Innovative With GI-FI Technology

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Abstract:

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. 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:

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.

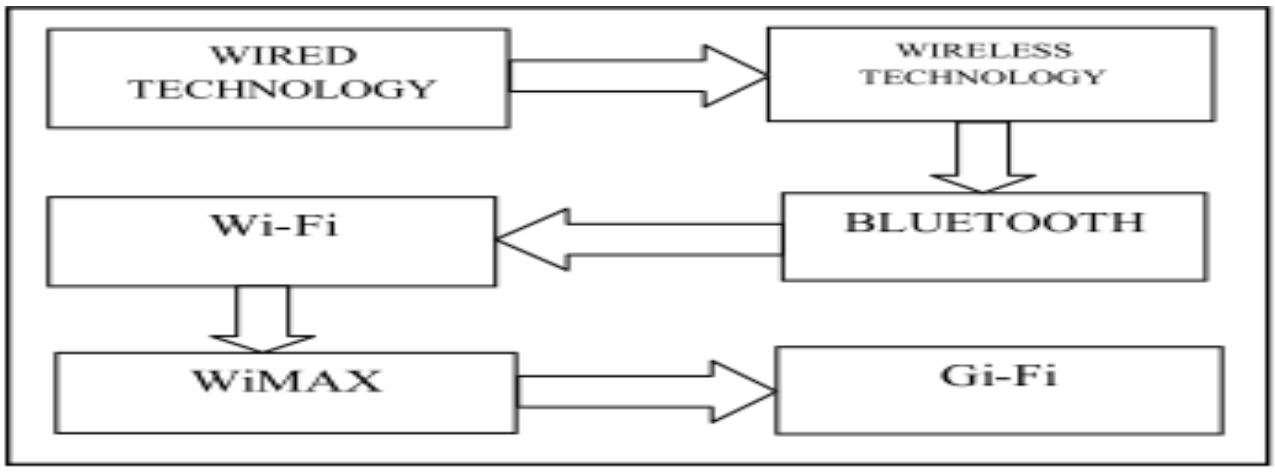
Researchers of Melbourne University has come up with a wireless technology which promises high speed short range data transfers with a speed of up to 5Gbps within a radius of 10 meters. The new wireless technology is named as Gi-Fi and operates on the 60GHz frequency band, which is currently mostly unused. 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.

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.

II. 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.



A. 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. 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 or65 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.

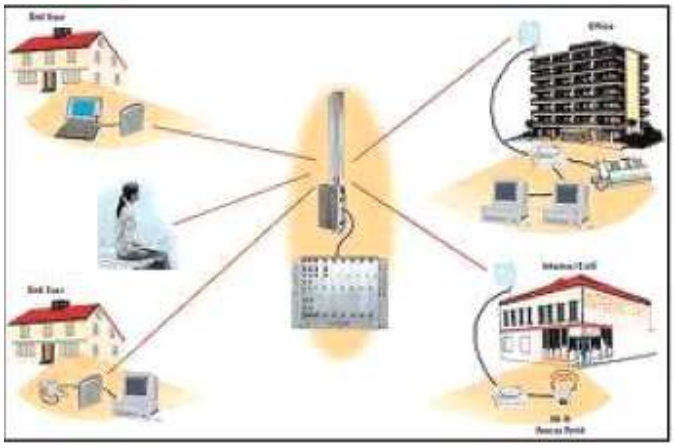


Fig 1. WiMAX Services

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 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 10meters. 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.

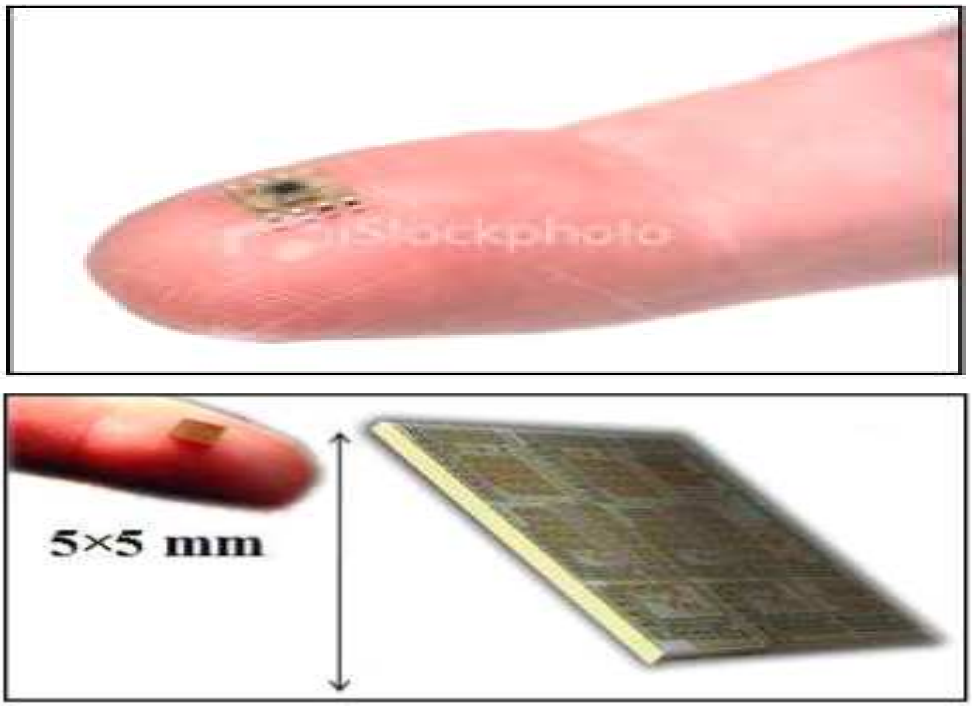


Fig 2.Chip of Gi-Fi.

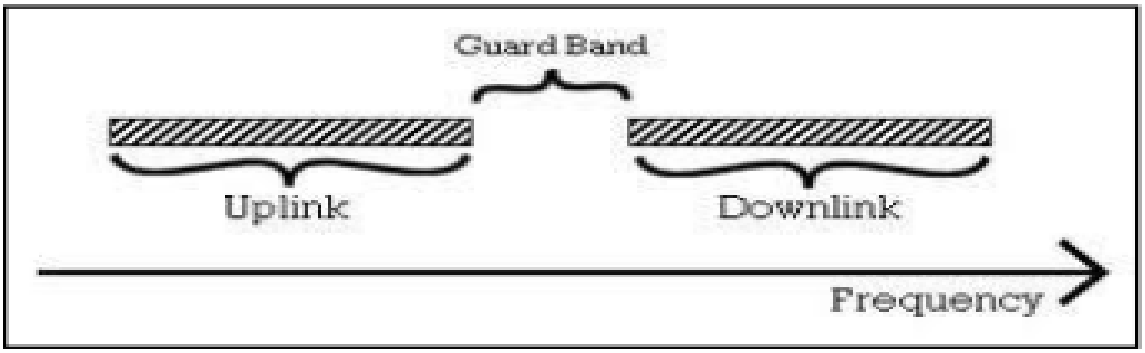
III. Working Principle Used in Gi-Fi:

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.

IV. Features:

- High level of frequency re-use enabled – communication needs of multiple customers within a small geographic region can be satisfied
- It is also highly portable-we can construct where ever we want.
- It deploys line of sight operation having only shorter coverage area, it has more flexible architecture.
- Multi-gigabit wireless technology that removes the need for cables between consumer electronic devices.
- More than 100 times faster than current short-range wireless technologies.
- Allows wireless streaming of uncompressed high-definition content.
- Operates over a range of 10 meters without interference.
- Entire transmission system can be built on a cost effective single silicon chip.

Comparison of Gi-Fi and Existing Technologies:

Characteristics	Bluetooth	Wi-Fi	Gi-Fi
Specification Authority	Bluetooth SIG	IEEE, WECA	NICTA
Development Start date	1998	1990	2004
	Mobile phones, PDAs,	Notebook Computers,	Mobile phones, Home Devices,

Primary Devices	Consumer, Electronics Office Industrial, automation Devices	Desktop Computers, Servers	PDAs, Consumer, Electronics, Office, Industrial, automation Devices
Power Consumption	5 mw	10 mw	<2 mw
Data Transfer Rate	800 Kbps	11 Mbps	5 Mbps
Range	10 Meters	100 Meters	10 Meters
Frequency	2.4 GHz	2.4 GHz	57-64 GHz

V. 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 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.

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. The Gi-Fi integrated transceiver chip may be launched by the starting of next year by NICTA. Due to the less cost of chip so many companies are coming forward to launch the chip. The potential of mm wave range for ultra-fast data exchange has prompted many companies like Intel, LG, Panasonic, Samsung, Sony& Toshiba to form wireless HD. Specifically wireless HD has a stated goal of enabling wireless connectivity for streaming high definition content between source devices and high definition device.

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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