Wireless technologies

Project assignment 1 – Topic: wireless technologies

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Abstract

This report will review the rise of the wireless technologies and their impact in the world.

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1 Introduction

This report will introduce with wireless technologies – what are wireless technologies, different types of wireless technologies, advantages and disadvantages, how they work and how they improved until nowadays.

2 What are wireless technologies?

Wireless communication is among technology's biggest contributions to mankind. Wireless communication involves the transmission of information over a distance without help of wires, cables or any other forms of electrical conductors. The transmitted distance can be anywhere between a few meters (for example, a television's remote control) and thousands of kilometres (for example, radio communication). Wireless is a term used to describe telecommunications in which electromagnetic waves (rather than some form of wire) carry the signal over part or all of the communication path. Some monitoring devices, such as intrusion alarms, employ acoustic waves at frequencies above the range of human hearing; these are also sometimes classified as wireless. The first wireless transmitters went on the air in the early 20th century using radiotelegraphy (Morse code). Later, as modulation made it possible to transmit voices and music via wireless, the medium came to be called "radio." With the advent of television, fax, data communication, and the effective use of a larger portion of the spectrum, the term "wireless" has been resurrected.

3 Types of wireless technologies

In recent days, the wireless communication technology has become an integral part of several types of communication devices as it allows users to communicate even from remote areas. The devices used for wireless communication are cordless telephones, mobiles, GPS units, ZigBee technology, wireless computer parts, and satellite television, etc.

3.1. Radio

Open radio communication was one of the first wireless technologies to find widespread use, and it still serves a purpose today. Portable multichannel radios allow users to communicate over short distances, while citizen's band and maritime radios provide communication services for truckers and sailors. Ham radio enthusiasts share information and serve as emergency communication aids during disasters with their powerful amateur broadcasting equipment, and can even communicate digital data over the radio spectrum.

3.2. Cellular

Cellular networks use encrypted radio links, modulated to allow many different users to communicate across a single frequency band. Because individual handsets lack significant broadcasting power, the system relies on a network of cellular towers, capable of triangulating the source of any signal and handing reception duties off to the most suitable antenna. Data transmission over cellular networks is possible, with modern 3G systems capable of speeds approaching that of wired DSL or cable connections. Cellular providers typically meter their service, charging customers by the minute for voice and by the megabyte for data.

3.3. Satellite

Satellite communication is one of the wireless technologies, which is widely spread all over the world allowing users to stay connected virtually anywhere on the Earth. The Satellites used in this mode of communication, communicate directly with the orbiting satellites via radio signals. Portable satellite phones and modems have more powerful broadcasting abilities than the cellular devices as they have high range, apart from being more expensive in terms of cost, than their counterparts.
For example, for outfitting a ship through satellite communication, a traditional communication system is linked to a single satellite, which allows multiple users to share the same broadcast equipment.

3.4. Wi-Fi

Wi-Fi is a form of low-power wireless communication used by many electronic devices such as laptops, systems, smart phones, etc. In a Wi-Fi setup, a wireless router serves as the communication hub. These networks are extremely limited in range due to low power of transmissions allowing users to connect only within close proximity to a router or signal repeater. Wi-Fi is common in home networking applications which provides portability without any need of cables. Wi-Fi networks need to be secured with passwords for security purposes in order not to be accessed by others.

4. Advantages and disadvantages of wireless communication

4.1. Advantages

- ✓ Any information can be conveyed or transmitted quickly and with a high speed.
- ✓ The Internet can be accessed from anywhere and at anytime without the need to carry cables or wires and it improves easy access and productivity.
- ✓ Helpful for Doctors, workers and other professionals working in remote areas as they can be in touch with the medical centers through wireless communication.
- ✓ Emergency situations can be alerted through wireless communication. The affected regions can be provided support with the help of these alerts through wireless communication.
- ✓ Wireless networks cost less for installation and maintenance.

4.2. Disadvantages

- × A Hacker can easily capture the wireless signals that spread through the air.
- × It is very important to secure the wireless network so that the information cannot be exploited by unauthorized users, and this also increases the risk of losing data or information.

Wireless networks are one of the fastest growing technologies in telecommunications market. WiMax, Bluetooth, Wi-Fi, Femtocell and 4G are some of the most significant standards of Wireless technology for the next generations. Radio, Mobiles, Internet, etc., all use technological advancements in wireless data transmission systems that carry invisible electromagnetic waves to transmit data over long distances within a short amount of time.

5. History of wireless technologies

I occasionally end seminars that I conduct on various wireless topics by saying, "Show me another area of high tech, especially one this old, where there's this much innovation going on - I don't think you can." But just how old is wireless technology, anyway? Most people are surprised to find that it goes back well over 200 years.

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.

Nowadays people use wireless devices and communicate to each other from the other side of the globe. There are wireless providers behind every corner and the access to it is easy and simple for the common user. Wireless communication technologies are in every part of our lives and they are more useful than ever.

6. Conclusion

This report explains what is wireless communication technology, what are the different types of these technologies, their history and what are they are used for.

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