A COMPARISION BETWEEN WIRELESS TECHNOLOGIES

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ABSTRACT

This research paper deals with a vital and important issue in computer world. It is concerned with the wireless technologies that examine latest wireless technology Gi-Fi that have more advantages over earlier technologies. It represents three technologies; these technologies have advantages and disadvantages as well. Therefore, the main objective of this research paper is to represent different technologies and make a comparison between them to show the features and defects of each technology. Gi-Fi will helps to push wireless communications to faster drive and more up-to-date standards for data exchange rate.

Keywords: Bluetooth, CMOS, Gi-Fi, Wi-Fi, Wireless Technology.

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 CMOS process. 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 (Rs380) to manufacture.

II LITRATURE REVIEW

2.1 Bluetooth

Bluetooth is an open wireless technology standard for exchanging data over short distances (using short wavelength radio transmissions) from fixed and mobile devices, creating personal area networks (PANs) with high levels of security. Created by telecoms vendor Ericsson in 1994, it was originally conceived as a wireless alternative to RS-232 data cables. It can connect several devices, overcoming problems of synchronization.

Bluetooth uses a radio technology called frequency-hopping spread spectrum, which chops up the data being sent and transmits chunks of it on up to 79 bands (1 MHz each) in the range 2402-2480 MHz This is in the globally unlicensed Industrial, Scientific and Medical 2.4 GHz short-range radio frequency band.

2.2 WI-FI

Wi-Fi technology builds on IEEE 802.11 standards. Wi-Fi allows the deployment of local area networks (LANs) without wires for client devices, typically reducing the costs of network deployment and expansion. Spaces where cables cannot be run, such as outdoor areas and historical buildings, can host wireless LANs. As of 2010 manufacturers are building wireless network adapters into most laptops. The price of chipsets for Wi-Fi continues to drop, making it an economical networking option included in even more devices. Wi-Fi has become widespread in corporate infrastructures. Products "Wi-Fi" designates a globally operative set of standards: unlike mobile phones, any standard Wi-Fi device will work anywhere in the world.

2.3 Comparison Between Bluetooth and WI-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. From the TABLE I we can conclude that the bit rate of Bluetooth is 800Kbps and Wi-Fi has 11Mbps.Both are having power consumptions 5mw and 10mw. And lower frequency of operation 2.4GHz.For transferring large amount of videos, audios, data files take hours of time. So to have higher data transfer rate at lower power consumption we move onto Gi-Fi technology.

TABLE I

Comparision between Bluetooth and Wi-Fi

Characteristics	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	800Kbps	11Mbps
Primary devices	Mobile phones, consumer electronics	Notebook computers, desktop computers, servers
Power consumption	Low	Medium
Primary uses	Travelling employees, office and industrial workers	Corporate campus users
Specification authority	Bluetooth SIG	IEEE,WECA

2.4 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 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 millimetre -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 metres. 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 "Gi-Fi" was unveiled today at the Melbourne University-based laboratories of NICTA, the national information and communications technology research centre. Professor Skafiadas said his team was the first to demonstrate a working transceiver-on-a-chip that uses CMOS technology- the cheap, ubiquitous technique that prints silicon chips. 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-millimetre-wide antenna and less than two watts of power, and would cost less than $10 to manufacture.

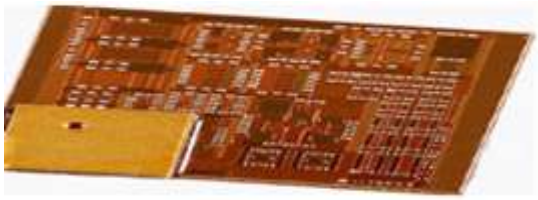

Fig.1: Transceiver Integrated on a Single Chip

2.5 Technologies used in GI-FI

This mmWave WPAN will operate in the new and clear band including 57-64 GHz unlicensed band defined by FCC 47 CFR 15.255. The millimetre 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)

2.5.1 Multiple Input Multiple Output

MIMO wireless is an emerging cost effective technology that offers substantial leverages in making 1Gbps wireless links a reality. 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 Array gain, Diversity gain, Spatial Multiplexing Gain, Interference Reduction.

2.5.2 System-On-A-Package

SOP approach for the next-generation wireless solution is a more feasible option. 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.SOP goes one step beyond Multi Chip Module (MCM) by enhancing overall performances and adding more functionalities.

2.5.3 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 RF60 GHz range by using 2 mixers and we will feed this to a power amplifier, which feeds millimetre wave antenna. The incoming RF signal is first down converted to an IF signal centred 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. 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. Time division duplex has a strong advantage in the case where the asymmetry of the uplink and downlink data speed is variable. As uplink traffic increases, more channel capacity can dynamically be allocated to that, and as it shrinks it can be taken away.

2.6 Fundamental Technologies in 802.15.3C

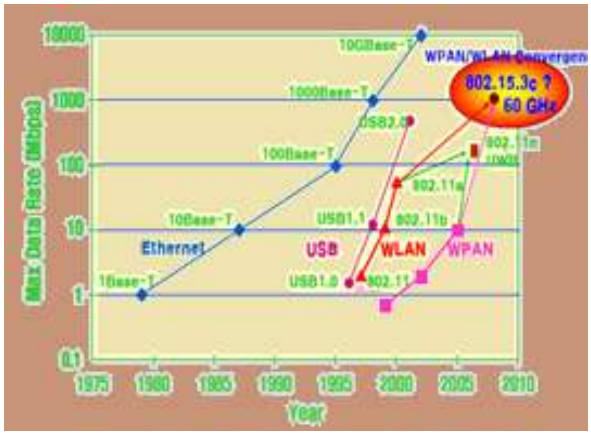

Fig.2: Graph Shows Maximum Data Rate (Mbps) Vs. Year

This mmWave WPAN will operate in the new and clear band including 57-64 GHz unlicensed band defined by FCC 47 CFR 15.255. The millimetre-wave WPAN will allow high coexistence (close physical spacing) with all other microwave systems in the 802.15 family of WPANs.

2.7. Frequency of Operation

2.7.1 Operation at 60 GHZ

Here we will use millimetre 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).For this reason, 60GHz is an excellent choice for covert communication.

2.7.2 Ultra Wide Band Frequency Usage

UWB (Ultra-Wideband) is 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. 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.

III FEATURES OF GI-FI

The features of Gi-Fi have been standardized with many objectives like:

3.1 High Speed Data Transfer

The main invention of Gi-Fi to provide higher bit rate .As the name itself indicates that data transfer rate is in Giga bits per second. Speed of Gi-Fi is 5Gbps, which is 10 times the present data transfer. Because of wider availability of continuous 7 GHz spectrum it results in high data rates.

3.2 Low Power Consumption

Though large amount of information transfer takes place it utilizes milli watts of power only. It consumes only 2mwatt power for data transfer of gigabits of information, whereas in present technologies it takes 10 watt power which is very high.

3.3 High Security

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. The combined effects of O2 absorption and narrow beam spread result in high security and low interference.

3.4 Cost-Effective

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, and the resultant integrated wireless transceiver chip which transfers data at high speed, low power at low price $10 only which is very less As compare to present systems .As go on development the price will be decreased.

IV APPLICATIONS

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

4.1 GI-FI Access Devices

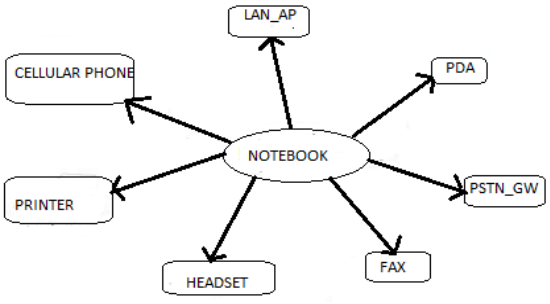

Fig.3: Gi-Fi Access Devices

Some of the Gi-Fi access devices are shown in Fig.3 .These access devices include termination units, internal radio modules, network interface cards ,printers, PC's,and all household electronic appliances.

4.2 Broadcasting and Video Signal Transmission System in Sports Stadium

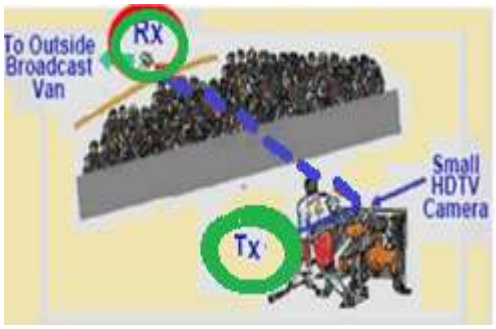

Fig.4: Broadcasting Video Signals

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.

4.3 Office Appliances

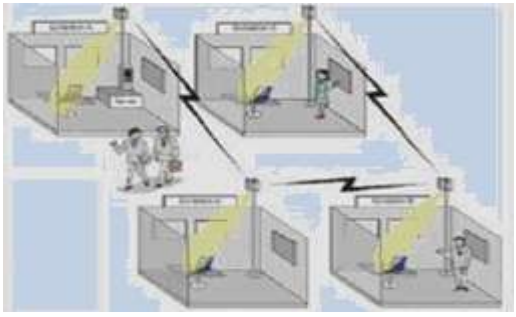

Fig.5: Office Appliances

As Gi-Fi data transfer rate is very high we can transfer data at very high speed in offices as shown in Fig.5 which made work very easy and it also provides high quality of information from the internet.

4.4 Video Information Transfer

Fig.6: Video Information Transfer

By using present technologies video swapping takes hours of time where as with this technology as shown in Fig.6 we can transfer data at a speed of giga bits/sec same as that for the transfer of information from a PC to a mobile and vice-versa. 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.

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

Fig.7: Household's Appliances

V CONCLUSION AND FUTURE WORK

Within five years, we expect Gi-Fi to be the dominant technology for wireless networking. By that time it will be to provide services with low-cost, high broadband access and with very high speed large files swapped within seconds that are used in wireless home and office of future. If the success of Wi-Fi and the imminent wide usage of WiMAX is any indication, Gi-Fi potentially can bring wireless broadband to the enterprise in an entirely new way.

As the range is limited to shorter distances only we can expect the broad band with same speed and low power consumption. 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. Due to the less cost of chip so many companies are coming forward to launch the integrated transceiver chip. The potential of mmWave 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 devices.

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