

## Cisco SGSN Serving GPRS Support Node: The Next-Generation SGSN for the UMTS/HSPA Packet Core

To keep pace with the tremendous growth in demand for mobile broadband services and the massive increase in mobility events from the movement to “always-on” applications, forward-thinking mobile operators are looking for ways to boost the performance and capacity of their 3G networks while easing migration to 4G. They are confronting the cost and complexity of supporting multiple platforms for 2.5G and 3G Serving GPRS Support Nodes (SGSNs), Gateway GPRS Support Nodes (GGSNs), and in the future the S4 SGSN. And many current SGSNs are optimized for General Packet Radio Service (GPRS) or Universal Mobile Telecommunications Service (UMTS) but unable to support migration to High Speed Packet Access (HSPA), HSPA+, and Evolved Packet Core (EPC) networks.

Cisco's SGSN has become the choice for many of the world's most innovative 3rd Generation Partnership Project (3GPP) network operators deploying GSM, UMTS, and HSPA networks. The SGSN offers full support for UTRAN/GERAN to 3GPP core network access, in order to perform mobility management, GPRS Tunneling Protocol (GTP) tunneling and detunneling, Packet Data Protocol (PDP) context activation and management, attaches and detaches, and billing.

Supported on the Cisco® ASR 5000, the SGSN provides comprehensive, high-capacity, and standards-compliant GSM/GPRS, EDGE, UMTS, and HSPA network access support. By performing IP-based transport on all radio and core network interfaces using standard interfaces, the SGSN's performance and scalability is enhanced, while interconnectivity complexity is reduced, providing operators with higher performance for less operational expenditure.

Additionally, the SGSN supports migration toward HSPA networks, and can be upgraded to a Release 8 SGSN that will allow interoperability with the Mobility Management Entity (MME) and the Serving Gateway (SGW) in EPC networks.

### **The SGSN Difference**

The Cisco ASR 5000 is purpose built to address the needs of mobile packet core networks. Beginning with activation, the Cisco ASR 5000 SGSN identifies and authenticates the subscriber and routes the subscriber's session to the GGSN within the core network. It can then be routed to any endpoint, such as the Internet or any operator service. The SGSN also manages subscriber mobility and maintains subscriber information, enabling a consistent experience as a subscriber roams. Cisco's SGSN accommodates a high rate of simultaneous attaches and detaches, making it the ideal solution for networks with high packet traffic and a significant subscriber base. In order to optimize the entire signaling chain, the SGSN's design eliminates or minimizes bottlenecks caused by large-scale control signaling.

### **Key Features and Benefits**

- Industry-leading performance includes high capacity, exceptional throughput, and session and mobility management.
- Full UTRAN/GERAN to core network access support includes mobility management, GTP tunneling and detunneling, and PDP context activation and management, as well as attaches/detaches and billing.
- Optional support for Direct Tunnel and Cisco's FastPath architecture helps improve the subscriber experience and reduce operational and capital expenditures by optimizing the usage of subscriber plane resources.
- 2.5G and 3G SGSNs may be combined on a single platform for greater flexibility.

- The SGSN can be combined with GGSN or EPC elements such as MME and SGW on a single platform to maximize efficiency and flexibility, reduce latency, and simplify and optimize network architecture.
- Frame Relay, ATM, and IP-based transport on all radio and core network interfaces enhances performance, offers outstanding scalability, and reduces interconnectivity complexity.

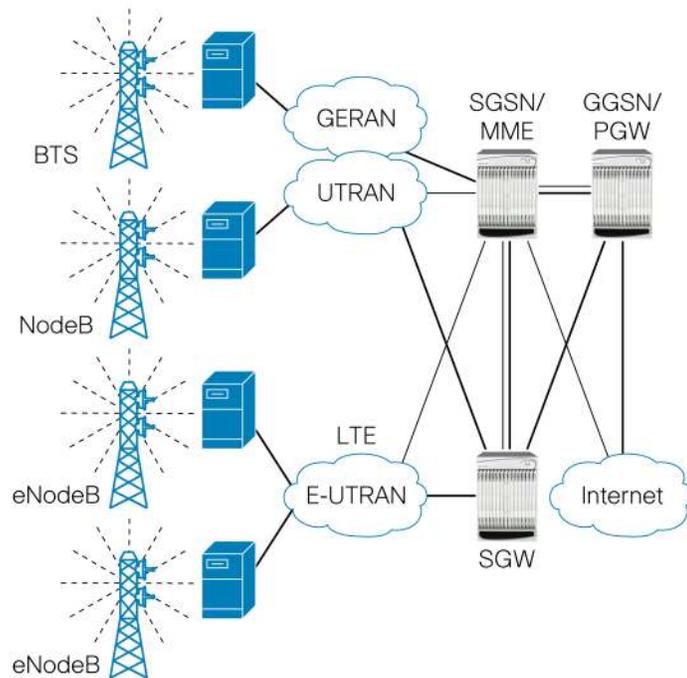
### Network Flexibility and Efficiency

Network efficiency and operational simplicity can be increased by combining the SGSN with Cisco's GGSN on the same Cisco ASR 5000 platform. The platform is capable of handling the SGSN's state-heavy characteristics and the GGSN's processing-intensive characteristics within a single system through the optimal use of common hardware, memory, and CPU resources.

The SGSN's capability to support 2.5G and 3G services in the same chassis results in operational efficiencies as well as cost savings. Because the SGSN handles 2.5G and 3G procedures in the same processes, fewer IP addresses are required, as both services appear as a single SGSN service and use common uplinks. In addition, there are no internal software interfaces between processes during 2.5G/3G handoffs. In this way, the SGSN avoids repeated exchanges with the Home Location Registry (HLR) to retrieve the same subscriber state.

Figure 1 illustrates how Cisco's complementary SGSN and GGSN can revolutionize the efficiency and performance of your network to provide intelligent and high-capacity GSM/GPRS, EDGE, UMTS, and HSPA network access.

**Figure 1.** Cisco's Complementary SGSN and GGSN



With a simple software download, the SGSN can be upgraded to, or integrated with, SGSN Release 8 or even other EPC elements such as a Mobility Management Entity. This flexibility is of particular value to mobile operators who may be operating a blended network for years to come.

## Direct Tunnel and FastPath Support

The SGSN makes use of the Direct Tunnel architecture, which enables the SGSN to establish a direct subscriber plane tunnel between the radio access network (RAN) and the GGSN. In addition, the Cisco ASR 5000 also supports FastPath, which frees up the SGSN to perform other high-touch services and signaling procedures. With FastPath, no change is required to your architecture because the SGSN discerns no difference between home and roaming users, eliminating the need to perform new procedures.

## Location Management

The SGSN supports outstanding scalability of standards-based routing area updates (RAUs) for location management, including periodic RAUs, intra-SGSN RAUs, and inter-SGSN RAUs. Further, the SGSN's high capacity and flexible functionality provide a great opportunity to convert high-impact inter-SGSN RAUs to lower-impact intra-SGSN RAUs.

## Session Management

Cisco's SGSN performs comprehensive session management, including context activation, modification, deactivation, and preservation. It also provides support for IPv4, IPv6, and PPP PDP context types. In addition, the SGSN's intelligent PDP context preservation feature facilitates efficient radio resource utilization.

## Charging

The SGSN supplies standards-based SGSN call detail records (S-CDRs) and mobility call detail records (M-CDRs). Further, the SGSN implements the standardized Ga interface for the exchange of charging data with one or more configured Charging Gateway Functions (CGFs).

## Conclusion

The Cisco SGSN provides comprehensive, high-capacity, and standards-compliant GSM/GPRS, EDGE, UMTS, and HSPA network access. With the SGSN, you can minimize capital and operational costs, ease deployment of revenue-generating services, and improve the reliability of your network to boost your competitive edge.

**Table 1.** SGSN Features

Description	Specification
<b>Interfaces</b>	<ul style="list-style-type: none"> <li>Gn: GTP v0 and v1</li> <li>Ga: AAA M-CDR/S-CDR</li> <li>Gc: Support for MAP-to-GTP conversion</li> <li>Gb: IP and Frame Relay E1</li> <li>Gr: IP (SIGTRAN) and NB-SS7</li> <li>luPS: ATM and IP (SIGTRAN)</li> </ul>
<b>Connectivity</b>	<ul style="list-style-type: none"> <li>IPv4</li> <li>IPv6</li> <li>PPP</li> </ul>
<b>Authentication, authorization, and accounting</b>	<ul style="list-style-type: none"> <li>3GPP TS 32.251 v7.2.0</li> <li>S-CDRs – 3GPP TS 32.251</li> <li>M-CDRs – 3GPP TS 32.251 v7.2.0</li> <li>GTPP v1 and v2</li> </ul>
<b>IP address allocation</b>	<ul style="list-style-type: none"> <li>Local pools</li> <li>Dynamic Host Configuration Protocol (DHCP)</li> <li>RADIUS</li> <li>GTP support</li> <li>GTPv0 and v1</li> <li>GTPv0 to v1 fall back/fall forward conversion</li> <li>GTPP v1 and v2</li> </ul>

Description	Specification
<b>VPN and tunneling</b>	<ul style="list-style-type: none"> <li>• Multiple virtual router support</li> <li>• IPsec</li> <li>• L2TP Access Concentrator (LAC) and L2TP Network Server (LNS)</li> <li>• PPP regeneration: PDP type IP sessions into Layer 2 Tunneling Protocol (L2TP) tunnel</li> <li>• IP-in-IP tunneling</li> <li>• Generic routing encapsulation (GRE) tunneling</li> <li>• 802.1q VLANs</li> </ul>
<b>Routing</b>	<ul style="list-style-type: none"> <li>• Routing Information Protocol (RIP)</li> <li>• Open Shortest Path First (OSPF)</li> <li>• Border Gateway Protocol 4 (BGP4)</li> </ul>
<b>Enhanced applications</b>	<ul style="list-style-type: none"> <li>• Paging controller</li> <li>• Location register</li> <li>• Enhanced content charging</li> <li>• Content filtering/parental control</li> <li>• Stateful firewall</li> <li>• Peer-to-peer (P2P) detection and control</li> </ul>

### For More Information

For more information, visit [www.cisco.com/go/mobileinternet](http://www.cisco.com/go/mobileinternet).



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