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IEEE 802.11 Wireless Technology Evolution: A Survey

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Abstract - *At present wireless technology utilized wherever like in instructive foundations, inquire about organizations, modern applications, car businesses, medicinal services and clinical applications. These days intrigue is expanding to utilize wireless communication advancements instead of wired communication innovations. Wireless correspondence implies move of data over a separation without wires. The separations included might be short similar to TV remote control or might be long similar to radio correspondences. In this paper I will illuminate the evolution and improvement of different wireless technology. The evolution of the access points devices which are connected to the devices for wireless transmission. The different elements of Wireless LAN are, for example, frequency and information rates, IEEE 802.11 design, segments, go just as its advantages*

***Key Words*: Wireless Technology, Wired Communication, Wireless LAN, IEEE 802.11.**

1. INTRODUCTION

Wi-Fi is the wireless network technology whose main function is movement of the data from one end to another end without use of wires. Wi-Fi is commonly used by many devices like smart-phones, laptops, tablets, remote sensors, actuators and many more. The innovations in the wireless technology started in back 1970's, before this optical fibers were the main source for communication. Wired technology dominated the whole industry but there were limitations with the wired technology. So people started looking for an alternative technology which should be reliable, consistent and with less limitations. Wireless technology begun with the innovation of Bluetooth technology which was able communicate within a distance of 8-9mts, But the innovation of Wi-Fi showed a whole new path for communication and the rise of the wireless technology. Wi-Fi can cover up to the distance of 91mts. Most likely the innovation of Wi-Fi technology answered the "last mile" issue[1].

Wireless Networking has changed the manner in which individuals convey and share data by dispensing with the limits of separation and area. Wi-Fi Networking comes out method of getting to data in remote zones where wired system are out of reach. System Communication innovation can be partitioned into two types.1) wired technology and 2) wireless technology.

2. WIRELESS STANDARDS

Most WLANs depend upon IEEE standard, because IEEE was who created it in 1997. In this year IEEE planed 802.11 to help the user to use higher data rate applications. It was the first station to be planned by IEEE which increased the data rate speed to 1-2 Mbps for remote transmission. Then later in the year 1999 802.11a was formed followed by 802.11b. But 802.11b got finished earlier than 802.11a so basically 802.11b came to market first and it was the first device used by the user for remote transmission. Later many standards was created by IEEE for example, 802.11g, 802.11n, 802.11ac [2].

Later Wi-Fi Alliance thought of making Wi-Fi Standard names simpler. So in the year 2018 they started changing the names of the Wi-Fi standard to make it more distinguished and easy to comprehend. So they changed the name of upcoming 802.11ax to Wi-Fi6, As for the past two standards name they changed them to Wi-Fi 4 and Wi-Fi 5.

IEEE 802.11b:

As 802.11b came to market first most people used it even there were new release present in the market. 802.11 standard works at 2.4Hz frequency with the modulation technique of DSSS(Direct sequence spread spectrum). It had pretty good speed back in early 2000, it has a speed of 11Mbps within the range of 30m. Back in those this speed was pretty good. In general the speed it works is mostly around 4-5Mbps but the range it can cover was up to around 150m. If it is compared with 802.11 standard and standard Ethernet it was way quicker than them [4].

IEEE 802.11a:

802.11a got released pretty late in the market till then people were used to 802.11b, and it did somewhat bad in the market. It was presented in the market in the year 2001. 802.11a uses the modulation technique called OFDM (orthogonal frequency division multiplexing), the main aim of this technique was to reduce impedance. And it utilizes the frequency 5GHz and the maximum speed it can obtain is 54Mbps. The first WLAN technology was developed by Motorola [3].

Many nations started using a portion of this band for many purposes like education, military service, administration authority. This band is not fully allowed by government for the use of the people. The main reason why many countries uses this 5GHz band is that it is very

dependent transmission medium and it has very less obstruction. But it has a one major problem that is it covers less area compare to 802.11b and the speed it shows comparatively slower than 802.11b. It can cover up to 50-75 feet and it can achieve the speed 54Mbps ideally. It costs way more than 802.11b. So basically because of this reasons most people never started using it.

IEEE 802.11g(Wi-Fi 3) :

Like 802.11b, 802.11g also works in the band 2.4GHz and have a bandwidth of 22MHz. The wireless technology it uses is OFDM (orthogonal frequency division multiplexing) same as that of 802.11a. The speed at which it works is also same as that of 802.11a that is 54Mbps. But it faces the problem of congestion in the band as 802.11b also works in this band. The devices which works on 802.11g are also backward compatible with 802.11b means 802.11b devices can interface with 802.11a devices. But they will have the same speed as that of 802.11b. 802.11b access points devices are less costly than 802.11g devices, so they far better option than 802.11g economically.

IEEE 802.11n (Wi-Fi 4) :

802.11n was the turning point for wireless technology. It just blow the market with its speed. Its innovation was a major step towards revolution in the history wireless technology. The technique it utilizes is the MIMO (Multiple Input Multiple Output) technique. In this technique the transmitter and collectors of the device can work at the same time without any problem. With this property only it boosted the speed at which the device works. It was a huge increment in the transfer speed and transmit power. 802.11n devices can work at both frequencies that is 2.4GHz and 5GHz. It can achieve the speed up to 450Mbps hypothetically. 802.11n devices are backward compatible with previous Wi-Fi access points.

IEEE 802.11ac (Wi-Fi 5):

Another major break through happened in the year 2013. It just broke all the record of the transmission speed, the speed exceeds from 443Mbps up to few Gigabits per second. 802.11ac works in the band of 5GHz and the bandwidth is of 80MHz. It has eight spatial streams. The technique it utilizes is called beamforming. Beamforming helps in targeting the device with the help of the radio signals which are produced by the receiving wires.

802.11ac also utilizes multi-client (MU-MIMO). What MIMO does is it provide support to various streams to focus on a single client. But in the case MU-MIMO it guides the various streams to multiple clients all the time. The main advantage of this is that the information can be transmitted throughout the system.

IEEE 802.11ax (Wi-Fi 6):

It can use up to 14 extra 80 MHz channels or 7 extra super-wide 160 MHz diverts in 6 GHz for applications, for example, top quality video gushing and augmented reality. Wi-Fi 6E gadgets influence these more extensive channels and extra ability to convey more noteworthy system execution and bolster more Wi-Fi clients on the double, even in extremely thick and clogged conditions. Wi-Fi 6E will acquire more noteworthy innovation progressions Wi-Fi that will present new utilize cases and quicken the cutting edge availability with 5G systems [5].

3. CONCLUSIONS

In the previous scarcely any years, the Wi-Fi innovation is becoming quickly in the rustic improvement territories. In the country zones, the innovation has been helped the purchasers in getting the fast network access. All through urban condition the wifi "problem areas" are getting progressively well known. At the point when the Wi-Fi innovation has raised to all the nations and urban territory the broadband web get to cost has been drive down. As indicated by the different modern applications, the system network for the mechanical remote arrangement gives that is financially savvy and proficient. To guarantee the unwavering quality of remote network and security of modern activities, an unsafe zone order is fundamental that gives the repetitive connections "radio". Right now, there are a few standard-based remote innovations that are utilized for the modern applications for the field sensors systems administration, for example, ISA100, WHART and ZigBee. The wireless technologies innovations are basic and simple to convey to the system. The IEEE 802.11 is the standard utilized for the Wi-Fi "problem areas".

With proper security highlights, mechanical equipment and modern interface items, wifi innovation has a specific relationship of business innovation, in light of the 802.11 innovation and is turning into an answer for some mechanical interchanges and systems administration.

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