

JYOTHISHMATHI INSTITUTE OF TECHNOLOGY & SCIENCE

(Approved by AICTE, New Delhi & Affiliated to JNTUH)



DEPARTMENT OF CSE

SUBJECT: Mobile Computing

NAME OF THE FACULTY: R.Satya Teja YEAR / SEMESTER: III-II

# GSM Architecture

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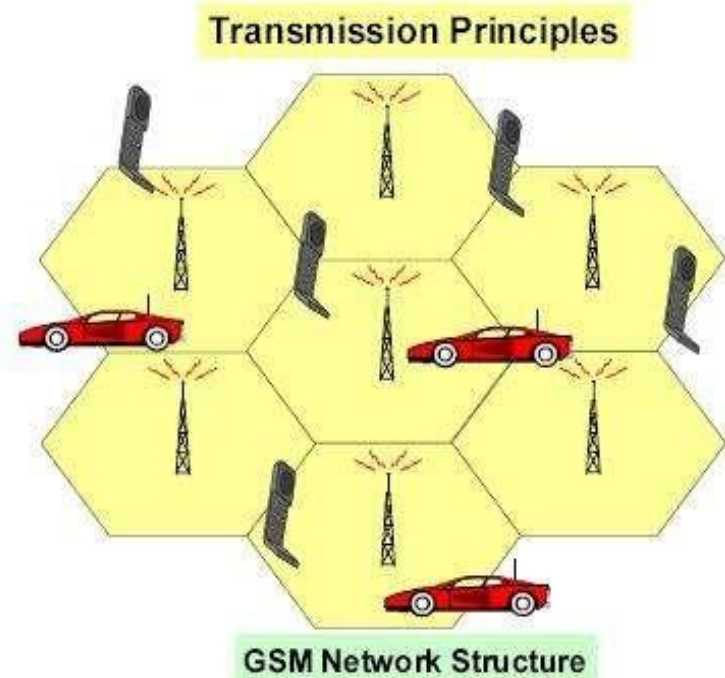
- What is GSM?
- Network structure
- GSM system architecture
  - Mobile Station (MS)
  - Base Station Subsystem (BSS)
  - Network Switching Subsystem (NSS)
- Characteristics

# What is GSM?

- The Global System for Mobile communications is a digital cellular communications system.
- Based on digital technology.
- The standardized system had to meet certain criteria's:
  - Spectrum efficiency
  - International roaming
  - Low mobile and base stations costs
  - Good subjective voice quality
  - Ability to support new services

# Network structure

- Cell
- Location area
- MSC service area
- PLMN service area
- GSM service area



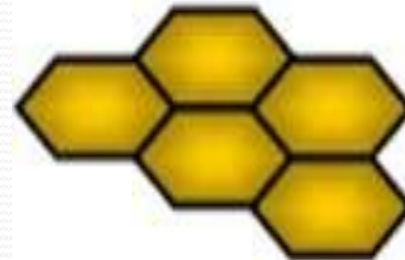
# Cell



A cell is the basic unit of a cellular system and is defined as the radio coverage given by one BTS.

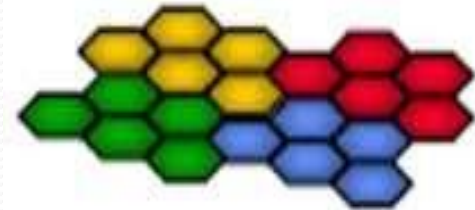
## Location area

- A group of cells served by one or more BSC.
- Within the network, a subscribers' location is known by the LA which they are in.
- The identity of the LA in which an MS is currently located is stored in the VLR.



- **MSC Service Area**

An MSC Service Area is made up of LAs and represents the geographical part of the network controlled by one MSC.



- **PLMN service area**

A PLMN service area is the entire set of cells served by one network operator.

Defined as the area in which an operator offers radio coverage and access to its network.



- **GSM service area**

The GSM service area is the entire geographical area in which a subscriber can gain access to a GSM network

**PLMN SERVICE AREA (1 operator's network)**

**MSC/VLR SERVICE AREA (area covered by 1 MSC)**

**LOCATION AREA (1 MSC consists of LAs)**

**CELL (area covered by 1 BTS)**



# GSM system architecture

- Mobile Station (MS)
- Base Station Subsystem (BSS)
- Network Switching Subsystem(NSS)



# Mobile Station (MS)

The Mobile Station is made up of two entities:

1. Mobile Equipment (ME)
2. Subscriber Identity Module (SIM)



# Mobile Equipment (ME)

- Portable, vehicle mounted, hand held device.
- Uniquely identified by an **IMEI** (International Mobile Equipment Identity).
- Voice and data transmission.
- Monitoring power and signal quality of surrounding cells for optimum handover.
- Power level : 0.8W – 20 W
- 160 character long SMS.



# Subscriber Identity Module (SIM)

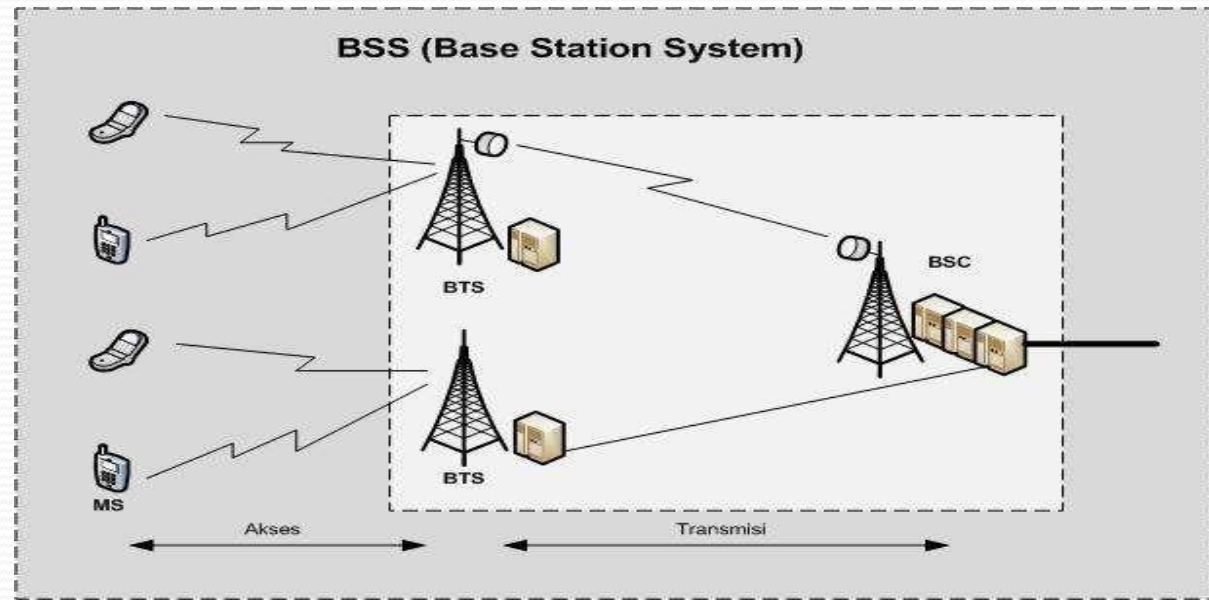
- Smart card contains the International Mobile Subscriber Identity (**IMSI**)
- Allows user to send and receive calls and receive other subscribed services
- Protected by a password or PIN
- Can be moved from phone to phone – contains key information to activate the phone



# Base Station Subsystem (BSS)

It consists of 2 major hardware components:

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



# Base Transceiver Station (BTS)

- The BTS contains the RF components that provide the air interface for a particular cell .
- Encodes, encrypts, multiplexes, modulates and feeds the RF signals to the antenna.
- Communicates with Mobile station and BSC.
- Consists of Transceivers (TRX) units.



# Base Station Controller (BSC)

- Provides the control for the BSS.
- Communicates directly with the MSC.
- May control single or multiple BTS.
- In charge of handovers, frequency hopping, exchange functions and control of power level of BTS.



# Network Switching Subsystem(NSS)

The system contains the following functional units

- Mobile Switching Center (MSC)
- Home Location Register (HLR)
- Visitor Location Register (VLR)
- Authentication Center (AUC)
- Equipment Identity Register (EIR)
- Operation and maintenance center (OMC)

# **Mobile Switching Center (MSC)**

- Central component of NSS.
- MSC performs the switching functions.
- Each MSC provides service to MS located within a defined geographic coverage area.



# **Home Location Register (HLR)**

- Stores information about each subscriber that belongs to its MSC in permanent and temporary fashion.
- As soon as mobile subscriber leaves its current local area, the information in the HLR is updated.
- Database contains IMSI, prepaid/postpaid, roaming restrictions and supplementary services.

## **Visitor Location Register (VLR)**

The Visitor Location Register (VLR) contains the information about subscriber parameters and location information for all mobile subscribers currently located in the geographical area controlled by that VLR.

## **Authentication Center (AUC)**

It is used for security purposes.

Authentication is a process to verify the subscriber SIM.

AUC & HLR collectively authenticate the subscribers.

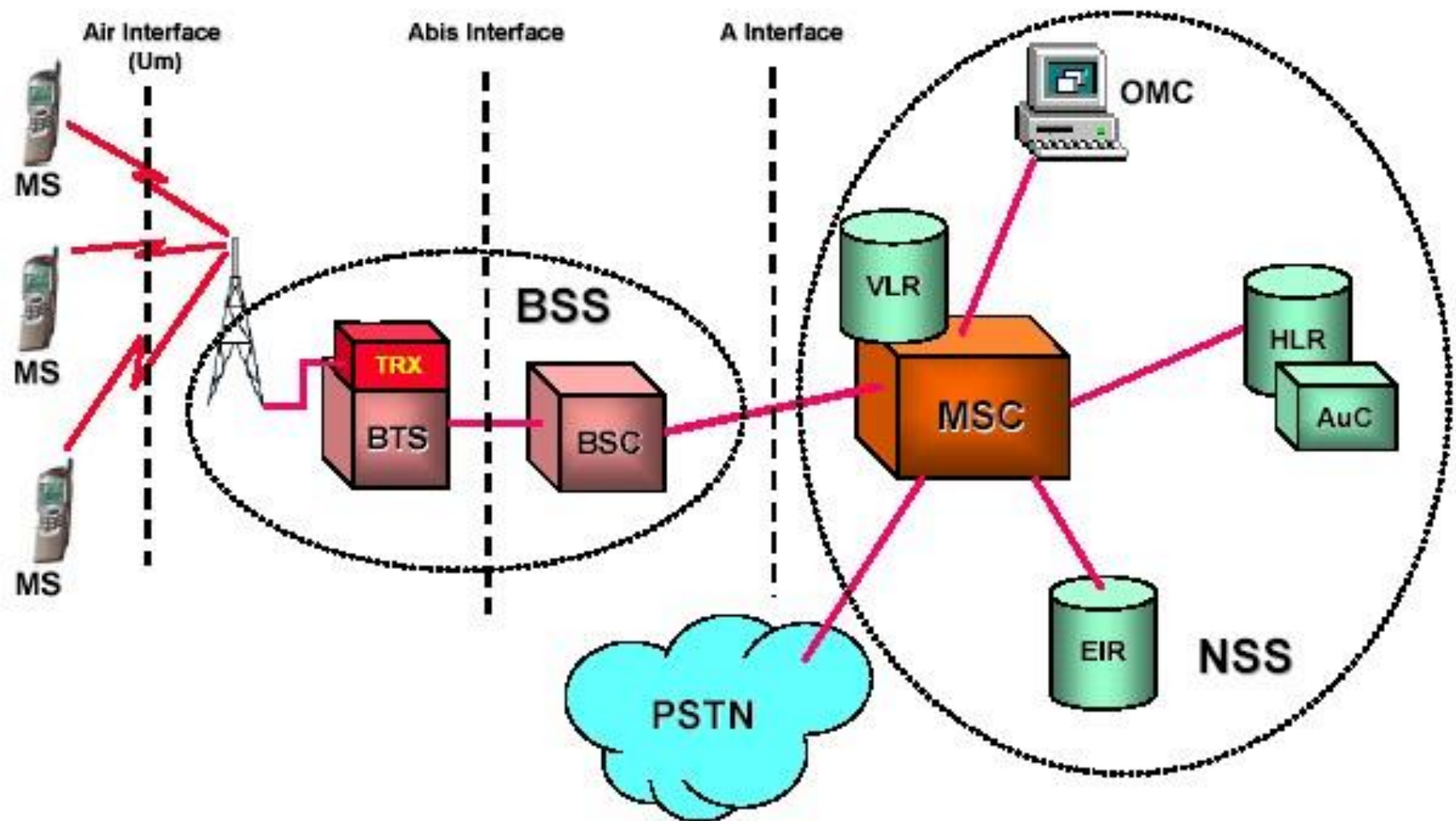
## **Equipment identity register (EIR)**

- Stores all devices identifications registered for this network.
- Database that is used to track handsets using the IMEI.
  - White or Valid list
  - Grey or Monitored list
  - Black or prohibited list

## **Operation and maintenance center (OMC)**

- The Operation and maintenance Center (OMC) is the centralized maintenance and diagnostic heart of the base station system (BSS).
- It allows the network provider to operate, administer , and monitor the functioning of the BSS.

# GSM Architecture Overview



# Characteristics

- Fully digital system using 900,1800 MHz frequency band.
- User/terminal authentication for fraud control.
- Full international roaming capability.
- Low speed data services (up to 9.6 Kb/s).
- Compatibility with ISDN.
- Support of Short Message Service (SMS).