



**MAKERERE UNIVERSITY**  
**COLLEGE OF COMPUTING & INFORMATION SCIENCES**  
SEMESTER 1 FINAL EXAM 2021/2022  
ADVANCED TOPICS IN COMPUTER SCIENCE  
**WIRELESS FIDELITY**

WENAREEBA INNOCENT | REG NO : 2021/HD05/2315U | MCS 710

### 1.0 Abstract

*Today's enterprises rely heavily on computer networks to expand their operating limits. Until date, traditional networking technologies have necessitated (Personal Computers) PCs to be linked directly to a hub or switch. Devices can now interact utilizing multiple light and wave emitting technologies thanks to recent advancements in networking technology. WiFi is based on the IEEE 802.11 standard and it's an excellent example in these advancing technologies, as it enables computing devices to interact without using traditional cords and allows people to share resources and communicate irrespective of geographical location.*

**Keywords :** WIFI Wireless Fidelity , WAN , Wide area network , Access Point, Internet

### 2.0 Introduction

In the early years , from the 1970s to the late 1980s, the internet was introduced and managed by the government of the United States mostly for research and communication within the military and the academic institutions. The Internet plays a significant part in the communications of today , since most of the information is now shared online , with the aspect of the zoom meetings , social media , online blogs , and a lot of information and communications are now worked out on the internet. WiFi," has become an industry standard and businesses are booming because of it since it's easy to set up.

### 3.0 Wireless Fidelity Protocols

There are many wireless protocols available , and they have different standards which are used in the connection of devices. These standards are continuously updated , and

they improve connection speeds, wifi standards are protocols that enable wifi connections to operate.

#### 3.1 The Evolution and Developments of Wireless Technology Standards

**(i) IEEE 802.11** , This standard came up in 1997, and it had a transmission rate which was optimum , but again this standard is not compatible with the technology of today.

**(ii) IEEE 802.11a** , This was introduced in 1999 , which works with a frequency of 5GHz and was to meet hopes of meeting less interference since many devices use 2.4GHz frequency. It was also fairly fast with speeds of 54Mbps though it had issues with dealing with signal interference.

**(iii) IEEE 802.11b**, This was designed in the year 1999 which works on a frequency of 2.4Ghz and a throughput with a maximum of 11Mbps.

**(iv) IEEE 802.11g** , This was developed in

the year of 2003 which led to an increase in the throughput to 54Mbps keeping 2.4GHz in usage and this led to its adoption at that time.

**(v) IEEE 802.11n**, In the year 2009 , is when this was released, the update was slow initially , and it supported operations which are multi-channel on 2.4GHz together with 5GHz . It also has a maximum data range of 150Mbps per channel and the standard data rate is 600Mbps.

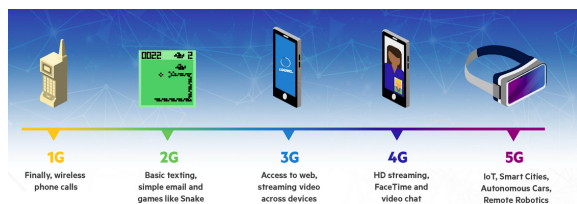
**(vi) IEEE 802.11ac**, Many wireless devices used this standard, which was introduced in year of 2014. This standard boosted the data throughput of wireless devices.

**(vi) IEEE 802.11ax**, This standard is good for routers and wireless devices, it allows access to network performance of 10Gbps, and it allows more simultaneous data streams.

**(vii) Wi-Fi 7 (802.11be)**

Despite the fact that Wi-Fi 6 was only recently introduced to the general public, There are talks on WIFI 7, and what will come by in the coming years. We expect faster speeds and better range.

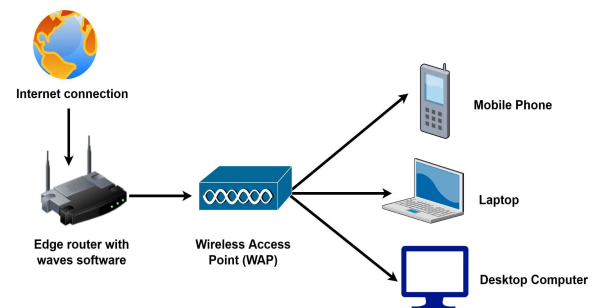
### 3.2 Fig: Evolution of Wireless Technology



### 4.0 How WI-FI Technology Works

In Wireless Networks, Radio waves are used to deliver signals to various devices. It uses frequencies of 2.4GHz through 5GHz , and this depends on the data under transmission. This is a higher frequency than walkie-talkies, cell phones, and televisions.

Because of the increased WiFi frequency spectrum, transmissions may carry more data. A fiber cable or analog line is frequently used as a chord. This connects a broadband modem to an internet source. The WiFi router is the device that connects to the internet via a wide area network (WAN) port. To establish two-way communication, the WiFi router sends wireless signals through radio waves to a card or adapter in a computer, phone, or other device. The illustration of how wifi works is shown in Fig:1.0.



**Fig 1.0 : How Wireless Fidelity Works**

### 5.0 Advantages of WI-FI

**(i) Mobility**, Wifi allows users to do daily works from any location, using mobile devices in case they have access to a wireless access point (WAP),

**(ii) Convenience**, Wireless networks allow many users to be able to join the network simultaneously without complex setups.

**(iii) Productivity**, WI-FI enables individuals to perform their internet duties, irrespective of the location, this makes work more easier to handle and increases productivity .

**(iv) Deployment**, When we look at setting up wireless networks , it's quite simple compared to setting up the wired networks , since there is less cabling required to set up

the site.

**(v)Expandability**,It is quite simple when the network administrators want to add new users to the network. If these users have the network passwords they are able to connect to the network without additional equipment.

**(vi) Cost**, Wireless networks offer a substantial cost and it does save labor in network setup, it saves money when setting up new wireless networks since there is less cabling.

### **6.0 Disadvantage of WI-FI**

**(i)Bandwidth**, Routers have device connection limits , and this means if more devices are added , the network connection will be slower.

**(iii)Reliability**, The frequency of wifi can be obstructed by electro-magnetic waves and this reduces signal strength.

**(iv)Range**, There is a range which is restricted , approximately 100-150 feet. There are challenges in case it is being installed in big projects sites, the more the users move from the access point , the more the network becomes weaker.

**(iv)Speed**, The network connections are slower than wired connections. Network speeds are fast with less connected devices, and slow with more connected devices.

**(v)Health Issues**, There are theories affirming that WIFI causes health problems to human beings like apoptosis, cancer. These issues are normally caused by electromagnetic radiation ,and these are not normally recommended for pregnant women to be near the radiations.

**(vi) Security**, Despite the fact that these networks employ a encryption methodologies , they can be monitored and

hacked by anonymous hackers mostly on public networks

### **7.0 Recommendations for Secure Wireless Networks**

**(i)Risk management**, This should be considered in order to create a good policy of security and understanding the right requirements for the network that will be setup on the site.

**(ii)Cryptography**, To protect data carried over the radio channel, robust cryptography is recommended, and equipment theft is a big worry.

**(iii)Firewalls** , It's also a good idea to use firewalls and other relevant security measures to be able to monitor traffic and block threats that appear on the network .

### **8.0 Applications of the Technology**

**(i)Hotspots** , This is an Internet wireless access point that allows users to establish hotspots on portable devices like phones or computers and share internet with other users within a specific range.

**(ii)WiFi at home** , People are using WI-FI at home to create a home network, which allows for internet access in the homes and may be shared among family members.

**(iii)Community WiFi**, Wifi is used in public places to enhance activities and businesses , these networks can be created in restaurants, railway stations , and institutions, which enable visitors and passers by to access the network.

**(iv)Industrial and logistics**, Industrial gadgets are becoming more intelligent, Mobile scanners and robots used in shipments can connect to manufacturing stations that process through a Wi-Fi network.

**(v)Healthcare**: Wi-Fi is used in the medical

field for medical device connections, in order to keep track of a patient's condition in real time and it enables medical practitioners to give faster results from the wifi connected devices.

**(vi)Internet of Things:** Wi-Fi is critical in the internet of things , since many smart devices and multiple sensors are used to power this technology through the use of the internet.

### **9.0 Future of WIFI**

With the rapid rise of wireless networks in businesses , which is expected to continue over the next five years, 5G is the latest innovation and it is significantly quicker than the other generations.The 'Internet of Things,endowed with wireless connectivity, has been coined to describe this development of linked gadgets. Facilities should commence working on a strategic plan now to upgrade or replace present wireless infrastructure in order to enable 5G capability or more advanced improvement in the future.

### **10.0 Conclusion**

When wireless networks and devices are safeguarded, both businesses and individuals gain.Organizations can mitigate the risks associated with wireless technology by implementing countermeasures to address specific threats and vulnerabilities after assessing the risks.

Although the countermeasures will not stop all occurrences and the penetrations, they can mitigate dangers of the technology. wi-fi has had an impact on the daily lives of people in the world today, since it is convenient for usage. Wifi has generally improved the lives of people , since it has the element of mobility , and this favors

mobile activities in the fields of learning , entertainment,education and communication

### **11.0 References**

- [1] Future Market Challenges and Opportunities, January 2006, Journal of Computer Science , DOI:10.3844/jcssp.2006.13.18
- [2] WIRELESS FIDELITY , Chris A. Nwabueze, M. Eng., MNSE, MNIEEE, MIEE. Silas A. Akaneme, M. Eng., MNSE, MNIEEE, MIEEE Dept. of Electrical/Electronic Engineering.
- [3] Wireless Technology in Networks, Surabhi Surendra Tambe , International Journal of Scientific and Research Publications, Volume 5, Issue 7, July 2015 1 ISSN 2250-3153
- [4]<https://www.hitechwhizz.com/2020/03/6-advantages-and-disadvantages-drawbacks-benefits-of-wifi.html>
- [5]<https://www.hfmmagazine.com/articles/3946-the-future-of-wireless-connectivity>
- [6]<https://ecomputernotes.com/computernetworkingnotes/communication-networks/wifi-applications>
- [7]<https://www.rfpage.com/future-applications-wi-fi-technology/>
- [8]<https://narmadi.com/wi-fi-technology-applications/>
- [9] How does WIFI-Works <https://www.britannica.com/story/how-does-wi-fi-work>
- [10]<https://www.stl.tech/blog/wifi-explained>
- [11]<https://www.makeuseof.com/tag/understanding-common-wifi-standards-technology-explained/>
- [12]<https://www.actiontec.com/wifihelp/evolution-wi-fi-standards-look-802-11abgnac/>