A

Seminar report

On

Wireless Communication

Submitted in partial fulfillment of the requirement for the award of degree
of Bachelor of Technology in Computer Science

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Preface

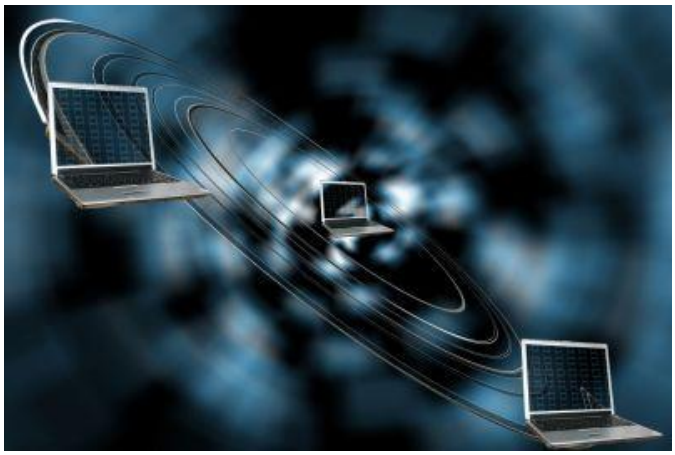
I have made this report file on the topic **Wireless Communication**; I have tried my best to elucidate all the relevant detail to the topic to be included in the report. While in the beginning I have tried to give a general view about this topic.

My efforts and wholehearted co-corporation of each and everyone has ended on a successful note. I express my sincere gratitude to ……..who assisting me throughout the preparation of this topic. I thank him for providing me the reinforcement, confidence and most importantly the track for the topic whenever I needed it.

Content

Introduction

Wireless communication is the transfer of information between two or more points that are not connected by an electrical conductor.



Wireless Communication

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 kilometers 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 include the use of other electromagnetic wireless technologies, such as light, magnetic, or electric fields or the use of sound.

History of Wireless Communication

If we ignore optics, which fascinated early scientists over two thousand years ago, one might argue that the long trail of innovations that have brought us to the fast, cheap, and (mostly) reliable wireless products and services of today in fact began with Benjamin Franklin and his famous kite.

It is very unlikely that Franklin actually conducted the experiment as it is often described, with keys tied to a kite string - had he done so, he might never have survived to sign the Declaration of Independence! But Franklin did, in 1747, propose a model of electricity that proved surprising correct. And at that point it was evident that electricity could in fact move through the air.

In 1819, the Danish physicist Hans Christian Oersted noted that a compass needle would move in the presence of an electric field, thus establishing the fundamental relationship between electricity and magnetism. We call the entire field *electromagnetics* to this day.

In 1831, Michael Faraday demonstrated electromagnetic induction and built the first direct-current generator. While this wasn't useful for wireless communications, it did provide a way to generate electricity.

The next big leap forward was the result of theoretical work by James Clerk Maxwell, the great Scottish physicist. He published "On a Dynamical Theory of the Electromagnetic Field" in 1865, and in 1873 "A Treatise on Electricity and Magnetism," which became what are known Maxwell's Equations.

These are a series of very difficult differential equations which describe the movement of electromagnetic waves through space. Remarkably, we use them to this day. I'm always amazed that someone working in a cold, damp building in Scotland, with little in the way of computational technology and probably nothing more than an oil lamp for light, devised something so fundamental and powerful that we still use it. Maxwell, by the way, had never seen a radio; they did not exist then, and he had no actual experience with radio waves themselves. But the theory he developed paved the way for the next set of critical inventions.

Building on Maxwell's work, Heinrich Hertz in 1887 invented the oscillator (an alternating-current generator) and created radio waves. By the way, this is the Hertz of *megahertz* and *gigahertz*, not the rental-car company. I should also note that Oersted, Faraday, and Maxwell all had units of physical measurement named in their honor as well.

Now, who exactly should get the credit for the radio is still a subject of debate. Many believe it was in fact Nikola Tesla who first sent information through the air. However, I've never seen evidence that Tesla really communicated something of value - he just moved energy between two points without wire, demonstrating electromagnetic induction. The credit for the radio itself belongs, I think, to Guglielmo Marconi, who in 1895 sent a radio telegraph transmission across the English Channel, and in 1901 a transmission across the Atlantic. Public use of radio began in 1907. By the way, no physical unit was named for Marconi, but he did win the Nobel Prize in 1909 - not bad for a self-taught inventor!

There have been so many great contributions since then, from Edwin Armstrong (who created FM radio, among others), to Lee De Forest (who invented the electron tube), and Andrew Viterbi (who came up with digital decoding and CDMA) - and so many more that we can't list them all here.

There are now more people working in wireless communications than at any other time in history. So as the computer industry suffers, to some degree, from the pains of maturity, wireless shows no such trend towards slowing down.

"If I have seen further it is by standing on ye shoulders of Giants," Isaac Newton wrote that in a famous letter of his to Robert Hooke, the great English scientist and inventor.

Today, after well over 200 years, we continue to build on the work of an amazing number of inspiring people who were fascinated with the concept of communication through the air. And the innovations, as regular readers of this column can attest, continue at a remarkable pace.

Types of Wireless Communication

Wi-Fi

Primarily associated with computer networking, Wi-Fi uses the IEEE 802.11 specification to create a wireless local-area network that may be secure, such as an office network, or public, such as a coffee shop. Usually a Wi-Fi network consists of a wired connection to the Internet, leading to a wireless router that transmits and receives data from individual devices, connecting them not only to the outside world but also to each other.

Wi-Fi range is generally wide enough for most homes or small offices, and for larger campuses or homes, range extenders may be placed strategically to extend the signal. Over time the Wi-Fi standard has evolved, with each new version faster than the last.

Current devices usually use the 802.11n or 802.11ac versions of the spec, but backwards compatibility ensures that an older laptop can still connect to a new Wi-Fi router. However, to see the fastest speeds, both your computer and the router must use the latest 802.11 version, so when you upgrade your personal computer, consider a router upgrade to match its speed.

Bluetooth

While both Wi-Fi and cellular networks enable connections to anywhere in the world, Bluetooth is much more local, with the stated purpose of "replacing the cables connecting devices," according to the official Bluetooth website. That's precisely what Bluetooth does; it connects iPods to car stereos, wireless keyboards and mice to laptops or cell phones to the ubiquitous hands-free earpieces.

Bluetooth uses a low-power signal with a maximum range of 50 feet, but with sufficient speed to enable transmission of high-fidelity music and streaming video. As with other wireless technologies, Bluetooth speed increases with each revision of its standard but requires up-to-date equipment at both ends to deliver the highest possible speed. Also, the latest Bluetooth revisions are capable of using maximum power only when it's required, preserving battery life.

NFC (Near Field Communication)

NFC is a short-range high frequency wireless communication technology that enables the exchange of data between devices over about a 10 cm distance.

NFC is an upgrade of the existing proximity card standard (RFID) that combines the interface of a smartcard and a reader into a single device. It allows users to seamlessly share content between digital devices, pay bills wirelessly or even use their cellphone as an electronic traveling ticket on existing contactless infrastructure already in use for public transportation.

The significant advantage of NFC over Bluetooth is the shorter set-up time. Instead of performing manual configurations to identify Bluetooth devices, the connection between two NFC devices is established at once (under a 1/10 second).

Due to its shorter range, NFC provides a higher degree of security than Bluetooth and makes NFC suitable for crowded areas where correlating a signal with its transmitting physical device (and by extension, its user) might otherwise prove impossible.

NFC can also work when one of the devices is not powered by a battery (e.g. on a phone that may be turned off, a contactless smart credit card, etc.).

LiFi

LiFi is a wireless optical networking technology that uses light-emitting diodes (LEDs) for data transmission.

LiFi is designed to use LED light bulbs similar to those currently in use in many energy-conscious homes and offices. However, LiFi bulbs are outfitted with a chip that modulates the light imperceptibly for optical data transmission. LiFi data is transmitted by the LED bulbs and received by photoreceptors.

LiFi's early developmental models were capable of 150 megabits-per-second (Mbps). Some commercial kits enabling that speed have been released. In the lab, with stronger LEDs and different technology, researchers have enabled 10 gigabits-per-second (Gbps), which is faster than 802.11ad.

Benefits of LiFi:

- Higher speeds than Wi-Fi.
- 10000 times the frequency spectrum of radio.
- More secure because data cannot be intercepted without a clear line of sight.
- Prevents piggybacking.
- Eliminates neighboring network interference.
- Unimpeded by radio interference.
- Does not create interference in sensitive electronics, making it better for use in environments like hospitals and aircraft.

By using LiFi in all the lights in and around a building, the technology could enable greater area of coverage than a single WiFi router. Drawbacks to the technology include the need for a clear line of sight, difficulties with mobility and the requirement that lights stay on for operation.

Applications of Wireless Communication

- **Broadcasting services**: including short wave, AM and FM radio as well as terrestrial television

- **Mobile communications of voice and data**: including maritime and aeronautical mobile for communications between ships, airplanes and land; land mobile for communications between a fixed base station and moving sites such as a taxi fleet and paging services, and mobile communications either between mobile users and a fixed network or between mobile users, such as mobile telephone services

- **Fixed Services**: either point to point or point to multipoint services

- **Satellite**: used for broadcasting, telecommunications and internet, particularly over long distances .

- **Amateur radio;**Professional LMR (Land Mobile Radio) and SMR (Specialized Mobile Radio) typically used by business, industrial and Public Safety entities
- Consumer Two Way Radio including FRS (Family Radio Service), GMRS (General Mobile Radio Service) and Citizens band ("CB") radios Consumer and professional Marine VHF radios.

- **Cellular telephones and pagers**: provide connectivity for portable and mobile applications, both personal and business.

- **Global Positioning System** (GPS): allows drivers of cars and trucks, captains of boats and ships, and pilots of aircraft to ascertain their location anywhere on earth.

- **Cordless computer peripherals**: the cordless mouse is a common example; keyboards and printers can also be linked to a computer via wireless.

- **Cordless telephone sets**: these are limited-range devices, not to be confused with cell phones.

- **Satellite television**: allows viewers in almost any location to select from hundreds of channels.

- **Wireless gaming**: new gaming consoles allow players to interact and play in the same game regardless of whether they are playing on different consoles. Players can chat, send text messages as well as record sound and send it to their friends.

- **Security systems**: Wireless technology may supplement or replace hard wired implementations in security systems for homes or office buildings.

- **Television remote control**: Modern televisions use wireless (generally infrared) remote control units. Now radio waves are also used.

- **Cellular telephony** (phones and modems): These instruments use radio waves to enable the operator to make phone calls from many locations world-wide. They can be used anywhere that there is a cellular telephone site to house the equipment that is required to transmit and receive the signal that is used to transfer both voice and data to and from these instruments.

- **Wi-Fi**: Wi-Fi (for wireless fidelity) is a wireless LAN technology that enables laptop PC's, PDA's, and other devices to connect easily to the internet. Technically known as IEEE 802.11 a,b,g,n, Wi-Fi is less expensive and nearing the speeds of standard Ethernet and other common wire-based LAN technologies

- **Wireless energy transfer**: Wireless energy transfer is a process whereby electrical energy is transmitted from a power source to an electrical load thatdoes not have a built-in power source, without the use of interconnecting wires.

Future Scope

By the year 2013, nearly one-third of the world's population will have access to high speed mobile networks, namely, 3G and 4G.

4G is the fourth generation in mobile communication networks and is aimed at fulfilling the ever-growing business and consumer needs of customers across Europe, North America and Asia. Mobile manufacturers will be gearing up to design and develop mobiles capable of supporting 4G technology.

Wireless communication will play a major role in the medical domain. Doctors will be able to monitor and diagnose patients who are thousands of miles away thanks to wireless communication.

The current generation of youngsters finds it difficult to believe that their elders used a phone tied to the wall for most of their lives. Similarly, the next generation will find it amusing that we once had to stick something up to our heads to talk.

Researchers have put forth the theory of embedded intelligence through implantation, where a simple thought is enough to wirelessly communicate with another individual anywhere in the world.

Advantages

Anywhere, Anytime Work

Through wireless communication, working professionals and mobile workers can work and access the Internet just about anywhere, anytime without the hassles of wires and network cables.

Enhanced Productivity

Workers, students, professionals and others need not be constrained by wired Internet connections or dial-up connectivity. Wireless Internet connectivity options ensures that work and assignments can be completed anywhere and enhance overall productivity of all concerned.

Remote Area Connectivity

Workers, doctors and other professionals working in remote-location hospitals and medical centers can keep in touch with anyone through wireless communication. Non-profit organization volunteers working in remote and underserved areas can stay connected to the outside world with the help of wireless communication.

On-Demand Entertainment Bonanza

For those unable to keep away from their daily soap operas, reality-programs, online TV shows and Internet surfing or download activities, wireless communication ensures an entertainment bonanza on--demand and anytime.

Emergency Alerts

Through wireless communication, many emergency situations and crisis situations can be addressed quickly. Help and other assistance can reach affected areas quickly through early alerts and warnings provided with the help of wireless communication.

Disadvantages

- Wireless communications are limited by the range of the transmitter
- Cost of wireless communication system and components are high
- When transmitting data, users must sometimes send smaller bits of data so the information moves more quickly. The size of the device that's accessing the information is also still an issue.
- Many applications need to be reconfigured if they are going to be used through wireless connections.
- Most client/server applications rely on a persistent connection, which is not the case with wireless.
- Since radio waves travel through the atmosphere they can be disturbed by electrical interferences (such as lightning) that cause static.

Conclusion

Wireless communication is the transfer of information over a distance without the use of electrical conductors or "wires". It encompasses various types of fixed, mobile, and portable two-way radios, cellular telephones, personal digital assistants (PDAs), and wireless networking.

Wireless communications begin with a message that is converted into an electronic signal by a device called a transmitter. The encoded electronic signal is then sent as a radio wave. Devices known as receivers decode or demodulate the radio waves and reproduce the original message over a speaker.

There are 4 types wireless communication; they are Infrared Wireless Transmission, Broadcast Radio, Microwave Radio, Communications Satellites.

Wireless communication is employed for a wide range of applications such as Broadcasting services, Mobile communications of voice and data, Fixed Services, Satellite, Cellular telephones and pagers, Global Positioning System , Cordless computer peripherals, Wireless gaming, Security systems, Wi-Fi, Wireless energy transfer.

Therefore wireless communication is advantageous over the wired communication as we can work without the hassles of wires and network cables and enhance overall productivity and also at a higher speed.

Reference

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