A Survey on GI-FI Technology

Ms. Sonali B. Maind (Author)
Department of Information Technology
DMIETR, Sawangi (Meghe), Wardha
Wardha, India
sonali.maind@gmail.com

Mr. Pravin V. Khawse (Author)
Department of Computer Engineering
MKSSS's Cummins college of Engg. for Women
Nagpur, India
pinku8jun@gmail.com

Abstract— Gi-Fi stands for Gigabit Wireless. GiFi is a wireless transmission system which is ten times faster than Wi-Fi and it's chip delivers short-range multigigabit data transfer in an indoor environment. Gi-Fi will helps 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. 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 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. 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.

Keywords- Gi-Fi, CMOS , Wi-Fi, Bluetooth

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I. INTRODUCTION

Wi-Fi (IEEE-802.11b) and Wi-Max (IEEE-802.16e) have captured our attention, as there are no recent developments in the above technologies which cannot transfer data and video information at a faster rate and led to the introduction of Gi-Fi technology. It offers some advantages over Wi-Fi, a similar wireless technology, that offers faster information rate in Gbps less power consumption and low cost for short range transmissions. Gi-Fi or Gigabit Wireless is the world's first transceiver integrated on a single chip in which a small antenna used and both transmitter receiver are 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 can be done within seconds. In theory this technology would transfers GBs 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. Gi-Fi 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.

This have low power conception of 2 watt and comes with 1 mm antenna. The complete GI-FI index is contained in the CRA's Guide to The General Index of Financial Information (GIFI). For Corporations which you can download or get in a paper or diskette version from your nearest tax services office, you will find links to both the Guide to the General Index of Financial Information (GIFI) For Corporations and the GIFI.

II. WHAT IS GI-FI

The Gi-Fi chip is only 5mm in size and use current CMOS technology. Cost is only $10. I say, let's begin mass producing it. Prof. Stan Skafidis of "Melbourne University Australia", is the inventor of Gi-Fi chip. The Gi-Fi chip uses only a tiny one-millimeter-wide antenna and less than two watts of power, and the Gi-Fi chip would cost less than $10 to manufacture it. The Gi-Fi uses the short-range wireless technology would potentially be a competitor or more than likely a replacement for Wi-Fi 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.
The world's first Gi-Fi wireless network chip developed at Australia's peak federal technology incubator has entered its commercialization phase. Nicta chief executive David Skellern confirmed that the research facility had formed a start-up around the new technology. 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.

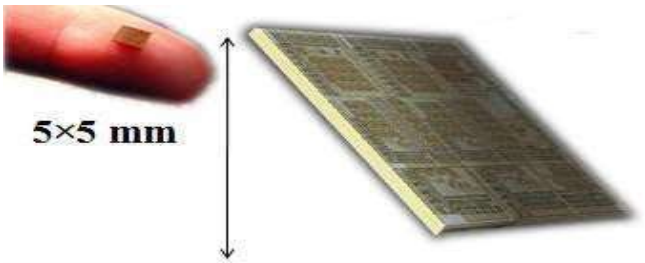


Fig. 1Chip of Gi-Fi

III. NEED OF GI- FI

The reason for pushing into Gi-Fi technology is because of slow rate, high power consumption, low range of frequency operations of earlier technologies i.e. Bluetooth and Wi-Fi, see the comparisons and features of those two technologies.

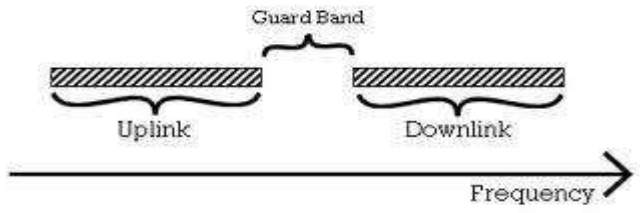
Characteristic	Bluetooth	Wi-Fi
Frequency	2.4 GHz	2.4 GHz
Range	10 meters	100 meters
Primary application	WPAN: cable replacement	WLAN: Ethernet
Data transfer rate	800 Kbps	11 Mbps
Power consumption	Low	Medium
Primary devices	Mobile phones, PDAs, consumer electronics, office and industrial automation devices	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

IV. WORKING OF 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.

1) Technologies Used

This mm Wave WPAN will operate in the new and clear band Including 57-64 GHz unlicensed band defined by FCC 47 CFR 15.255. The millimeter-wave WPAN will allow high coexistence (close physical spacing) with all other microwave systems in the 802.15 family of WPANs.
Two Technologies that help realize GWLAN are,
• Multiple Input Multiple Output (MIMO)
• System-On-a-Package (SOP)

(a) Multiple Input Multiple Outputs

MIMO wireless is an emerging cost effective technology that offers substantial leverages in making 1Gbps wireless links a reality. We can in principle, meet the 1Gbps data rate requirement if the product of bandwidth (measured in Hz) and spectral efficiency (measured in bps/Hz) equals 10^9.
MIMO wireless constitutes a technological breakthrough that will allow Gbps speeds in NLOS wireless networks.
The performance improvements resulting from the use of MIMO systems are due to
• 1. Array gain
• 2. Diversity gain
• 3. Spatial Multiplexing Gain
• 4. Interference Reduction

(b) System-On-A-Package

SOP approach for the next-generation wireless solution is a more feasible option than SOC. Recent development of materials and processes in packaging area makes it possible to bring the concept of SOP into the RF world to meet the stringent needs in wireless communication area.
Wireless devices implementing complex functionality require a large amount of circuitry and consequently, require a large conventional package or MCM real estate. SOP goes one step beyond Multi Chip Module (MCM) by enhancing overall performances and adding more functionality.

2) *OPERATION AT 60 GHZ*

Here we will use millimeter wave antenna which will operate at 60 GHz frequency which is unlined band Because of this band we are achieving high data rates energy propagation in the 60 GHz band has unique characteristics that make possible many other benefits such as excellent immunity to co-channel interference, high security, and frequency re-use.
Point-to-point wireless systems operating at 60 GHz have been used for many years for satellite-to-satellite communications. This is because of high oxygen absorption at 60 GHz (10-15 dB/Km).

As shown in the figure 2 the absorption attenuates 60 GHz signals over distance, so that signals cannot travel far beyond their intended recipient. For this reason, 60GHz is an excellent choice for covert communication.

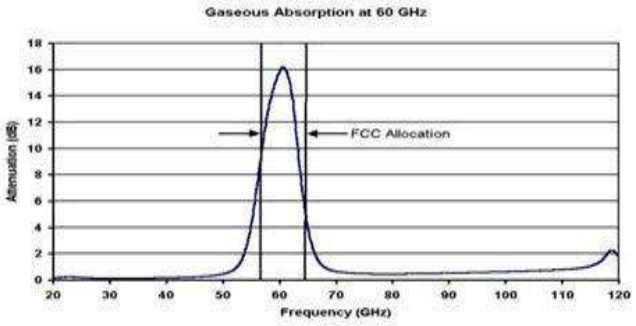


Fig. 2 Oxygen Attenuation vs. Frequency

(i). Ultra Wide Band Frequency Usage

A technology with high bit rate, high security and faster data transmission. It is a zero carrier technique with low coverage area. So we have low power consumption. These features are Ultra-Wideband is a technology for transmitting information spread over a large bandwidth (>500 MHz) that should, be able to share spectrum with other users. Regulatory settings of FCC are intended to provide an efficient use of scarce radio bandwidth while enabling both high data rate personal-area network (PAN) wireless connectivity and longer-range, low data rate applications as well as radar and imaging systems.

V. GIGABIT WIRELESS FEATURES

This Gi-Fi technology allows wireless uncompressed high definition content and operates over a range of 10 meters without interference. Gi-Fi chip has flexible architecture. It is highly portable and can be constructed in everywhere. Entire 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 enables the future of information management, is easy to deployment with the small form factor. 2.1 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 main invention of Gi-Fi. An entire High-Definition (HD) 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.

A. Interference in Data Transfer

It uses the 60GHz millimeter wave spectrum to transmit the data, which gives it an advantage 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 almost unoccupied, and the new chip is potentially hundreds of times faster than the average home Wi-Fi technology.

B. Power Consumption

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

C. Provides High Security

Gi-Fi technology is based on IEEE 802.15.3C and this standard provides more security since it provides optional security in the link level and service level. Point-to-point wireless systems operating at 60 GHz have been used for many years by the intelligence community for high security communications and by the military for satellite to satellite communications.

VI. APPLICATIONS

There are many usage scenarios that can be addressed by Gi-Fi. The following are some mobility usage applications of Gi-Fi

A. House Hold Appliances

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 theater, etc.), real time streaming and wireless data bus for cable replacement. It makes the wireless home and office of the future.

B. GI-FI Access Devices

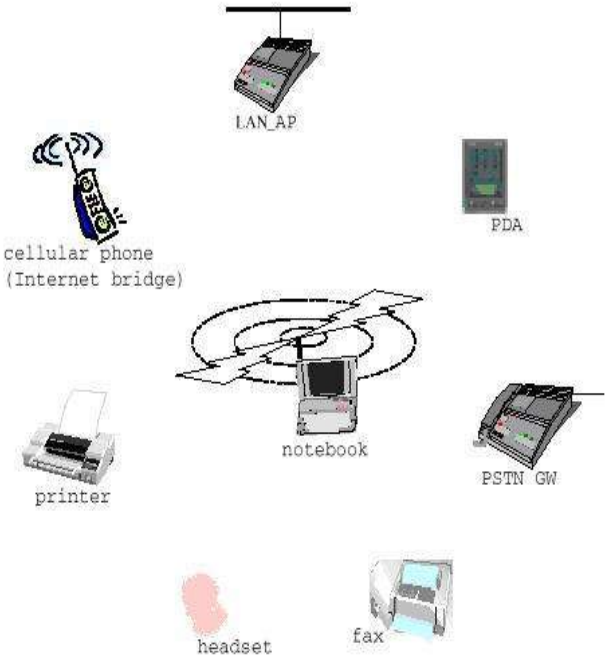


Fig. 3 Gi-Fi access devices

Some of the Gi-Fi access devices are shown in fig. These access devices include termination units, internal radio modules, network interface cards, printers, PC's, and all household electronic appliances.

C. Broadcasting Video Signal Transmission System in Sports Stadium

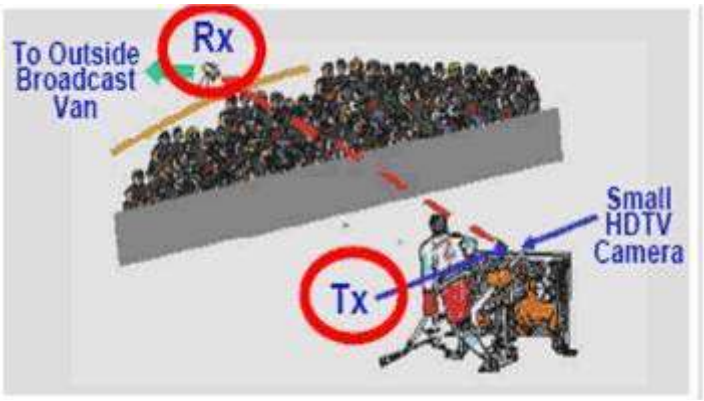


Fig. 4 Sports Stadium

Easy and immediate construction of temporal broadband network such as in sports stadium for the advertisement of information distribution can be possible as shown in fig. 4.

VII. CONCLUSION

Within five years, we expect Gi-Fi to be the dominant technology for wireless networking. By that time it will be fully mobile, as well as providing low-cost, high broadband access, with very high speed large files swapped within seconds which will develop wireless home and office of future. Two important characteristics of CMOS a device that is used in this technology is are high noise immunity and low static power consumption. The same Gi-Fi system is currently used to print silicon chips. The Gi-Fi Chip developed by the Australian researchers. Gi-Fi 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. If the success of Wi-Fi and the imminent wide usage of Wi-Max is any indication, Gi-Fi potentially can bring wireless broadband to the enterprise in an entirely new way.

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