



## Wireless Communication

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**Abstract**— *In the recent years, the various engineers research, that the most of people depends upon the modern technology, which is mobile phones, internet, laptops etc. that by the field of wireless and mobile communication has reached on the top of all the communications. Most common wireless technologies used Radio. Wireless communication is a transfer of information over a distance without use wires. It is also used wireless remote control, wireless energy transfer etc.*

**Keywords** -*Wireless, Communication, Wimax, Transmission, Wifi, Systems*

### I. INTRODUCTION

Wireless communication is a modern technology. It plays the important role in the field of communication. It is the transformation of any type of information between two or more point without wire connection and any other mode which connects the two points with any wire. In 1946 the first public mobile telephone are introduced in five American cities. In 1947 the first microwave system consisting of seven towers operational[4]. In 1958 a new era in wireless communications was initiated with the launch of the SCORE (Signal Communication by Orbital Relay Equipment). In 1981 the first analog cellular system Nordic Mobile Telephone was introduced and the Advanced Mobile Phone Service in North America in 1983. In first digital cellular system Global System for Mobile are introduced in 1988 into Europe.

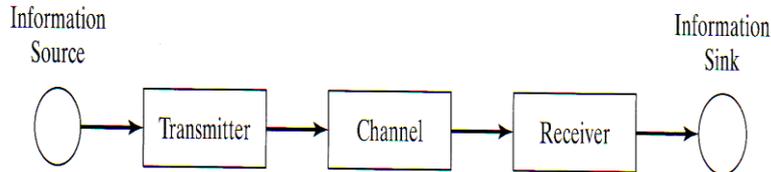


Figure1: Block Diagram of Wireless Communication

#### Transmitter:

- In wireless system
  - Transmitter shape the signal for efficient use of transmission medium resources.
  - Due to the power limitation, transmitter must use robust and power efficient modulation techniques.
  - As the medium is shared with other users, the design should minimize the interference.

#### Channel:

- In wireless system, the channel impairments include:
  - Channel distortion in form of multipath.
  - Time-varying nature
  - Receiver noise

#### Receiver

- In wireless system:
  - Estimation of the time-varying nature of the channel is necessary for implementing compensation techniques.
  - Error-correction technique to improve the reliability.
  - Maintain synchronization.

### II. DIRECTION OF TRANSMISSION

- Simplex Transmission:** Simplex transmission occurs in only one direction, from device to another. A broadcast radio station is an example of simplex transmission: the signal goes from the radio transmitter to the listener's radio, but the listener has no way of communicating back to the station using the same radio signal[8]. Simplex is rarely used in wireless communication today except for broadcast radio and television.
- Half-duplex Transmission:** Half-duplex Transmission sends data in both directions, but only in one way at a time. Half-duplex Transmission is used in consumer devices such as citizens band radios or walkie-talkie. Both sender and receiver can receive information but only one at a time.

- c) *Full-duplex Transmission:* Full-duplex Transmission sends data in both directions simultaneously. A telephone system is an example of Full-duplex Transmission. Both sender & receiver can speak at the same time and they are able to hear each other. Most modern wireless systems such as cellular telephones use the Full-duplex Transmission.

### III. TYPES OF WIRELESS COMMUNICATIONS

The following are the considered types of wireless communications:

a) *Cellular Systems (1G, 2G, 2.5G (GPRS), 3G, B3G):*- 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 phones) moves from one place to the next, its identify, location and radio frequency is handed over by one cell to another without interrupting a call.

b) *Satellite Systems:*- The information to be transmitted from a mobile user should be correctly received by a satellite and forwarded to one of the earth stations. Satellites are used for a large number of purposes[2]. Common types include military and civilian Earth observation satellites,

#### Application Areas of Satellite System

Traditionally

- Meteorological satellites
- Radio and TV broadcast satellites
- Military satellites
- Satellites for navigation and localization (e.g GPS)

Telecommunications

- Global telephone connections
- Backbone for global networks
- Connections for communication in remote places
- Global mobile communication

c) *Paging Systems:*-

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

Paging System Coverage Area

- 2 to 5 km
- Within individual buildings
- Worldwide coverage

d) *Cordless Phone:* - The handset communicates with a base station connected to a fixed telephone line. The range is limited usually to the same building or some short distance from the base station[7]. The base station attaches to the telephone network the same way a corded telephone does. 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

e) *Wireless Local Area Networks (WLANs)*

- Suitable for local short-distance networking.
- Compatible with existing LANs.
- WLANs use unlicensed radio frequency.
- WLAN is already affordable and popular
- Used widely in airports, railway stations, hotels, business parks and office buildings Integrating to laptops and PDA devices

**f) Bluetooth:-** Bluetooth use a radio technology called frequency-hopping spread spectrum which chops up the data being send and transmits chunks of it on up to 79 bands of 1MHz width in the range 2402-2480 MHz. Bluetooth is an open wireless technology standard for exchanging data over short distance (using short length radio waves) from fixed and mobile devices, creating personal area network (PANs) with high level of security. It is used for short-range connections between desktop and laptop computers, PDAs (like the Palm Pilot or Handspring Visor), digital cameras, scanners, cellular phones, and printers.

**g) Infrared:-** infrared light is electromagnetic radiation with the wavelength between 0.7 and 300 micrometers, which equates to a frequency range between approximately 1 and 430 THz. IR wavelengths are longer than that of visible light, shorter than THz radiations.



Figure2: Infrared Communication

#### **Applications**

- Infrared filters
- Night vision
- Tracking
- Art history
- Photobiomodulation

**h) WiMAX:-** While over-the-air data is fast becoming the realm of cellular providers, dedicated wireless broadband systems also exist, offering fast Web surfing without connecting to cable or DSL. One well-known example of wireless broadband is WiMAX, offered by providers such as Clear or Skyriver[9]. Although WiMAX can potentially deliver data rates of more than 30 megabits per second, providers offer average data rates of 6 Mbps and often deliver less, making the service significantly slower than hard-wired broadband. The actual data rates available to someone using WiMAX can vary widely with their distance from the transmitter. WiMAX is also known as one version of 4G wireless and has been available in phones as Sprint's 4G technology[1]. However, the company has been building out a network using LTE(LONG TERM EVOLUTION), the 4G technology used by AT&T, Verizon and T-Mobile.

**g) Wi Fi:-** The term Wi Fi suggest wireless fidelity, resembling the long established audio-equipment classification term high fidelity of high Hi Fi.even the Wi Fi alliance itself has often used the phrase wireless fidelity in its press release and documents, the term also appear in white paper on Wi Fi from ITAA.

#### **Applications**

- Internet access
- Direct computer to computer communication
- Future directions

Various standards are use in WiFi

- IEEE802.11
- IEEE802.11a
- IEEE802.11b
- IEEE802.11g
- IEEE802.11n

#### **IV. BENEFITS OF WIRELESS TECHNOLOGY**

- a) *Increased efficiency* – with increased efficiency one can transfer bulk of data within spurs of moment.
- b) *You are rarely out of touch* - you don't need to carry cables or adaptors in order to access office networks.
- c) *Greater flexibility and mobility for users* - office-based wireless workers can be networked without sitting at dedicated PCs.
- d) *Reduced costs* - relative to 'wired', wireless networks are, in most cases, cheaper to install and maintain.
- e) *Less cumbersome*: Wireless technology is easy to use as it does not need any cables and wires.
- f) *More user supported* – cable device have limited slots whereas wireless does not.
- g) *Reliability*: network cables failure may be the most common source of network problems. Moisture from a leak during a thunderstorm can erode metallic conductors. Using wireless technology eliminates this type of cable failure and increased the reliability of network.

#### **V. LIMITATION OF THE WIRELESS COMMUNICATION**

Wireless communication is a form of communication that is transmitted by wireless systems. The Internet and cell phones are examples of this type of system. There are many advantages to this form of communication, but there are also some major disadvantages[5]. These disadvantages are signal interference, health hazards, and security issues. Signals from other electronics can disrupt wireless communication. Wireless devices give off low levels of radiation. Over time this radiation is known to cause health issues. Security issues occur when wireless devices are hacked.

#### **VI. CHARACTERISTICS OF WIRELESS COMMUNICATION**

- Communication via wireless means.
- Reduced complexity
- Advanced technology
- Uses electromagnetic waves to transfer data
- Easy to handle

#### **VII. WIRELESS TECHNOLOGY COMMUNICATION APPLICATIONS**

- *Communication*: It is used to transfer information from one geographical position to another
- *Industrial Application*: Wireless communications use in industries in control the automotive assembly plants because machines need to be monitored and record or download the status of equipments[3]. Wireless networks can solve these problems. Remote sensors called MOTES can connect to WLAN, then collect data and transmits it to a central location.
- *Home*: Several large computer manufactures are introducing specialized media PCs that enable audio & videos for entertainment and education. It is also used for downloading purposes. These are portable devices and can be carrying anywhere. Wireless modems are used nowadays which makes a user free from wires.
- *Education*: Wireless technology is an ideal application for colleges and schools. An instructor can create a classroom presentation on notebook computer in his home, school & office and carry that computer right into the classroom. He does not have to plug and unplug the cable to attach to the campus networks.
- *Health care*: Administering medication in a hospital setting is a major problem area for health care industry. Wireless point-of-care computer system allows the medical staff to access and update patient records immediately. Many hospitals are using notebook computers on mobile carts or handheld PDAs with bar code scanner and a wireless connection. The system immediately verifies that medication is being administrated to the correct patient in the correct dosages, which eliminates potential error and documentations (patient data) inefficiencies.
- *Military*: The US military has created a universal Handset, a 1.5 pound device that will be delivered to over 3000,000 soldiers. It allows military personnel in the field to communicate through a variety of methods using wireless technologies.
- *Travel*: Because wireless technology creates mobility, the travel industry was one of the first to embrace wireless technology. Wireless global positing system (GPS) that tie in to emergency road side assistance services have become standard feature on many automobile sold today[6]. Satellite radio transmission of over 150talk station solves the problem of losing a station outside of its transmission range.

#### **VIII. CONCLUSION**

This paper provides the comparative study of the wireless communication. The various types of wireless communications are Cellular System, Satellite System, Infrared, Wifi, WiMAX, WLAN, Bluetooth etc. The paper covers general introduction about the wireless technology, various types of transmissions, systems available in the market along with the development in the technology right from the beginning. Topic mainly focuses on the applications and advantages of the technology that how it is more beneficial over others.

In near future research is going on 4G network which is also called LONG TERM EVOLUTION in which one can transfer data at the rate of 100 mbps. With such extremely high speed there will hardly be any waiting time for downloading and uploading. Nowadays, mobile phone chargers are also wireless. Over all wireless technology is still in growing age as data rate beyond 100 mbps is still not possible.

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