Sri SAI RAM ENGINEERING COLLEGE
INSTITUTE OF TECHNOLOGY
West Tambaram, Chennai - 44

Sairam INSTITUTIONS

SAIRAM DIGITAL RESOURCES

UNIT NO 5 MULTI USER RADIO COMMUNICATION

5.1 Global system for Mobile Communication(GSM)

YEAR II SEM III

EC8394

ANALOG AND DIGITAL COMMUNICATION

ELECTRONICS & COMMUNICATION ENGINEERING

4 QUALITY EDUCATION

- Introduction to gsm.
- What is gsm.
- Specifications of gsm.
- Gsm network area.
- Gsm architecture.
- Mobile station.
- Mobile identification numbers.

WHAT IS GSM?

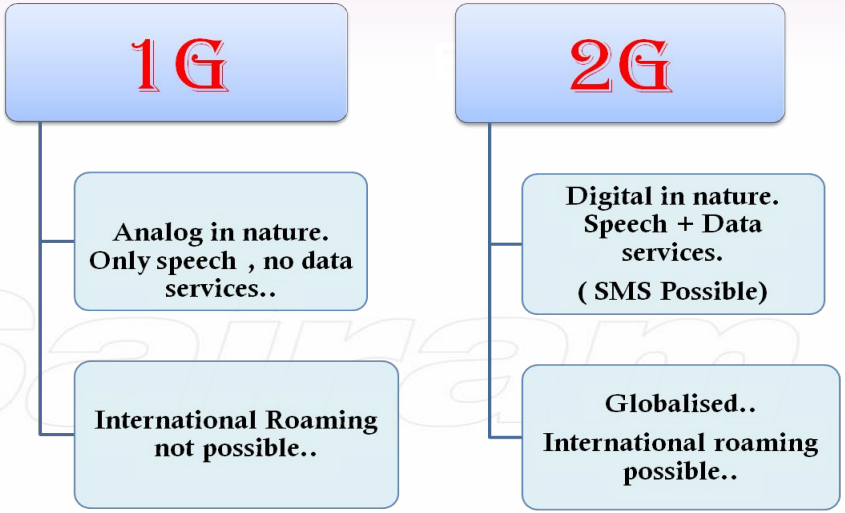
 The **Global System for Mobile Communications** (**GSM**) is a standard developed by the European Telecommunications Standards Institute (ETSI)

Describe the protocols for second-generation (2G) digital cellular networks used by mobile devices such as mobile phones and tablets.

 Global System for Mobile (GSM) is a second generation cellular standard developed to cater voice services and data delivery using digital modulation

HISTORY

- 1946 First car phone by st.Louis
- 1973 First hand held mobile phone by martin cooper
- 1980 1G Cellular Technology Launched
  TACS,NMT,AMPS etc. analog systems launched in American and UK countries
- 1990 Digital 2G cellular technology launched
  GSM,CDMA etc. Launched with GSM being the standard.



In 2001 the first commercial launch of 3G was done in Japan.
With 3G following services are available :

Video Conferencing
online games
net surfing..

GSM SERVICES

TELE SERVICES : Includes mobile phones, emergency calling et

DATA SERVICES : Includes SMS (Short message service), fax, voicemail, electronic mail.

SUPPLYMENTARY SERVICES : I/C & O/G calls, call forwarding, call hold, call waiting, conference, etc.

ADVANTAGES OF GSM

Communication

– mobile, wireless communication, support for voice and data services

Total mobility

– international access, chip-card enables use of access points of different providers.

Worldwide connectivity

– one number, the network handles every location.

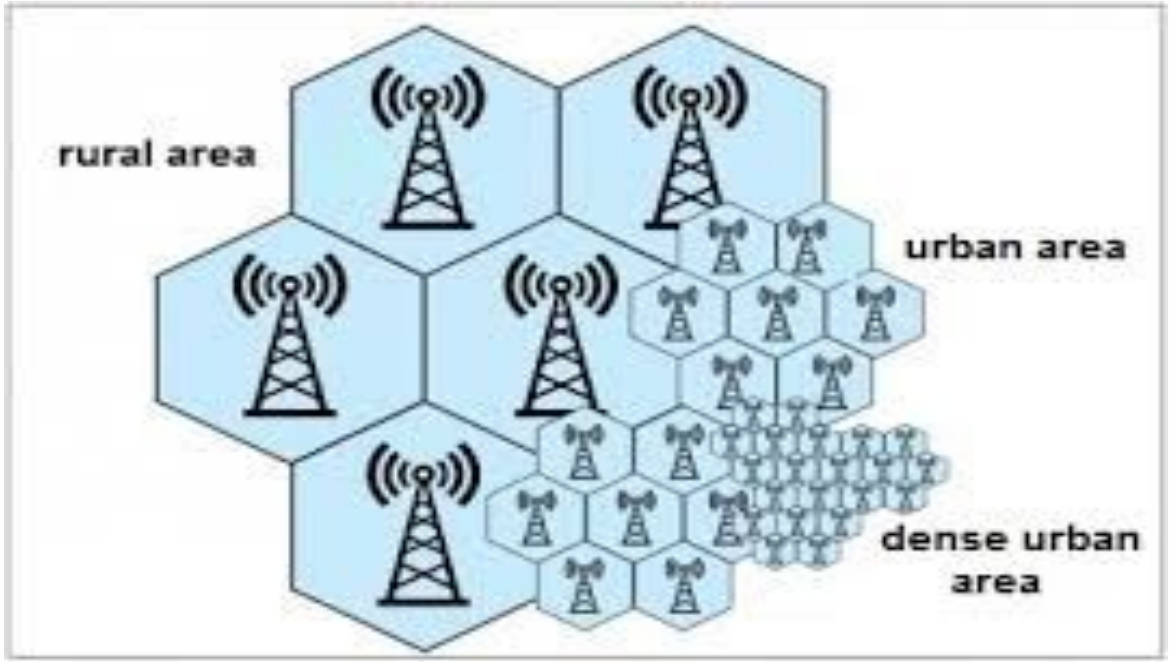
High capacity

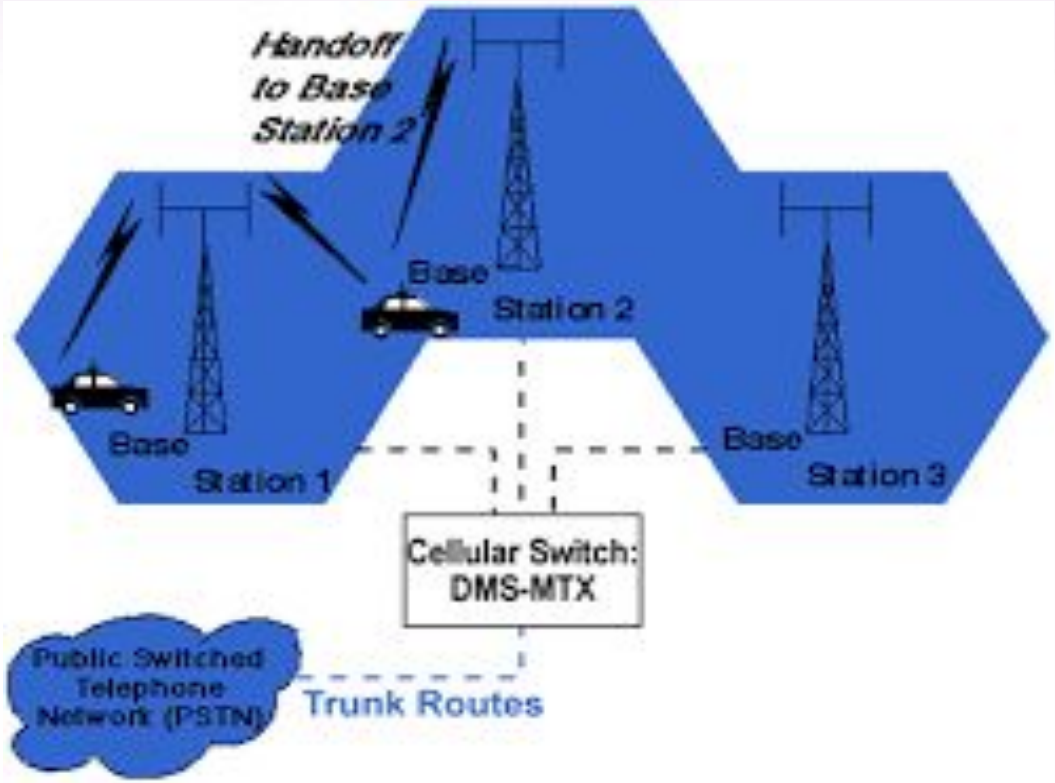
– better frequency efficiency, smaller cells, more customers per cell.

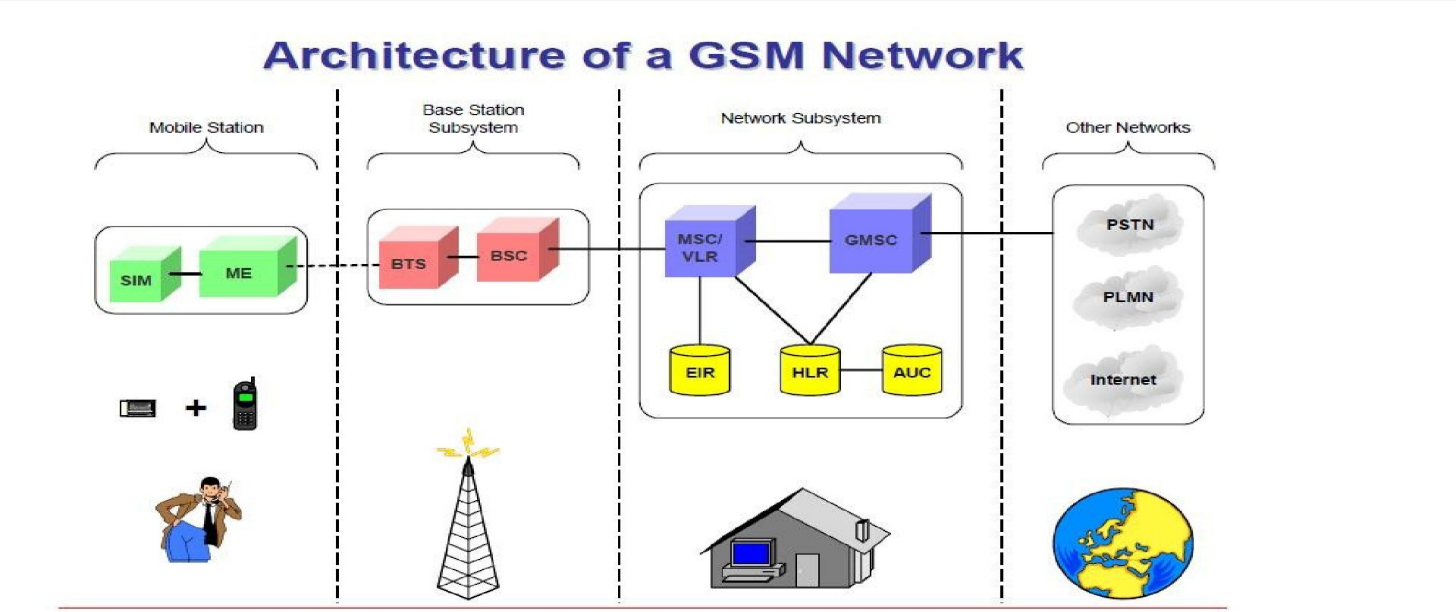
High transmission quality

– high audio quality and reliability for wireless, uninterrupted phone calls at higher speeds (e.g., from cars, trains).


7K+
VIEWS
Simplified Structure
Tower
Equipment
Center
Telephone network
MS
BTS
BSC
MSC
PS
GSM ARCHITECTURE


rural area
urban area
dense urban area

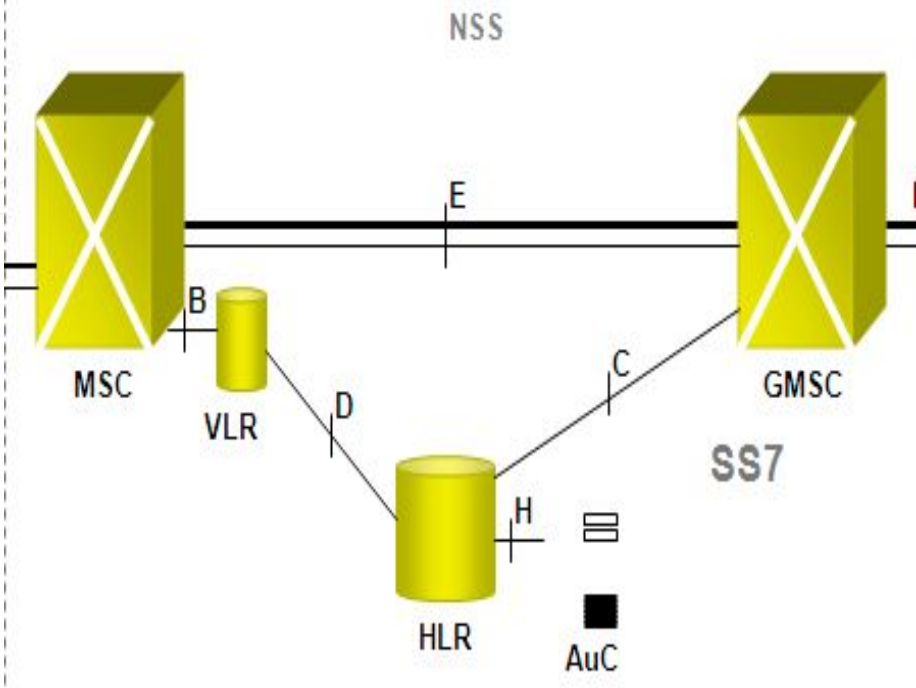

Handoff to Base Station 2
Base Station 2
Base Station 1
Base Station 3
Cellular Switch: DMS-MTX
Public Switched Telephone Network (PSTN)
Trunk Routes


Architecture of a GSM Network
Mobile Station
Base Station Subsystem
Network Subsystem
Other Networks
SIM
ME
BTS
BSC
MSC/ VLR
GMSC
EIR
HLR
AUC
PSTN
PLMN
Internet

NETWORK SUB SYSTEM

Performs call processing and subscriber related functions. It includes:

MSC: Mobile Switching Centre
HLR: Home Location Register
VLR : Visitor Location Register
AuC: Authentication Centre
EIR: Equipment Identity Register
GMSC:Gateway MSC.



MOBILE SWITCHING CENTRE

It is included in the GSM system for call-switching. Its overall purpose is the same as that of any telephone exchange.

The functions carried out by the MSC are listed below:

Call Processing

Includes control of data/voice call setup, inter-BSS and inter-MSC handovers and control of mobility management (subscriber validation and location).

Operations and Maintenance Support

Includes database management, traffic metering and measurement, and a man–machine interface.

Internetwork Interworking

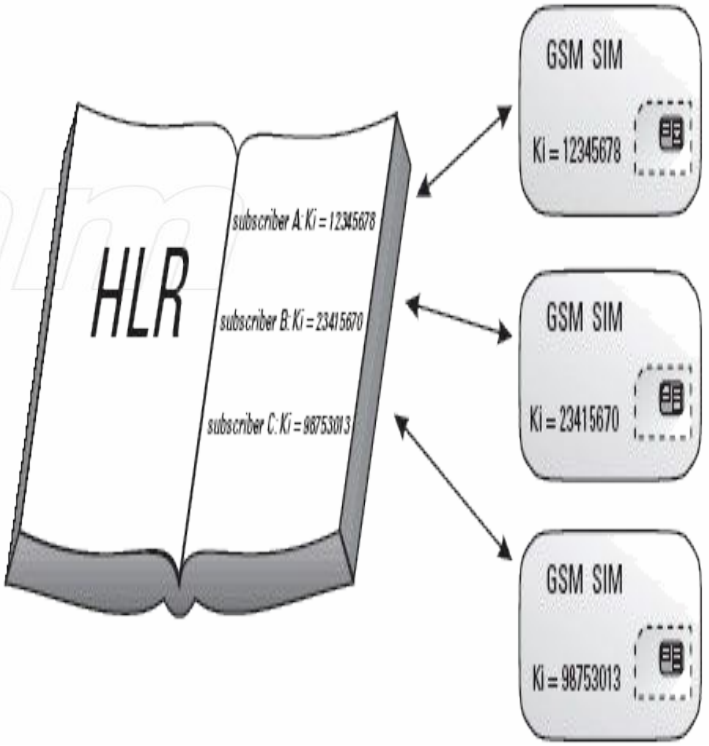
Manages the interface between the GSM network and the PSTN.

When the MSC provides the interface with the other networks in the GSM network it is known as a **Gateway MSC**.

HOME LOCATION REGISTER

Reference database for subscriber parameters.

- Subscriber ID (IMSI & MSISDN).
- Current location of subscriber.
- Subscriber status (registered/unregistered)
- Authentication key and AUC functionality.
- Mobile subscriber roaming number.

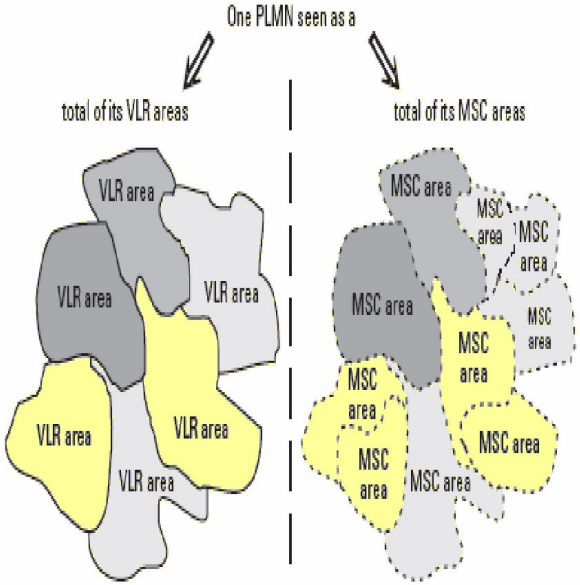


VISITOR LOCATION REGISTER

- It provides local database for the subscribers wherever they are physically located within a PLMN, this may or may not be the "home" system.
- It is a local database and contains copy of most of the data stored in HLR.

It contains:

- Mobile status(busy/free/no ans)
- Location area identity(LAI)
- TMSI AND MSRN .



AUTHENTICATION CENTRE

- It provides authentication and encryption parameters for verification of subscriber identity.
- It ensures confidentiality of each cell.
- It protects network operators from frauds in today's cellular world.
- It is associated with HLR.
- The authentication process will usually take place each time the subscriber “initializes” on the system.

EQUIPMENT IDENTITY REGISTER

- The EIR contains a centralized database for validating the International Mobile Equipment Identity (IMEI).

It contains three lists:

- **White List**

Contains those IMEIs which are known to have been assigned to valid MS equipment.

- **Black List**

Contains IMEIs of MS which have been reported stolen or which are to be denied service for some other reason.

- **Grey List**

Contains IMEIs of MS which have problems (for example, faulty software). These are not, however, sufficiently significant to warrant a ‘‘black listing”

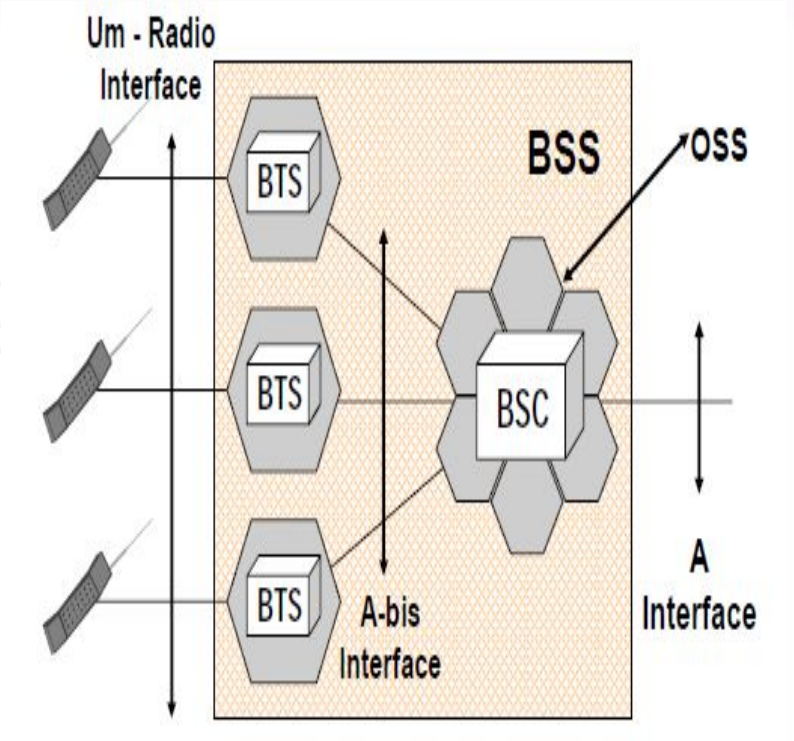
RADIO SUBSYSTEM

- Management of radio network and is controlled by a MSC . One MSC controls many radio subsystem.

  It consists of :

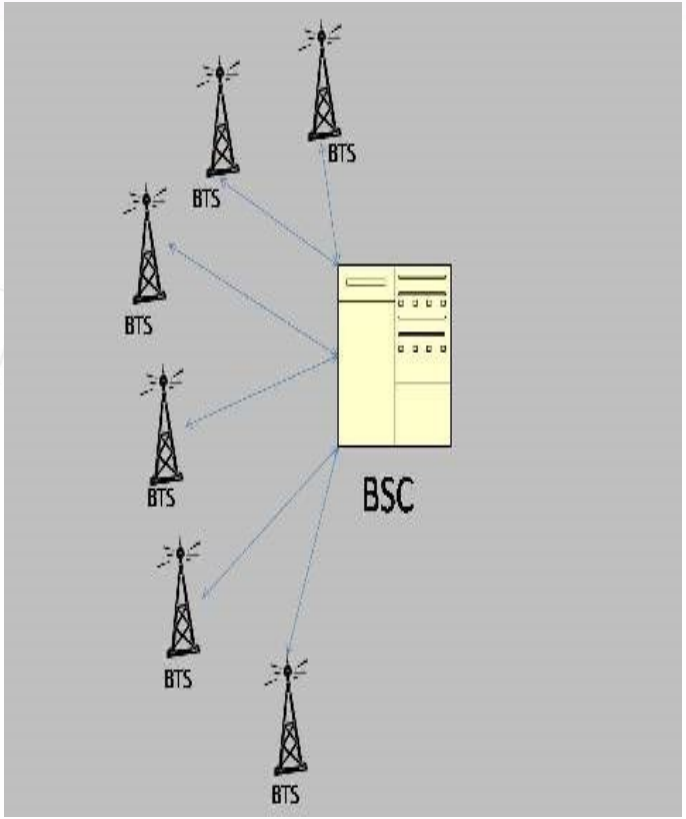
- BSC: Base station controller.

- BTS: Base transceiver station.



BASE STATION CONTROLLER

- It is connected to MSC.
- Controls one or more BTS.
- Switches traffic and signaling to/from BTSs and MSC.
- Connects terrestrial circuits and channels on air interface.
- Controls handover performed by BTS.
- Frequency allocation and power control.



BASE TRANSCEIVER STATION

- Maintains air interface and minimize transmission problems.
- Paging information.
- Radio level power control.
- BTS identification.
- Ciphering
- Speech processing.

OPERATION AND MAINTENANCE SUBSYSTEM

- Dynamic monitoring and controlling of network.
- operation and maintenance data function.
- Configuration management.
- Fault report and alarm handling.
- Performance supervision.
- Storage of software and data.
- Stores data for minimum one year.

FROM SPEECH TO RADIO TRANSMISSION

Blah... Blah... Blah...

Digitizing and Source Coding

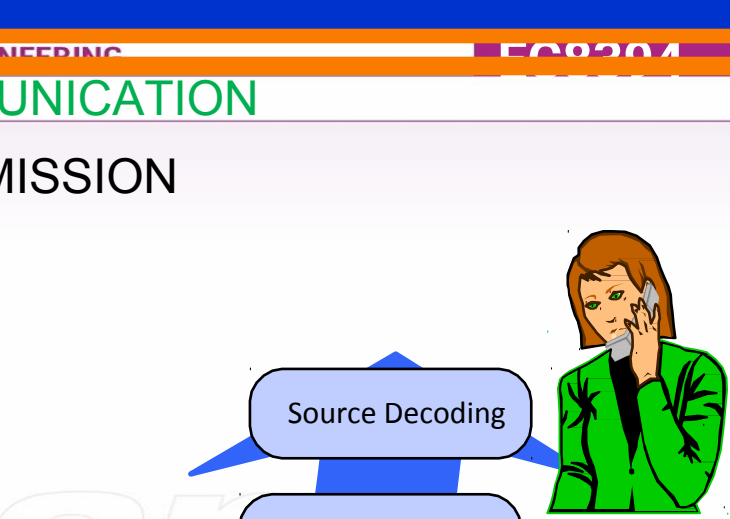
Channel Coding

Interleaving

Ciphering

Burst Formatting

Modulating



Source Decoding

Channel Decoding

De-interleaving

Deciphering

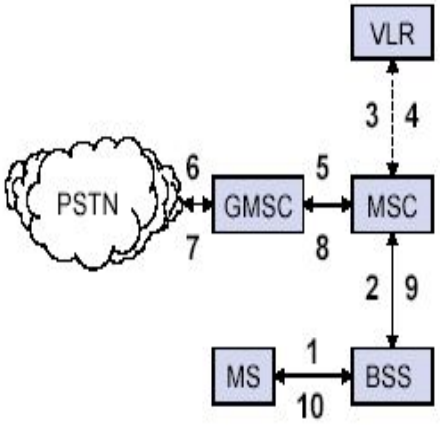
Burst De-formatting

Demodulating

CALL ROUTING

- Call Originating from MS
- Call termination to MS

OUTGOING CALL



1. MS sends dialed number to BSS
2. BSS sends dialed number to MSC

3,4 MSC checks VLR if MS is allowed the requested service. If so, MSC asks BSS to allocate resources for call.

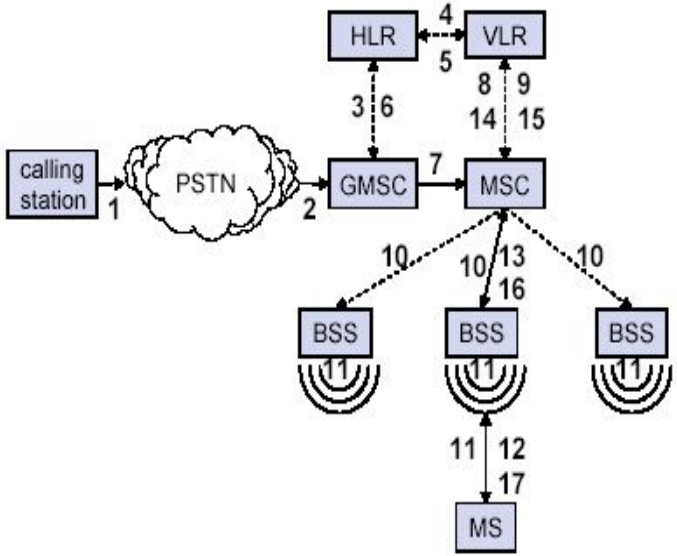
5 MSC routes the call to GMSC

6 GMSC routes the call to local exchange of called user

7, 8,

9,10 Answer back(ring back) tone is routed from called

INCOMING CALL



1. Calling a GSM subscribers
2. Forwarding call to GSMC
3. Signal Setup to HLR
4. 5. Request MSRN from VLR
6. Forward responsible MSC to GMSC
7. Forward Call to current MSC
8. 9. Get current status of MS
10. 11. Paging of MS
12. 13. MS answers
14. 15. Security checks
16. 17. Set up connection

https://youtu.be/cJQZvxfDFug