UNIT - 5

GSM Architecture

Um interface

A Interface

Public network

MS

| BTS |
| BTS | — | BSC |
| BTS |
| BTS |
| BTS | — | BSC |
| BTS |

HLR | VLR

MSC

EIR | AUC

PSTN

ISDN

Data Networks

to MC

Operating support System (OSS)

Abis interface

MS

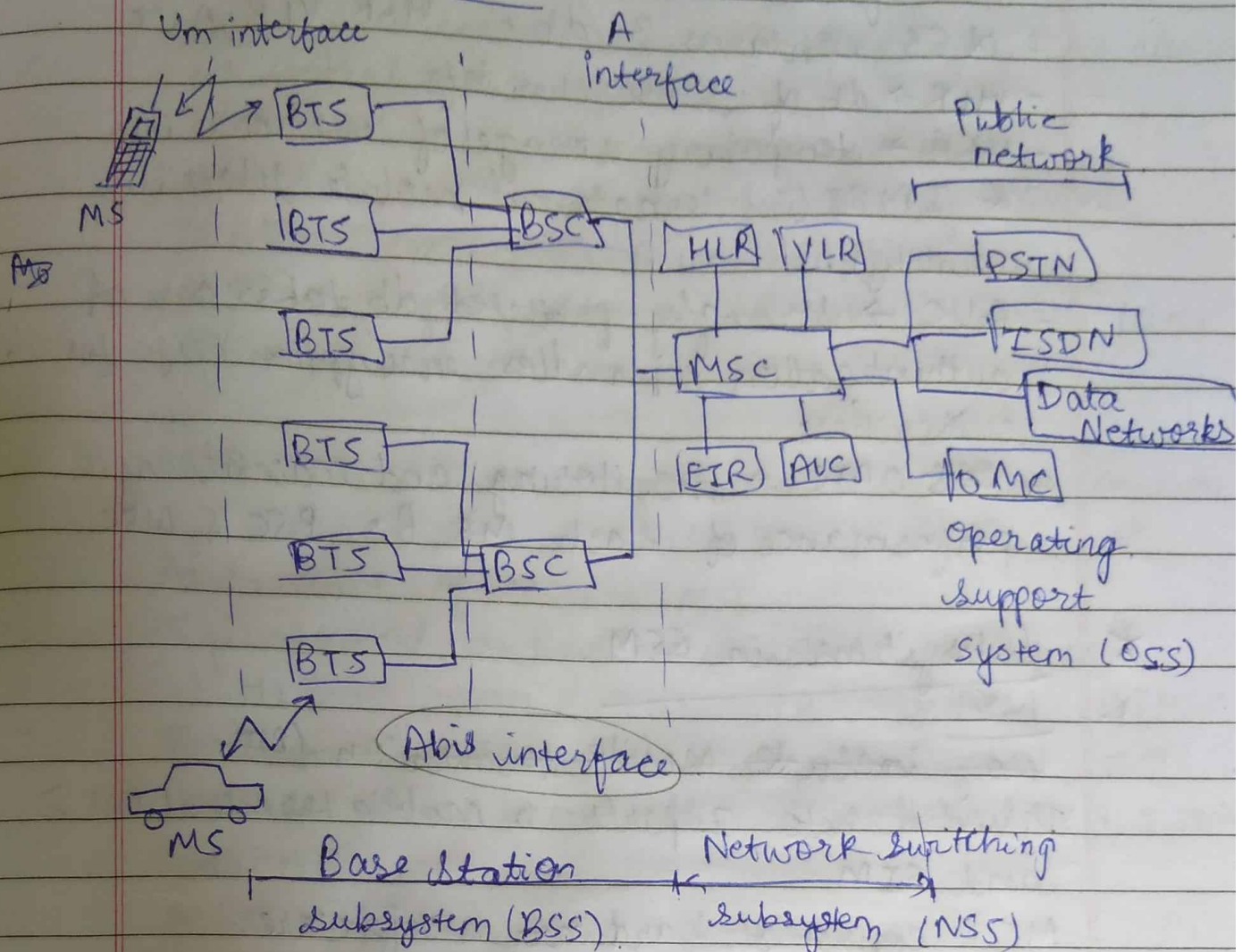|← Base Station Subsystem (BSS) →|← Network Switching Subsystem (NSS) →|

- BTS & BSC both are part of Base Station Subsystem (BSS)

(BTS - Base transreceiver station)
(BSC - Base Station Controller)
(HLR - Home Location Register)
(VLR - Visitor Location Register)
(MSC - Mobile Switching centre)
(EIR - Equipment Identity Register)
(AUC - Authentication center)
(OMC - operation Maintainance Centre)

- BTS controlled by BSC.
- (Write abt interfaces).

Abis interface to carry voice data.

- A interface - BSC connected MSc
- NSS contains 3 dbs. HLR, VLR, AUC
- HLR → db of Subscriber info
- VLR → temporary storage of customer info & IMSI (international mobile subscriber identity).
- AUC → strongly protected db, takes care of authentication. Handles encryption keys for subscribers
- ~~BSS~~ OMC → monitoring and maintaining performance of each MS, BS, BSC & MSc.

★ <u>Subsystems in GSM.</u>

1. <u>MS:</u>
~~May include Mobile termination (MF~~
Divided into 2 parts: a mobile terminal (MT) and SIM.
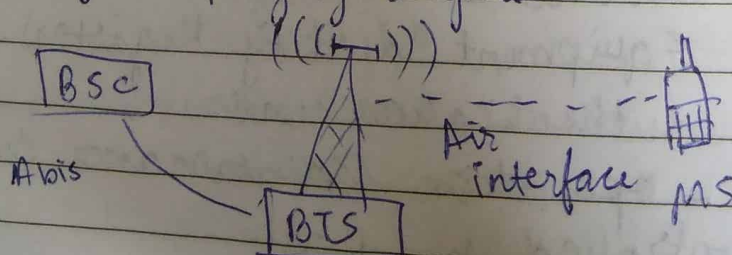MT: consist of hardware & software.
SIM (Subscriber identity module): It is microprocessor based entity implemented on smart card.

2. BSS: Manages signalling & traffic b/w MS & NSS.
Functions: 1) coding of speech channels.
2) Allocate available radio channels to MS on request
3) transmit paging signals.

BSS consist of BTS & BSC.

- BTS : direction antenna equipment. TRX acts as central unit of BTS.
TRAU is used for encoding & decoding of speech & rate adaption function of data.
TRAU - Transcoder Rate adaption unit

- BSC : high quality switch which controlls 100s of BTS simultaneously

3. NSS : BSS fwds signals to NSS which consists of Main switching centre (MSC).
Main unit of NSS is MSC.
5 functional entities associated with MSC :
1) HLR - 2). VLR 3). EIR 4). AUC 5)GMSC
Function of NSS is to manage comm bet. GSM n/w & users from other n/w like PSTN, ISDN Data n/w.

MSC : main unit of NSS

Functions —
1) Perform all necessary switching fnx.
2) Comm. with other MSCs present in GSM
3) Comm. with other n/w like PSTN.
4) to track location of subscriber to carry out handover.
5) Perform internetworking functions.
6) Perform call routing & echo control functions

a) HLR : db of permanent subscriber info, contains imp info like address, account, status & preferences
functions : 1)Identification : stores IMSI & MSISDN used for call routing.

2) Subscriber service provision.
3) VLR address.
b) VR VLR : temporary storage of IMSI & customer info.
c) EIR : db of legit & faulty MS. Keeps track of all valid & invalid mobile equipment.
d) AUC : db that stores secret key authentication. It also generates security related params for protection. that key is stored in SIM.
e) GMSC: All calls are routed through GMSC.

4. OMSS : 3 entities.
- <u>Fault management system</u>: Where there is fault it invokes alarms from BSS. fault is then resolved.
- <u>Config. management System</u>: to install & maintain software of newly setup BSS. n/w.
- <u>Software management system</u>: installs software updates & manages s/w inventory lists.

x <u>GSM services</u>
1 Digital telephony : provide high quality digital voice transmission. Codecs are used for

2 Emergency calling : same emergency no used through the contry.
3. SMS : upto 160 chars. Can transfer logos, ring tons, horoscopes, text msg.
4. Enhanced message service (EMS): successor of SMS. upto 760 chars msg size Possible to send text, ringtones, small images animated pics.

5. Multimedia Message Service (MMS)
Can transmit large pictures (GIF, JPEG), short video clips.

6. Group 3 Fax : fax data transmitted as digital data.

* Data Service/Bearer Services.
GST is GSM service ~~that~~ corresponding to comm. bet comps & packet switched traffic. 300 bps to 9.6 Kbps. 2 modes of data transf.
- Transparent mode : provides std channel coding method for user data.
- Non-transparent mode - provides special coding methods based on particular data inface

* Bearer Services.
Data service corresponding to comm. bet comp. & packet switched traffic

* Supplementary Services:
1. Conference Call   2) Call waiting.
3. Call on hold.   4) Call forwarding
5. Call Barring   6) Caller identification
7. Suggestion of charge   8) Closed user group

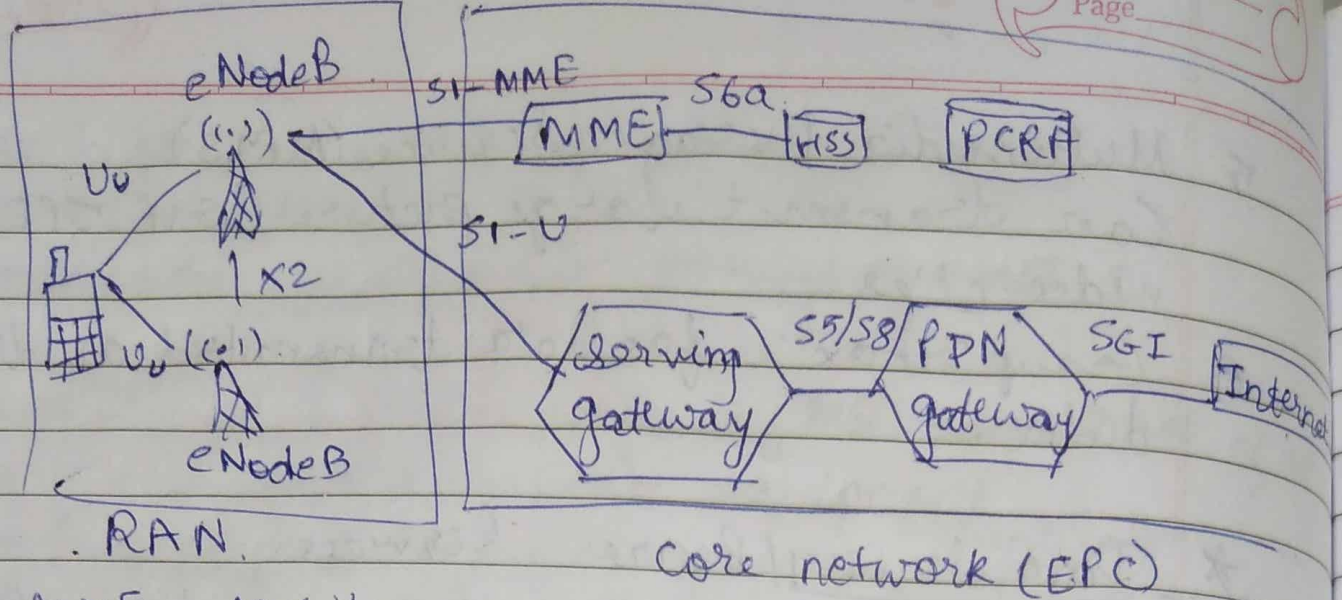* LTE Network Structure (Architecture)
↳ Long term evolution.
LTE n/w contains i) Radio Access network (RAN) EUTRAN
2) Core network (EPC)   3) Radio Interface
i) RAN - also called as EUTRAN (Evolved universal Mobile Telecommunications system.
- RAN consist of LTE MT (mobile terminal), radio ~~interference~~ & eNodeB.

. RAN .   Core network (EPC)

MME - Mobile Management Entity.
HSS - Home subscriber server
PCRF - Policy & charging rules function.
PDN - Packet Data n/w.
UE - user equipment.

- Ran contd...

a) LTE MT - mobile phones or devices supporting
              LTE

b) RI - links that connect LTE MT and eNodeB

c) eNodeB - E-UTRAN connect LTE MT to core
n/w via radio interface SI.

functions :

1) Scheduling / radio resource allocation.
2) Retransmission control
3) Physical layer functions.
4) Air interface.

2.   Core n/W (EPC) :

Enhanced Packet Core (EPC)
Also known as System archi Evolution (SAE)
EPC consist of

a)   Mobility Management Entity (MME)
     Handles signalling of msg, tracking, security
b)   & paging of mobile terminals.
     Serving gateway (S-GW) : connected to
     RAN through SI interface. Route for fwding data

packets b/w the user equipment & PDN GW.

c) PDN (Packet data n/w) gateway (PP-GW) connects EPC n/w with internet through SGI interface interface.

d) HSS (Home subscriber server) — db of all mobile users which contains all subscribers. Responsible for authentication & call session setup.

e) Policy & charging rules function (PCRF) manges all data sessions, policies & charging rules.

functions :

1) Charging & subscriber management.
2) Mobility management
3) Provision of quality of service
4) Policy control of user data flows.
5) Connection to other external n/w.

3) Radio interface :

- Interface X2 : connects diff base station. info req. for co-ordination of transmission in neighbouri cells can be exchanged through this

- Interface S1 : Ran connected to core through this

- Interface Uu : connects UE & eNodeB. Interface for user plane bet E-UTRAN & S-GW. Provides GTP tunnel per carrier

- Interface S1-MME : for control plane b/w E-UTRAN & MME.

- Interface S6 a : control plane b/w HSS & MME. Exchanges subscription & auth info.

- Interface S5/S8 : control & user plane b/w P S-GW & P-GW.

- Interface SGI - control & used plane b/w P-GW & internet.

* Open Wireless archi of 5G / Protocol Stack.

	OSI model		5G model
7	Application layer		Application
6	Presentation -"-		(services)
5	Session -"-		Open transport
4	Transport -"-		protocol (OTP
3	N/W -"-		upper n/w layer
			lower -"-
2	Data link -"-	-"-/-"-,	Open wireless
1	Physical -"-		archi (OWA)

1) Open wireless archi (OWA): lowest layer of 5G model. corresponds to physical & data link layer of OSI model.

2) N/w layer: divided into 2 layers. upper & lower N/w layer corresponds to N/w layer of OSI of 5G.

3) OTP — corresponds to transport layer & session layer of OSI. Mobiles having ability to download desired version wireless tech installed at BS. This is OTP.

4) Application layer — top most layer. corresponds to application & presentation layer. provides quality testing. Stores info in db at mobile terminal.