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International Journal of Innovative Research in Technology, Science & Engineering (IJIRTSE)
ISSN: 2395-5619, Volume – 4, Issue – 1. March 2018

A Comparative study of wireless technology

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Abstract:
This article is proposed to different type of fidelity's between the Bluetooth. The purpose of these articles is to remind innovators that in the end, Wi-Fi's future will be determined less by its internal technological evolution than by the ways institutions and individuals are encouraged to adopt it. Increased density will in turn inspire innovative devices. A Comparative study of Wi-Fi/Li-Fi/Mi-Fi/Gi-Fi/Hi-Fi enabled pay phones are powered alarm boxes, fire hydrants, Videogames, and baby carriages. The explosive growth of internet over last decade has led to an increasing demand for high-speed, ubiquitous Internet access. Using open broadband wireless technologies and implementing mobile computing architectures, one can overcome the challenges of ground, infrastructure and finance to increase access.

Keywords: Wi-Fi, Li-Fi, Mi-Fi, Gi-Fi, Hi-Fi the Next Generation Wireless

A.INTRODUCTION: We all are very familiar with Wi-Fi and WiMax technology. These are used to transfer data at a faster rate. But the transfer of video files takes a lot of time. This leads to the development of a new technology called Gi-Fi. It has some advantages over Wi-Fi and other wireless technology. The Gi-Fi technology has faster information rate, low cost for short range transmission and consumes less power. Gi-Fi is developed on an integrated wireless transceiver chip. In that a small antenna is used and both transmitter-receiver integrated on one chip which is fabricated using the complementary metal oxide semiconductor (CMOS) method. With Gi-Fi large video files are transferred within seconds. Both the Bluetooth and Wi-Fi can be used to transfer files. But they have certain limitations such as, the bit rate of Bluetooth and Wi-Fi are 800Kbps and 11 Mbps respectively. They have lower frequency of operation 2.4GHz having power consumption of 5mw and 10 mw. It also takes a lot of time to transfer large amount of audio, video and data files. In order to achieve larger data transfer with lower power consumption we use Gi-Fi technology. HiFi is really just a shortened ersion of "high fidelity," which as you might guess, implies a high degree of accuracy (fidelity) in reproducing sound. In other words it means high quality re-production of sound. These Hi-Fi equipments will have minimal noise and distortion and accurate gain versus frequency response.

B.LITERATURE SURVEY

1.Bluetooth: It is a standard wire-replacement communications protocol primarily designed for low power consumption, with a short range based on low cost transceiver. tablets,media players, and robotics systems, handheld, laptops etc. The indication of Bluetooth is shown in figure.

CHARACTERISTICS	BLUETOOTH	WI-FI	GI-FI
Specification Authority	Bluetooth SIG	IEEE, WECA	NICTA
Development Start date	1998	1990	2004
Primary device	Mobile phones, PDAs, Consumer, Electronics office Industrial Automation Devices	Notebook, Computers, Desktop, Computer servers	Mobile phones, Home devices, PDAs, Consumer, Electronics office Industrial Automation Devices
Power consumption	5mw	10mw	< 2mw
Data transfer rate	800Kbps	11Mbps	5 Gbps
Range	10 meters	100 meters	10 meters
Frequency	2.4GHz	2.4GHz	57-64GHz

Disadvantages of Bluetooth & Wi-Fi

✓The bit rates of Bluetooth is 800Kbps and Wi-Fi has 11Mbps

✓Both are having power consumptions 5mw and 10mw

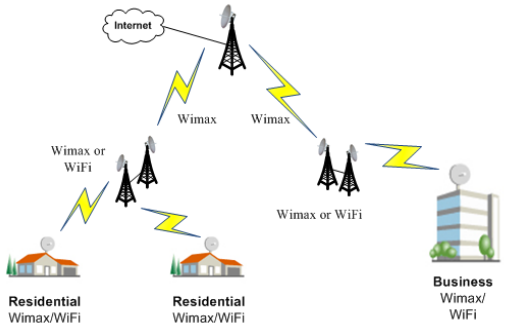
✓ The lower frequency of operation 2.4GHz.For transferring large amount of videos, audios, data files take hours of time.

so, to have higher data transfer rate at lower power consumption we move onto Gi-Fi technology

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

It operates in the range of 2400–2483.5 MHz and uses a radio technology called frequency-hopping spread spectrum (FHSS).

2. WI-FI WIRELESS FIDELITY: WiFi or Wireless Fidelity is a wireless technology that uses radio frequency to transmit data through the air.IEEE established the 802.11 Group in 1990. Initial speeds were 1 and 2 Mbps. IEEE modified the standard in 1999 to include: 802.11b, 802.11a, 802.11g was added in 2003.



It uses 5GHz frequency to transmit the data over the network. It makes the use of Orthogonal Frequency Division Multiplexing (OFDM).It can transfer the data for up to 54 Mbps. 802.11. It uses the frequency of 2.4 GHz to transmit the data over the network. It can transfer the data for up to 11 Mbps 802.11g. it also uses the frequency of 2.4 GHz to transmit the data over the network. It uses the OFDM & DSSS. It can also achieve the data rate of up to 54 Mbps.

Working Principle of WiFi: A Wifi network is created by establishing hotspots. The hotspot device that is connected to the computer or any other device translates the data to be sent into the radio signals. The radio signals are then transmitted into the air through an antenna. On the receiving side, the decoder translates the radio signals back to the data, and thus the information is received. Wifi uses the band of 2.4 GHz to 5.0 GHz for the transmission of the radio waves. All the Wifi standards use the bandwidth of 22MHz. WiMAX : IEEE standard 802.16, also known as WiMAX, is a technology for last-mile wireless broadband as an alternative to cable and DSL and where the cost is high. It is intended to deliver high speed data communication. The current WiMAX revision provides up to 40 Mbit per second with the IEEE 802.16m update and expected to offer up to 1 Gbit/s fixed communication speeds.

Advantages & Disadvantages of WiFi: Wireless laptop can be moved from one place to another place. Wi-Fi network communication devices without wire can reduce the cost of wires. Wi-Fi setup and configuration is easy than cabling process. it is completely safe and it will not interfere with any network Disadvantages. Wi-Fi generates radiations which can harm the human health. There are some limits to transfer the data, we can't able to transfer the data for long distance. Wi-Fi implementation is very expensive when compared to the wired connection

3. MiFi : Mobile WiFi

Introduction to Mi-Fi: MiFi is a portable broadband device that allows multiple end users and mobile devices to share a 3G or 4G mobile broadband Internet connection and create an ad-hoc network. The name MiFi is thought to stand for "my WiFi." Some 3G/4G carriers sell MiFis (or similar devices) with pay-as-you-go plans, while others require a monthly fee or annual contract.

Working Principle of MiFi: The MiFi is a little box, small enough to fit into a jeans pocket, and it has one function: to pluck the internet from the air using a cellular radio and share it with up to five other devices via Wi-Fi. It is essentially a wireless router with 3G inside, and it has been getting rave reviews and it turns out to be as great as everyone says, although there are a few problems which are not the fault of the MiFi itself. Setup is easy, and if you buy it configured from your cell provider it should just be a matter of switching the thing on. The MiFi is pre-set to switch off after five minutes without use, and although you can change this, the default setting works fine. users are happy to choose the advantages of a 4G connection (if unavailable, the Overdrive reverts to using 3G) even if its not built into the iPad rather than opt for a slower iPad 3G (the generally noted speed range of 4G is 3 to 6 Mbps, considerably faster than 600 Kbps to 1 Mbps offered by 3G).

Advantages of Mi-Fi: Multiple devices (not just an iPad, e-reader, or notebook) – big plus for families, Choice of carriers – including regional carriers (pick the best network, and best service plan for you), Potential discount if added to an existing service plan (depends on the carrier), Optional 4G (where available), Potential for contract-free/prepaid service from the likes of Cricket and Virgin Mobile (great if you don't need service all the time), Ease of upgrade (4G service is expected to be available from all major carriers soon and you'll probably want the faster speed when its available without replacing each 3G device), There are other advantages to choosing a Wi-Fi-only model over the integrated 3G one as well (worth noting since the Wi-Fi iPad went on sale at Verizon stores yesterday, where it can be purchased along with a 3G Wi-Fi card with discounted data plans) – and these advantages aren't just limited to the iPad. They apply to any devices that offer a choice between Wi-Fi and

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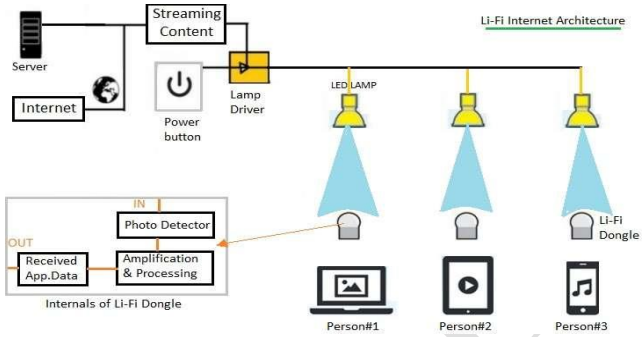
integrated 3G models including many netbooks, e-readers like the Kindle and Nook, and the forthcoming Android-based Galaxy Tab.

Mifi Router Features: The popular mifi hotspots also referred as mifi routers. As mentioned they have wifi as well as cellular connectivity. It Supports mobile broadband with CDMA, EVDO Rev.0 and EVDO Rev. A Supports 600 kbps to 1.4 Mbps download speed and 500-800 Kbps upload speed. Supports 802.11b (2.4GHz,11Mbps) and 802.11g (2.4 GHz, 54Mbps), Supports security types-WEP 64bit and 128bit, WPA Personal/PSK (TKIP) and WPA2 Personal/PSK (AES).

4.LI-FI: LIGHT FIDELITY

Introduction to LiFi: LiFi is a wireless technology that uses optics for the Data transmission. It makes the use of Light Emitting Diodes to send the data over a distance. This technology has vast applications where the use of Wi-Fi is limited or banned. It takes out the adverse health effects of using electromagnetic waves. Unless light is seen, data can't be hacked and so data transmission is secure. Data transmission is typically in terms of Giga bytes per second.

Working Principle of LiFi: An LED lightbulb light source which can be dipped and dimmed up and down at extremely high speeds, without being visible to the human eye.The working of LiFi accommodates a photo-detector to receive light signals and a signal processing element to convert the data into 'stream-able' content. Data is fed into an LED light bulb (with signal processing technology), it then sends data (embedded in its beam) at rapid speeds to the photo-detector (photodiode). The tiny changes in the rapid dimming of LED bulb is then converted by the 'receiver' into electrical signal.



Features of LiFi: Li-Fi technology provides 1000 times with greater data density compared to that of Wi-Fi. The system would be of low cost as it requires less number of components No additional power input is required for this technology and moreover LED illumination is already efficient. It eliminates any health hazards caused by RF waves. Use of light cannot interfere with any electronic circuitry and hence the technology is safe and non-hazardous. Data theft or hacking is negligible compared to Wi-Fi since the range of data transmission is confined to a certain area.

Drawbacks of LiFi: LiFi has a very short range up to the illumination of LED bulbs. Interference from external light sources can interrupt the communication. Difficult to communicate in outdoor scenarios during day time. LiFi has no standard yet, so equipment from one vendor won't work with another.

4. GI-FI GIGABIT WIRELESS

Introduction of GiFi: Gi-Fi or gigabit wireless is the world's first transceiver integrated on a single chip that operates at 60GHz on the CMOS. Gi-Fi is ten times faster than Wi-Fi and allows the wireless transfer of audio and video data up to 5 gigabits per second at low power consumption within range of 10 meters. Developed by NICTA (National Information & Communication Technology Research Center), Melbourne, Australia. This technology provides a high broadband access, high speed transfer of data within seconds and a low cost one. It uses the frequency range of 57-64 GHz of unselected frequency band.

Working of GiFi: There is use of time division duplex for both transmission and receiving. Data files are up converted from IF range to RF 60Ghz range by using 2 mixers. The output will fed be into 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 ▪ Due to availability of 7GHz spectrum, the total data will be transferred within seconds. Use of 60 GHz Band in GiFi Advantages: Can transmit 7 Gbps only in 1 second for 1 b/Hz (BPSK ok).

Feature	Gi-Fi	Li-Fi

Full form	Gigabit wireless Fidelity	Light Fidelity
IEEE standard	802.15.3C	802.15.7
Data rate	5Gbps	1-3.5 Gbps
Operating range	10 meters	10 meters
Size	Chip 5mm	LEDs
Operating frequency	57-64GHz	100 times of Tera Hz
Data Transfer Medium	radio spectrum	light
Network Topology	Point-to-point	Point-to-point

5. Hi-Fi: high fidelity

Introduction to Hi-Fi: It refers to high quality sound produced using high fidelity sound equipments. In other words it means high quality re-production of sound. These Hi-Fi equipments will have minimal noise and distortion and accurate gain versus frequency response. the reproduction of an effect (such as sound or an image) that is very faithful to the original of or having high fidelity of sound reproduction.

Working Principle of Hi-Fi: HiFi is really just a shortened version of "high fidelity," which as you might guess, implies a high degree of accuracy (fidelity) in reproducing sound. "HiFi" is a term originating in the 1950s, around the time home record and tape playing equipment was transitioning from mono to stereo, and consumers were becoming more particular about the sound quality.

Features of HiFi: So "HiFi" actually meant "high fidelity," using rapidly improving recording and playback techniques of the 1950s and 60s, whether mono or stereo, with great attention being paid to recording and playback quality. The goal was to accurately create the audio & video illusion of sharing the space with the home listener.

Advantages of Hi-Fi Audio: Hi-Fi audio comes with something you cannot get from any other system. These types of speakers are known as the most accurate and they provide the best possible sound. However, for some, this perfect quality may seem less warm sounding and a bit more brittle.When you're looking for the best possible sound, hi-fi audio is the right choice. Comparing this type of audio to any other type isn't really fair because it's so far above and beyond.

Disadvantages of Hi-Fi Audio: Hi-Fi audio isn't flawless. It does come with just a couple disadvantages. With most configurations, it can be harder to control the volume and you may need separate amplifiers with their own on and off switches.

Hi-Fi system: units such as tape deck, amplifier and /or turntable will pick up RF (Radio Frequency) interference. This RFI should be eliminated to obtain high quality audio output using HiFi system. **Difference between HiFi and WiFi:** There is absolutely no difference between these two similar looking terms. HiFi is releated to transmission of high quality audio using one of the transmission mediums such as fiber optic, USB or wireless (using WiFi). On the other hand, WiFi refers to technology related to WLAN standards .

HiFi-High Fidelity Applications: TVs, Speakers, Smartphones, Tablets, Headphones, streaming , portable devices such as radio set, digital TV boxes, Games consoles, CD player, Amplifiers, Home-Cinema etc.

C. COMPARISONS

Comparisons Operation ▪ Wifi technology is operated by transmission and reception of radio signals ▪ LiFi is operated by frequently flickering LED bulbs for the data transmission ▪ GiFi technology uses millimetre waves to transmit data over the air Data Rate ▪ Wifi is only able to provide the data rate speed of 150 Mbps ▪ LiFi technology aims to provide the speed of up to 1 Gbps ▪ GiFi technology can provide the speed of up to 5 Gbps

Features	802.11(Wi-Fi)	802.16(WiMAX)	802.15(Gi-Fi)	802.15.7(Li-Fi)
Primary Application	Wireless LAN	Wireless MAN	Wireless PAN	Wireless PAN
Range and coverage	20-100 meters	50 kilo meters	10 metres	10 metres
Cost	High	High	Low	Low
Frequency Band	Unlicensed Band 2.4 GHz to 5 GHz	Licensed and Unlicensed Band 2 GHz to 11 GHz	Unlicensed Band 57 GHz to 64 Ghz	Vissible Light Spectrum More than 100 times Tera Hz
Channel Bandwidth	On the range from 20-25 MHz	Adjustable range From 1.25 to 20 MHz	5 Gbps	1 to 3.5 Gbps
Latency	50 ms	25 to 40 ms	N/A	N/A
Radio Technique	OFDM 64 channels And Direct Sequence Spread Spectrum	OFDM 256 Channels	FCC 47 CFR 15.255 Ultra Wideband (UWB)	optical orthogonal frequency-division multiplexing (O-OFDM)
Security	Security is better, Encryption technique like WPA and WEP available	Good Security, AES	High	Very High
Mobility	In the development Phase now	Mobile WiMAX Build in to 802.16e	Low	Low

and even more. HiFi is releated to transmission of high quality audio using one of the transmission mediums such as fiber optic, USB or wireless (using WiFi). high-tech prototyping is that users can truly interact with the system, as opposed to the sometimes awkward facilitator-driven simulations found in lo-fi prototyping.

Characterstics	802.11(Wi-Fi)	802.16(WiMAX)	802.15(Gi-Fi)	802.15.7(Li-Fi)
Frequency Band	2.4 to 5 GHz	2 to 11 GHz	57-64 GHz	100 times of Tera HZ

Comparison Parameters: WiFi LiFi GiFi Speed 150 Mbps 1 Gbps 5 Gbps Data Density Very Low High Very High Security Less Secure Very Secure Less Secure Range Varying 100 Meters 10 Meters Cost High Low Very Low up to 10$ Frequency 2.4 GHz & 5 GHz Up to 50 THz 57-64 GHz Operation Data transmission by radio waves Data transmission by light of LED bulbs Data Transmission by 5mm chip. Hi-fi goal was to accurately create the audio & video illusion of sharing the space with the home listener.

Comparison between the Wi-Fi, WiMAX, Li-Fi, Gi-Fi and Hi-Fi

Characteristics	Wi-Fi	WiMAX	Gi-Fi	Li-Fi
Bandwidth	20 MHz	20 MHz	5 gps	1 to 1.3 gps
Latency	50ms	25 to 40ms	N/A	N/A

D. Conclusion

This paper has studied five wireless standard technologies. Wi-Fi, WiMAX, Li-Fi Gi-Fi and Hi-Fi in terms of how they could be applied to the creation of a wireless access infrastructure. The advantages of lo-fi or low-tech are numerous. In addition to being cheap, fast and accessible to non-programmers, these rudimentary techniques can yield a maximum of feedback on design ideas at a minimal cost. Wi-Fi gives us the point-to-multiple point internet facility, by which we can create the Wi-Fi hotspot zone anywhere. Wi-Max completely revaluated the business world for the faster internet facility. Now according to the demand of consumers we introduced the Li-Fi technology for more than 1 Gbps speed. Gi-Fi follows the tradition of Li-Fi. The Bluetooth, which covers 9-10mts range and Wi-Fi followed 91mts, so we have no doubt introduction of Wi-Fi wireless network. The Li-Fi system is also follows the path of Gi-Fi. The **MiFi** is the brand name for Novatel Wireless portable devices which provides mobile **WiFi** connection. MiFi router consists of two main parts viz. modem and wifi router. Wifi router part takes care of providing wifi connectivity. There are different versions of MiFi to support different cellular standards such as EVDO, HSPA, LTE etc. **HiFi** refers to high quality sound produced using high fidelity sound equipments. In other words it means high quality re-production of sound. These Hi-Fi equipments will have minimal noise and distortion and accurate gain versus frequency response. Hi-Fi system units such as tape deck, amplifier and /or turntable will pick up RF (Radio Frequency) interference. This RFI should be eliminated to obtain high quality audio output using **HiFi system**.

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