UNIT I

WIRELESS COMMUNICATION

WHY WIRELESS COMMUNICATION

- Freedom from wires.
- No bunch of wires running from here and there.
- “Auto Magical” instantaneous communication without physical connection setup e.g.- Bluetooth, Wi-Fi.
- Global coverage
- Communication can reach where wiring is infeasible or costly
- E.g.- rural areas,buildings,battlefield,outerspace.
- Stay connected,flexiblity to connect multiple devices.

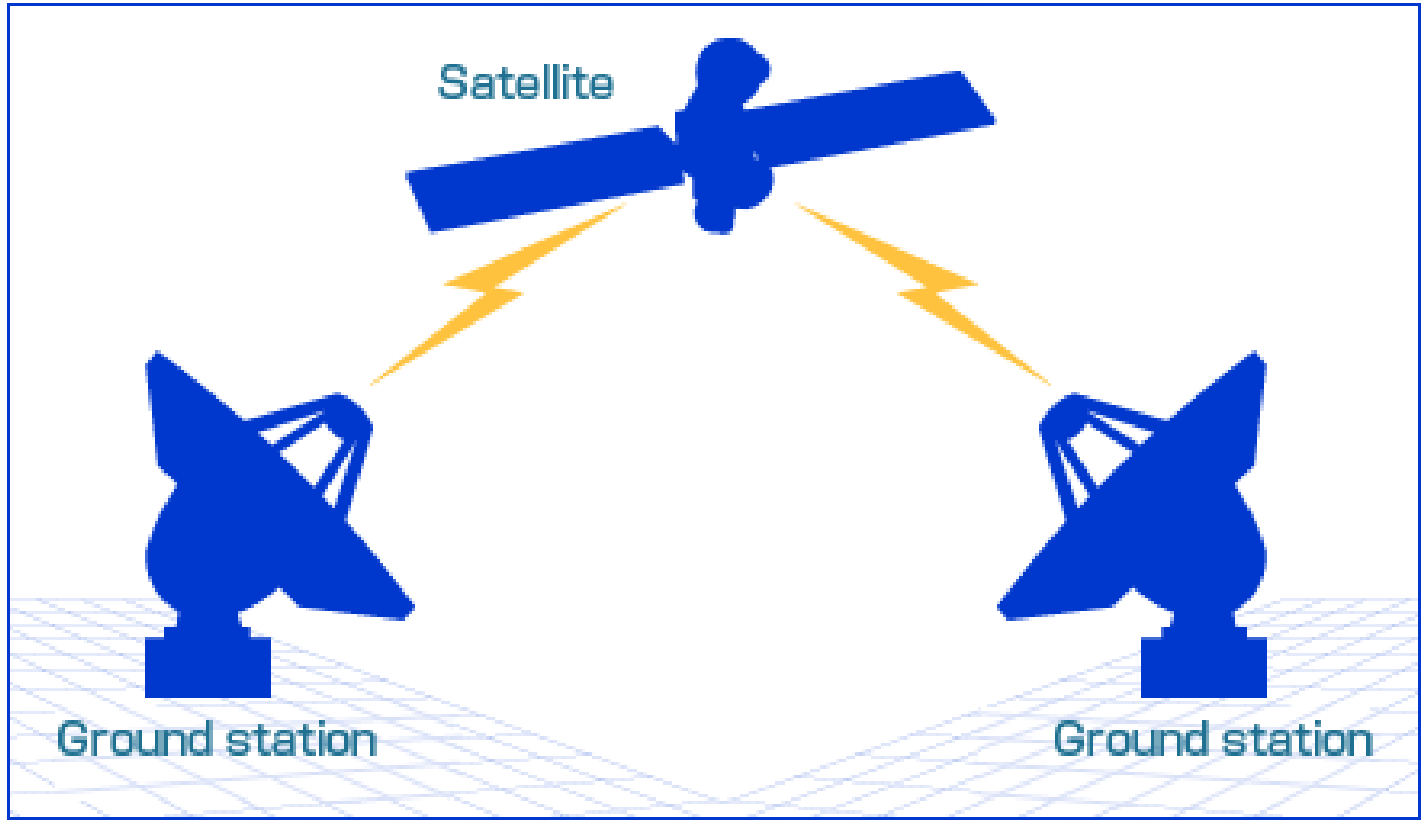
WHAT IS WIRELESS COMMUNICATION

- Transmitting/receiving voice and data using electromagnetic waves in open space.
- The information from sender to receiver is carried over a well defined channel.
- Each channel has a fixed frequency bandwidth & capacity(bit rate).
- Different channels can be used to transmit information in parallel and independently.

TYPICAL FREQUENCIES

FM RADIO	88 MHZ
TV BROADCAST	200 MHZ
GSM PHONES	900 MHZ
GPS	1.2 GHZ
PCS PHONES	1.8 GHZ
BLUETOOTH	2.4 GHZ
Wi-Fi	2.4 GHZ

How communication takes place



TYPES OF WIRELESS COMMUNICATION

RADIO TRANSMISSION:- easily generated, Omni- directional , travel long distance , easily penetrates buildings.

- PROBLEMS:- frequency dependent , relatively low bandwidth for data communication , tightly licensed by government.

MICROWAVE TRANSMISSION:- widely used for long distance communication , relatively inexpensive.

- PROBLEMS:- don’t pass through buildings , weather and frequency dependent.

TYPES OF WIRELESS COMMUNICATION

INFRARED AND MILIMETER WAVES:-

Widely used for short range communication , unable to pass through solid objects , used for indoor wireless LANs , not for outdoors.

LIGHT WAVE TRANSMISSION:-

unguided optical signal such as laser , unidirectional , easy to install , no license required.

PROBLEMS:- unable to penetrate rain or thick fog , laser beam can be easily diverted by air.

Advantages and disadvantages

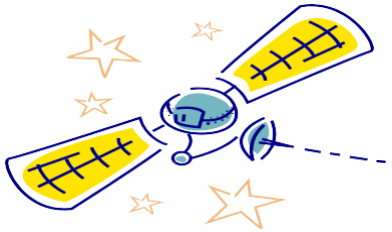
- Advantages:
  - Working professionals can work and access Internet anywhere and anytime without carrying cables or wires wherever they go. This also helps to complete the work anywhere on time and improves the productivity.
  - A wireless communication network is a solution in areas where cables are impossible to install (e.g. hazardous areas, long distances etc.)
  - Wireless networks are cheaper to install and maintain
- Disadvantages:
  - Has security vulnerabilities
  - High costs for setting the infrastructure
  - Unlike wired communication, wireless communication is influenced by physical obstructions, climatic conditions, interference from other wireless devices

CURRENT WIRELESS SYSTEMS

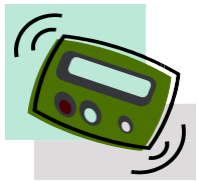
- CELLULAR SYSTEM

- WIRELESS LANs

- SATELLITE SYSTEM



- PAGING SYSTEM

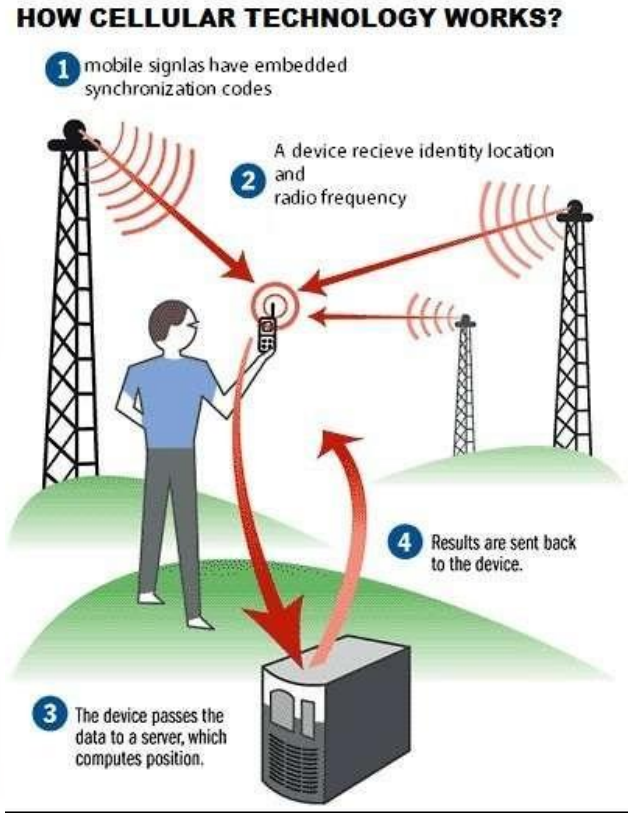


- PANs(BLUETOOTH)

What is cellular system

Definition

Wireless communication technology in which several small exchanges (called cells) equipped with low-power radio antennas (strategically located over a wide geographical area) are interconnected through a central exchange. As a receiver (cell phone) moves from one place to the next, its identity, location, and radio frequency is handed-over by one cell to another without interrupting a call.



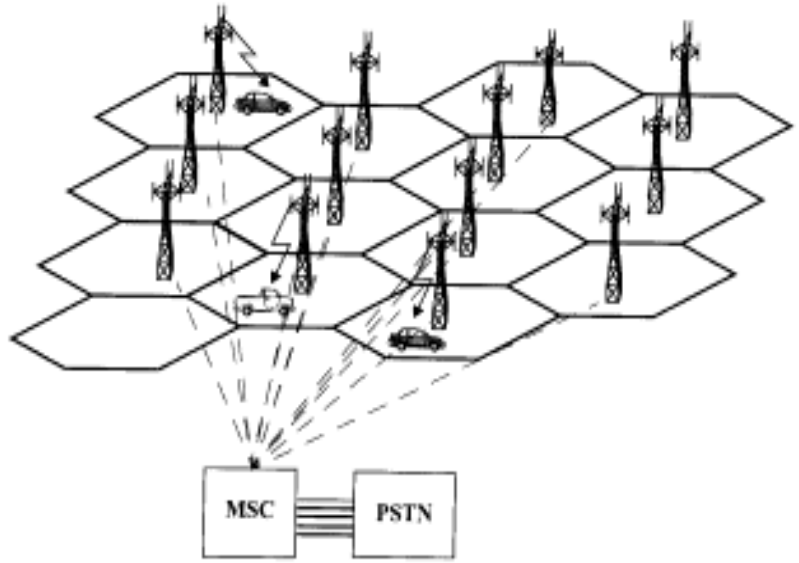
cellular system

Communication between the base station and mobiles is defined by the standard common air interface (CAI)

- Forward voice channel (FVC): voice transmission from base station to mobile
- Reverse voice channel (RVC): voice transmission from mobile to base station
- Forward control channels (FCC): initiating mobile call from base station to mobile
- Reverse control channel (RCC): initiating mobile call from mobile to base station

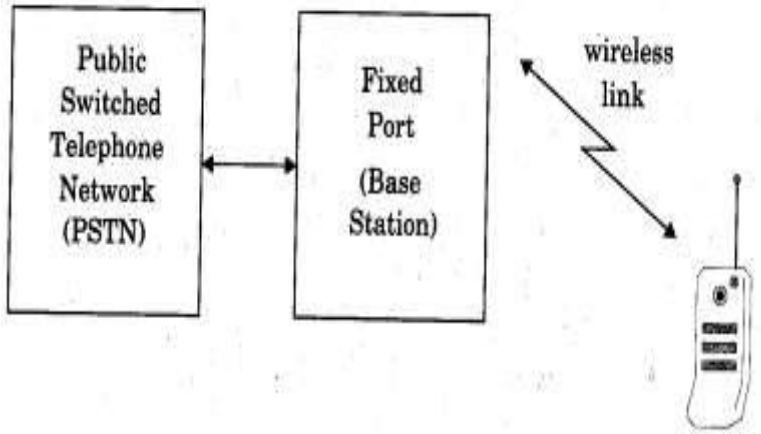
Cellular Telephone Systems

- Provide connection to the PSTN for any user location within the radio range of the system.
- Characteristic
  - Large number of users
  - Large Geographic area
  - Limited frequency spectrum
  - Reuse of the radio frequency by the concept of“cell”.
- Basic cellular system: mobile stations, base stations, and mobile switching center.



Cordless Telephone System

- Cordless telephone systems are full duplex communication systems.
- First generation cordless phone
  - in-home use
  - communication to dedicated base unit
  - few tens of meters
- Second generation cordless phone
  - outdoor
  - combine with paging system
  - few hundred meters per station



Evolution of Mobile radio Communication

1934 - Police Radio uses conventional AM mobile communication system.

1935 - Edwin Armstrong demonstrate FM

1946 - First public mobile telephone service - push-to-talk

1960 - Improved Mobile Telephone Service, IMTS - full duplex

1960 - Bell Lab introduce the concept of Cellular mobile system

1968 - AT&T propose the concept of Cellular mobile system to FCC.

1976 - Bell Mobile Phone service, poor service due to call blocking

1983 - Advanced Mobile Phone System (AMPS), FDMA, FM

1991 - Global System for Mobile (GSM), TDMA, GMSK

1991 - U.S. Digital Cellular (USDC) IS-54, TDMA, DQPSK

1993 - IS-95, CDMA, QPSK, BPSK

Example of Mobile Radio Systems

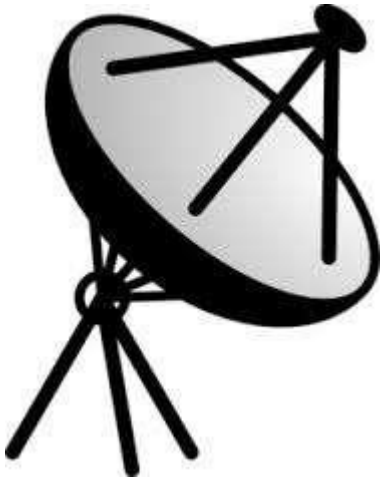
- Examples
  - Cordless phone
  - Remote controller
  - Hand-held walkie-talkies
  - Pagers
  - Cellular telephone
  - Wireless LAN
- Mobile - any radio terminal that could be moves during operation
- Portable - hand-held and used at walking speed
- Subscriber - mobile or portable user

Wireless Local Area Network(WLAN)

- WLAN connect local computers
- Range (100 m) confined region
- Break data into packets
- Channel access is shared
- Backbone internet provides best service
- Poor performance in some application like videos
- Low mobility

Satellite system

- Global coverage
- Optimized for good transmission
- Expensive base stations.
- Voice and data transmission
- Telecommunication application
- GPS , global telephone connection
- TV broadcasting , military , weather broadcasting

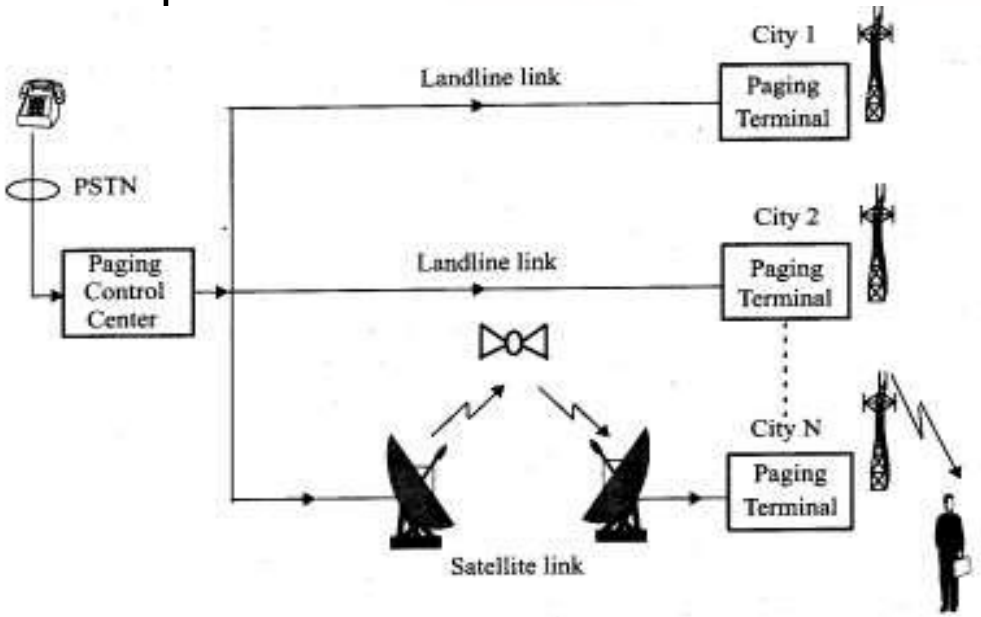


Paging system

- Broad coverage for short messages
- Message broadcast from all base stations
- Simple terminals
- Optimized for one way transmission
- Answer back hard
- Overtaken by cellular
- **Pager system**

Paging Systems

- Conventional paging system send brief messages to a subscriber
- Modern paging system: news headline, stock quotations, faxes etc.
- Simultaneously broadcast paging message from each base station.
- Large transmission power to cover wide area.



Thank You