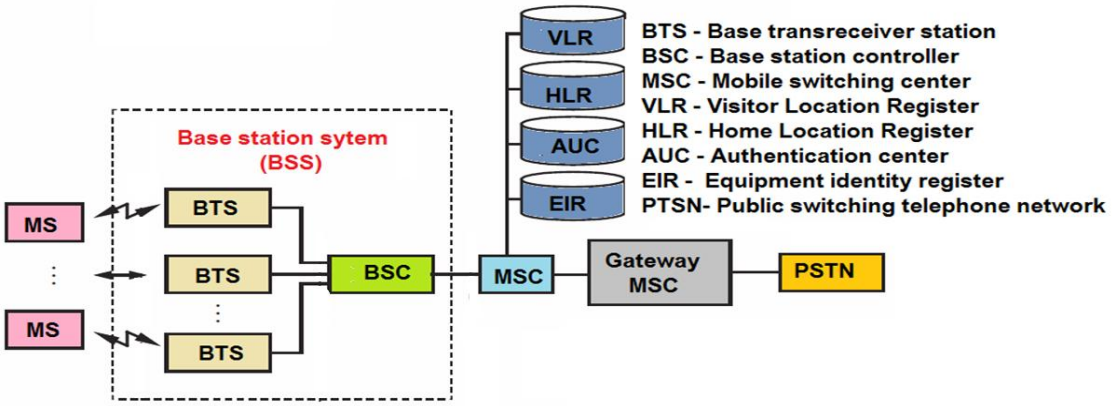
The GSM System

- Global System for Mobile Communications is the standard for mobile telephone systems in the world.
- In GSM, the signaling and speech channels are digital, therefore GSM is considered a 2G (Second Generation) system.
- This helps wide-spread implementation of data communication applications.
- Most 2G GSM networks operate in the 900 MHz or 1800 MHz bands while 3G GSM in the 2100 MHz frequency band.

GSM System Architecture

The GSM network is divided into three major systems −

- Network and Switching System (NSS)
- Base Station System (BSS)
- Mobile Station (MS)



1. Mobile Station

Mobile Station (MS) Is mobile handset which contains two parts:

A. **Mobile Equipment (ME):** Mobile equipment contains the software and hardware circuitry specific to the radio interfaces.

B. **SIM:** SIM is a small chip which contains Personal identity Number (PIN), provided by the network operator at the time of activation of the SIM.

2. Base Station System (BSS)

- Provides & manages radio transmission paths between the MS and the MSC.
- Consists of two parts.

❑ Base Transceiver Station (BTS) also called Base Station.

❑ Base Station Controller (BSC).

A. Base Transceiver Station (BTS)

- Provides wireless communication environment to the mobile user using the antennas.
- Encodes, encrypts, multiplexes, modulates and feeds the RF signal to the antenna.

B. Base Station Controller

- Supervises BTSs, Handles Handoffs, maintains appropriate power levels of the signal.
- Transfers the calls from MSC towards required BTS and from BTS to required MSC.
- Manages the radio resources for one or a group of BTS's.

3. Network and Switching System

- Responsible for performing call processing and subscriber-related functions.
- Manages the switching functions of the system and allows MSCs to communicate with other networks such as PSTN and ISDN.
- It consists of

A. Mobile Switching Center
B. Home Location Register
C. Visitor Location Register
D. Equipment Identity Register
E. Authentication Center

A. Mobile Switching Center

- Manages communication between GSM and other networks.
- Performs all the switching functions for all MS's, located in the geographic area controlled by its assigned BSSs.
- MSC contains the four parts: *visiting location register, home location register, equipment identity registers and authentication centre*.
- The home location register (HLR) and visitor location register (VLR) are two sets of pointers that support mobility and enable the use of the same cell phone number (or mobile phone) over a wide range.

B. Home Location Register (HLR)

- Maintains the record of all mobile users within the home area.
- HLR is located at the MSC where the MS is initially registered and is the initial home location for billing and access information.

C. Visitor Location Register (VLR)

- Maintains the record of mobile users which moves from their own home area to roaming area.
- VLR contains information about all MSs visiting that particular MSC and hence points to the HLR of the visiting MSs for exchanging related information about the MS.

D. Equipment Identity Register

- Database that contains information about the identity of mobile equipment called International Mobile Equipment Identity (IMEI), which may be valid, suspect and prohibited.

E. Authentication Centre

- Provides authentication and encryption parameters that verify the user's identity.
- Protects network operators from different types of frauds.