Overview of GPRS

This chapter provides a brief introduction to the General Packet Radio Service (GPRS) technology and its implementation in the Cisco IOS software.

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Overview

GPRS is a new service designed for Global System for Mobile Communications (GSM) networks. GSM is a digital cellular technology that is used worldwide, predominantly in Europe and Asia, with current estimates of 400 million subscribers and growing. GSM is the world’s leading standard in digital wireless communications.

GPRS is standardized by the European Telecommunications Standards Institute (ETSI). The most common application of GPRS is expected to be Internet/intranet access. Cisco Systems’ GPRS solution enables mobile wireless service providers to supply their mobile subscribers with packet-based data services in GSM networks.

GPRS introduces the following two new major network elements:

- SGSN—Sends data to and receives data from mobile stations, and maintains information about the location of a mobile station (MS). The SGSN communicates between the MS and the GGSN. SGSN support is available from Cisco partners or other vendors.
- GGSN—A wireless gateway that allows mobile cell phone users to access the public data network (PDN) or specified private IP networks. The GGSN function is implemented on the Cisco Systems’ router.
Overview of GPRS

Figure 2 provides a view of the basic GPRS network components. The functions shown in boxes beneath the network show the different types of network services that are commonly used in a GPRS network.

**Figure 2  GPRS Network Components**

User sessions are connected from a mobile station to a Base Transceiver Station (BTS), which connects to a Base Station Controller (BSC). The combined functions of the BTS and BSC are referred to as the Base Station Subsystem (BSS). From there, the SGSN provides access to the GGSN, which serves as the gateway to the data network.

Multiple SGSNs and GGSNs within a GPRS network are referred to collectively as GPRS Support Nodes (GSNs). The connection between the SGSN and the GGSN is enabled through a protocol called the GPRS Tunneling Protocol (GTP). The connection between the GGSN and the PDN is enabled through the Internet Protocol (IP).

To assign mobile sessions an IP address, the GGSN uses the Dynamic Host Configuration Protocol (DHCP). The GGSN can use a Remote Dial-In User Service (RADIUS) server to authorize and authenticate the remote users. DHCP and RADIUS services can be specified at the global configuration level (using GPRS DHCP and RADIUS commands), or for each access point configured on the GGSN.

In Cisco IOS Release 12.1(5)T and later, the GGSN (with an Industry-Standard Architecture (ISA) card), supports the IP security protocol (IPSec) to provide data confidentiality, data integrity, and data authentication between participating peers.

**GPRS Interface Reference Model**

The GPRS standards use the term *interface* to label (or identify) the communication path between different GPRS network elements. The GPRS standards define the requirements and characteristics of communication between different GPRS network elements over these interfaces. These interfaces are commonly referred to when describing aspects of a GPRS network.

**Figure 3** shows the GPRS interfaces that are implemented in the Cisco IOS GPRS feature:

- **Gn interface**—Interface between GSNs within the same PLMN in a GPRS network. GTP is a protocol defined on the Gn interface between GSNs in a GPRS network.
- **Gi interface**—Reference point between a GPRS network and an external packet data network.
- **Ga interface**—Interface between a GGSN and charging gateway (CG) in a GPRS network.
Virtual Template Interface
To facilitate configuration of connections between the GGSN and SGSN, and the GGSN and PDNs, the Cisco IOS GPRS software uses an internal interface called a virtual template interface. A virtual template is a logical interface on the router. A logical interface configuration on the router is not tied directly to a specific physical interface, but it can be associated dynamically with a physical interface.

As with a physical interface on the router, you can assign an IP address to the virtual template interface. You can also configure IP routing characteristics on the virtual template interface. You are required to configure certain GPRS-specific elements on the virtual template interface, such as GTP encapsulation (which is necessary to communicate with the SGSN) and the access list that the GGSN uses to determine which PDNs are accessible on the network.

Access Points
The GPRS standards define a network identity called an access point name (APN). An APN identifies a PDN that is configured on and accessible from a GGSN in a GPRS network. To configure APNs, the Cisco Systems GPRS software uses the following configuration elements:

- Access point—Defines an APN and its associated access characteristics, including security and method of dynamic addressing.
- Access point list—Logical interface that is associated with the virtual template of the GGSN. Each access-point list contains one or more access points.
- Access group—An additional level of security on the router that is configured at an access point to control access to and from a PDN. When an MS is permitted access to the GGSN as defined by a traditional IP access list, the IP access group further defines whether access is permitted to the PDN (at the access point). The IP access group configuration can also define whether access from a PDN to an MS is permitted.

For more detailed information on access-point configuration, refer to the “Configuring the GPRS Access Point List on the GGSN” section on page 27 in the “Configuring Network Access to the GGSN” chapter.
Benefits

The GPRS technology provides the following benefits:

- Enables the use of a packet-based air interface over the existing circuit-switched GSM network, which allows greater efficiency in the radio spectrum because the radio bandwidth is used only when packets are sent or received.

- Supports minimal upgrades to the existing GSM network infrastructure for those network service providers who want to add GPRS services on top of GSM, which is currently widely deployed.

- Supports data rates of about 115 Kbps, which is greater than the traditional 9.6 Kbps rate available in a circuit-switched connection.

- Supports larger message lengths than Short Message Services (SMS).

- Supports virtual private network (VPN)/Internet service provider (ISP) corporate site access.