

Lecture #2 Fundamentals of Cellular Communication

1. Evolution of Cellular Communication

- 1893 - Radio communication was invented by Nikola Tesla and Marconi
- 1940 - First walkie-talkie was used by the US military
- 1947 - John Bardeen and Walter Brattain invented the transistor
- 1979 - First Cellular Phone service was launched by the Nordic Mobile Telephone (in Finland, Sweden, Norway, Denmark).



2. Cellular System Generation

1G	Voice oriented systems based on Analog technology	Advanced Mobile Phone Systems Cordless System
2G	Voice oriented systems based on Digital technology	Global System for Mobile (GSM) US Time Division Multiple Access (US-TDMA)
3G	Voice oriented systems integrate with data Services	General Packet Radio Service (GPRS) and Code Division Multiple Access (CDMA)
4G	Based on Internet protocol networks and will provide voice, data and multimedia service to subscribers	

3. What is frequency reuse?

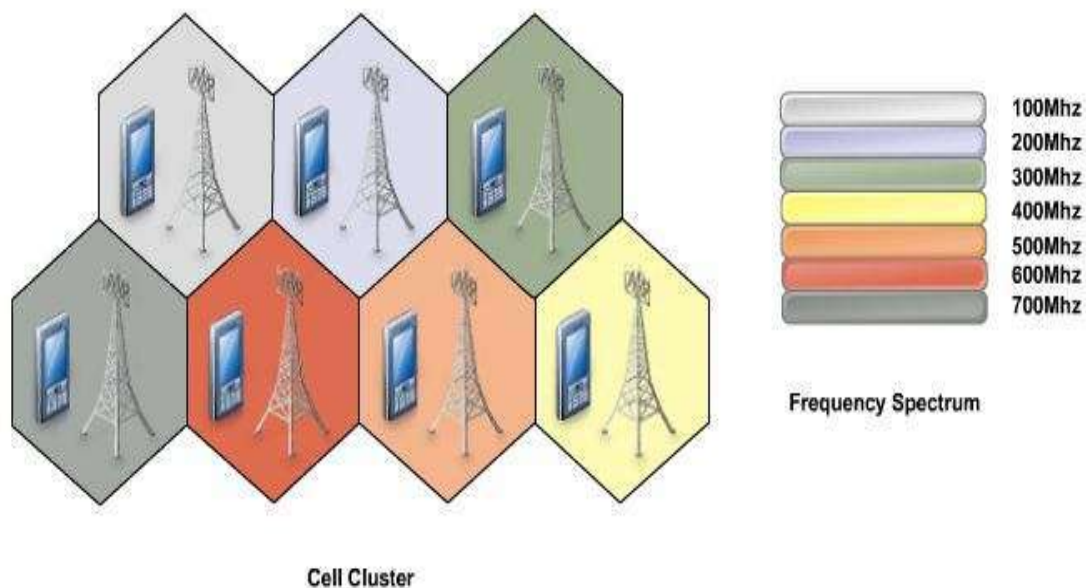
It is a method used by service providers to improve the efficiency of a cellular network and to serve millions of subscribers using a limited radio spectrum

4. Define Network Cell

- Basic geographical unit of a cellular network;
- It is the area around an antenna where a specific frequency range is used;
- It is represented graphically as a hexagonal shape, but in reality it is irregular in shape
- When a subscriber moves to another cell, the antenna of the new cell takes over the signal transmission
- In heavy traffic zones cells are smaller, while in isolated zones cells are larger

5. What is Cluster?

A cluster is a group of adjacent cells, usually 7 cells



5. What are the types of cells?

- Macro Cell
- Micro Cell
- Pico Cell

6. Define Macro Cell

- Their coverage is large (approx. 6 miles in diameter);
- It is used in remote areas,
- High-power transmitters and receivers are used

7. Define Micro Cell

Their coverage is small (half a mile in diameter)

It is used in urban zones;

Low-powered transmitters and receivers are used

8. Define Pico Cell

It covers areas such as building or a tunnel

9. What is meant by Handover?

Moving a call from one zone to another zone due to subscriber's mobility

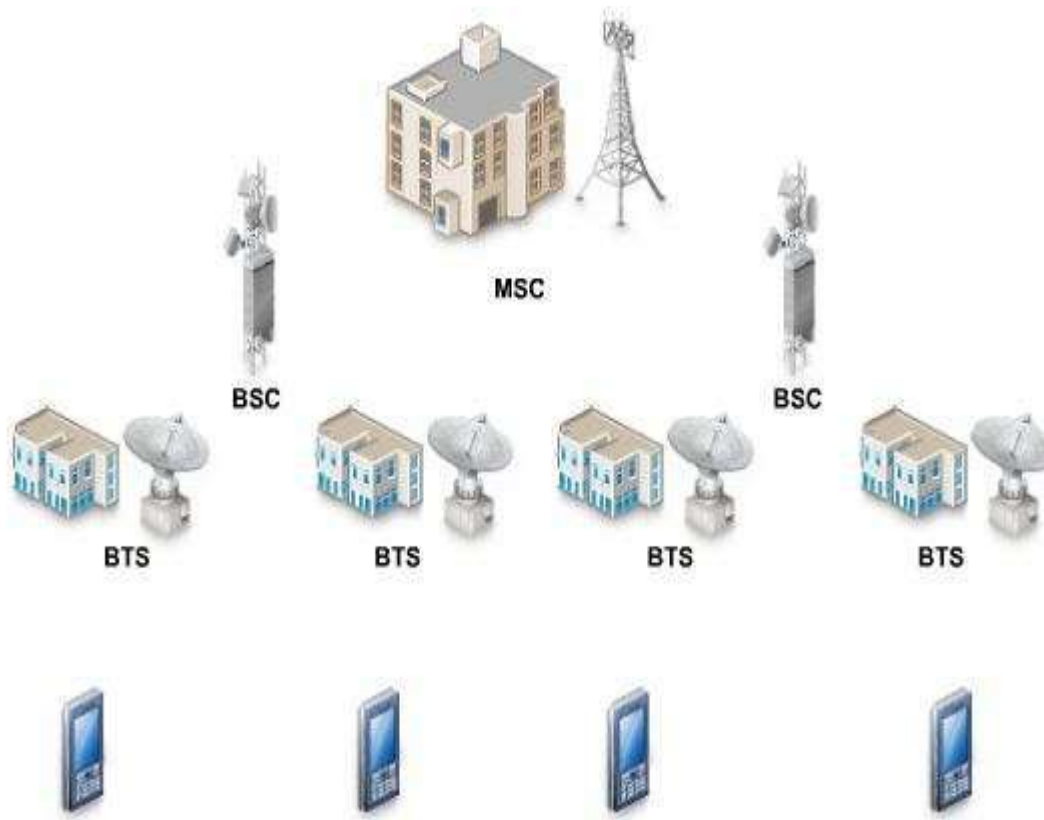
10. What is meant by Roaming?

Allowing the subscriber to send/receive calls outside the service provider's coverage area

11. What are the services provided by Cellular Networking?

- ▶ voice communication
- ▶ Short Messaging Service (SMS)
- ▶ Multimedia Messaging Service (MMS)
- ▶ Global Positioning System (GPS)
- ▶ Wireless Application Protocol (WAP) – to access the Internet

12. Draw the diagram of Cellular Network Components



BTS - Base Transceiver Station

BSC - Basic Station Controller

MSC - Mobile Switching Center

MSU - Mobile Subscriber Unit

13. What are the components of Cell Phone?

- ▶ **Radio Transceiver** – low power radio transmitter and receiver
- ▶ **Antenna**, usually located inside the phone
- ▶ **Control Circuitry** – formats the data sent to and from the BTS; controls signal transmission and reception
- ▶ **Man-Machine Interface** – consists from a keypad and a display; is managed by the control circuitry
- ▶ **Subscriber Identity Module (SIM)** – integrated circuit card that stores the identity information of subscriber
- ▶ **Battery** - the power unit of the phone

