UNIT- 2

Components of a wireless cellular network

These network elements may be divided into three groups.

- MS- Provides the user link to wireless network
- RBS, BSC – The B.S system provides the wireless system link to the subscriber over the air-interface
- MSC- Provides the interfaces to the PSTN and PDN and the correct information and connections to locate the subscriber and the databases needed to support system operations.

3.1 Common Cellular Network Components

- Subscriber devices
  - Transmitter/Receiver section
- Man-machine interface
- RF transceiver section
- Signal processing section
- System control processor
- Power subsystem

**Base station system components**
Radio base station
- TDMA and CDMA radio base stations
- Base station controller
- Transcoder controller
- Vocoder

Switching system components
- Visitor location register
- Mobile switching center

MSC interface and switching functions
- MSC signaling functions
- MSC database functions

Home location register
- HLR implementation and operation
- HLR subscription profile
- HLR/AUC interconnection
Inter-working location register
Authentication center and equipment identity
Register
Gateway MSC
Network management systems
Other nodes
  • Service center
  • Billing gateway
  • Service order gateway
Hardware and Software Views of the Cellular Network

Hardware view of a cellular network

- Serving areas
- Cells
- MSC boundaries

Software view of a cellular network

- Location area identity
- Cell global identity
- Mobile country code and network code
3G Cellular System Components
- Core network
- Radio access network
- Radio network controller
- Radio base station

**Cellular Component Identification**

Subscriber device identification

- Mobile station ISDN identification number - It is a dialable number that is used to reach a mobile telephone.

**Cellular Component Identification**

- International mobile subscriber identity - For international public land mobile networks an international mobile subscriber identity is assigned to each subscriber
- International mobile equipment identity- It is used to uniquely identify a mobile station as a piece of equipment to be used within the network.

Cellular system component addressing

- Location area identity- It is used for paging an M.S during an incoming call and for location updating of mobile subscribers.
  \[ \text{LAI} = \text{MCC} + \text{MNC} + \text{LAC} \]

  MCC- Mobile country code
  MNC- Mobile network code
  LAC- Location area code

- Cell global identity – It is used for the unique identification of a cell within a location area. It is formed by adding 16 bits to the end of a LAI.

- Radio base station identity code- Used by the mobile operator to identify the RBS’S with in a wireless network.

- Location numbering

- Addressing cellular network switching nodes
• Global title and global title translation – GT is an address of a fixed network element.

Call Establishment

• Mobile-terminated call
  • PSTN messages
  • GMSC operations
  • MSC/VLR operations
  • BSC operations

• Mobile-originated call
  • Mobile operations
  • Radio base station operations
  • Base station controller operations
  • MSC operations
- Call release
  - Connection management operations
  - Radio resource operations
Answers to Problems and Questions

Chapter 2

Section 2.1

1. The radio base station and the mobile station perform the “air interface” function.

2. The transcoder controller has the function of rate adaptation. It changes PCM (64 kbps voice) signals to a much lower bit rate (typically 8 kbps) signal that can be more easily transmitted by a cellular telephone.

3. The visitor location register (VLR) is used to temporarily store information about any mobile station that attaches to an RBS in the area serviced by a particular MSC.

4. The home location register (HLR) is used to store permanent information about every user that has a cellular service contract with a specific wireless service provider.

5. The mobile switching center (MSC) has the function of setting up, routing, and supervising voice calls to and from the mobile station to the PSTN.

6. The wireless cellular network elements that provide security functions for the system are the HLR, AUC, and EIR. These data bases, together, form the heart of the security and privacy functions of a cellular system.

Section 2.2

7. The cell global identity (CGI) number corresponds to a unique cell site within a location area.

8. The LAI is used for identification of a specific number or group of cell sites (usually located in one area) within a cellular system. It is typically used by the cellular system during the paging a mobile when there is an incoming call.
Section 2.3

9. A radio network controller (RNC) is the name associated with a cdma2000 network element that performs many of the functions normally associated with or similar to those performed by a base station controller.

10. The two core networks associated with 3G cellular networks are the circuit-switched and the packet-switched networks.

Section 2.4

11. The MSISDN number is a dialable number that is used to reach a particular mobile phone, while an IMSI number is an international number assigned to each subscriber of an international PLMN.

12. A global title (GT) is used to indicate the address of a fixed network element.

13. A mobile global title (MGT) is used by a mobile system to indicate the location of a mobile’s HLR.

14. Global title translation (GTT) is the process through which a mobile global title (MGT) is created.

15. The mobile country codes (MCCs) for Mexico are 521 through 528.

Section 2.5

16. The mobile station roaming number (MSRN) is used to indicate the location of the present, serving MSC/VLR for a mobile.
17. During a mobile originated call, authentication and encryption functions are performed after the mobile requests service from the system.

18. The first step performed by the mobile during a call release operation is the sending of a Disconnect message to the RBS by the mobile.

19. The last step performed during a call release operation is the MSC sending a Clear Complete message to the BSC.

20. The wireless cellular network elements involved in a mobile originated call are the MSC/VLR, HLR/AUC, EIR, BSC, RBS, and the Mobile.