IOSR Journal of Computer Engineering (IOSR-JCE)
e-ISSN: 2278-0661,p-ISSN: 2278-8727, Volume 18, Issue 6, Ver. IV (Nov.-Dec. 2016), PP 01-05
www.iosrjournals.org

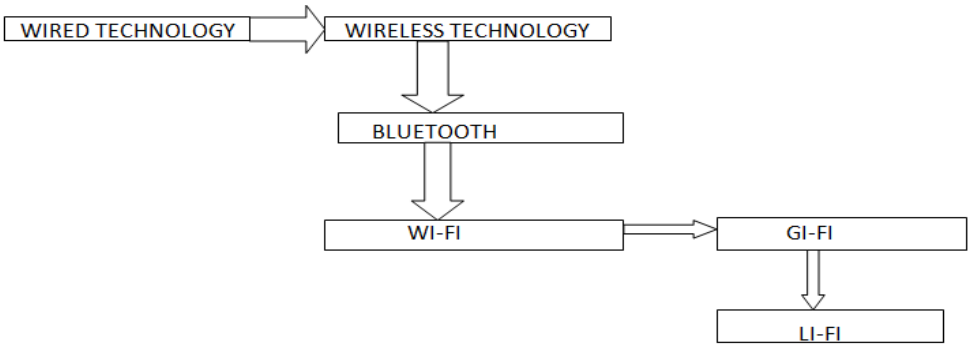
Evolution of Wireless Technology: A Survey

Sharmila
(Department of CSE, Maharani Kishori Jat Kanya Mahavidyalaya , Rohtak, India)

Abstract: *At present wireless communication used everywhere like in educational institutes, research institutes, industrial applications, automotive industries, health care and medical applications. Nowadays interest is increasing to use wireless communication technologies in place of wired communication technologies.*
Wireless communication means transfer of information over a distance without wires. The distances involved may be short like television remote control or may be long like radio communications. In this paper I shall throw light on the evolution and development of various wireless technology along with their significance and advantages of one over the other.
Keywords: *wired technology , wireless technology, bluetooth, wi-fi, wimax, gi-fi, li-fi.*

I. Introduction

Wireless Networking industry has started its technology creation, revolution and evolution since early 1970s. For many years cables ruled the world. Optical fibers played a dominant role for its higher bit rates and faster transmission. But the installation of cables caused a greater difficulty and thus led to wireless access. The foremost of this is Bluetooth which can cover 9-10mts. Wi-Fi followed it having coverage area of 91mts. No doubt, introduction of Wi-Fi wireless networks has proved a revolutionary solution to "last mile" problem[7].
Wireless Networking has changed the way people communicate and share information by eliminating the boundaries of distance and location. Wi-Fi Networking comes out way of accessing information in remote areas where wired network are inaccessible. Network Communication technology can be divided into two types.1) wired technology and 2) wireless technology. The evolution of wireless technology will leads to the LI-FI technology. The following diagram will gives the network evolution.



1) Introduction to wireless Networks(Wi-Fi)

Overview of Wi-Fi (Wireless Fidelity)Technology According to its speed and the presented time, Wi-Fi technology can be divided into IEEE 802.11b, IEEE 802.11a, IEEE 802.11g and IEEE802.11n. IEEE802.11b and IEEE802.11g are commonly used [2]. IEEE802.11b is the oldest wireless network criterion and the most widely used Wi-Fi standard. Its maximum bandwidth is 11Mbps. When the signal is weak or there are interferences, the bandwidth can be adjusted to 5.5Mbps, 2Mbps and 1Mbps. The autoconditioning of bandwidth effectively ensure the stability and reliability of network.

802.11b. It works in the 5.8GHz frequency band and has good anti-interference ability. But it can not be compatible with IEEE 802.11b and IEEE 802.11g. Moreover, its coverage is relatively small (only about 30m indoor). So IEEE 802.11a is still rarely used among all the Wi-Fi standards currently. In order to solve the incompatible problems between IEEE 802.11a and IEEE 802.11b, IEEE 802.11 working group formally approved the IEEE 802.11g standard in July 2003[2]. It can be compliant with IEEE 802.11b. So the applications of IEEE 802.11g are more than IEEE 802.11a. IEEE 802.11n standard approved in 2009 by IEEE is the latest Wi-Fi standard. It has a standard of 300Mbps and up to 600Mbps transmission speed [3]. The IEEE 802.11n standard combined MIMO and OFDM technology [4], not only to improve the quality of wireless transmission, but also greatly enhance the transmission speed. Comparison on Wi-Fi technology standard is shown in Table I.

Features of Wi-Fi [2][3][4]

1) Long transmission distance. The radius of 802.11n standard is up to about 1000m.
2) Fast transmission speed. Its transmission speed is very fast.The speed can reach 600Mbps, which meets the personal and social needs.
3) Compatibility with other services. In and above the second layer of Wi-Fi technology are fully consistent with the Ethernet.
4) Convenient to form the network. Any devices with a wireless network adapter can be easy to enter the network. Therefore, it is very suitable for mobile requirement and has broad market.
5) Security for use. The actual transmission power of IEEE802.11 is only about 60-70mW. In contrast, the transmission power of cell phone is about 200mW to 1W.The transmitter power of hand-held interphone is 5W. Therefore, Wi-Fi technology is absolutely safe.

Wi-Fi, or Wireless Fidelity is freedom :it allows you to connect to the internet from your couch at home, in a hotel room or a conferance room at work without wires . Wi-Fi is a wireless technology like a cell phone. Wi-Fi enabled computers send and receive data indoors and out; anywhere within the range of a base station. And the best thing of all, it is fast.

II. Bluetooth

It is under IEEE 802.15.1 standard. It works under wireless PAN and utilize 10 Mbps datarates[1]. It is only for indoor use. And get interference from sunrays. It uses in short rang up to 100m[1]. It works in 2.4 GHz ISM band and uses frequency hopping [1]. We are using this technology for communication. Each technology that uses Bluetooth has its own profile. Two connectivity topologies are defined in Bluetooth that is: Piconet and Scatter net.

A piconet is a collection of Bluetooth devices which are synchronized to the same hopping sequence. piconet is a WPAN used by Bluetooth device that is serving as a master and one or more Bluetooth devices are serving as slaves[5]. As describe in fig. 3 Slaves only communicate with the master with point-to-point fashion under the control of the master. Masters transmission is may be point-to-point or opint-tomultipoint. Slaves can be in parked or standby mode so it reduces power consumptions.

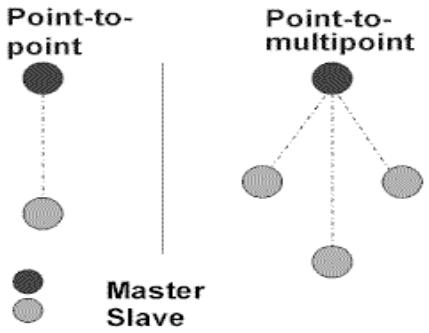


Fig. 3 Pico net

Scatternet is the collection of piconets. A device in scatternet is may be slave in many piconet but master in only one of them[5].

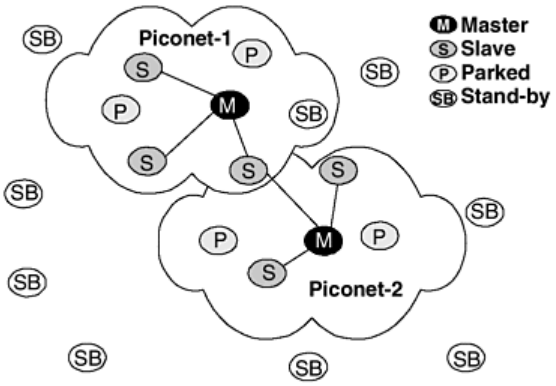


Fig. 4 Scatter net

2.1) Bluetooth Devices

A Bluetooth USB dongle with a 100 m range.

Bluetooth exists in many products, such as telephones, tablets, media players, robotics systems, handheld, laptops and console gaming equipment, and some high definition headsets, modems, and watches. The technology is useful when transferring information between two or more devices that are near each other in low-bandwidth situations. Bluetooth is commonly used to transfer sound data with telephones (i.e., with a Bluetooth headset) or byte data with hand-held computers (transferring files)[7].

Bluetooth protocols simplify the discovery and setup of services between devices. Bluetooth devices can advertise all of the services they provide. This makes using services easier, because more of the security, network address and permission configuration can be automated than with many other network types[7].

III. WiMAX

WiMAX(Worldwide Interoperability for Microwave Access) is a wireless digital communications system, also known as IEEE 802.16, that is intended for wireless "metropolitan area networks". WiMAX can provide broadband wireless access (BWA) up to 30 miles (50 km) for fixed stations, and 3 - 10 miles (5 - 15 km) for mobile stations. WiMAX is an IP based, wireless broadband access technology that provides performance similar to 802.11/Wi-Fi networks with the coverage and QOS (quality of service) of cellular networks[6].

WiMAX operates on both licensed and non-licensed frequencies, providing a regulated environment and viable economic model for wireless carriers. The average cell ranges for most WiMAX networks will likely boast 4-5 mile range (in NLOS capable frequencies) even through tree cover and building walls. Service ranges up to 10 miles (16 Kilometers) are very likely in line of sight (LOS) applications (once again depending upon frequency. WiMAX is often cited to possess a spectral efficiency of 5 bps/Hz, which is very good in comparison to other broadband wireless technologies, especially 3G.

It is important to remember that WiMAX is a global broadband wireless standard. The IEEE 802.16 (WiMAX)technical specification has now evolved through three generations:

- IEEE 802.16: High data rate, highpower, PTP, LOS, fixed SSs
- IEEE 802.16-2004: Medium data rate, PTP, PMP, fixed SSs
- IEEE 802.16-2005: Low-medium data rate, PTP, PMP, fixed or mobile SSs.

WiMAX is a wireless broadband solution that offers a rich set of features with a lot of flexibility in terms of deployment options and potential service offerings. Some of the more salient features that deserve highlighting are as follows −

3.1)Two Type of Services

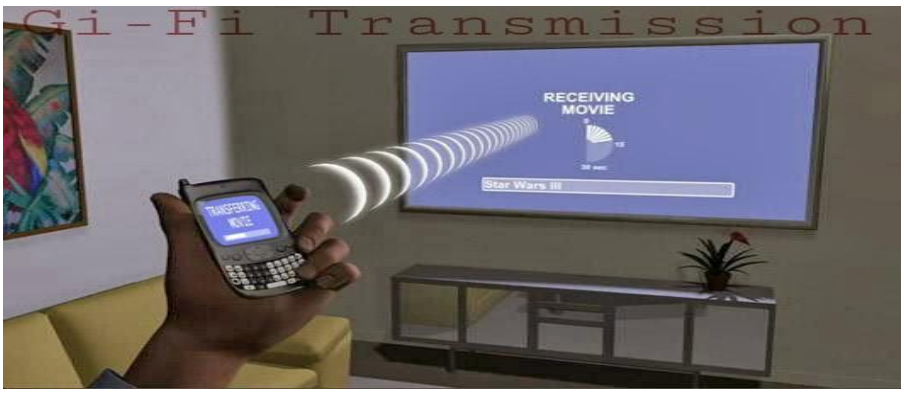
WiMAX can provide two forms of wireless service[10] −

- **Non-line-of-sight** − service is a WiFi sort of service. Here a small antenna on your computer connects to the WiMAX tower. In this mode, WiMAX uses a lower frequency range -- 2 GHz to 11 GHz (similar to WiFi).
- **Line-of-sight** − service, where a fixed dish antenna points straight at the WiMAX tower from a rooftop or pole. The line-of-sight connection is stronger and more stable, so it's able to send a lot of data with fewer errors. Line-of-sight transmissions use higher frequencies, with ranges reaching a possible 66 GHz.

IV. Gi-Fi

Gi-Fi will helps to push wireless communications to faster drive. Gi-Fi or Gigabit Wireless is the world's first transceiver integrated on a single chip that operates at 60GHz on the CMOS process. It utilizes a 5mm square chip and a 1mm wide antenna burning less than 2m watts of power to transmit data wirelessly over short distance, much like Bluetooth. The breakthrough will mean the networking of office and home equipment without wires will finally become a reality. In this report we present a low cost, low power and high broadband chip, which will be vital in enabling the digital economy of the future[8].

Wi-Fi (ieee-802.11b) and WiMax (ieee-802.16e) have captured our attention. As there is no recent developments which transfer data at faster rate, as video information transfer taking lot of time. This leads to introduction of Gi-Fi technology. It offers some advantages over Wi-Fi, a similar wireless technology. In that it offers faster information rate in Gbps, less power consumption and low cost for short range transmissions. GiFi which is developed on a integrated wireless transceiver chip. In which a small antenna used and both transmitter- receiver integrated on a single chip which is fabricated using the complementary metal oxide semiconductor (CMOS) process. Because of Gi-Fi transfer of large videos, files will be within seconds.



The GiFi uses the short-range wireless technology would potentially be a competitor or more than likely a replacement for WiFi, and things like Bluetooth might want to look out as well. The transfer speeds combined with the constantly increased storage capacities of small handheld devices could really take media down some new avenues as well. The Age newspaper uses an example of transferring a high-definition movie from a kiosk at a store to your mobile phone in seconds. Then that same movie can be transferred just as quickly from the phone to our home computer or entertainment system to watch.

In theory this technology would transfers GB's of our favorite high definition movies in seconds. So Gi-Fi can be considered as a challenger to Bluetooth rather than Wi-Fi and could find applications ranging from new mobile phones to consumer electronics. GiFi allows a full-length high definition movie to be transferred between two devices in seconds to the higher megapixel count on our cameras, the increased bit rate on our music files, the higher resolution of our video files, and so on. We demand more than ever, but we also want this content to be transferred in the most expedient manner possible. 802.11g and 802.11n are fine and all, but some people want to push the envelope even further. This chip is 5mm per side and it can operate at a frequency of 60GHz while wi fi chip can operate only at 2.4GHz. This have low power conception of 2 watt comes and comes with 1mm antenna. The GiFi chip is one of Australia's most lucrative technology. This chip is 5mm per side and it can operate at a frequency of 60GHz while wifi chip can operate only at 2.4GHz.

V. Li-Fi

Li-Fi(Light-Fidelity) is a new member of wireless data transmission family ,which uses the concept of flickering light faster than human's eye ability for data transmission. As we know speed of light is much more than existing wireless data transmission technique, it is like to achieve speed of fiber optics in wireless communication. The idea of Li-Fi came out from the mind of **Dr. Harald Haas** who has been working in this field from 2004 and finally in 2011 he demonstrated of sending video by LED light lamp at speed of 10 Mb/s. Dr. Gordan, Prof. Harald and Dr. Mostafa from university of Edinburgh named this technique Visible Light Communication (VLC). Li-Fi is now part of VLC PAN IEEE 802.15.7 standard [9].

This technique use conventional binary method of 0 and 1 of data transmission by manipulating light intensity that is beyond the human capability to see. Li-Fi can be the technology for the future where data for laptops, smart phones, and tablets will be transmitted through the light in a room. Security would not be an issue because if you can't see the light, you can't access the data. As a result, it can be used in high security military areas where RF communication is prone to eavesdropping.

Li-Fi is a fast and cheap optical version of Wi-Fi. It is based on Visible Light Communication (VLC).VLC is a data communication medium, which uses visible light between 400 THz (780 nm) and 800 THz (375 nm) as optical carrier for data transmission and illumination. It uses fast pulses of light to transmit information wirelessly. The main components of Li-Fi system are : (1) a high brightness white LED which acts as transmission source. (2) a silicon photodiode with good response to visible light as the receiving element.

VI. Conclusion

Wireless Network has become very essential part of our everyday life. Their current technology is the outcome of various previous technologies. In this paper we review the various technologies of wireless Networking one technology over other. This field is still full of research opportunities.

Li-Fi is the upcoming and on growing technology acting as competent for various other developing and already invented Wireless technologies.

References

[1]. Palak P. Parikh, Student Member, IEEE, Mitalkumar. G. Kanabar, Student Member, IEEE, Tarlochan S. Sidhu, Fellow, IEEE,

[2]. Ma Xinluo; Li Xiaozhong; Ge Changtao . Construction and application of Wireless Local Area Network [M] . Beijing : National Defense Industry Press.2009

[3]. Mei-Fang Lin, Jung-Yung Tzu, Lin, L., Huey-Ming Lee. The IEEE802.11n capability analysis model based on mobile networking architecture[C]. in: Systems, Man and Cybernetics, 2009. SMC 2009. IEEE International Conference on,pp,1857-1860

[4]. Nakamura, R., Sanada, Y. Experimental Investigation of IEEE802.11n Reception with Fractional Sampling[C]. in: Personal Indoor and Mobile Radio Communications (PIMRC), 2010 IEEE 21st International Symposium on,pp.1044-1048

[5]. Jin-Shyan Lee, Yu-Wei Su, and Chung-Chou Shen A Comparative Study ofWireless Protocols: Bluetooth, UWB, ZigBee, and Wi-Fi The 33rd Annual Conference of the IEEE Industrial Electronics Society (IECON) Nov. 5-8, 2007, Taipei, Taiwan.

[6]. V. Singh and V. Sharma, Efficient and fair scheduling of uplink and downlink in IEEE 802.16 OFDMA Networks, IEEE WCNC, April 2006.

[7]. https://en.wikipedia.org/wiki/Bluetooth

[8]. J.Santhan Kumar Reddy, "Gi-Fi Technology," International Journal of Advanced Scientific and Technical Researh, vol 1, 2013, pp. 2249-9954.

[9]. http://en.wikipedia.org/wiki/Li-Fi.

[10]. https://www.tutorialspoint.com/wimax/what_is_wimax.html.