

2.5 Mobile DATA NETWORK

- * 2.5 G technology standard is allow existing 2G equipment to be modified & supplemented with new base station add-ons & subscriber unit software upgrades to support higher data rate transmission

Evolution For 2.5 G TDMA Standards.

- * The three TDMA upgraded options are
 - 1) High Speed Circuit Switched Data (HSCSD)
 - 2) General Packet Radio Service (GPRS)
 - 3) Enhanced Data Rate for GSM Evolution (EDGE).

HSCSD,

- 1) it is a circuit switched technique that allows single mobile user subscriber to use continuous time slot.
(that is instead of limiting user to one time slot).

- 2) it supports individual data user to commander consecutive time slot in order to obtain higher speed data access on the GSM N/w.

- 3) it relaxes the error control coding algorithm.

- *) By using up to four consecutive time slots, it is able to provide a raw transmission rate of up to 57.6 Kbps to individual users.
- *) Ideal for dedicated Streaming Internet access or real time interactive web sessions.

GPRS

- ↳ it is a packet based data Networks, which is well suited for non-real time Internet usage including the recovering of Email, faxes & asymmetric web browsing.
- ↳ it supports multiuser N/w sharing of individual radio channel by time slots.
- ↳ the GPRS standard provides a packet network on dedicated GSM or IS-136 radio channel for transmit the data from one point to another.
- ↳ GPRS subscriber unit are automatically instructed to tune to dedicated GPRS radio channel & particular time slot for "always on" access to N/w services.

EDGE

- ↳ it is more advanced upgrade to the GSM standards & require the addition of new hardware & software standard at B.S.
- ↳ it allows nine different air interface format known as multiple modulation & Coding Scheme with varying degree of error control.
- ↳ it uses high order Q-PSK modulation by a family of MSC for each GSM radio channel time slot.

GPRS (GENERAL PACKET RADIO SERVICE)

↳ Only small no. of GSM subscribers use data service as easy access & high data rates were not supported by original GSM System.

↳ To increase demand of GSM, GPRS introduced

↳ GPRS provides faster data transmission

↳ technology make it possible for user to make telephone calls & transmit data at same time.

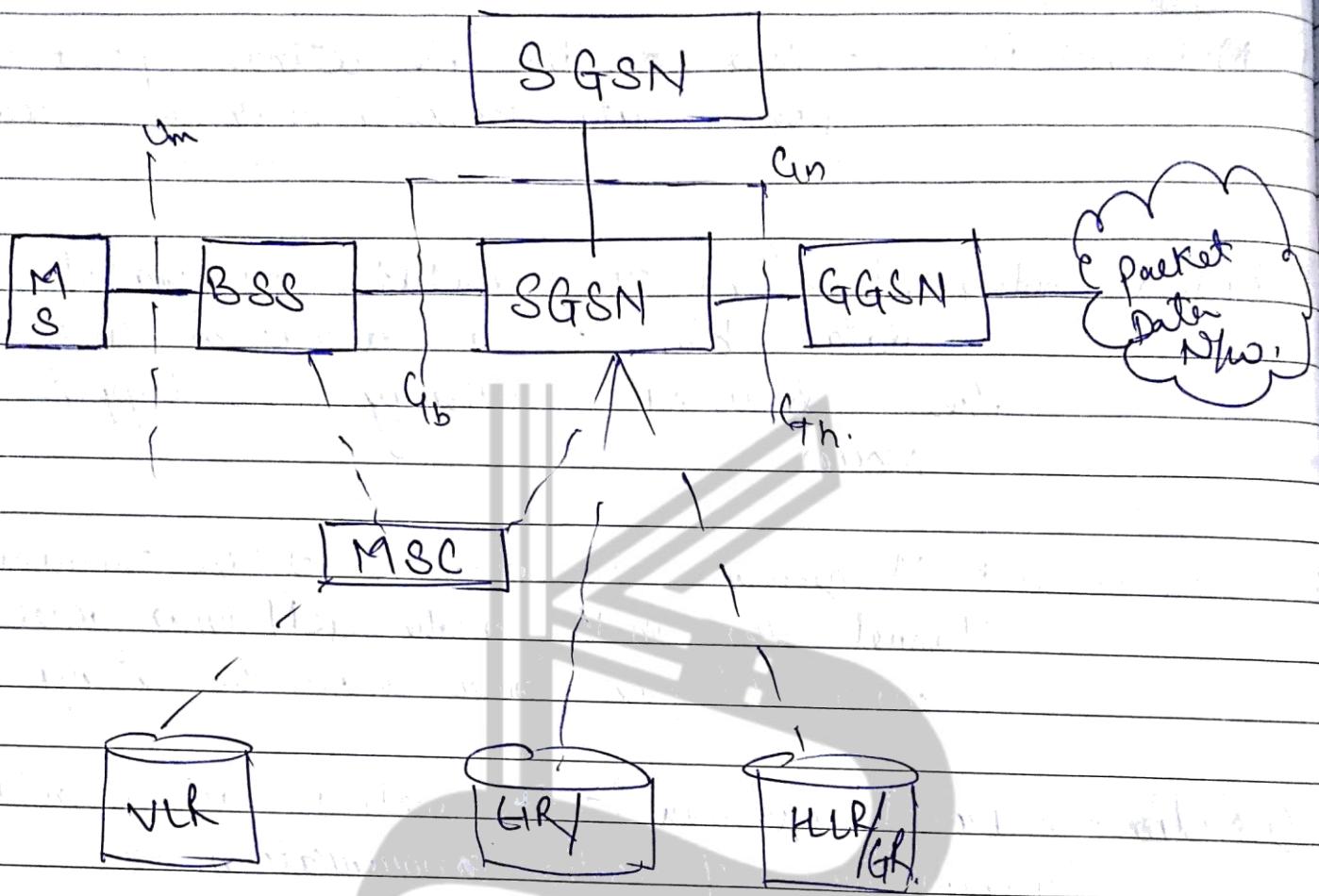
↳ GPRS involves packet switching which means that GPRS mobile phones have no dedicated circuit assigned to it.

GPRS FUNCTIONS

Date _____

- 1) Network Access: This provides the standard point to point data transfer to Anonymous Access.
- 2) Packet Routing & Transfer: This includes Routing of data b/w MS & destination through the viewing gateway. GPRS support Nodes.
- 3) Logical Link Management: Maintenance of the communication channel b/w an MS & the GSM N/w across radio interface comes under this category.
- 4) Radio Resource Management: It includes allocation & maintenance of radio communication paths.
- 5) Mobility Management: It includes keeping track of the current location of an MS.
- 6) N/w Management: It provides mechanism to support operation, administration & maintenance for related to GPRS.

GPRS ARCHITECTURE



- * It reuses existing GSM Architecture.
- * The Support Node (GSN) take on the task of delivering & routing the data packets b/w MS & PDN.

INTERFACES

- 1) Um interface \rightarrow b/w MS & BSS
 ↳ defines new logical structure to control Signalling & traffic flow.
- 2) Gb interface \rightarrow b/w BSS & SGSN.
 ↳ implemented to accommodate fn. such as paging & mobility management for GPRS.
- 3) Gn & Gp interface \rightarrow Gn connects SGSN & GGSN which are in same GPRS N/w
 ↳ Gp connects SGSN & GGSN which are in diff. GPRS N/w.
- 4) A & Gs interface \rightarrow A \rightarrow B/w MSC/VLR & BSC.
 Gs \rightarrow B/w MSC/VLR & SGSN.
- 5) Gr & Gc \rightarrow Gr \rightarrow SGSN & HLR.
 Gc \rightarrow GGSN & HLR.
- 6) Gi \rightarrow B/w GGSN & PSDN or PDN
- 7) D \leftrightarrow interface \rightarrow HLR & MSC/VLR.

GPRS N/w Nodes

- 1) MS
- 2) BSS
- 3) HLR
- 4) VLR

5) GSN (GPRS Support Node)

Service GSN

↳ deliver packet to MS
within its Service Area.

↳ Send queries to HLR
to obtain profile data
of GPRS Subscribers.

↳ SGSN perform
mobility management
fr. Such as mobile
subscriber attach/detach
& location Management.

Gateway GSN

↳ used as interface to
external IP N/w.
Such as Public Internet or
Mobile service provider

↳ It translates data format,
signalling protocol &
address information to
permit communication
b/w different N/w.

→ HLR
→ VLR.

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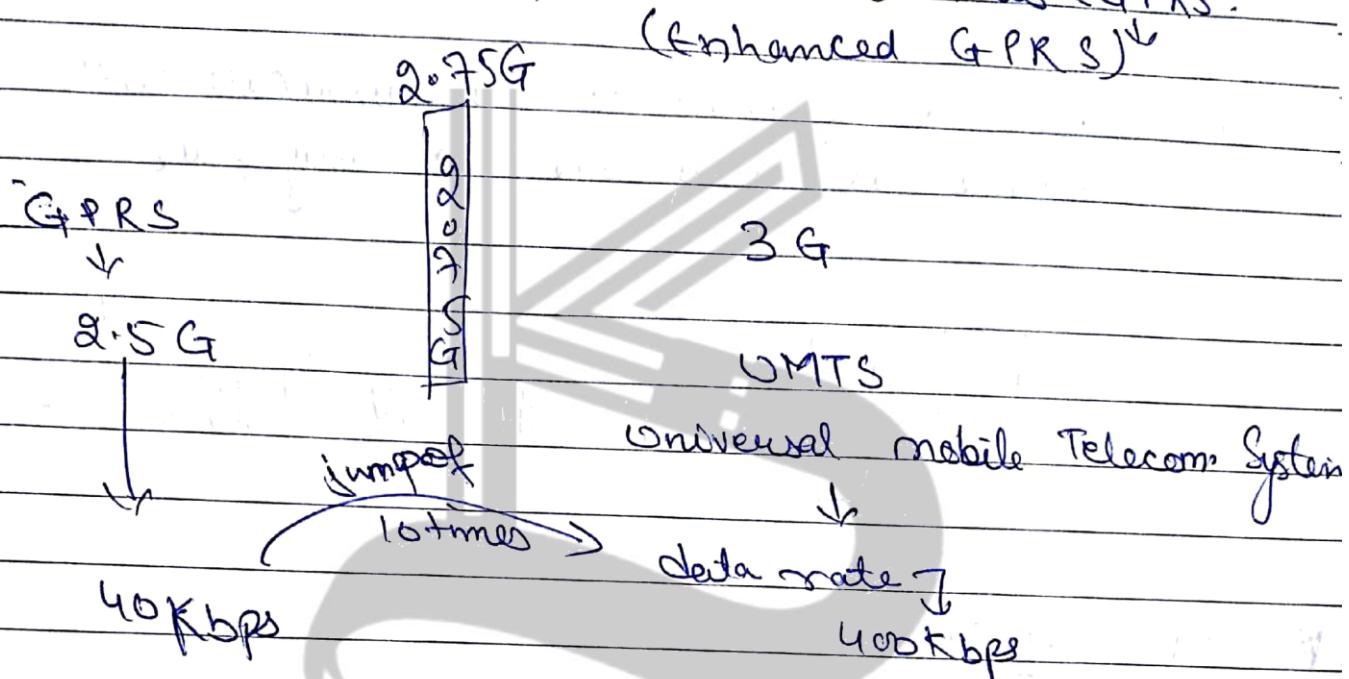
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HLR
VLR.

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EDGE (ENHANCED DATA RATE FOR GSM EVOLUTION)

- ↳ it is a new kind of modulation method
- ↳ it does not actually refer to an actual service.
- ↳ it has been designed to be used in connection with for example GPRS known as EGPRS.
(Enhanced GPRS)



~~Note~~ * we do not replace any component of GPRS in Edge we just require hardware & S/W upgrade.

~~Note~~ * Modulation Scheme.

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GSM/GPRS

GMSK

1 bit at a time

EDGE

8PSK

2B

3 bit at a time

3G

Features Come along with 3G

- ↳ Provides access world wide web acc. to requirement.
- ↳ Information now may be in form of voice data & video format.
- ↳ Enables a person to communicate with anyone at any time at any place.

IMT (INTERNATIONAL MOBILE TELECOMMUN.

IMT - 2000

- ↳ 2000 indicate target availability i.e. yr. 2000.
also radio freq. band (2000 MHz range)
- ↳ it is also known as future public land mobile telecommunication system. (FPLMTS)

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- ↳ it aimed to form a seamless radio & N/w infrastructure capable of offering a wide range of telecommunication service worldwide.

* PMT - 2000 Vision

Key aspect of PMT-2000 vision are:-

- ↳ Common Spectrum worldwide (1.8 - 2.2 GHz band)

- ↳ multiple radio Environment (Cellular, cordless, Satellite, etc.)

- ↳ Data rates upto 2 Mbps → for indoor Environment

- ↳ Enhanced Security & performance

* Radio Specification of IMT-2000

for reverse link operation - 1885 - 2025 MHz.

for forward link operation - 2110 - 2200 MHz.

In these frequency band

30MHz Reserved for → MSS (Mobile Satellite Service)

1980 - 2010 — uplink

2170 - 2200 — downlink

PRIMARY Features

- ↳ Common frequency Spectrum Worldwide

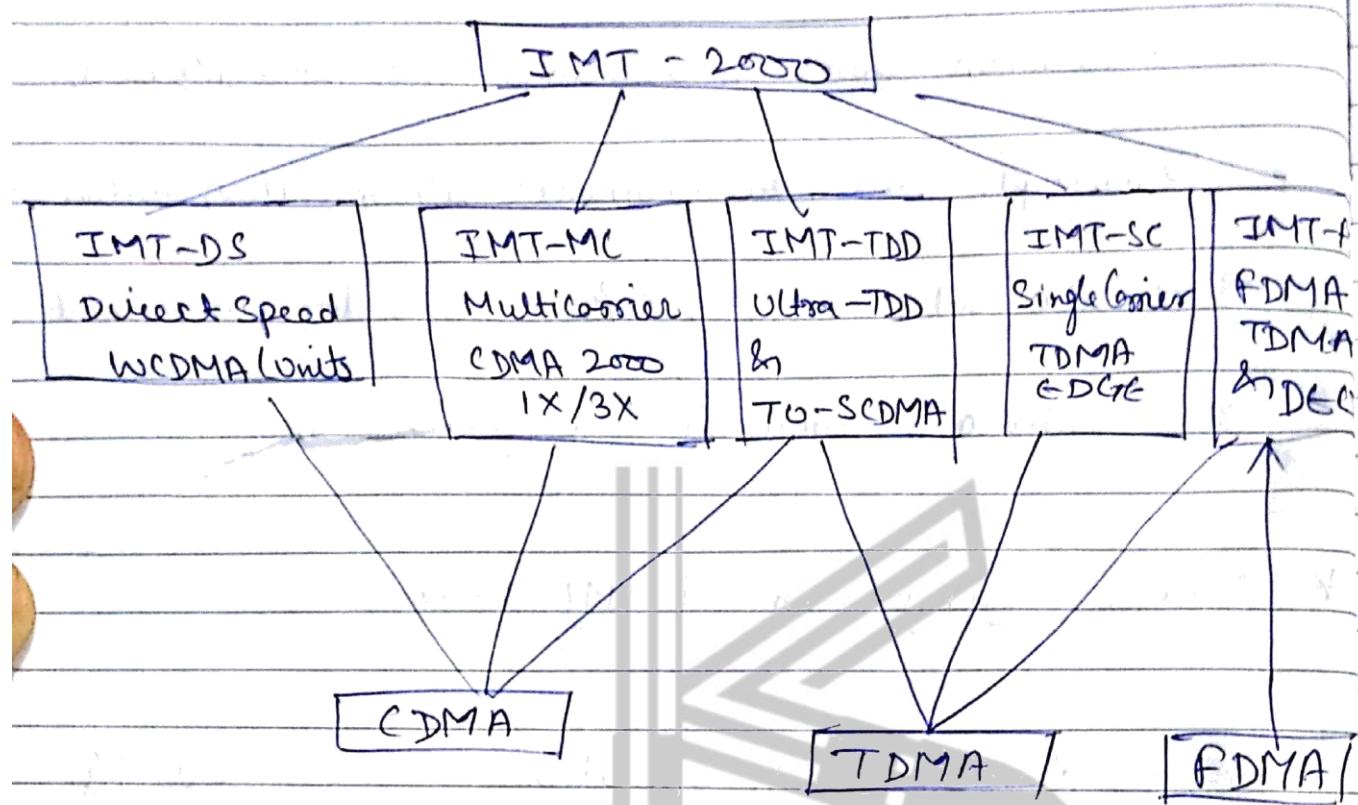
- ↳ high level flexibility

- ↳ Cost effectiveness in all operating Environments

- ↳ similar radio access design worldwide

IMT - 2000 TECHNOLOGIES

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* IMT-DS (Direct Spread): - This technology comprises WCDMA System & used by all Europeans providers & some Japanese providers for 3G Wide area services.

* IMT-MC (Multi Carrier): - This included multi carrier like the CDMA 2000, Standardized by 3GPP2.

* IMT-TDD: - This technology only contained Ultra-TDD system which uses time-division CDMA (TD-CDMA). After a while, the Chinese proposal, TD-Synchronous CDMA (TD-SCDMA) was added.

* IMT-SC (Single Carrier): - This included Single Carrier technique UWC-136 which is enhancement of the US TDMA system.

* IMT-F (Frequency Time): - It included Enhanced Version of Cordless Telephone Standard DECT.

Q. 5. What are the 3G QoS classes?

Ans. Four QoS classes have been defined for 3G:

- **Conversational class:** It is defined for applications such as traditional voice calls *i.e.*, the most delay-sensitive applications. In this, the transfer delay is strictly limited.
- **Streaming class:** It is defined for one-way real time video/audio such as video-on-demand.
- **Interactive class:** It is defined for interactive online applications such as Telnet, interactive e-mail, and Web browsing.
- **Background class:** It is defined for other online activities such as FTP or the background downloading of e-mails.

Q. 6. What are the requirements of 3G QoS?

Ans. Requirements for QoS: 3GPP has specified high level requirements for UMTS QoS. These requirements are divided into three categories-end user, general and technical, requirements.

1. End User Requirements for QoS:

- Only the QoS perceived by end-user matter.

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- The number of user defined/controlled parameters has to be as small as possible.
- Derivation/definition of QoS attributes from the application requirements has to be simple.
- QoS attributes must be able to support all applications that are used, a certain number of applications have the characteristic of asymmetric nature between two directions, uplink/downlink.
- QoS has to be provided end-to-end.

2. General Requirements for QoS:

- QoS parameters (or mapping of them) should not be restricted to one or few external QoS control mechanisms but the QoS concept should be capable of providing different levels of QoS by using UMTS specific control mechanism (not related to QoS mechanisms in the external networks).
- QoS mechanism have to allow efficient use of radio capacity.
- Allow independent evolution of Core and Access networks.

3. Technical Requirements for QoS :

- The UMTS QoS mechanisms shall provide a mapping between application requirements and UMTS services.
- The UMTS QoS control mechanisms shall be able to efficiently interwork with current QoS schemes.
- QoS shall support efficient resource utilisation.
- The QoS parameters are needed to support asymmetric bearers.
- QoS behaviour should be dynamic, *i.e.*, it shall be possible to modify QoS parameters during an active session.



KS ACADEMY

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