

Improving Wireless Capability of GiFi

¹ Reshma R, ²Dr. Anjana S Chandran,

¹ Student, ²Assistant Professor,

¹ Department of Master of Computer Applications,

¹ SCMS School of Technology and Management, Muttom, Aluva, India

Abstract: Gi-Fi (Gigabit Fidelity) or Gigabit Wireless refers to wireless communication at a data rate of more than one billion bits (gigabit) per second. 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. 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. Since the major disadvantage of the Gi-Fi technology is the limited range it has, one suggestion to improve this is to increase the size of the chip so that the size of the antenna, that is on the chip can be increased. Increasing the size of the inbuilt antenna can increase the range of the gif.

IndexTerms – Gi-Fi, Beamforming, MIMO

I. INTRODUCTION

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. Gi-Fi which is developed on an integrated wireless transceiver chip. In which a small antenna is 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 will be sent within seconds.^[3]

Robotic Process Automation delivers direct profitability while improving accuracy across organizations and industries. Designed to perform on a vast range of repetitive tasks, software robots interpret, trigger responses and communicate with other systems just like humans do. Only substantially better: a robot never sleeps, makes zero mistakes and costs a lot less than an employee.^[2]

II. GIFI TECHNOLOGY

With internet spectrum swelling up to 5G and so on, the requirement to transfer data with huge size at the faster rate becomes a challenge. The solution came up, with a new technology namely Gi-Fi. Gi-Fi provides fast information rate in Gbps, less power consumption and low cost for short range communication. Gi-Fi or gigabit wireless is the world's first transceiver integrated on a single chip (as shown in figure 9) 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. It is almost ten times the current maximum wireless transfer rate, at one-tenth the cost. The Melbourne University based laboratories of NICTA (National ICT Australia Limited) [8], Australia's Information and Communications Technology Research Centre of Excellence 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 within a range of 10 meters. It fulfills the standards of IEEE 802.15.3C^[11].

III. ARCHITECTURE OF GIFI

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 of a 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 multiple signals across the path of transmission, at the same time having different frequencies^[16].

IV. WORKING OF Gi-Fi

Here we use time division duplex for receiving and transmission. The data files are converted to RF 60GHz range by making use of two mixers from an IF range. The output is then stored in a power amplifier, that stores a millimeter wave antenna within. The RF incoming data is first converted to IF signal at 5GHz and then converted to a normal data range. A heterodyne construction is used for this procedure to avoid any leakage because of direct conversion. With the availability of a 7GHz spectrum, the data gets transferred in a matter of seconds^[2].

V. FEATURES OF Gi-Fi

Main features of GiFi as a Wireless technology

Better transfer rates- The main reason for the invention of GiFi was to provide a better transfer rate in comparison to Wi-Fi and Bluetooth. As the name suggests, it offers transfer rates in Gigabits (GB) per second. It supports a 5 Gbps speed, which is approximately ten times better than the current rate of data transfer. Due to the high speed, audios, videos can be easily transferred in a matter of seconds. Due to a higher availability of 7 GHz spectrum, it results in high data rates.

Lower power consumption- The data is transmitted at a low rate of 2mwatts while other technologies make use of 5mwatts to 10mwatts, which is comparatively very high. Even though, it allows the transfer of a large amount of information it makes use of milli watts power only.

Secure and Cost-Efficient- The IEEE 802.15.3C offers more security, it offers both service level and link level security. Operating systems of 60GHz have been used for years by intelligence companies for security reasons and by the militants for satellite to satellite communications. The overall effects of narrow beams and O2 absorption lead in low interference and higher level of security. Coming to the cost perspective, it is based on an international and open standard. It makes use of mass-product and low cost chipsets, which drops down the rates dramatically and results in a **wireless technology** with high speed and low prices.

Small sized- Another feature of GiFi is the small size. The chip measures approximately 5mm on each side, incorporates a small antenna and makes use of a 60 GHz spectrum. Therefore, GiFi offers high mobility and portability. It provides better coverage area which allows the technology to go higher.

Quick Positioning- In comparison to the positioning of the present technologies, GiFi offers the deployment of service within a few minutes, which may take hours for other solutions.

Additional Features of GIFI wireless technology

- GiFi is highly –portable, which makes it very convenient to construct it wherever we need it.
- GiFi installs line of sight operations having a short coverage area, as it offers a versatile architecture.
- 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. Hence, leaving them satisfied^[18].

VI. ADVANTAGES OF GI-FI

1. **Removing cables:** This technology removes need for cables to connect consumer electronics devices and all the devices can be connected so as to transmit the information wirelessly.
2. **Low cost:** Low-cost chip permits technology to be easily incorporated into several devices. The chip in Gi-Fi would likely cost less to create.
3. **Security and privacy:** Encryption technology in Gi-Fi ensures security and privacy of content. About 70 per cent of companies have deployed their WLAN in a very secure firewall zone but are still using the previous WEP protocol, that doesn't protect the application layer effectively, thus better encryption is urgently required.
4. **Flexibility:** One of the issues with wire connections and cables is complexity for connecting, but within the Gigabit wireless technology simplicity is one among the features. Easy connection improves the consumer experience. The advantages related to the Gi-Fi technology that may be achieved by the deployment and use of this technology^[3].

VII. DISADVANTAGE OF GI-FI

1. The main disadvantages of the Gi-Fi is that it works in short distance only and not in long distance^[4].

VIII. APPLICATIONS

1. This technology can be effectively used in wireless pan networks, Inter-vehicle communication systems, Ad-hoc information distribution with Point-to-Point network extension, media access control (MAC), imaging and other applications.
2. Gi-Fi technology also can be used in broadcasting video signal transmission system in sports stadiums and mm-Wave video video-signals transmission systems. The technology could also be used for beaming full HD video in real-time and could be used by notebooks and other computers to wirelessly connect virtually all the expansion needed for a docking station, including a secondary display and storage.
3. Gi-Fi technology has many attractive features that make it suitable for use in many places and devices. Gi-Fi technology offering reduced the chip size and power consumption, can be used to send and receive large amounts of data in a variety of applications For example, it is intended for use in a wide range of devices including personal computers, tablets, and smart phones. The technology's fast data-synchronization rates enable the rapid transfer of video, bringing the wireless office closer to reality.
4. Gi-Fi technology is able to transfer gigabits of data within seconds and therefore it can be used for huge data file transmission and it is expected that this chipset replaces HDMI cables and could develop wireless home and office of future^[6].

IX. ANALYSIS

The method of Gi-Fi would employ a chip that transmits at an enormously high 60GHz frequency versus the 5GHz used for the fastest forms of Wi-Fi. Mixing and signal filtering used in Gi-Fi technology would maintain the signal strong versus the longer-ranged except slower and more drop-prone Wi-Fi option of today. The chip in Gi-Fi would probably cost about \$10 or less to build. In modern years, new wireless local area networks (WLANs) such as Wi-Fi and wireless personal area networks (WPAN) such as Bluetooth have become accessible. Wi-Fi needs 10mili watts and Bluetooth needs 5mili watts when Gi-Fi requiress less than 2mili watts [7, 8].

Data transfer rate of Wi-Fi is up to 11 Megabit per second and Bluetooth has 800 kilobits per second while Gi-Fi is able to transmit the data at the rate of 5 Gigabit per second. Wi-Fi and Bluetooth are operating in the frequency of 2.4 Giga Hertz but Gi-Fi uses the 60GHz millimeter wave spectrum to transmit the data, which bestows it a 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. We can wind up that the Gi-Fi is a suitable technology for short distance data transmission to be used in various devices and places^[5].

X. PROPOSED SYSTEM

An antenna is basically a transducer and a conductor of current which converts input electrical current into electromagnetic waves or produce electrical current in response to an electromagnetic wave. Though any conductor of electricity can be used as an antenna, there are many types of antennas and their functionality as transmitter or receiver of electromagnetic waves is governed by well-established theories.

The distance to which an antenna can transmit or receive signal from, can be increased by increasing the power applied to the antenna. This technique increases the strength of the carrier wave and the radio signal becomes capable of transmitting to greater distance before fading away.

Another method is to use standard height of the antenna as formulated by established antenna theory. Using the standard height of the antenna depending upon the frequency of the carrier wave can increase the range of operation up to two or three times. According to the antenna theory, the height of the antenna should be half or quarter of the wavelength of the carrier signal. The power input to the antenna has been kept constant to experience the sole effect of antenna height on the operational range of the module.

1. For many years antenna technology has been used to improve the performance of systems. Directive antennas have been used for very many years to improve signal levels and reduce interference. Directive antenna systems have, for example, been used to improve the capacity of cellular telecommunications systems. By splitting a cell site into sector where each antenna illuminates 60° or 120° the capacity can be greatly increased - tripled when using 120° antennas. With the development of more adaptive systems and greater levels of processing power, it is possible to utilise antenna beamforming techniques with systems such as MIMO.

Beamforming techniques can be used with any antenna system - not just on MIMO systems. They are used to create a certain required antenna directive pattern to give the required performance under the given conditions.

Smart antennas are normally used - these are antennas that can be controlled automatically according the required performance and the prevailing conditions.

Smart antennas can be divided into two groups:

- **Phased array systems:** Phased array systems are switched and have a number of pre-defined patterns - the required one being switched according to the direction required.
- **Adaptive array systems (AAS):** This type of antenna uses what is termed adaptive beamforming and it has an infinite number of patterns and can be adjusted to the requirements in real time.

MIMO beamforming using phased array systems requires the overall system to determine the direction of arrival of the incoming signal and then switch in the most appropriate beam. This is something of a compromise because the fixed beam is unlikely to exactly match the required direction.

2. Two antennas monolithically integrated on-chip to be used respectively for wireless powering and UWB transmission of a tag designed and fabricated in 0.18- μm CMOS technology. A multiturn loop-dipole structure with inductive and resistive stubs is chosen for both antennas. Using these on-chip antennas, the chip employs asymmetric communication links: at downlink, the tag captures the required supply wirelessly from the received RF signal transmitted by a reader and, for the uplink, ultra-wideband impulse-radio (UWB-IR), in the 3.1-10.6-GHz band, is employed instead of backscattering to achieve extremely low power and a high data rate up to 1 Mb/s. At downlink with the on-chip power-scavenging antenna and power-management unit circuitry properly designed, 7.5-cm powering distance has been achieved, which is a huge improvement in terms of operation distance compared with other reported tags with on-chip antenna.
3. 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.

XI. ADVANTAGES OF THE PROPOSED SYSTEM

1. It increases the strength of the carrier wave and the radio signal becomes capable of transmitting to greater distance before fading away.
2. The higher data rate can be achieved with the help of multiple antennas and SM (Spatial Multiplexing) technique. This helps in achieving higher downlink and uplink throughput and also it helps in achieving reduction in BER

3. Adaptive array systems are able to direct the beam in the exact direction needed, and also move the beam in real time - this is a particular advantage for moving system ie mobile communication.
4. There is lower susceptibility of tapping by unauthorized persons due to multiple antennas and algorithms.
5. The systems with MIMO offers high QoS (Quality of Service) with increased spectral efficiency and data rates.
6. The wide coverage supported by MIMO system helps in supporting large number of subscribers per cell

XII. DISADVANTAGES OF THE PROPOSED SYSTEM

1. MIMO based systems cost higher compare to single antenna based system due to increased hardware and advanced software requirements.
2. The resource requirements and hardware complexity is higher compare to single antenna based system. Each antenna requires individual RF units for radio signal processing. Moreover advanced DSP chip is needed to run advanced mathematical signal processing algorithms.
3. The hardware resources increase power requirements. Battery gets drain faster due to processing of complex and computationally intensive signal processing algorithms. This reduces battery lifetime of MIMO based devices.

XIII. CONCLUSION

After comparing Gi-Fi with other wireless technology we have come to the conclusion that Gi-Fi solves the problem of low data transfer rate, high power consumption and low frequency range of earlier technology. It can provide better data transfer rate with low power consumption due to be integrated transceiver on a single chip. By improving the size of antenna on chip, range to which gi-fi can be used can be increased.

XIV. REFERENCES

- [1]International Journal of Advanced Research in Computer and Communication Engineering Vol. 4, Issue 6, June 2015 Copyright to IJARCCCE DOI 10.17148/IJARCCCE.2015.4618 80 Gi-Fi: Future of Wireless Technology <https://www.ijarccce.com/upload/2015/june-15/IJARCCCE%2018.pdf>
- [2] International Journal of Advanced Research in Computer and Communication Engineering Vol. 5, Issue 3, March 2016 Copyright to IJARCCCE DOI 10.17148/IJARCCCE.2016.5309 31 GIFI New Era of Wireless Technology <https://www.ijarccce.com/upload/2016/march-16/IJARCCCE%209.pdf>
- [3] IJCSN International Journal of Computer Science and Network, Volume 2, Issue 3, June 2013 Evolution Evolutionof Gi-Fi Technology over other Technologies <https://arxiv.org/ftp/arxiv/papers/1307/1307.0616.pdf>
- [4] <https://getseminar.in/showthread.php?tid=30223>
- [5] International Journal of Research in Advent Technology, Vol.3, No.5, May 2015 E-ISSN: 2321-9637 Evaluation of Gi-Fi Technology for High-Rate Wireless Communication. <http://www.ijrat.org/downloads/may-2015/paper%20id-35201531.pdf>
- [6]Gi-Fi:<http://c.mi.com/forum.php?mod=viewthread&tid=475051&aid=1289081&from=album&page=1>
- [7] International Journal of Computer Applications (0975 – 8887) National Conference on Advancements in Alternate Energy Resources for Rural Applications (AERA-2015) 14 GiFi (Gigabit Fidelity) Technology <http://research.ijcaonline.org/ncrmc2015/number1/ncrmc2903.pdf>
- [8] January 2017, Volume 4, Issue 01 JETIR (ISSN-2349- 5162) JETIR1701019 Journal of Emerging Technologiesand Innovative Research (JETIR) www.jetir.org 125 GIFI next generation wireless technology <http://www.jetir.org/papers/JETIR1701019.pdf>
- [9] IJREAT International Journal of Research in Engineering & Advanced Technology, Volume 4, Issue 1, Feb – March, 2016 Future of Wireless Communication Network Technologies: Wi-Fi Vs Gi-Fi Vs Super Wi-Fi <http://www.ijreat.org/Papers%202016/Issue19/IJREATV4I1009.pdf>
- [10] International Journal of Computer Sciences and Engineering Volume-4, Special Issue-3, May 2016 http://ijcseonline.org/spl_pub_paper/31-N048-IJCSE.pdf
- [11] Dr J Sebastian Nixon. Int. Journal of Engineering Research and Application www.ijera.com ISSN : 2248- 9622, Vol. 6, Issue 7, (Part -1) July 2016, pp.11-16A Study on Guided and Unguided Transmission Medias and a Proposed Idea to Extend the Limit of Gi-Fi http://www.ijera.com/papers/Vol6_issue7/Part%20-1/C060701011016.pdf
- [12] International Journal of Emerging Trends & Technology in Computer Science (IJETTCS) Volume 4, Issue 2, March-April 2015 NEOTERIC INNOVATION IN GI-FI TECHNOLOGY <http://www.ijettcs.org/Volume4Issue2/IJETTCS-2015-03-15-29.pdf>
- [13] IJIRST || National Conference on Innovations in Micro-electronics, Signal Processing and Communication Technologies (V-IMPACT-2016) February 2016A Review Paper on Gi-Fi Technology <http://www.ijirst.org/articles/IMPACTP021.pdf>

[14]International Journal of Innovative Research in Advanced Engineering (IJIRAE) ISSN: 2349-2163 Volume 1 Issue 7 (August 2014) New Adaption With Gi-FI Technology <https://www.scribd.com/document/238282848/New-Adaption-With-Gi-FI-Technology>

[15] International Journal of Advanced Research in Computer Science & Technology (IJARCST 2014) Innovative With GI-FI Technology <http://www.ijarcst.com/doc/vol2-issue1/psrikanth.pdf>

[16]<https://www.slideshare.net/shubhrikasehgal/gifi-59986266>

[17] International Journal of Science, Engineering and Technology Research (IJSETR) Volume 6, Issue 4, April 2017, ISSN: 2278 -7798

[18]<https://www.mepits.com/tutorial/253/wireless/latest-emerging-wireless-technologies/>

[19]International Refereed Journal of Engineering and Science (IRJES) GI-FI, the Technology of New Era <http://www.irjes.com/Papers/vol3-issue9/E393538.pdf>

