Gi-fi Technology

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Abstract: **Wireless technology improvement has become follower in today's modern life. One of the greatest improvements made on wireless technology field was inventing a new Wireless Technology (Gi-Fi). Gi-Fi or Gigabit Wireless is the world's first transceiver integrated on a single chip that operates at 60GHz on CMOS process. Gi-Fi is a wireless transmission system which is ten times faster than Wi-Fi and its chip delivers short-range multi-gigabit data transfer in an indoor environment. It will allow wireless transfer of audio and video data up to 5 gigabits per second, low power consumption, usually within a range of 10 meters .This technology providing low-cost, high broadband access, with very high speed large files exchange within seconds. It is required that Gi-Fi to be the preferred next generation wireless technology used in home and offices**.

Keywords: WI-FI, Gi-Fi, IEEE,Silicon Chip

I. INTRODUCTION

For many years cables ruled the world. Optical fibres 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 mans 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**.Researchers of Melbourne University has come up with a wireless technology which promises high speed short range data transfers with a speed of up to 5Gbps within a radius of 10 meters. The new wireless technology is named as Gi-Fi and operates on the 60GHz frequency band, which is currently mostly unused. The Gi-Fi Chip developed by the Australian researcher's measures 5mm square and is manufactured using existing complementary metal-oxide-semiconductor (CMOS) technology, the same system that is currently used to print silicon chips. The best part about this new technology is its cost effectiveness and power consumption, it consumes only 2watts of power for its operation with antenna (1mm) included and the development of Gi-Fi chip costs approximately $10(Rs 380) to manufacture.

II. WHAT IS Gi-Fi

Gi-Fi or gigabit wireless is the world's first transceiver integrated on a single chip that operates at 60GHz on the combs process. It will allow wireless transfer of audio and video data at up to 5gigabits 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.

III. ARCHITECTURE

Gi-Fi wireless technology incorporates one subscriber station that is made available for different access points. It supports IEEE 802.15.3C standard millimeter wave wireless networks that are used majorly for communication between computer devices. The subscriber station basically comprises ofa small antenna that is mounted on the top in order to support the light of sight operations.In order to avoid any interference, it transmits multiples signals across the path of transmission, at the same time having different frequencies.

The core components of a GI-FI system is the subscriber station which available to several access points. It supports standard of IEEE 802.15.3C supports millimetre- wave wireless pan networks. The wireless pan is computer network used for communication among computer devices (including telephones and personal digital assistants) close to one person. An 802.15.3c based system often uses small antenna at the subscriber station. The antenna is mounted on the roof. It supports line of sight operation.

IV. 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 cantered 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 will be transferred within seconds.

A. Time -Division Duplex

Time-Division Duplex (TDD) is the application of time-division multiplexing to separate outward and return signals. It emulates full duplex communication over a half duplex communication link. As uplink traffic increases, more channel capacity can dynamically be allocated to that, and as it shrinks it can be taken away. Time division duplex (TDD) refers to duplex communication links where uplink is separated from downlink by the allocation of different time slots in the same frequency band. It is a transmission scheme that allows asymmetric flow for uplink and downlink data transmission. Users are allocated time slots for uplink and downlink transmission. This method is highly advantageous in case there is an asymmetry of uplink and downlink data rates. TDD divides a data stream into frames and assigns different time slots to forward and reverse transmissions, thereby allowing both types of transmissions to share the same transmission medium.

TABLE I. COMPARISON BETWEEN BLUETOOTH AND WIFI AND GIFI

COMPARISON BETWEEN BLUETOOTH, WiFi AND GiFi

CHARACTERISTICS	BLUETOOTH	WI-FI	GI-FI
Specification Authority	Bluetooth SIG	IEEE, WECA	NICTA
Development Start date	1998	1990	2004
Primary device	Mobile phones, PDAs, Consumer, Electronics office Industrial Automation Devices	Notebook, Computers, Desktop, Computer servers	Mobile phones, Home devices, PDAs, Consumer, Electronics office Industrial Automation Devices
Power consumption	5mw	10mw	< 2mw
Data transfer rate	800Kbps	11Mbps	5 Gbps
Range	10 meters	100 meters	10 meters
Frequency	2.4GHz	2.4GHz	57-64GHz

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V. ADVANTAGES OF GI-FI

This Gi-Fi technology permits wireless uncompressed high definition content and operates over a range of 10 meters without interference. Gi-Fi chip has flexible architecture. It is highly convenient and can be constructed in all over the place. The complete transmission system can be built on a cost-effective single silicon chip that operates in the unlicensed, 57-64 GHz spectrum band. Gi-Fi technology also facilitates the future of information management, is simple to employment with the small form factor. The most significant benefits of the Gi-Fi technology can be recapitulated as follows:-

A. Low Cost Chip

Gi-Fi's chip uses only a tiny one-millimeter-wide antenna and less than 2mili watts of power. Low-cost chip allows technology to be readily incorporated into multiple devices. The chip in Gi-fi would likely cost about $10 or less to build. This and a small design would allow cell phones and other small devices to add the technology without significantly drive up the price, according to the company. Gi-Fi is based on an open, international standard. Mass adoption of the standard, and the use of low-cost, mass-produced chipsets, will drive costs down dramatically, which is very less in compare to present technologies.

B.Capacity of High Speed Data Transfer

The data transfer rate of Gigabit wireless technology is in Gigabits per second. Speed of Gi-Fi is 5 Gbps; which is 10 times the data transfer of the existing technologies. Providing higher data transfer rate is the major invention of Gi-Fi. A complete High-Definition (HD) movie could be transmitted to a mobile handset in a few seconds, and the handset could then upload the movie to a home computer or screen at the similar speed.

C. Security

Among the factors that have held back enterprise uptake of wireless LANs outside green field sites have been security fears and lack of performance compared to wire line Ethernet. About 70 per cent of firms have deployed their WLAN in a secure firewall zone but are still using the old WEP protocol, which does not protect the application layer effectively, so better encryption is urgently needed. Secure encryption technology in Gi-Fi ensures privacy and security of content.

D. No Interference

It utilizes the 60GHz millimeter wave spectrum to transmit the data, which offers it an benefit over Wi-Fi. Wi-Fi's part of the spectrum is increasingly crowded, sharing the waves with devices such as cordless phones, which leads to interference and slower speeds. But the millimeter wave spectrum (30 to 300 GHz) is about unoccupied, and the new chip is hundreds of times faster than the average home Wi-Fi technology.

E. Low Power Consumption

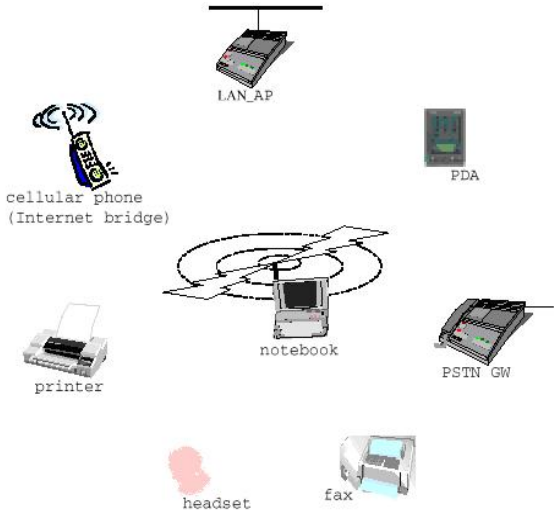
Power consumption of the current technologies such as Wi-Fi and Bluetooth are 5mili watts and 10mili watts but chip of Gi-Fi employs a small one-millimeter-wide antenna and it has less than 2mili watts of power consumption that in contrast to the existing technologies is very less.

VI. APPLICATIONS

A. *House hold Application*

Consumers could typically download a high definition movie from a kiosk in a matter of seconds to music player or smart phone and having got home could play it on a home theatre system or store it on a home server for future viewing, again within a few seconds, high speed internet access, streaming content download (video on demand, HDTV, home theatre, etc.), real time streaming and wireless data bus for cable replacement.

FIGURE 1: WIRELESS HOME ANDOFFICE OF THE FUTURE.



B. *Video information transfer*

By using present technologies video swapping takes hours of time, whereas by this we can transfer at a speed of Gbps. Information Transfer Data transfer rate is same for transfer of information from a PC to a cell or a cell to a PC. It can enable wireless monitors, the efficient transfer of data from digital camcorders, wireless printing of digital pictures from a camera without the need for an intervening personal computer and the transfer of files among cell phone handsets and other handheld devices like personal digital audio and video players.

C. *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

VII. FUTURE SCOPE

A completely integrated single chip transceiver has been fabricated, tested and demonstrated in Gi-Fi chip and a transceiver with integrated phased array antenna on 65nm CMOS technology has been sent for fabrication. Gi-Fi technology demonstrates the world's first fully integrated transceiver on CMOS technology operating at 60 GHz and provides new technique for integrating antennas on CMOS. Demonstrations of Gi-Fi technology can be arranged showing the huge potential it has to change the way consumers use their in-home electronic devices. The Gi-Fi team is looking for partners interested in commercializing its 60GHz chips and with growing consumer adoption of High-Definition (HD) television, low cost chip and other interesting features of this new technology it can be predicted that the anticipated worldwide market for this technology is vast. Within next few years, we expect Gi-Fi to be the dominant technology for wireless networking. By providing low-cost, high broadband access, with very high speed large files swapped within seconds it could develop wireless home and office of future.

VIII. DISADVANTAGES

The major disadvantage of Gi-Fi technology is its work in short distance only and it is not work in long distance. So if we want to use its advantages for a wide range we need to wait for the wide range application of Gi-Fi in future.

IX. 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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