SNS COLLEGE OF TECHNOLOGY

Coimbatore – 35

An Autonomous Institution

Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A++' Grade
Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

19ECT311 / Wireless Communication

III ECE/ VI SEMESTER

Unit III - **CELLULAR NETWORKS**

Topic 1: GSM

GUESS?????? THE TOPIC

GSM

•A GSM network comprises of many functional units. These functions and interfaces are explained in this chapter. The GSM network can be broadly divided into −

- The Mobile Station (MS)
- The Base Station Subsystem (BSS)
- The Network Switching Subsystem (NSS)
- The Operation Support Subsystem (OSS)

GSM - The Mobile Station

The MS consists of the physical equipment, such as the radio transceiver, display and digital signal processors, and the SIM card. It provides the air interface to the user in GSM networks. As such, other services are also provided, which include −

- Voice teleservices
- Data bearer services
- The features' supplementary services

GSM

The MS also provides the receptor for SMS messages, enabling the user to toggle between the voice and data use.

Moreover, the mobile facilitates access to voice messaging systems.

The MS also provides access to the various data services available in a GSM network. These data services include −

- X.25 packet switching through a synchronous or asynchronous dial-up connection to the PAD at speeds typically at 9.6 Kbps.
- General Packet Radio Services (GPRSs) using either an X.25 or IP based data transfer method at the speed up to 115 Kbps.
- High speed, circuit switched data at speeds up to 64 Kbps.

GSM

What is SIM?

The SIM provides personal mobility so that the user can have access to all subscribed services irrespective of both the location of the terminal and the use of a specific terminal.

You need to insert the SIM card into another GSM cellular phone to receive calls at that phone, make calls from that phone, or receive other subscribed services.

BSS

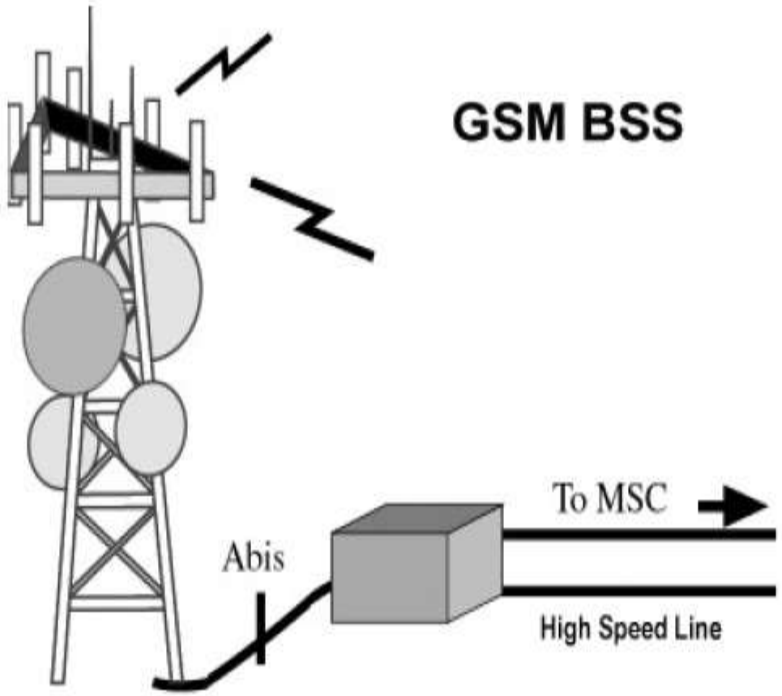
GSM - The Base Station Subsystem (BSS)

The BSS is composed of two parts −

- The Base Transceiver Station (BTS)
- The Base Station Controller (BSC)

The BTS and the BSC communicate across the specified Abis interface, enabling operations between components that are made by different suppliers. The radio components of a BSS may consist of four to seven or nine cells. A BSS may have one or more base stations. The BSS uses the Abis interface between the BTS and the BSC. A separate high-speed line (T1 or E1) is then connected from the BSS to the Mobile MSC.

GSM



The Base Transceiver Station (BTS)

The BTS houses the radio transceivers that define a cell and handles the radio link protocols with the MS.

In a large urban area, a large number of BTSs may be deployed.

ACTIVITY

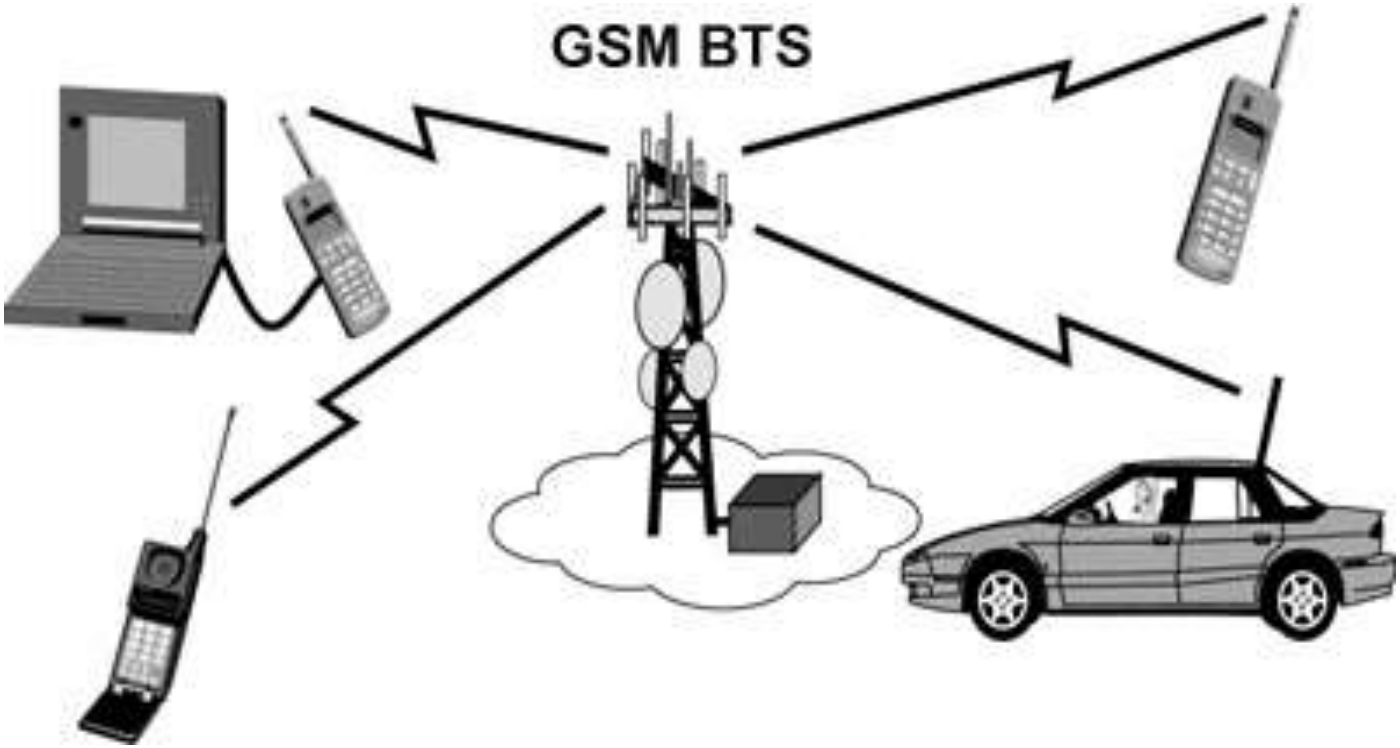
Activity: Draw a logo which may describe your character or things you like.

BTS

The BTS corresponds to the transceivers and antennas used in each cell of the network. A BTS is usually placed in the center of a cell. Its transmitting power defines the size of a cell. Each BTS has between 1 and 16 transceivers, depending on the density of users in the cell. Each BTS serves as a single cell. It also includes the following functions −

- Encoding, encrypting, multiplexing, modulating, and feeding the RF signals to the antenna
- Transcoding and rate adaptation
- Time and frequency synchronizing
- Voice through full- or half-rate services
- Decoding, decrypting, and equalizing received signals
- Random access detection
- Timing advances
- Uplink channel measurements

BTS



BSC

The Base Station Controller (BSC)

The BSC manages the radio resources for one or more BTSs. It handles radio channel setup, frequency hopping, and handovers.

The BSC is the connection between the mobile and the MSC. The BSC also translates the 13 Kbps voice channel used over the radio link to the standard 64 Kbps channel used by the Public Switched Telephone Network (PSDN) or ISDN.

It assigns and releases frequencies and time slots for the MS. The BSC also handles intercell handover. It controls the power transmission of the BSS and MS in its area.

The function of the BSC is to allocate the necessary time slots between the BTS and the MSC. It is a switching device that handles the radio resources.

The additional functions include−

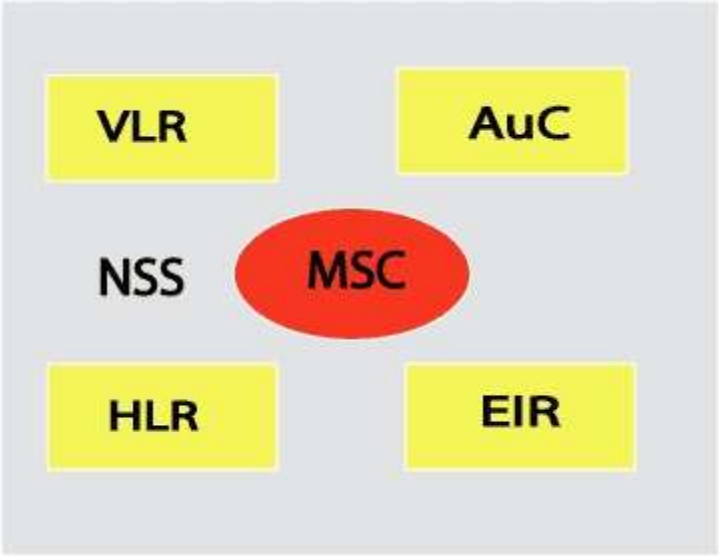
GSM

- Control of frequency hopping
- Performing traffic concentration to reduce the number of lines from the MSC
- Providing an interface to the Operations and Maintenance Center for the BSS
- Reallocation of frequencies among BTSs
- Time and frequency synchronization
- Power management
- Time-delay measurements of received signals from the MS

GSM

GSM - The Network Switching Subsystem (NSS)

The Network switching system (NSS), the main part of which is the Mobile Switching Center (MSC), performs the switching of calls between the mobile and other fixed or mobile network users, as well as the management of mobile services such as authentication.



OSS

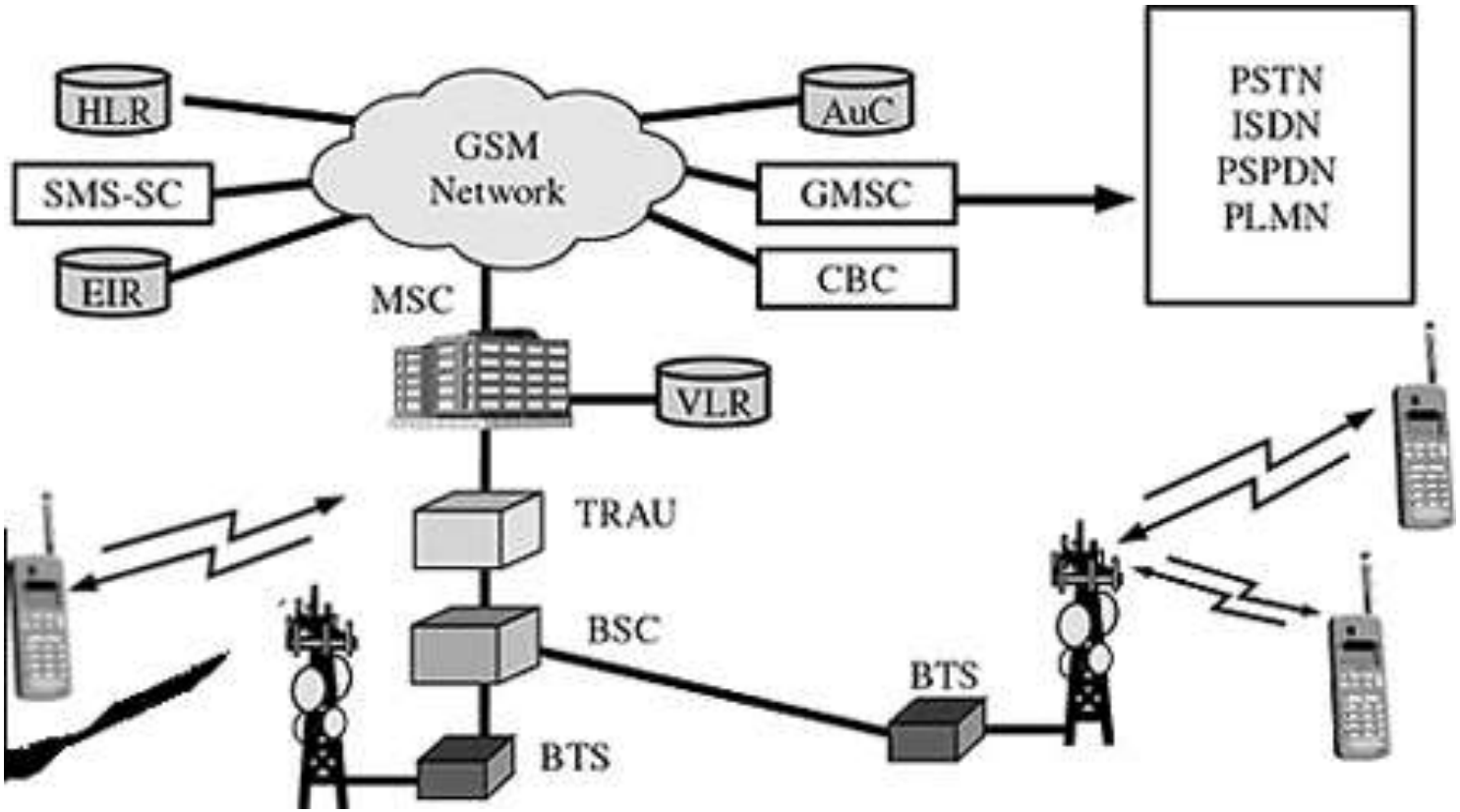
GSM - The Operation Support Subsystem (OSS)

The operations and maintenance center (OMC) is connected to all equipment in the switching system and to the BSC. The implementation of OMC is called the operation and support system (OSS).

Here are some of the OMC functions−

- Administration and commercial operation (subscription, end terminals, charging, and statistics).
- Security Management.
- Network configuration, Operation, and Performance Management.
- Maintenance Tasks.

GSM


HLR
SMS-SC
EIR
GSM
Network
AuC
GMSC
CBC
PSTN
ISDN
PSPDN
PLMN
MSC
VLR
TRAU
BSC
BTS
BTS

Assessment

- **1. The rainbow pattern seen on a CD is an example of**
  1. Reflection
  2. Refraction
  3. Diffraction
  4. None of the above
- **2. Fresnel Reflection Coefficient is a factor of**
  1. Polarization of the wave
  2. Properties of the material at which reflection occurs
  3. Angle of incidence of wave

  a. 1) and 2) are correct

  b. All the three are correct

  c. 1) and 3) are correct

  d. 2) and 3) are correct.

- **3. Diffraction, at high frequencies, depends upon**
  1. Geometry of the object
  2. Polarization of the incident wave
  3. Amplitude of the incident wave
  4. Frequency of the incident wave

  a. 1) and 2) are correct

  b. 1), 2) and 3) are correct

  c. 2) and 3) are correct

  d. All are correct