

Wireless Communication: The Current Network Technology

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Abstract: The fourth generation wireless communication (4G) systems have been deployed or are soon to be deployed in many countries. However, with an explosion of wireless mobile devices and services, there are still some challenges that cannot be accommodated even by 4G, such as the spectrum crises and high energy consumption. Wireless system designers have been facing the continuously increasing demand for high data rates and mobility required by new wireless applications and therefore have started research on fifth generation (5G) wireless systems that are expected to be deployed beyond 2020. The main purpose of 5G is planned to design the best wireless world that is free from limitations and hindrance of the previous generations. 5G is going to change the way most high bandwidth users access their mobile radio communication.

Keywords: Mobile, Wireless devices, Bandwidth, Radio communications, Mobility.

1. Introduction

Wireless communication is a type of data communication that is performed and delivered wirelessly. This is a broad term which incorporates all procedures and forms of connecting and communicating between two or more devices using a wireless signal through wireless communication technology and devices. Wireless communication generally works through a signal called electromagnetic signals that are broadcast by an enabled device within the physical environment. The sending device can be a sender or an intermediate between two devices with the ability to propagate wireless signals. Early wireless systems used crude though often quite powerful, spark gap transmitters and were suitable only for radiotelegraphy.

Why electromagnetic signal? Signals can be transmitted in the form of voltage or current through wires, radio emissions through the air or as light through optical fibres. Transmitted signals can be regarded as electromagnetic waves in communication systems. An electromagnetic wave is a disturbance in the electromagnetic field. This field exists everywhere, and disturbances in this field exist around the presence of electricity or magnetism. If the electromagnetic field is like water in a lake then electromagnetic waves are like ripples in the water. An electromagnetic wave is created when there is a disturbance in the electromagnetic field. A disturbance like this can be created when you do something as simple as briefly touch both ends of a wire to the terminals of a

battery. This allows an electric current to flow through the wire, which in turn creates a weak electromagnetic wave which expands outward in all directions. The wave created in our example would not travel far and would not contain any information. If it were intercepted by a radio transmitter, it would just sound like static. But it's actually pretty easy to create an electromagnetic wave, and it's not much harder to use them to send information.

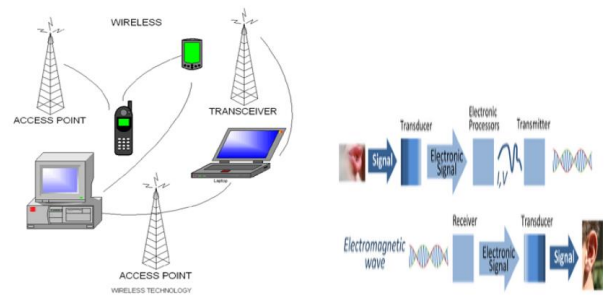


Fig. 1. Electromagnetic signal

2. Types of wireless networks

A. Radio communications

Radio communication was one of the first wireless technology developed and it is still in use. The portable multi-channel radios allow the user to communicate over short distances whereas citizen band and maritime radios provide communication services over long distances for truckers and sailors. A radio communication system may send information only one way. Radio communication is the transmission of signals by modulation of electromagnetic waves with frequencies below those of visible light. Electromagnetic radiation travels by means of oscillating electromagnetic fields that pass through the air and the vacuum of space. Information is carried by systematically changing (modulating) some property of the radiated waves such as amplitude, frequency, or phase.

B. Cellular communications

A cellular network uses encrypted radio links, modulated to allow many users to communicate across the single frequency band. As the individual handsets lack significant broadcasting power, the system depends on a network of cellular towers

which are capable of triangulating the source of any signal and handing reception duties off to the most suitable antenna. The data transmission over cellular networks is possible with modern 4G systems capable of speeds reaching that of wired DSL. Cellular companies charge their customers by a minute of their voice and by the kilobytes for data.

C. Satellite Communications

Satellite communication is a wireless technology having significant importance across the globe. They have found widespread use in specialized situations. The devices using satellite technology to communicate directly with the orbiting satellite through radio signals. This allows users to stay connected virtually from anywhere on the earth. Portable satellite phones and modems have powerful broadcast feature and reception hardware than the cellular devices due to the increased range.

D. Wi-Fi communications

Wi-Fi is a low-cost wireless communication technology. A Wi-Fi setup consists of a wireless router which serves a communication hub, linking portable device with an internet connection. This network facilitates connection of many devices depending on the router configuration. These networks are limited in range due to the low power transmission, allowing the user to connect only in the close proximity. This network facilitates connection of many devices depending on the router configuration. These networks are limited in range due to the low power transmission, allowing the user to connect only in the close proximity.

3. Applications

A. Mobile telephones

One of the best-known examples of wireless technology is the mobile phone, also known as a cellular phone, with more than 6.6 billion mobile cellular subscriptions worldwide as of the end of 2010. These wireless phones use radio waves from signal-transmission towers to enable their users to make phone calls from many locations worldwide. They can be used within range of the mobile telephone site used to house the equipment required to transmit and receive the radio signals from these instruments.

B. Peripherals

Periphery devices in computing can also be connected wirelessly as part of a Wi-Fi network or directly by optical infrared, Bluetooth or Wireless USB. Originally these units used bulky, highly local transceivers to mediate between a computer and a keyboard and mouse; however, more recent generations have used small, higher-quality devices. A battery powers computer interface devices such as a keyboard or mouse and send signals to a receiver through a USB port by the way of an optical or radio frequency (RF) receiver. A RF design makes it possible to expand the range of efficient use, usually up to 10 feet but distance, physical obstacles, competing signals, and

even human bodies can all degrade the signal quality.

C. Energy transfer

Wireless energy transfer is a process whereby electrical energy is transmitted from a power source to an electrical load (Computer Load) that does not have a built-in power source, without the use of interconnecting wires. There are two different fundamental methods for wireless energy transfer. They can be transferred using either far-field methods that involve beaming power/lasers, radio or microwave transmissions or near-field using induction.

D. Medical technologies

New wireless technologies, such as mobile body area networks (MBAN), have the capability to monitor blood pressure, heart rate, oxygen level and body temperature. The MBAN works by sending low powered wireless signals to receivers that feed into nursing stations or monitoring sites. This technology helps with the intentional and unintentional risk of infection or disconnection that arise from wired connections.



Fig. 2. Wireless technologies

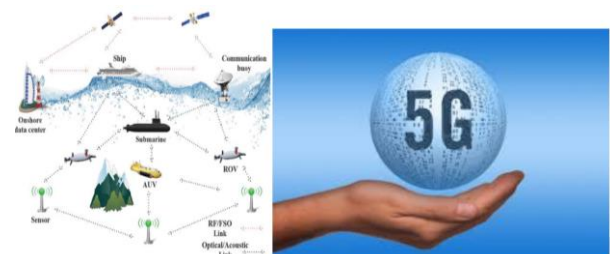


Fig. 3. Communication

E. Advantages

- As wireless frequency penetrates the walls, wireless networks are easy to install anywhere.
- They are easy to install and easy to maintain.
- Flexibility is one of the greatest advantage of wireless networks.
- Any data or information can be transmitted faster and with a high speed.
- Maintenance and installation cost is very less as compared to other networks.
- Internet can be accessed anywhere wirelessly.
- High amount user access wireless network.

- Very helpful for workers, doctors working in remote areas as they can be in touch with medical centers.

F. Disadvantages

- Wireless communication networks require careful radio frequency planning at the beginning of installation.
- Wireless communication is subject to interference. There are various receiver techniques and modulation techniques which makes wireless system robust against any kind of interference.
- An unauthorized person can easily capture the wireless signals which spread through the air.
- It is very important to secure the wireless network so that the information cannot be misused by any third party.
- When a person uses crackers to access the password of the wireless network it is termed as malicious network.
- Maintenance cost Carrier & Industrial setups.
- Not as fast as wired communication.
- File-sharing transfer speeds are normally slower with wireless networks than they are with cabled.

4. Future of wireless communications

A. Wireless local loop

Wireless local loops using radio transmission in the VHF and UHF bands have been employed in isolated areas for some time, because they can transmit signals for several kilometers without the need for stringing cable.

B. Third generation PCS

Cellular radio and PCS have been very successful, but they are not the ultimate in wireless personal communication. Manufacturers, service providers and standard bodies were already working on improvements when the first systems went into operation.

C. Requirements for the third generation

Improved data communication: All the digital personal communication systems we have looked at so far were designed mainly for voice communications. The emphasis was on keeping bandwidth requirements low, along with minimizing power requirements for the mobile unit.

Greater capacity: For some time it has seemed obvious that the next generation of wireless communication must incorporate the possibility of using much higher data rates when needed. Adaptability to mobile, pedestrian and fixed operation: The second generation systems were designed for portable phones and incorporate more extensive use of micro cells and pico cells. For third generation it is expected that in addition to vehicle and pedestrian use some people will use their wireless phones from fixed locations such as home or office. No doubt wireless network is an amazing wireless technology which has totally changes the means of communication. There is no business, industry, project which can be progressed without the needs of wireless networks. Now a wireless network has become the significant option of any business because of its salient features like speed, security, mobility and Wi-Fi hotspot. Voice application like VOIP (Voice over Internet Protocol) can be only possible because of wireless network. Now wireless network has become the essential point of any network to make their customer more satisfied.

5. Conclusion

Wireless Technology continues to develop very quickly down to the corner of the world, but not with strong will and hard work, information technology, chaired by the computer becomes a linear phenomenon with the development progress of the age. The development of information technology is developing very rapidly, this development cannot be separated from the ability of computers to perform data communication. Wireless communications globally is something that people can expect as technology advances. With more research and experiments conducted, the problems associated with wireless communications can be reduced and make it a more significant part of the world. Wireless technologies often tend to increase convenience and decrease 'safety'. Wired technologies are mostly used whenever reliability is of major importance.

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