An Introduction to Wireless Communication

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***Abstract*. Wireless communications is becoming more essential than ever in today's modern society and access to information and knowledge will be of crucial differences between success and failure. We have already begun to see clear tendencies that the wireless communications is taking over more and more and makes by no means difference between different application areas. Thus are areas like current interest, quality and security in evident focus.**

I. INTRODUCTION

Wireless communication is the transfer of information between two or more points that are not connected by an electrical conductor. The most common wireless technologies use radio. With radio waves distances can be short, such as a few meters for television or as far as thousands or even millions of kilo meters for deep-space radio communications. It encompasses various types of fixed, mobile, and portable applications, including two-way radios, cellular telephones, personal digital assistants (PDAs), and wireless networking. Other examples of applications of radio wireless technology include GPS units, garage door openers, wireless computer mice, keyboards and headsets, headphones, radio receivers, satellite television, broadcast television and cordless telephones. Somewhat less common methods of achieving wireless communications includes the use of other electromagnetic wireless technologies, such as light, magnetic, or electric fields or the use of sound. Wireless operations permit services, such as long-range communications, that are impossible or impractical to implement with the use of wires. The term is commonly used in the telecommunications industry to refer to telecommunications systems (e.g. radio transmitters and receivers, remote controls etc.) which use some form of energy (e.g. radio waves, acoustic energy, etc.) to transfer information without the use of wires. Information is transferred in this manner over both short and long distances.

II. HISTORY

The first wireless networks were developed in the Pre-industrial age. These systems transmitted information over line-of-sight distances (later extended by telescopes) using smoke signals, torch signalling , flashing mirrors, signal flares, or semaphore flags. An elaborate set of signal combinations was developed to convey complex messages with these rudimentary signals. Observation stations were built on hilltops and along roads to relay these messages over large distances. These early communication networks were replaced first by the telegraph network (invented by Samuel Morse in 1838) and later by the telephone. In 1895, a few decades after the telephone was invented, Marconi demonstrated the first radio transmission from the Isle of Wight to a tugboat 18 miles away, and radio communications was born. The first network based on packet radio, ALOHANET, was developed at the University of Hawaii in 1971. This network enabled computer sites at seven campuses spread out over four islands to communicate with a central computer on Oahu via radio transmission. The network architecture used a star topology with the central computer at its hub. The U.S. military was extremely interested in the combination of packet data and broadcast radio inherent to ALOHANET. Throughout the 1970's and early 1980's the Defense Advanced Research Projects Agency (DARPA) invested significant resources to develop networks using packet radios for tactical communications in the battle field. Packet radio networks also found commercial application in supporting wide-area wireless data services. These services, first introduced in the early 1990's, enable wireless data access (including email, file transfer, and web browsing) at fairly low speeds, on the order of 20 Kbps. A strong market for these wide-area wireless data services never really materialized, due mainly to their low data rates, high cost, and lack of ―killer applications‖. These services mostly disappeared in the 1990s, supplanted by the wireless data capabilities of cellular telephones and wireless local area networks (LANs). The introduction of wired Ethernet technology in the 1970's steered many commercial companies away from radio-based networking.

III. MODES OF WIRELESS COMMUNICATION

Wireless communications can be via:

1. Radio communication,

2. Microwave communication, for example long-range line-of-sight via highly directional antennas, or short-range communication,

3. Light, visible and infrared (IR) for example consumer IR devices such as remote controls or via Infrared Data Association (IrDA).

4. Sonic, especially ultrasonic short range communication

5. Electromagnetic induction short range communication and power. Applications may involve point-to-point communication, point-to-multipoint communication, broadcasting, cellular networks and other wireless networks.

6. Wi-Fi technology.

IV. ADVANTAGES & DISADVANTAGES

Advantages: Wireless communication has the following advantages:

i. Communication has enhanced to convey the information quickly to the consumers.

ii. 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.

iii. Doctors, workers and other professionals working in remote areas can be in touch with medical centres through wireless communication.

iv. Urgent situation can be alerted through wireless communication. The affected regions can be provided help and support with the help of these alerts through wireless communication.

v. Wireless networks are cheaper to install and maintain.

Disadvantages

The growth of wireless network has enabled us to use personal devices anywhere and anytime. This has helped mankind to improve in every field of life but this has led many threats as well.

Wireless network has led to many security threats to mankind. It is very easy for the hackers to grab the wireless signals that are spread in the air. It is very important to secure the wireless network so that the information cannot be exploited by the unauthorized users. This also increases the risk to lose information. Strong security protocols must be created to secure the wireless signals like WPA and WPA2. Another way to secure the wireless network is to have wireless intrusion prevention system.

V. APPLICATIONS

Applications of wireless technology

Mobile telephones

One of the best-known examples of wireless technology is the mobile phone, also known as a cellular phone, with more than 4.6 billion mobile cellular subscriptions worldwide as of the end of 2010. These wireless phones use radio waves 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.

Wireless data communications

Wireless data communications are an essential component of mobile computing. The various available technologies differ in local availability, coverage range and performance, and in some circumstances, users must be able to employ multiple connection types and switch between them. To simplify the experience for the user, connection manager software can be used, or a mobile VPN deployed to handle the multiple connections as a secure, single virtual network. Supporting technologies include:

Wi-Fi is a wireless local area network that enables portable computing devices to connect easily to the Internet. Standardized as IEEE 802.11 a,b,g,n, Wi-Fi approaches speeds of some types of wired Ethernet. Wi-Fi has become the de facto standard for access in private homes, within offices, and at public hotspots. Some businesses charge customers a monthly fee for service, while others have begun offering it for free in an effort to increase the sales of their goods.

Cellular data service offers coverage within a range of 10-15 miles from the nearest cell site. Speeds have increased as technologies have evolved, from earlier technologies such as GSM, CDMA and GPRS, to 3G networks such as W-CDMA, EDGE or CDMA2000.

Mobile Satellite Communications may be used where other wireless connections are unavailable, such as in largely rural areas or remote locations. Satellite communications are especially important for transportation, aviation, maritime and military use.

Wireless Sensor Networks are responsible for sensing noise, interference, and activity in data collection networks. This allows us to detect relevant quantities, monitor and collect data, formulate meaningful user displays, and to perform decision-making functions

Wireless energy transfer

Wireless energy transfer is a process whereby electrical energy is transmitted from a power source to an electrical 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 beam power/lasers, radio or microwave transmissions or near-field using induction. Both methods utilize electromagnetism and magnetic fields

Wireless Medical Technologies

New technologies such as mobile body area networks (MBAN) the capability to monitor blood pressure, heart rate, oxygen level and body temperature, all with wireless technologies. 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.

Computer interface devices

Answering the call of customers frustrated with cord clutter, many[who?] manufacturers of computer peripherals turned to wireless technology to satisfy their consumer base[citation needed]. Originally these units used bulky, highly limited transceivers to mediate between a computer and a keyboard and mouse; however, more recent generations have used small, high-quality devices, some even incorporating Bluetooth. These systems have become so ubiquitous that some users have begun complaining about a lack of wired peripherals.[who?] Wireless devices tend to have a slightly slower response time than their wired counterparts; however, the gap is decreasing. Computer interface devices such as a keyboard or mouse are powered by a battery and send signals to a receiver through a USB port by way of a radio frequency (RF) receiver. The RF design makes it possible for signals to be transmitted wirelessly and expands the range of effective use, usually up to 10 feet. Distance, physical obstacles, competing signals, and even human bodies can all degrade the signal quality Concerns about the security of wireless keyboards arose at the end of 2007, when it was revealed that Microsoft's implementation of encryption in some of its 27 MHz models was highly insecure.

VI. CONCLUSION

Wireless technology is certainly able to improve our life quality. Especially since wireless communication systems are becoming cheaper, easier to implement and smaller every day, so more and more devices can profit from it. Wireless solutions can be time saving, easier to use, and more mobile. Also, wireless conditioning monitoring reveals different applications not even realizable through a wired network. Still, the issues mentioned in this paper need to be taken into account every time a new wireless application is considered.

Only if we make responsible choices in replacing wired technology by its wireless alternative, we will be able to continue to improve our life quality, in the near as well as distant future. Especially high bandwidth technology, like digital television, should remain wired to limit RF radiation and spectrum fill-up. Also, critical communication technology, like medical devices, should remain wired where possible, or otherwise extensively secured. Finally, more research needs to be conducted about the long-term health effects of different levels and frequencies of RF exposure.

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