Wireless Technology and its Applications: A Review Study

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ABSTRACT
Wireless is a term used to describe telecommunications in which electromagnetic waves carry the signal over the communication path. Advanced technologies of wireless communication are used in different personal and commercial applications of voice and data services. In this paper, authors have presented the state of art of wireless technology with its various contemporary applications in today life.

Keywords
Wireless Communication, WLAN, Application of Wireless technology.

1. INTRODUCTION
The Modern world is being shortened and fast due to the lot of development of the technologies. During the past few decades, the world has seen astonishing changes in the wireless communication due to advancement in the wireless technologies. Wireless technologies have been mass deployed and implies communicating without wires. As indicated in [1], mobile and wireless technology has improved substantially, making wireless devices remarkably convenient and affordable. Wireless networking is specifically appropriate for situations wherein installation of physical media is not feasible and which require on-the-spot access to information. Wireless networking makes it possible to have access to both voice and data. We attempt to highlight specific characteristics of various wireless technologies and categorize their applications. Table 1 shows an overview of different wireless technologies; Table 2 shows the comparison among different cellular technologies and Table 3 lists potential applications in numerous areas.

2. CELLULAR TECHNOLOGY AND ITS APPLICATIONS
We have seen lots of changes in the realm of wireless communication networks. Landline is becoming obsolete. Cell phones not only keep us connected to the world at large scale but also serve the purpose of entertainment. From 1G to 2.75G and from 3G to 5G the world of telecommunication has seen a number of improvements along with performance and quality of voice and data services with every passing day.

2.1. First-Generation (1G)
The 1st generation was launched for the voice services in early 1980‘s. All the systems were analog systems embedded transmission using FDMA with the frequency modulation technique for radio. The channel capacity of the 1G system was approx 30 KHz [2]. It was based on the technology known as Advance Mobile Phone Service (AMPS).

2.2. Second Generation Systems (2G)
The 2nd generation was pioneered in 1990‘s and is a digital system. It is mainly used for voice communication with additional features like e-mails and SMSs. Digital modulation schemes used in 2G technology are time division multiple access (TDMA) and code division multiple access (CDMA) [3, 7] with Frequency band of approximately 850-1900 MHz and is a GSM based technology that uses eight channels per carrier with a frame of 4.6 milliseconds (ms) duration and data rate of 22.8 kbps [4]. Family of this generation includes of 2G, 2.5G and 2.75G.

2.3. Third Generation Systems (3G):
3rd Generation service includes high speed mobile access along with Internet Protocol services. The main features of 3rd Generation include wireless web base access, multimedia, email, as well as video conferencing. The 3rd generation WCDMA air interface was designed for packet switching-based wireless services, so that computer, telephones and other devices may share the same wireless network and Internet anytime [5]. 3rd Generation system offers data rates up to 2 Mbps over 5 MHz channel carrier width, depending on the device mobility and spectrum efficiency. The data rate depends on the environment surrounding the device (like 144 kbps in satellite communication [2], 384 kbps in urban areas). Frequency band allotted under 3rd Generation is 1.8 - 2.5 GHz.

2.4. Fourth Generation Systems (4G)
4G is an advance version of 3G and 2G standards. The 3GPP is recently standardized LTE Advanced as future 4G standard. 4G frameworks are expected to provide a secure IP based network with numerous advanced facilities such as voice, streamed multimedia and data at much higher rates as compared to previously existing technologies. One common characteristic of the new services facilitated by 4G is their demanding requirements in terms of QoS Wireless broadband access, mobile TV, HDTV, Multimedia Messaging Service (MMS), video chat, and Digital Video Broad-casting (DVB) are being developed in the 4G network.

2.5. Fifth Generation Systems (5G)
5G is the further step in the evolution of mobile communication. It is not deployed yet. But it will change the manner in which cellular plans are offered worldwide. Main challenge for the deployment of 5G wireless system will be tolimited frequency spectrum, whose frequency band will be 3-300GHz and the Bandwidth of 1Gbps or higher.

Table 1. Wireless technologies and associated characteristics

Technology	Services/ Features	Coverage Area	Limitations	Example Systems
Cellular	Voice and data through hand held phones	Continuous coverage	Very low bandwidth	Cellular phones, PDAs, Palm Pilots
Wireless LAN (WLAN)	Traditional LAN with wireless interface	Only in local environment	Limited range	NCR's Wave LAN, Motorola's ALTAIR
GPS	Determines three dimensional position, and velocity	Any place on earth	Expensive	GNSS, NAVSTAR, GLONASS
Satellite-based PCS	Mainly for paging	Almost any place on Earth	Expensive	Iridium, Teledesic
Ad hoc networks	Group of people come together for short time to share data	Similar to local area networks	Very limited range	Bluetooth
Sensor networks	Tiny sensors with wireless capabilities	Small terrain	Very limited range	Defense and civilian applications

Table 2. Comparison among various wireless cellular technologies

Technology	1G	2G	3G	4G	5G
Evolution	1970-1980	1990-2004	2004-2010	2010	2015
Frequency Band	824-894MHz	850-1900MHz	1.8-2.5GHz	2-8GHz	3-300GHz
IEEE Standards	802.11	802.11b	802.11g/a	802.11n	802.11ac
Speed	2.4Kbps	64Kbps	144kbps- 2Mbps	100Mbps- 1Gbps	Higher than 1Gbps
Switching	Circuit	Circuit, Packet	Packet except for air interface	All Packet	All Packet
Standards	AMPS,TACS	GSM based, GPRS (50Kbps), EDGE (1Mbps)	UMTS/HSPA	LTE/LTE Advance, WiMAX, Wi-Fi	WWWW
Signal	Analog	Digital	Digital	Digital	Digital
Core Network	PSTN	PSTN	Packet N/W	Internet	Internet
Handoff Type	Horizontal	Horizontal	Horizontal	Horizontal & Vertical	Horizontal & Vertical
Services	Voice Telephony	Digital voice, SMS, Higher capacity packetized data	Integrated high quality audio, video and data	Dynamic data access, wearable devices	Dynamic information access, wearable devices with aIl capabilities.

3. WLAN AND ITS APPLICATIONS

In WLAN, electromagnetic waves transmit and receive data over the air. A wireless LAN (WLAN) is a flexible data communication system implemented as an extension to a wired LAN. The technologies for wireless LANs are specified by the IEEE 802.11 standards, which are often identified as "Wi-Fi" (Wireless Fidelity). Wi-Fi is a wireless LAN technology which could be used in short range. It's a most common wireless technology used in home, Hotspots and corporate internal wireless networks. Wi-Fi operates in 2.4GHz or 5GHz which are unallocated frequency band. The current generation of Wi-Fi support up to 11Mbps data rates within 300 feet of the base station. Wi-Fi is a flexible data communication system execute as an extension to a wired LAN within a building or site. Wi-Fi broadcast and receives data in excess of the air by electrical signals, minimizing the need for wired connections. Retailers use wireless POS terminals and WLANs to order, sell, and keep inventories of merchandise. Warehouse staff can use the technology to manage goods, conduct inventory, and ship goods to customers. Once items are received for storage in a warehouse, a clerk scans bar-code numbers into the database via a handheld device. With the help of WLANs, corporations and students at universities can use wireless connectivity to facilitate laptops to access necessary information. Hospitality

Table 3. Applications of different wireless services

Wireless Cellular	Features	WLAN	GPS	Satellite Network	Ad-hoc and Sensor Networks
Application Area	Field Service Sales Force Field Audit Bill Paying Public Safety Transportation Industry Airline Activities	Retail Warehouses Healthcare Telediagnostics Students Hospitality Office Applications Manufacturing Industry	Surveying Car Rental Agency Robin Toll Collection Sports	GPS Multimedia Telemetry	Battlefield Surveillance Environmental Sensing Machinery Prognostics Roadside weather conditioning Bio-sensing Bridge damage detection

establishments check customers in and out and keep track of room service orders and laundry requests. Restaurants can track the names and numbers of people waiting for entry, table status, and drink and food orders. State and provincial government officials can use WLANs to effectively and efficiently deal with legislature, constituent offices, and other government officials at municipal and federal levels.

4. GPS NETWORKS AND ITS APPLICATIONS

Global Positioning Systems (GPS) [6,8] are space-based radio positioning systems that provide 24-hour, 3D position, velocity, and time information to suitably equipped users anywhere on the surface of the Earth. The NAVSTAR system, operated by the U.S. Department of Defense, is the first GPS system that allows intelligent vehicle location and navigation. It has many military applications such as intelligence and target location, command and control, mine laying and detection, testing combat aircraft, missile guidance, and artillery pointing, to name a few. GPS can be used for surveying and can be done in almost all weather conditions. GPSs are useful in agriculture for precision farming as well as for search and rescue operations. Automobile manufacturers have introduced GPS-based navigation in cars, with a four-inch monitor asking travelers their destination, displaying a color map of the area and scrolling down a list of preselected points of interest, such as hotels, convention centers, or a specific street address. Another example of GPS-based applications is the use of mobile notebooks in sporting competitions, including sailboat races, where progress is recorded and communicated wirelessly to satellites.

5. SATELLITE COMMUNICATION NETWORKS AND ITS APPLICATION

The satellite-based communication use constellation of low earth orbit (LEO), medium earth orbit (MEO) and geostationary earth orbit (GEO) satellites, orbiting around the Earth at afew hundred miles. The Iridium project, conceived and created by Motorola, is a satellite-based technology consorsium for PCS. The satellites in the sky cover any point on Earth with continuous lines of sight. They provide small handheld phones with the conventional wireless options, and small pagers with text messaging. Teledesic is building a global, broadband Internet-in-the-sky network. The service is targeted to begin in 2004, and the idea is to provide affordable, worldwide access to telecommunications services such as computer networking, broadband Internet access, high-quality voice, and other digital data.

6. AD-HOC NETWORKS AND ITS APPLICATION

An ad-hoc network [8] is a WLAN in which mobile or portable devices are parts of the network but only when they are in a relegated, close proximity. There is no fixed infrastructure, and information is forwarded in a peer-to-peer mode using multihop routing. Military applications for ad-hoc networks include a group of close-by soldiers who can share the information in their notebook computers using RF signals.

7. SENSOR NETWORKS AND ITS APPLICATION

Sensor networks [2, 7] are the newest of wireless networks in which a large number of tiny immobile sensors are planted on an ad-hoc basis to sense and transmit some physical characteristics of the environment. The information from sensors is aggregated on a "data centric basis." Battlefield surveillance with a large number of sensors dropped from an airplane in enemy territory is the most noted example. Other potential commercial fields include machinery prognosis, biosensing, and environmental monitoring.

8. CONCLUSION

In this paper we review the different wireless technologies and its application in different fields. This article offers a qualitative evaluation of different wireless technologies that might be viewed all together as alternate and/or corresponding paths for developing to wireless access services.Wireless networks are emerging areas with around 300 millioncurrent users and are anticipated to grow to one billion users in personal, commercial and industrial applications. A real challenge is to locate an addressee among millions of globally distributed terminals quickly. Other issues involve effective use of limited power for transmitting both voice, data and other king of signals.. The future applications look promising

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There are lots of improvements will be in process in wireless technologies.

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