802.11ac- Fifth Generation Wi-Fi

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Abstract— **Wireless Technology is a popular communication which is going worldwide at faster rate. One such protocol that is used in Wi-Fi is 802.11ac. It is called "Next Gen" Wi-Fi. This 802.11ac standard is used to provide improved power consumption over wireless communication and also data rate. It works faster than the other 802.11 standard. It makes use of "Beamforming" technology to detect devices over a wide range. It is also specified how it is able to work faster than 802.11n and overcoming the drawback of 802.11n.**

Keywords— - 802.11ac, Gigabit Ethernet, Beamforming, MAC and physical layer

I. INTRODUCTION

Wireless networks are very popular in today's world. It is becoming one of the most ubiquitous and continues to be the fastest growing area in the field of networks. There is high drive for Wi-Fi and data transfer over wireless for smartphone, tablet, pc and other user activities. To support all these there is an invention of fifth generation Wi-Fi called 802.11ac. It is called as "next gen" Wi-Fi. It make uses the MAC and physical layer. It facilitates the faster data transfer, improved reliability, good range, low interface level and improved better power consumption. This wifi is the latest and particularly for video streaming and

This standard is the evolution of 802.11n. Offering high speed over wider bandwidth. [1]This is accomplished by extending the air interface concepts embraced by 802.11n.it has a very good compatibility. [2]

II. WHAT IS 802.11AC?

802.11ac is a wireless network standard from the family of 802.11 which is developed to provide high throughput

Fig.3: 5GHZ Wi-Fi [6]

WLANs (Wireless Local Area Network) on the band of 5Hz[3]. It is the improved version of factors like providing wider RF bandwidth, more spatial streams and high modulation of density.

A. Goals of 802.11ac

There are many goals and drivers for 802.11ac. One of the goals is it must provide a higher performance that are equivalent with gigabit Ethernet networking for delivery of data. It should give the user an instantaneous experience of data transfer experience. Even at higher loads in the link it should be able to provide a wider RF wider bandwidth, more spatial streams (up to 8), downlink multi user MIMO(up to 4 clients) and higher density modulation(up to 250- QAM).[1]This standard has an favour in evolutionary improvement in technology over half a dozen years. It provides more functionality by integrating the access points. It supports some of the dimensions like space division multiplexing, low density parity check (LDPC), coding, space time block coding(STBC), explicit feedback transmit beamforming and shortened guard intervals. The main goal is to increase its throughput using its basic set. It uses orthogonal frequency division multiplexing to regulate the transmission of bits over wireless link.[5]

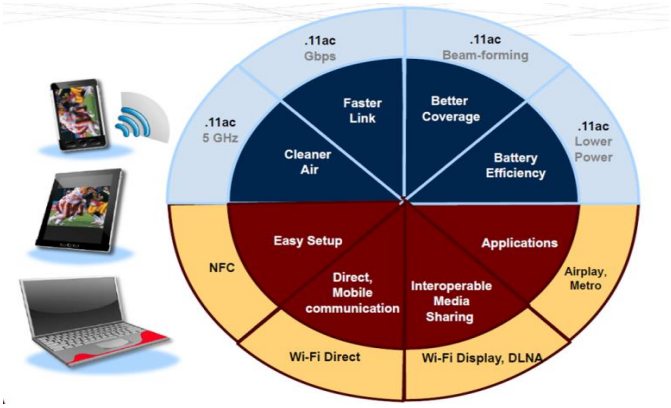

Figure 2: Goals implementation [6]

B. ACRONYMS

- MIMO – Multiple Input Multiple Output.
- QAM- Quadrature Amplitude Modulation
- MU-MIMO- Multi User Multiple Input Multiple Output.
- LDPC- Low Density Parity Check
- STBC- Space Time Block Coding

C. HOW DOES THE 802.11ac WORKES SO FASTER??

As the main goal of this device is to provide data transfer at faster rate,the speed of this device depends on mainly 3 factors. They are,

- It has extended channel binding up to 160MHz.
- Denser modulation
- More MU-MIMO

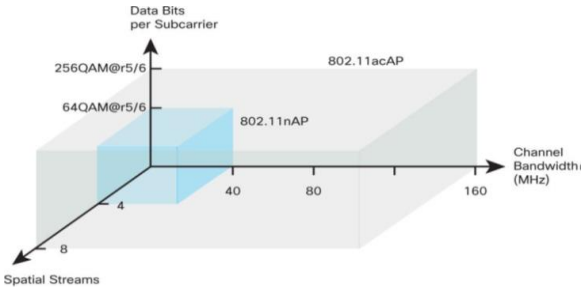

Figure 3: 802.11ac acceleration [6]

Some of the other features that speeds up the standard are

- Changes in MAC layer
- Beamforming technology
- Downlink MU-MIMO that is it can connect up to 4 clients at simultaneous

The speed of this standard is directly proportional to the spatial streams. More is the spatial stream more is the antennas, RF chains, RF connectors are required t transmitter and receiver so that it can drive many more mobile devices to reduce the number of antennas. And this antennas
have to be placed one-third apart of wavelength [2].

III. "BEAMFORMING " TECHNOLOGY IN 802.11AC

Beamforming technology is a non-proprietary that can integrate devices that can provides a greater performance over the wireless communication. It is a powerful technology that is capable of detecting the devices that is need of wireless and focuses on it. The number of devices it can focus is in range of 1 to 20. An access point with implicit beamforming can beamform devices without it by giving a better performance. 802.11ac uses this technology to transfer data at wider range and also with access points with or without it. It is also used in digital system processing (DSP) logic to access point over a range. In single system it uses the principal where signals are sent over different antennas and collectively received at receiver side by use of this technology. So 802.11ac can detect strongly needed wireless devices and gives better performance over data transfer [3]..

IV. COMPARING 802.11AC WITH 802.11N

802.11ac is evolution of 802.11n. It has overcomes many of the disadvantage of 802.11n.

- In both the standard MIMO, IDPC and STBC are supported.
- The channel bandwidth of 802.11n is 20-40MHz whereas of 802.11ac is from 80-160MHz.
- 802.11n has a bandwidth of 2.4GHz whereas in 802.11ac it is of 5GHz.
- No of spatial stream in 802.11n is up to 1-4 whereas in 802.11ac is up to 1 to 8.
- MU-MIMO is not at all supported in 802.11n but it is an optional in 802.11ac.
- Implicit feedback transforming is not supported in 802.11ac but it is supported in 802.11n.
- Max A-MPDU size is 65,535 octets in 802.11n whereas in 1,048,575 octets in 802.11ac.[2][5]

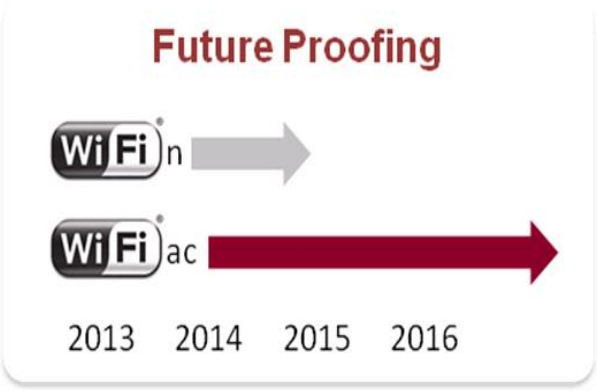

Figure 3: Increase in the performance.

V. MU-MIMO

MU-MIMO is a technology where it shares the network to the user using the hardware like filters, antennas. This router measures the time it takes for the user to receive the data on network and also compares the time between different users network. This router works on principle of first identifying the location of the user then from base station it transmits the beam signal through the antenna strongly to that particular user. It works in downstream direction and makes use of beamform technology to transmit signals to the user. This is not mainly used to increase the performance of the data transfer but increases the utilisation by transmitting to the multiple users .[7][8]

VI .CONCLUSION

Overall it can be concluded that 802.11ac standard provides an efficient way of data transfer over heavy loads. When compared with 802.11n many of the features are same and some of them are improved for increasing the performance, range, efficiency and detecting the devices which is need of wireless and provides communication better by using beamform technology.

REFERENCES

[1]"802.11ac – The Fifth Generation of Wi-Fi", Technical White Paper, http://www.cisco.com/c/en/us/products/collateral/wireless/aironet-3600-series/white_paper_c11-713103.html
[2]" IEEE 802.11ac -2015", http://en.wikipedia.org/wiki/IEEE_802.11ac
[3] Bart Giordano," Beamforming: 802.11ac Promises Great Wi-Fi Enhancements But You Can Jump Today", www.networkworld.com
[4] Siguard Schelstrate, "Designing Reliable Wi-Fi for HD delivery Through out House", White Paper www.quantenna.com
[5] Bill Kish www.rukuswireless.com/technology/802.11ac
[6] www.google.co.in
[7] Ian Poole, www.radio-electronics.com
[8] Peter Bright, arstechnica.com