



MorganDoyle Limited

15 Devon Street, Bury, BL9 9BN, UK

Tel: +44 (0) 7736 609469 Email: info@morgandoyle.co.uk Web: <http://www.morgandoyle.co.uk>

GPRS Tutorial

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1 Introduction

GPRS (General Packet Radio Service) is a packet based communication service for mobile devices that allows data to be sent and received across a mobile telephone network. GPRS is a step towards 3G and is often referred to as 2.5G. Here are some key benefits of GPRS:

Speed

GPRS is packet switched. Higher connection speeds are attainable at around 56–118 kbps, a vast improvement on circuit switched networks of 9.6 kbps. By combining standard GSM time slots theoretical speeds of 171.2 kbps are attainable. However in the very short term, speeds of 20-50 kbps are more realistic.

Always on connectivity

GPRS is an always-on service. There is no need to dial up like you have to on a home PC for instance. This feature is not unique to GPRS but is an important standard that will no doubt be a key feature for migration to 3G. It makes services instantaneously available to a device.

New and Better applications

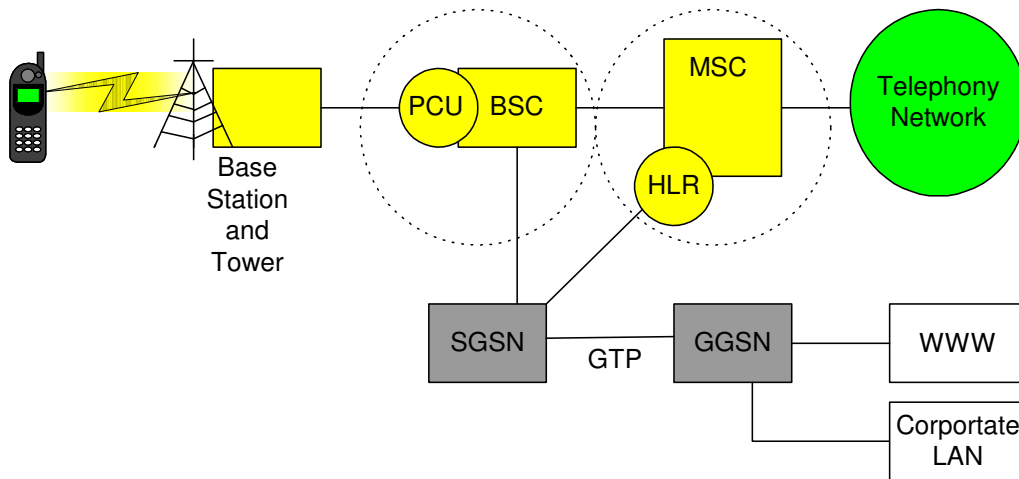
Due to its high-speed connection and always-on connectivity GPRS enables full Internet applications and services such as video conferencing straight to your desktop or mobile device. Users are able to explore the Internet or their own corporate networks more efficiently than they could when using GSM. There is often no need to redevelop existing applications.

GSM operator Costs

GSM network providers do not have to start from scratch to deploy GPRS. GPRS is an upgrade to the existing network that sits along side the GSM network. This makes it easier to deploy, there is little or no downtime of the existing GSM network whilst implementation takes place, most updates are software so they can be administered remotely and it allows GSM providers to add value to their business at relatively small costs.

The GSM network still provides voice and the GPRS network handles data, because of this voice and data can be sent and received at the same time.

2 Simple GPRS Technical Overview



As mentioned earlier GPRS is not a completely separate network to GSM. Many of the devices such as the base transceiver stations and base transceiver station controllers are still used. Often devices need to be upgraded be it software, hardware or both. When deploying GPRS many of the software changes can be made remotely.

There are however two new functional elements which play a major role in how GPRS works. The Serving GPRS Support Node (SGSN) and the Gateway GPRS support node (GGSN). These 2 nodes are new to the network with the other changes being small if any.

Before explaining what these 2 new members of our network do it is important to ask how does the network differentiate between GSM (circuit) and GPRS (packet)?

In simple terms there are in practice two different networks working in parallel, GSM and GPRS. In any GSM network there will be several BSC's (Base Station Controllers). When implementing GPRS a software and hardware upgrade of this unit is required. The hardware upgrade consists of adding a Packet Control Unit (PCU). This extra piece of hardware differentiates data destined for the standard GSM network or Circuit Switched Data and data destined for the GPRS network or Packet Switched Data. In some cases a PCU can be a separate entity.

From the upgraded BSC there is a fast frame relay connection that connects directly to the newly introduced SGSN.

2.1 SGSN

The Serving GPRS Support Node, or SGSN for short, takes care of some important tasks, including routing, handover and IP address assignment.

The SGSN has a logical connection to the GPRS device. As an example, if you where in a car travelling up the M1 on a long journey and were browsing the Internet on a GPRS device, you will pass through many different cells. One job of the SGSN is to make sure the connection is not interrupted as you make your journey passing from cell to cell. The SGSN works out which BSC to "route" your connection through.

If the user moves into a segment of the network that is managed by a different SGSN it will perform a handoff of to the new SGSN, this is done extremely quickly and generally the user will

not notice this has happened. Any packets that are lost during this process are retransmitted. The SGSN converts mobile data into IP and is connected to the GGSN via a tunnelling protocol.

2.2 GGSN

The Gateway GPRS Support Node is the “last port of call” in the GPRS network before a connection between an ISP or corporate network’s router occurs. The GGSN is basically a gateway, router and firewall rolled into one. It also confirms user details with RADIUS servers for security, which are usually situated in the IP network and outside of the GPRS network.

2.3 Connectivity Between the SGSN & GGSN

The connection between the two GPRS Support Nodes is made with a protocol called GPRS Tunnelling Protocol (GTP). GTP sits on top of TCP/IP and is also responsible for the collection of mediation and billing information. GPRS is billed on per megabyte basis unlike GSM. In practice the two GSN devices may be a single unit.

2.4 HLR

The HLR or Home Location Register is a database that contains subscriber information, when a device connects to the network their MSISDN number is associated with services, account status information, preferences and sometimes IP addresses.

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