Services on the GSM network

There are a number of services available via GSM such as:

⠿ Telephony
⠿ CSD (**C**ircuit **S**witched **D**ata, data transfer).
⠿ SMS (**S**hort **M**essage **S**ervice).
⠿ MMS (**M**ultimedia **M**essage **S**ervice).
⠿ FAX.
⠿ GPRS (**G**eneral **P**acket **R**adio **S**ervice).

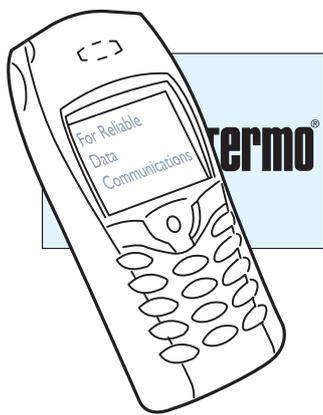| Speed	Protocol
2400 bit/s	V.22 bis
4800 bit/s	V.32
9600 bit/s	V.32
14400 bit/s	V.32 bis
2400 bit/s	V.110
4800 bit/s	V.110
9600 bit/s	V.110
14400 bit/s	V.110

Telephony

The most common GSM service, which has contributed towards its global usage. The algorithms to code and decode traffic have been under constant development, which has resulted in the continuous minimization of the bandwidth for telephony while maintaining the transmission quality.

Circuit Switched Data

The transfer of data, speeds from 2400 bit/s up to 14.4 kbit/s are possible. The table opposite shows the available speeds and protocols.

Data communication can be set up for transparent or non transparent data transfer. RLP (**R**adio **L**ink **P**rotocol) is used in non transparent transfer; this is an error corrected GSM protocol. This protocol creates a more reliable transfer, but also generates delays in the transfer. In order to use this function requires the support of both the service and the connected devices.

SMS

The most used service after telephony. An SMS message utilises the signal channel to transfer text messages. SMS has become popular for both private and professional use on account of its simplicity. In summary the service offers:

- A message may be up to 160 characters in length.
- Transfer cannot be guaranteed as the receiver may be switched off or outside of the coverage area. The message can be sent with different settings:
- How long the message will "live" on the network when it does not reach the receiver before being discarded (up to a week).
- Received confirmation, i.e. the sender receives confirmation that the message has arrived.
- You receive an acknowledgement that the message has been sent.
- Sending and reception can take place during a call.
- Transmissions can be made to individual recipients or groups of recipients.

MMS

MMS stands for **M**ultimedia **M**essaging **S**ervice and works in the same way as SMS, but with options to:

- Send images and animations.
- Send music.
- Record and send your own messages.
- Type long text messages.
- An MMS holds thousands of characters, depending on which mobile phone you use.

Fax

Available for class 1 and class 2 fax

GPRS

GPRS is an extension to the GSM network where packet switching data traffic is supported. This is different to the circuit switching data traffic that is supported in GSM. With GPRS each channel that is not busy with call traffic is available for packet switching data traffic. Packets from several different users can be mixed within the same channel, which results in efficient sharing of available network resources.

GPRS permits even higher transfer rates as it uses several time slots for the transfer. In theory rates of up to 115.2 kbit/s can be achieved, however, transfer rates of between 20 – 50 kbit/s are more common (compared to HSCSD, *High Speed Circuit Switched Data,* which offers rates from 9.6 – 43.2 kbit/s which some operators also offer for circuit switched GSM traffic). Transfer rate is however dependent on several factors such as: operator, terminal, number of users on the same cell, distance to the base radio station (retransmissions), whether the device is on the move, (hand over between base radio stations lowers the transfer rate) etc.

The transmission rate is also dependent on how many time slots are being used as well as which Coding Scheme the communication link is using. There are 4 **C**oding **S**chemes (CS) in GPRS where CS1 is the most secure and the most reliable, but also the one that has the lowest transfer rate (9.05 kbit/s) while CS4 does not have such stringent error correction and retransmissions and thus reaches speeds of 21.4 kbit/s. The speeds as set out above depend on the number of time slots and CS, which means that 4 time slots on CS4 gives 4 x 21.4 = 85.6 kbit/s. It is also worth mentioning that the GSM standard specifies 4 CS yet only the two first CS1 and CS2 (13.4 kbit/s/ time slot) are currently implemented on active GPRS networks.

The difference between circuit switching and packet switching networks can in short be described as:

> In the **circuit switching** network the connection works with a physical connection between the two parties. This is constantly open, and is not closed until one of the parties decides to do so, just like a telephone call. This has both advantages and disadvantages. The communicating units have a constant connection with each other; they detect the available capacity and know that this will not be used by another. On the other hand, it is a waste of resources when the parties are not exchanging data as the line is engaged and no one else can use it. Accordingly, the parties must hang up the connection when it will no longer be used.

A B C D E

Information

Information packet 1

Information packet 2
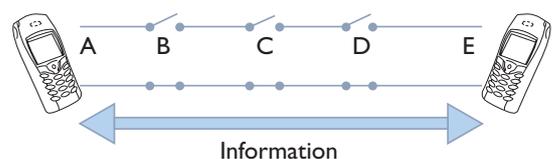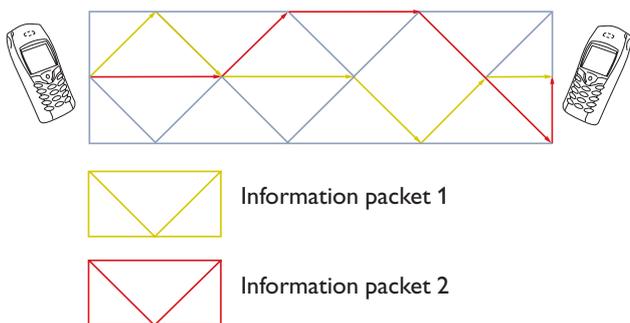
A **packet switching** network is a network where the traffic is divided up into small packages which are sent over the network. This means that others can utilise the network at the same time. If you compare a circuit switching network with a telephone call, you can compare a packet switching network with a haulage contractor or the post office. Several persons can send a lot of packages at the same time. The post office or haulage contractor ensures that all packages arrive at the recipient. The packages share the trucks and facilities on the roads.

In February 2004 there were 172 operators in numerous countries that offered the option of GPRS. The number of mobile telephones with GPRS is expected to grow from 10 million in 2001 to 280 million in 2005.

Network security

GSM

The most important security mechanisms on the GSM network are:
- Strong authentication of users (the network authenticates the SIM card, the SIM card authenticates the user with the PIN code).
- Protection against tapping data on the radio interface.
- Protection against tapping signalling on the radio interface.
- Check of the unit's identity, can be blocked if stolen.

Encryption of data over the radio connection, i.e. between the unit and the base station. Each user's secret encryption key is stored on the SIM card, the home operator's authentication central.

GPRS

Uses essentially the same security mechanisms as GSM. Authentication is done in the same way, the same authentication technology and SIM card can be used. However, the cryptographic key generated is always different for GSM and GPRS. Special cryptographic algorithms are used for GPRS, these use 64 bit keys.