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Gi-Fi: Future of Wireless Technology

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Abstract: Gi-Fi is one of the most important wireless technology that enhances our personal environment, either work or private, by means of networking or a variety of personal and wearable devices within the space and with the outside world. In optical fibers, Gi-Fi played an important role for its high speed large files transfers within seconds. It is a scalable wireless platform for constructing alternative and complementary broadband networks and it operates at 60 GHz on the CMOS process. It will also allow the transfer of wireless audio and video files within a range of 10 meters. The installation of cables in optical fiber caused a greater difficulty and thus led to wireless access. Initially wireless technology includes infrared which was a very slow technology further inventions were done to make wireless technology a better for communication and the invention of Bluetooth, WI-MAX moved wireless communication to a new era.

Keywords: Gi-Fi wireless, Optical Fibers, CMOS Process.

I. INTRODUCTION

Wireless is a unique technology. Despite being over a century old, it continues to improve at an ever increasing rate. Yet all the past, present and future improvements stem from one underlying process. It can transfer large videos and audio files within seconds. A set of new technologies are just coming into early use. 802.11 ac promises a Gigabit per second from a single access point; LTE- A (Long Term Evolution- Advanced) is cutting out a path to full mobile broadband integrated with direct local device to device communications and smart spectrum reuse is easing the bandwidth crunch. Further out, the promise of terabit systems combines with innovative reuse of existing ideas to provide more services further a field than ever before. Gi-Fi was developed at the National Information and Communication Technology Research center in Melbourne, Australia where researchers has developed a wireless technology which gives high speed data transfers with a speed of up to 5 Gbps [1]. In wireless technology, the base station is the central location that collects all traffic to and from subscribers within a cell. The indoor base station equipment consists of channel groups. The best feature of this technology is its power consumption. While Wi-Fi technology is also used to cover larger distances, its design is mostly suitable for indoor-outdoor clients, rather than point- to-point links. This technology also has full reconfiguration capability to compensate for fabrication imperfections and it optimizes on C- band with a channel crosstalk as low as -20 Db. So, Gi-Fi can be considered as a best challenger to Wi-Max and can find so many applications ranging from new mobile phones to consumer electronics.

II. LITERATURE SURVEY

S. Dheeraj and S. Gopichand et.al, 2002 [1] proposed a model in which they implement a technology which gain flexibility of infrastructure, reduce capital expenditure, gain advantages over competitors and to solve business problems. Gowtham S Shetty et.al, 2006 [2] proposed that wireless dual band router and wireless dual band USB adapter are based on the next generation Wi-Fi technology, which is a new wireless computer networking standard in the 802.11 ac family. Ross and John et.al, 2007 [3] proposed a model that MIMO (Multiple input Multiple output) increase the capacity 10 times or more and simultaneously improve the radiated energy efficiency of the order of 100 times and the system enables significant reduction of latency on the radio interface using the low numbers and be forming in order to avoid feeding pipes. Sachin Abhyankar et.al, 2009 [4] proposed a model that the introduction of Wi-Fi wireless network has proved a solution to Bluetooth problem, the limitations for data exchange rate and range. Ramirez et.al, 2011 [5] proposed that the radio links can be operated in indoor environments with low power transmission and with reduced fading margin, making ultra-wide band systems good.

III. EVOLUTION OF NETWORK

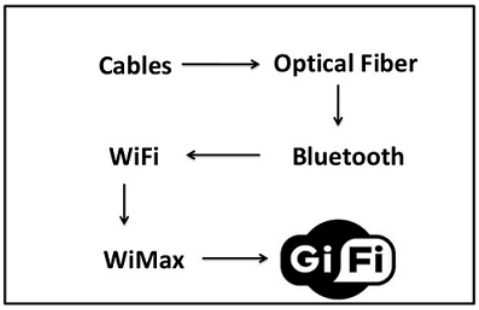

Fig-1. Network Evolution

A. WI-MAX

There are wireless broadband systems that offer fast web surfing without being getting connected through cable. Although WI-MAX Can potentially deliver data rates of more than 30 megabits per second, yet it provides offer average zero data rate of 6 Mbps and often deliver less, making the service significantly slower than the hard-wired broadband [2].

The actual cost of the data available using WI-MAX transmitting station would send data to WI-MAX enabled computers or routers as shown in Fig. 2.

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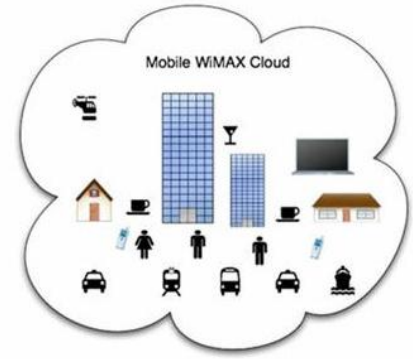

Fig-2. WI Max Services

B. Wi-Fi

Wi-Fi is a local area wireless computer networking technology that allows electronic devices to network, mainly using the 2.4 gigahertz (12 cm) UHF (Ultra High Frequency) and 5 gigahertz (6 cm) SHF ISM radio bands. The Wi-Fi alliance defines Wi-Fi as any "wireless local area network" (WLAN) product based on the Institute of Electrical and Electronics Engineers (IEEE) 802.11 standards". "Wi-Fi" is a trademark of the Wi-Fi alliance. The "Wi-Fi certified" trademark can only be used by Wi-Fi products that successfully complete Wi-Fi alliance interoperability certification testing. Many devices can use Wi-Fi, e.g. personal computers, video-game consoles, smartphones, digital cameras, tablet computers and digital audio players. These can connect to a network resource such as the internet via a wireless network access point. Such an access point (or hotspot) has a range of about 20 meters (66 feet) indoors and a greater range outdoors. Hotspot coverage can be as small as a single room with walls that block radio waves, or as large as many square kilometers achieved by using multiple overlapping access points.

IV. PRINCIPLE USED IN GI-FI TECHNOLOGY

In this paper, we will use the frequency division duplex for both transmission and receiving. Here the FDD (Frequency division duplex) transmissions require a guard band between the transmitter and receiver frequencies.

A. Frequency- Division Duplex

Frequency division duplex, FDD, uses the idea that the transmission and reception of signals are achieved simultaneously using two different frequencies. Using FDD it is possible to transmit and receive signals simultaneously as the receiver is not tuned to the same frequency as the transmitter as shown in Fig. 3.

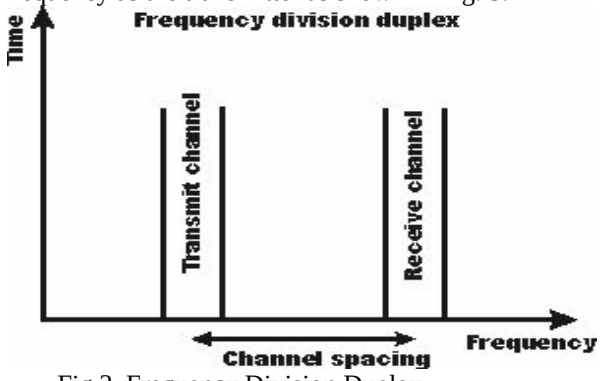

Fig.3. Frequency Division Duplex

The use of an FDD system does enable true simultaneous transmission and reception of signals. However, two channels are required and this may not always use the available spectrum efficiently. As there is a frequency separation between the uplink and downlink directions, it is not normally possible to reallocate spectrum to change the balance between the capacity of the uplink and downlink directions if there are changing capacity requirements for each direction.

V. TECHNOLOGIES USED IN GI-FI

A. Data transmission

As the volume of data and the size of files transmitted via the internet has increased, so has the importance of ensuring that the data is transmitted in the fastest, most efficient way possible. Similarly, data compression is used in software applications to reduce the size of data files by reducing or eliminating redundancy [3]. The patent issues surrounding the use of GIF for online graphics are of particular interest to web developers who, of necessity, rely upon and make use of industry- sponsored and supported standards in applications created for the internet.

B. Transmission of digital video and audio signals

This method of transmitting of digital video and audio signals could have important implications for parties wishing to transmit digitalized content such as graphics or music via the internet for a fee. This method describes a processor of digitized materials to receive a transfer of money via a telecommunication line, connect electronically to second party, and transmit the digitized materials to the second party who then stores the materials locally. Thus, it becomes relevant to emerging areas of internet commerce such as the sale and distribution of digitized music via web sites. A wireless device implements complex functionality and requires a large amount of circuitry and consequently, requires a large conventional package to enhance overall performances.

VI. ADVANTAGES OF GI-FI TECHNOLOGY

1. High Speed of Data Transfer

As the name indicates, data transfer of Gi-Fi technology is in Gigabits per second. Speed of Gi-Fi is 5 Gbps; which is 10 times the data transfer of the existing technologies. As the high data transfer rate could be transmitted in cellular networks and mobile phones.

2. Low Power Consumption

The power consumption of Gi-Fi wireless technology is low as in a range of tiny one- millimeter- wide antenna and it has less than 2 milli watts of power consumption that in comparison to the current wireless technologies.

3. Secure

Gi-Fi technology has to be more secure as compared to other wireless technologies such as Bluetooth. Operating systems of 60 GHz have been used for years by intelligence companies for security reasons and by the militants for satellite to satellite communications.

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4. Cost Effective

Coming to the point of cost perspective, it makes use of low cost chipsets, which drops down the rates dramatically and results in wireless technology with high speed and low prices. Re- use of high frequency levels is enabled which makes it easier to communicate with a wide range of customers within a specific geographic region and it makes them cost efficient.

5. Portability

As the Gi-Fi is highly portable, which makes it very convenient to construct it wherever we need it and it also installs the line of sight operations having a short coverage area, as it offers a versatile architecture. It is highly portable in accessing devices such as in internal radio modules, network interface cards, network transmission units, in household appliances.

6. High Mobility

As the Gi-Fi offers high mobility and portability, it provides a better coverage area which allows this technology to go higher and it provides a better data rates at higher speed.

VII. APPLICATIONS OF GI-FI TECHNOLOGY

Gi-Fi offers a wide number of applications in today's scenario. Let us take a look of these applications:

1. Household Appliances

Fig. 4. Household Appliances

As the Gi-Fi used in vast number of household appliances such as in cellular phones and home theatre TVs and the consumers can download their movies and video songs and many other applications of their use in a matter of seconds and save it anywhere whenever they desired to use [4]. It offers a higher speed of internet and bandwidth, higher downloading speed, wireless data and real time streaming as shown in Fig. 4.

2. Inter- Vehicle Communication

Gi-Fi technology uses a wide number of applications in inter- vehicle communication systems as it enables the vehicles to stay connected and go and it also offers better speed of vehicles in advent of communication system. The data exchange between vehicles is made possible by ad-hoc networks as shown in Fig. 5.

Fig.5. Inter Vehicle Communication

3. Wireless PAN Networks

With the current technologies, the use of Gi-Fi in wireless PAN networks can take a better perspective in today's technology as the data files are transferred to RF 60GHz range by making use of two mixers from an IF(Intermediate Frequency) . The output is then stored in a power amplifier, that stores a millimeter wave antenna within. Due to a higher availability of 7 GHz spectrum, it results in higher data rates in a number of networks as shown in Fig. 6.

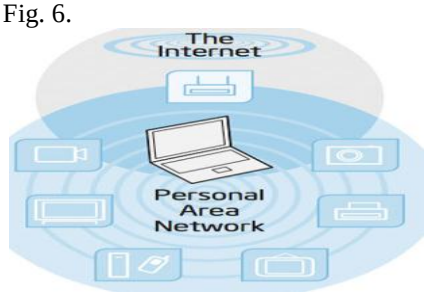

Fig.6. Wireless PAN Networks

VIII. GI-FI ACCESS DEVICES

Within 5 years, we will expect Gi-Fi to be dominant technology for wireless networking. Gi-Fi can bring wireless broadband and to the enterprise in an entirely better way which will develop wireless home and office of future.

Fig.7. Representation of GI-Fi Access Devices

The Gi-Fi team is looking for partners who are interested in commercializing its 60 GHz chips and with growing features of wireless technology it can be predicted that worldwide market for this technology is vast as it uses a number of high speed data transfer rates and no interference involved in this wireless technology [5]. Due to its cost efficient technique and high portability many companies will be going to launch the chip.

The potential of high speed range for data exchanges has prompted many companies like LG, DELL, Sony and Toshiba to form wireless HD (High- Definition) as shown in Fig. 7.

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IX. COMPARISON TABLE

The comparison between Wi-Fi & Bluetooth is given in Table I.

Table I - Comparison of Wi-Fi and Bluetooth with Gi-Fi

SPECIFICATI--ON	BLUETOOT-H	WI-FI	GI-FI
Frequency	2.4 GHz	2.4GHz	NA
Primary Application	10 meters	91 meters	10 meters
Data Transfer Rate	800 kbps	11 mbps	5 gbps
Power Consumption	Low	Medium	Low
Primary Device	Mobile phone, PDA's, Consumer electronic etc.	Notebook, Computer, Desktop Computers, Server	Both areas
Primary Application	WPAN Cable Replacement	WALN Ethernet	Both
Development Start Date	1998	1990	Under Develo pment

The comparison of Wi-Fi and Bluetooth with Gi-Fi as shown in table I. The frequency of Bluetooth is 2.4 GHz and of Wi-Fi is also 2.4 GHz as compared to Gi-Fi which is not applicable. The primary application of Bluetooth is 10 meters and of Wi-Fi is 91 meters as compared to Gi-Fi is 10 meters. On the basis of power consumption, the power consumption of Bluetooth is low and of Wi-Fi is medium as compared to Gi-Fi is low. The primary devices used in Bluetooth are mobile phones, consumer electronic etc. and of Wi-Fi are notebook, computers, desktop computers, server etc. as compared to Gi-Fi are used in both areas. The development of Bluetooth started in 1998 and of Wi-Fi started in 1990 as compared to Gi-Fi is under development.

X. CONCLUSION

In this paper, we were discussed about the Gi-Fi technology, its network evolution, how it is based on the process of implementing networks between servers, notebooks, computers etc. The advantages and applications of Gi-Fi are also discussed. The mobility, portability, low power consumption can help various field to improve their working and their applications.

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BIOGRAPHIES

Shikhar Bahl is pursuing M.Tech from Ajay Kumar Garg Engineering College, Ghaziabad (affiliated to Uttar Pradesh Technical University, Lucknow) in electronics and communication engineering. His areas of interest are Control Systems, Electronic Devices and Circuits and Wireless Communication. He completed his B.Tech from Meerut Institute of Engineering and Technology, Meerut (affiliated to Uttar Pradesh Technical University, Lucknow) in Electronics and Telecommunication Engineering with first class in the year 2013. During his career he had done his industrial training at BSNL and RRVNL. He had done his major work on project in filter design and its specifications in the respective branch for consecutive four years during his batch.

Rishabh Rai is pursuing M.Tech (2013-15) from Ajay Kumar Garg Engineering College, Ghaziabad (affiliated to Uttar Pradesh Technical University, Lucknow) in VLSI Design. His areas of interest are Digital System Design, Embedded System Design, & Low Power VLSI Design. He completed his B.Tech from Vishveshwarya Institute of Engineering & Technology, Gr.Noida (affiliated to Uttar Pradesh Technical University, Lucknow) in Electronics and Telecommunication Engineering with Honours in the year 2013. During his career, he has been appreciated and certified for academic performance & excellence in the respective branch for consecutive four years during B.Tech and Amul Vidya Bhushan Award for his academic performance & excellence in AISSCE-2009, at the District Level. During his graduation, he has also been awarded with the Best Paper Presentation in the IEEE Sponsored National Conference, ETEAT-2013. He is the student member of IEEE (Membership Number: - 92416730).