

GI-FI TECHNOLOGY

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Abstract :

Gi-Fi will help to push wireless communications to faster drive. 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. However, the standard’s original limitations for data exchange rate and range, number of channels, high cost of the infrastructure have not yet made it possible for Wi-Fi to become a total threat to cellular networks on the one hand, and hard-wire networks, on the other. But the man’s continuous quest for even better technology despite the substantial advantages of present technologies led to the introduction of new, more up-to-date standards for data exchange rate i.e., Gi-Fi. 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 will allow wireless transfer of audio and video data up to 5gigabits per second, ten times the current maximum wireless transfer rate, at one-tenth of the cost, usually within a range of 10 meters. It utilizes a 5mm square chip and a 1mm wide antenna burning less than 2watts of power to transmit data wirelessly over short distances, much like Bluetooth. The development will enable the truly wireless office and home of the future. As the integrated transceiver is extremely small, it can be embedded into devices. The breakthrough will mean the networking of office and home equipment without wires will finally become a reality. In this we present a low cost, low power and high broadband chip, which will be vital in enabling the digital economy of the future.

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. HISTORY OF GI-FI

Melbourne University researchers have achieved up to 5 Gbps knowledge transfer rates on a wireless chip. This can be plenty quicker than any current Wi-Fi speeds. Dubbed Gi-Fi, for obvious reasons, it will deliver the affiliation speed up to 10 meters. To totally comprehend how briskly Gi-Fi is, one of the researchers speak that a full-length high- definition motion picture are often transferred from one device to a different in a matter of seconds. The Gi-Fi chips is barely 5mm in size and use current CMOS technology. Value is barely \$10. I say, let’s begin mass manufacturing it. Professor Stan Skafidas of —Melbourne University, Australial is that the discoverer of Gi-Fi chip. The Gi-Fi chip uses solely a little one-millimeter-wide antenna and fewer than 2 watts of power, and therefore the Gi-Fi chip would value but \$10 to manufacture it. —But the millimetre wave spectrum (30 to 300Ghz) is sort of unoccupied, and therefore the new chip is probably many times quicker than the typical home Wi-Fi unitl.

The simplest half regarding this new technology Gi-Fi is its value effectiveness and power consumption, it solely consumes two watts of power for its operation with antenna (1mm) enclosed and therefore the development of Gi-Fi chip prices some \$10 (Rs. 380) to manufacture. In theory this technology would transfers GB's of our favorite high definition movies in seconds. The Gi-Fi uses the short-range wireless technology would doubtless be a challenger or quite probably a replacement for Wi-Fi, and things like Bluetooth would possibly wish to seem out furthermore. The transfer speeds combined with the perpetually exaggerated storage capacities of little hand-held devices might very take media down some new avenues furthermore. The Age newspaper uses Associate in Nursing example of transferring a high-definition picture from a stall at a store to your itinerant in seconds. —It's not up to Pine Tree State to announce it. It's up to the corporate that has fashioned, however there's Associate in Nursing activity happening to protract a corporation from Nicta which will take that technology to plug, Dr.Skellem same. The Gi-Fi chip might become one amongst Australia's most profitable technology. The Nicta gigabit wireless chip is a 100 times quicker than current Wi-Fi chips and may be designed for a tenth of their value. The team behind it picked up a gong at the international Innovic's Next Big factor Award for Innovation Excellence last July —There'll be a sort of party between all the protagonists for all the various approaches and one can find yourself being a winner. We'll be in there proposing our solutions. The Australian contacted the CSIRO for discuss whether or not Nicta would want its co-operation to develop the chip or use its patents, however neither of the CSIRO's lead Wi-Fi spokesmen, Tom Mc ginness and Nigel Poole, were offered. A CSIRO spokesperson same the organization had not been told Nicta was designing a Gi-Fi start-up.

III. NETWORK EVOLUTION

Communication technology can be divided into two types.1) wired technology and 2) wireless technology. The evolution of wireless technology will leads to the GI-FI technology. The following diagram will gives the network evolution.

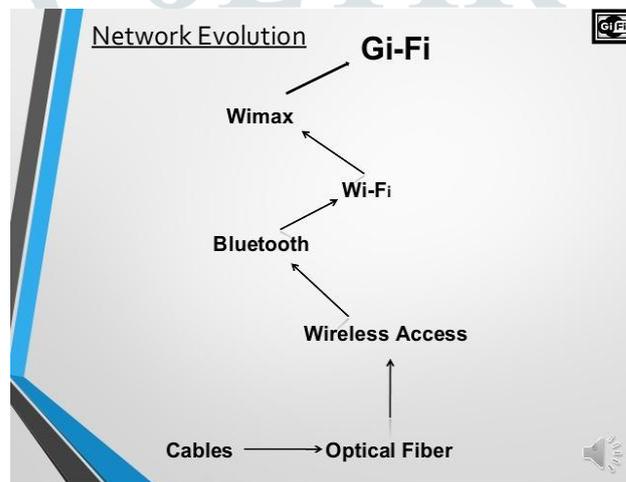


Fig:3.1 Network Evolution

3.1. WI-MAX:

Worldwide Interoperability for Microwave Access (WiMAX) is the common name associated to the IEEE 802.16a/REVd/e standards. These standards are issued by the IEEE802.16 subgroup that originally covered the Wireless Local Loop (WLL) technologies with radio spectrum from 10 to 66 GHz.

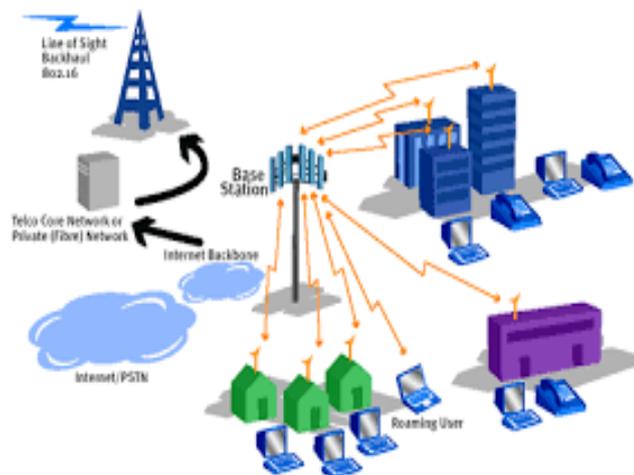


Fig: 3.2 transmission of gi-fi

Recently, these specifications were extended below 10GHz. Harmonize standards and certify interoperability between equipment from different vendors. Standardized Interoperable solutions will result in mass volume and bring down costs, promote and establish a brand for the technology. Wi-Fi style access will be limited to a 4-to-6 mile radius (perhaps 25 square miles or 65 square km of coverage, which is similar in range to a cell-phone zone). Through the stronger line – of sight antennas, the WiMAX transmitting station would send data to WiMAX-enabled computers or routers set up within the transmitter’s 30-mile radius (3,600 square miles or 9,300 square km of coverage). This is what allows WiMAX to achieve its maximum range

3.2 Gi-Fi

3.2.1 Proposed System:

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 will allow wireless transfer of audio and video data at up to 5 gigabits per second, ten times the current maximum wireless transfer rate, at one-tenth the cost. NICTA researchers have chosen to develop this technology in the 57-64GHz unlicensed frequency band as the millimeter-wave range of the spectrum makes possible high component on-chip integration as well as allowing for the integration of very small high gain arrays. The available 7GHz of spectrum results in very high data rates, up to 5 gigabits per second to users within an indoor environment, usually within a range of 10 meters. It satisfies the standards of IEEE 802.15.3C. A new silicon chip developed in Melbourne is predicted to revolutionize the way household gadgets like televisions, phones and DVD players talk to each other. The tiny five-millimeter a-side chip can transmit data through a wireless connection at a breakthrough five gigabits per second over distances of up to 10 meters. An entire high-definition movie could be transmitted to a mobile phone in a few seconds, and the phone could then upload the movie to a home computer or screen at the same speed. This means his team is ahead and stood in front of the competition in terms of price and power demand. His chip uses only a tiny one-millimeter-wide antenna and less than two watts of power and would cost less than \$10 to manufacture.



Fig: 3.3 gi-fi

IV. NEED FOR GI-FI

The reason for pushing into Gi-Fi technology is due to slow rate, high power consumption, low vary of frequency operation of earlier technologies i.e. Bluetooth and Wi-Fi, see the comparisons and options of these 2 technologies.

4.1 Comparison of Bluetooth and WI-FI:-

Table 4.1 comparison of Bluetooth and Wi-Fi

Characteristic	Bluetooth	Wi-Fi
Frequency	2.4 GHz	2.4 GHz
Range	10 meters	100 meters
Primary application	WPAN: cable replacement	WLAN: Ethernet
Data transfer rate	800 Kbps	11 Mbps
Power consumption	Low	Medium
Primary devices	Mobile phones, PDAs, consumer electronics, office and industrial automation devices	Notebook computers, desktop computers, servers
Primary users	Traveling employees; electronics consumers; office and industrial workers	Corporate campus users
Usage location	Anywhere at least two Bluetooth devices exist — ideal for roaming outside buildings	Within range of WLAN infrastructure, usually inside a building
Development start date	1998	1990
Specifications authority	Bluetooth SIG	IEEE, WECA

4.2 Demerits of Bluetooth and Wi-Fi:

From the table we will conclude that the bit rate of Bluetooth is 80Kbps and Wi-Fi has 11 Mbps. 2. Each are having power consumptions 5mw and 10mw. And lower frequency of operation two.4GHZ. 3. For transferring great deal of videos, audios, information files take hours of your time thus to own higher information transfer rate at lower power consumption we tend to move onto Gi-Fi technology.

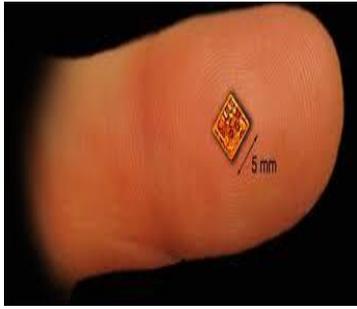


Fig:4.2 chip of gi-fi

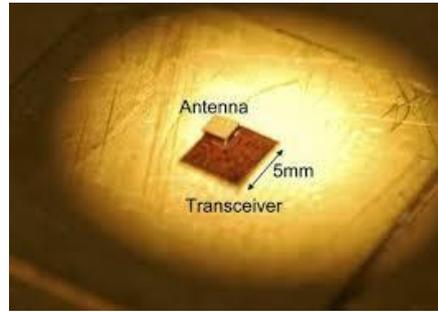


Fig: 4.3 gifl Antenna

V. WORKING PRINCIPLE

Used in Gi-Fi in this we will use time division duplex for both transmission and receiving. Here data files are up converted from IF range to RF60GHz range by using 2 mixers and we will feed this to a power amplifier, which feeds millimeter wave antenna. The incoming RF signal is first down converted to an IF signal centered at 5 GHz and then to normal data ranges. Here we will use heterodyne construction for this process to avoid leakages due to direct conversion and due to availability of 7 GHz spectrum the total data will be transferred within seconds.

5.1 Time-Division Duplex

Time-Division Duplex (TDD) is that the application of time-division multiplexing to separate outward and come back signals. It emulates full duplex communication over a half-duplex communication link. Time division duplex features a sturdy advantage within the case wherever the imbalance of the transmission and downlink knowledge speed is variable. As transmission traffic will increase, a lot of data rate will dynamically be allotted to it, and because it shrinks it will be detached. Another advantage is that the transmission and downlink radio.

5.2 60 GHZ:

Here we are going to use metric linear unit wave antenna which can operate at 60 GHz frequency that is unlined band. Due to this band we have a tendency to square measure achieving high knowledge rates energy propagation. In the 60 GHz band has distinctive characteristics that modify several different edges like wonderful immunity to co-channel interference, high security, and frequency re-use. Point-to-point wireless systems in operation at 60 GHz are used for several years for satellite-to-satellite communications. This is often due to high oxygen absorption at 60 GHz (10-15 dB/Km). This absorption attenuates 60 GHz signals over distance, in order that signals cannot travel way on the far side their meant recipient. For this reason, 60GHz is a superb selection for covert communications. Most important aspect is Point-to-point wireless systems in operation at 60 GHz are used for several years by the IC for prime security communications and by the military for satellite-to-satellite communications. Their interest during this band stems from a development of nature: the O molecule (O₂) absorbs magnetic force energy at sixty GHz sort of a piece of food in a very kitchen appliance (see Fig half-dozen). This absorption happens to a far higher degree at sixty GHz than at lower frequencies generally used for wireless communications. This absorption weakens (attenuates) sixty GHz signals over distance, in order that signals cannot travel way on the far side their meant recipient. The main invention of Gi-Fi is to produce higher bit rate. Because the name itself indicates knowledge transfer rate is in Giga bits per second. Speed of Gi-Fi is 5 Gbps, which is ten times the current knowledge transfer. Because to this highspeed knowledge transfer, we are able to swap giant video, audio, knowledge files inside seconds. Attributable to wider accessibility of continuous seven gigacycle spectrum ends up in high knowledge rates.

5.3 Low Power Consumption

As the great amount of data transfer it utilizes milli-watts of power solely. It consumes solely 2mwatt power for knowledge transfer of gigabits of data, wherever as in gift technologies it takes 10mwatt power, that is incredibly high. As the IEEE 802.15.3C provides a lot of security, it provides link level and repair level security, wherever these options are elective. Point-to-point wireless systems operative at 60 GHz are used for several years by the intelligence for top security communications and by the military for satellite-to satellite communications. The combined effects of O₂ absorption and slim beam unfold lead to high security and low interference.

VI. APPLICATIONS OF GI-FI

6.1 GI-FI Access Devices:

Access devices include termination units, internal radio modules, network interface cards, printers, PC's, and all household electronic appliances.

6.2 Broadcasting Video Signal Transmission System in Sports Stadium:

Easy and immediate construction of temporal broadband network such as in sports stadium for the advertisement of information distribution can be possible.

6.3 Office Appliances:

As Gi-Fi data transfer rate is very high we can transfer data at very high speed in offices as shown in fig. 7 which made work very easy and it also provides high quality of information from the internet.

6.4 Video Information Transfer:

By using present technologies video swapping takes hours of time where as with this technology as shown in fig 8 we can transfer data at a speed of giga bits/sec same as that for the transfer of information from a PC to a mobile and vice-versa.

6.5 Inter Vehicle Communication System:

The data exchange between vehicles is made possible by ad-hoc networks. These short- distance connections are spontaneously created between the vehicles as the need arises and can organize themselves without the help of any external infrastructure.

VI. CONCLUSION

In this paper Gi-Fi technology is defined that will allow wireless transfer of audio and video data up to 5 gigabits per second, ten times the current maximum wireless transfer rate, at one-tenth of the cost, usually within a range of 10 meters that operates at 60GHz on the CMOS process. This technology removes cables that for many years curled the world and provides high speed data transfer rate. The comparison that is performed between Gi-Fi and existing wireless technologies in this paper shows that these features along with some other benefits such as Low-cost chip, No Frequency Interference, Low Power Consumption and High Security that are explained in detail in this paper, makes it suitable to replace the existing wireless technologies for data transmission between devices that are placed in the short distances from each other. Gi-Fi technology has much number of applications and can be used in many places and devices such as smart phones, wireless pan networks, media access control and mm-Wave video-signals transmission systems. This chip could also replace HDMI cables and develop wireless home and office of future. finally some of the future works related to Gi-Fi has given and it is conspicuous that more research should be done in the field of this new wireless technology and its applications.

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