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## REVOLUTIONARY GI-FI TECHNOLOGY

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**Abstract:** Since many years wired data transmission ruled the world. Optical fibers played an important and dominant role as they have higher bit rates and faster transmission. But they are difficult for the installation of cables hence it ultimately led to wireless access. The existing technology of this is Bluetooth which can cover 9-10mts and Wi-Fi followed it having coverage area of 91meters. Obviously, Wi-Fi wireless networks have proved a revolutionary solution to "last mile" problem. However, its main 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 both cellular networks and hard-wire networks. 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. 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 absolutely necessary in enabling the digital economy of the future.

**Keywords:** Gi-Fi, CMOS, Time Division Duplex, Wi-Fi, WiMAX

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## INTRODUCTION

Gi-Fi stands for Gigabit Wireless. Gi-Fi is a wireless transmission system which is ten times faster than other technology and its chip delivers short-range multi-gigabit data transfer in a local environment. As there is no recent technological development in Wi-Fi (IEEE-802.11b) and WiMAX (IEEE-802.16e) 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, 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 who 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. In theory this technology would transfers GB's of your 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.

### I. EVOLUTION OF NETWORK

Communication technology can be divided into two types such as wired technology and wireless technology. The evolution of wireless technology will leads to the GI-FI technology.

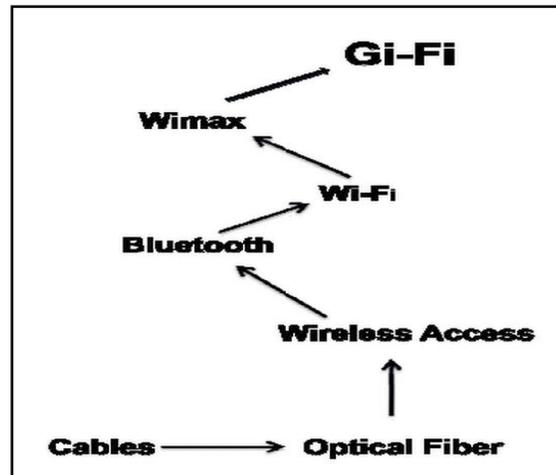
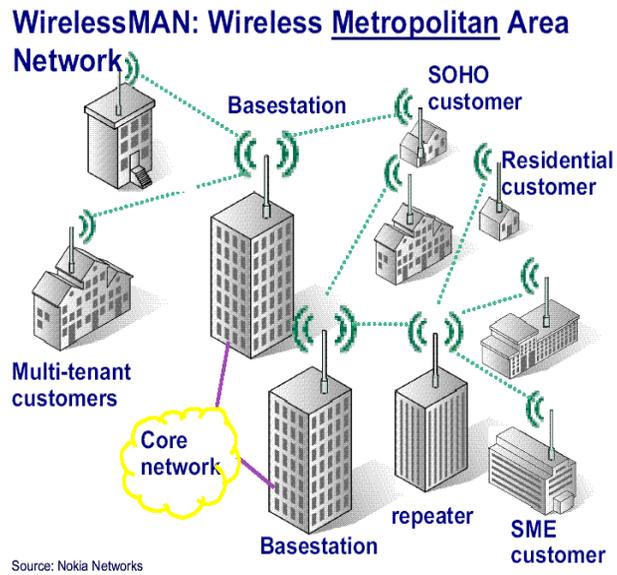


Fig. 1 Network Evolution

#### A. WiMAX

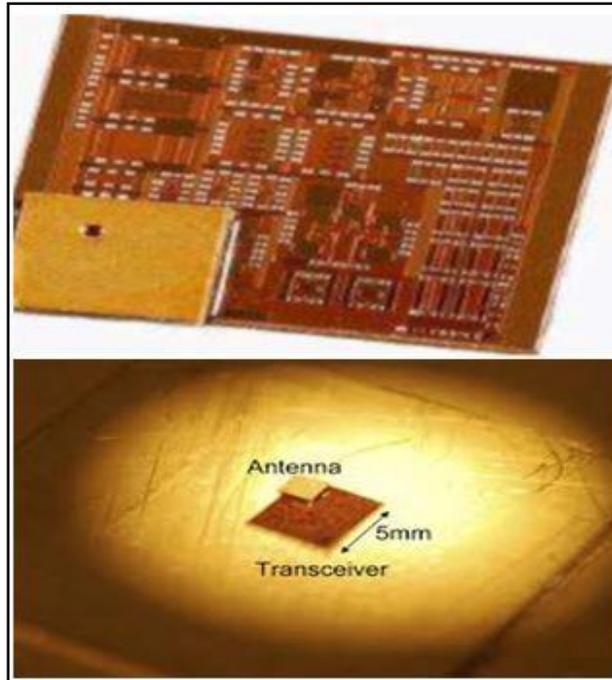
The diagram below will give the network evolution. Worldwide Interoperability for Microwave Access (WiMAX) is commonly associated with the IEEE 802.16 standards. This is a wireless communications technology aiming to provide wireless data over long distances in a variety of ways as an alternative to cable and DSL, from point-to-point links to full mobile cellular type access. This technique originally covered the wireless area with radio spectrum from 10 to 66 GHz. The name WiMAX was created by the WiMAX Forum, which was formed in June 2001 as an industry-led, not-for-profit organization to promote conformance and interoperability of the standard. The goal of this deliverable is to provide an overview of the functionality and a description of the WiMAX network architecture. With the help of special features like 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.



**Fig. 2 WiMaX**

**B. 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. 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. A new silicon chip is predicted to revolutionize the way household gadgets like televisions, phones and DVD players talk to each other. Gi-Fi satisfies the standards of IEEE 802.15.3C. The tiny 5mm side chip can transmit data through a wireless connection at 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 (Rs.380) to manufacture.



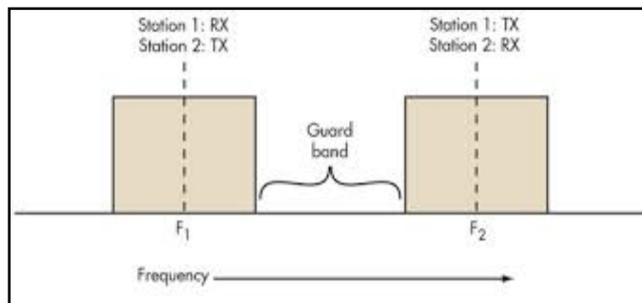
**Fig. 3 Gi-Fi chip**

## II. WORKING PRINCIPLE USED IN GI-FI TECHNOLOGY

The important aspect of this technology is that the limit of band frequency. In this we will use time division duplex for both transmission and receiving. Here data files are up converted from IF range to RF 60GHz 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 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.



**Fig. 4. Time Division Duplex**

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.

**B. COMPARISON OF GI-FI AND OTHER TECHNOLOGIES**

Characteristics	Bluetooth	Wi-Fi	Gi-Fi
<b>Primary Device</b>	Mobile phones, PDAs, Electronics Office Industrial, automation Devices	Desktop computers, Servers, Notebook Computers	Mobile phones, Home Devices, PDAs, Consumer, Electronics, Office, Industrial, automation Devices
<b>Data Transfer Rate</b>	800Kbps	100Mbps	5Gbps
<b>Power consumption</b>	5 mw	10 mw	< 2 mw
<b>Range</b>	10 meters	100 meters	10 meters
<b>Frequency</b>	2.4 GHz	2.4 GHz	57-64 GHz
<b>Data Transfer</b>	Unlimited	Unlimited	Unlimited
<b>Communication path</b>	Wire-less	Wire-less	Wire-less

Above comparative table shows some characteristics, features over existing technology and more number of devices that are using such Gi-Fi technology. Due to these characteristics this technology is more preferable over other technologies.

### III. FEATURES OF GI-FI

#### A. High speed data transfer

The main advantage of Gi-Fi is that, it provide higher bit rate Because of this high speed data transfer, we can transfer large video, audio, data files within seconds. As the name itself indicates data transfer rate is in Giga bits per second, it is 10 times faster than the present data transfer rate. The speed of Gi-Fi is 5 Gbps. Along with audio Gi-Fi also provide transmission of entire High-Definition (HD) movie to a mobile phone in a few seconds, and we can upload same data or any data from phone to home computer or screen at same speed.

#### B. High Security

Gi-Fi provides Point-to-point wireless systems operating at 60 GHz which have been used for many years by the United States intelligence community for high security communications and by the military for satellite-to satellite communication.

#### C. Low power consumption

This is one of the best feature since it utilizes milli-watts of power even when the large amount of information is transferred. Generally in present technologies it takes 10mwatt power, which is very high but this technology consumes only 2mwatt power for its operation with antenna or data transfer of gigabits of information.

#### D. Small size

Gi-Fi chip is just 5mm per side which uses only one milli-meter wide tiny antenna and less than 2 milli-watts of power. Because of this small size feature of chip, we can easily implement it in any embedded multimedia device. Hence complexity decreases.

#### E. Low cost

The chip in Gi-Fi would likely cost about \$10 or less to build which is very less as compared to other technologies. Gi-Fi is based on an open, international standard due to which the use of low-cost, mass-produced chipsets will bring down the cost automatically. As time will pass and development increases , the price of Gi-Fi will be decreased.

#### F. Simplicity

Simplicity in circuit means simple connection so that we can easily predict all the connection and wired connection complexity decreases. As Gi-Fi is multi Giga-bits wireless connection so it removes the need of cables and wires between consumers and electronic devices. Gi-Fi chip has flexible architecture. It is highly portable and can be constructed in everywhere. This technology allows wireless streaming of uncompressed high-definition content and operates over a range of 10 meters without interference. Entire transmission system can be built on a single silicon chip that has 57-64 GHz spectrum band.

#### IV. APPLICATION OF GI-FI

##### A. Office appliances

Gi-Fi technology provides wireless communication in Offices of any field. Transfer rate of internet connection is in Giga-bits so it consume very less time. All industrial, government or private sector, colleges consist of offices can use this Gi-Fi technology.

##### B. Home appliances

Consumers can download a high definition movie from internet within a few seconds to music player or smart phone and play it on a home theatre system or store it on a home server for future viewing. User can also use this high speed internet for accessing purpose. The use of this household appliances increases rapidly and Gi-Fi technology can fulfil all the required possible high speed data transmission. Fig. 5 shows some appliances which can be used in Home.



**Fig. 5 Home Appliances**

### C. Online Library system

In colleges library is very important for students where this Gi-Fi is used to transfer of video, audio data within a second. Some IIT's or any Guest lecture or their videos are conducted in colleges then this videos are shown to students in different class rooms. This videos are transfer to other computers of different class rooms within a second. Sometimes Guest lecture is conducted in one class room and same lecture is shown in other class rooms with delay of time required for transfer such video without using any cables.

## V. CONCLUSION

In this paper the best concept defined as transfer rates of bits using Gi-Fi technology. Gi-Fi provides wireless transfer of audio and video data up to 5 Giga bits per second, ten times the current maximum wireless transfer rate, at one-tenth of the cost. This is the wireless data transmission which overcomes the cable complexity. This technology uses single silicon chip that operates at 60GHz on the CMOS process with a 57-64 GHz unlicensed frequency band. This paper explained the features of Gi-Fi over existing technology such as high speed data transfer, low cost, high security, no frequency interference, small size architecture. Applications based on the current scenario are also explained such as home and office appliances, online library system. This is very important application areas in which high speed data transfer is widely used. This paper also explained the comparison between Gi-Fi and existing wireless technology WiMAX, Wi-Fi. This chip could also replace HDMI cables and develop wireless home and office of future. There is more scope for such high speed wireless communication as world is moving so fast in accessing new technologies.

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