

# Mobile Computing.

17'07'19.

User Mobility

Device portability

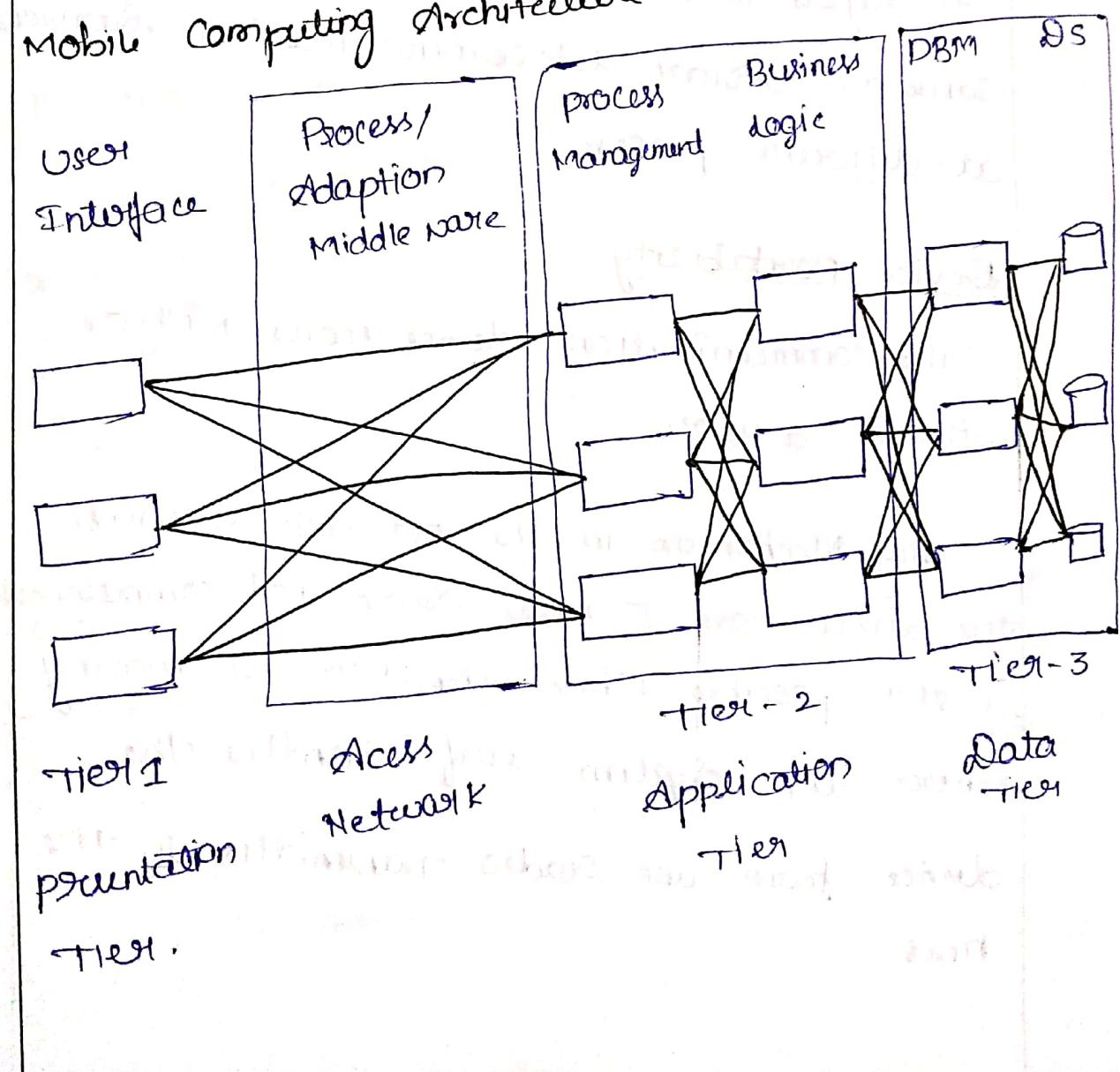
→ Device has to be moved share the network

It there:

communication Devices.

- fixed and wired - Desktop Systems
- mobile and wired - laptop & dan
- fixed and wireless - modem
- mobile and wireless - smart phones.

Mobile computing architecture



## Presentation Tier

In presentation Tier Encryption and Decryption is performed, packet transformation will also be done by using layer three protocol.

## Application Tier

All the applications are performed at Tier-2

## Data Tier

Data will be stored at Tier-3

## User Mobility :-

It refers to a user who has access to the same or similar telecommunication services at different places.

## Device Portability:

The communication device moves with or without a user.

any mechanism in the network or inside the device have to make sure that communication is still possible while the device is moving where the system itself handles the device from one radio transmitter to the next.

## Communication Devices

Mobile computing technology:  
It is a technology that allows transmission of data voice and video via a computer or any other wireless enabled devices without having to be connected to a fixed physical link.

This concept involves-

- 1) Mobile communication
- 2) Mobile hardware
- 3) Mobile software

1) Mobile communication.

It refers to the infrastructure to ensure that a reliable communication goes on, these would include devices such as portable, services, bandwidth, protocols, necessary to facilitate and support the services.

- The data format is also defined at this stage.
- This also ensures that there will be no collision with other existing systems, which after the same services.

## Mobile Hardware.

- It includes device components that achieve or access the service of mobility.
- Examples: portable laptops, Smartphones, tablets
- All these devices will have receptor medium to operate in full duplex whereby capable of sending and receiving signals at the same time.

## Mobile Software.

It is the actual program that runs on the mobile hardware which deals with the characteristics and requirements of mobile application.

- This is also called as engine of the mobile device as it the essential component that operates the mobile device.

## Applications of Mobile Computing.

- 1) Real Estate
- 2) Emergencies
- 3) Vehicles
- 4) Business
- 5) Banking.

## Limitations of Mobile computing.

- Insufficient Bandwidth
- Human Interface with Device
- Transmission Interferences.
- Power consumption
- Security Standards.

## GSM (Global System for Mobile Communications)

- 1980 - NMT by British Spectrums rate - 450MHz  
(Nordic mobile telephone)
- 1980 - CTI → cordless telephones
- 1984 - CTI
- 1989 - CT2 → 864 MHz SR.
- 1991 - GSM → 5000 page  
Spectrum rate of 900 MHz  
Roaming throughout Europe
- Fully digital  
    Data & voice transmission.

GSM. 900 → 890 - 915 MHz Uplink 935 - 960 MHz downlink

GSM 1800 → 1710 - 1785 Uplink 1805 - 1880 downlink

GSM 1900 → 1850 - 1910 Uplink 1930 - 1990 downlink

GSM 400 →

Iot: Mobiles are connected to the things. Household components like fans, refrigerators, light etc are connected to Internet and operated by Smart phones.

### Banking:

Accessing Banks information and making transaction through mobiles through internet connection from any place.

### GSM

#### Mobile Services:

- Data
- Voice
- Video
- 2) → Bearer Services
  - ↳ Transparent Bearer services
  - ↳ Non " "
- 3) → Tele services
- 3) → Supplementary Services
  - ↳ synchronous data services
  - ↳ Asynchronous " "

#### Tele Services

- It gives data, voice, video.
- 9600 bit/sec
- It also provide an additional facilities like Emergency number, SMS (Short Message Service)
- Earlier when SMS was used by people, it provide only 160 characters.

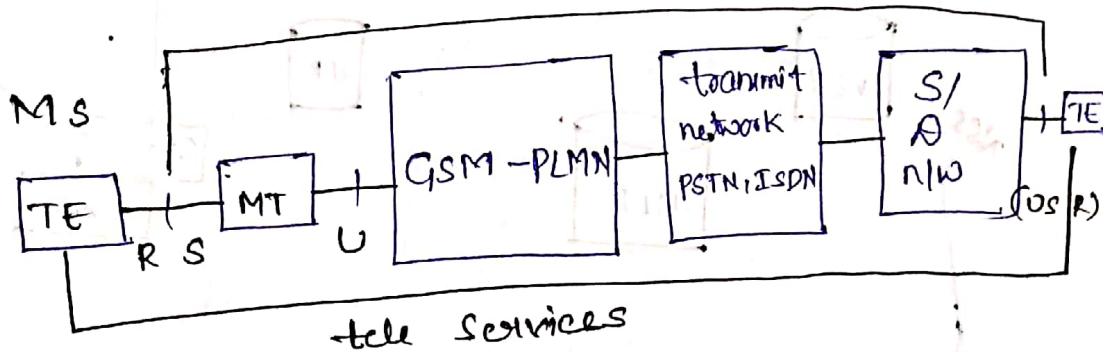
- EMS (Enhanced Message Services)
  - Short messages
  - Ring tones
  -

## → MMS

- Big Image - JPG
- Ring tones

## Supplementary Services.

- user identification
- call forwarding
- call barring
- closed group calls (inside the company)



## \* GSM System Architecture

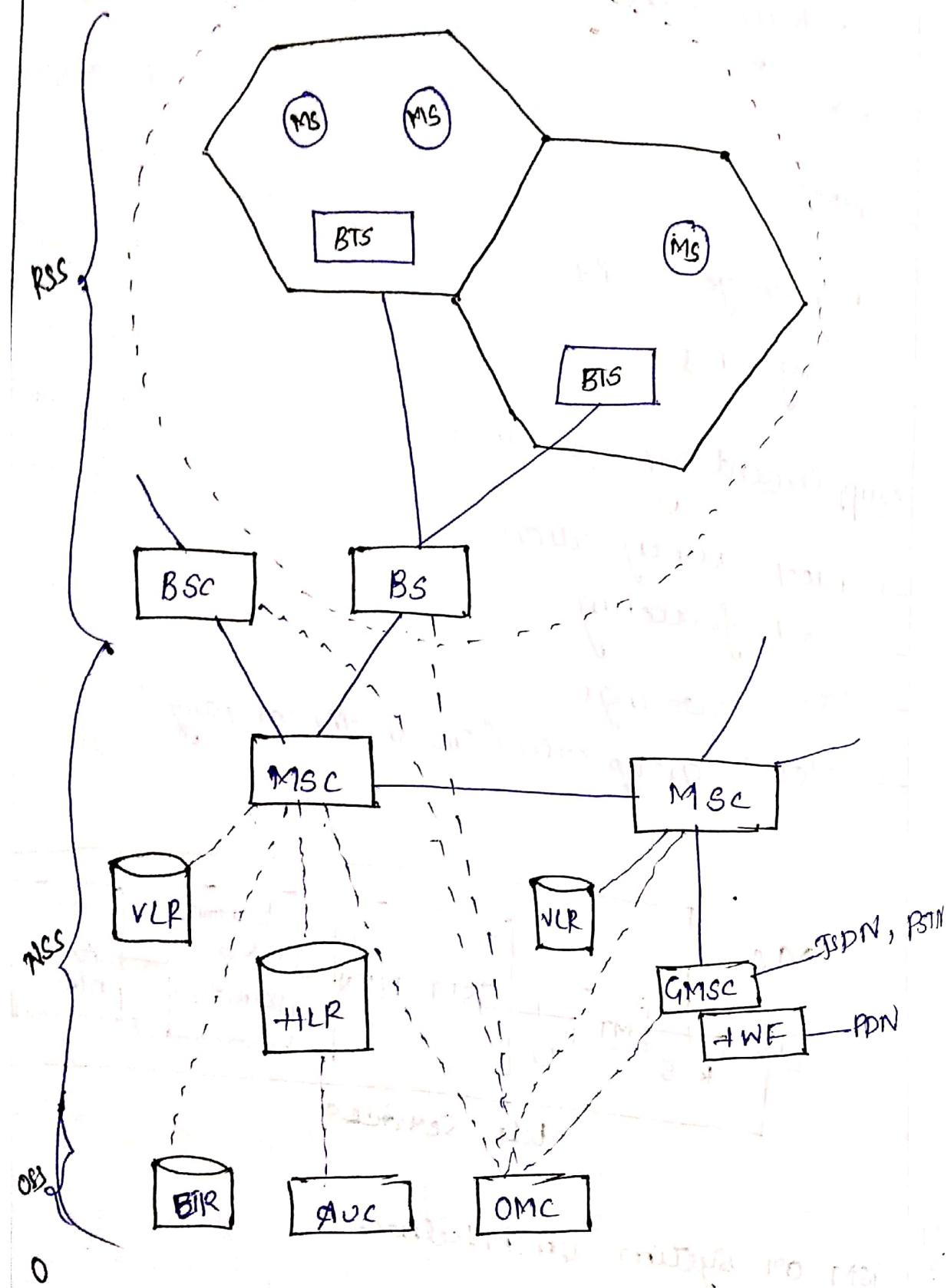
### RSS (Radio Subsystem)

BSS (Base Station Subsystem)

BSC - Base station controller.

BTS - Base station transceiver station.

# GSM 091 System Architecture



## Mobile Services.

GSM permits integration of voice and data services interworking with existing networks.

GSM has defined 3 diff categories of services

1) Basic Services

2) Tel Services

3) Supplementary Services

→ A mobile station (MS) is connected to GSM public land mobile n/w (PLMN) via an interface OM (GSM PLMN is the infrastructure needed for GSM n/w). This n/w is connected to transmit n/w.

e.g.: ISDN (Integrated Services Digital n/w)

or PSDN (public switched telephone n/w)

There might be an additional n/w the source destination n/w before another terminal TE.

→ (MT) mobile termination performs all n/w specific tasks (FDMA, TDMA, coding etc) and offers an interface for data transmission.

Scanned by CamScanner

### i) Bearer Services

These are connection oriented OSI circuit packet switch which permit transport by transparent bearers and non-transparent bearers.

Synchronous Data transmission.

Asynchronous Data transmission.

### ii) Transparent bearer Services:-

This will use the function of physical layer to transmit the data. Data transmission has a constant delay and throughput if no transmission errors occurs.

- The only mechanism to ↑ transmission quality
- ii the use of forward error correction (FEC)

→ adds redundancy into data stream and helps to reconstruct the original data in case of transmission errors. Depending on the fec data rates of 2.4, 4.8 or 9.6 kbps are possible.

- Tb services do not try to recover lost data in case of interruption due to hand-over.

### iii) Non-Transport bearer services.

→ This use protocols of layers 1 and 3 for implement error correction and flow-control. Their services uses all the transparent bearer services adding radio link protocol (RLP) which comprises an mechanism to trigger re-transmission of data.

### iv) Synchronous Data transmission.

Data transmission can be full-duplex with data rates 1.2, 2.4, 4.8 and 9.6 kbit/sec.

### v) Asynchronous Data transmission.

Data transmission can be full duplex from 300 to 9600 kbit/sec.

### vi) Tele Services.

As the main services of GSM in telephonic which offers a typical bandwidth of 3.1 kilobytes of analog phone system. Special codes (code/decoder) are used for transmission of analog data.

→ Another service offered by GSM is emergency Number the same another number can be used throughout and this service is mandatory for all service providers with free of charge. This connection will be having highest priority preemptive all other connections and will automatically setup with closed emergency center.

→ Another service offered by <sup>GSM</sup> <sub>EMS</sub> is SMS (short message service) which offers transmission of messages of upto 160 characters. Sending and receiving of message data or voice transmission. SMS in EMS which offers a larger message size of 160 characters and transmission of animated pictures, small images but EMS never really look of as SMS was availability as MMS.

→ Another non voice tele Service is  
group pack i.e. pack data

8) transmitted as digital over the  
analog telephone Network.

## Supplementary Services.

These Service offers user identification,  
call bill direction, call forwarding,  
closed or user group calls, multiparty calls.

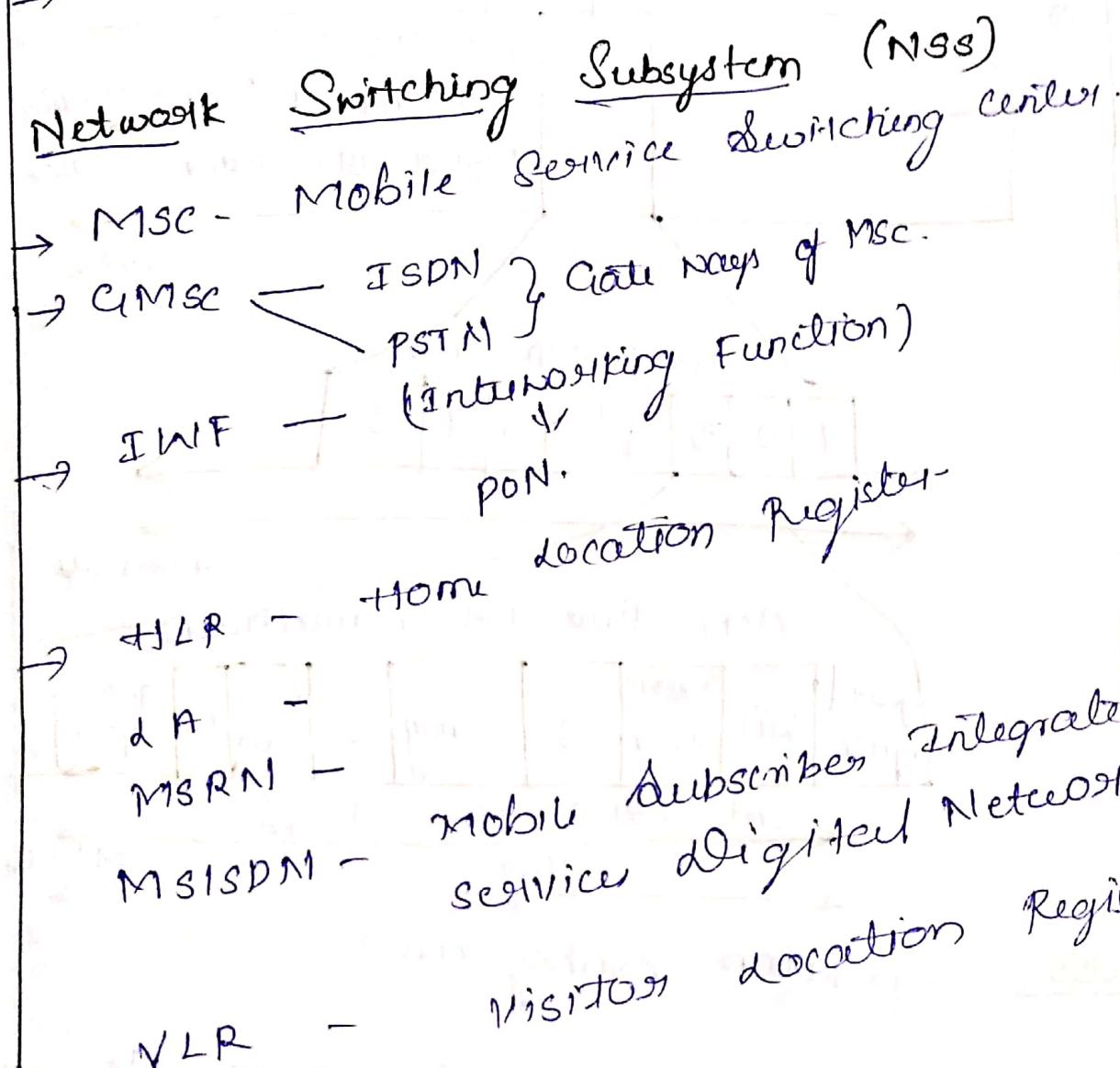
# Telecommunication System

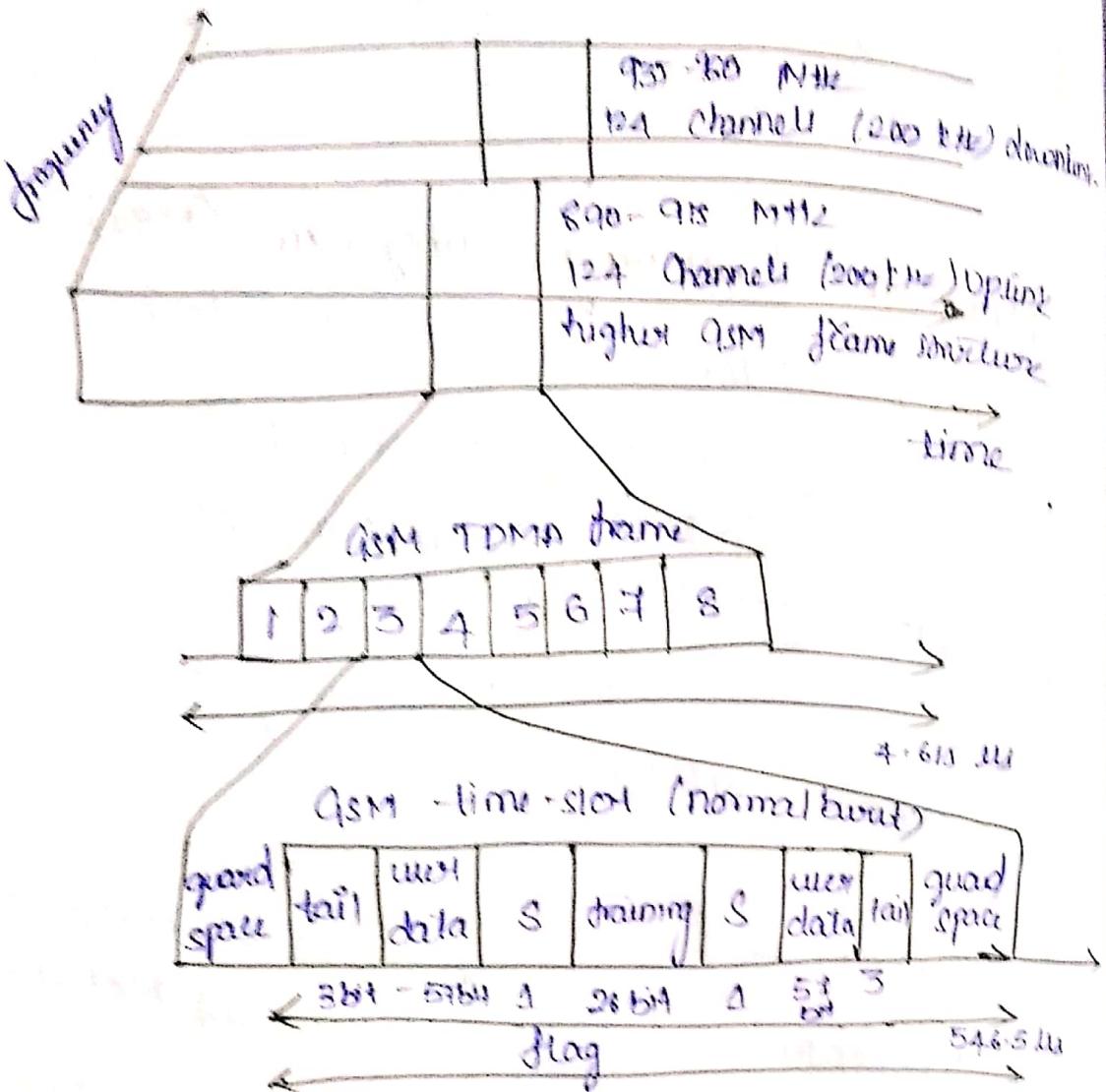
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Function	BTS	BSC
Management of radio channels	-	X
Frequency hopping	X	X
Management of terrestrial channels	-	X
Management of terrestrial onto radio channel	-	X
channel coding and decoding	X	-
Rate adaptation	X	-
Encryption and decryption	X	X
paging	X	-
Uplink Signal Measurement	-	X
Traffic Measurement	-	X
Authentication	-	X
Location registry, location update	-	X
Handover Management	-	

## MS (Mobile Station)

- user specific - IMEI
- device specific - IMSI
- vendor specific - MS.





### OSS: (Operation Subsystem)

- GMC - It is situated in middle part of GSM architecture. It deals with
- Traffic Monitoring
- Status Report
- Connection Setup and releases.
- Accounting
- Billing

AVC: Authentication center

- It is situated under the special part of the HLR
- It deals with algorithms and keys to prevent the unauthorized access.

EIR :-

- Blacklist - all the stolen devices comes under this
- Whitelist - IMEI number + original SIM.
- Graylist - IMEI + without SIM

Radio Interface:

- OM (plays a major role while transferring wireless data transmission)
- GSM implements SDMA with some BTS (home location)
- media access combines TDMA & FDMA.
- FDD (frequency duplex division) which separates downlink & uplink.

- In ASIM 900 there are 124 channels.
- 1 and 124 channels will not work.
- 122 channels will work. In that 32 channels for organization and 90 channels used for autonomy.

S:

- S is a flag it indicates whether user field consists of user data (organizational data).

Guard Space: Present at both side of a frame.

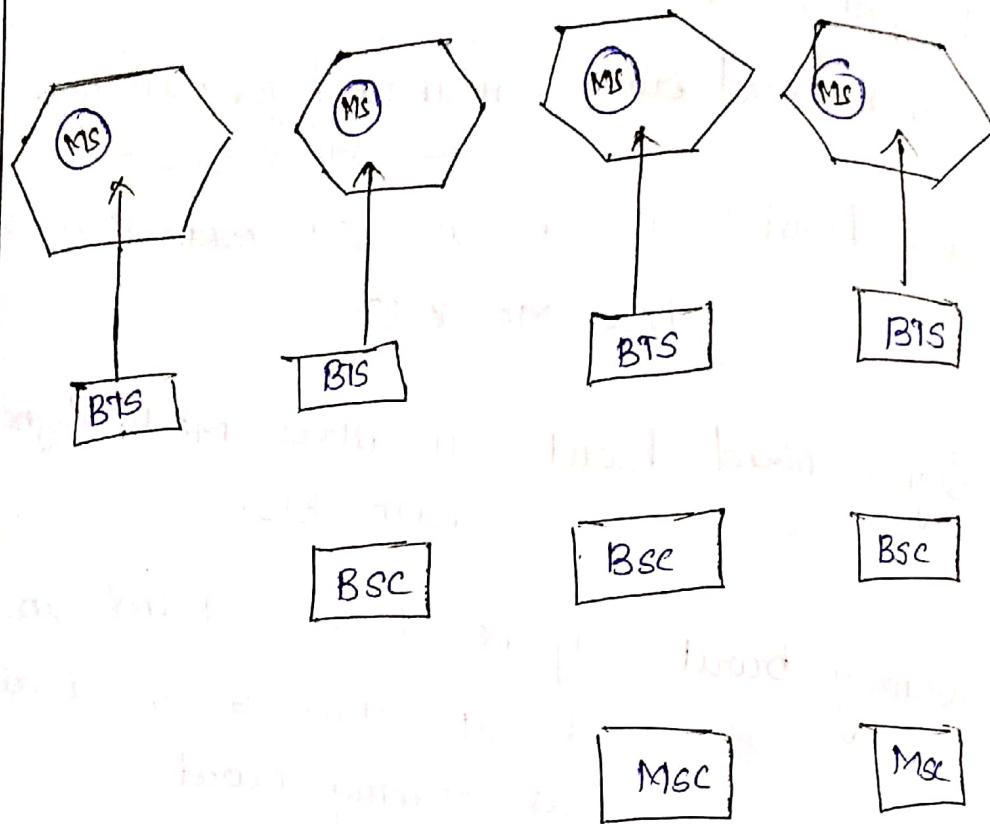
Tail: Tail has 8 bits. Everytime it is set to '0'.

- It is used to enhance the receiver performance.

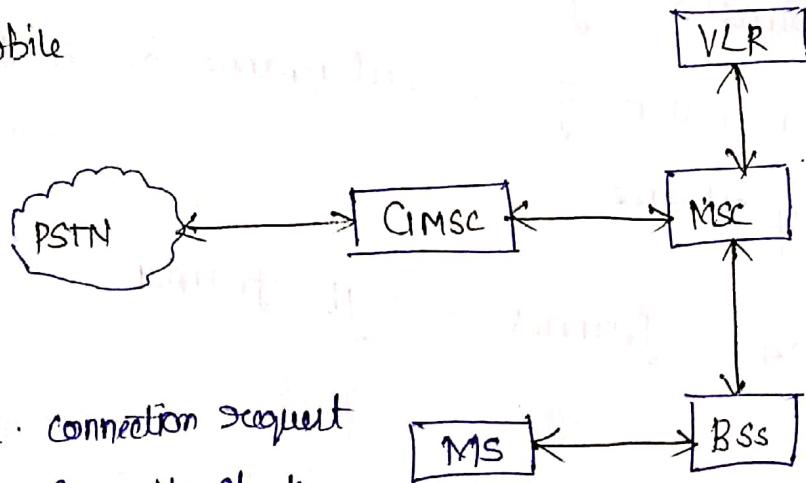
Training: used to give the current path.

## Apart from Normal burst

- Frequency burst:
- Synchronized burst: It is used for connection setup  
bw ms & BTS
- Access burst: It is used for connection setup  
bw ms & BTS.
- Synchronized burst: It allows MS to synchronize with BTS.
- Dummy burst: If no data is found in data burst then it is invalidated as dummy burst
- combination of 26 frames → Multiframe
- combination of 26 multiframe or 51 frames → Superframe.
- 2048 frames → hyperframes



Mobile

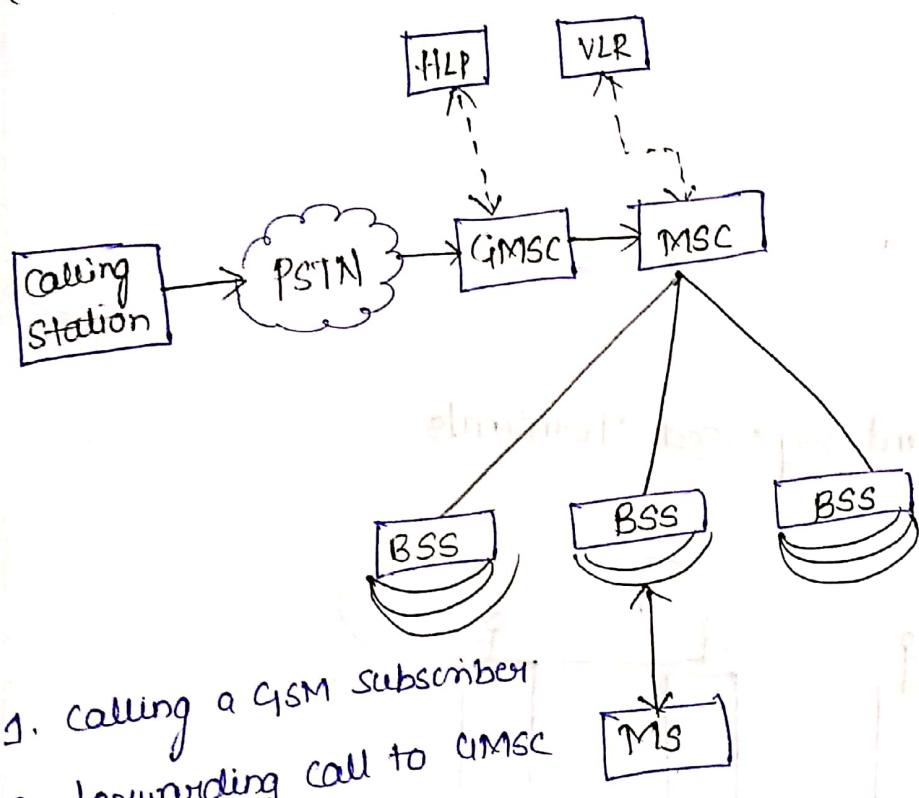


- 1, 2. connection request
- 3, 4. Security check
- 5, 8. Check resources
- 9, 10. Set up call.

## Handover.

- It provides Signal range of 35 km in stemile area.
- 4 types of handover
  - Intra-cell
  - Inter-cell & Intra Bsc
  - Inter Bsc & Intra MSC
  - Intra MSC

## (Mobile Terminate Call)



1. calling a GSM subscriber
2. forwarding call to GMSC
3. signal call setup to HLR
4. 5. request MSRN from VLR
6. forward responsible MSC to GMSC
7. forward call to coverd MSC
8. 9. Get coverd status of ms.
10. 11. paging of Ms.

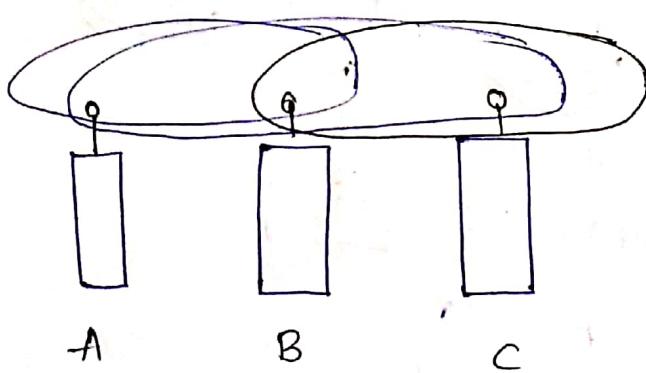
## UNIT - 2

### MAC:

Medium Access Control

- It is a data communication Sublayer.
- It is a Sublayer of Data link layer specified in Seven layer OSI Model.
- Hardware that implements MAC in Medium Access controller.

### Hidden and Exposed Terminals:



- Consider three mobile AB & C.

Near and further.

