High Speed Wireless Terms

- **1G**- It uses analog transmission (AMPS).
- **2G** - Uses digital transmission for voice signals.
  - Improved the battery life for wireless phones.
  - -Added many features like Caller ID, text messaging and intelligent roaming.
  - -Data is usually transported over voice channels at speeds ranging from 9.6 kbps to 14.4 kbps.
- **2.5G**- No change in the way voice is transported,
  - -Introduced packet data services, allowing for speeds of 20 to 40 kbps about the same speed as a dial-up service.
- **3G**- Increases the speed of packet data transport through the network to avg. speeds above 100 kbps.

WHAT IS EDGE?

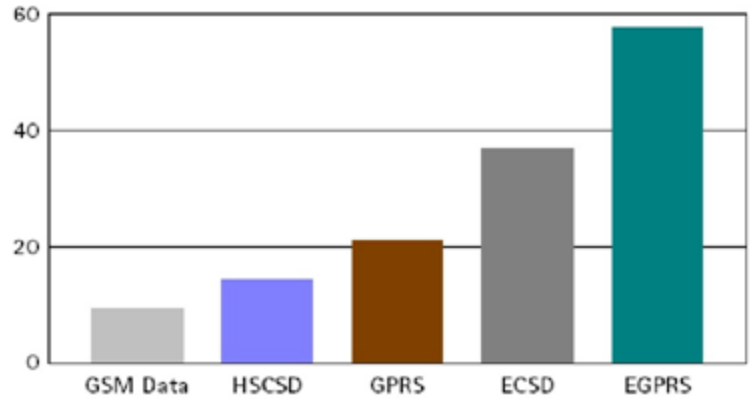
- It stands for Enhanced Data rates for GSM Evolution.
- EDGE is extended version of GPRS i.e. EGPRS.
- First launched in the United States in 2003 by Cingular, which is now AT&T.

- EDGE is a new set of GSM-bearer services that provides packet mode transmission within the GSM network & interconnects with external packet data networks.
- Designed to deliver multimedia applications such as streaming television, audio and video to mobile phones at speeds up to 384 Kbps, theoretically up to 473.8 kbps.

Salient Features of EDGE

- Compliment to 3G.
- Standardized by ETSI.
- EDGE is deployed over GPRS network.
- Provides Data Packet delivery service.
- Support for leading internet communication protocols.
- Billing based on volume of data transferred.
- Utilizes existing GSM/GPRS authentication and privacy procedures.

Evolution of EDGE/EGPRS



Data rate evolution, throughput in kbit/s per single radio timeslot

GSM:
- 9.6-14.4 Kbps
- launched 1991 in Finland
- 900 m subs by 2003

GPRS (2001):
- 115 Kbps (1 user)
- 20-30 Kbps (avg)
- GMSK modulation
- >280m subs by 05

EDGE/EGPRS (2003):
- 384 Kbps (1 user)
- 100-130 Kbps (avg)
- 8PSK modulation
- >36m subs by 2005

GPRS v/s EDGE

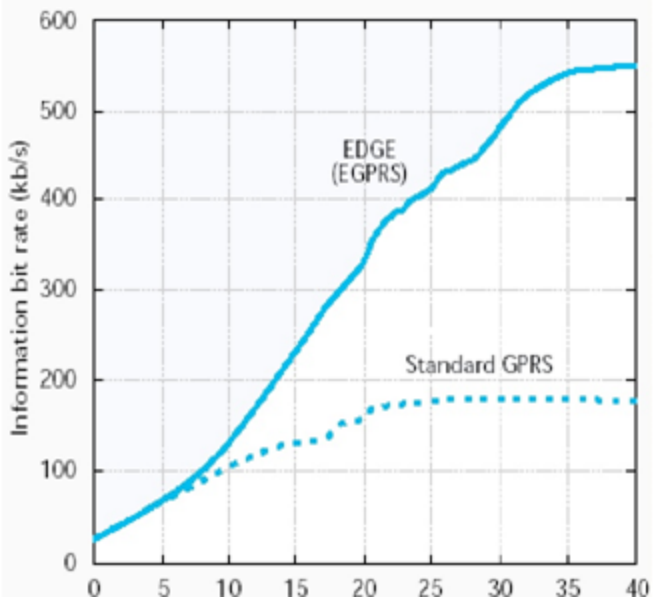
- EDGE only introduces a new modulation technique and new channel coding that can be used to transmit both packet-switched and circuit-switched voice and data services.
- EDGE is an add-on to GPRS and cannot work alone. And is therefore much easier to introduce than GPRS. GPRS has a greater impact on the GSM system than EDGE has.
- EDGE offers significantly higher throughput and capacity.
- EDGE can transmit three times as many bits as GPRS during the same period of time.
- GPRS can transfer data at rates of 115 kbps theoretically and up to 60 kbps on physical layer,
  whereas EDGE/EGRPS can transfer up to 473.6 kbps and 384 kbps respectively.

GPRS v/s EDGE (cont…)

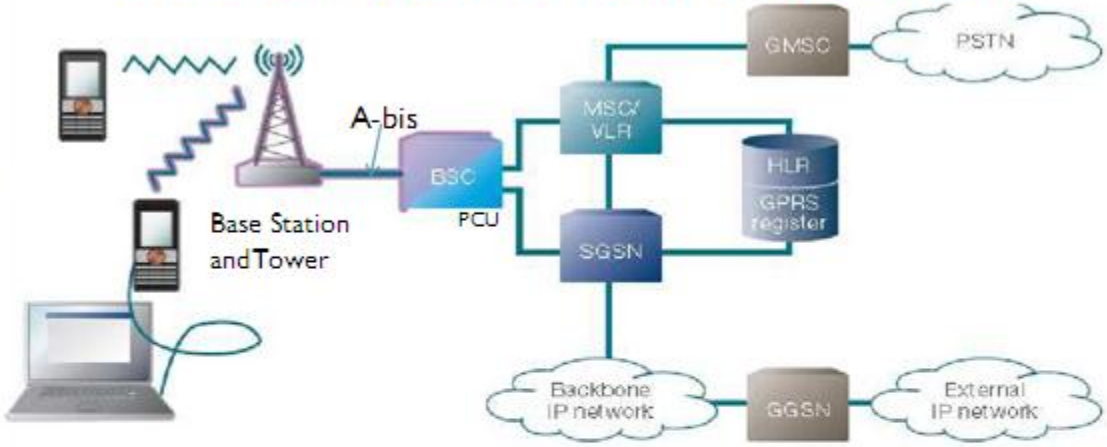
- With EDGE, the same time slot can support more users.
- GPRS and EDGE have different protocols and different behaviour on the base station system side.

•On the core network side, GPRS and EDGE share the same packet-handling protocols and, therefore, behave in the same way.

•GPRS and EDGE share the same symbol rate, but the modulation bit rate differs.



EDGE Network Architecture

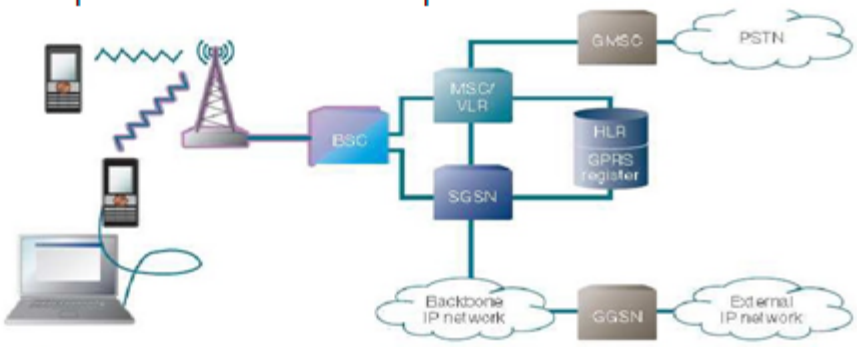


Affected by EDGE introduction

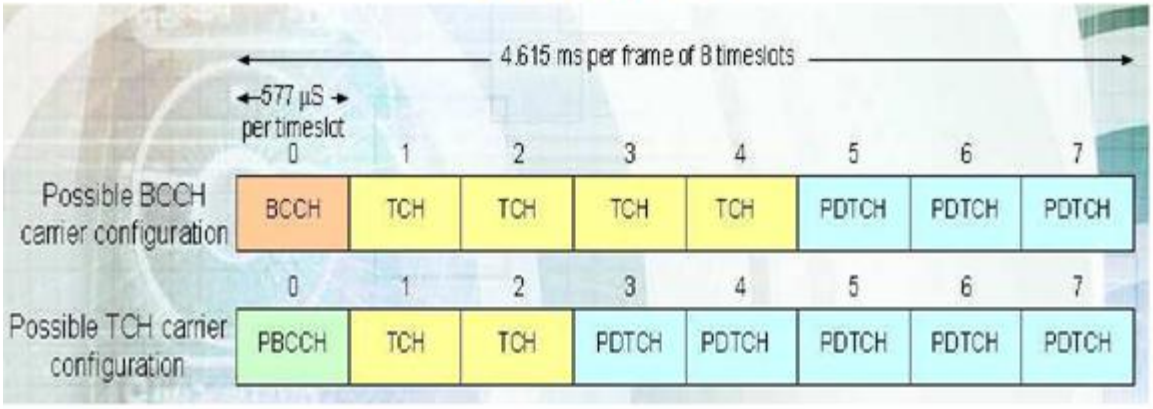
SGSN – Serving GPRS Support Node- takes care of routing, handover and IP address assignment and Performs security functions and access control.
GGSN – Gateway GPRS Support Node- gateway/anchor to external networks.
HLR – Home Location Register- database that contains subscriber information.
VLR – Visitor Location Register- mobile station's profiles are preserved in it.
PSTN – Public Switched Telephone Network
BSC – Base Station Controller
GMSC – Gateway Mobile Switching Centre
PCU – Packet Control Unit- Distinguishes data and voice

Impact of EDGE on existing GSM/GPRS network

- Hardware upgrade to BSS (new transceivers in each cell).
- Software upgrade to BS and BSC.
- No change in the core network.(independent of user bits)
- New terminals
  - Terminal which provides 8PSK in the uplink and downlink
  - Terminal which provides GMSK in the uplink and 8PSK in the downlink.



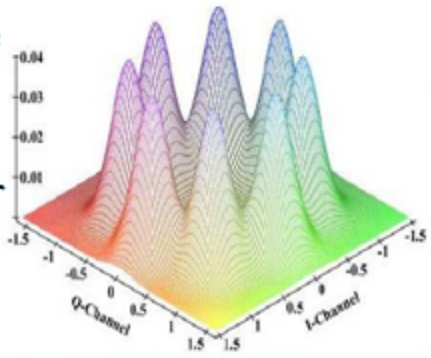
Example of EDGE Time Slot Structure

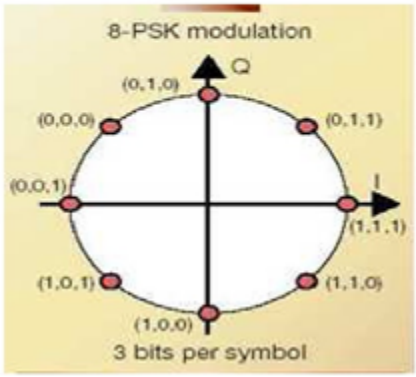


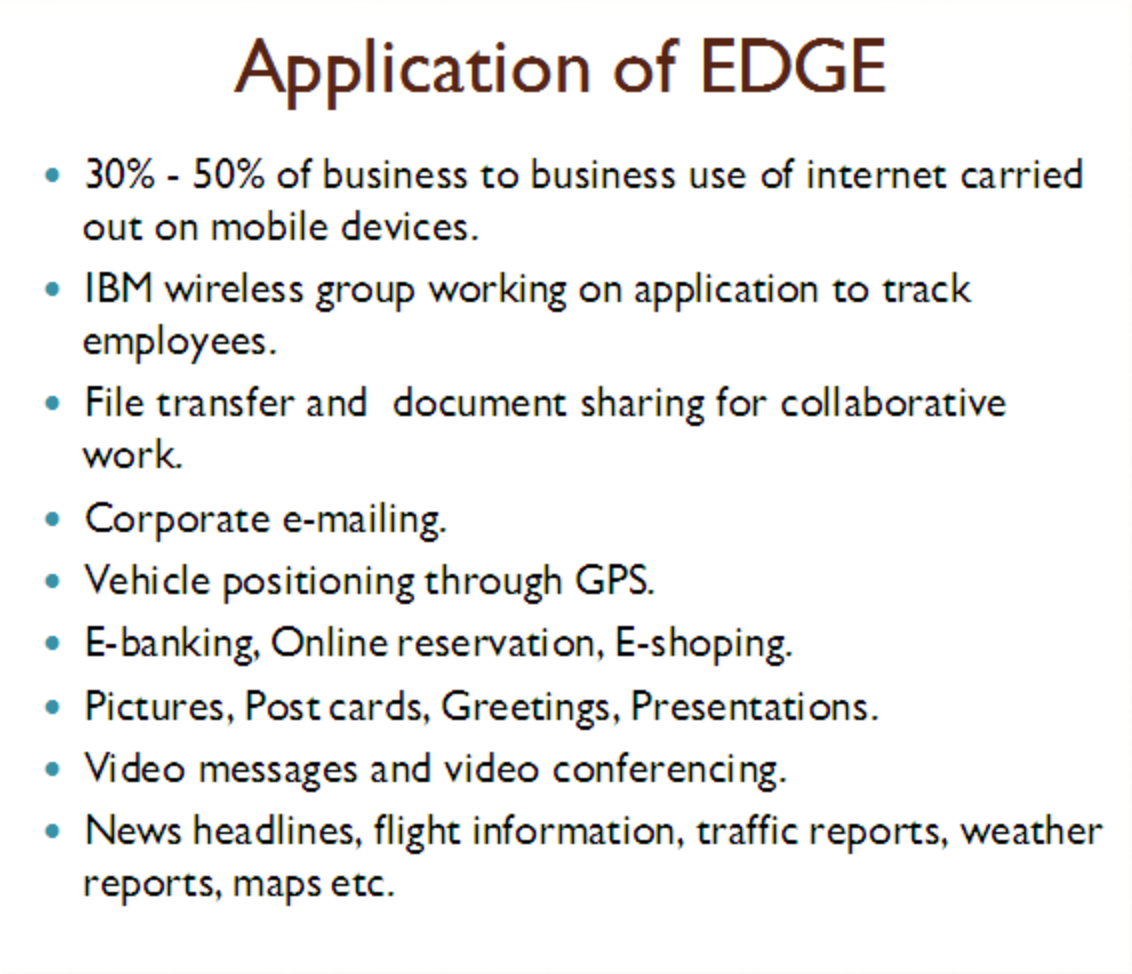
- BCCH: Broadcast Control Channel- carries synchronization, paging and other signalling information
- TCH: Traffic channel- carries voice traffic data
- PDTCH: Packet data traffic channel- carries packet data traffic for EDGE
- PBCCH: Packet broadcast control channel- additional signalling for EDGE; used only if needed

8PSK Modulation in EDGE

- New modulation technique 8-PSK.
- High-level linear modulation in 200 kHz TDMA method that carries three times more information through an extended signal constellation.
- Constellation diagram is simply phasor diagram representing phases as angles around a circle.
- EDGE produces a 3-bit word for every change in carrier phase.
- The symbol rate is 271 kb/s.
- Gross bit rates per time slot is 69.2 kb/s.

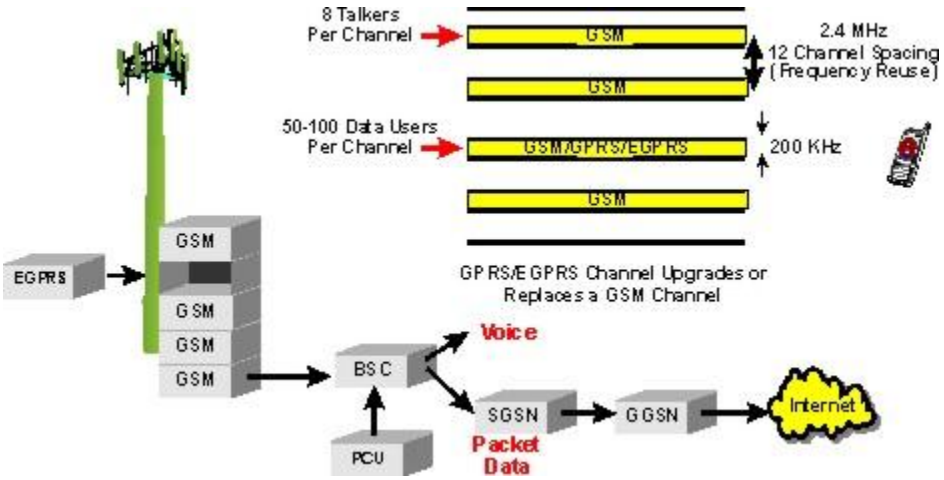






GPRS Protocol Layers

This figure shows how a GSM system can be upgraded to offer GPRS services. This diagram shows that an existing GSM channel is removed, replaced, or upgraded to have GPRS and EDGE/EGPRS modulation and transmission capability. This diagram shows that packet control unit (PCU) must be added to the base station controller (BSC) and packet data switching nodes and gateways must also be added to allow data packets to be routed between mobile devices and data networks (e.g. the Internet).



GPRS Addressing

This figure shows how a GPRS system uses multiple addresses to allow IP datagram packet to transfer between the end user an Internet web sites. This example shows that the end user mobile data device uses its IMSI to communicate with the SGSN. The SGSN links this IMSI to a private IP address that routes the data packets to a gateway router. When the data packets reach the GGSN, they are linked (mapped) to a public Internet address that allows the packet to reach its destination.

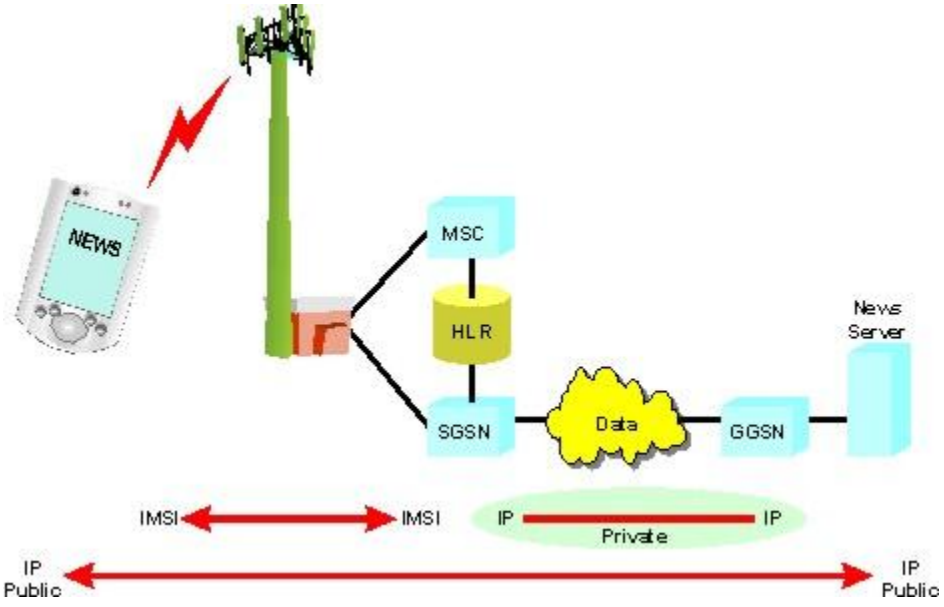


Table of Contents

Global System for Mobile Communication (GSM)
General Packet Radio Service (GPRS)
Enhanced Data for Global Evolution (EDGE)
Enhanced GPRS (EGPRS)
Compact GPRS