internet SCSI over parallel SCSI transport, Fibre Channel Protocol (FCP), TCP/IP • Flexible call detail record (CDR) triggers: time, volume, QoS, SGSN, public land mobile network (PLMN), and RAT change triggers • Event-, volume-, or duration-based billing • Generation of standard G-CDR, eGCDR, and service /event/content CDR, and transaction-based billing records • Per-user billing plans and service control • User-messaging support (via redirection) for account top-up, advice of charge, etc. • Connection time expiration • Forced user disconnection • Automatic event failure refunding • Time-based tariff change 	Flexible Traffic Classification <ul style="list-style-type: none"> • Deep Packet Inspection (DPI) based on Layer 4–7 protocol analysis <ul style="list-style-type: none"> ◦ Layer 3–4: IP, TCP, UDP ◦ Browsing: WAP 1.x/2.0, HTTP ◦ Messaging: IMAP, SMTP, POP3 ◦ URL match ◦ HTTP (and WAP2) header match • DPI based on heuristic analysis <ul style="list-style-type: none"> ◦ Peer-to-Peer ◦ Instant messaging ◦ Voice ◦ Streaming media ◦ Mail services
Service Control <ul style="list-style-type: none"> • Dynamic service control with 3GPP diameter-based Gx+ interface • Gx extensions: Layer 7 rules and triggers • Classification-based service control: rate limiting, flow gating, zero rating, redirection, and AOC 	Real-Time Prepaid <ul style="list-style-type: none"> • 3GPP diameter-based Gy interface • Simple or content-based prepaid • Dual quota support • Quota pullback • Event-, volume-, or duration-based billing

Cisco eGGSN Hardware Configuration

- All Cisco 7600 Series Router chassis are supported: Cisco 7604, 7606, 7609, and 7613 including S series chassis, with a minimum Cisco IOS Software release requirement of 12.2(33)SRC or 12.2(33)SRB1.
- Cisco eGGSN features are supported on a Cisco SAMI blade, with a minimum Cisco IOS Software release requirement of 12.4(15)XQ.
- Supported supervisor engines are: Cisco 7600 Series Supervisor Engine 720-3BXL, Supervisor Engine 32, and Route Switch Processor (RSP) 720.
- Single or redundant supervisor configurations are permitted.
- No restriction is applied on any other cards in the chassis.
- Up to nine SAMI blades may be in the Cisco 7613 chassis.

Ordering Information

Table 2 lists the product codes for the Cisco GGSN base software, upgrade licenses, and SAMI hardware.

The base license provides an unlimited number of subscribers, limited by hardware resource capacity and traffic mix.

Table 2. Cisco GGSN Ordering Information

Product Number	Description
SAMI	
WS-SVC-SAMI-BB-K9	Service and Application Module for IP 6 x PPCs w/ 1GB (Crypto)
MEM-SAMI-6P-2GB	Service and Application Module 2GB Upgrade
Software Licenses	
SSAG90-12422YE SSAC30K9-12422MD	eGGSN Right to Use (RTU)
Subscriber Licenses	
FL-SE-10K-SUB=	eGGSN 10K Connected Subscribers
FL-SE-100K-SUB=	eGGSN 100K Connected Subscribers

Upgrade Licenses	
FL-SG-R8R9-UP FL-SC-R2R3-K9-UP	eGGSN R2 to R3 SW Upg

Additional Information

For more information about Cisco mobile wireless products and solutions, visit <http://www.cisco.com/go/mobile>.



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